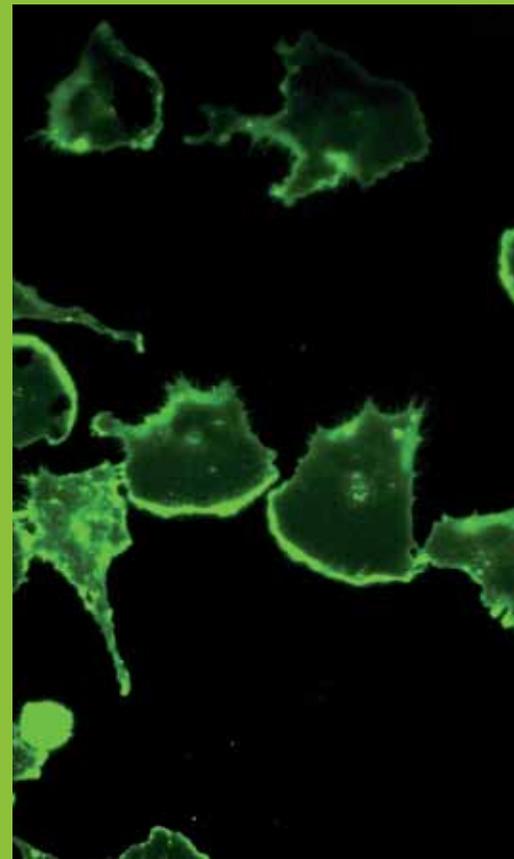
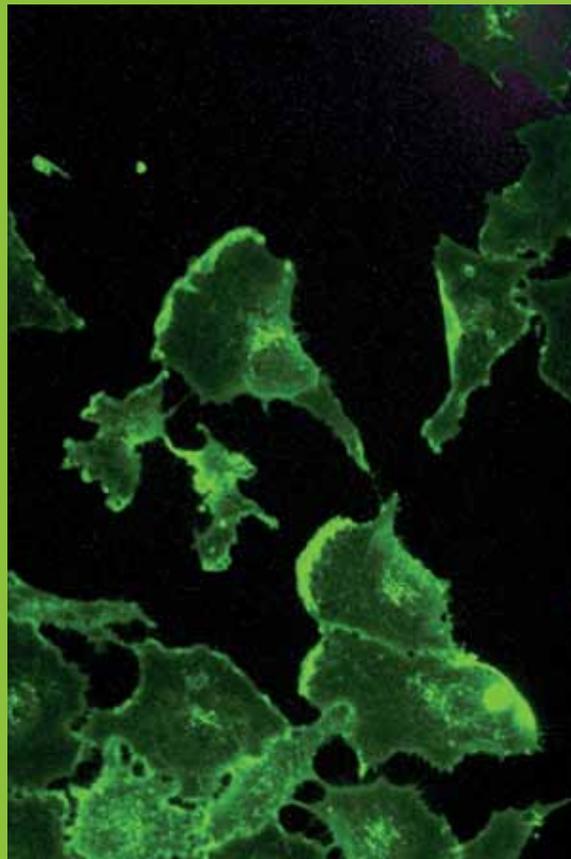
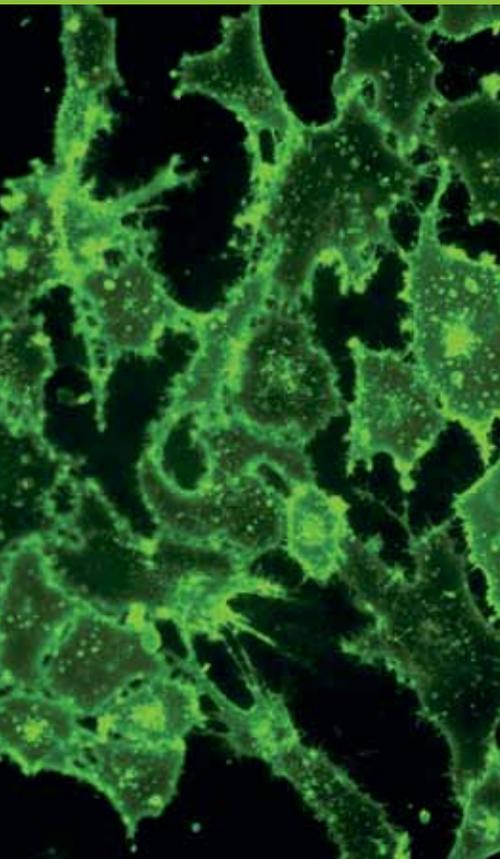


# CenterPiece

Research Scholarship, Collaboration, and Outreach at Northwestern University

FALL 2010



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## Innovation Issue

The Bayh-Dole Act of 1980 encouraged universities to license and commercialize inventions made with federal funds, thus bringing to the public a return on the investment of their tax dollars. Getting those inventions to the market, however, is a rocky road. In this issue of *CenterPiece*, we gather success stories of researchers who overcame the obstacles to bring their inventions to market. And we also give credit to some of those whose job it is to enable such success. Because for Northwestern, "Innovation is an organization-wide effort," as Alicia Löffler says in the interview on page 6.

You spoke — we listened and took action, as you might notice in this issue of *CenterPiece*. The results of our spring readership survey were gratifying. A majority of respondents in every group surveyed (faculty, staff, students, and postdocs) told us that *CenterPiece* improved their opinion of Northwestern University. Almost half of our readers read or scanned the whole issue, although very few read it online. A number said they needed fewer or more copies sent to them, so we have streamlined our

distribution. The most consistent criticism we heard was that our readers wanted to read more about the social sciences and humanities, and we have begun to address that concern in this issue (see pages 17, 24, and back cover).

As always, we thank you for your input. Please feel free to continue your constructive feedback on Office for Research publications. We're always looking for article ideas, so please let us hear from you.



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Jay Walsh, Vice President for Research  
Meg A. McDonald, Senior Executive Director  
Joan T. Naper, Director of Research Communications  
Kathleen P. Mandell, Senior Editor  
Amanda B. Morris, Publications Editor  
Beth Herbert, Assistant Director, Science in Society

Address all correspondence to:  
Joan T. Naper  
Director of Research Communications  
Northwestern University  
Office for Research, 633 Clark Street  
Evanston, Illinois 60208

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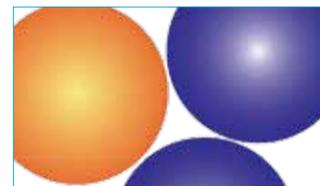
The Office for Research promotes, facilitates, and enhances research at Northwestern University.

Editors  
Joan T. Naper, Kathleen P. Mandell, Amanda B. Morris  
Tom Fredrickson, University Relations

Design, Art Direction & Production  
Kathleen P. Mandell

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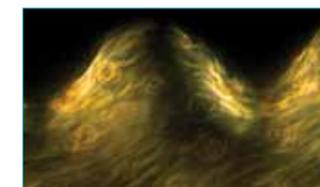


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**COVER** – Researchers at the Falk Center for Molecular Therapeutics have identified abnormal molecules on the cell surfaces of brain tumors. Malignant brain tumor cell-surface sugar structures are shown by using a panel of fluorescently labeled sugar binding proteins (lectins). It can be seen that the changes responsible for decreasing glioma invasivity are predominantly localized to the invasive leading edge of these cells (the especially brighter green areas at the edges of the cells). This work has led to a novel class of potential therapeutics for malignant brain tumors in adults and children. Images courtesy of the Falk Center [<http://falk.mccormick.northwestern.edu/>]. See article on p. 22.



**26**  
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William Halperin, physics and astronomy, could sense that something was in the air. In October 2008, one of the students in his lab called a supplier to place an order for 10 liters of helium-3 to discover that prices had increased from \$150 per liter to \$1,000.

“That didn’t sound right,” says Halperin, who uses helium for basic research and discovery at low temperatures. “We checked around with other companies, and they wouldn’t even give us a quote. So I knew something was happening.”

## THE HEAVY TRUTH ABOUT HELIUM

Halperin later spoke with representatives from six companies, finding that only two still had helium supplies. The prices ranged from \$800 to a whopping \$2,000 per liter, well outside of his research budget. And things continued to worsen.

The following summer, Halperin was contacted by the largest supplier of low-temperature refrigerators, which use liquid helium for cryogenic cooling. The company informed him that they were unable to obtain any helium-3 from their supplier, so their business was in jeopardy.

The helium shortage was sudden, taking businesses and researchers by surprise. And the shortage was global, touching every corner of the international market.

Helium-3 has its origins in the nuclear weapons industry. Tritium, an isotope of hydrogen used as fuel for the H-bomb, has a shelf life and decays with time into the more inert helium-3. Helium-3 must be extracted as a maintenance measure. Naturally occurring helium-3, on the other hand, is a million times more rare than helium-4, the more massive isotope that’s found in party balloons.

Because it can achieve cryogenic temperatures as low as within a few thousandths of a degree of absolute zero, helium-3 is ideal for low-temperature scientific programs, including superconductivity, magnetism, nanoscience, and quantum information technology. In addition, the valuable isotope is used for neutron detection, oil and gas-well evaluation, building construction technology, and the improvement of lasers.

“Since the end of the Cold War, helium-3 has diminished year by year,” Halperin explains. “There was a huge stock available early in 2001 that vanished due to a tremendous increase in demand.”

The question on Halperin’s mind was what caused the sudden increase in demand, and he found that the answer was amazingly opaque. “I’m not normally in tune with this,” he says. “I have a lab. We use helium. But I don’t know the marketplace.”

Halperin began making phone calls and was ultimately put in touch with three men at the Department of Energy (DOE) and

Department of Homeland Security. Through this chain, he discovered that helium-3 played a major role in security upgrades established after September 11, 2001. The gas is used as a detector of radioactive materials, such as plutonium and enriched uranium, at ports, airports, and border crossings.

“Homeland Security decided it needed many of these screening devices and contracted a company to develop the detectors,” Halperin says. “The company made them without first checking how much gas was available. So Homeland Security committed itself to a major capital program with billions of dollars invested, but it turns out there’s insufficient helium-3. The first reaction of the DOE and Homeland Security was that they’d just take everything they could. They depleted the stockpiles — taking about 150,000 liters — without looking to see what the equilibrium was between supply and demand.”

This left the stocks near zero, putting cryogenic research in a desperate situation. Matthew Grayson, electrical engineering and computer science, is one of the many scientists feeling the crunch.

“I was extremely lucky because I purchased and received my refrigeration system before the shortage hit,” says Grayson, who uses low temperatures to study conductors and quantum electronics. “But if I want to buy another system, I can just forget it. Not because the equipment is too expensive but because there is nothing. Nothing. The cupboard is bare.”

Armed with a comprehensive e-mail list of contacts from the global cryogenics community that he created when he chaired an international conference on low-temperature physics at Northwestern, Halperin became a point person for communications on the issue. With help from staff at Weinberg College, he created and conducted a survey finding that the purchase of helium-3 for low-temperature science averaged 3,500 liters of gas per year and grows at a rate of 12 percent per year. The current demand worldwide for all applications is

about 20 times greater. The production of helium-3 from the tritium in the remaining nuclear bomb stockpiles in the United States is 8,500 liters per year, creating a crisis for not just scientists but Homeland Security as well.

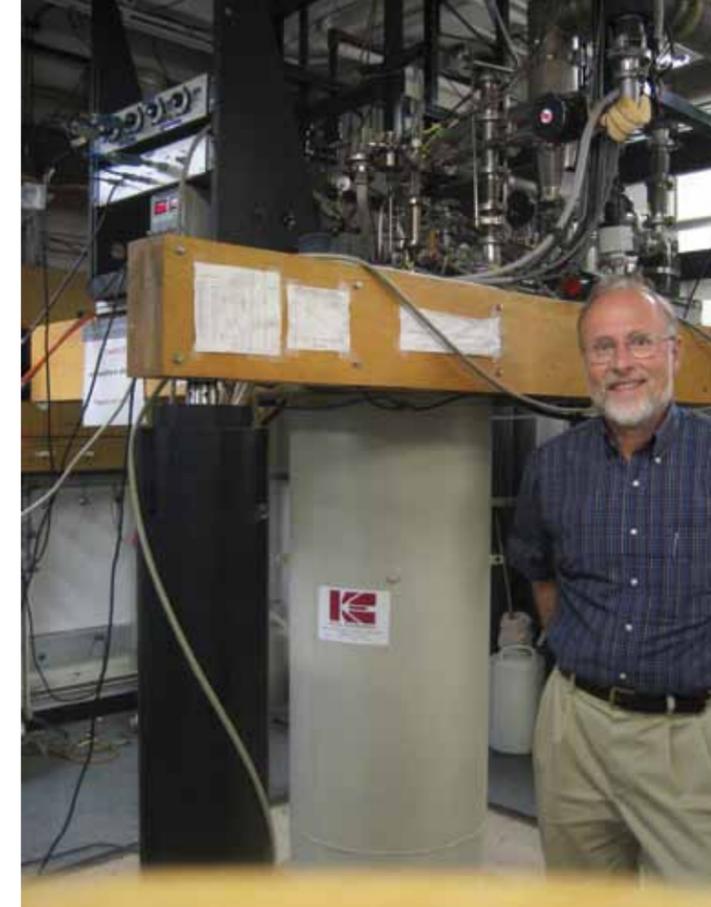
“The cryogenic community does not have any possibility for development of an alternative scheme,” Halperin says. “Helium-3 is in its DNA. There are no other alternatives.”

Helium’s stability and low energy of the electron cloud state make it inert, meaning that it is not chemically reactive like hydrogen and nitrogen. This quality combined with its ability to produce the lowest melting and boiling points of all elements, make it irreplaceable in the field of science.

When the U.S. Congress caught wind of the helium crisis, the Committee on Science and Technology organized a hearing called “Caught by Surprise: Causes and Consequences of the Helium-3 Supply Crisis.” Halperin was called to testify.

In his testimony, Halperin noted that eight Nobel laureates in physics in the past 25 years owed their accomplishments to the availability of helium-3. He stated that the DOE needs to explore alternate strategies for the detection of radioactive materials, implement helium recycling, and establish effective communication with the cryogenic community. He added that new sources of helium-3 must also be developed, and — because it takes tritium 12 years to decay — the process needs to start immediately.

Halperin’s lab has an immediate need for 20 liters and currently survives by recycling what it has. “When helium is released, the atoms go into the upper atmosphere and escape,” he explains. He keeps the gas in a closed circuit and



**Bill Halperin and the ultra-low temperature demagnetization cryostat.** This cryostat requires the rare isotope, helium-3, to achieve temperatures less than one thousandth of a degree from absolute zero temperature. Photo by Jai Li.

says he “tries very hard not to let it go.” But even the smallest threat to the system could be disastrous.

“We have to eliminate any risk of damaging our measurement system,” Grayson says. “It’s zero percent tolerance for any mistakes in the lab.”

In the meantime and under Halperin’s leadership, communication between government officials and the cryogenic community is improving. Working together, there are hopes that new solutions will be discovered, and the future of low-temperature science will become a lighter topic of discussion. — by *Amanda Morris*



Halperin (middle) testifies before Congress with Richard Arsenault (left) director of health, safety, security and environment at ThruBit LLC and (right) Jason Woods, assistant professor of radiology at Washington University in St. Louis. Photo courtesy of the U.S. House of Representatives Committee on Science and Technology.

# The Memory Ensemble: Enriching Lives Through Improv



In the first two photos, Memory Ensemble participant Janet has been sculpted by a partner into statues of feelings experienced in day-to-day life. In the third photo, Janet and Christine Mary Dunford improvise a scene together as the ensemble works on character development. Photos by Kristine Zachrich.

Each session starts with members describing what color best represents their mood that morning. Today, many people are green or yellow — happy — about spending the next hour sharing, learning, and laughing with their peers.

That is what the Memory Ensemble, a new collaboration between Northwestern's Cognitive Neurology and Alzheimer's Disease Center (CNADC) and the Lookingglass Theatre Company in Chicago, is all about. Designed for people with Alzheimer's disease and other forms of memory loss, the ensemble is a research program intended to enrich the lives of its participants through interactive, improvisational, performance-based activities.

"While we're searching for cures, treatments, and prevention for Alzheimer's disease, part of our job is to also find ways of improving the quality of life for people who have been diagnosed," says Mary O'Hara, a clinical social worker with the CNADC who directs the initiative with Christine Mary Dunford, an ensemble member of the Lookingglass.

The idea originated last year in a brainstorm between Dunford, also a cultural anthropologist, and Darby Morhardt, research associate professor and director of education for the CNADC. While there are many programs for people with early-stage memory loss that focus on the

creative arts, the incorporation of improvisational theater makes the Memory Ensemble one of the first of its kind in the country.

It kicked off this past summer with six participants; most are also patients in CNADC's clinical division. Each session combined group discussions with skill-building activities that allowed participants to act out their feelings and experiences in new ways. During one session, members took turns as sculptors and statues, nonverbally molding one another into forms that embodied different emotions.

"We're identifying and exploring common concerns — situations we all face in our daily lives — and then improvising moments that come to mind around these concerns," says Dunford, who leads the activities.

"Basically, we're just listening to each other. A few topics will surface that we'll choose to spend the rest of our time on. It may be directly related to memory, and it may not. That's okay."

Dunford and O'Hara feel that acting provides an especially comfortable framework in which to explore these thoughts and feelings, in large part due to the nature of improv. "For people with memory loss, trying to remember the past can be really frustrating and thinking about the future can be almost anxiety-provoking," says O'Hara.

However, improv focuses on the present — being "in the moment" — which O'Hara described as a "comfortable and safe place."

In addition to the fun factor, the Memory Ensemble may also provide participants with skills that are valuable both in and outside of their sessions. "Because we're using improvisation, people are learning or rediscovering their imaginations and how skilled they are at making sense of things in the moment," says Dunford. This may help alleviate some of the anxiety that comes with memory loss, she explained, by providing participants with new tools to help them communicate.

"They might realize that they have other skills and use what they know to improvise their way into being successful at that moment," she says. "They don't always have to know exactly the right word. They can trust that they'll come up with something to get their point across."

The eight-week pilot ended in August, and Dunford and O'Hara are hopeful that the project will resume in spring 2011. They conducted pre- and post-session evaluations to determine the benefits of the program, and the results were very positive: participants found the sessions both cognitively stimulating and emotionally supportive, which helped them better cope with their diagnoses and feelings of isolation.

Some of this success may be traced to the fact that, while retaining common themes, the sessions featured new, stand-alone activities each week. "When you are diagnosed with any kind of cognitive impairment, we emphasize how important it is to stay active and keep your mind engaged and stimulated," says O'Hara. "It would be difficult for such a person to take a regular class because it demands a lot from a person's memory. This program is specific to their needs, something they can feel good about doing — a place where they can feel successful and supported."

Perhaps most important, the ensemble brought together people experiencing the same changes and challenges. In the final evaluations, some members noted that the ensemble brought a sense of normalcy to their lives. "It can be so isolating to have memory loss," says O'Hara. "That's one of the benefits of this program: participants know they're not alone and that there are other people who understand their experience. There's camaraderie there." —by Beth Herbert

For more information about future sessions of the Memory Ensemble, contact Kristine Zachrich, research study programs coordinator with CNADC, at 312-908-9023.

# BRINGING IT ALL TOGETHER: ALICIA LÖFFLER



Alicia Löffler

Gregory Snyder/INVO

**E**arlier this year, the Office for Research named Alicia Löffler as associate vice president for Innovation and New Ventures and executive director of the new Innovation and New Ventures Office (INVO), an umbrella organization that brings together commercialization ventures from across the University, including the former Technology Transfer Program. INVO provides a focal point for faculty in their roles as researchers, innovators, and inventors as well as for investors, entrepreneurs, research sponsors, government partners and leaders, and corporations interested in bringing Northwestern's research innovations to market.

## Why does NU need INVO?

Part of INVO's responsibility is to make sure the research conducted at Northwestern reaches the public. While invention is often an individual effort, innovation is not. Innovation is an organization-wide effort that influences how Northwestern behaves within and with the world around.

In order to get NIH and NSF grants today you need to show that the University has the infrastructure to move those innovations to the public. Northwestern brought in more than \$500 million in research funds last year, mainly from the

federal government — that's taxpayers' money — and so we have to ensure that we get the greatest impact possible from that research.

There are many types of technology and innovation offices at universities. On the one hand, at Stanford and MIT the offices are very transactional — they mainly do intellectual property transactions. They do them very well. They work in an environment so entrepreneurially vibrant that they can specialize in only one aspect of commercialization. Venture capitalists walk the halls of Stanford and MIT looking at researchers' innovative ideas. In other places — like Northwestern — that don't have that ecosystem, we have to invest more resources in trying to build an infrastructure that allows the movement of the innovations to market.

People from MIT tell me that in the past few years they hardly ever see a faculty member walk into their offices. Instead, they usually have venture capitalists come in and tell them, "You have this technology. You have to patent this technology." We haven't reached that point.

## How is INVO different from the Technology Transfer Office?

We moved from a transactional office, where you wait for faculty to come, to a more proactive, more customer-focused organization. We have people like Jim Bray and Marta Melar-New at NUCATS in the trenches seeking innovations with commercial or public impact and working with faculty to bring those innovations to a point where it makes sense to disclose them. We also are expanding our network with investors and corporations to help us develop our inventions and bring them closer to the market.

INVO will also be bringing some resources to the inventors by managing a pre-seed program, which originated at the Farley Center at McCormick. This program gives faculty members money — \$25,000 to \$50,000 — to commercialize their innovations. The money comes from funds or gifts from alumni. There may be other funding programs created as well.

We also have reached an agreement with representatives from capital organizations — venture capitalist types — who have agreed to look at our

innovations periodically. They assess the maturity of the inventions that are being developed.

## How can INVO help faculty members?

It's important to me that faculty see INVO not only as a service but as a place that adds value to Northwestern. At INVO, we have people and a network that can provide good advice about the next steps for commercialization.

We can help faculty bridge the gap between their research and its practical use for public benefit. We can help them to decide what's the best way to move their ideas to market, what should be their next move, which direction they should take.

We knew when we started INVO that we wanted to establish the accountability of the office and get more feedback from various groups. We have the subcommittee of the Board of Trustees, which existed even before INVO. And we now have an Investors' Board, which is composed mostly of alumni — entrepreneurial types who have an interest in the University — to help us become an innovation center. They are looking at our technologies and suggesting how faculty members can position their technologies for funding. It's a way to leverage our resources, which includes one of the greatest alumni networks, especially if you consider Kellogg and all the other schools. We have alums in influential positions in almost every company and venture firm. So every quarter I'm sending this Investors' Board a list of the innovations Northwestern is producing.

Then we have the Faculty Committee, which meets quarterly, and helps us listen to faculty needs and lets them hear how we operate.

We also are working with the local universities to augment our ecosystem. For example, we're creating the Chicago Innovation Mentors Program with the Chicago Biomedical Consortium (CBC) schools (Northwestern, the University of Chicago, the University of Illinois) and iBio to mentor the faculty to help start up companies.

This system is modeled on the Kauffman-MIT Venture Mentoring Service. It's a way to engage alumni, to engage people with entrepreneurial experience on the coasts, and to encourage them to develop more meaningful relationships with the University. Alums like it because it

connects them not only with other Northwestern alums but also with alumni from other universities. It creates the feeling of a club — people who are in the same space and have an excuse to get to know each other. It's a very high-level type of interaction. And then faculty get advice from very highly qualified people from all three universities.

#### What do you personally bring to INVO?

My PhD is in science, I've been on the board of several start-up companies, and I still am on the board of several others. I've been on the board of venture firms, so I understand how the investment community works. I served on the Kellogg faculty for many years. I've been on the board of small companies for the last 20 years. I lived through the biotech booms. Since biotech started I have been connected with start-ups. I've been in the industry for 30 years. Those who know me know what I've done; they know my work.

#### What is the biggest misconception people have about intellectual property?

Not everything has to be patented. There are other ways to protect your ideas.

Also commercialization is not necessarily about making money. A good example is the Global Health Foundation, the first non-profit from any university to develop and distribute products for the developing world. Dave Kelso, a faculty member in biomedical engineering at McCormick, and his group started the foundation because otherwise these products would never have seen the light. No venture capitalist would invest in them because no company would be interested in products with such small profit margins. How can you make money in Africa with a diagnostic kit that costs \$1? Yet these are great products that should make it to the public.

At INVO we're installing a new online knowledge system called Wellspring that will make the technology transfer process transparent. Faculty will be able to follow the process of their patents and other contracts in real time. Transparency is a good strategy for working well with others.

#### What's the best way for a faculty member to start the process?

Call INVO. If they don't know whether they have an idea or an invention, they should call the office. Call Jim Bray, for biotechnology products. Call Alan Hauser, the INVO executive director for business development.

We expect to have about four spinoffs a year. This year it was Aurasense, Chad Mirkin's company that develops nanoparticles to deliver biomaterial directly into cells; David Kelso's Global Health Foundation; and Kristian Hammond's Narrative Science, a news media service. And we have other options for potential start-ups.

#### What do you think the future will bring?

I want people to think about Northwestern as a very innovative, creative place. There are reasons for this optimism. Our size is just right, and we have every single discipline. We interact well with each other. We have the perfect brew for innovation and creativity.

The innovations that come from Northwestern will be a little different from the ones that come from MIT, for example. An example of the new innovations coming up can be illustrated with Narrative Science, where you have people from engineering interacting with people from journalism and coming up with something really new and creative. Those innovations are uniquely Northwestern's. I can see interactions with engineering and theater, or medicine and communications. I think that being close to journalism, law, communications, education, and theater is key to having very creative innovations.

We can bring forward innovations that no one else can. At the University of Chicago, for example, they don't have engineering. We have great opportunities to create something wonderful.

One member of my advisory board keeps saying, "This is going to be so great. You really can create Northwestern as a brand for innovation." Northwestern's innovation will reflect all the creative elements we enjoy here at the University. —by Joan Naper

# From Ideas to Innovation: Bridging the Gap

The concept of the solitary scientist creating major discoveries at his or her workbench has been made obsolete by the complexity of today's scientific research.

In his testimony to the U.S. Congressional Subcommittee on Health in June, Francis S. Collins, director of the National Institutes of Health (NIH), compared current scientific research to a race: "Science is not a 100-yard dash. It is a marathon — a marathon run by a relay team that includes researchers, patients, industry experts, lawmakers, and the public."

Here at Northwestern there are a number of people on that relay team helping to translate basic science into solutions for society's medical, physical, and social ills. They include Jim Bray, assistant director of the Center for Translational Innovation at NUCATS (Northwestern University Clinical and Translational Sciences Institute); Michael Marasco, director of Farley Center for Entrepreneurship and Innovation at McCormick; Andrew Mazar, entrepreneur in residence at the Chemistry of Life Processes Institute (CLP); and Marta Melar-New, project manager for the Innovation to Commercialization Consulting Group (I2C) at NUCATS. All of them — and others — work with Alicia Löffler, vice president for Innovation and New Ventures, and the staff of the Innovation and New Ventures Office (INVO) to create, nurture, and inspire a culture of innovation at the University.



Jim Bray and Alicia Löffler listen to an entrepreneur during the Innovation Day pitch session.

## CREATING A CULTURE OF INNOVATION

In his testimony before the congressional subcommittee, Collins outlined the future strategy of the NIH: “NIH’s emphasis today and beyond will be on translating basic discoveries into new diagnostic and treatment advances in the clinic. That kind of translation must be built upon a vigorous foundation of basic science research supported by NIH — or else there will be nothing to translate.”

Translating research ideas into innovation is a relatively new role for universities. “The University’s role in society and in scientific research is changing,” says Andrew Mazar. “Even NIH, the primary benefactor for most university investigators, has said, “We want deliverables.’ We want to see that our grant money — taxpayers’ money — is being used in a productive way.”

Michael Marasco credits trendsetting companies that began in universities — such as Facebook (Harvard) and Google (Stanford) — for creating what he calls “the Facebook effect,” which inspires faculty as well as students to aim their research ideas toward the marketplace at early stages of product development. “This is a new responsibility for universities — to move research ideas toward commercialization,” says Marasco. “Technology advances that come from faculty, labs, and students can create phenomenal opportunities.”

Mazar says that the NIH’s new emphasis on deliverables parallels a de-emphasis on basic research in the biomedical industry. “Pharma has really abandoned a lot of the early-stage research. Here, we can cherry-pick research ideas,” he says. “We can take things that have gone down the pipeline slowly with NIH funding. When they hit the right point, we can get involved and shepherd them through the next set of experiments or whatever else it takes.”

Marasco says the faculty members who are successful commercializing their ideas often are the ones who are equally passionate about their research and teaching. “For some, their full potential isn’t reached without that third hat of entrepreneurship. Because we’re a private institution, we are able to give faculty members more flexibility to pursue that role, unlike public institutions that often have policies against faculty becoming officers of companies.”



Sam Levitan

Michael Marasco

## IN THE BEGINNING IS THE IDEA

The people interviewed for this article talked about welcoming faculty, postdocs, and students into their offices to talk about their ideas at early stages of development. Marta Melar-New is part of a new initiative between NUCATS and INVO called the Innovation to Commercialization Consulting Group or I2C, funded by an NIH supplementary grant to NUCATS, that handles biomedical ideas exclusively. “We saw an unmet need to help faculty understand the business potential for their ideas and discoveries,” says Melar-New.

I2C develops several projects each quarter, assigning three to five graduate students to every team to help move ideas toward commercialization. “Students used to be mostly from the Kellogg School of Management but not anymore,” says Melar-New. “We assign at least one medical or engineering student to each team as a technology consultant.” Students work with faculty to explore what the faculty members’ rights are, whether their inventions can and should be patented, expectations concerning royalties and licensing, options for commercialization, and potential funding sources. “Not all faculty need projects — for some, just a consultation for an hour or two will move them forward,” says Melar-New.

Mazar sees his role and that of CLP as a “One Northwestern” effort, serving all the scientific- and medical-related entities within the University. Drawing on his own biotechnology

## CONTACT INFORMATION

**Jim Bray**, assistant director  
Center for Translational Innovation  
NU Clinical and Translational Sciences Institute, Feinberg  
School of Medicine

j-bray@northwestern.edu  
312-503-1941

**Michael A. Marasco**, director  
Farley Center for Entrepreneurship and Innovation  
McCormick School of Engineering and Applied Science

mmarasco@northwestern.edu  
847-467-6347

**Andrew P. Mazar**, entrepreneur in residence  
Chemistry of Life Processes Institute  
Silverman Hall

a-mazar@northwestern.edu

**Marta Melar-New**, I2C project manager  
NU Clinical and Translational Sciences Institute, Feinberg  
School of Medicine

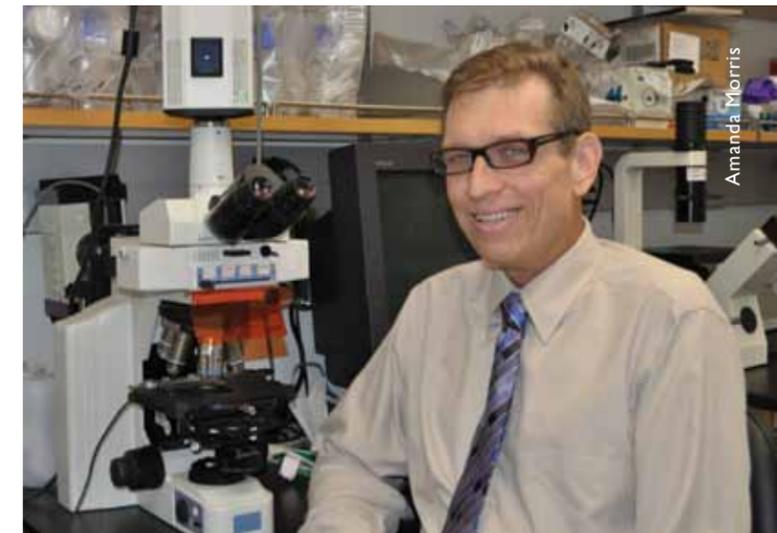
m-melar@northwestern.edu  
312-503-2221

experience, he specializes in drug development and is working a great deal with the Robert H. Lurie Comprehensive Cancer Center of Northwestern University. “I don’t have a specific agenda right now, except to try to help investigators bridge the obstacles that they might see for taking their ideas forward toward clinical use and ultimately toward commercialization,” he says.

One of the many projects Mazar is working on with the Lurie Cancer Center is the development of the Center for Developmental Therapeutics, which will contain disease-specific cores. The first core focuses on tumor biology and will serve the needs of cancer researchers working on drug development.

The Farley Center for Entrepreneurship and Innovation was begun in 2007 with the support of, among others, William J. White, professor of industrial engineering and management science and a University trustee; Julio Ottino, dean of McCormick; and Jay Walsh, then a professor and associate dean for research at McCormick and now the University’s vice president for research. “One of our roles is to serve as a sounding board for faculty members,” says Marasco. “The Farley Center has always served the University as a whole. We are excited to see INVO offering these services in a centralized fashion.”

One of the many hats Marasco wears as director of the center is that of landlord. He is in charge of the University incubator, two small offices in downtown Evanston that offer an address, desk, and shared services to faculty and students starting up their commercialization efforts. Faculty members can apply for a spot in the incubator. Each commercialization project is given six months to succeed, which can be extended by another six months if the project is making progress. Northwestern helps support the incubator. —continued on page 14



Amanda Morris

Andrew Mazar



Randy Belice

Marta Melar-New, project manager of Innovation-to-Commercialization (I2C), engages in a discussion at Innovation Day 2010.

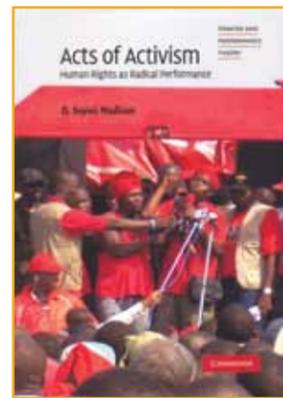
# ON THE BOOKSHELF

## *Human Rights as Radical Performance*

Cambridge University Press, 2010

**D. Soyini Madison, performance studies**

Madison presents the neglected yet compelling and necessary story of local activists in South Saharan Africa who employ modes of performance as tactics of resistance and intervention in their day-to-day struggles for human rights. The



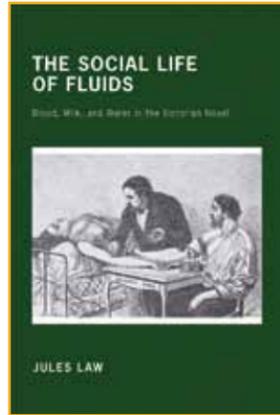
dynamic relationship between performance and activism are illustrated in three case studies: The first presents a battle between tradition and

modernity as the bodies of African women are caught in the cross-fire. The second focuses on “water democracy” as activists fight for safe, accessible public water as a human right. The third examines the efficacy of street performance and theatre for development in the oral histories of Ghanaian gender activists. Unique to this book is the continuing juxtaposition between the everyday performances of local activism and their staged enactments before theatre audiences in Ghana and the United States. Madison demonstrates how these disparate sites of performance cohere in the service of rights, justice, and activism.

## *The Social Life of Fluids: Blood, Milk, and Water in the Victorian Novel*

Cornell University Press, 2010

**Jules Law, English**



British Victorians were obsessed with fluids — with their scarcity and with their omnipresence. By the mid-nineteenth century,

hundreds of thousands of citizens regularly petitioned the government to provide running water and adequate sewerage, while scientists and journalists fretted over the circulation of bodily fluids. In *The Social Life of Fluids* Jules Law traces the fantasies of power and anxieties of identity precipitated by these developments as they found their way into the plotting and rhetoric of the Victorian novel.

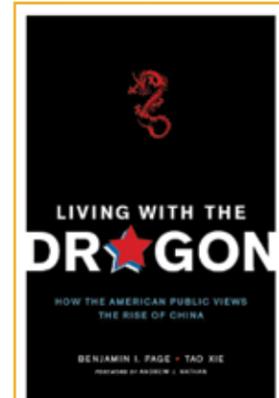
Analyzing the expression of scientific understanding and the technological manipulation of fluids — blood, breast milk, and water — in six Victorian novels (by Charles Dickens, George Eliot, George Moore, and Bram Stoker), Law traces the growing anxiety about fluids in Victorian culture from the beginning of the sanitarian movement in the 1830s through the 1890s. Fluids, he finds, came to be regarded as the most alienable aspect of an otherwise inalienable human body, and, paradoxically, as the least rational element of an increasingly rationalized environment. Drawing on literary and feminist theory, social history, and the history of science and medicine, Law

shows how fluids came to be represented as prosthetic extensions of identity, exposing them to contested claims of kinship and community and linking them inextricably to public spaces and public debates.

## *Living with the Dragon: How the American Public Views the Rise of China*

Columbia University Press, 2010

**Benjamin I. Page and Tao Xie, political science**



It is widely believed that most Americans not only distrust but also despise China. Considering the country's violent political

history, unprecedented economic rise, and growing military capabilities, China has become America's strongest market competitor and arguably the most challenging global threat to the United States.

Nevertheless, a full consideration of American opinion proves the opposite to be true. Carefully analyzing all available polls and surveys, Page and Xie find most Americans favor peaceful engagement with China. The public view has been surprisingly coherent and consistent, changing only in response to major events and new information.

While a majority of Americans are not happy that China's economy is projected to become as large as that of the United States, they are prepared to live with it. "Unfair" Chinese trade practices and their

impact on American jobs and wages are a concern, along with the quality and safety of Chinese-made goods. Page and Xie examine these opinions in relation to facts about China and in light of current U.S. debates on diplomacy and policy.

## *Murder and Its Consequences: Essays on Capital Punishment in America*

Northwestern University Press, 2010

**Leigh Buchanan Bienen, law**



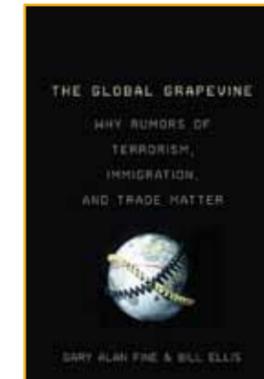
These essays span several periods in the history of capital punishment in America and the professional career of Bienen, a leading

researcher on the death penalty. “A Good Murder” describes the subtle relationship between high-profile murders and the death penalty, while “The Proportionality Review of Capital Cases” places the well-known study of proportionality in New Jersey within a nationwide context. “Anomalies” suggests that the arcane protocols written for lethal injection have little to do with insuring humane executions, but rather are concerned with protecting the sensibilities of witnesses and the liability of corrections officials. Other essays address the groundbreaking developments surrounding the death penalty in Illinois, and take a retrospective look at the evolution of the author's own and the country's thinking about this complex, divisive topic.

## *The Global Grapevine: Why Rumors of Terrorism, Immigration and Trade Matter*

Oxford University Press, 2010

**Gary Alan Fine, sociology** (with Bill Ellis, English and American studies, Pennsylvania State University)



Far from mere idle tales, rumors are a valuable window into our anxieties and fears. Rumors let us talk as a community about some very

inflammatory issues — issues that may be embarrassing or disturbing to discuss — allowing us to act as if we are talking about real events, not personal beliefs. We can air our hidden fears and desires without claiming these attitudes as our own.

In *The Global Grapevine*, Fine and Ellis, two leading authorities on rumor, folklore, and urban legend, shed light on what contemporary rumors can tell us about the fears and pressures of globalization. In particular, they examine four major themes that emerge over and over again: rumors about terrorism, about immigration, about international trade, and about tourism. The authors analyze how various rumors underscore American reactions to perceived global threats, show how we interpret our changing world, and highlight our fears, fantasies, and cherished beliefs about our place in the world.

Rumors are the visible tip of a vast iceberg of hidden anxieties. Illuminating the most widely circulated rumors in America in

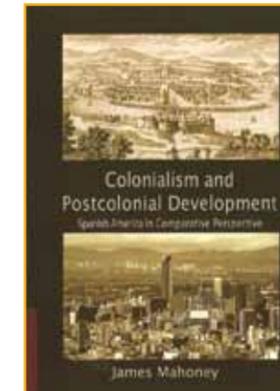
recent years, *The Global Grapevine* offers an invaluable portrait of what these tales reveal about contemporary society.

## *Colonialism and Postcolonial Development: Spanish America in Comparative Perspective*

Cambridge University Press, 2010

**James Mahoney, political science and sociology**

In this comparative-historical analysis of Spanish America, Mahoney offers a new theory of colonialism and postcolonial



development. He explores why certain societies are subject to certain kinds of colonialism and why these forms of colonialism

give rise to countries with differing levels of economic prosperity and social well-being. Mahoney contends that differences in the extent of colonialism are best explained by the potentially evolving fit between the institutions of the colonizing nation and those of the colonized society. Moreover, he shows how institutions forged under colonialism bring countries to relative levels of development that may prove remarkably enduring in the postcolonial period. The argument is sure to stir discussion and debate, both among experts on Spanish America who believe that development is not tightly bound by the colonial past, and among scholars of colonialism who suggest that the institutional identity of the colonizing nation is of little consequence.

*Innovations to Ideas* —continued from page 11

NUCATS's Jim Bray sees his role, in part, as a research concierge, sending researchers in the appropriate directions to meet their needs. "If investigators need to find a person or a resource at or outside the University, I have connections. I don't know everyone — far from it — but I know who to go to."

## BUILDING THE NETWORK

Moving an idea toward commercialization requires funding as well as ideas and effort. Another role these people play is putting faculty in touch with potential investors and advisers. Each of the groups they represent has an advisory board and formal or informal networks with alumni. The Farley Center works with NUCATS and INVO to provide seed funding for faculty business startups. With the Northwestern Memorial Foundation, the charitable arm of the hospital, NUCATS administers the Dixon Translational Research Grants Initiative, funded by the Dixon family, who donated money to the foundation for pilot grant funding.

This quarter, NUCATS and INVO started a quarterly commercialization clinic that offers a consulting service that gives faculty, postdocs, and students an opportunity to meet with lawyers, early-stage investors, and University experts on such topics as FDA regulations, commercialization, and licensing.

NUCATS sponsors a monthly commercialization seminar series in which speakers with relevant experience talk about a specific topic related to commercialization. NUCATS also sponsors an Innovation Day event held during Northwestern's Entrepreneurship Week each May, where faculty and students are invited to give five-minute pitches about their ideas to an audience of investors and representatives of companies involved in the licensing process.

According to Bray, many people have negative associations with the word "commercialization" because it sounds like it's all about the money. "The whole point is to develop these technologies and potential products into something that actually benefits the public," he says. "People don't understand that because of the failure rate, there's a lot of risk. Money and expertise are needed to get the product to market. Investors expect a return on their investment, and they want to be compensated for that risk — which is usually made possible through patent protection. That is why it's so important for investigators to work with INVO

to protect research that could have commercial implications. Without that protection, no one is going to invest in developing an invention and it will wind up sitting on a shelf."

Bray also is involved with INVO in rolling out the new Chicago Innovation Mentors Program based on the Kauffman-MIT model. "We connect biomedical faculty with experienced executives, who are often alumni of Northwestern or from one of our partner institutions: University of Illinois at Chicago and the University of Chicago. The goal is to help them navigate the path to commercialization for their potential products."

One of the tasks Mazar has taken on is helping faculty find out about the commercialization and start-up grants that are available to them. "Occasionally I'll run across the kind of grant that an academic scientist might not see; I'll recognize it as an opportunity for one of the scientists I've been working with and bring it to his or her attention," he says.

## FORGING THE FUTURE

Mazar agrees that the innovation effort reaches beyond Northwestern. "We're here for the university community," he says. "Not just Northwestern but UIC and the University of Chicago. A lot of us would like to see a strong biotech community grow here. We've got the intellectual firepower."

The national labs located in the Chicago area — Argonne National Laboratory and Fermilab — are great resources for these efforts, says Marasco. "We want to expand those relationships," he says. He also gives credit to ISEN (the Initiative for Sustainability and Energy at Northwestern) for "being a partner that makes energy research and teaching a key dimension of Northwestern."

"We're helping to bring about innovations to improve the quality of life and enhance the University's reputation," says Bray. "They can also help power the local economy by creating opportunities for companies and high-paying jobs. We're trying to maximize that potential for Northwestern and for the community."

Whatever the future of innovation brings for Northwestern, many people are working to make sure it happens. Francis Collins, quoting French author Antoine de Saint-Exupéry in the April 2010 issue of *Nature*, put it this way: "As for the future, your task is not to foresee, but to enable it." —by Joan Naper



Andrew Campbell

Charles Kuehmann and Gregory B. Olson

# INNOVATION AND RESULTS IN THE QUEST FOR BETTER MATERIALS

Although people use man-made materials every day, few realize how much work was poured into the materials' creation. Historically, new materials have been mixed in a lab through an expensive and time-consuming process of trial and error. One of the world's strongest and highest performing alloy steels, AerMet® 100, was purportedly named such because it was the 100th prototype in the discovery process. What if it could have been developed on the first try?

A new method based on the research of Gregory B. Olson, materials science and engineering, designs materials using computers and omitting the laboratory guesswork.



This work is the basis of QuesTek Innovations LLC ([www.questek.com](http://www.questek.com)), a company cofounded by Olson that designs new materials for customer-specific applications. "A customer will come to us with a problem and describe the properties and manufacturing requirements for the material they need," says Charles Kuehmann, cofounder, president, and CEO of QuesTek. "Using a computer



◀ An A-10 landing gear prototype production component made from QuesTek's *Ferrium S53* alloy. Image courtesy of QuesTek.

▶ An A-10 fighter jet, an aircraft for which prototype parts made of QuesTek's new alloys are being produced and/or soon will be flight-tested. Image courtesy of U.S. Department of Defense.



algorithm, we design a whole new material just for that application."

So far QuesTek's Materials by Design® method has been used to create new alloys for golf clubs, lighter gears for NASCAR vehicles, and more durable dental tools that require less frequent sharpening. However, the group's main focus is on the world of aerospace engineering.

"I was an aerospace engineer as an undergraduate at Arizona

State," Kuehmann says. "I had worked on designing aircrafts and knew the biggest problem was the materials."

Kuehmann decided to pursue materials science in order to further explore this problem. He came to Northwestern in 1988 and was the first PhD student in Olson's lab at McCormick. The pair has collaborated ever since, starting QuesTek in 1997 with a staff of four. Thirteen years later, the growing company has 18 on staff, many of whom graduated from Northwestern.

QuesTek recently redesigned the material used for landing gear on the Northrop T-38 Talon, the world's first and most produced supersonic jet trainer, and many other aircraft used by the US Air Force and others. The current landing gear

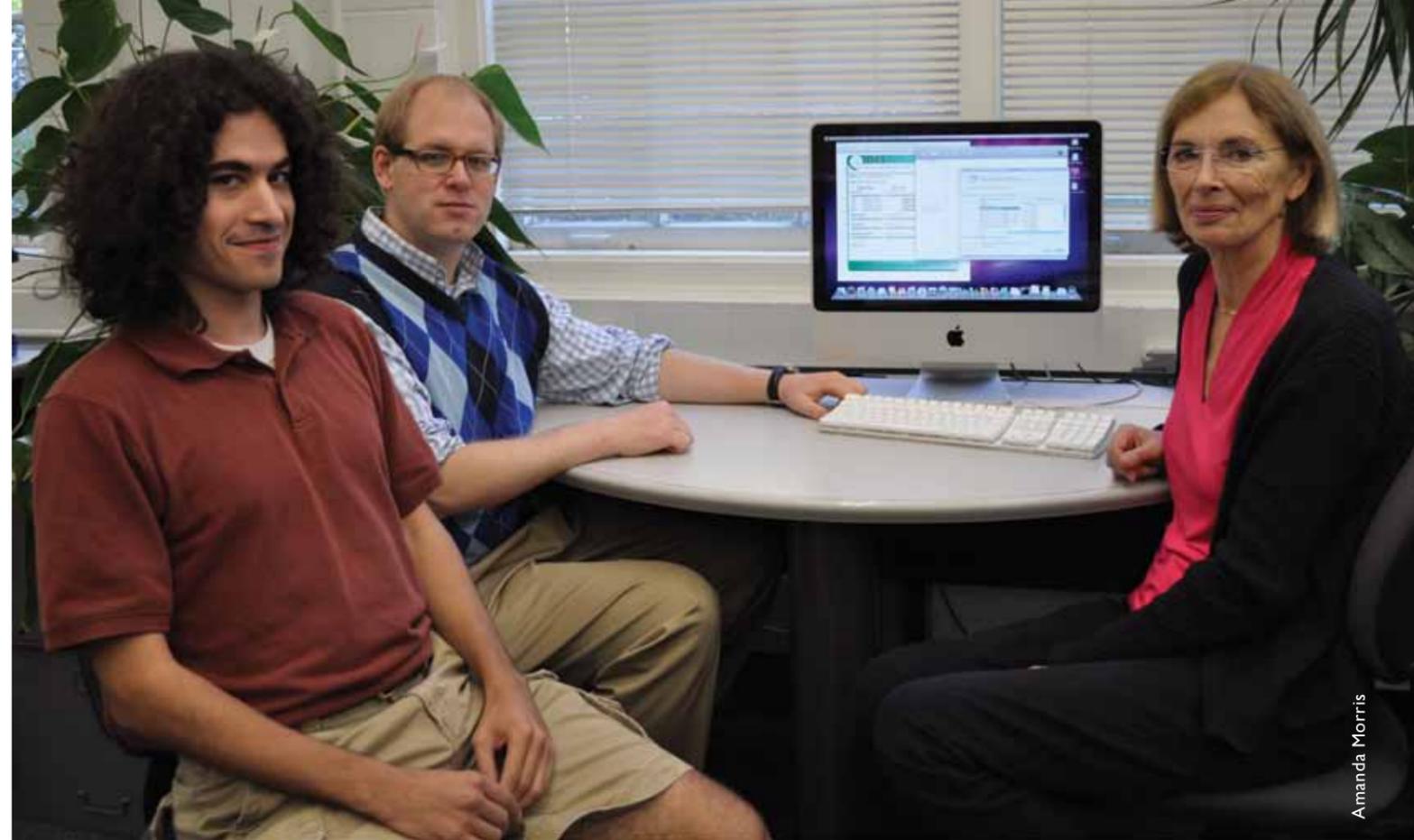
material is sensitive to environmental factors, causing it to corrode easily. It is commonly coated with cadmium, a metal that prevents corrosion but is toxic.

The team at QuesTek computationally designed a new alloy, *Ferrium S53*®, that had all the mechanical properties of the steels already being used as well as corrosion resistance that requires only a coat of paint. The first T-38 jet trainer with this new alloy is expected to take flight in December. QuesTek's next project is for a similar but tougher material for U.S. Navy planes; this alloy — *Ferrium M54*™ — is already in early production. QuesTek has commercially introduced four high-performance alloys (through production licensees) in all and has more than 10 other materials in its development pipeline.

"We do this kind of work because the needs are great and traditional methods are so inefficient," Kuehmann says. "It's pretty exciting to see our new materials get out there and get used, to protect the environment and improve lives."

In the long term, QuesTek is expanding into the energy industry with ideas for improving the efficiency of coal-fired power plants and the durability of wind turbines. The group is researching new materials for the Department of Energy.

"What we're doing at QuesTek really is the future," Kuehmann says. "Fifty years from now, it will all be done this way. People won't be mixing alloys in a laboratory anymore. This is the future, and we're in the forefront." —by *Amanda Morris*



From left to right: Zachary Schneirov, Matthew Taylor, and Janine Spencer

Amanda Morris

## DiLL: Language Lab of the Future

Students who learned languages in the second half of the 20th century probably remember language labs: the tight little carrels, perfect for afternoon naps; the tape-eating analog tape recorders that played improbable and often incomprehensible conversations; the earmuff-style headsets that would screech with the slightest adjustment. Janine Spencer, French and Italian, refers to them as "jails."

Now, language students have access to the Digital Language Learning Lab (DiLL), thanks to the efforts of faculty and staff at Northwestern. DiLL is a unique Macintosh-based audio system that can enhance the way language is taught. Installed and developed at the Multimedia Learning Center (MMLC) in Kresge Centennial Hall, DiLL is also being licensed to run in other venues. DiLL is the brainchild of Janine Spencer, academic program director of the MMLC, in consultation with Li-Cheng (Richard) Gu, African and Asian languages. Their ideas were translated into software and are being continuously updated by the MMLC's Matthew Taylor, systems architect and Zachary Schneirov, software developer.



John Paluch, distinguished senior lecturer in the Department of German, leads students of German 101-1 in a paired-partner activity using DiLL. Five sections of the course make use of DiLL on a biweekly basis. The German program set the improvement of pronunciation as a goal and now uses DiLL to sharpen aural comprehension, polish pronunciation and provide students with additional structured conversation practice.

## Digital Solution

DiLL software provides a central digital control panel from which a language instructor can listen to and correct students as they speak. Using the DiLL software, an instructor can see and hear what each student is working on and communicate with the entire class or with individual students. Every recording a student makes while working or testing is automatically saved to the server where the instructor can access them remotely at any time to review and evaluate the student's work.

The genesis of DiLL came about when Spencer was tapped to be acting director of WCAS's language lab in 1994. She was faced with outdated equipment and a tight budget. The few proprietary systems available were

extravagantly expensive and required replacement of all the existing equipment. She decided to explore the possibility of a computer-based solution to replace the old language lab.

Then, in 2003, a summer internship funded by the Hewlett Fund for Curriculum Innovation brought undergraduate computer science major Schneirov into the picture. Schneirov was already experienced in developing software on the Mac platform, having developed Notational Velocity, a note-taking application, and development of DiLL took off. Spencer had identified a number of necessary features the revamped lab would need to have. She wanted open space, not claustrophobic carrels; she wanted students to have the ability to communicate easily with one another and with the instructor; and she wanted a digital system to replace

the outmoded analog technology of tape recorders. As the software was being developed, Schneirov recommended that the lab make use of unobtrusive laptops to further break down the barriers Spencer sought to eliminate.

Audio quality was essential to Gu because of the importance of tones to the Chinese language. The developers applied digital sound processing, which takes sound as a wave form and enables the transformation of the signal. Students using DiLL can slow down the audio without losing its sound quality.

## Protecting and Licensing Their Intellectual Property

Recognizing the potential applications of their system, Spencer and her team knew it was important to bring their invention to the Technology Transfer Program (the predecessor of the new Innovation and New Ventures Office) at an early stage. Working first with Indrani Mukharji (now executive director of international research partnerships in the Provost's office), and then with Gary Behler (now INVO licensing associate), they realized that licensing was the appropriate road to take to both protect and market the product. "TTP was indispensable to our work," says Taylor. "We couldn't have done it without them."

The DiLL team's relationship with their local Apple representative led to their first licensing opportunity. A school district in northern Illinois that used Mac computers was looking for a language learning system, and the match was made. Illinois Township High School District 214 became a beta tester site as well as their first licensee in 2005. The license

began with two schools and now is installed in all seven schools in the district. Other licensees include the University of Chicago Laboratory Schools, the University of Minnesota, and Columbia University in New York. The first international license was issued in 2006 to the coincidentally named North-West University, in Potchefstroom, South Africa, in a predominantly Afrikaans-speaking region. Approximately 26 licenses have been issued so far.

Licensing of DiLL is somewhat constrained by limited resources. Taylor and Schneirov, who work on installation of the licensed systems, have other responsibilities at the MMLC. Despite the time pressures, what they learn installing the system proves invaluable in further developing the application. Taylor cites creative curricula that he has discovered in language classrooms — such as setting up the room as a United Nations assembly or playing the "telephone" game — as innovative uses of the system's flexible configuration. Taylor and Schneirov hope that in the future their installation experiences can help develop the product even further, using the MMLC — where DiLL is installed on 55 computers in three computer labs — as a proving ground.

"Instructors are able to create their own curriculum and have students play games and have fun while they learn," says Spencer. "We can see that the students have more fun and that they're more engaged and more comfortable. We no longer have to wake them up as we used to have to do in the old language labs." —by Joan Naper



Photos in this article by Amanda Morris.



Mercouri G. Kanatzidis looks on as Manolis Manos, postdoc in the lab, examines a crystal of a cesium-capturing sulfide material for possible x-ray diffraction. New materials in the Kanatzidis lab are investigated with x-ray diffraction in order to determine their composition and atomic structure. Photo courtesy of Department of Chemistry.

## Seizing the Cesium: The Venus Flytrap Effect

Since the beginning of the nuclear age in the 1940s, the United States has accumulated 77 tons of radioactive nuclear waste — with no secure or permanent place to put it. The proposed plan for a national nuclear waste dump at Yucca Mountain, Nevada, has been withdrawn. The *New York Times* reports that more than \$10 million has been spent since 1983 to find a place to store nuclear waste.

Mercouri Kanatzidis, chemistry, has developed a partial solution to the problem of radioactive nuclear waste storage: a gallium compound that traps cesium, one of the most lethal components in nuclear waste. Cesium is a byproduct of nuclear fission processes in nuclear reactors and nuclear weapons testing.

“Cesium comes from the conversion of the nuclear fuel,” says Kanatzidis. “When the rods are processed, soluble cesium is generated.”

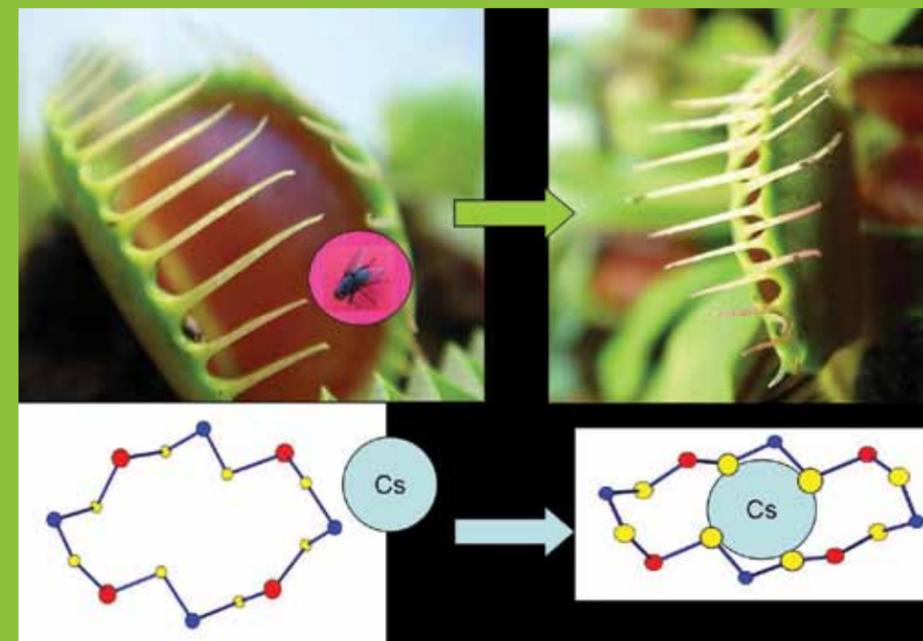
Small quantities of cesium<sup>137</sup> also can be found in the environment from nuclear weapons tests in the 1950s and 1960s and from nuclear reactor accidents such as the Chernobyl power plant accident in 1986, which spread cesium<sup>137</sup> to many European countries.

Kanatzidis compares his cesium-capturing compound to the Venus flytrap. Just as that plant captures only its prey, ignoring less appetizing intruders, his material also discriminates, trapping only radioactive cesium.

“The challenge is to find something that recognizes that very small amount of cesium and discriminates against other ions that are in greater concentrations like sodium and calcium,” Kanatzidis says. “This material acts like a Venus flytrap and actually has open pores. When the cesium gets in, it’s recognized and the pores close. Other materials can go in, but the pores don’t close, and they can come out. Only when the cesium goes in do the pores close. Therefore you can capture it.”

### Reducing the Volume of Radioactive Waste

A major benefit of this material is that it can reduce the volume of radioactive nuclear waste. Spent reactor fuel, which contains cesium, usually is stored in large water-cooled ponds at nuclear power plants. The water is considered part of the waste in volume.



The Venus fly trap is an analog for the process that uses a gallium compound to capture toxic cesium from nuclear waste. In the same way the Venus fly trap closes only upon its prey, the compound discriminates, trapping only the radioactive cesium, allowing harmless materials to flow through untouched. Image courtesy of Kanatzidis lab.

But if the water were removed and cleaned, the volume of radioactive waste would be greatly reduced.

“Let’s say you have a big, Olympic-size swimming pool contaminated with cesium,” says Kanatzidis. “Using my process, you should be able then to reduce all the cesium in that swimming pool to an amount that can be contained in an average jar. It’s a very high-level reduction. You can reuse or dispose of all that water in another way because it’s no longer harmful.”

The captured cesium can be converted into a glass by combusting it and melting it into an oxide, which has glass properties. Glasses are very stable and can be disposed of according to government protocols.

### Removing Toxic Metals

The road to commercialization of the Venus flytrap material is a rocky one, admits Kanatzidis, because gallium, a component of the material that captures the cesium, is extremely expensive. Yet the Kanatzidis lab has developed variations of the Venus flytrap cesium-capture process that remove toxic metals such as mercury, cadmium, and lead from compounds that are hazardous to human health. These heavy toxic metals are most often found in water polluted by industrial wastes. As a result, nearly all fish and shellfish contain traces of mercury, which can accumulate in an organism’s blood stream over time.

“These materials that capture the toxic metals are inexpensive, and the process is scalable to large industry,” says Kanatzidis. “You can pass contaminated water through columns of these materials and then the stuff that comes out the other side is devoid of any of these toxic metals. When the column is saturated, you can dispose of it.”

Like the cesium-trapping material, the materials that capture the toxic metals belong to the general class of materials called sulfides,

which have sulfur in their structures. It is the sulfur that shows the selectivity for binding with the toxic atoms.

“The sulfur in heavy metals likes to make strong bonds, we’ve known that for a long time,” Kanatzidis says. “And in these materials the sulfur is positioned in such a way to make strong bonds easily — permanent bonds, basically. Once these structured bonds take hold, it’s very difficult to break them.”

Kanatzidis, the Charles E. and Emma H. Morrison Professor of Chemistry at Northwestern University, holds a joint appointment with Argonne National Laboratory and conducts some of his research there. He is part of ANSER, the Argonne-Northwestern Solar Energy Research Center; NSEC, the Nanoscale Science and Engineering Center; and the Center for Catalysis and Surface Science. His materials research is funded in great part by the National Science Foundation.

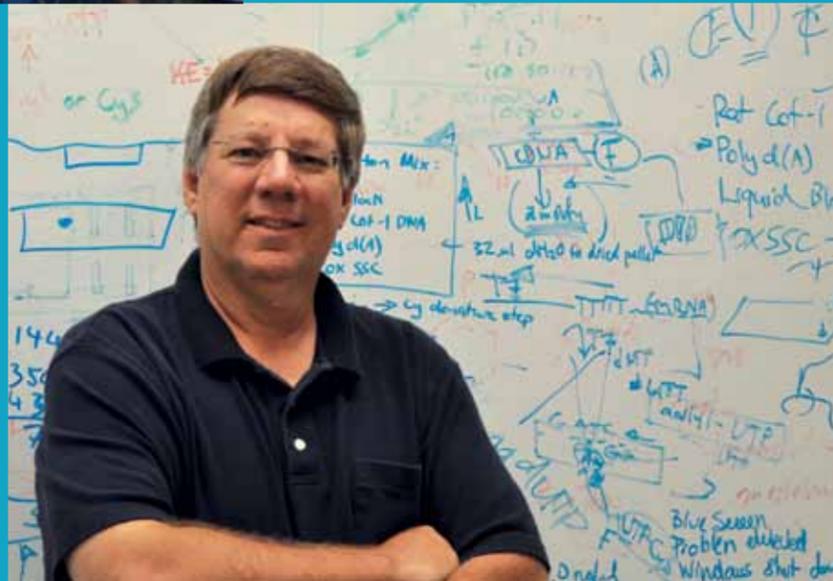
His cesium-capturing material was described in an article authored with former doctoral student Nan Ding, “Selective Incarceration of Cesium Ions by Venus Flytrap Action of a Flexible Framework Sulfide,” which appeared in the journal *Nature Chemistry* in January.

Kanatzidis admits that his research is energized not so much by the usefulness of the application as by the possibility of making new materials. “Our satisfaction and excitement derive from the fact that we can put atoms together in novel architectures and novel arrangements,” he says. “That means that we are trying to control the chemistry at the cutting edge. After we discover new systems, we investigate them in detail. Then we ask ourselves, what are these things good for? We worry about applications, but the initial challenge is to make something nobody has been able to make before.” —by Joan Naper



Joseph R. Moskal

# brain cancer warriors



Roger Kroes

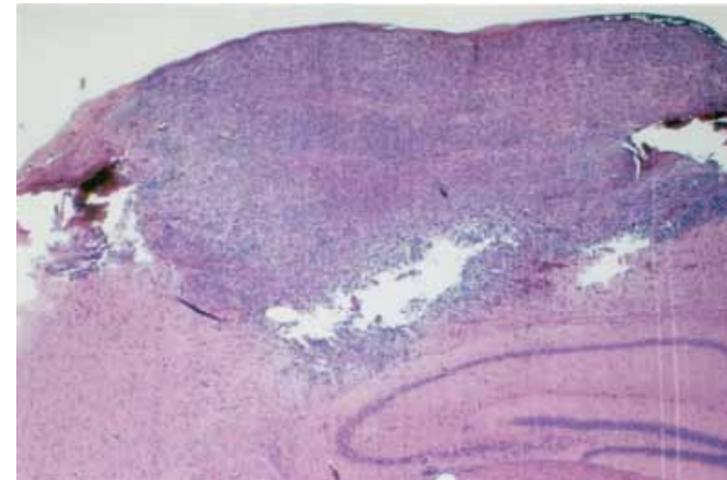
Of the 76 organs in the human body, none is more important to who we are than the brain. It controls our senses, our movements, our thinking, and our personality. So when something goes awry in this precious and privileged area, such as the development of cancer, it must be approached with a delicate touch.

"The problem with tumor cells in the brain is that they always recur because it's hard to remove them entirely," says Joseph Moskal, biomedical engineering. "If we scooped out half your brain, then the tumor probably wouldn't recur, but then there wouldn't be any you left. In trying to remove an invasive brain tumor, there are always some residual tumor cells left."

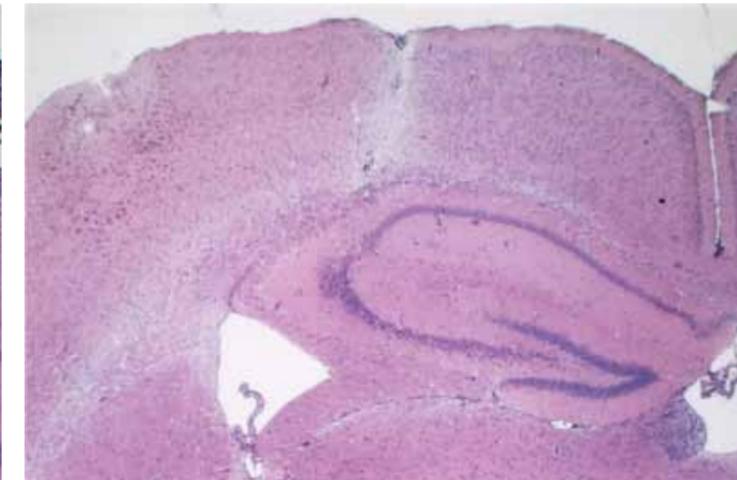
An ideal solution would be to kill the tumor cells without disrupting the surrounding circuits and tissues. This is nearly impossible using the common, currently available methods of chemotherapy, radiation, and surgical resection. If only the solution could come in the form of something as simple and safe as a pill.

For the past 30 years, Moskal and his team at the Falk Center for Molecular Therapeutics in Evanston have been exploring possible solutions and coming closer to this ideal. With a recent breakthrough in brain tumor glycobiology — the study of the structure and biology of saccharides, which are essential components of all living

Photos on this page by Amanda Morris.



**A glycogene therapeutic:** Human brain tumor cells grown in tissue culture will form large tumors when implanted directly into the brain of mice (left panel). Putting a glycogene into the tumor cells by exposing them to a virus that carries the gene inhibits the ability of these cells to form tumors (right panel). The gene has a specialized name:  $\alpha$ 2,6 sialyltransferase. It controls the tumor cell glycosylation pattern.



things — they are more convinced than ever that they are on the right path.

"Over the years, our lab has been working on glycogenes, which encode the enzymes that put the sugars onto proteins and lipids that are on cell surfaces," explains Moskal, who is the founding director of the center. "These sugars are important because they allow for cell-to-cell communication."

Any brain tumor is inherently life threatening because the cells are highly invasive, and can quickly migrate to attack different parts of the brain. Even if radiation or surgery destroys most of them, it only takes one or two cells to proliferate and cause the tumor to recur. The sugars on the cell surfaces are what help tumor cells evade immune surveillance and spread.

"Our program is based on the idea that if we can alter the sugar structures, then maybe we can inhibit tumor invasiveness," Moskal says.

Moskal along with Roger Kroes, a molecular biologist who joined Moskal's group 15 years ago and help create the Falk Center, first manipulated brain tumor material extracted from humans by altering one particular type of glycogene. They found this alteration also changed the biochemistry and sugar structures in the tumor cells. "Rather than try to unravel all the complexities of a sugar structure, we went at it one glycogene at a time," Kroes says. "And it was transforming."

After the success in the human tissue, the technique was tested in an animal model. Not only did it suppress tumor formation, but it changed the whole biochemistry of the tumor cells. During the process Kroes also discovered a unique protein that seems to be associated with invasiveness and adhesion. This provides a new target for a potential therapeutic pathway. The research captured a lot of attention and was published in the July issue of the *Proceedings of the National Academy of Sciences* with Kroes as the lead author.

"This gives us proof of concept that this family of genes really does regulate invasiveness," Moskal says. "It's not a therapeutic yet, but it does give us direction."

It's a direction that may lead to a cure in an area where very little progress has been made and where patients are highly likely to die within one year of diagnosis.

"People have worked on brain tumors for 50, 60, or 70 years, and there are still no effective therapeutics," Kroes says. "There's nothing clinicians can offer patients. Participating in clinical trials can buy them some time, but that's about it."

Moskal believes that continued work could result in a gene therapy that is injected into the tumor to stop growth. Even further down the road, he sees potential for a small-molecule therapy that actually can be taken as a pill. Kroes says the next step is to examine the additional 34 glycogenes they identified for their effect on tumors and intracellular signaling in order to find an optimal target for a therapeutic. They are collaborating with clinicians in the field to pursue this goal.

The Falk Center team works closely with the neurosurgery group at MD Anderson Cancer Center at the University of Texas, which has an oncolytic virus — a virus that kills tumor cells but not normal cells — in clinical trials. Kroes discovered that when he took the glycogenes used in the Falk study and integrated them into the oncolytic virus, it worked markedly better to halt brain tumor growth than the virus alone.

Kroes and Moskal agree that while this successful study might be another high point in their research, it's certainly not an end point. "We're in this for therapeutic development," Kroes says. "And we're all so passionate about our work because we see an end product being a viable therapeutic that will really help people."

"We're trying our best," Moskal adds. "And we've made huge progress." —by Amanda Morris

# The Secret Life of the Mischievous Renaissance Traveler

Susan Phillips, English, began her study of early modern travel dictionaries with the expectation that the books would be orderly with an emphasis on etiquette and manners. She discovered the exact opposite.

"During this period, courtesy was one of the prevailing discourses," Phillips says. "There was this idea that if you could master manners, then you could succeed socially. I expected these books to be obsessed with courtesy, but it turns out they're all about mischief."

Created primarily for traveling merchants, soldiers, and women, the dictionaries appear in multiple languages and provide, in addition to word lists, playful dialogues that teach readers how to speak in national vernaculars. "The books are less about etymology and tying words back to Latin and more about conveying how to communicate in the various colloquial languages of Europe," says Phillips. And then adds with a laugh, "Although Latin is in there. It's just bad Latin — exceptionally bad Latin. They even apologize for how bad it is but never fix it."

While there are neat lists of vocabulary words, they typically go awry before reaching the end. Phillips points out a list of body parts from *The Spanish Schoolmaster* as an example. The list begins logically with translations of various body parts, such as feet and knees. "But then you get into these gossipy snippets," Phillips says. "So that when readers arrive at the words for thighs and buttocks, it also says 'She is a worthy woman, but she hath great buttocks.' So she's a proper lady, but she has a huge behind."

Phillips spent six months during the summer and fall of 2009 digging through various archives around Western Europe in search of these popular Renaissance travel dictionaries and phrasebooks. She also discovered some books in Northwestern's Charles Deering McCormick Library of Special Collections and accessed other works through virtual libraries and online resources. "Then I ordered digital and microfilm copies," she says. "I have this big stash that I'm working through."

One of the recurring themes Phillips found while combing through a number of books from different countries was the prevalence of stereotypes. There are assumptions about which countries have the best food and wine, as well as stereotypes for how different groups of people behave. Italians are often portrayed as lustful and lecherous, while the French are temperamental, Germans are proper, and the Dutch are miserly.



Susan Phillips

Phillips recounts a scene of dialogue from the *Colloquia et Dictionariolum* (or *Conversations and a Little Dictionary*) between a traveler and a chambermaid at an inn. The English and German dialogues show proper conversations whereas the Italian man asks to see his room and then boldly exclaims, "Beautiful girl! Blow out the candle and come closer to me!" She says these presumptions can tell us a lot about the cultural associations of the time.

"My project looks at the secondary lessons that come with education," Phillips says. "If you think about language learning as only vocabulary and grammar, then you miss the cultural lessons that are taught along with it."

As time passed, the more mischievous scenes often were removed. A schoolmaster from Antwerp wrote a popular conversation book called *The Garland for Young Women* in the 16th century. It includes an entertaining scene of schoolgirls arguing with the governess about having to arise early in the morning. In the 17th century, *The New Garland for Young Women* was published with a much less playful tone. In this version, the schoolgirls happily wake up early in order to say their morning prayers. Phillips says this is a reflection of a cultural shift that occurred as civic and religious authorities began to reassert restrictions on behavior.

"The 15th and 16th century was a period of increased freedom and flexibility as literacy rates increased and interest in education expanded," she says. "By the 17th century, there was a desire to control behavior and put people in their places by gender, class, or occupation."

This social shift caused publishing to become more uniform as individuals were required to gain special privileges from the king in order to produce dictionaries and textbooks.

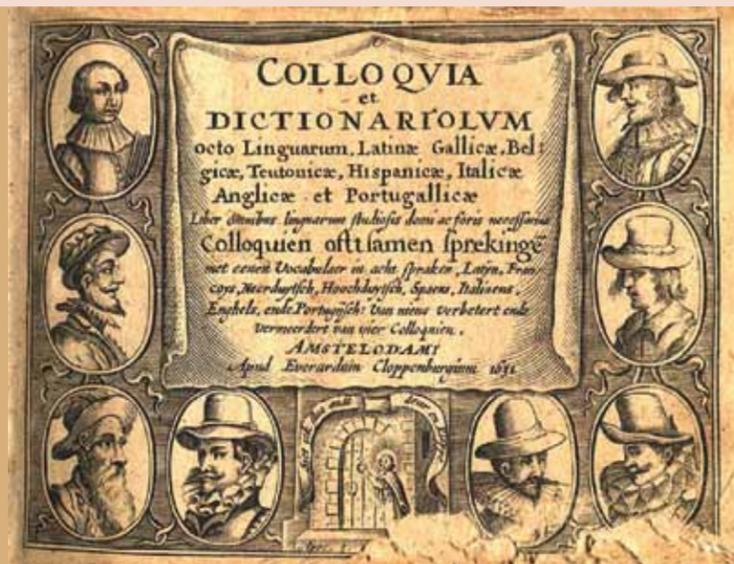
Censors were put in place to make sure books adhered to proper ways of teaching languages. As books became more proper, the characters became more stereotypical.

This trend is particularly noticeable in the representation of black characters in these books. Although black characters were included in the earlier editions, their depiction was unproblematic and without racial tension. In later books, these characters exist only as a part of racist jokes. The shift occurs as England, and other European nations, increased their roles in the slave trade. The racist stereotypes propagated by these books made the idea of trading and trafficking slaves seem more palatable.

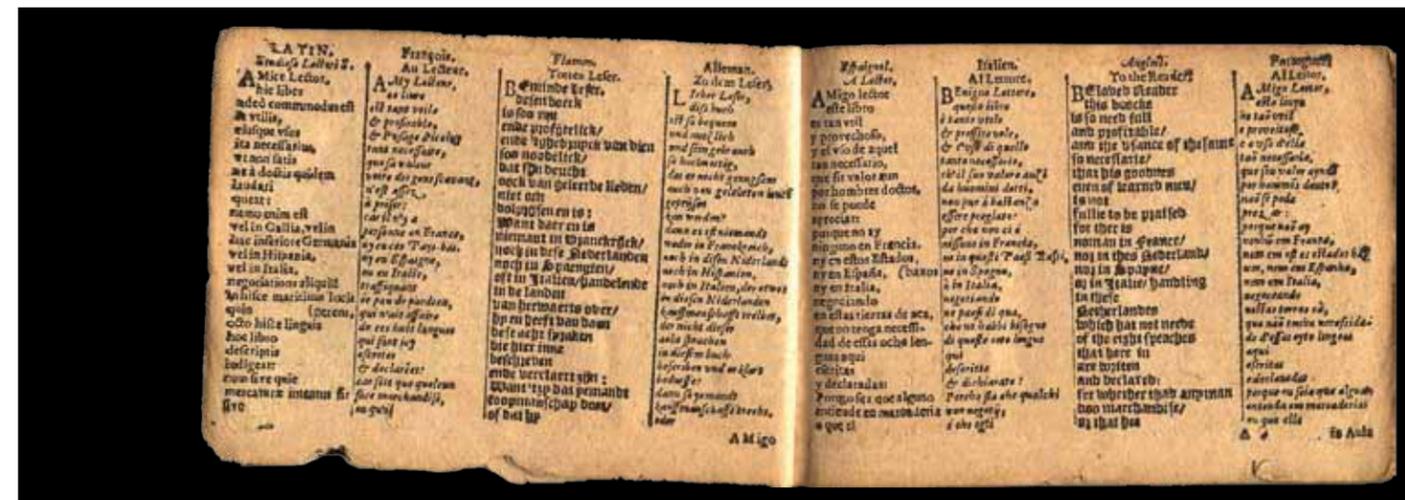
"As commerce and communication become more global, people are constantly evaluating how to interact with other cultures and communities, and stereotype is a fundamental part of that," Phillips says. "Many of these stereotypes have been around for ages, perhaps since the Roman Empire, and still endure today. If you recently followed the World Cup, and you listened to the commentary, all of these stereotypes came out."

Phillips' first book, *Transforming Talk: The Problem with Gossip in Late Medieval England*, examined how idle talk shaped culture in 14th century England. "When I started this new project, I thought it was as far away from my first book as possible, but it turns out they're both about conversation. I seem to have an abiding interest in mischievous conversation," she says.

Phillips plans to complete her new book about the cultural history of travel dictionaries and phrasebooks by late 2012. — by Amanda Morris

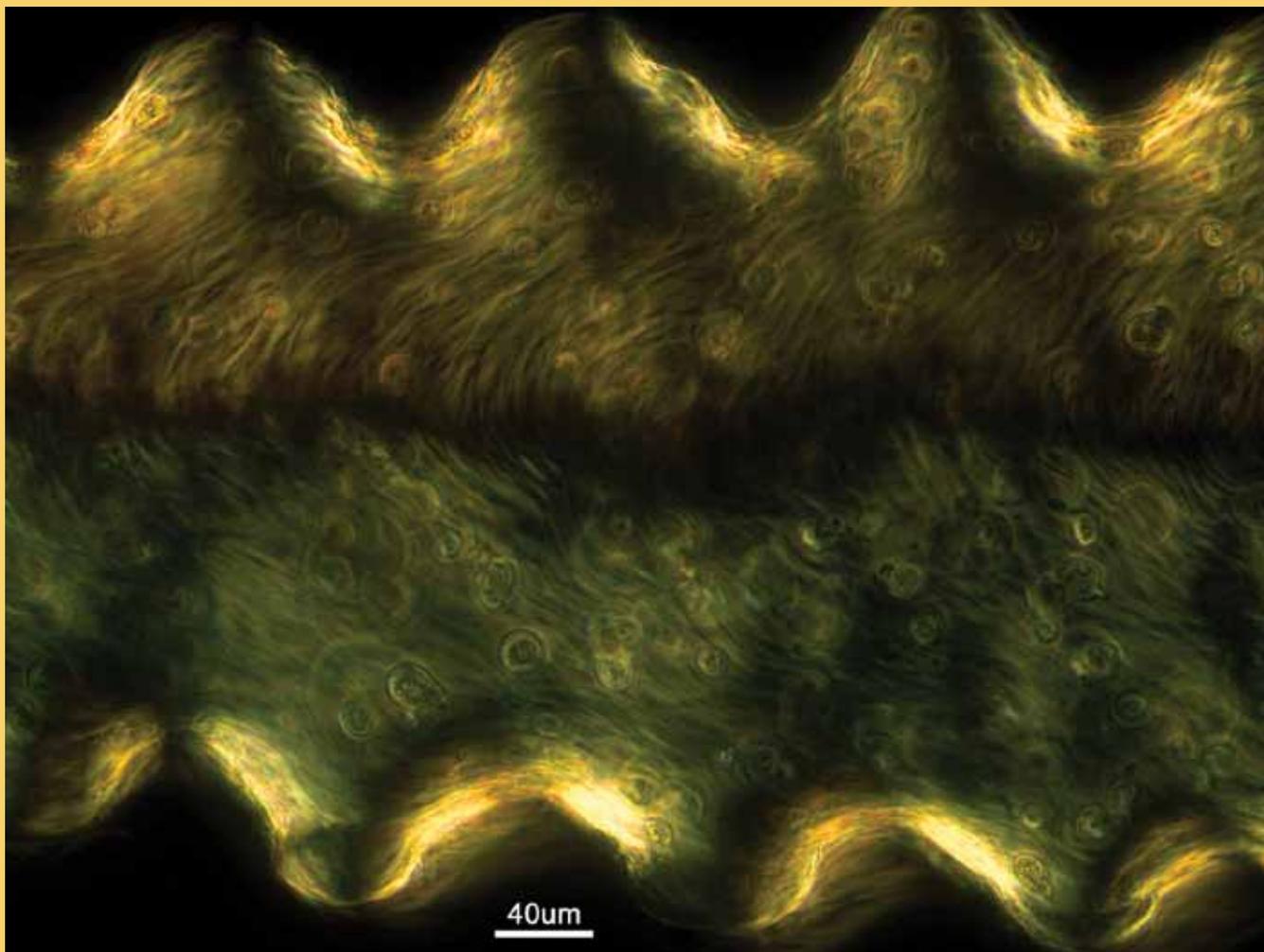


When people think of the European Renaissance, they generally picture a time of intellectual and cultural transformation with high art and inspired thinking. But popular travel dictionaries from the 15th through 17th centuries paint a picture of a surprisingly roguish and ill-behaved society, full of drunken brawls, dirty humor, biting insults, and shameless stereotypes.



The images on these pages are from the 15th century book *Colloquia et Dictionariolum*. The men in the image on the previous page represent the eight different languages in the book, starting from left to right: Latin, French, Flemish, German, Spanish, Italian, English, and Portuguese.

## Center | Point



"Science is always beautiful, but not all science is so easily captured by an image," says Mark Trospen McClendon, IBNAM, PhD, a student in Samuel Stupp's research group. "I'm lucky enough to be in a field that is very photogenic. When you are culturing cells with advanced materials such as nanofibers it is hard not to get an impressive image.

"The funny thing about this image is that the sample was an accident. I was attempting to create uniformly straight alignment of nanofibers, but I botched the procedure by ejecting the solution too fast and got this ripple effect. Even though the sample was not good for that experiment,

it produced a beautiful pattern under the polarized light microscope. I never thought I would get recognition for it."

McClendon's image (above) won first place in the 2010 Northwestern Scientific Images Contest, sponsored by Science in Society. The image shows many millions of nanofibers together making up a gel.

For more information and the other winners and honorable mentions, visit the winners' gallery at: <http://scienceinsociety.northwestern.edu/gallery/2010-northwestern-scientific-images-contest-winners>.



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Office for Research  
633 Clark Street  
Evanston, IL 60208-1108