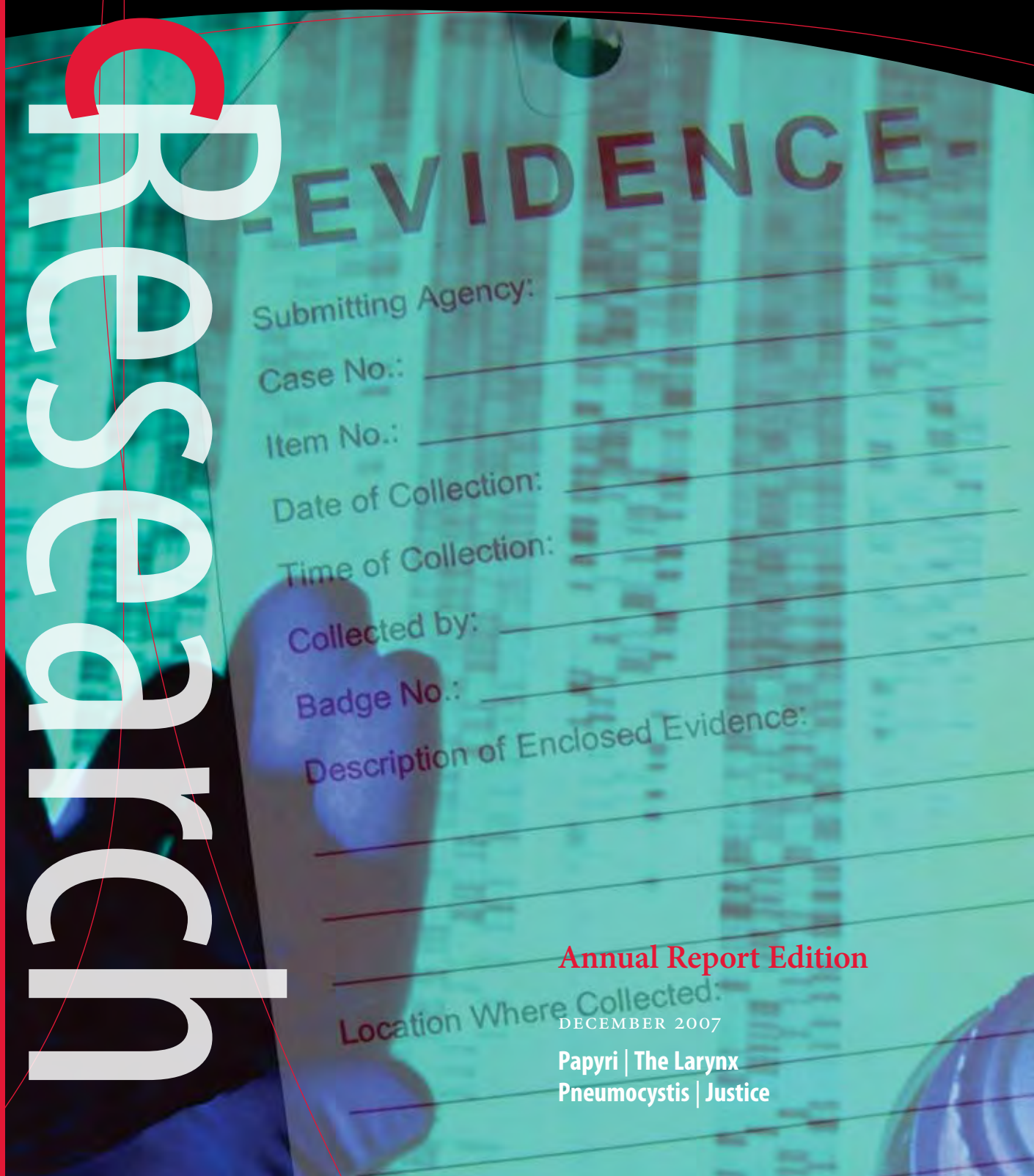
UNIVERSITY OF Cincinnati

Research



Annual Report Edition

DECEMBER 2007

Papyri | The Larynx
Pneumocystis | Justice

Photo: Dave Collins

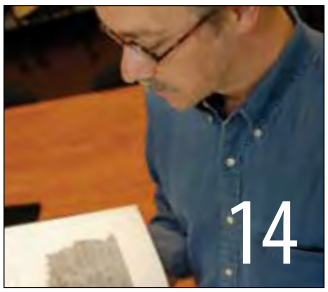
Karyn Butler, MD, is a true "surgeon-scientist"—who as a surgeon manages intense patient care responsibilities at University Hospital's Level 1 trauma center and conducts clinical research focused on patient care issues and complications in the intensive care unit.

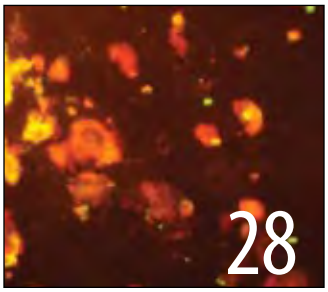
In the laboratory, the scientist in her focuses on discovering new ways to help the heart work better by studying what happens after cardiac ischemia—a condition of decreased blood flow.

Butler has developed an animal heart model that mimics the conditions of congestive heart failure in humans. She uses this to study the heart's response to restored blood flow after cardiac ischemia and the protective role of a molecular pathway known as "JAK-STAT."

But Butler is also working hard on another effort. An active member of the Society for Black Surgeons, she understands her uniqueness and the power she has as a role model for others. Just as female surgeons are a rare find, African-American surgeons are a rarity, too. Her goal is to make successful African-American surgeons—and female surgeons in general—more visible so students can look and say, "OK, she did it. I can, too."

UNIVERSITY OF Cincinnati





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DECEMBER | 2007

Undergraduate Research

A picture of how some students spent their summer PAGE 8

Piecing Together the Past

Solving puzzles of the ancient world PAGE 14

Going With the Flow

Engine commotion reveals mysteries of the voice PAGE 22

The Old Hitchhiker

Getting to know an ambiguous passenger PAGE 28

COVER STORY

Revealing Evidence

Research that gets the evidence in, and the truth out PAGE 36

Noted.....

A Gift That's 'Out of This World'

A $20 million gift from an anonymous donor will support UC's numerous initiatives in space exploration research. The gift is the largest bequest by an individual in UC's history and establishes the Thomas Jefferson Endowed Chair in Space Exploration and the Alan B. Shepard Endowed Chair in Space Exploration. A substantial portion of the funds are earmarked to create a Space Exploration Research Fund. The two chairs will be awarded on a competitive basis to researchers who epitomize the passionate and investigative natures of Jefferson and Shepard. The Space Exploration Research Fund will create a long-term program that encourages collaboration among disciplines and enhances UC's research excellence in specialties related to the exploration of space. The fund will also support educational programs and fellowships for students performing research in areas related to space exploration, establishing space exploration as a center of excellence at UC.

Photo: NASA

$420 MILLION IN-KIND CONTRIBUTION IS LARGEST IN UC'S HISTORY

A group of international firms announced in October that UC will receive a highly competitive, in-kind contribution of software commercially valued at more than $420 million.

The in-kind contribution comes from PACE, Partners for the Advancement of Collaborative Engineering Education, which comprises a consortium of international companies including General Motors, EDS, Hewlett-Packard Co., Siemens PLM Software and Sun Microsystems.

The PACE contribution represents the largest ever given the university, and UC is the first (and only) educational institution in Ohio to receive such recognition.

The software coming to UC could allow students and faculty to design and visualize buildings, hybrid vehicles and efficient factories, and could even lead to the development of innovative medical devices.

UC is one of only 21 universities nationally to be designated as a PACE institution and to receive such software and hardware from the PACE consortium. Other schools receiving similar recognition and in-kind contributions are the Massachusetts Institute of Technology, the University of Michigan and Virginia Tech. The more than $420 million value of the in-kind contribution to UC is the second-largest PACE has ever provided to a U.S. school and the third-largest to any school in the world. ●

Photo: Lisa Ventre

'Highest' Honor Awarded to UC Physiologist

UC physiologist Jay Hove, PhD, has been named a winner of the prestigious 2006 Presidential Early Career Award for Scientists and Engineers (PECASE).

PECASE is recognized as the highest award offered to young scientists by the United States government. Hove received his award Nov. 1 at a White House reception and is the first scientist from UC to receive the honor.

Photo: Dan Davenport

The PECASE program was initiated by President Clinton in 1996 to honor the "extraordinary achievements of young professionals at the outset of their independent research careers in the fields of science and technology."

PECASE candidates must be nominated by one of nine participating U.S. agencies. Hove's nomination came from the National Institutes of Health (NIH). Because the NIH recommends only first-time winners of its R01 research grant program for PECASE awards, scientists have just one shot at an NIH nomination. Hove is the only scientist from Ohio ever to win the PECASE award from a nomination submitted by the NIH. ●

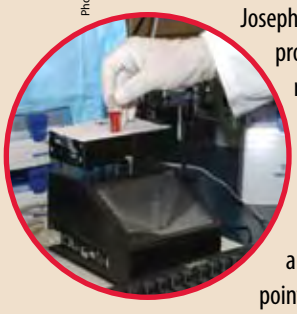
INVENTION TO INTERVENTION:

Engineering, Medicine Get $9 Million

Researchers from the colleges of engineering and medicine have been awarded a $9 million, five-year grant from the National Institutes of Health to develop technologies geared toward early detection of neurologic emergencies.

The award funds the Point-of-Care Center for Emerging Neuro Technologies—a resource for UC and national researchers who need help with any stage of technology development.

Photo: Lisa Britton



Principal investigator Fred Beyette, PhD, associate professor of engineering, and co-principal investigator Joseph Clark, PhD, professor of neurology, are no strangers to the work required to conceptualize and develop point-of-care technologies.

The two are developing an instrument that can rapidly analyze spinal fluid. A laboratory procedure that with current technology can take hours is reduced to three minutes with the duo's innovation.

The device—called "Bililbox" and now about the size of a shoebox—can quickly detect the presence of red blood cells in spinal fluid. But more importantly, the technology can detect bilirubin, a chemical found when red blood cells begin to break down. The technology could lead to improved diagnosis of subarachnoid hemorrhage. ●

A $5.5 million gift has established the **JAMES J. AND JOAN A. GARDNER FAMILY CENTER FOR PARKINSON'S DISEASE AND MOVEMENT DISORDERS** at the Neuroscience Institute at University Hospital and the University of Cincinnati College of Medicine. The gift, from the James J. and Joan A. Gardner Family Foundation, will endow clinical and research programs, accelerating collaboration among scientists and physicians.

Photo: Dan Davenport

The center already treats 2,000 patients and investigates Parkinson's disease using multiple laboratory and clinical research approaches. In 2006 it was named the first national Davis Phinney Research Center—a collaboration among universities to promote sharing of laboratory and clinical research data related to Parkinson's. ●

'Remote Control' for Fat Metabolism

A system in the brain already known to regulate food intake also serves as a direct "remote control" for the way fat is stored and metabolized in the body, say University of Cincinnati researchers.

What is known as the melanocortin system, the researchers say, controls fat metabolism and the way it accumulates in the body completely independent of food intake.

The finding, the researchers report, could lead to the development of new and urgently needed medications to treat the growing, worldwide obesity epidemic.

Led by Matthias Tschöp, MD, UC associate professor of psychiatry, and coauthored by scientists at the German Institute of Human Nutrition, the study appeared in the Sept. 20, 2007, online edition of the *Journal of Clinical Investigation*. ●

Photo: Dan Davenport

George Rieveschl, Inventor of Benadryl, Dies

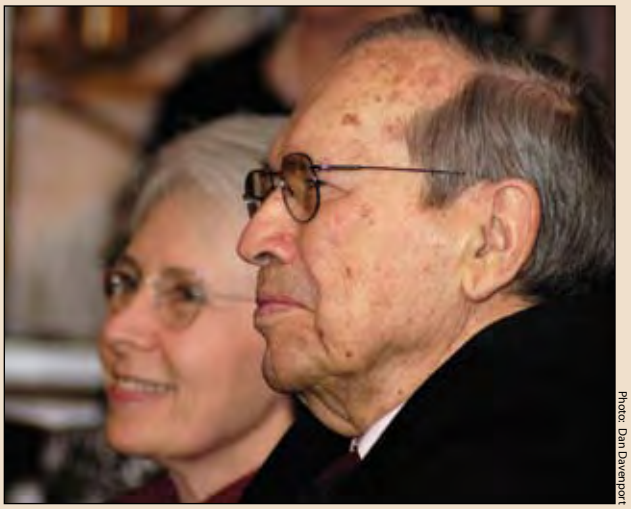


Photo: Dan Davenport

UC alumnus and vice president emeritus George Rieveschl, PhD, known for inventing Benadryl, the world's first effective antihistamine, died Sept. 27, 2007. He was 91.

A longtime supporter of the College of Medicine and the university as a whole, Rieveschl developed the widely used allergy treatment 61 years ago while serving as a chemistry professor at UC.

The scientist found to his surprise that a two-part compound he was originally testing to improve muscle-relaxing medications dramatically blocked histamine, the naturally released chemical that narrows air passages in the lungs and causes inflammation.

This breakthrough led, in 1946, to Benadryl's becoming the first FDA-approved prescription antihistamine. First produced by Parke, Davis and Company, the drug is now distributed over-the-counter by the Parke-Davis division of Pfizer.

A 1937 alumnus, Rieveschl worked 26 years in the chemical industry as both a scientist and a consultant before returning to UC in 1970. ●

'KNOCK-OUT' MODEL PROVIDES BREAST CANCER CLUES


Photo: Dave Collins

NEW INSIGHTS INTO THE ROLE OF ESTROGEN receptor in mammary gland development may help scientists better understand the molecular origin of breast cancer, according to new research from the University of Cincinnati.

After two years of work, Sohaib Khan, PhD, professor of cell and cancer biology at UC, says his team has developed a knock-out mouse model that will allow scientists to study the role of estrogen receptor in specific organs (for example, mammary glands) without affecting estrogen-signaling throughout the rest of its body.

Khan and his coworkers reported on the creation of this model and its potential implications in an early online edition of the *Proceedings of the National Academy of Sciences* on Sept. 4, 2007, followed by the print issue Sept. 11, 2007.

This study was funded by grants from the National Institutes of Health, U.S. Department of Defense and the UC pilot cancer grant program. ●

TOP FIRMS SELECT UC AS 'INNOVATION INCUBATOR'

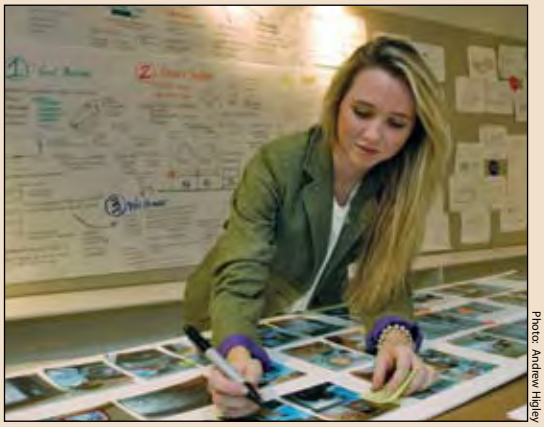


Photo: Andrew Higley

UC has entered into a unique business model that will link faculty and students with corporations seeking new product and service innovations for those aged 50 and over. This new business-university model is called the Live Well Collaborative.

Pioneering private-sector members joining UC in the collaborative are Procter & Gamble (P&G), General Mills, CitiGroup, AARP, Hillenbrand Industries and the design and branding firm LPK.

The model works quite simply: These firms will come to UC students for help with building brands and specific product concepts for the 50-plus market segments. The UC students and faculty will conduct research and develop ideas within an interdisciplinary environment encompassing design, engineering, business, medicine and anthropology.

It's hoped that the collaborative will provide insights and information about the 50-plus population, respond to the 50-plus consumer with new solutions for better living, stimulate economic development and test a business-university model that may later be expanded.

In fact, the business-university model represented by the Live Well Collaborative was already successfully "test driven" over spring quarter as part of a studio course within UC's internationally ranked College of Design, Architecture, Art, and Planning (DAAP). Students researched and then designed new concepts related to P&G's Iams pet-food line to better meet the needs and wants of the pet-owning 50-plus market.

The collaborative will principally involve students and faculty from DAAP and UC's colleges of arts and sciences, business, engineering and medicine. ●

UC Research Takes Silver

Don't turn the page. *UC Research* was recently honored with a silver medal from the Pride of CASE (Council for the Advancement and Support of Education) District V Awards Program. This marks the magazine's fourth award since it was launched in 2006. The publication received a 2007 Bronze Quill Award of Merit from the International Association of Business Communicators, an Award of Excellence from the 13th Annual Communicator Awards and platinum recognition from the MarCom awards program. OK, read on. We hope you enjoy *UC Research* as much as they do! ●

NATIONAL AND STATE AGENDAS have placed major emphasis on recruiting more students and faculty into the science, technology, engineering and mathematics areas. Known in Ohio as STEM—or STEMM here at UC, where we add an extra "M" for medicine—this initiative is designed to maintain "scientific and technological leadership" and promote economic growth and development.

In this edition of *UC Research*, you'll read about several undergraduate students who spent their summer months at UC laboratories working side-by-side with other students and faculty researchers. Summer research programming is one example of how UC is keeping students interested in science.

And from now on, in each issue of *UC Research*, we'll highlight the connection between STEMM and a real-world research project taking place at UC.

Summer undergraduate research is just one STEMM-research connection. Turn to page 22 to see how the university's voice research fits in with STEMM.

Don't forget to check out the 2007 research annual report, *By the Numbers*, included near the back of this edition of *UC Research*. The report takes a "numerical" look at research data, construction progress and even sustainability efforts at UC.

UC has reviewed its STEMM disciplines and identified nine centers of excellence:

- **Nanotechnology**
- **Computation Science**
- **Neuroscience**
- **Urban Environmental Health and Sustainability**
- **Advanced Fuels**
- **Imaging and Sensing**
- **Cancer**
- **Metabolic Disease**
- **Cardiopulmonary Science**

As always, we welcome your comments and questions about the stories you find in this edition of *UC Research*.

Photo: Dottie Stover

Sandra Degen, PhD, vice president for research, showed her support for UC's Solar Decathlon team at the solar house send-off celebration.

Supporting Science

"Greening" chemistry is how Brittny Humphrey passed the time last summer. The senior chemistry major from Youngstown State University joined the lab of UC chemistry assistant professor James Mack, PhD, a leading researcher in the new field of green chemistry who is finding ways to create reactions without solvents. Humphrey worked with other researchers to study high-speed ball milling (HSBM)—a solvent-free way to reduce waste in organic synthesis. Specifically, Humphrey studied HSBM for oxidizing alcohols.

Brittny Humphrey

Senior, Youngstown State University

Major: Chemistry

Summer Program: National Science Foundation Research Experience for Undergraduates in Chemistry

Photo: Dottie Stover

SUMMER UNDERGRADUATE RESEARCH programs—which drew more than 150 students to UC's campus in 2007—provide undergrads the chance to work one-on-one with faculty and other student researchers in some of UC's most active laboratories and research facilities.

Bryan Poulsen, a junior biomedical engineering major at Rose-Hulman, spent summer 2007 in the lab of UC's Andrew Herr, Ohio Eminent Scholar and assistant professor of molecular genetics. There, he worked with

Bryan Poulsen

Junior, Rose-Hulman Institute of Technology

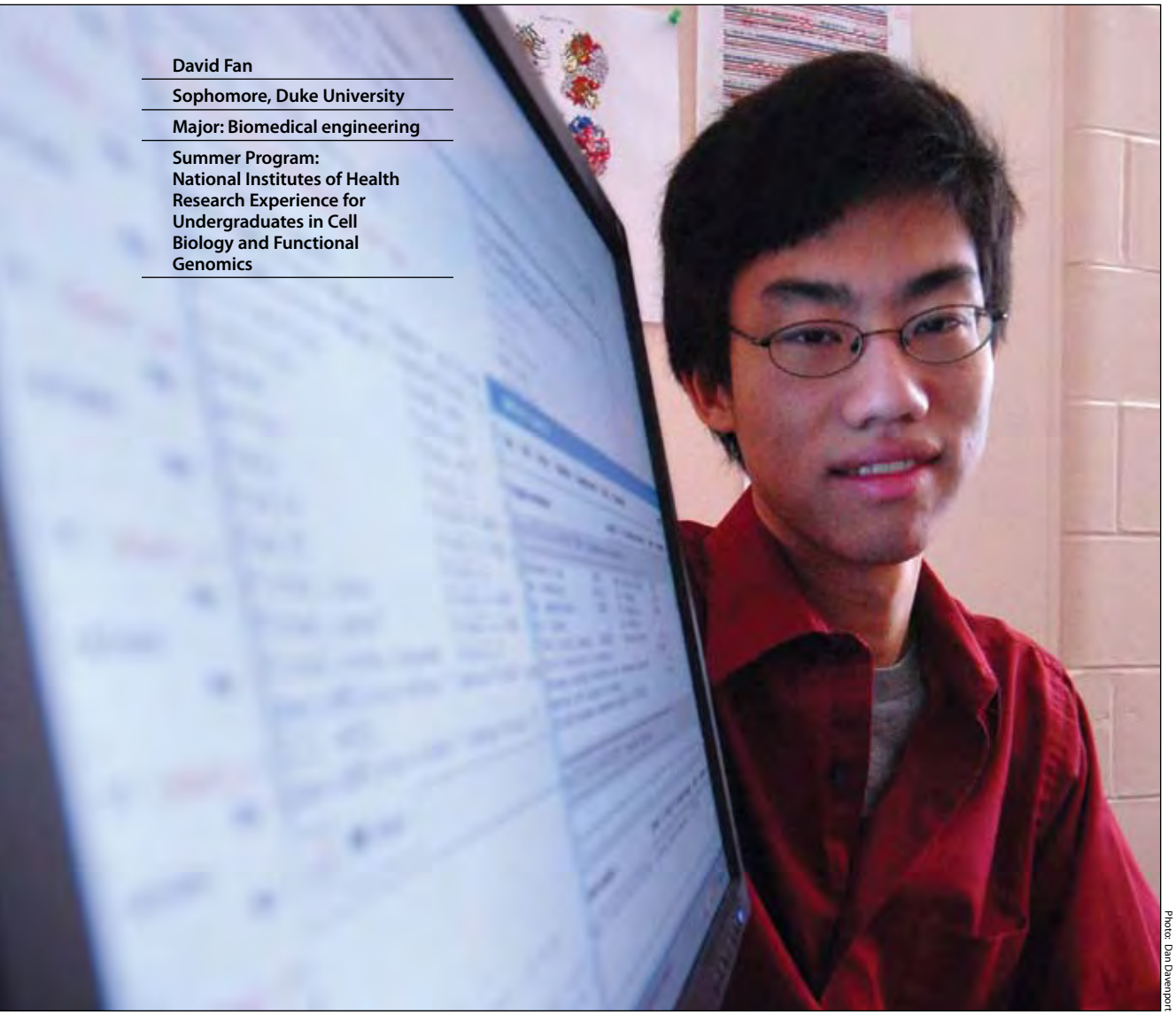
Major: Biomedical engineering

Summer Program: National Institutes of Health Research Experience for Undergraduates in Cell Biology and Functional Genomics

Photo: Dan Davenport

others studying a region of the infection-preventing antibody Immunoglobulin A (IgA). The region, called C_H3, was isolated from IgA and Poulsen, along with UC graduate student Monica Brooks, was able to clone this segment, purify it and "refold" it into its original confirmation. The refolded C_H3 can now be tested to see if it will bind directly to the IgA receptor and cause an anti-inflammatory response the team is looking for.

David Fan spent his summer under the supervision of UC's Jarek Meller, PhD, and found himself enjoying an area of research he never expected to even be part of—bioinformatics. This computer-based science uses



David Fan

Sophomore, Duke University

Major: Biomedical engineering

Summer Program: National Institutes of Health Research Experience for Undergraduates in Cell Biology and Functional Genomics

Photo: Dan Davenport

informatics, statistics, computer science, artificial intelligence and biochemistry to solve some of the world's toughest biological problems. More specifically, Fan worked on piecing together the genome for *Pneumocystis carinii*, the parasitic fungus that can cause an often deadly pneumonia in people with suppressed immune systems.

Understanding how an ancient civilization used the land around them is how junior biology major Sally Woods spent her summer. Under the supervision of David Lentz, PhD, professor in UC's division of biological

Photo: Dottie Stover

Sally Woods
Junior, University of Cincinnati
Major: Biology
Summer Program: Women in Science and Engineering (WISE)

sciences, Woods evaluated the agroforestry practices of the ancient Mayans to determine how they impacted the tropical forest around them. She analyzed samples of carbonized plant remains collected from the Chan site in Belize to compare wood age and species. Ultimately, Woods hopes her work will provide an understanding of how the forest was altered.

Felicia Fullilove's summer in the lab of UC assistant professor of chemistry James Mack, PhD, was spent studying corannulene—an aromatic molecule whose derivatives are known to be useful in the medical and

Felicia Fullilove

Senior, Butler University

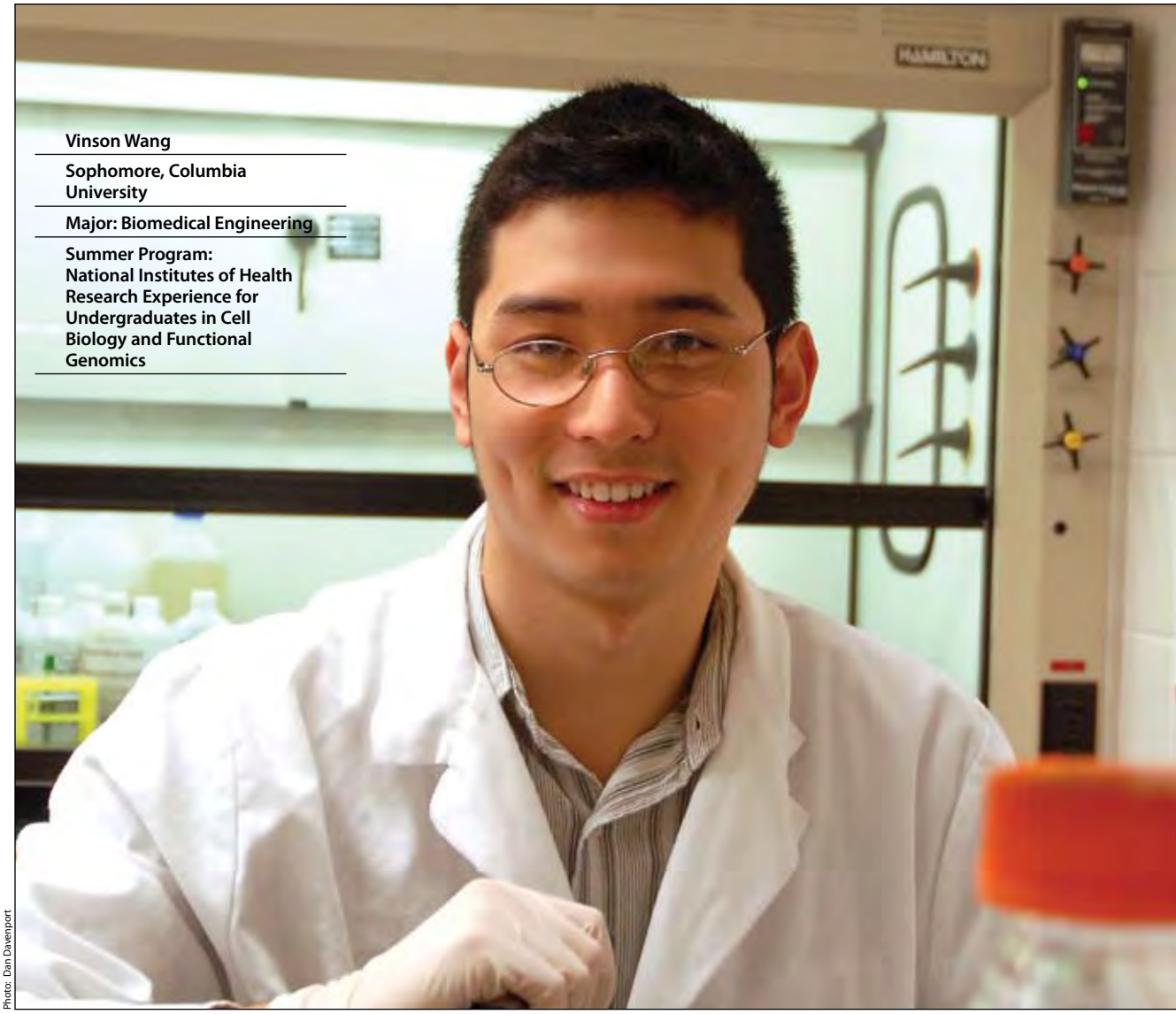
Major: Chemistry

Summer Program: National Science Foundation Research Experience for Undergraduates in Chemistry

Photo: Dottie Stover

technology fields for organic displays in televisions or computers. However, research progress has been limited by difficulties in making the molecule. Fullilove worked with graduate students to develop methods to accelerate corannulene synthesis—which ultimately will allow scientists to devote more of their time to understanding this chemical and its derivatives.

Vinson Wang traveled to Cincinnati from New York to study a biomarker that could one day yield a better diagnostic test for prostate cancer. The sophomore biomedical engineering major worked in the lab of Shuk-Mei Ho,



Vinson Wang

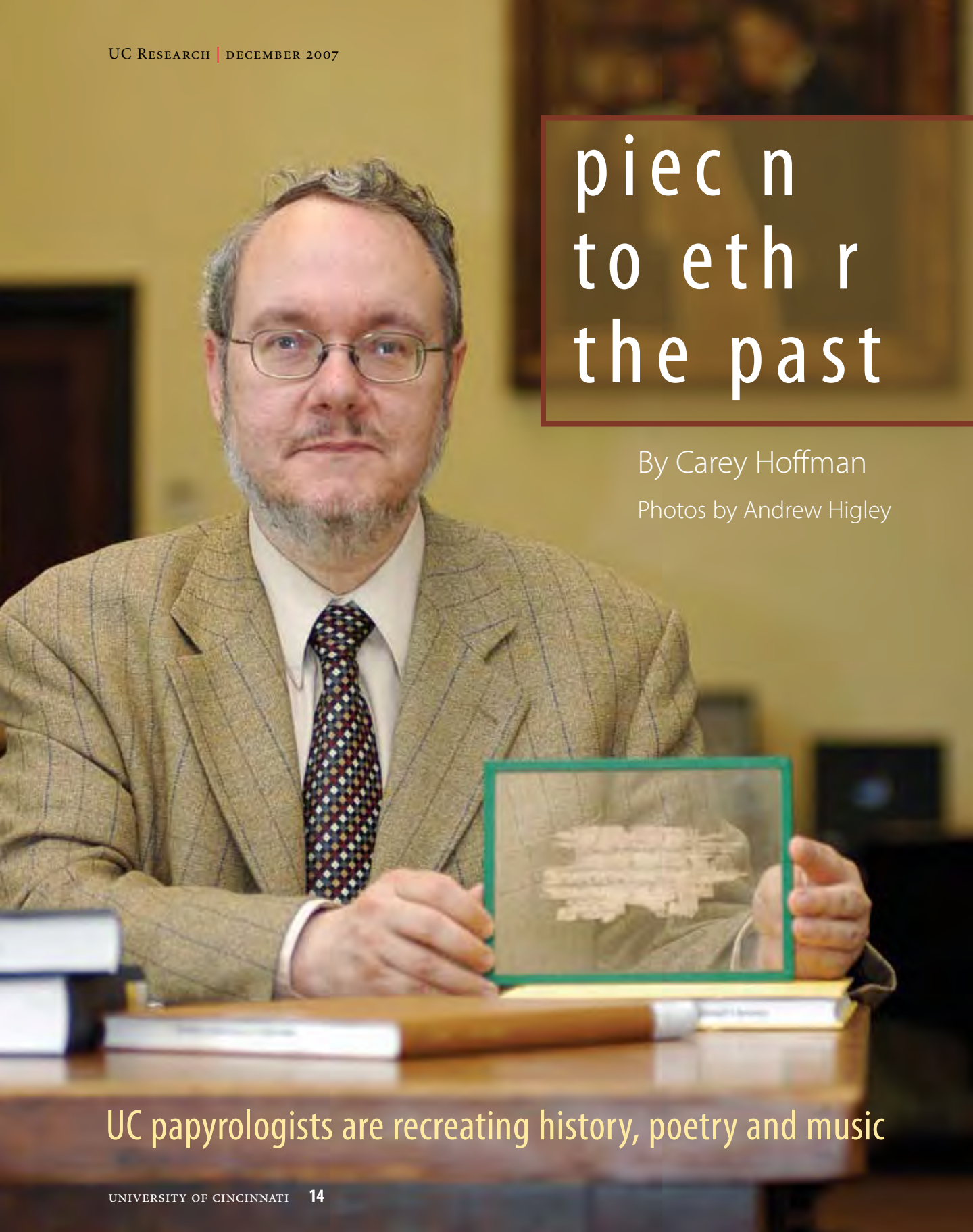
Sophomore, Columbia University

Major: Biomedical Engineering

Summer Program: National Institutes of Health Research Experience for Undergraduates in Cell Biology and Functional Genomics

Photo: Dan Davenport

PhD, chair of UC's environmental health department, to study alpha-methylacyl-coenzyme A racemase (AMACR), a biomarker that appears to be over expressed in prostate cancer. He worked with other researchers trying to determine whether particular variations of AMACR, or combinations of different versions of this enzyme, could be used to more effectively diagnose prostate cancer.



piec n to eth r the past

By Carey Hoffman

Photos by Andrew Higley

UC papyrologists are recreating history, poetry and music

THE FIRST CLUE to understanding Peter van Minnen, PhD, is found when you enter his office and look at the opposing wall.

There, inside Blegen Library at the University of Cincinnati, hangs an image of the Rosetta Stone.

If you get a little closer, though, you notice it's not just a photo of the Rosetta Stone. It's actually a completed jigsaw puzzle of one of the most valuable archaeological finds in history.

The Stone allowed scholars to decipher the underpinnings of ancient language. The same message is chiseled into its surface in three different scripts—Greek, demotic and hieroglyphic.

To the modern eye, the framed puzzle looks like three different headaches waiting to happen.

But that's not how van Minnen sees it.

He purchased the puzzle as a challenge to his grad students. And although they were admitted to study in what has historically been considered one of the most prominent classics departments in the world, the students failed to turn the chicken-scratch fragments into a whole.

So van Minnen ended up doing the puzzle himself.

Fitting, since solving the ancient world's most complex challenges is the essence of van Minnen's professional career.

"I do things as long as they are a puzzle," says the associate professor of classics and ancient history who joined the UC faculty in 2002. "If it's complete, it's no longer interesting."

His professional puzzles take shape in the field of papyrology—the study of ancient writings preserved on papyrus, the most common form of paper in the ancient world.

Where artifacts give clues about how ordinary people lived, papyri have the potential to go a step farther, letting us know what they thought and how they saw the world around them.

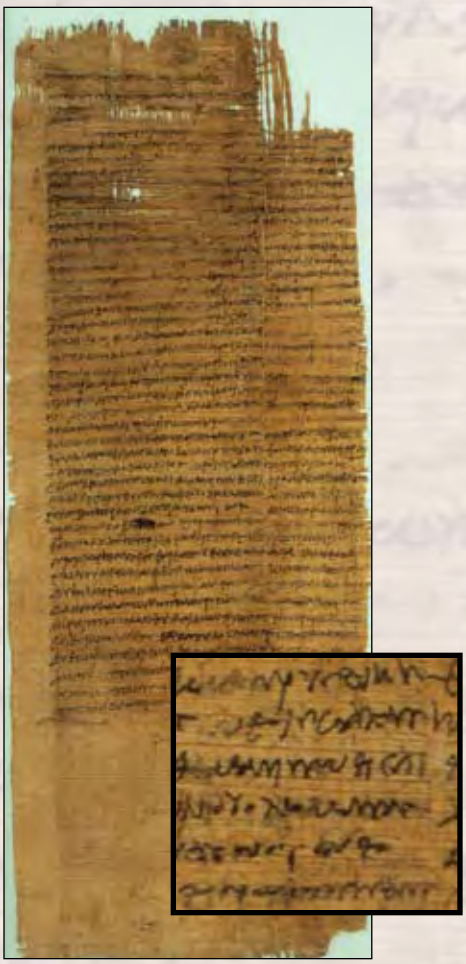
"As a papyrologist, I study papyri from Egypt," says van Minnen. "Manuscripts that have survived from the ancient world. And I can deal with both the physical material and also read what is written on it."

That is hardly as straightforward as it sounds.

Every aspect of the process in understanding the significance of a papyrus find is complex.

The material itself can range anywhere from the form of a scroll down to a scrap as small as a postage stamp. That's not surprising when you're dealing with an item that can be more than 2,000 years old and has essentially the texture of paper.

Though it was used throughout the Greek and Roman empires,



SALE OF A GOLDSMITHY, 18 BC
Inventory 13047 recto, formerly Egyptian Museum, Berlin, now Department of Papyrology, Warsaw University.
37 cm x 14.5 cm (inset shown at actual size)

DETAIL OF ORNAMENTATION FROM UC'S BLEGEN LIBRARY

surviving papyri are mostly found in Egypt—most abundantly in Nile valley and desert oases. The reason is simple: climate.

"Where it rains, organic material disappears rather quickly," van Minnen says. "But from the time of Alexander the Great (who conquered Egypt in 332 B.C.) through the Roman period and even after the Arab Conquest in the 7th century A.D., there's 1,000 years of history in papyrus texts from as dry a place as Egypt."

The animated tone in van Minnen's voice when he talks about the challenges presented by studying papyri gives a hint to just how much he enjoys what he does.

But the secrets of the past don't just fall off the page.

This is where nearly 20 years of academic preparation really kicks in.

A native of the Netherlands, van Minnen did his undergraduate work at Leiden University, the oldest college in his homeland. And if he was fated to be a papyrologist, his introduction couldn't have come any more directly.

"On the first day, the first thing they showed me [in the classics department] was a papyrus," he recalls. "And that sold me forever."

Learning how to read what was on that page took years and years of dedicated study. Van Minnen estimates fewer than 75 people in the world have the skill set of a papyrologist. Figuring out the message

SIGNATURE FIND

Among other facts that distinguish Peter van Minnen: he's the only classicist William Johnson knows personally who has been on ABC's "World News."

Obviously, given the obscure nature of the material van Minnen works with, it would take something quite extraordinary to interest a national news program, and in this case, van Minnen's find easily met that bar.

Papyrologists often find themselves going over source material that others have already worked on. Van Minnen was doing just that sort of review in 2000 at the world-famous Egyptian Museum of Berlin. He was reviewing a papyrus from the royal palace at Alexandria. The document dealt with a taxation matter in Alexandria, but the previous editor misunderstood the implication of a word written on the page that was actually in a different hand than the rest of the writing.

The Greek word, which translates to "make it so," was exclusively used as the official authorization from the ruling authority in Egypt. And in 33 B.C.—the date of the document under review—the ruling authority was Cleopatra.

What van Minnen had uncovered was Cleopatra's original "signature," which she penned on the papyrus just three years before she expired in the arms of Mark Antony.

At first, van Minnen thought little about his find, but when he shared it with a colleague, excitement quickly spread. Within days, he found himself in the auditorium of the Egyptian Museum at a press event with more than 60 reporters from around the world eager to learn about his discovery.

For anyone, that would be heady stuff. For a papyrologist, it was off the charts.

Most of van Minnen's work is perhaps less flashy. But he finds it no less fascinating.

on the papyrus is only half the trick. There's also the question of what it means.

"It's a very exciting kind of work he does," UC classics department Director William Johnson says of van Minnen. "He constructs history from the primary sources on a daily basis, and that's what classics is all about."

The papyrologist is literally piecing together history.

Surviving papyri only occasionally are literary in nature. More often, they are contracts and legal documents that reveal in an indirect way details about life in ancient societies.

For example, Alexandria, Egypt, van Minnen says, was the third most important city in the ancient world, behind Rome and Athens. There are so many aspects of its history that remain unknown.

"Can you write a social history out of several hundred documents from ancient Alexandria?" he playfully asks. "The answer is: How good of a historian are you?"

"Peter is a world-renowned figure in papyrology, and he has tremendous range in what he does," says Johnson. "He can do things that are quite literary to things relating to economic history, just a wide range of social and historical topics. Unlike most historians, he not only has the ability to synthesize these things in his head, he also stores a huge 'library' of original documents [on recall] in his head."

Van Minnen has just begun a six-year term as editor of the only North American academic journal in his field, the *Bulletin of the American Society of Papyrologists*.

He publishes on a consistent basis. Already with five books to his credit, he is well along with research on three others—one on the economy of Roman Egypt, another on life in the city of Hermopolis and a third that is a collection of essays.

Only 10 percent of the known papyri in collections around the world have been well researched to this point. So van Minnen knows he will never lack for work.

"With new finds being made in Egypt each year, we are not yet subject to the law of diminishing returns," he says. "And it's the piecing together of what we have barely looked at, the dealing with fragmented material, that makes papyrology interesting. You have to use your imagination as a historian, but you also have to control your imagination as a papyrologist."

Sounds just like one big jigsaw puzzle.

"What keeps you going in this work is the constant challenge," van Minnen adds. "It's a puzzle of words and past reality.

"In the old days, papyrologists were really only interested in the texts. Now we also want to know how the papyri fit in with the material world excavated by archaeologists."

Solving the ancient world's most complex challenges is the essence of van Minnen's professional career.

Peter van Minnen, PhD

sounding out papyri

Ancient Greek and Roman cultures are often identified as the true creators of fine arts.

William Johnson, PhD, papyrologist and director of UC's classics department, says papyri might just confirm that.

He says that in decoding the secrets of a few rare papyri, the actual sounds of ancient culture can be brought back to life.

Many papyrologists read ancient papers and translate words, but Johnson looks for early clues about a culture's musical past.

While pursuing his doctorate at Yale in literary papyri, he became a fixture in the school's Beinecke Rare Book and Manuscript Library, home of the university's papyrus collection. When a new collection of papyri came in that included one of poetry with additional unusual markings on it, the curator asked Johnson to take a look.

A year and a half later, he was ready to publish about the rarest of subjects—ancient Greek music, an art form that is largely lost to history.

"What you have is essentially a melody line, with some rhythmic indications," says Johnson. "It's difficult to determine what the symbols are and how they fit together."

As a resourceful researcher, Johnson was able to make determinations about the beat of the music from the way it is tied to the metrical pattern of the accompanying poetry.

Researchers also know about the kind of musical instruments the ancient Greeks employed.

There was enough there that the music on the papyrus eventually was able to be performed.

"It's a little odd sounding, because it doesn't have thematic repetition, which we in Western culture expect," says Johnson.

It was the kind of unusual insight into history that captured the attention of many who otherwise might have had little interest in papyri.

And it caught the eyes (and ears) of colleagues at other universities.

When speaking at a Washington, D.C., meeting about the Yale papyrus, Johnson was approached by someone from the University of Michigan who knew of an interesting papyrus in their collection that he believed had been mislabeled. Johnson agreed to take a look, and it turned out to be the score for a piece of instrumental music.

Johnson has published about both pieces of musical work, and he expects more music to be discovered.

"People keep declaring the age of great papyri discoveries as over, and that's never quite true," says Johnson. "We seem to find an exception every five years or so."

A small amount of those discoveries will turn out to be new music, adding a different spin to the world of ancient papyri.

Today, the music of the Yale papyrus—along with the other from the University of Michigan that Johnson helped decode—is available for listening on the UC classics Web site (classics.uc.edu/music). And the sounds continue to draw visitors from around the world.

Johnson was particularly struck by an e-mail he received from an elementary school class in Greece in the weeks after the Sept. 11 terrorist attacks in 2001. They had found his music page on the Web.

"They were saying that their hearts and minds were with me and all Americans, and thank you for helping us to rediscover the music of our ancient ancestors," says Johnson. "It was demonstrative of how even esoteric scholarly research has little ripples far beyond what you assume. I think any scholar would like to think what he or she does affects the world indirectly, but it's nice to have an indication like that."

William Johnson, PhD


NEW POSIDIPPUS

thwarting greek 'tragedy'

UC professor of classics Kathryn Gutzwiller, PhD, has spent years researching ancient Greek epigrams, a brief poetry form that is sometimes found on papyri. She has long argued that compilations of multiple poets in collections occurred much earlier than most scholars first thought.

Then, along came Posidippus to show that she was right.

The Greek poet from the 3rd century B.C. has become something of a star in the classics field since a papyrus bookroll of his epigrams was discovered last decade. The papyrus was found covering the chest cavity of a mummy, apparently placed there as scrap as the body was prepared.

The survival of that "scrap" collection has been immeasurable in value to modern scholars. The discovery proved Gutzwiller's theory about the age of Greek epigram collections to be right, as Posidippus' writings were soon labeled the oldest extant Greek poetry book to survive as an artifact. In fact, the bookroll was estimated to be produced at least 200 years earlier than most scholars thought work of that kind was being created.

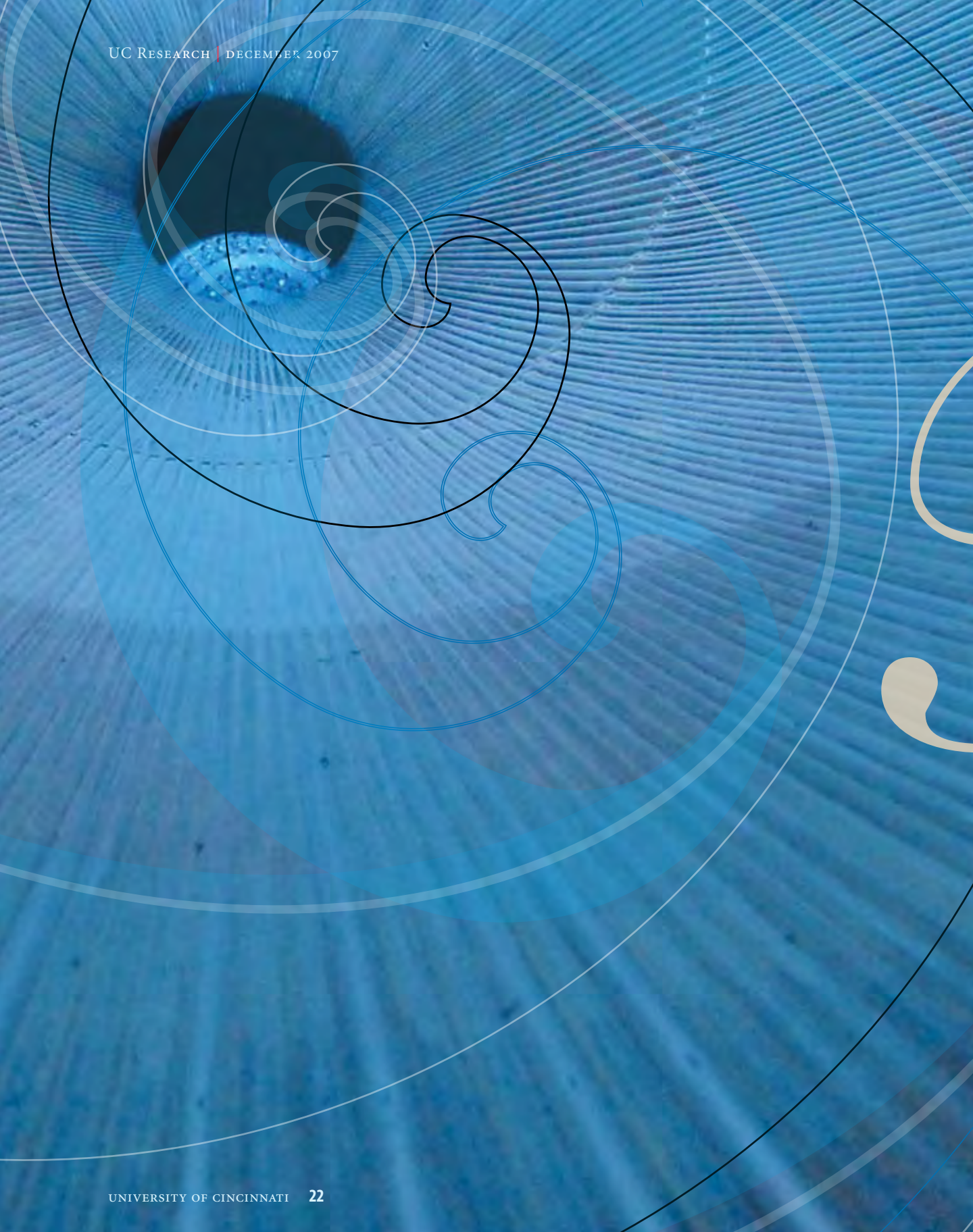
"This particular papyrus was a really remarkable and notable discovery," Gutzwiller says.

And not just for its age, she adds.

"Typically we find at most a few letters or words in a papyrus fragment, but in this case we had a significant amount of literature on this bookroll."

Gutzwiller has since published through the Oxford University Press a volume of essays on Posidippus. She also was elected a director of the American Philological Association, North America's leading professional group for the study of ancient Greek and Roman languages, literatures and civilizations. She serves as editor of the association's Monograph Series.

Gutzwiller was instrumental in organizing an international conference of 60 experts to come to Cincinnati for a symposium that looked at the significance of the Posidippus find. Much of the work done for that symposium is published in her Oxford volume. ▬

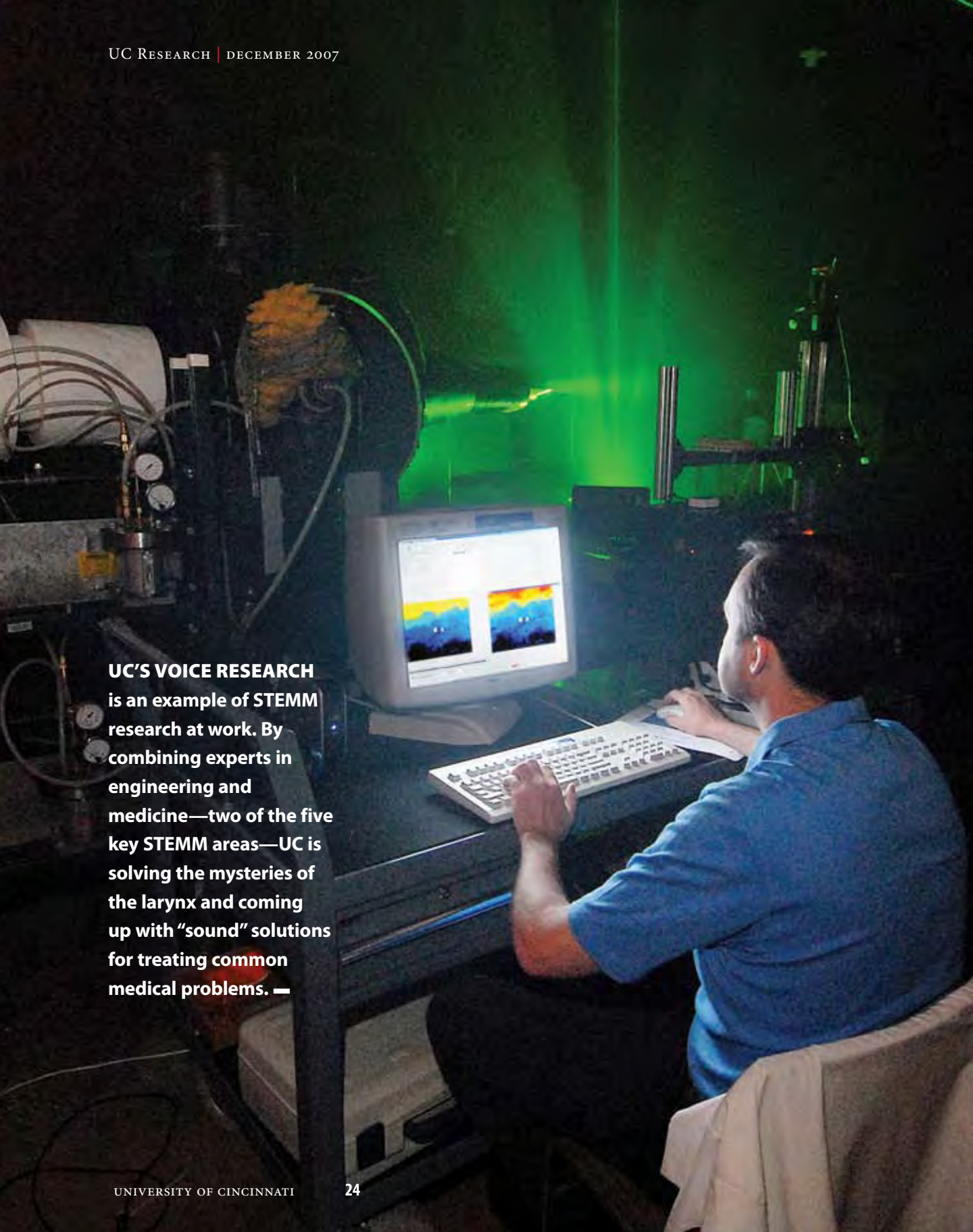


Going with the Flow

Mysteries of the human voice box yield to the pressure of jet engine aerodynamics

By Jamie Davis

Photos by Dan Davenport



UC'S VOICE RESEARCH is an example of STEMM research at work. By combining experts in engineering and medicine—two of the five key STEMM areas—UC is solving the mysteries of the larynx and coming up with "sound" solutions for treating common medical problems.

The ROAR

of an engine as an airplane takes off can be as unpleasant as the person in row 23 kicking the back of your seat.

But even though engine noise can be an annoyance, it's a welcomed sound to researchers studying one of the body's least-understood organs—the larynx, commonly known as the voice box.

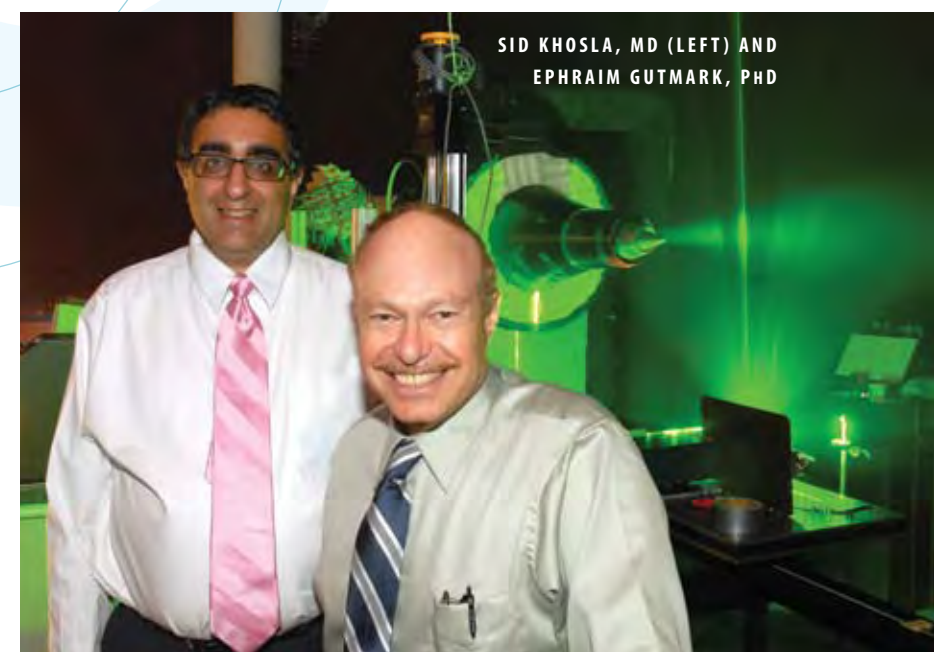
It all has to do with airflow patterns.

UC aerospace engineering professor Ephraim Gutmark, PhD, knows well how airflow produces sound in jet engines (known as aeroacoustics), and how the interaction between the flow and structure (aeroelasticity), an aerodynamic phenomenon, can affect the flow and noise production.

Couldn't those same elements affect another noisemaker—your throat?

It was Gutmark's 30 years' experience with flow patterns in jet engines that led otolaryngologist Sid Khosla, MD, to Cincinnati two years ago to pursue just that hypothesis.

A specialist in laryngeal disorders, Khosla wanted to better understand just how the larynx really works. Although scientists know about basic voice production—the two "vocal folds" in the larynx vibrate and pulsate airflow from the lungs—they still don't understand how it actually produces sound.



SID KHOSLA, MD (LEFT) AND EPHRAIM GUTMARK, PhD

So, in an unlikely collaboration, the aerospace engineer and the ear, nose and throat surgeon decided to team up to see if the airflow in jet engines can help solve the mysteries of the voice.

Gutmark, aerospace engineering colleague Shanmugam Muruguppan, PhD, and otolaryngology department faculty have pooled their knowledge to come up with the answer.

"Sound produced by vocal-fold (vocal cord) vibration has been extensively researched in computational and theoretical models," says Khosla, "but the specifics of how airflow actually affects sound have not been shown using an animal model—until now."

"Understanding the aeroacoustics in a jet engine helps us determine how we can reduce the noise," says Gutmark. "This same physical understanding can be applied to study normal and abnormal voice."

The intense sound generated by a jet engine is produced by rapidly spinning "vortices" of air, much like miniature tornadoes—and equally noisy. Aerospace engineers commonly measure this flow with a technique known as particle image velocimetry (PIV).

In aerospace engineering, PIV equipment typically consists of digital cameras, a high-powered

laser, synchronizing electronics and special software. The laser produces a light "sheet" that is scattered by micro-scale particles that follow the engine exhaust jet stream. Flow velocity patterns are interpreted from the motion of the particles captured by the cameras.

"PIV enables us to quantify the features of jet engine flow, such as how the hot and cold streams mix, what kind of turbulence they generate, what kind of vortices are evolved and how they produce noise," says Gutmark.

Khosla says vortices may help explain why individual voices vary in richness and sound quality. In fact, if vortices didn't affect sound production, the voice would sound mechanical, he says.

Khosla and Gutmark decided to use PIV to detect vortices in an animal model larynx, which would be more applicable to the human larynx than computational and theoretical models.

One of the challenges is that any larynx is much smaller than a jet engine.

So to make the PIV technique

It all has to do with *airflow patterns.*

work in the animal model, Gutmark and Muruguppan designed and built what is possibly the only technology of its kind in the world that can detect flow structures in the larynx during vocal-fold vibration—which may open up a whole new way to treat voice disorders.

In addition to improving current surgical techniques, Khosla says, understanding how vortices affect voice production could help in the development of new and/or improved drugs, clinical pathology services and voice training techniques.

Determining how airflow affects sound is just one UC project that combines aerospace engineering with medical research.

Using technology Gutmark developed 20 years ago for aerospace applications, a means of producing airflow without pressure, the team is now working on a multi-use prototype that could be used, for example, to treat obstructive sleep apnea, a condition usually caused when the soft tissue in the rear of the throat (uvula) collapses and blocks airflow to the trachea (windpipe). Each time the breathing stops, the body wakes itself to resume breathing, which significantly reduces sleep quality.

Most current airflow generators used to treat sleep apnea, such as the widely used continuous positive airway pressure machine, provide pressure to keep the airway open. Although effective in treating obstructive sleep apnea, long-term studies have shown that only about 70 percent of patients are compliant in wearing the device.

"Some feel claustrophobic or find it uncomfortable to sleep wearing a mask," says Khosla. "That's why we think it would be ideal to develop a device that provides airflow to a patient without the bulkiness, cost and weight associated with some ventilators."

"We can't say too much about it right now, of course, since we're still refining it, but we hope it will be useful for many medical applications," Gutmark says.

So the next time the roar of a jet engine has you reaching for earplugs, console yourself in knowing it's that noise that may lead to advances in treating voice disorders and sleep apnea—and far more people than just those on your flight will one day be able to rest easy because of it.

STUDYING EVEN SMALLER VOICE BOXES

In addition to working with Sid Khosla on the airflow device and larynx research, Ephraim Gutmark and his team are applying their aerospace engineering skills to helping pediatric physicians treat children with obstructive sleep apnea and airway obstruction.

"Currently, we have effective surgical techniques for treating children with narrowing of the tracheal airway," says Ravi Elluru, MD, assistant professor of pediatric otolaryngology.

"However, we have a very poor understanding of how certain airway obstructions lead to the sensation of shortness of breath, and what minimally invasive procedures are needed to relieve this symptom."

Elluru says that understanding what happens to airflow when there is an anatomical abnormality in the airway can help physicians predict which airway lesion will lead to shortness of breath and how to optimally repair the lesion.

Surgeons at Cincinnati Children's Hospital Medical Center are gaining those insights by using an engineering technique called computational fluid dynamics (CFD) to solve and analyze problems involving airflows.

"In jet engines, we use CFD to calculate how the engine geometry affects the turbulent flow behavior, how it changes the temperature distribution of the jet and how it impacts the engine efficiency," explains Gutmark.

"Once you have that information," Gutmark says, "you can look at how to change the exhaust of the jet engine so the behavior of the flow produces less noise."

Gutmark and his engineering colleague, Mihai Mihaescu, PhD, worked with UC and Cincinnati Children's radiologist Lane Donnelly, MD, and pulmonary specialist Maninder Kalra, MD, to figure out how to use CFD to study clinical images to learn more about airways in pediatric patients with sleep apnea and other flow-related conditions.

They use the magnetic resonance or computed tomography scans of the child's respiratory tract to reconstruct an anatomically accurate three-dimensional model of the patient's airway. Using CFD, they can predict virtually how that particular patient's airway will be affected by surgery.

"Knowing pre-op how surgery will affect a patient's airway allows us to determine the most appropriate technique for a particular patient and to reduce the likelihood they'll develop post-op complications," says Elluru.

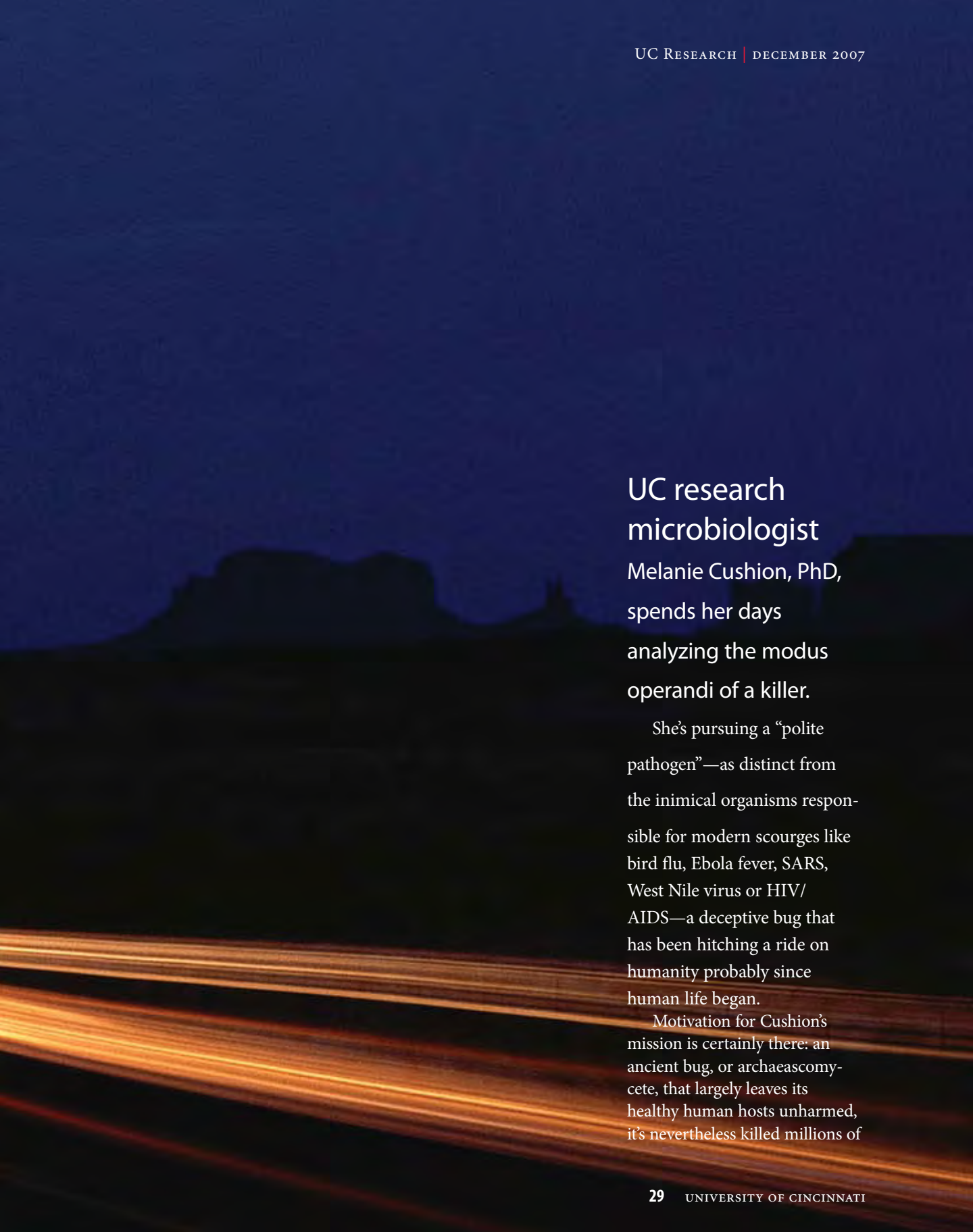
Gutmark and his team study clinical images to learn more about airways in pediatric patients with sleep apnea and other flow-related conditions.

the old hitch hiker

An ancient organism thumbs a ride on people and, like the stranger seen waiting roadside, just what kind of passenger have we picked up?

By David Bracey

Photos by Dan Davenport



UC research microbiologist

Melanie Cushion, PhD, spends her days analyzing the modus operandi of a killer.

She's pursuing a "polite pathogen"—as distinct from the inimical organisms responsible for modern scourges like bird flu, Ebola fever, SARS, West Nile virus or HIV/AIDS—a deceptive bug that has been hitching a ride on humanity probably since human life began.

Motivation for Cushion's mission is certainly there: an ancient bug, or archaeascomycete, that largely leaves its healthy human hosts unharmed, it's nevertheless killed millions of

MELANIE CUSHION, PHD

people, particularly in our own AIDS-stricken generation.

And as our much-traveled, densely populated world appears ever more prone to bug-based pandemic diseases, Cushion's quarry becomes potentially more dangerous.

The subject of her attention is *Pneumocystis carinii*, an ancient, sexually reproducing parasitic fungus that can cause an often deadly pneumonia in infants, the sick, the aged—and anyone whose immune defense system is suppressed by medications or by chronic illnesses like AIDS (for which the presence of Pneumocystis is a major diagnostic clue).

Like other "biotrophic" fungi, organisms that need other living tissue on which to survive and reproduce, Pneumocystis attaches itself to specific lung cells in its host and grows there "in communion with the host without destroying it," as Cushion describes it.

"It enters the lung and proliferates slowly," says Cushion. "That's one of its hallmarks. Somehow the host's immune system keeps it in check, so it's not causing any damage. However, if the immune system becomes severely debilitated, especially in AIDS patients, it spreads out and fills the lungs."

But no matter the actual precipitating illness, if it's serious enough, the patient's immune defense weakens, and if it's not properly treated, it's usually Pneumocystis that delivers the *coup de grâce*.

If Cushion were not on her deadly serious, career-long mission, the readily laughing scientist would be pursuing her other passion: scuba diving in the Caribbean. (And continuing to worry professionally about the concerning decline in the fish population in her favorite diving grounds.)

But when it comes to microbiology, this spouse of a pathologist and mom to a college English major ("with no interest in science whatsoever!") is internationally recognized as a formidable foe of Pneumocystis—she agrees it's almost a personal vendetta. Cushion and her colleagues are committed to reducing the toll of thousands who die of Pneumocystis-induced pneumonia each year, especially in the burgeoning HIV/AIDS community.

A professor in UC's infectious diseases division, Cushion leads the worldwide Pneumocystis Genome Project from her lab at the Cincinnati Department of Veterans Affairs (VA) Medical Center. Coeditor with UC's Peter Walzer, MD, of the third edition of the definitive text *Pneumocystis Pneumonia*, she's only the third Cincinnati scientist in 20 years to win the VA's Research Career Scientist Award, the VA's highest award for nonclinician researchers.

The tricky thing about Pneumocystis, she explains, is that even though science has known about it and the threat it poses for nearly a century, it has dodged identification, definition … and the pharmacological bullet.

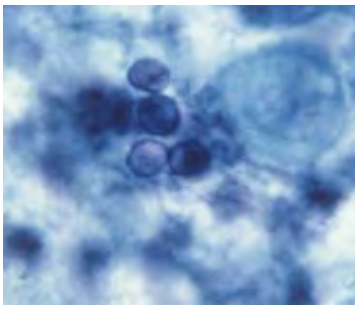
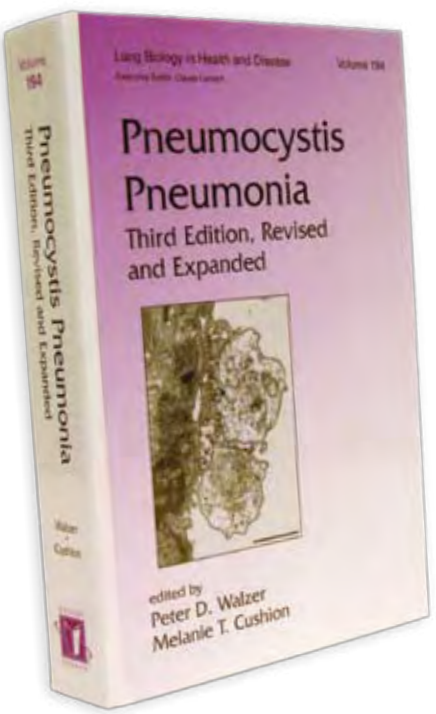


Photo: Centers for Disease Control

Although known to science for nearly a century, Pneumocystis has dodged identification, definition … and the pharmacological bullet.



Killer Chronology

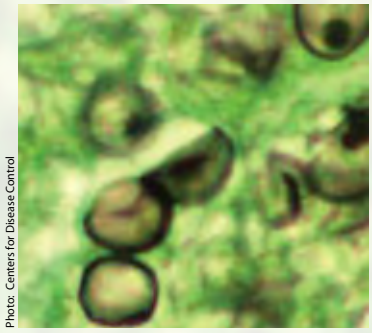


Photo: Centers for Disease Control

PNEUMOCYSTIS was first identified in 1912, but at the time no one could "grow it outside the animal" to provide material for study, and it lapsed into obscurity. ● It came back to attention again after a deadly pneumonia epidemic among undernourished children in European orphanages after **World War II**. Back then, no one knew what had caused the outbreak. But when scientists studied leftover tissue in the 1950s, using the latest staining technology, they realized the culprit was Pneumocystis. ● In the 1960s and 1970s, when cancer chemotherapy became widely available, Pneumocystis attracted attention again. But by then researchers had electron microscopy in their armamentarium, "and that's when we really got a handle on it and what it looked like," Melanie Cushion says. ● Then came the **1980**s, and the worldwide AIDS epidemic began. "And boom, there it was again!" says Cushion. ● The battled was joined.

Photo: Library of Congress

Photo: National Institutes of Health

Photo: © The NAMES Project Foundation

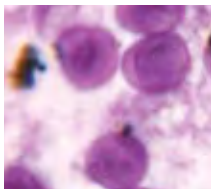


Photo: Centers for Disease Control

Its elusiveness is compounded by its willingness to ride inside us without causing harm. It's only when we get ill, or weakened pharmaceutically, that it turns on us.

The major difficulty, says Cushion, has been in finding a way to grow it for research purposes outside the human lung.

"Since we didn't have a culture system to grow it and study its metabolism," she says, "we had to see what genes it contains, what it's capable of doing."

Its elusiveness is compounded by its willingness to ride inside us without causing harm—an "independent operator," as Cushion puts it, with its own metabolic capacity. It's only when we get ill, or weakened pharmaceutically, that it turns on us.

Although this edgy symbiosis is a classic example of the caution, "With friends like that, who needs enemies?" Cushion says Pneumocystis' MO should cause us to rethink our relationship with microorganisms in general. Maybe they do want to be our friends.

"It's not like Pneumocystis is going to war with its host," she says. "We have to stop thinking about infectious diseases in this very black-and-white way, that we are going to get infected, and that this is a bad thing. Actually there's a continuum, so there are microorganisms that have evolved to be able to exploit us as hosts, but not kill us. In some cases we, the hosts, benefit by their presence.

"That's a new appreciation or concept of these microorganisms, especially among the fungal pathogens. The thinking has been that it's either out there in the garbage dump, degrading garbage, or it's killing its host.

"But this is one that's not killing its host. It wants to keep us alive so it can keep spreading. It's become so adapted to us that if it had its druthers it wouldn't cause any problems whatsoever. That's what we have to begin to appreciate about organisms like this."

Cushion admits Pneumocystis intrigues her "because the survival strategy it's chosen is very benign, and it's unusual because we know so little about it."

Why humans play host to Pneumocystis in the first place remains a mystery.

"Do we need it?" she says. "It's not clear. But we do have it, and almost all our lives. Some organisms, like those in our intestines, don't do us any harm. They're even good for us. So you can figure it may be one of those.

"But although we don't see a purpose for Pneumocystis at this point, that doesn't mean there isn't one. We have to study it to understand its life cycle, to see if we should get rid of it or not.

"Maybe it's keeping other organisms in check. We just don't know. But scientists like me who study infectious diseases tend to look at their 'own' organisms and don't consider it in the whole

UC's pneumocystis genome project team is led by Melanie Cushion, PhD, codirected by George Smulian, MD, and includes Tom Sesterhenn, the technician who provided the material for sequencing, and Jarek Meller, PhD, Alexey Porollo, PhD, Rafal Adamczak, PhD, and Brad Slaven—the bioinformatics push behind the genome assembly. The team coauthored an article on their *Pneumocystis carinii* research in the May 2007 edition of the online journal *PLoS ONE*. Also collaborating on Pneumocystis research at UC are investigators Peter Walzer, MD, Kieran Daly, PhD, Michael Linke, PhD, James Stringer, PhD, Scott Keely, PhD, and Edna Kaneshiro, PhD.

bio- or microbial community. So we have to begin to understand how it's operating within the host.

"It's intriguing that once the host becomes debilitated, as with AIDS, why is it that it's Pneumocystis that takes off, and not Pseudomonas?" (*Pseudomonas aeruginosa* is another common "opportunistic" pathogen, which characteristically occurs in the hospital setting among sick and weakened patients.)

FROM LEFT TO RIGHT: TOM SESTERHENN, ALEXEY POROLLO, PHD, GEORGE SMULIAN, MD, BRAD SLAVEN AND MELANIE CUSHION, PHD.

Photo: Centers for Disease Control

PSEUDOMONAS AERUGINOSA

Cushion and her Genome Project colleagues from UC are currently examining the genetics, natural history and life cycle of Pneumocystis.

Originally a "zoonosis," a disease like TB, bird flu and Lyme disease that can jump from animals to humans, it probably became seated within the different mammalian lineages during the mammalian radiation of the Cenozoic era—meaning up to 65 million years ago. Since each mammalian species has its own form of Pneumocystis, it seems to have coevolved with the different lines as the mammals took over.

"It's probably evolved a survival strategy over the years so as not to fully lose all its machinery," she says, "or it could be in the process of losing it, and we've caught it in the middle. So right now it's kind of in between the dependent parasites that we know of, and those that live outside the environment and can survive without a host."

While Cushion and her co-researchers are identifying the essential components that allow Pneumocystis to survive, they have a few clues to go on as they seek out the organism's weaknesses and possible drug targets.

Its sex life is one of them.

Like all biotrophic or truly parasitic fungi, and unlike some nasty primary invaders that conjugate outside the host, Pneumocystis has sex inside its human home, and in the act its cells form a characteristic "resistant cyst."

"Well, what happens if we can stop them from forming a cyst?" Cushion ponders.

"In this day and age, when we think we can know everything about every organism, when its genome is sequenced and when so far there are no major surprises, this one continues to defy us."

Translation

UC INVENTION COULD LITERALLY

"SNIFF OUT" DISEASE SYMPTOMS

Alzheimer's, Parkinson's and nearly every other disease of the aging central nervous system have one thing in common—loss of sense of smell.

Measuring that loss could lead to earlier disease diagnosis and treatment.

UC's Robert Frank, PhD, professor of psychology, and Robert Gesteland, PhD, professor emeritus of cell and cancer biology, have developed a way to measure the power of a sniff. Their Sniff Magnitude Test—seven years in the making—has received more than $1.3 million in support from the National Institutes of Health.

The test works by evaluating the strength of someone's sniff as they take whiffs from an odorless container and one filled with some very specific scents—including a rancid rotting smell from the chemical methylthiobutyrate, a strong, skunk-like odor given off by ethyl 3-mercaptoproprionate, and a more pleasant banana scent (to give smellers a bit of a break!) created by amyl acetate.

The Sniff Magnitude Test measures a reflex-like reduction in sniffing that happens after an odor is encountered. For people with a healthy sense of smell, sniffs of odorless air will be longer than sniffs to air that's odorized.

As sniff testers take in the odors, those with a keen sense of smell will only need to take quick sniffs, but people having trouble smelling may sniff longer. Those longer sniffs, say the UC researchers, could be a sign of trouble.

The test has proven to be an effective measurement and is now under development by WR Medical Electronics in Stillwater, Minn., and is set to be manufactured and marketed to neurologists and ear, nose and throat physicians.

Because the test only measures sniff strength, and doesn't require test-takers to identify what they smell, it can be used on children who may not know what they're smelling, elderly patients with speech difficulty, non-English speakers, and even for cultures unfamiliar with odors that can be commonly identified by Americans.

UC researchers will soon begin testing five different prototypes of the Sniff Magnitude Test. An earlier model is already being studied in a clinic in Germany, at the University of Pennsylvania and at Rush University Medical Center in Chicago. Researchers at another university are exploring its use as part of a major epidemiological study on aging, Alzheimer's disease and sense of smell.

Photo: Lisa Ventre

Revealing

By Carey Hoffman

Photos by Dottie Stover

The Mark Godsey of today finds plentiful grounds for disagreement with the pre-2001 version of himself. ■ Back then, he was wrapping up a five-year stint as a federal prosecutor in New York and had a prosecutor's mindset. ■ As befitting a lawyer, Godsey's conversion to his modern-day self began with evidence—irrefutable evidence.

Evidence

MARK GODSEY

After leaving his prosecutor's position, Godsey joined the faculty at Northern Kentucky University's Chase College of Law. Among his first-year duties: helping to supervise a pair of students working on the claim of innocence by a man serving time in a Kentucky prison on a rape conviction.

"I remember sitting in on the first meeting where the students had gotten back from a prison visit, and they were so convinced just from talking with this guy for two hours that he was innocent," Godsey recalls. "I remember thinking just how naïve they were."

In the prosecutor's world, everyone says they're innocent. Godsey had too much experience to lightly buy into that kind of claim.

But then, for the first time since the crime, authorities in the Kentucky case arranged to have DNA testing done on evidence that was recovered. When the test came back, it proved that the man had been telling the truth—he could not have committed the rape.

The inmate was soon set free, and Godsey was propelled forward in a new direction—with a new mindset.

He began looking into the subject of exonerations, which led him to the 2002 national Innocence Project conference, where further discussion revealed that Cincinnati might become the future home of the Ohio Innocence Project (OIP).

LOU BILIONIS

Events fell into place and by May 2003, Godsey was making the jump to the UC College of Law, which would become home to the OIP.

"Within a year or so, I was a firm believer that false convictions were problems that needed to be addressed," says Godsey, UC law professor and OIP's faculty director. "When I came to UC and Ohio had no Innocence Project, there was no hesitation whatsoever that this was what we needed to do."

The impact of the OIP has been profound. In just four years, three men have already been freed from prison. Perhaps just as importantly, 80 law students have gained the kind of experience with demanding and complex real-world legal situations that they would be hard-pressed to match anywhere else.

Annually, 20 second-year students become fellows of the college's Rosenthal Institute for Justice, the center that is home to the OIP. Their experiences, UC College of Law Dean Lou Bilionis says, are akin to being able to go to work for a busy law firm during the formative years of their legal education.

At the heart of OIP is developing the kind of research tenacity necessary to survive in a profession built on arguments.

Each year, the students hear from hundreds of inmates seeking assistance. And each inmate knows from the outset that OIP cases need new evidence to go forward and that physical evidence such as DNA has the same potential to prove them guilty as it does innocent.

If a case meets the initial OIP criteria and shows promise, then UC law students start the heavy lifting of researching the paper trail that is the case's history.

"They're trying to answer the crucial question: Is there some piece of new evidence that will shed light on the question of innocence or guilt in a powerful way?" says Godsey. "Usually, that's DNA or biological evidence."

He recalls the case of Chris Bennett, which after three years of work, resulted in Bennett's exoneration in 2006. It is a prime example of the power that comes from OIP students' research efforts.

Bennett was imprisoned for aggravated vehicular manslaughter after a 2001 accident that killed his friend, Ron Young. Both had been drinking in a bar before the crash and Bennett, who suffered head injuries in the wreck, couldn't recall any details of what had happened, including who was driving.

Students started investigating and then hit the jackpot: the mangled van from the accident was still sitting in a junkyard, allowing them access to the actual crime scene. They were amazed to find a cracked windshield on the passenger's side and, even more remarkably, dried blood down in the crevice between the dashboard and the passenger-side window. It became important evidence because Young had not suffered head injuries. DNA testing proved the blood to be a match to Bennett, putting him—not Young—in the passenger seat at the time of collision.

More diligent digging turned up additional significant evidence, including a new eyewitness who was actually first on the scene, and an accident reconstruction specialist who answered all the lingering questions about Bennett's and Young's injuries. Despite resistance from those who convicted him, the new evidence convinced Ohio's Fifth District Court of Appeals to reverse Bennett's conviction. Rather than risk a new trial with the new evidence, local authorities chose to make a plea deal with Bennett on a lesser charge that allowed him to be immediately released.

The story of Bennett and the OIP students who helped him was told this fall in the debut episode of a new Court TV series, "Justice Delayed," hosted by famed author Scott Turow.

Each inmate knows from the outset that physical evidence such as DNA has the same potential to prove them guilty as it does innocent.

RESEARCHING INNOCENCE

"The entire process is about research," says Godsey, laying out how students dig into court records and read trial transcripts, or try to locate a piece of physical evidence that, if it even still exists, could be in a police station, courthouse, hospital, crime lab—or even a junkyard.

Irrefutable Proof

When he was a prosecutor, all Mark Godsey knew about DNA and its implications in a legal sense was what was taught to him in law school.

Which, he says, was next to nothing.

"Most prosecutors and defense attorneys are woefully ignorant about DNA," says Godsey. "It's not a subject most lawyers are exposed to in law school, and even the more recent grads who might know a little about it find themselves easily intimidated because the science behind it advances so quickly.

"I think people are scared of it if they haven't done a DNA case before. They're intimidated. They don't know how to start or what to ask, so they just avoid it," says Godsey.

That kind of scenario suggests why prisoners may have case-relevant DNA evidence available that wasn't thoroughly investigated.

Godsey got serious about DNA through a regimen of self-education. He has taken it upon himself to learn all that he can about the use of DNA in the legal system. He's become so well-versed that he now teaches the DNA training course each year at the national gathering of Innocence Project personnel. He's also turned the content from that course into a written guide.

The guide explains the finer points about the different kinds of DNA testing—STR, YSTR and mitochondrial—and offers practical advice as to when each type might be the best option and in what kind of cases they might best be applied.

The combination of variables can be daunting—that's clear even reading Godsey's guide—and validates the idea that inexperienced lawyers may not readily look to DNA testing.

But as the Clarence Elkins and Chris Bennett cases showed in Ohio—and as many other cases have proved nationally—DNA testing can be the difference between freedom and imprisonment.

Godsey uses the same material to help prepare the new Ohio Innocence Project students each year for the work that lies ahead of them.

They have a week-long orientation and Godsey presents his DNA course, where they talk about all the different kinds of research they'll be doing through the year.

"Of course, you can't learn it all in one week," he says "so it's sort of trial-and-error after that."

Just like the lawyers in the real world.

The experience is already paying off for Curtis Scribner. A member of the college's Class of 2007, he landed a job in New York with the firm of Shearman & Sterling. Even though he won't be doing criminal law, the kind of work he did with the OIP helped separate him from the pack, Scribner was told during the interview process.

"Working with inmates, filing documents in court, those are exceptional experiences for a second-year law student," says Scribner.

He was so good at his job that it led to another unlikely experience for a law student—a visit to the U.S. Supreme Court to hear the argument of a case he helped research involving the Americans with Disabilities Act.

MELINDA ELKINS

Scribner was also among those who worked on the most celebrated victory thus far won by the OIP, the exoneration of Clarence Elkins. Elkins spent seven years in prison after being convicted in a rape and murder case involving members of his wife's family.

No physical evidence was ever found that linked Clarence to the crime scene, and his wife, Melinda, never believed that her husband committed the crimes. She worked vigorously to make that case on his behalf.

The turning point in her battle may have come when the OIP began working on the Elkins case in 2004.

Soon after becoming involved, the OIP was able to prove—through DNA examination—that biological evidence recovered at the scene could not have come from Elkins.

That wasn't good enough for local authorities in northern Ohio who still had eyewitness testimony they found to be credible. Digging in their heels, the OIP and Melinda Elkins then began the task of identifying the actual perpetrator of the crime.

The trail soon led to Earl Mann, a convicted child molester who was the boyfriend of a neighbor who lived near the crime scene. In an astounding coincidence, it turned out Mann was back in prison—and was actually in the same cell block with Clarence Elkins. Elkins was able to recover a cigarette butt that Mann had been smoking, and his advocates had DNA testing done on it.

Earl Mann, they learned, was a match for the biological evidence recovered at the crime scene.

Amazingly, the battle was not yet won. Local authorities still resisted freeing Elkins. In a remarkable moment, then-Ohio Attorney General Jim Petro, the state's top law enforcement official, came out publicly advocating for Elkins's release based on the latest evidence. In

CLARENCE ELKINS

THEN-OHIO ATTORNEY GENERAL JIM PETRO

December 2005, just as the dispute was preparing to enter another phase, the local authorities did a sudden about-face, dismissing all charges against Elkins and allowing him to be freed just 10 days before Christmas after serving seven-and-a-half years in prison.

Like many others, the Elkins case gained not only OIP's research power, but also a powerful advocate, Mark Godsey, who helped coordinate efforts on several fronts. Melinda Elkins quickly became impressed with both his professional abilities and his personal commitment.

"There are two sides of Mark that people may or may not know: he has a side that's laid back and easy to understand, and then there's a passionate side about him that gets very intense," says Melinda, who has continued to work with the OIP since Elkins's exoneration. "Mark is truly bothered by the idea that there are innocent people in prison, and his demeanor shows that. It's not just a job for him, it's his life."

The Elkins case was exceptional for its difficulty—even among all the work done by innocence projects nationally, which has resulted in the freeing of 200 individuals who combined had wrongly served nearly 2,500 years in prison. It has already been the subject of a "Dateline NBC" episode and is in script development in Hollywood as a potential movie.

PLAYING OFFENSE

Godsey says innocence projects are constantly playing offense.

"Prosecutors are offense, defense attorneys are defense," says Godsey. "Innocence projects are more analogous to a prosecutor's office than we are to a defense attorney."

As a defense attorney, he says, you're just playing defense and reacting.

"You're not concerned with the ultimate issue of justice, as a prosecutor is supposed to be," he adds. "With the Innocence Project, you are much more like a prosecutor. You are concerned with that ultimate issue of justice and you are taking the offensive."

That's exactly how it played out in the Elkins case, Godsey says. Ultimate justice was served.

But, even after all the success of innocence projects nationwide, convincing prosecutors to look at new evidence—particularly DNA—is still tough.

"When I talk to people in a cocktail party setting, a lot of times they can't understand why, when we get a case and there's DNA available, the prosecutors almost always say no when we ask to get it tested," Godsey says.

He points to the Elkins case and to a more recent DNA testing case the OIP was involved in where the results showed that a prisoner named Joe Elliott actually had committed the crime.

"One outcome is that the person is proven innocent, like Elkins," says Godsey. "And in that case, we actually identified the true killer,

The Ohio Innocence Project is one of three efforts supported by the Lois and Richard **Rosenthal Institute for Justice** at the UC College of Law. A major gift by the Rosenthals, a family well known for their philanthropy in the Greater Cincinnati community, helped establish the institute by providing a $1 million endowment in 2004. Last winter, they gave a second $1 million gift in support of the institute.

GARY REESE, FREED BY THE OHIO INNOCENCE PROJECT

MELINDA ELKINS, CLARENCE ELKINS (SEATED) AND MARK GODSEY (STANDING FAR RIGHT) AND STUDENTS FROM THE ROSENTHAL INSTITUTE OF JUSTICE OHIO INNOCENCE PROJECT INVOLVED WITH THE ELKINS EXONERATION.

a guy who went on to commit other crimes when he was free.

"In the other case, the Joe Elliott case, our test proved he was guilty, and this was a guy who had been screaming from prison that he's innocent for 15 years and causing all kinds of problems for the victim's family. We shut him up."

The bottom line, Godsey says, is this research aspires to get to the truth. Innocence is innocence and guilt is guilt, and "we're not trying to get guilty people out of prison," he says.

Godsey now finds it psychologically interesting to watch those in his former prosecutor role grapple with the possibilities that DNA testing presents. It is no longer a matter of a prisoner claiming innocence; it's asking for the chance to definitively prove it.

"People who become prosecutors do it to do good, to help society, and that's what they do with their job 99 percent of the time," he says. "It's just a very strange phenomenon, how these otherwise reasonable people can get tunnel vision when something like this [new information] is presented to them.

"It's just silly to me that some people get so up in arms about this. What can having more information possibly hurt? How can it possibly hurt when new technology comes along?"

The work of innocence projects nationally has resulted in the freeing of 200 individuals who combined had wrongly served nearly 2,500 years in prison.

The Last Word

ON DISPARITIES

"¿Y tu abuela, donde esta?"

"And where is your grandmother?"

If you are a Puerto Rican born on the "Island," you will immediately recognize this phrase that originates from Juan Boria's black poetry about our descent and identity as a race. Neither white, nor black nor Indian, but all-in-one and—in many cases—a mixture of multiple foreign nationalities.

To begin to understand health care disparities in the Hispanic population, we need to start at the beginning by asking a seemingly simple question: who is a Hispanic?

The answer is that we are a blended race, a group of at least 23 uniquely different nationalities who are united only by the classification "Hispanic."

As a physician, if you depend on translators to find out what's wrong with your Hispanic patient, you need to understand that even if their first language is Spanish, there are striking differences in the language's meaning based on accent, mannerisms, regionalisms and expressions.

The language barrier is just one part of the health care disparities indicative of an ever-growing Hispanic population across the world and right here in the United States.

Socioeconomic and lifestyle differences among the Hispanic population—including poor dietary habits, a lack of knowledge about infectious and sexually transmitted diseases, as well as tobacco use—have contributed to preventable cancer deaths among Hispanic-Americans.

Chronic cancer care and prevention of this devastating disease should be of utmost importance in today's health care agenda. We need a worldwide intervention and education initiative focused on lifestyle changes and early cancer detection to reduce cancer mortality rates among this growing population.

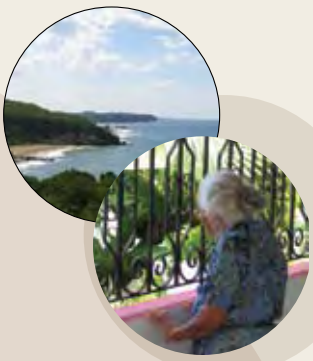
Hispanics are the fastest growing minority in the United States, however, they're also the least likely to follow screening guidelines and the most likely minority to be uninsured. Some Hispanics avoid seeking medical attention for fear of being deported (if they lack appropriate documentation) or finding out they have a serious disease. In addition, foreign-born Hispanics are less likely to speak English or to have had preventive care and screening tests. This can make American doctor visits and screening tests both an emotionally and financially

stressful experience for the family.

These combined factors result in Hispanics showing up in cancer clinics with advanced, difficult-to-treat cancers that often require more expensive, less successful treatment regimens.

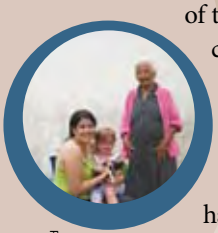
Moreover, "el fatalismo," a fatalistic view toward cancer, is prevalent among Hispanics. This view and its implications to the family dynamics and culture play a major role in Hispanics' decision to pursue screening tests and preventive medical care. This fatalistic view is more prominent in foreign-born Hispanics and can potentially explain some of the disparities previously attributed to ethnicity.

Although cancer survival statistics have dramatically improved in the past 30 years, currently accepted screening tests are only available for breast cancer, colorectal cancer, cervical cancer and prostate cancer. Based on SEER data (Surveillance Epidemiology and End Results) from 2001–2003, the lifetime risk of developing cancer for men and women born today is about 41 percent.



"¿Y *tu abuela,* donde esta?"

Today this phrase has a different meaning for me. "Mi Abuela", my grandma, recently died of gastric cancer—a highly preventable form of the disease. She had a well-known risk factor for gastric cancer that was undiagnosed and untreated because she was afraid to go to the doctor to see why she had the "hervedera" (burning feeling) in her stomach.



After she had her esophagogastroduodenoscopy, she told my mother it "was not such a bad procedure to have the 'maguera' (hose) down to her stomach." My heart broke. It turns out my grandmother had been sick for at least a year before I was told about her illness. My family did not want to worry me … a blood-relative and oncologist.

So, there it is. A little cultural lesson for all of us.

Photos: Courtesy of Margie Gerena-Lewis

MARGIE GERENA-LEWIS, MD, IS A CLINICAL INSTRUCTOR AND RESEARCHER IN THE DIVISION OF HEMATOLOGY AND ONCOLOGY IN UC'S DEPARTMENT OF INTERNAL MEDICINE. IN MARCH 2007, SHE SPOKE ABOUT HEALTH CARE DISPARITIES AS PART OF A NATIONAL HISPANIC MEDICAL ASSOCIATION CHRONIC CARE WORKSHOP TITLED "CANCER PREVENTION, A WORLD HEALTH CARE PROBLEM."

A Different View

This up-close look at human breast cells helped UC scientist Nelson Horseman, PhD, and his team to demonstrate that it's the neurotransmitter serotonin that causes inhibited milk production and secretion in mammary glands. By staining different parts of the cells with fluorescent dyes, Horseman's team could track where milk is leaked into the blood stream—ultimately leading to inhibited milk secretion and synthesis—and were able to attribute this 'leakage' to a build-up of serotonin. The team hopes their finding might one day aid in development of therapeutics or technologies that would increase milk production and yields from other mammals.

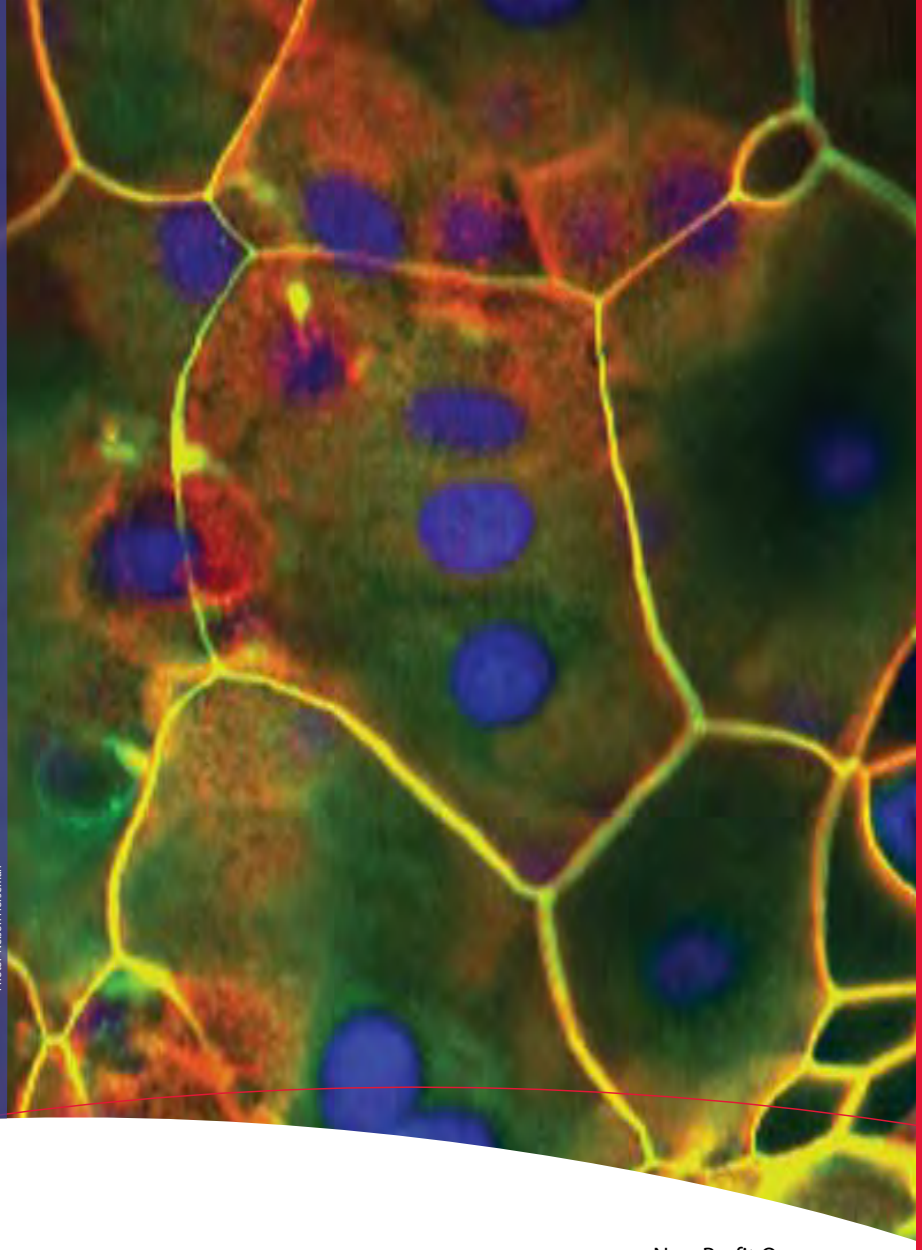


Photo: Nelson Horseman

UNIVERSITY OF Cincinnati

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By the Numbers

REPORT ON RESEARCH

2007

UNIVERSITY OF Cincinnati

UC Snapshot

LEADERSHIP
Jeffrey Wyler, Chairperson, Board of Trustees
Nancy Zimpher, PhD, President
Jane Henney, MD, Provost, Academic Health Center
Anthony Perzigian, PhD, Provost, Baccalaureate and Graduate Education

50,508
and counting

It takes all **50,508** UC faculty, staff and students to make UC's research enterprise such a success.

COLLEGES
McMicken College of Arts & Sciences
College of Allied Health Sciences
College of Applied Science
College of Business
Clermont College
College-Conservatory of Music
College of Design, Architecture, Art & Planning
College of Education, Criminal Justice, and Human Services
College of Engineering
College of Law
College of Medicine
College of Nursing
James L. Winkle College of Pharmacy
Raymond Walters College
School of Social Work
Graduate School

PROGRAMS OF STUDY

Doctoral	98
Master's	170
Bachelor's	167
Associate	139

ENROLLMENT (2006-2007)
35,527

PERSONNEL (January 2007)

Faculty (Full-Time)	2,514
Faculty (Part-Time)	2,724
Staff (Full-Time)	3,089
Staff (Part-Time)	293
Total (Without students)	8,620
Student Workers/Graduate Assistants	6,361
Total	14,981

ENDOWMENT (June 2007)
$1.185 billion

EXTERNAL GRANTS AND CONTRACTS (2007)
$333.5 million

LAND AND BUILDINGS
Acreage 473
Gross Square Footage 13,453,824
Buildings 117

LIBRARIES
16 Libraries
(University Libraries, Law, Academic Health Center, Clermont College, Raymond Walters College)
Holdings: 3,209,337 volumes; 42,265 periodicals.
Use: 451,815 items circulated; 116,532 reference transactions.
Ranked 47th in the U.S. and Canada by the Association of Research Libraries (2005-06).

Research is a major enterprise at the University of Cincinnati. Substantial dollars come in to support tens of thousands of faculty, staff and students who keep working every day to grow UC's research excellence.

Although we're made up of many valued employees, students and partners, UC is still one university working to create endless opportunities. And this one university has fared well as research budgets have tightened across the nation.

Together with our affiliates, our research-dollar total has increased to an all-time high of **$333.5** million.

Our university continues to rank among the top **25** public research institutions for federal expenditures, according to the National Science Foundation.

And in **2007**, UC won both of Ohio's only Eminent Scholars awards, gaining funds to recruit two faculty members from among the nation's finest research talent—one in nanosensors and the other in advanced propulsion and power systems.

Additionally this year, sustainability research on UC's campus literally took shape, as students from the colleges of arts and sciences; business; design, architecture, art, and planning; and engineering came together to design and construct a solar house for the international Solar Decathlon competition. University researchers also collaborated to create a new Sustainable Urban Engineering education and research center.

On the Academic Health Center campus, construction of the nine-story CARE/Crawley Building continues. Upon completion in **2008**, the university will have added **240,000** gross square feet of laboratory, education and quality-of-life space.

$333.5 million. Top **25**. Two new Ohio Eminent Scholars. Nine new stories of research space. These numbers give us many reasons to be proud of our accomplishments during **2007**.

While research at UC is much more than just data, we think it's important to show you just how the numbers add up to make UC such a successful research engine.

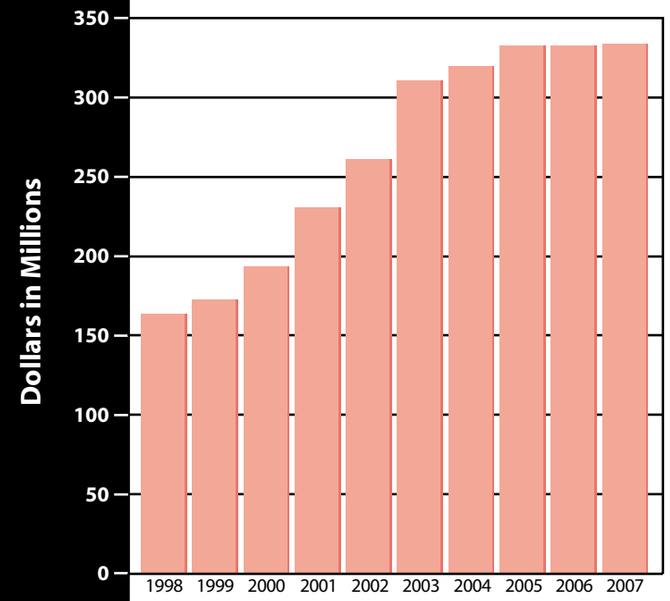
Read on to get a glimpse of UC *By the Numbers.*

Nancy Zimpher, PhD
President

Sandra Degen, PhD
Vice President for Research

10-Year Research Funding*

**Total awarded amount to UC and affiliates.*



2007	**$333,502,261**
2006	$332,655,266
2005	**$332,298,402**
2004	$319,624,151
2003	**$310,483,057**
2002	$260,890,739
2001	**$230,354,172**
2000	$193,686,549
1999	**$172,588,905**
1998	$163,454,626

UC and its affiliates generated **$333.5** million in research funding in 2007.

$333.5

10

In just **10** years, UC has more than doubled its research enterprise.

Sponsored Programs Awards by Unit*

**Not including affiliates—total includes research and instruction.*

Academic Information Technology and Libraries	$82,470	0.04%
Academic Planning	**$1,209,584**	**0.59%**
Allied Health Sciences	$1,185,368	0.58%
Applied Science	**$824,394**	**0.40%**
Arts and Sciences	$6,038,213	2.95%
Business	**$605,119**	**0.29%**
Clermont	$866,816	0.42%
Conservatory of Music	**$99,960**	**0.05%**
Design, Architecture, Art, and Planning	$1,010,012	0.49%
Education, Criminal Justice, and Human Services	**$10,742,564**	**5.24%**
Engineering	$18,568,146	9.06%
Graduate School	**$26,028**	**0.01%**
Hoxworth Blood Center	$1,366,679	0.67%
Institute for the Study of Health	**$687,925**	**0.34%**
Medicine	$134,464,267	65.63%
Nursing	**$1,375,213**	**0.67%**
Pharmacy	$1,958,044	0.96%
Raymond Walters	**$698,492**	**0.34%**
School of Social Work	$53,622	0.03%
SVP/Provost for Health Affairs	**$65,851**	**0.03%**
Student Affairs (enrollment services)	$22,570,234	11.02%
Vice President for Information Technology	**$4,000**	**0.00%**
Vice President for Research	$389,790	0.19%
Total	**$204,892,792**	**100.00%**

With more than $134.4 million in research funding, the UC College of Medicine represents ⅔ of the university's research-dollar total.

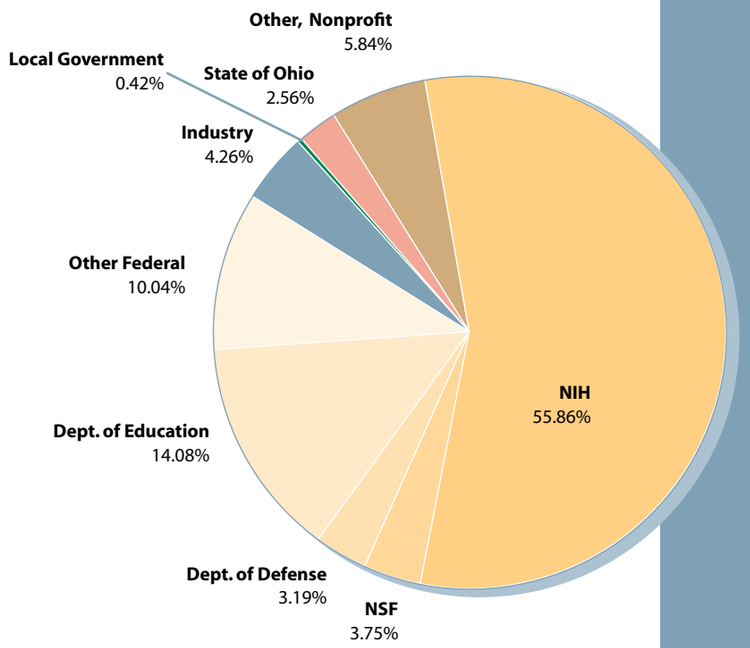
⅔

87%

87% of UC's research dollars come from federal funding sources.

FY 2007 Research Awards by Funding Source*

**Not including affiliates—based on a total of $204,892,792.*



Federal	**$178,098,550**	**86.92%**
NIH	$114,449,445	55.86%
NSF	$7,689,197	3.75%
Dept. of Defense	$6,532,336	3.19%
Dept. of Education	$28,861,164	14.08%
Other Federal	$20,566,408	10.04%
Industry	**$8,726,966**	**4.26%**
Local Government	**$853,687**	**0.42%**
State of Ohio	**$5,245,144**	**2.56%**
Other, Nonprofit	**$11,968,445**	**5.84%**

National Institutes of Health Funding by Agency*

**Top 10 sources listed. Number does not include affiliates.*

National Heart, Lung, and Blood Institute	**$22,736,250**
National Institute of Diabetes and Digestive and Kidney Diseases	$16,214,698
National Institute of Neurological Disorders and Stroke	**$15,308,833**
National Institute of Environmental Health Sciences	$11,515,308
National Cancer Institute	**$10,378,818**
National Institute of Allergy and Infectious Diseases	$9,627,270
National Institute on Drug Abuse	**$7,048,868**
National Institute of Mental Health	$7,003,379
National Institute of General Medical Sciences	**$3,202,778**
National Eye Institute	$2,741,573

Funding From Foundations or Nonprofit Organizations*

**Top 10 sources listed. Number does not include affiliates.*

American Heart Association	**$1,768,588**
Donald W. Reynolds Foundation	$808,298
American Cancer Society	**$540,310**
Cystic Fibrosis Foundation	$369,519
United Way of Greater Cincinnati	**$255,000**
Susan G. Komen Breast Cancer Foundation	$250,000
Michael J. Fox Foundation	**$235,355**
American Diabetes Association	$229,999
Research to Prevent Blindness	**$220,000**
John A. Hartford Foundation	$201,471

23

Nearly $23 million of UC's NIH dollars come from the National Heart, Lung, and Blood Institute.

1/2

More than ½ of the federal dollars generated by UC researchers come from the National Institutes of Health.

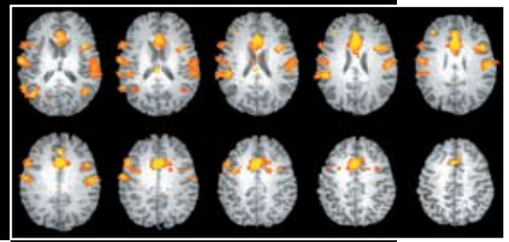
A sampling of some of UC's largest federal and private industry grants awarded in 2007

In **2007**, researchers at UC were awarded a **$9** million five-year grant to find new ways to improve and personalize treatments for bipolar disorder, and to better understand how to identify this brain disorder earlier with the goal of preventing disease progression.

Bipolar disorder affects close to **6** million Americans each year and is recognized as one of the leading causes of disability worldwide.

The grant, led by Stephen Strakowski, MD, supports the formation of the Bipolar Disorder Imaging and Treatment Research Center at the UC College of Medicine and was awarded by the National Institute of Mental Health of the National Institutes of Health.

Psychiatry researchers were awarded **$9** million in 2007 to improve diagnosis and treatment for bipolar disorder.



UC's Mouse Metabolic Phenotyping Center, led by Patrick Tso, PhD, had its funding renewed to the tune of **$4.7** million in **2007**. This core facility—supported by the National Institutes of Health and based at UC's Genome Research Institute—is one of only three centers of its kind in the United States delivering crucial research data about disease formation not only to Cincinnati scientists, but also to researchers across the country.

A new project supported by Cincinnati's City Council and led by experts from UC's division of criminal justice will assist police, community members and social service providers in reducing homicides in Cincinnati. Associate professor Robin Engel and professor John Eck—both faculty in UC's criminal justice division and members of the UC Policing Institute—are working with other criminal justice faculty and the director of trauma services at Cincinnati Children's Hospital Medical Center to implement the Cincinnati Initiative to Reduce Violence.

A $6.4 million grant from the National Institute of Diabetes and Digestive and Kidney Disorders will help UC obesity researchers to investigate how diets containing high amounts of fat increase the risk for becoming obese and developing symptoms of metabolic syndrome. The study, led by Obesity Research Center director Stephen Woods, PhD, will be divided into sub-projects designed to consider a high-fat diet's effect on several parts of the body including the digestive system, the brain and the pancreas.

In 2007, UC received nearly $700,000 from the Howard Hughes Medical Institute (HHMI) to support a series of science-enrichment programs for middle and high school students and science teachers. The funding comes from a **$22.5** million HHMI initiative aimed at closing the gap between research institutions and their local communities by supporting educational programs that stimulate interest in science, particularly among young students. UC will use the funding to continue three programs: ExSEL (Excellence in Science Education and Learning), Saturday Science Academy and Teachers' Initiative: Program in Biomedical Research.

UC's AIDS Clinical Trials Unit, part of the National Institutes of Health-supported AIDS Clinical Trials Group, received **$6.4** million in **2007** from the National Institute of Allergy and Infectious Diseases to continue conducting clinical trials in people infected with HIV. The UC group, led by Carl Fichtenbaum, MD, has already improved care and treatment for people living with HIV/AIDS. They have defined the standard of care for prevention and treatment of most opportunistic infections, demonstrated that antiretroviral therapy prevents maternal-child transmission of HIV, and defined how to manage the complications of antiretroviral therapy.

13 { 13 patents were issued to UC researchers in 2007.

Technology Transfer Activity

Invention Disclosures	Royalty Income
2007 … 111	2007 … $582,057
2006 … 116	2006 … $741,995
2005 … 89	2005 … $967,546
2004 … 77	2004 … $321,972

Patent Applications	Start-Up Activity
2007 … 56	2007 … 1
2006 … 73	2006 … 2
2005 … 60	2005 … 1
2004 … 35	2004 … 1

Patents Issued
2007 … 13
2006 … 11
2005 … 9
2004 … 12

CF Research Spurring New Therapies

It has been known for some time that the bacterium *Pseudomonas aeruginosa* grows within the deadly, lung-clogging mucus found in the airways of cystic fibrosis (CF) patients and significantly compromises lung function.

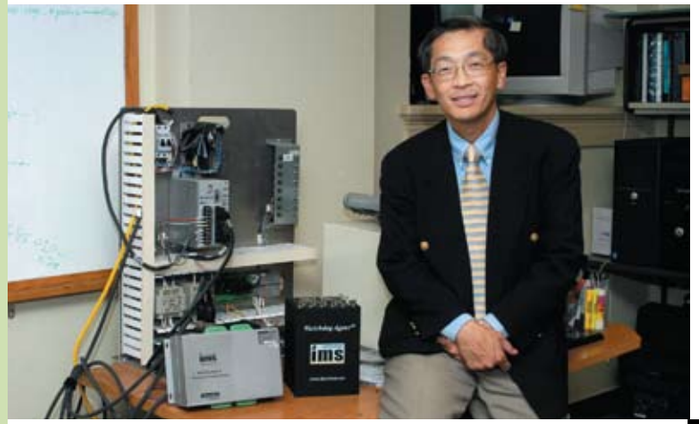
Daniel Hassett, PhD, associate professor in UC's molecular genetics, biochemistry and microbiology department, found that a mutation (*mucA*) in *P. aeruginosa* also represents an "Achilles' heel"—a fatal flaw that could help physicians eradicate this highly problematic organism, and the ensuing characteristic "goop" it produces, from the lungs of advanced CF patients.

The reason for optimism, Hassett says, is that the same genetic change (mutation) that turns *P. aeruginosa* into a sticky, antibiotic-resistant killer also leaves it susceptible to destruction by slightly acidified sodium nitrite, a common chemical that is widely used in the curing of lunch meat, sausages and bacon. The same chemical is also used to treat individuals suffering from cyanide poisoning.

Hassett's research—and the urgent need for new CF therapies—has attracted a San Diego-based entrepreneur interested in developing an inhaled sodium nitrite therapeutic for CF and other lung diseases. Aires Pharmaceuticals, a venture-backed start-up company, licensed Hassett's sodium nitrite finding as part of its founding technology and is currently in the preclinical stage of development of its sodium nitrite therapeutic. The license agreement includes annual license fees, milestone payments and royalties. This important technology may lead to the creation of new therapeutics and new hope for cystic fibrosis patients and their families.

The Ohio Eminent Scholar program, created by the Ohio General Assembly and administered by the Ohio Board of Regents, recognizes outstanding academic and research achievements by university faculty across the state. Ten faculty members at UC have been named Ohio Eminent Scholars. In 2007, Ohio awarded two additional Eminent Scholars positions. UC received both and will use the $1.37 million awarded to recruit two faculty members—one in nanosensors and the other in advanced propulsion and power systems.

Ohio awarded 2 Eminent Scholar positions in 2007—both to the University of Cincinnati. } 2



Jay Lee, DSc, L.W. Scott Alter Chair and professor in the college of engineering, is one of UC's 10 Ohio Eminent Scholars. Lee—whose research interests include "smart" prognostic technologies for e-manufacturing, predictive maintenance and self-maintenance systems—is founding director of the National Science Foundation Industry/University Cooperative Research Center on Intelligent Maintenance Systems. This partnership between UC, the University of Michigan and the University of Missouri-Rolla also includes more than 40 global companies such as Boeing, GE Aviation, Procter & Gamble, Siemens, Toshiba and Toyota, among others.

UC's Ohio Eminent Scholars

John Dedman, PhD
Professor
Department of Genome Science
College of Medicine

Effie Gutmark, PhD, DSc
Professor
Department of Aerospace Engineering
College of Engineering

Andrew Herr, PhD
Assistant Professor
Department of Molecular Genetics
College of Medicine

Jay Lee, DSc
Professor
Department of Mechanical, Industrial and Nuclear Engineering
College of Engineering

Patrick Limbach, PhD
Professor and Acting Chairman
Department of Chemistry
McMicken College of Arts and Sciences

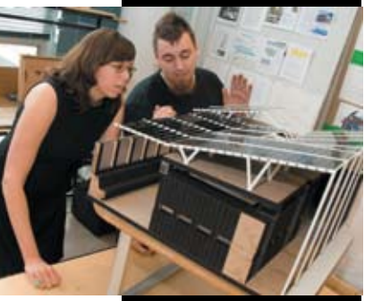
Michael Magazine, PhD
Professor
Department of Quantitative Analysis and Operations Management
College of Business

John Monaco, PhD
Professor
Department of Molecular Genetics
College of Medicine

Masato Nakafuku, MD, PhD
Professor
Department of Pediatrics
College of Medicine

Andrew Steckl, PhD
Professor
Department of Electrical and Computer Engineering
College of Engineering

James Tocco
Professor
Keyboard Studies Division
College-Conservatory of Music



Sustainability is on the minds of many as we move further into the 21st century. Finding environmentally friendly ways to live, work and commute has become a top priority for many UC researchers.

Investigators across campus—from engineering to medicine and design to arts and sciences—have teamed up to find solutions to problems ranging from long-term health to energy efficiency.

UC's solar house construction team used **36** photovoltaic panels to convert the sun's rays into electricity for the house's Energy Star-efficient appliances.

36

Nothing 2 Make Light Of

UC was one of **20** universities from around the world selected to compete in the Solar Decathlon competition. More than **200** business, design and engineering students constructed a completely solar-powered house on UC's campus and then broke it down into four parts and reconstructed it for judges on the National Mall in Washington, D.C.

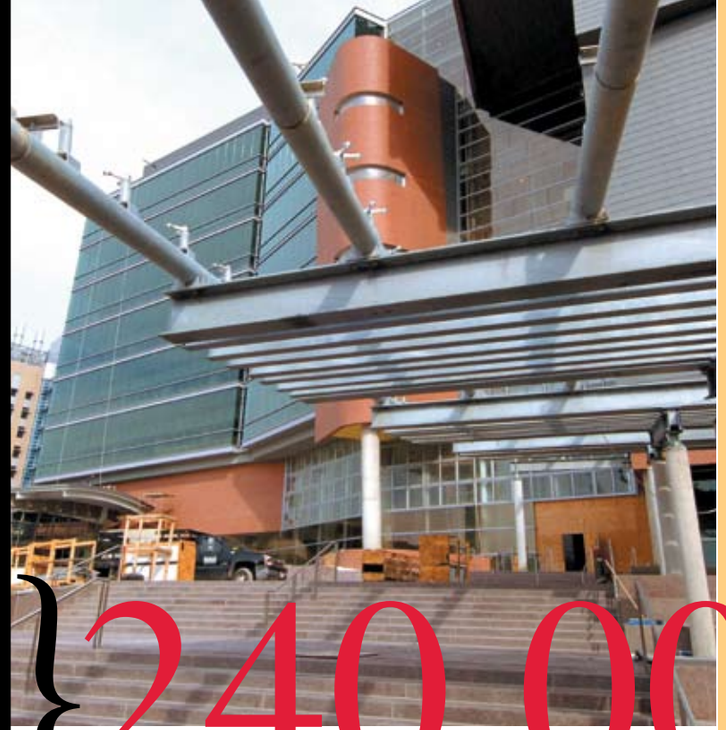
Solar house competitors, as well as the public touring the houses, got a better understanding of the benefits of renewable energy, and the competition—which made its way into many major national and international news outlets—may have gone a long way toward raising awareness about energy efficiency.

Competition organizers hope that the work by university students helps to quickly move solar energy technologies into the marketplace.

120

UC's solar house team used **120** evacuated tubes ("tubes within tubes" in which the inside tube contains water) to form a privacy fence on the house's south side. A metal "fin" hit by the sun's rays transferred heat to the water in the inner tube—leaving the outside tube cool to the touch. The heated tubes created enough energy to air condition the house and produce all hot-water needs.

URBAN ENGINEERING
UC isn't just talking sustainability, it's teaching it. The university's new Sustainable Urban Engineering (SUE) education and research center works to break down disciplinary silos to solve the challenges of modern urban centers without compromising future generations' ability to meet their own needs.



The CARE/Crawley Building will add **240,000** gross square feet of laboratory, education and quality-of-life space to UC's Academic Health Center campus.

240,000

Future Research Home

Work continues on the CARE/Crawley Building. It's expected that the research tower—which will boast nine stories of laboratory, education and quality-of-life space—will be completed in April **2008**. Teaching labs are scheduled to open next summer and research labs will be occupied by fall **2008**.

The site has long been taking shape, and a key green space around the building, Levine Park, was officially rededicated in September **2007**.

Workers are currently finishing the seven bridges that will span the CARE/Crawley Building and the existing Medical Sciences Building, and site work continues on the CARE/Crawley exterior, where a front entry stairway and landscaping are being completed.

Seven bridges will join the new CARE/Crawley Building to the existing Medical Sciences Building.

7

It takes just **1** university, partnering with others, to grow our research excellence and create ENDLESS opportunity.

UNIVERSITY OF Cincinnati

University of Cincinnati | Report on Research 2007

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