FROM INNOVATION TO IMPACT

Transforming lives through research, discovery and creative activity
By all measures, 2010 has been a remarkable year for research at Indiana University-Purdue University Indianapolis (IUPUI). With sponsored research funding reaching an all-time high of $400.3 million, IUPUI researchers are forging breakthroughs and discoveries that advance knowledge, address important national and global needs, and, through technology transfer and civic engagement, contribute to the economic growth and social advancement of Indiana and the nation, and benefit humanity as a whole.

This report highlights a few of the broad range of research and creative activity carried out by IUPUI investigators in fiscal year 2010. It is organized around key campus-wide strategic initiatives. These include the Translating Research into Practice, the Signature Centers, the Indiana Physician Scientist, the Indiana Clinical and Translational Sciences Institute, the IUPUI Arts and Humanities, and the RISE to the Challenge and STEM initiatives. The report also provides a glimpse of the outstanding research infrastructure supporting IUPUI investigators, including world-class health and life sciences, and information technology resources. Moreover, it highlights how, through technology transfer and commercialization, IUPUI research outcomes are making an impact on economic development and social well-being.

To learn more about the innovative research conducted at IUPUI, I invite you to visit our research webpage at research.iupui.edu, or contact us at OVCR@iupui.edu.

Kody Varahramyan, Ph.D.
Vice Chancellor for Research
Through the vision and leadership of Chancellor Charles R. Bantz, IUPUI has embarked on a multi-year initiative to leverage its remarkable growth in research capacity into international prominence for translating research into practice. The Translating Research into Practice (TRIP) initiative builds on extraordinary relationships with IUPUI’s surrounding communities, its links to other state research universities, and the on-campus presence of nationally ranked schools such as Medicine, Law, Liberal Arts, Nursing, Education, and Business. Bantz points out that, “IUPUI’s distinctive focus on research makes a difference in our community and the world.”

In the United States and around the world, an enormous gap has been recognized between our ability to produce new knowledge and our capacity to bring the fruits of that knowledge to those most in need. Efforts to reduce this gap are broadly labeled “translational” research.

A group of IUPUI TRIP scholars, from left to right: Dr. Patricia Scott, Dr. Brian Beck, Dr. Ralph Bahamonde, Dr. Joseph D’Onofrio, Dr. Mark Pescovitz, Dr. Aman Khetan, Dr. Shuzhen Shen, Dr. Jonathan Fries, Dr. Kristin Blank, Dr. Ayesha Morris, Dr. Maryann Urban, Dr. John Parrish-sprowl, Dr. Susan Hyatt, Dr. Khadija Khaja.
As program director, Dr. Sandra Petronio works to bring recognition to the real-world impact that TRIP scholars make through their research and innovation. She endeavors to accomplish Chancellor Bantz’s charge to develop the TRIP Initiative as a catalyst to stimulate the growth and development of research that is useful to the people of Indiana and those beyond our borders. TRIP Manager Stephan Viehweg, MSW, alongside Dr. Petronio, has helped propel the initiative from an idea to a reality. In particular, Viehweg provides resources and infrastructural support to more than 100 TRIP scholars on the IUPUI campus.

Another phase of TRIP began in 2010 with efforts to cultivate a “culture” of translational research at IUPUI through the guidance of Dr. Dennis Fortenberry, a Chancellor’s Faculty Fellow. These efforts are based in the understanding that continued growth as a translational university requires substantial infrastructure investment to support and nourish translational research. IUPUI has historically emphasized the importance of research aimed at improving the quality of life. TRIP seeks to move into the coming decade with a new commitment to translational research by supporting a new generation of scholars working within IUPUI as well as the community at large. One significant point of emphasis is the annual “TRIP Community Showcase” event. Each spring the event fosters an ongoing dialogue among the multiple stakeholders in translational research on campus: faculty, students, business and technology leaders, local government officials as well as non-profit groups.

Marjorie Iyles (Kelley School of Business) examines the international strategies of mid-sized Indiana-based firms, their interest in China, the barriers and challenges they face, and what types of assistance they most need from the university, chambers of commerce, and government for successful business plans. Her research helps Indiana businesses explore opportunities in China.

Dr. Matthew Aalsma (Pediatrics, School of Medicine) focuses his research on improving the lives of children in the juvenile justice system as well as their chances for successful reentry into community life. Successful practices developed in Indiana can have a positive impact on juvenile justice systems across the country.

Dr. Khadija Khaja (School of Social Work) points out that 1 billion people, nearly one in five, in the world are Muslim. They also represent the majority in 50 countries. Khaja’s research studies the impact of 9/11 on Muslims living in Australia, Argentina, Canada, and the United States. It also provides recommendations about social service needs and cross-cultural interventions that will foster the well-being of Muslim communities.

A SAMPLING OF TRIP WORK SHOWCASED AT THE ANNUAL EVENT
Since 2006, when Executive Vice Chancellor and Dean of the Faculties Uday Sukhatme announced the creation of the IUPUI Signature Centers Initiative, nationally and internationally recognized research centers have been emerging, which are unique to IUPUI, and make a difference in the real world. Centers supported under this initiative receive three years of institutional funding. The first five centers, after completing three years of support and a peer-review process, were designated as official IUPUI Signature Centers.

**IUPUI SIGNATURE CENTERS INITIATIVE: DISTINCTION THROUGH INNOVATION**

- **BINATIONAL/CROSS-CULTURAL HEALTH ENHANCEMENT CENTER**
  - Dr. E. Angeles Martínez-Mier, Director
  - A unique center dedicated to research on binational health issues of recent immigrants to the State of Indiana and of the rural communities in Mexico from where many of those immigrants come. The center focuses on oral health and nutrition, including behaviors and social determinants of health in these two areas and related conditions, such as obesity and Type 2 diabetes.

- **CENTER FOR EARTH AND ENVIRONMENTAL SCIENCE**
  - Dr. Lenore Tedesco, Director
  - A leader in research and teaching on water quality and health, the center creates an integrated program, applying innovative scientific discovery to current and emerging threats to water resources in central Indiana, the Midwest, and elsewhere.

- **CENTER FOR THE STUDY OF RELIGION AND AMERICAN CULTURE**
  - Dr. Philip Goff, Director
  - Established in 1989 with start-up funds from the Lilly Endowment, the center is considered the premier research institute in the nation working in American religious studies. A top research and public outreach institute, the Center promotes a better understanding of the relation between religion and other aspects of American culture.

- **CENTER FOR PHARMACOGENETICS AND THERAPEUTIC RESEARCH IN MATERNAL AND CHILD HEALTH**
  - Dr. David Haas, Director
  - Distinctive in the field of pharmacogenetic and therapeutic research, the Center is improving the therapy of health problems related to both women and their unborn children. The center uses a personalized medicine approach that builds on its strength in neonatology coupled with the cutting-edge science of pharmacogenomics.

- **CENTER FOR SERVICE AND LEARNING RESEARCH COLLABORATIVE**
  - Dr. Robert Bringle
  - Dedicated to scholarship and research focused on service learning, the Center supports research on service learning practice, including international service learning and the development of new conceptual frameworks and methodological tools to improve the quality of service learning research.

From left to right: Dr. E. Angeles Martínez-Mier, Dr. Robert Bringle, Dr. Philip Goff, Dr. David Haas, Dr. Lenore Tedesco.
The Initiative is an effort to capitalize on the unique skills that research scientists with medical degrees bring to the research enterprise. The initiative was created in December 2009 with a $60 million grant from the Lilly Endowment to the IU School of Medicine, located on the campus of Indiana University-Purdue University Indianapolis.

“The process of attracting new investigators has begun,” said David S. Wilkes, M.D., director of the Indiana Physician Scientist Initiative and executive associate dean for research at the School of Medicine.

Rebecca Shilling, M.D., a pulmonologist from the University of Chicago, has joined the school as assistant professor of medicine and of microbiology and immunology. Shilling’s research focuses on the chronic rejection process that plagues many lung transplant recipients.

“Physicians can generally control the body’s initial attempts to reject transplanted lungs with immunosuppressive drugs,” Shilling said. “But that acute phase can be followed by a chronic rejection process that often leads to scarring in the lungs’ small airways and failure of the transplant in as few as five years—a process for which there is no effective treatment.”

The School of Medicine also has recruited Helmut Hanenberg, M.D., a specialist in Fanconi anemia who is researching gene therapy for this inherited bone marrow failure syndrome and other hematopoietic disorders. Hanenberg said, “If the techniques can be perfected, gene therapy offers advantages over risky bone marrow transplants, which in Fanconi anemia patients often give rise to secondary tumors years later.”

In addition to recruiting 20 or more established physician researchers to the school, the Physician Scientist Initiative will:

- Provide $10 million to strengthen the school’s M.D./Ph.D. education program—the NIH-designated Medical Scientist Training Program.
- Invest $8 million in the Indiana Biobank, which houses the biological samples necessary to conduct modern biomedical research and supports specialists needed to manage Biobank data.
- Provide $2 million to expand the school’s global health initiative, building on its world-class Kenya program and strengthening the IU Center for Global Health.
- Provide $2 million to expand the Indiana Translational Research Acceleration Collaboration (ITRAC), a program developed at the IU Melvin and Bren Simon Cancer Center to help turn discoveries made in the laboratory into new treatments for patients.
URBAN HEALTH PROJECTS PROTECT AGAINST LEAD INFECTION

They once made the city a center for industry, but Indianapolis’ old smelting plants also left behind a harmful environmental legacy. Youths in America have type 2 diabetes, and 60 percent are at risk to get it. An innovative approach to weight loss intervention and coaching program, Indiana CTSI researchers are helping reduce diabetes in at-risk populations across the state.

In July, Filippelli and Wiehe received a three-year, $200,000 grant from the IUPUI Signature Centers Initiative to create the IUPUI Center for Urban Health, whose mission is to enhance the health and sustainability of urban populations, with an eye toward environmental legacy and emerging threats. Other founding members include Dr. Daniel Johnson, associate professor of geography in the School of Liberal Arts, and Terrell Zillinge, professor of public health, IUSM.

PARTNERING WITH LOCAL GYMS TO PREVENT DIABETES

About 24 million Americans have type 2 diabetes, and 60 million more are pre-diabetic. Using a group-based model that is scalable across the country, CTSI researchers are helping reduce diabetes in at-risk populations across the state.

To make it clear this is a place to learn, not just to spend a summer vacation,” says Dr. Hiremagalur Jayaram, a senior scientist at the Richard L. Roudebush VA Medical Center and a postdoc at the Indiana CTSI. “But these kids are so enthusiastic—they’re hungry to learn.”

While other high school students spent their summer vacation stretched out in the sun, Rachel Hawn, a junior at Warren Central High School in Indianapolis, was performing laboratory research on targeted gene therapy for colorectal and cervical cancer.

“I never in my life, not even in college, did I think I would be working with cancer cells,” says Hawn, joking that whenever her family hears about what she’s working on, they say, “She’s a genius.”

This year, the Indiana CTSI summer internship program matched 28 high school students, six undergraduates, and 20 medical students with faculty mentors engaged in real-world clinical or laboratory research. Project partners also include the IUPUI Center for Academic Medicine, the National Cancer Institute, and the IUSM Student Research Program in Academic Medicine.
IMPACT IN THE ARTS AND HUMANITIES

IUPUI has a rich history of cultivating partnerships with cultural, educational, and professional organizations to expand university resources. The IUPUI Arts and Humanities Initiative (AH) was established in 2009 to reinforce the campus as a leader in arts and humanities research and creative activity as well as expanding its engagement with the broader community.

WESTERN MEDICINE AND MODERN CHINA

Women’s Medicine has been one of the earliest and most important influences in modern Chinese history. Unfortunately, wars and revolutions prevented access to important historical records when it came to understanding why the Chinese were drawn to Western medical practices and the broader influences felt within the country. History professor Dr. William Schneider hopes to help change that. Funded by a grant from the Henry Luce Foundation, “The History of Western Medicine and Modern China” is likely to conjure pastoral farmland or the open road, but an assistant professor and artist at the Herron School of Art and Design is reassessing our ideas of landscape in the Midwest through a filter that combines a multi-disciplinary approach and to bridge the gap between modern materials and the historical patterns of oppression and domestic servitude. Contemporary art often incorporates historical patterns and strives to make it comprehensible. Agha’s interest in political and social context is the result of her upbringing in Lahore, Pakistan where women do not enjoy either the freedoms or the mobility that they do here. Her years of struggle in Pakistan combining protest and discrimination created in her a panacea desire for equality and justice. Her work offers a deep personal perspective on gender, culture, and value.

A woman’s work undone

Anila Quayyum Agha, assistant professor of drawing at the Herron School of Art and Design, explores the medium to emphasize the multiple layers resulting from the interaction of concept and process and to bridge the gap between modern materials and the historical patterns of oppression and domestic servitude. Contemporary artists interpret an increasingly polarized world and strive to make it comprehensible. Agha’s interest in political and social context is the result of her upbringing in Lahore, Pakistan where women do not enjoy either the freedoms or the mobility that they do here. Her years of struggle in Pakistan combining protest and discrimination created in her a panacea desire for equality and justice. Her work offers a deep personal perspective on gender, culture, and value.

MUSLIMS IN AMERICA

When I was in graduate school, I had no way of knowing that my research specialization would become the subject of so many headlines,” says Dr. Edward E. Curtis IV, “It was an odd experience for Curtis, who had just returned from a year in Amman, Jordan as a Fulbright Scholar. Instead of explaining America to Muslims, Dr. Curtis was called on to explain Muslims to Americans. “I feel grateful for the opportunities to share my research with the broader community, and the responsibility artists carry to reflect on place and contemporary life.”

The Mythic Midwest” consists of merging technology and contemporary life.

After the fall

Invoke images of Midwestern landscapes and one is likely to conjure pastoral farmland or the open road, but an assistant professor and artist at the Herron School of Art and Design is reassessing our ideas of landscape in the Midwest through a filter that combines a multi-disciplinary approach and to bridge the gap between modern materials and the historical patterns of oppression and domestic servitude. Contemporary art often incorporates historical patterns and strives to make it comprehensible. Agha’s interest in political and social context is the result of her upbringing in Lahore, Pakistan where women do not enjoy either the freedoms or the mobility that they do here. Her years of struggle in Pakistan combining protest and discrimination created in her a panacea desire for equality and justice. Her work offers a deep personal perspective on gender, culture, and value.

American Muslims and the Public Record

According to Winship, “We live in a world in which the ‘global’ has become local, personal relationships have bound themselves to technology, and the traditional desires for security and well-being has shifted to the new and innovative. It is my hope that my research can continue to provide a forum for discussion on, and the coping with, the uncertainties that many of us face with regard to jobs, family, health, and sustenance.”

Millenarian Chair in the School of Liberal Arts and professor of religious studies. “I got my doctorates one year before 9/11.”

The national controversy heated up over the construction of a new Muslim center near Ground Zero. Curtis’s scholarship attracted the attention of the Washington Post, New York Daily News, and National Public Radio, each organization asking him for a historical analysis of Muslim Americans and anti-Muslim prejudices. It was an odd experience for Curtis, who had just returned from a year in Amman, Jordan as a Fulbright Scholar. Instead of explaining America to Muslims, he did in classes at the University of Jordan, he was called on to explain Muslims to Americans. “I feel grateful for the opportunities to share my research with the broader community, and the responsibility artists carry to reflect on place and contemporary life.”

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and technologists, from a range of disciplines and organizations within the university, with external partners.

The Pervasive Technology Institute at Indiana University, with its digital high-end computer graphics, and visual telecollaboration; computational biology; biomedical applications; and IUPUI researchers also have access to resources and specialized consulting services for virtual and immersive reality, initiatives as the transPaC3 connection to Asia and the aCe (America Connects to Europe) network.

Operations continues to enlarge the international framework for scholarly communication through such recent facilities, high-resolution visualization environments, scientific instruments, large datasets, and computing portals for scientific research, investigators can access remote computing power, data management and storage the university research cyberinfrastructure includes the supercomputer clusters Big Red, Quarry, and the Collaborative Initiative on Fetal Alcohol Spectrum Disorders, an international consortium of researchers supported by the National Institute on Alcohol Abuse and Alcoholism.

The multidisciplinary IUPUI team uses visualization technologies, including 3D surface scanning technology, to capture many subtle features of prenatal alcohol exposure that are impossible to capture with 2D images. Anthropologists trained in computational anthropometric techniques to analyze information through such recent initiatives as the TransPaC3 connection to Asia and the aCe (America Connects to Europe) network.

IUPUI researchers also have access to resources and specialized consulting services for virtual and immersive reality, high-end computer graphics, and visual telecollaboration; computational biology, biomedical applications, and digital library development. In addition, the Pervasive Technology Institute at Indiana University, with the Digital Science Center, Data to Insight Center, and Center for Applied Cybersecurity Research, develops innovative digital library development. In addition, the Pervasive technology Institute at Indiana University, with its digital high-end computer graphics, and visual telecollaboration; computational biology; biomedical applications; and IUPUI researchers also have access to resources and specialized consulting services for virtual and immersive reality, initiatives as the transPaC3 connection to Asia and the aCe (America Connects to Europe) network.

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In the university setting, discovery and innovation are not confined to the research and creative activity process, nor does the process always result in the completion of a study, or a scholarly or artistic artifact. For some, the process reaches far beyond university boundaries, necessitating the creation of a critical bridge between discovery and the real-world application of that discovery. IUPUI values this unique contribution to the scholarly enterprise and continues to foster a climate of support that helps faculty move their work and ideas toward practical application.

The Indiana University Research and Technology Corporation (IURT) serves as the primary bridge for IUPUI faculty to take their proven ideas to the marketplace. The IURT mission is to help faculty commercialize new technology to support technology-based economic development throughout Indiana and the nation.

Half of the specialties are “reductionists,” scientists (including medical doctors) who dissect the systems down to their molecular, cellular and tissue levels through research. The remaining half are “integrationists,” engineers who build systems through mathematical modeling to understand the integrated functioning of the organs.

Additionally, Kassab’s research and invention have launched four companies thus far. Three of these companies address different aspects of heart disease, including Indianapolis-based FlowCo, launched with funding from BioCrossroads and other venture funds. The device to be marketed through FlowCo as early as 2015 does not use ultrasound to gauge artery characteristics for stent procedures, but rather electrical impedance, resulting in a more precise and less expensive measuring device. The fourth company addresses an epidemic not unrelated to heart failure – that of obesity – and provides patients an alternative to bariatric surgery that does not alter the anatomy or physiology of the stomach. Five grants from the National Institutes of Health, as well as funding from the American Heart Association, have supported this important collaborative research.

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Dr. Jafari also invented Oncourse, an online course management system now used at all Indiana University campuses. Most recently, Jafari created the Epsilen Environment, a business development and networking platform, for the New Vie New You as an equity investor and strategic partner.

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Undergraduate students—

conducting hands-on inquiries and investigations that result in contributions to their disciplines—

This is undergraduate research, and it has been hailed as “the pedagogy for the 21st century.” At IUPUI, undergraduate research fosters critical thinking, creative problem solving, and communication skills that are necessary for advanced academic study. Demanded by employers and crucial for informed citizenship, postgraduate degrees start with undergraduates.

In 2009, IUPUI added to its undergraduate research commitments with RISE to the Challenge. RISE represents the “r” in RISE. “I” is for international experiences; “s,” service learning; and “e,” experiential learning. Through RISE, students complete courses designed to engage them in unique hands-on experiences. All four types of RISE courses are infused with the spirit of discovery found at the core of research and scholarship.

Examples of How IUPUI Integrates Research into the Undergraduate Educational Experience

Dr. Jefferson Streepew (School of Physical Education and Tourism Management) revised a Biomechanics offering as an experiential learning course. As part of their experience, students conducted literature searches as well as collecting and analyzing data. They then presented their results in class, providing concrete examples of how the principles discussed in class could be used in their everyday and professional lives.

Dr. Peter Hylton (School of Engineering and Technology) revised an existing Motorsports Engineering course, Vehicle Dynamics, to become a RISE course. His students learned to use state-of-the-art motorsports industry software from one of its developers and spent time actually participating in testing. The research the students performed as part of the class allowed them to test the chassis and suspension dynamics of an Indy 500 racecar.

Kirk Barber and Paul Lucce worked with Don Schumacher Racing, helping to redesign the chassis of a top fuel dragster that went on to set a new world record.

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Dr. Edgar Huang and Professor Barbara Hayes (School of Informatics) developed and taught Computing for a Cause. Their students worked on service-learning projects for local community partners, including the Indiana Organ Procurement Organization, Volunteers of America, and School on Wheels. The students were required to complete extensive background research on their specific project topics before putting that knowledge to work in the field.

Dr. Mary Beth Riner (School of Nursing) developed a RISE course for undergraduate and graduate nursing students to use a participatory action research approach to design and implement a Healthy Eating Program in partnership with nursing students from the Universidad Autonoma de Estados del Hidalgo in Pachuca, Mexico. Students collaborated to design and implement aspects of the program. The project served as a graduate student research project and as the required community health nursing practicum for all the undergraduate participants.

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IUPUI Students Poised to Rise to the Challenge

Undergraduate students under the mentorship of faculty researchers—

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During the past five years, IUPUI has attracted more than $9.5 million of extramural funding in science, technology, engineering and mathematics (STEM) education, including over $3.6 million in 2010. This has led to the realization of innovative STEM initiatives that impact Indiana. These initiatives include STEMWorks Indiana, the Woodrow Wilson Indiana Teaching Fellows, and the Central Indiana STEM Talent Expansion Program.

STEMWORKS INDIANA

STEMWorks Indiana is a partnership between the Indianapolis Private Industry Council and the Purdue School of Engineering and Technology at IUPUI. The $2.7 million dollar initiative is funded by the U.S. Department of Labor and focuses on helping eligible high school students and dislocated workers in central Indiana develop a successful pathway to employment opportunities in the STEM fields. Tools and support enable these individuals to identify occupational interests and focus on feasible training or education paths. The crux is to enhance the competitive position of local and regional employers by developing a transformed workforce.

TEACHING FELLOWS GROOMED FOR INDIANAPOLIS URBAN SCHOOLS

The Woodrow Wilson National Fellowship Foundation funded the second group of Woodrow Wilson Indiana Teaching Fellows in 2010. The Schools of Education, Science, and Engineering & Technology prepared the Fellows to become secondary STEM teachers. Fellows commit to teaching for at least three years in a high-need school upon graduation. The program is based in the School of Education’s Urban Center for the Advancement of STEM Education.

The U.S. Department of Education awarded IUPUI’s School of Education and the Indianapolis Public Schools a $2.7 million grant for the Indianapolis Urban Teacher Residency program. The grant expands the Woodrow Wilson Teaching Fellowship program by leading to master’s degrees in STEM areas with dual certifications in STEM and special education.

CENTRAL INDIANA STEM TALENT EXPANSION PROGRAM

With a $2 million National Science Foundation grant, IUPUI aims at increasing the number of STEM-field bachelor’s degrees conferred by an additional 782. The 5-year award provides funding in five areas: 1) specialized summer bridge programs; 2) development and support of the associate degree in mathematics at Ivy Tech and STEM-field bachelor’s at IUPUI; 3) expanded learning support for STEM majors; 4) greater student services including specialized Career Days and internship opportunities; and 5) targeted career placement. The funding encourages more students to embark on careers in the STEM fields by providing the financial and academic support needed to achieve this goal.

INNOVATIVE STEM INITIATIVES IMPROVE INDIANA

Better training and more education is the most direct route to a regional workforce that is employed in high-growth, high-demand industries.

A group of IUPUI STEM education leaders from left to right: Dr. Andrew Gavrin, Dr. Josh Smith, Dr. Charles Feldhaus, Dr. Kim Nguyen, Dr. Kathy Marrs, Dr. Olivia Hoss, Dr. Patricia Yoder

IUPUI AWARDS BY AGENCY TYPE FOR FISCAL YEAR 2010

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IUPUI RESOURCES COMMERCIALIZATION METRICS

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Impact by the Numbers
As one of the outstanding urban research universities in the United States, IUPUI is Indiana’s urban research university, located in the heart of Indianapolis, just blocks from the Indiana Government Center and Fortune 500 companies. IUPUI is Indiana University’s home campus for state-wide programs in medicine, law, dentistry, nursing, health and rehabilitation science, and social work, and it excels in providing programs in art and design, business, education, engineering and technology, informatics, journalism, liberal arts, library and information science, physical education and tourism management, public and environmental affairs, and science.