

# FROM INNOVATION TO IMPACT

*Transforming lives through research, discovery and creative activity*

2010  
RESEARCH REPORT

**IUPUI**

**OFFICE OF THE  
VICE CHANCELLOR  
FOR RESEARCH**







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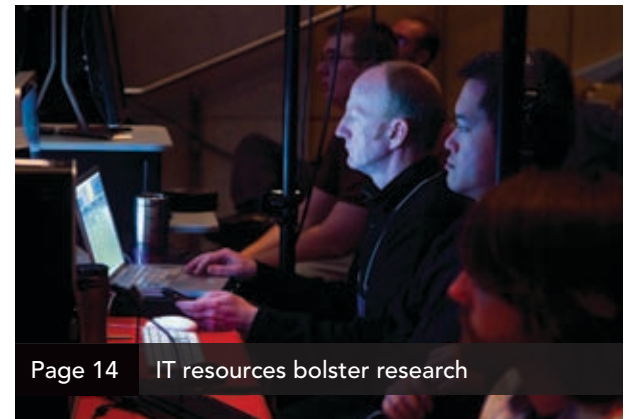
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# FROM INNOVATION TO IMPACT

*Message from the Vice Chancellor for Research*

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](http://research.iupui.edu), or contact us at [OVCR@iupui.edu](mailto:OVCR@iupui.edu).

Kody Varahramyan, Ph.D.  
Vice Chancellor for Research



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## IUPUI CHANCELLOR'S RESEARCH INITIATIVE

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.

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.”

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A group of IUPUI TRIP Scholars, from left to right: Dr. Patricia Scott, Dr. Steven Koch, Dr. Ralph Bahamonde, Dr. Joseph DeFazio, Dr. Mark Pescovitz, Dr. Anne Belcher, Dr. Tamilyn Bakas, Dr. Joanne Martin, Dr. Fred Rees, Dr. Josette Jones, Dr. Marjorie Lyles, Dr. Li Shen, Dr. Marquita Walker, Dr. Judith Chin, Dr. Joshua Smith, Dr. Gwendolyn Morrison, Dr. John Parrish-Sprowl, Dr. Susan Hyatt, Dr. Khadija Khaja





Dr. Sandra Petronio

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.

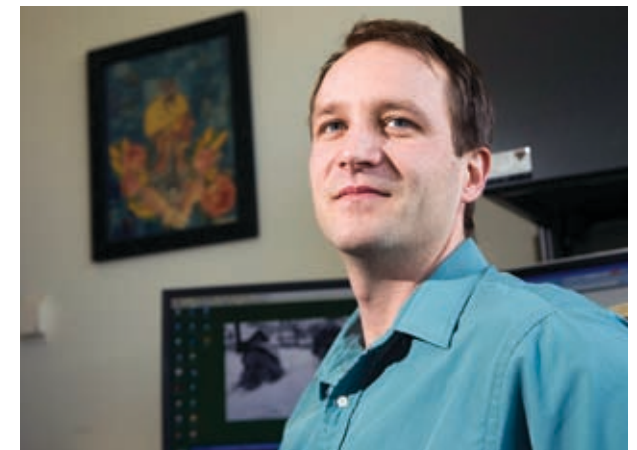
Another phase of TRIP began in 2010 with efforts to cultivate a "culture" of translational research at IUPUI through the guidance of Dr. Dennis Fortenberry, a Chancellor's Faculty Fellow. These efforts are based in

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 Lyles (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.

## A SAMPLING OF TRIP WORK SHOWCASED AT THE ANNUAL EVENT





► 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.

◄ 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.





# IUPUI SIGNATURE CENTERS INITIATIVE: DISTINCTION THROUGH INNOVATION

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 official IUPUI Signature Centers.

## 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 those 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.







Dr. Uday Sukhatme

### CENTER FOR PHARMACOGENETICS AND THERAPEUTICS 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.

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### 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.

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From left to right: Dr. E. Angeles Martínez-Mier, Dr. Robert Bringle, Dr. Philip Goff, Dr. David Haas, Dr. Lenore Tedesco



Dr. David S. Wilkes





# INVESTING IN THE FUTURE OF HEALTH CARE RESEARCH

The chronic rejection issues that affect lung transplant patients and the genetic problems that lead to a devastating childhood anemia – and many human cancers – are among the research interests that will be explored by the first faculty recruited as part of the Indiana Physician Scientist Initiative.

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 currently 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.

“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,” Hanenberg said. In addition, the Fanconi anemia DNA repair pathway is relevant to human cancer because several genes in the pathway are associated with breast/ovarian cancers (BRCA1, BRCA2) and other tumor types.

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.



Dr. Sarah Wiehe  
and Dr. Gabriel Filippelli

## INDIANA CTSI BRINGS RESEARCH INTO THE COMMUNITY

The Indiana Clinical and Translational Sciences Institute (Indiana CTSI), led by Anantha Shekhar, M.D., Ph.D., is an alliance among Indiana University, Purdue University, University of Notre Dame, and community partners, that bridges the gap between basic and clinical research, improving health care across Indiana. In 2010, the Indiana CTSI improved community health by pioneering an innovative diabetes prevention program; creating the IUPUI Center for Urban Health; and training the next generation of researchers by introducing local students to laboratory research at a young age. The Indiana CTSI is funded by a five-year \$25 million award from the National Center for Research Resources at the National Institutes of Health and nearly \$60 million collectively contributed by the state of Indiana, the three allied universities, and public and private donors.

### URBAN HEALTH PROJECT PROTECTS AGAINST LEAD INFECTION

They once made the city a center for industry, but Indianapolis' old lead smelting plants also left behind a harmful environmental legacy. Now research by two IUPUI faculty members could help Hoosiers protect themselves against the worst effects of toxic inheritance.

From a desire to explore local issues, oceanographer Dr. Gabriel Filippelli, professor of earth sciences in the School of Science, “dug into” urban soil contamination after relocating to Indiana. A preliminary investigation suggested that soil lead levels were connected to childhood lead poisoning, but more data were needed.

“Establishing a connection between lead in soil and lead in blood is the first step in reducing exposures,” says Filippelli.

Together with Dr. Sarah Wiehe, an assistant professor of pediatrics involved in urban health studies at Indiana University School of Medicine (IUSM), Filippelli applied to the Indiana CTSI for assistance. The Indiana CTSI formed a Project Development Team (PDT) that provided planning expertise, regulatory knowledge, access to clinical data, laboratory equipment and technology, and funding.

With guidance from the PDT, database access and data mining services provided by the Regenstrief Institute (an Indiana CTSI partner), Filippelli obtained more than 16,000 individual pieces of data from local children tested for lead poisoning between 1999 and 2008. This included demographic information and—most importantly—addresses.

Geolocating the information confirmed that children living near the city's formerly industrial center experienced significantly higher blood lead poisoning rates. Furthermore, the results revealed multiple sources of lead in soil, including former industrial emissions and a legacy of lead used in gasoline and paint.



In July, Filippelli and Wiehe received a three-year, \$300,000 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 legacies and emerging threats. Other founding members include Dr. Daniel Johnson, assistant professor of geography in the School of Liberal Arts, and Terrell Zollinger, 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 an innovative weight loss intervention and coaching program, Indiana CTSI researchers are helping reduce diabetes in at-risk populations across the country.

Dr. Ronald Ackermann, director of the Indiana CTSI Community Health Engagement Program and associate director of the IUSM Diabetes Translation Research Center, is transforming an effective weight loss program developed by the multi-institutional Diabetes Prevention Program Research Group into a “real-world,” cost-effective, group-based model that is scalable across the country.

The original program, involving one-on-one lifestyle coaching, showed that people at high risk for diabetes could successfully lose enough weight to reduce that risk. Ackermann showed the same results could be accomplished on a shoestring budget.

The solution? Partnering with community organizations, such as the YMCA, significantly reduced costs. Also, group sessions are less costly, provide greater support and increase



Dr. Ronald Ackermann



Rachel Hawn and Dr. Hiremagalur Jayaram

accountability. Sixteen sessions, 60 to 90 minutes each, focusing on behavioral strategies for weight loss, give people the tools they need to change their lifestyle habits.

After six months, participants saw a mean weight loss of about 6 percent, or 12.5 pounds. Losing two pounds equals a 16 percent diabetes risk reduction. Moreover, 28 months later, they had kept the weight off.

In April 2010, the Centers for Disease Control adopted the program in a joint initiative with the YMCA and United Health Group. It's now operating in seven cities across the U.S. (including Indianapolis), with 25 more expected in the next two years.

### TRAINING THE NEXT GENERATION OF RESEARCHERS

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.

Hawn's experience as a lab assistant was made possible by the Indiana CTSI in partnership with Project SEED, an organization that pairs scientifically minded high school students with local researchers, including many from the Indiana University School of Medicine.

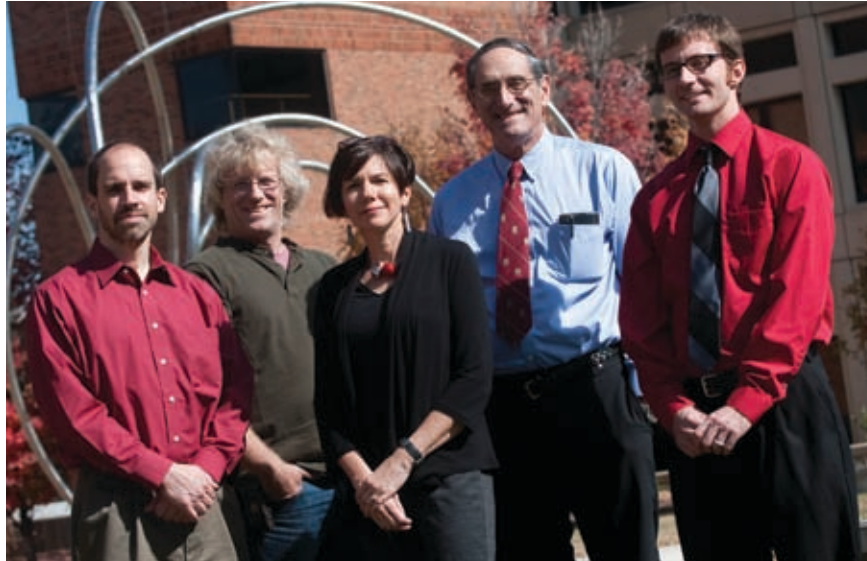
“We make it clear this is a place to learn, not just to spend a summer vacation,” says Dr. Hiremagalur Jayaram, a senior scientist at the Richard L. Roudebush VA Medical Center, in whose lab Hawn spent the summer. “But these kids are so enthusiastic—they're hungry to learn.”

“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 20 high school students, six undergraduate students and 20 medical students with faculty mentors engaged in real-world clinical or laboratory research. Project partners also include the IUPUI Center for Research and Learning 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 (IAHI) 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.



◀ A group of IUPUI Arts and Humanities Council members from left to right: Dr. Mark Pfaff, Dr. Gregory Hull, Dr. Karen Kovacic, Dr. William Schneider, Flounder Lee

▶ Anila Quayyum Agha, Agha's My Forked Tongue Installation, Andrew Winship, Winship's Reeler Photograph, Dr. Edward E. Curtis IV

## WESTERN MEDICINE AND MODERN CHINA

Western 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 in China, 1800-1950," brings the IUPUI Medical Humanities Program, the Center on Philanthropy, and the Center for the History of Medicine at Peking University together to study the history of hospitals, medical schools, and other institutions supported by Western philanthropy and missionary efforts in China.

The grant will help fund two conferences (one in Indianapolis and one in Peking). It will also identify major archival holdings and historical documents within and outside China. Ultimately, documents

from the conferences and other archival materials will be digitized to be accessible online.

"Medicine was a very important field for Westerners working in China," says Schneider, who is the Baker-Ort Chair in International Healthcare Philanthropy and Director of the Medical Humanities Program. "The archives and records in the West are documented and well-known, but not those in China. A major goal of our work is to increase the access Chinese scholars have to sources in the West in addition to helping them identify resources in China."

## WOMEN'S WORK UNDONE

Anila Quayyum Agha, assistant professor of drawing at the Herron School of Art and Design, explores the relationships between gender, culture, and labor through mixed media collage, drawings and installations. By combining textile processes (such as embroidery, batik, and screen printing) with sculptural techniques, Agha

critiques the patriarchal perspective that textile work is inherently woman's work. She uses embroidery as a 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 content 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 combating prejudice and discrimination created in her a passionate desire for equality and justice. Her work offers a deeply personal perspective on diversity, gender, and culture.

In November 2009, she was the recipient of the prestigious Efroymson Arts Fellowship and in 2010 she had two major solo shows in Lahore and Islamabad. Agha says, "An artist's role is to give a satisfyingly integrated expression to our physical, emotional and intellectual dimensions. It is





important that each work I create be embedded with a socially mindful purpose. Through my art, I want to advance the ideologies of equality, justice, and comprehension in our world.”

### 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 contemporary world. Andrew Winship is examining the Midwest through a filter that combines a multi-disciplinary approach to media with a pluralistic view of our environment.

“My intent is to examine our idyllic notions of place with the realities of failed industry,” says Winship. His current research endeavor titled “Dreams of Arcadia: The Mythic Midwest” consists of merging technology and digital art with the traditional studio practices of

sculpture, painting, and printmaking in order to create installation-driven environments. Acting as a powerful pedagogical tool for his students, his work highlights the relevance and application of interdisciplinary research and the responsibility artists carry to reflect on place and contemporary life.

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 desire 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.”

### 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,

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

Curtis has authored *Muslims in America: a Short History* (named one of the 100 best books of 2009) and the two-volume *Encyclopedia of Muslim-American History*.

As the national controversy heated up over the construction of a new Muslim center near Ground Zero, Curtis’ 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 prejudice.

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, as he did in classes at the University of Jordan, he was called on to explain Muslims to Americans. “I feel grateful that my research has allowed me to confront people’s fears of each other.”

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# INFORMATION TECHNOLOGY RESOURCES BOLSTER IUPUI RESEARCH

Researchers across the disciplines on the IUPUI campus have access to an advanced cyberinfrastructure that accelerates research, supports scholarly collaboration and promotes the creation and dissemination of artistic works. Access to constantly refreshed IT resources is necessary to attract and retain the best faculty, students, and researchers. The university's investment in the development and deployment of a national research cyberinfrastructure contributes to US research competitiveness and bolsters Indiana's economy.

The university research cyberinfrastructure includes the supercomputer clusters Big Red, Quarry, and the Research Database Complex. Through multi-year efforts to build a comprehensive, distributed infrastructure for scientific research, investigators can access remote computing power, data management and storage facilities, high-resolution visualization environments, scientific instruments, large datasets, and computing portals and toolkits. The Data Capacitor, a high-speed, high-bandwidth storage system, allows sharing of large amounts of data with researchers at multiple remote sites. The university's expertise in network research, planning, and operations continues to enlarge the international framework for scholarly communication 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 its Digital Science Center, Data to Insight Center, and Center for Applied Cybersecurity Research, develops innovative information technology to advance research, education, and industry. The Institute brings together researchers and technologists, from a range of disciplines and organizations within the university, with external partners.

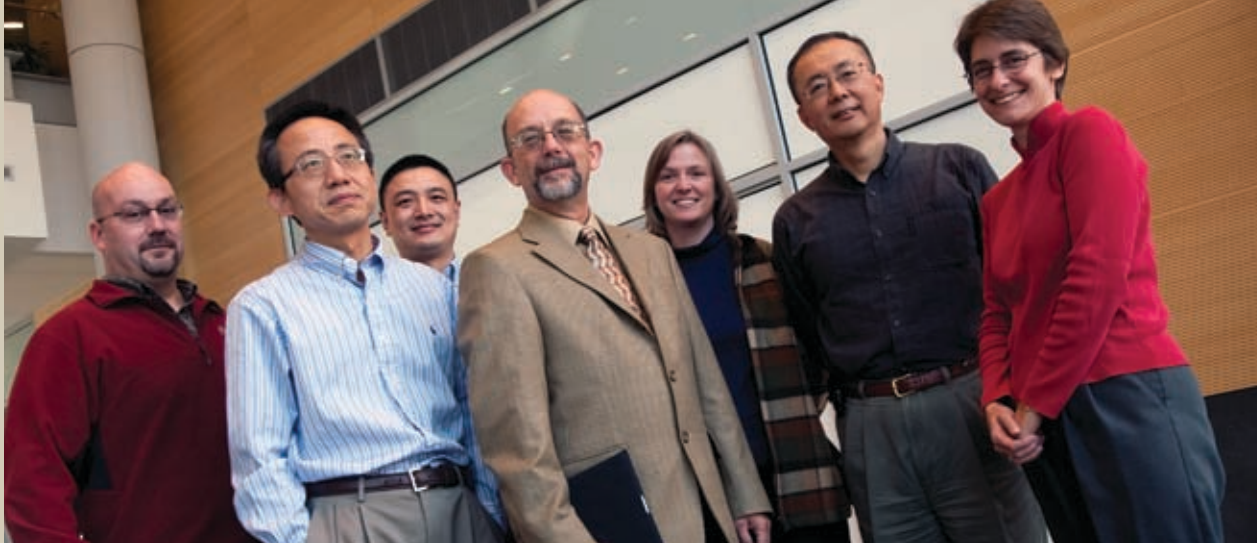
## NAVIGATING THE AURAL WEB

Dr. Davide Bolchini, assistant professor of human-computer interaction at the School of Informatics seeks to make the Web a more accessible environment for users. With funding from the National Science Foundation's highly-competitive Human-Centered Computing Program, Bolchini is working on ways to identify and evaluate strategies to help blind and visually-impaired users better navigate the Web using their auditory senses. The three-year project, "Navigating the Aural Web," hopes to improve upon existing audio-only web navigation designs and applications for both visually-impaired and sighted users. Design and evaluation will directly involve students from the Indiana School for the Blind and Visually Impaired using screen readers as well as sighted participants using mobile devices. The mobile navigation solutions investigated in the project may prove to be transferable to other situations such as walking, where users must listen to content, rather than read it on a screen.



Dr. Davide Bolchini





From left to right: Jeff Rogers, Dr. Shiao-fen Fang, Dr. Li Shen, Dr. Richard Ward, Leah Wetherill, Dr. Feng Zhou, and Dr. Tatiana Foroud

## INFORMATION TECHNOLOGY ADVANCES EFFORTS TO DETECT AND TREAT FETAL ALCOHOL SYNDROME

Fetal alcohol syndrome (FAS) is considered the most common and preventable birth defect. Early diagnosis, intervention, and treatment for the disorder remain great challenges worldwide. A clinical diagnosis of FAS is typically based on appearance of certain facial features, developmental disabilities, and documented alcohol exposure. However, the diagnoses made through these factors are just the tip of the iceberg, according to Dr. Tatiana Foroud, Director of the Division of Hereditary Diseases and Family Studies, Department of Medical and Molecular Genetics in the School of Medicine. The greater part of the fetal alcohol spectrum comprises individuals who have been exposed to alcohol but do not have easily recognizable effects. Foroud and collaborators Dr. Richard Ward, Dr. Li Shen, Dr. Shiao-fen Fang, and faculty colleagues across IUPUI as well as University IT Services and medical practitioners are collaborating to find better ways to identify children with alcohol exposure across the spectrum and to provide intervention and treatment. Their study is part of the

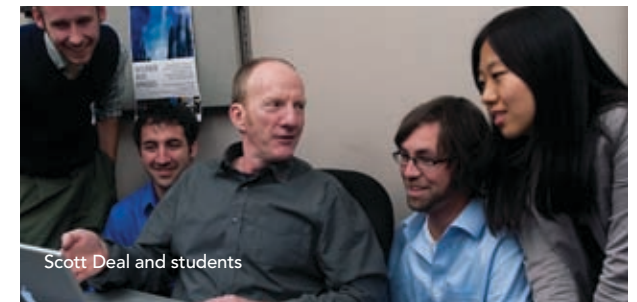
Collaborative Initiative on Fetal Alcohol Spectrum Disorders, an international consortium of researchers supported by the National Institute on Alcohol Abuse and Alcoholism.

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 computerized anthropometric techniques contribute to understanding the variable expression of this complex disorder, according to Dr. Richard Ward, professor of anthropology and dentistry. Dr. Shiao-fen Fang, professor of computer and information science, applies facial recognition software to enable remote diagnosis. The technologies and protocols developed by this team in collaboration with the Advanced Visualization Lab (University Information Technology Services) enable the researchers to capture and collect thousands of images of individuals of different nationalities, ages, and levels of exposure. Results of their work extend the detectable spectrum range, holding promise for more effective clinical diagnosis, intervention, and treatment.

## EXPLORING THE FRONTIERS OF TECHNOLOGY AND THE ARTS

Imagine an opera in which the performers are connected via high bandwidth Internet from diverse locations, the subject is climate change in the Arctic, and the audience participates via text messaging. The result is *Auksalaq*, a telematic opera, co-created by Scott Deal, professor of music and director of The Donald Tavel Arts Technology Research Center. The Center is located in the Department of Music and Arts Technology at the School of Engineering and Technology. This project, the first of its kind, is just the latest example of Deal's path-breaking work that explores new modes of interactivity at the nexus of science and the arts.

Professor Deal is the founder of the Telematic Collective, an Internet performance group comprised of artists and computer specialists. The Collective explores issues of culture and thought through funded research, production and education in collaboration with arts, humanities and research institutions – employing location-based applications (media, performance, and installation events) as well as distribution-based formats (Internet2 high-speed bandwidth). Students assist with research on software and platforms for networked collaboration and other projects that explore the boundaries between computer activity and the arts.

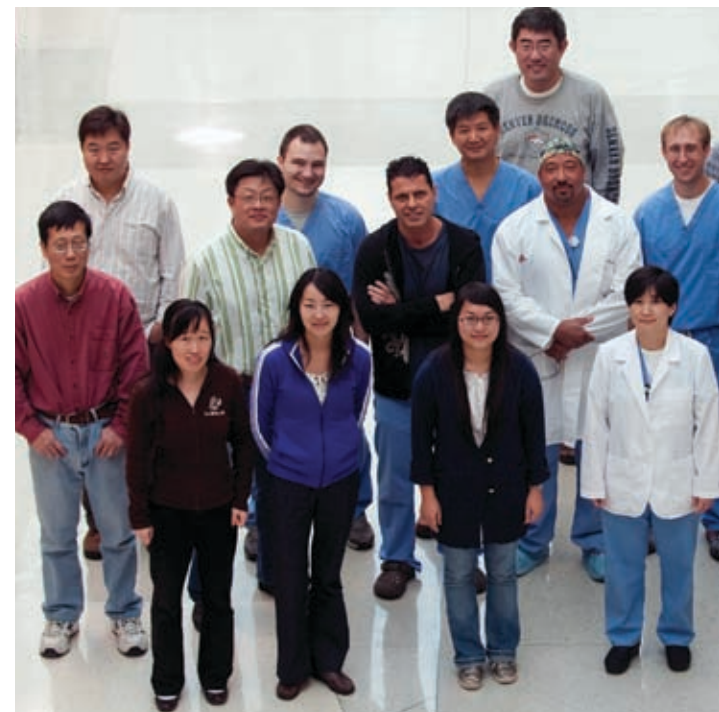


Scott Deal and students

# IMPACT THROUGH TECHNOLOGY TRANSFER, COMMERCIALIZATION, AND ECONOMIC DEVELOPMENT

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 (IURTC) serves as the primary bridge for IUPUI faculty to take their proven ideas to the marketplace. The IURTC mission is to help faculty commercialize new technology to support technology-based economic development throughout Indiana and the nation. The IURTC is also dedicated to enhancing the research and development capability of Indiana University, creating new Indiana-based companies, and supporting entrepreneurial development.



Dr. Ali Jafari

## ANGEL LEARNING: A STAR IN INDIANA UNIVERSITY START-UPS

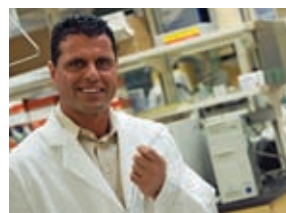
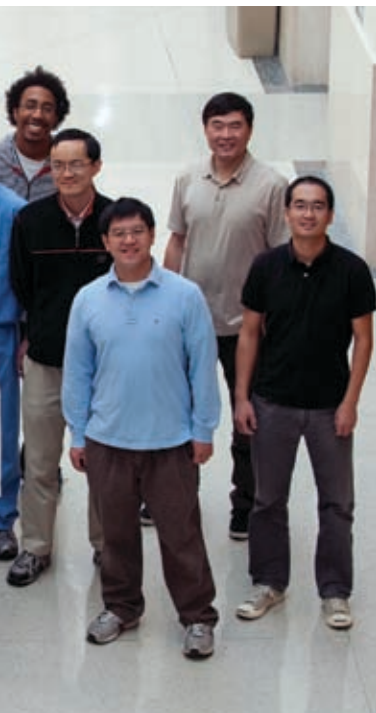
ANGEL Learning, an Indianapolis-based educational software provider was acquired in 2009 by Blackboard Inc. (Nasdaq: BBBB), an educational software provider headquartered in Washington, D.C., for \$100 million. This is the largest commercial transaction Indiana University has experienced.

Angel Learning produces educational and course management software using technology developed at IUPUI by Dr. Ali Jafari, a professor of computer and information technology, and director of the Cyber Lab in the School of Engineering and Technology at IUPUI, and David Mills, a 1999 graduate of the School

of Engineering and Technology. Since its founding nine years ago, the company has grown to about 200 programmers, analysts and sales/marketing personnel, and is now housed at Indianapolis' INTECH Park. The deal to acquire ANGEL Learning was the result of an unsolicited offer from Blackboard.

Dr. Jafari also invented Oncourse, an online course management system now used on all Indiana University campuses. Most recently, Jafari created the Epsilon Environment, a business development and networking platform, that counts *The New York Times* as an equity investor and strategic partner.





Dr. Ghassan Kassab and his team of medical researchers, physicians, and engineers

## INITIATIVES IN BIOMEDICAL ENGINEERING CONTRIBUTE TO HEALTH, ECONOMIC DEVELOPMENT

New technologies to address the epidemics of heart disease and obesity, both of which are on the rise, are being developed through the efforts of Dr. Ghassan Kassab and his team of medical researchers, physicians, and engineers. Kassab's team researches the biomechanics of the cardiovascular system in health, and diseases such as heart failure. The focus is cardiovascular engineering, especially vascular systems, coronary circulation, and tissue remodeling. His group seeks to translate new developments from the lab to the bedside through their research collaboration and inventions.

Half of the specialists are “reductionists,” scientists (including medical doctors) who dissect the systems down to their molecular, cellular and tissue levels through basic research. The remaining half are “integrationists,” engineers that 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 2011 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.

## MEDICAL INFORMATICS VISUALIZATION ASSISTANT HOLDS PROMISE FOR PATIENT CARE AND INTERVENTION

Intensive Care Units (ICUs) serve the most critical and vulnerable patients in healthcare facilities. These environments contain numerous technological devices and equipment that produce a potentially overwhelming amount of data, which medical practitioners must be able to monitor and interpret swiftly and accurately to provide an effective response. To address this critical situation, a team of researchers led by Dr. Anthony Faiola, Executive

Associate Dean, Director of Human-Computer Interaction, and Associate Professor in the School of Informatics, have developed MIVA—the Medical Information Visualization Assistant.

MIVA consolidates large amounts of essential patient data into a visual and interactive format – allowing physicians and nurses to streamline workflow, while expediting critical care treatment. Devices monitoring patients' vitals, such as blood pressure, heart rate and other measures, are integrated with MIVA and displayed on a large touch-screen within the ICU. MIVA can also track changes over time. This means physicians can interpret the long-term effects of an intervention on patients' health, such as a newly administered drug or surgery. Faiola and his team are currently developing usability and risk assessment studies with clinicians to evaluate the impact and quality of the product. The long-term goal is to give MIVA mobility by taking it to a commercial platform, thereby enabling clinicians the ultimate freedom of moving from patient to patient.



Dr. Anthony Faiola

# IUPUI STUDENTS POISED TO RISE TO THE CHALLENGE

Undergraduate students—

under the mentorship of faculty researchers—

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

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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*. Research 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 Streepey (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.



► 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 Lucas worked with Don Schumacher Racing, helping to redesign the chassis of a top fuel dragster that went on to set a new world record.



◄ 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 a 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.



◄ 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.

# INNOVATIVE STEM INITIATIVES IMPROVE INDIANA



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.

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## 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.

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

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## 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.

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. Gina Yoder, Dr. Patricia Rogan

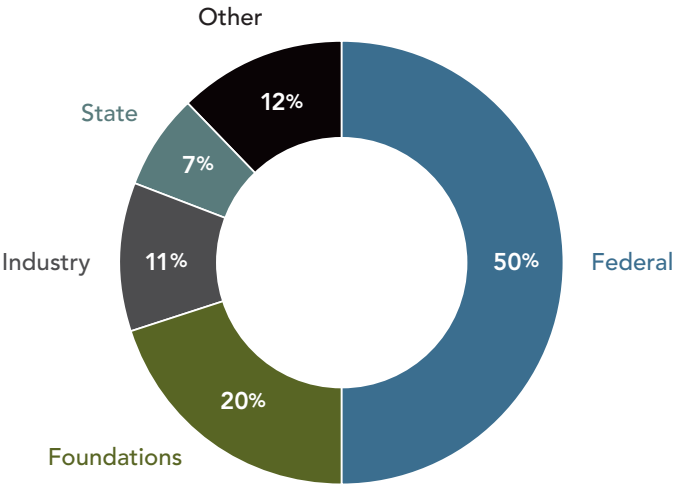
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## CENTRAL INDIANA STEM TALENT EXPANSION PROGRAM

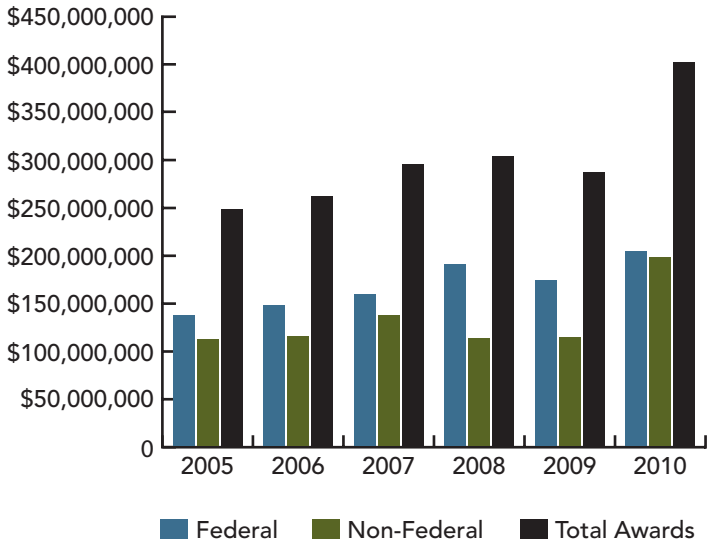
With a \$2-million National Science Foundation grant, IUPUI aims at increasing the number of STEM-field bachelor's degrees conferred by an additional 782. The 5-year award provides funding in five areas: 1) specialized summer bridge programs; 2) development and support of the associate degree in mathematics 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.



IUPUI AWARDS BY AGENCY TYPE FOR FISCAL YEAR 2010  
TOTAL: \$400,343,195



IUPUI TOTAL AWARDS 2005 - 2010 FEDERAL VS NON-FEDERAL



IMPACT BY THE NUMBERS

IUPUI RESEARCH COMMERCIALIZATION METRICS

	FY 2009	FY 2010
Disclosures Received	98	112
Patent Applications Filed	98	126
Provisional	43	62
Patent Cooperation Treaty (PCT)	17	24
Regular U.S.	16	19
Foreign	22	21
Patents Issued	3	8
Start-Up Companies Formed	5	3
Total Active Start-Up Companies	22	25
Licenses Executed	20	16
License Income	\$3,756,459	\$4,814,207

# IUPUI

## OFFICE OF THE VICE CHANCELLOR FOR RESEARCH

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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.

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