

SHAPING *the* FUTURE *of* MEDICINE



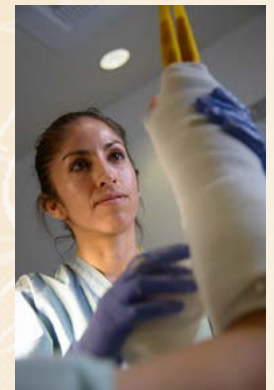
THE UNIVERSITY OF ARIZONA
College of Medicine
Tucson

Our mission:

Advancing health and wellness through education, research and patient care.

Give Now

To maintain the College of Medicine – Tucson’s tradition of excellence, we must provide the financial support necessary to offer the best training possible, recruit exceptional faculty talent and enable groundbreaking research and clinical care. The need for support from individuals, foundations and corporations is greater than ever before as government funding continues to decline. Thank you to all our donors and friends who have supported the College throughout the years.



About the University of Arizona Health Sciences

The University of Arizona College of Medicine – Tucson is part of the University of Arizona Health Sciences, the statewide leader in biomedical research and health professions training. In addition to the Tucson medical school, the UA Health Sciences includes the UA College of Medicine – Phoenix; the UA College of Nursing; the UA College of Pharmacy; and the UA Mel and Enid Zuckerman College of Public Health. With main campus locations in Tucson and the growing Phoenix Biomedical Campus in downtown Phoenix, the UA Health Sciences reaches across the state of Arizona and the greater Southwest to provide cutting-edge health education, research, patient care and community outreach services. A major economic engine, the UA Health Sciences employs almost 5,000 people, has nearly 1,000 faculty members and garners more than \$126 million in research grants and contracts annually. For more information, please see uahs.arizona.edu.

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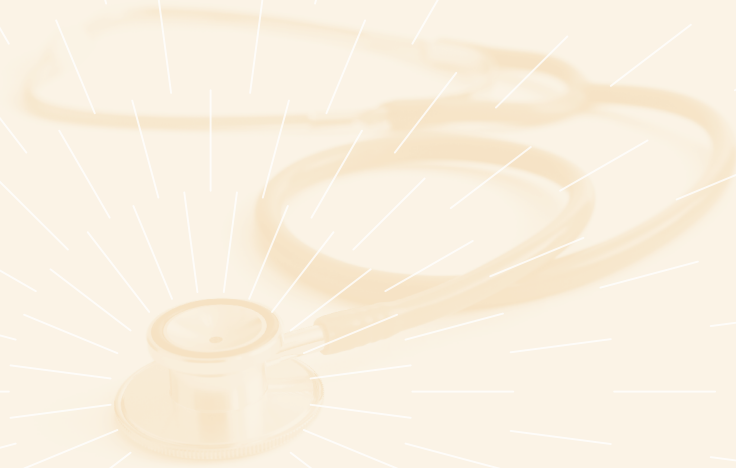
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UA College of Medicine – Tucson Sees Many Advances, Accomplishments

The University of Arizona College of Medicine – Tucson is in the midst of major expansion, growth and renewal of mission, poised to accomplish major breakthroughs to improve health and treat and cure disease.

This report provides highlights and accomplishments from the past several months for each of the College departments. We're pleased to share many of the exciting advancements, new projects and high-profile research grants and leadership appointments that are fueling our journey to become a premier U.S. medical school.

*Joe G.N. "Skip" Garcia, MD, and
Charles B. "Chuck" Cairns, MD*

Thanks to several ongoing strategic-growth initiatives, strong institutional and external support and a momentous agreement with Banner Health, the College is prepared to provide innovative new ways to educate the next generation of physicians and improve the health of our state, nation and beyond through our discoveries and new models of compassionate care.

Certainly, the past months have been filled with significant achievements and advances at the College. For example, we received national attention in February 2015, when the UA and Banner Health finalized the terms of a 30-year academic affiliation agreement in which Banner Health becomes the primary clinical partner for the UA Colleges of Medicine in Tucson and Phoenix. Of critical significance, Banner agreed to provide \$261 million toward a \$300 million Academic Enhancement Fund to support the academic enterprise at the two medical schools. Banner also committed at least \$500 million in capital-improvement projects, including a replacement hospital for Banner – University Medical Center Tucson to support the clinical enterprise and provide cutting-edge equipment and facilities for our patients and the next generation of physicians and physician-scientists.

We also heard good news in June 2014, when the UA College of Medicine – Tucson received full re-accreditation from the Liaison Committee on Medical Education (LCME) through 2022, the full eight-year term. And during a time with decreased federal and state support, the College's awards from the National Institutes of Health (NIH) increased by almost 4 percent over FY2013: \$52.6 million awarded in FY2014, compared to \$51.7 million in FY2013.

We also received approval for a new department in October 2014, when the Arizona Board of Regents approved establishment of a Department of Otolaryngology – Head and Neck Surgery at the College of Medicine – Tucson. Alex Chiu, MD, was named the inaugural chair.

In March 2015, the College was recognized in the 2016 edition of *U.S. News & World Report's* "Best Graduate Schools" issue. This year, a notable gain was made in a key college program, which moved up 40 positions to rank No. 42 nationally as one of the best medical schools for primary care medicine. In the rankings of research-intensive medical schools, the UA College of Medicine – Tucson's ranking improved from 68 to 67 nationally, a significant increase considering the overall decline in federal research funding.

In addition, the College welcomed new leaders in several major positions:

- ▶ In August 2014, Leigh A. Neumayer, MD, MS, was appointed the first female chair of the UA Department of Surgery. She previously was professor of surgery and vice chair for academic affairs at the Department of Surgery at the University of Utah School of Medicine and co-director of the multidisciplinary team treating breast cancer at Huntsman Cancer Institute.
- ▶ In September 2014, Andrew S. Kraft, MD, was appointed director of the UA Cancer Center, UAHS associate vice president for oncology programs and senior associate dean for translational research in the UA College of Medicine – Tucson, among other duties. He previously was director of the Hollings Cancer Center at the Medical University of South Carolina.
- ▶ In December 2014, Monica Kraft, MD, was appointed chair of the UA Department of Medicine. She previously served as chief of the Division of Pulmonary, Allergy and Critical Care at Duke University and as director of the Duke Asthma, Allergy and Airway Center, among other duties.
- ▶ In January 2015, Wayne K. Jacobsen, MD, FCCM, was appointed head of the UA Department of Anesthesiology after serving as interim head since 2013.
- ▶ In April 2015, Myra Muramoto, MD, MPH, was appointed head of the UA Department of Family and Community Medicine. She had served as interim head of the department since October 2014.

This is a very exciting and invigorating time at the UA College of Medicine – Tucson and the entire University of Arizona Health Sciences, and we anticipate major advances in the future. As you read this report, please note that we could not accomplish such challenging initiatives without our talented faculty and staff, whose dedication to advancing innovation and collaboration in the classroom, in the laboratory and at the patient's bedside is helping create a world-class college of medicine and academic health center at the University of Arizona.

Joe G.N. "Skip" Garcia, MD

*Senior Vice President for Health Sciences
and the Merlin K. DuVal, MD, Endowed Chair for Leadership and
Innovation in the University of Arizona Health Sciences*

Charles B. "Chuck" Cairns, MD

*Interim Dean, College of Medicine – Tucson
University of Arizona*

An Amazing Adventure: Historical Highlights From Arizona's First College of Medicine

In 1964, Merlin K. "Monte" DuVal, MD, arrived in Tucson with a bold vision and the energy and determination to engage the entire state in the amazing adventure of building the state's first medical school. Three years later, the University of Arizona College of Medicine admitted its first class of 32 pioneering students, just as the Basic Sciences Building was completed.

Following is a glimpse of some of the history-making milestones at the UA College of Medicine – Tucson.



First class, first day with Merlin K. DuVal, MD

Highlights: UA College of Medicine – Tucson

1963

Unanimous Opinion Given Regents
UA GETS MEDICAL SCHOOL
Survey Group Recommends Speedy Start
Arizona Chosen Over ASU Because Of Present And Projected Resources
TEMPE, June 12 (Special) — Establishment of a medical school at the University of Arizona was recommended unanimously to the State Board of Regents Monday. The formal proposal was made to the Regents by the year-old Medical Study team. It had set up to survey the need for such a institution.
Dr. Joseph F. Volker, study director, announced that his 12-member national advisory board agreed unanimously on the University of Arizona as the proper locale.

By a razor-thin margin, the Arizona Legislature voted to establish the **state's first medical school** in Tucson. The University's leadership in medical education, research and outreach began just four years later when the first medical students arrived at the UA.

1970

UA Rural Health Office founded by Andy Nichols, MD, UA professor of family and community medicine and later a state representative, then senator.

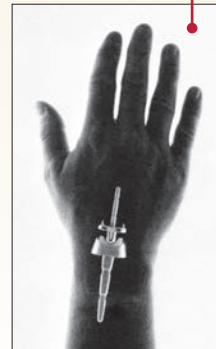
1971



UA teaching hospital opened in September as University Hospital. (In 1985, University Hospital became private, non-profit University Medical Center.)

Arizona Respiratory Sciences Center established as the College's first Center of Excellence. (Renamed the Arizona Respiratory Center in 2001 to reflect its national reputation for outstanding respiratory care.)

1974



First artificial wrist, recognized in 1976 by the American Hospital Association as one of the nation's 10 most important medical advances, developed by Robert Volz, MD, later co-founder of the UA College of Medicine's Arizona Arthritis Center.

1976

Arizona Cancer Center established under the leadership of Sydney E. Salmon, MD. Now the UA Cancer Center, the center is the only one headquartered in Arizona designated by the National Cancer Institute as a Comprehensive Cancer Center, the NCI's highest designation.

1979

A handful of students and faculty members started the CUP – **Commitment to Underserved People** – program, one of the oldest community-service programs at a U.S. medical school. In 2013, the Liaison Committee on Medical Education (LCME) singled out CUP as one of the UA College of Medicine – Tucson's "institutional strengths."



University Heart Center established. (In 1998, renamed the UA Sarver Heart Center in recognition of generous support from the Robert Sarver family.)

Children's Research Center approved by Arizona Board of Regents; Lynn Taussig, MD, appointed director. (In 1990, renamed the Steele Memorial Children's Research Center, in honor of Horace Steele and the Steele Foundation.)

Arizona Center on Aging established under the Older Americans Act. (The Arizona Board of Regents approved it as a Center of Excellence 11 years later.)



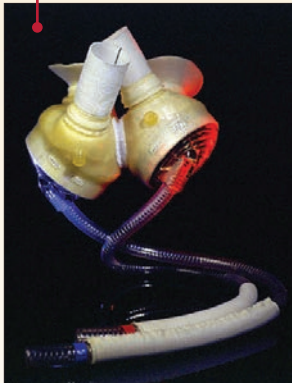
UA College of Medicine's first **dual-degree program**, the MD-PhD, established.



Nation's first **Program in Integrative Medicine** established under director Andrew Weil, MD, Lovell-Jones Endowed Chair in Integrative Rheumatology. It became the Arizona Center for Integrative Medicine in 2008.

1980 • 1985 • 1986 • 1990 • 1993 • 1994

Arizona's first heart transplant performed by cardiothoracic surgeon Jack Copeland, MD, at University Hospital (now Banner – University Medical Center Tucson).



World's first successful use of a **total artificial heart** as a temporary "bridge to transplant."

Arizona Arthritis Center established by the Arizona Board of Regents, with Eric Gall, MD, and Robert Volz, MD, as founding directors.

Arizona Emergency Medicine Research Center established under founding director Harvey Meislin, MD. Today it is a national leader in emergency medicine research and training.



Arizona Board of Regents authorized the creation of the **Arizona Graduate Program in Public Health** (precursor to the College of Public Health) at the UA College of Medicine, under founding director Cheryl Ritenbaugh, PhD, MPH.



● **James E. Dalen, MD, MPH**, dean of the UA College of Medicine since 1988, appointed first UA vice president for health sciences. He served in both roles through 2001.

Arizona Telemedicine Program established under founding director Ronald S. Weinstein, MD, then-head of the UA Department of Pathology. The program now is recognized as a world leader in telemedicine.



UA Sarver Heart Center Resuscitation Research Group begins to advocate **chest-compression-only CPR**.



● **UA VIPER Institute** established as a Center of Excellence by the Arizona Board of Regents.

1995

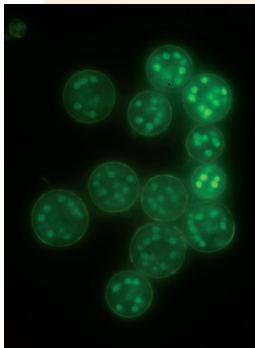
1996

1999

2003

2004

2005



Valley Fever Center for Excellence established under founding director John N. Galgiani, MD.

Arizona Hispanic Center for Excellence designated a Center of Excellence at the UA College of Medicine.



● Arizona's **first medical simulation laboratory**, the Arizona Simulation Technology and Education Center (ASTEC), established under the leadership of Allan J. Hamilton, MD.

● In September 2015, "the **University of Arizona Health Sciences**" became the new name for the UA's academic health center. Formerly called "the Arizona Health Sciences Center," the new name clearly identifies the UA's health sciences enterprise as an integral statewide component of the University of Arizona, one of the nation's premier research universities.





First-year medical students begin studies at the **UA College of Medicine - Phoenix**. The College was established in Arizona's largest metropolitan area to better address the health-care needs of Greater Phoenix and the entire state of Arizona.

Diamond Children's Medical Center opened as a pediatric medical center within a hospital at University Medical Center, and as Arizona's only children's medical center connected to an academic research facility, the UA Steele Children's Research Center.



University Medical Center and University Physicians Healthcare, in partnership with the UA College of Medicine - Tucson, integrate to form the **University of Arizona Health Network**, bringing together two academic hospitals and affiliated clinics, a health plan division and the medical practice of physicians from the UA College of Medicine - Tucson.



Banner University Medicine

The UA College of Medicine - Tucson is entering a new era thanks to a major partnership with Banner Health. **Banner - University Medicine** was formed through the merger of Banner Health and the UA Health Network. The University received national attention in February 2015, when the UA and Banner finalized the terms of a 30-year academic-affiliation agreement in which Banner became the primary clinical partner for the UA Colleges of Medicine in Tucson and Phoenix.

Most significantly for the colleges, Banner agreed to provide \$261 million toward a \$300 million Academic Enhancement Fund to support the academic enterprise at the two medical schools. Banner also committed to at least \$500 million in capital improvement projects, including a replacement hospital for Banner - University Medical Center Tucson (formerly University of Arizona Medical Center) to support the clinical enterprise.

2006

2007

2010

2014

2015

UA College of Medicine - Tucson accredited by the Liaison Committee on Medical Education (LCME) through 2022, a full eight-year term.

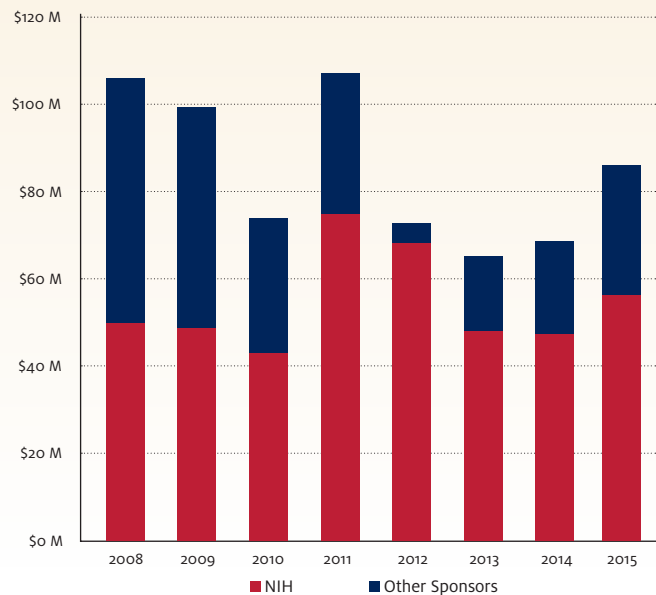
Where Do We Go From Here?

Because Banner values and respects the academic mission, this new partnership creates an extraordinary platform that will enable the UA Colleges of Medicine in Tucson and Phoenix to move forward with plans to develop a world-class academic health center in two cities, serving the entire state and beyond.

At the same time, the UA maintains control and oversight over the UA Colleges of Medicine. An Academic Management Council, established as part of the agreement, with leaders from the UA and from Banner, oversees faculty operations and activities associated with teaching, research and patient care within Banner - University Medicine.

In 2017, the UA College of Medicine - Tucson will celebrate its 50th anniversary. As the College looks back on an outstanding record of achievement in innovative medical education, groundbreaking research and state-of-the-art patient care, our profound responsibility is to always look forward and work together to develop one of the top medical schools in the world.

College of Medicine - Tucson Awards




*For 2012, 2013, 2014 and 2015 the following have been excluded: clinical trials, ancillary contracts.



The College of Medicine – Tucson Dean's leadership team (from left): Francisco Moreno, MD; Judy DiMarco, PhD; Charles "Chuck" Cairns, MD; Anne E. Cress, PhD; Kevin Moynahan, MD; and David Elmer, MBA.

UA College of Medicine – Tucson

Leadership Team



The UA College of Medicine – Tucson leadership team brings a wealth of academic and professional experience to support students, faculty and staff. Committed to innovation and progress, this highly experienced team works tirelessly to move the College forward. These are the people who keep the UA College of Medicine – Tucson on the path to excellence.

Charles “Chuck” Cairns, MD, Interim Dean, joined the UA in November 2014 as vice dean of the UA College of Medicine – Tucson, as well as assistant vice president for clinical research and clinical trials at the University of Arizona Health Sciences and UA professor of emergency medicine. He previously was professor and chair of the Department of Emergency Medicine at the University of North Carolina at Chapel Hill, where he also served as consulting faculty for the Duke Clinical Research Institute at Duke University Medical Center. In February 2015, Dr. Cairns was promoted to interim dean of the UA College of Medicine – Tucson.

Anne E. Cress, PhD, Deputy Dean for Research and Academic Affairs, is a professor of cellular and molecular medicine, radiation oncology and molecular and cellular biology. She is widely recognized for her research in cancer cell biology, and has been awarded several patents for applications being tested for their ability to prevent cancer metastasis and to sensitize tumors to currently available therapies. Dr. Cress has a 25-year history of contributing to interdisciplinary research through the publication of more than 100 original research articles.

Judy DiMarco, PhD, Deputy Dean for Administrative Affairs and Chief of Staff, works closely with the Dean and is responsible for strategic planning, policy development and implementation, problem resolution and oversight of strategic public relations and communications. She came to the UA in June 2012 after serving as a department administrator and assistant dean for administration at the University of Texas Medical Branch School of Medicine, where she oversaw strategic and operational planning, budget planning and control and fiscal projections. Her doctorate is in population health sciences and epidemiology from UTMB in Galveston.

David Elmer, MBA, Deputy Dean for Finance and Business Affairs, played a critical role in the successful completion of the Banner Health - University of Arizona Health Network due diligence and negotiations during the fall of 2014 and has continued to play a key role in implementation of the agreement following completion of the agreement on Feb. 28, 2015. He continues to oversee resource management relating to College budgets, financial resources, information technology, administrative staffing and space; and to improve budget and staffing alignment between the clinical enterprise and the College of Medicine – Tucson.

Francisco Moreno, MD, Deputy Dean for Diversity and Inclusion, was named to this new post in January 2013. A professor of psychiatry, Dr. Moreno developed and oversees Pre-Medical Admissions Pathway, a one-year program for Arizonans who want to become doctors but face such challenges as being first-generation college students, who come to the UA from rural or border communities, or are enrolled in Indian tribes. In November 2014, Dr. Moreno also was named assistant vice president for diversity and inclusion at the University of Arizona Health Sciences.

Kevin Moynahan, MD, Deputy Dean for Education, has devoted his academic career to medical education, while continuing to maintain an active clinical practice. He was associate chief and then chief of the Section of General Internal Medicine, until becoming director of the Societies Program in 2006. Selected as a Dean’s Teaching Scholar in 1999, he won the Clinical Sciences Educator of the Year award in 2000, 2001 and 2002 and subsequently received the Clinical Sciences Educator of the Year Lifetime Award. He is a Faculty Fellow with the Liaison Committee on Medical Education, and helped lead the College to a full, eight-year LCME accreditation in 2014.

Anesthesiology

The University of Arizona Department of Anesthesiology provides a full range of clinical services at Banner – University Medicine’s two Tucson hospitals and Outpatient Surgery Center, as well as the Southern Arizona VA Health Care System. The department also treats patients through its Chronic Pain Management Clinic at Banner – University Medical Center South.

The department’s faculty include generalists and specialists in pediatric and cardiac anesthesiology, and critical care. Faculty members are engaged in a variety of basic and clinical research projects, many of them collaborative efforts with the Departments of Neurology, Pathology, Pharmacology and Surgery.

The strength of Anesthesiology’s residency program is evidenced in residents’ outstanding board exam scores, and the fact that the department annually receives as many as 700 applications for 13 residency positions. Graduates of the program are in high demand for clinical and academic appointments at hospitals throughout the nation.



Mohab Ibrahim, MD, PhD, and Amol Patwardhan, MD, PhD, with spinal cord stimulator

Kris Hanning, UAHHS BioCommunications

Seeking Non-Opioid Solutions to Chronic Pain

The UA Department of Anesthesiology’s Chronic Pain Management Clinic at Banner – University Medical Center South is emerging as a leader in non-opioid treatments for chronic pain.

Mohab M. Ibrahim, MD, PhD, and Amol M. Patwardhan, MD, PhD, both assistant professors of anesthesiology, joined the faculty in July 2014 and are director and co-director, respectively, of the pain clinic. In addition, they are pursuing laboratory studies with the goal to find safer and equally or more effective alternatives to opioid-based pain medications. Their goal is to taper patients off opioids completely.

In 2013, the U.S. Centers for Disease Control and Prevention reported 16,235 deaths involving opioid analgesics. From 1999 to 2013, the rate for drug poisoning deaths involving opioid analgesics nearly quadrupled, from 1.4 to 5.1 per 100,000.

“We do not use opioids, except in a small number of cases,” Dr. Ibrahim said. “We’ve had success with patients who have been on opioids for years and on disability, and now they are off opioids and some of them are actually going back to work.”

Drs. Ibrahim and Patwardhan often treat chronic pain with a spinal cord stimulator, an implanted electronic device analogous to a cardiac pacemaker that interrupts pain signals before they reach the brain, thereby reducing patients’ pain. Their lab research, which includes collaborations with Frank Porreca, PhD, a pain expert in the Department of Pharmacology, includes testing synthetic cannabinoids as another alternative to opioids. “The clinical arena for cannabinoids is not yet clear,” Dr. Ibrahim said, “but there are promising data.”

Dr. Patwardhan received a College of Medicine Young Investigator Award to study possible alternatives to narcotic anesthetics currently used in surgery, many of which can increase patients’ risk of infection.

Dr. Ibrahim earned his bachelor’s degree and doctorate in pharmacology and toxicology at the UA, and is a 2008 graduate of the UA College of Medicine – Tucson. He did his surgical internship at the UA, and his anesthesiology residency at Brigham and Women’s Hospital, followed by a clinical pain fellowship at Massachusetts General. Dr. Patwardhan also studied pharmacology and toxicology in his native India, where he earned his medical degree. After receiving his doctorate from the University of Texas at San Antonio, he completed his internship in surgery and his residency in anesthesiology at the UA, followed by a pain medicine fellowship with the Department of Anesthesiology at the University of California, San Diego.



Wayne Jacobsen, MD, department head

Kris Hanning, UAHHS BioCommunications

**Coagulation
Laboratory:
Preventing Abnormal
Blood Clots in
Patients Most at Risk**

Patients with cancer, who are obese, who suffer from migraine headaches or are living with ventricular-assist devices or the total artificial heart are at significant risk for blood clots that can lead to stroke, heart attack and death. Vance Nielsen, MD, professor of anesthesiology, and associate head for research, is a leader in hypercoagulability – abnormal blood clotting – research.



Vance Nielsen, MD

Kris Hanning, UAHs BioCommunications

In earlier studies, Dr. Nielsen found that hypercoagulability results from the up-regulation of an enzyme system called

hemoxygenase. Since coming to the UA in 2012, he has continued his research in collaboration with colleagues in the UA Department of Surgery. “We know hemoxygenase is a source of abnormal clotting,” Dr. Nielsen said. “We’re continuing to explore it with the hope of finding ways to stop it in its tracks.”

Center for Consciousness Studies Marks 20th Anniversary

Stuart Hameroff, MD, professor emeritus of anesthesiology and psychology, established the Center for Consciousness Studies in 1994 to promote research that could lead to a better understanding of human consciousness. An intriguing topic, it also is one that eludes measurement and other fundamental principles of clinical research. But every year since 1994, scientists and others interested in understanding consciousness have attended the center’s conferences on the topic, which are held every other year at the UA. In 2014, more than 700 people from 60 nations attended, drawn by the chance to hear from such experts as Australian philosopher David Chalmers, University of Michigan anesthesiologist George Mashour, MD, and Deepak Chopra, MD, author and advocate of alternative medicine and spirituality.

Global Health Outreach: A Contrast in Hope and Despair

The UA Department of Anesthesiology’s faculty and residents travel frequently to Africa, South America and other underserved areas of the world to assist and train local doctors and nurses to provide the best possible care for their patients.

Kerry Kreidel, MD, who completed her residency with the Department of Anesthesiology in 2011, and now is assistant professor of anesthesiology, also is director of the department’s global outreach program. In December 2013, she made her first trip to the Baptist Medical Centre in Nalerigu, Ghana, accompanied by anesthesiology resident Jeremy Nielsen, MD. For two weeks, the doctors worked with

C-sections and other ob-gyn procedures, as well as bowel perforations, a common result of typhoid fever. Drs. Kreidel and Nielsen also taught local hospital providers how to assess



Jeremy Nielsen, MD

and resuscitate unstable patients, and they mentored the local anesthetist in the use of modern equipment and assembled the hospital’s first crash cart.

In November 2014, Dr. Kreidel traveled again, this time with resident Jamie McCulloch,

MD, to the Sergio Bernales Hospital in Lima, Peru, where they spent six full days in surgery, mostly for pediatric cleft lip and palate repair.

Other UA Department of Anesthesiology faculty members have been part of the global health effort. They include: Janelle Jambrosic, MD, who traveled to Ghana in March 2014 with resident Sana Hussaini Zaidi, MD; and Anthony Lucas, MD, and 2014 Chief Resident Benjamin Garol, MD, who traveled to the Phillipines in February 2014, following the November 2013 typhoon that affected 16 million people.



Kerry Kreidel, MD, center, and Jamie McCulloch, MD, in dark cap

Biomedical Engineering

Faculty in the University of Arizona Department of Biomedical Engineering collaborate extensively with UA College of Medicine – Tucson faculty. Established in 2009 by the Arizona Board of Regents as the newest department of the UA College of Engineering, the Department of BME reflects a UA tradition of interdisciplinary research in medicine, science and engineering that is more than 50 years old.

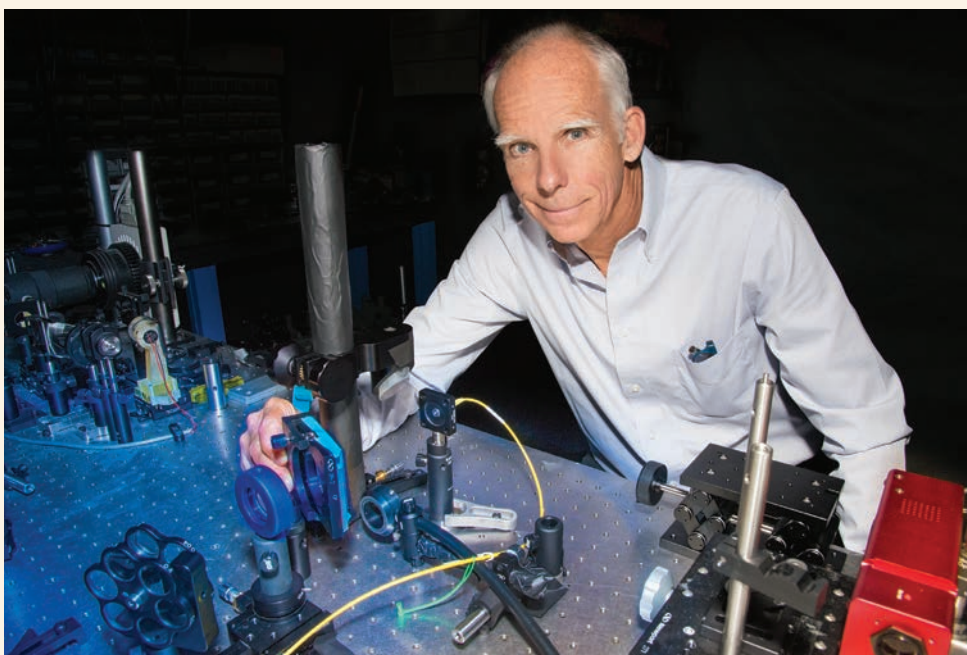
The field of biomedical engineering combines the engineering sciences with a focus on applications in biology and medicine. The field has grown dramatically over the past 20 years, leading to the development of a wide variety of medical devices and medical procedures, and a basic understanding of biological processes.

BME research encompasses a broad range of topics, including biomedical imaging (fundamental, pre-clinical and clinical imaging), cardiovascular mechanics and devices, sensors and instrumentation, and the study of cancer and other disease processes.

A number of UA College of Medicine – Tucson faculty members have joint appointments in the Department of BME; similarly, many BME faculty hold joint appointments in departments in the UA College of Medicine – Tucson. These collaborating faculty have a variety of backgrounds and areas of research but all are dedicated to improving human health through the application of engineering and scientific principles.

Researcher Arthur F. Gmitro, PhD, professor and head of the Department of BME, has a dual appointment as professor in the UA College of Medicine – Tucson Department of Medical Imaging as well as a joint appointment in the UA College of Optical Sciences. He also holds the Margaret E. and Fenton L. Maynard Chair in Breast Cancer Imaging. Dr. Gmitro became head of the BME department in November 2014, succeeding interim department head Urs Utzinger, PhD, associate professor of BME with a joint appointment in the UA College of Medicine – Tucson Department of Obstetrics and Gynecology.

Dr. Gmitro said, “I look forward to working with the BME faculty to build a strong department that translates engineering innovation into improved cost-effective health care and educates the workforce necessary to achieve that outcome. The future of health care is not only in improved treatments for patients with injury or disease, but in providing the resources and tools required for individuals to take a more active role in monitoring and maintaining their own health. I believe the UA has the foundation of interdisciplinary research collaboration necessary to help shape that future.”



Arthur F. Gmitro, PhD

BME Education Opportunities

The Department of BME undergraduate program graduated its first class of 27 students in 2013 with a bachelor of science in BME. Forty-three graduated in May 2014, and the program continues to grow in popularity as an undergraduate engineering major. The program's upper

Mark Thaler, UAHS BioCommunications



David Armstrong, DPM, MD, PhD, holds joint appointments as professor of surgery and BME. He also holds a joint appointment in the UA Mel and Enid Zuckerman College of Public Health and is director of the Southern Arizona Limb Salvage Alliance (SALSA), scientific director of the interdisciplinary Consortium on Advanced Motion Performance (iCAMP) and a member of the UA BIOS Institute.

level classes focus on biomechanics, biomaterials, biosensors and pre-health. Students graduate after completing a cross-disciplinary capstone project, and many pursue graduate degrees in medicine, engineering or life sciences.

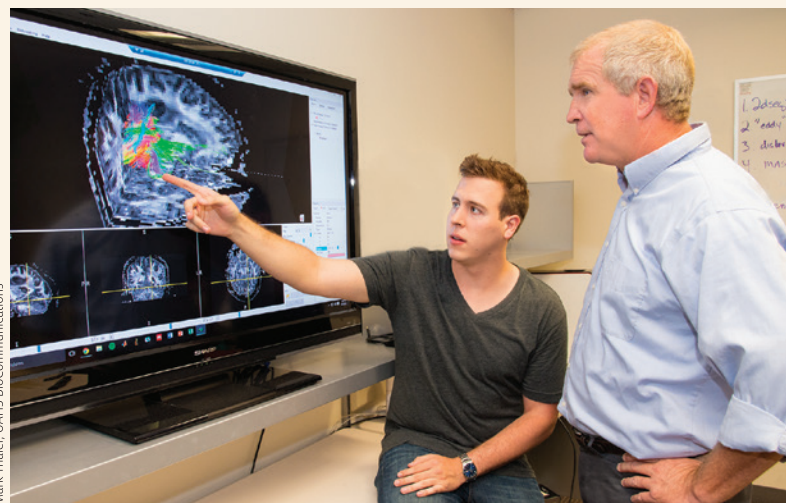
Graduate education opportunities in BME are organized through the UA's Graduate Interdisciplinary Program (GIDP) in BME. The BME GIDP serves as one of the academic homes for College of Medicine – Tucson MD-PhD students. The MD-PhD Program was established in 1990 as a collaboration of the UA College of Medicine and UA Graduate College. In September 2014, Kenneth S. Ramos, MD, PhD, PharmB, UAHS associate vice president of precision health sciences, was named head of the MD-PhD Program, succeeding Emmanuel Katsanis, MD, who directed the program since 2010.

The MD-PhD Program is designed for students planning careers in academic medicine and biomedical research and they may elect to complete doctoral work in biomedical engineering. Students who elect the BME option often devote their careers to developing new tools and devices to improve quality of life and health, such as wearable devices and digitized sensors.

Adam Bernstein was accepted into the MD-PhD Program in 2013, the year he graduated with a Bachelor of Science in Health Sciences with a major in physiology from the UA College of Medicine – Tucson and a Bachelor of Science in BME with a minor

in mathematics from the UA College of Engineering. As an undergraduate, Bernstein worked as a technician in the retinal neuroscience lab of Erika Eggers, PhD, assistant professor of physiology, BME and neuroscience, examining the origin and timing of inhibitory neural signals in the retina and how they might change in diabetic retinopathy. He also worked with Phillip Kuo, MD, PhD, professor of medical imaging, medicine and BME, on a project to demonstrate that significant reductions in radiation dose for bone PET (positron emission tomography) scans are achievable with minimal detriment to image quality; and with Theodore Trouard, PhD, associate professor of BME and medical imaging, on the potential applications of susceptibility weighted imaging, a relatively new magnetic resonance imaging (MRI) technique. Bernstein currently works with Dr. Trouard, now his thesis adviser, on clinically feasible, advanced diffusion MRI techniques to allow accurate visualization and quantification of neural connectivity in health and disease. "I hope to be involved in bringing health care to everybody's computer/tablet/phone and in personalizing medicine," Bernstein said.

The Department of BME is closely affiliated with the GIDP in BME, a cross-departmental program established by the UA to address the increasing importance of engineering approaches in modern biomedical research and new medical technologies. John A. Szivek, PhD, professor of orthopaedic surgery and BME, chaired the GIDP in BME from 2011 to July 1, 2015, when he was succeeded by Dr. Trouard. The program capitalizes on the research and teaching expertise of more than 64 faculty in the Department of BME and 19 other departments in the UA Colleges of Engineering, Science, Optical Sciences, Agriculture and Life Sciences, and UA College of Medicine – Tucson. Research ranges from basic bioscience to clinical applications in radiology, cardiology, internal medicine, neurology, orthopedics, surgery and oncology.



Graduate student **Adam Bernstein**, left, with his thesis adviser **Theodore Trouard, PhD**, who is associate professor of BME and medical imaging; a member of the UA Cancer Center, UA BIOS Institute and UA Evelyn F. McKnight Brain Institute; and chair of the UA GIDP in BME.

Cellular and Molecular Medicine

The University of Arizona Department of Cellular and Molecular Medicine is home to the graduate program in cell and developmental biology, a newly created master's program, a certificate program in biomedical sciences, the willied body program and the gross anatomy and histology labs.



Carol Gregorio, PhD, professor and head of the UA Department of Cellular and Molecular Medicine, with students in the Gregorio Laboratory.

The department's doctoral program attracts outstanding students from around the world. Graduate students in cancer biology, genetics, molecular and cellular biology, biochemistry, neuroscience and physiology also receive training in cellular and molecular medicine laboratories.

Department graduate students develop into leaders in biomedical research in academic and industrial settings throughout the world, while department faculty members frequently earn national and college honors, including UA College of Medicine – Tucson teaching awards.

CMM faculty research areas include cellular structure and function, developmental biology, bioinformatics and the physiological basis for complex disease mechanisms. Multi-disciplinary research focuses on cardiovascular biology, cell polarity and intracellular trafficking, cancer cell biology and complex disease biology and genetics. Collaborative research efforts team CMM faculty members with the UA Cancer Center, UA Sarver Heart Center, the UA Respiratory Center and the BIOS Institute, among others.

P-MAP: Increasing Diversity of College of Medicine Admissions

The Department of Cellular and Molecular Medicine serves a key role in the Pre-Medical Admissions Pathway (P-MAP) program, which the College of Medicine – Tucson launched in 2014 to assist students who have experienced greater-than-average challenges in becoming competitive medical school

applicants. P-MAP is open to students who are Arizona residents, with preference given to those who are socioeconomically disadvantaged, first-generation college students, students who grew up in rural or border communities and those enrolled in American Indian tribes.

Rogers Lab Studies Genomic Instability in Cancer

Greg Rogers, PhD, heads a research laboratory studying molecular mechanisms that contribute to genomic instability in cancer. The Rogers lab includes a network of researchers from around the United States. In the last five years, the lab has published 18 peer-reviewed manuscripts in high-impact journals, describing fundamental mechanisms of centriole duplication and nuclear organization. The lab is funded by an ongoing National Science Foundation grant and a five-year, \$1.4 million NIH R01 grant.



Greg Rogers, PhD

Dr. Antin Heads FASEB, iPlant

Parker Antin, PhD, professor of cellular and molecular medicine and associate dean for research, UA College of Agriculture and Life Sciences, was elected president of the Federation of American Societies for Experimental Biology (FASEB), an organization representing 27 scientific societies and more than 120,000 researchers from around the world. The organization is recognized as the policy voice of biological and biomedical researchers, advocating for science funding and regulatory policies that

maximize research productivity. Dr. Antin, who began his duties as FASEB president July 1, 2015, also was named principal investigator of iPlant, a 10-year, \$100 million project initially funded by the National Science Foundation in 2007. The project's objective is to develop, deploy and maintain a national cyber-infrastructure to enable basic and applied



Parker Antin, PhD

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Cress, Anne E	Arizona Cancer Center - Cancer Center Support Grant	NCI	\$26.74 M
Antin, Parker B	Geisha: A Chicken Embryo Gene Expression Resource	NICHHD	\$3.64 M
Gregorio, Carol C	Deciphering the Role of the RNA-Binding Protein, FXR1, in Cardiac Muscle Assembly	NHLBI	\$1.89 M
Wilson, Jean M	Regulation of Intestinal Tight Junction Structure by Membrane Traffic	NIDDKD	\$1.69 M
Granzier, Hendrikus L	Role of the Giant Protein Titin in Skeletal Muscle Structure and Function.	NIAMSD	\$1.68 M
Futscher, Bernard W	Epigenetic Features of Pregnancy-Associated Breast Cancer in Hispanic Women	NCI	\$1.63 M
Granzier, Hendrikus L	Function of Giant Sarcomere Matrix Proteins in Muscle	NHLBI	\$1.62 M
Cress, Anne E	Human Prostate Cancer Metastasis and Laminin Binding Integrins	NCI	\$1.51 M
Vercelli, Donata	Human IL-13 Gene Regulation and Impact of Polymorphisms	NHLBI	\$1.49 M
Granzier, Hendrikus L	Roles of Nebulin in Structure and Function of Striated Muscle	NIAMSD	\$1.39 M
Ghosh, Sourav	Apical-basal Polarity Signaling in Glioblastoma	NCI	\$1.35 M
Ignatenko, Natalia	Role of Kallikrein 6 Expression and Secretion in Colon Cancer	NCI	\$1.34 M
Granzier, Hendrikus L	Titin-based Adaptations of Cardiac Function	NHLBI	\$1.12 M

biological research, and to train the next generation of scientists in its use. This internationally recognized project enables life scientists to pursue scientific questions involving large datasets and that require computing resources not available in individual laboratories. Originally focused on plant research, iPlant now focuses on all realms of the life sciences.

Dr. Mouneimne’s Lab Studies Cell Motility and Cancer Metastasis

Ghassan Mouneimne, PhD, who arrived at the UA in fall 2013, studies the regulation of cell motility, especially relating to metastasis. An associate member of the UA Cancer Center, his first application for an NIH RO1 grant has been approved for funding, beginning in July 2015.



A graduate student operates the atomic force microscope in the Granzier Lab. During experiments, an enclosure protects the sensitive instrument from vibrations that would skew the measurements.

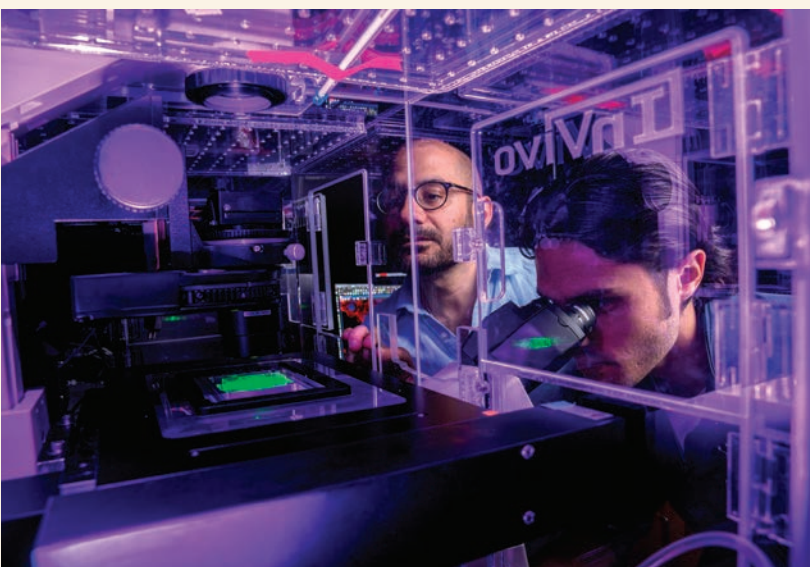
Dr. Granzier Earns Strong Grant Support for Studies of Muscle Proteins



Henk L. Granzier, PhD

Henk L. Granzier, PhD, is the Allen and Alfie Norville Endowed Chair for Heart Disease in Women’s Research in the UA Sarver Heart Center’s Molecular Cardiovascular Research Program and a member of the UA BIO5 Institute. He also is director of the recently established Mouse Phenotyping Core. Dr. Granzier is known as a leading investigator in the pathophysiology of the giant muscle proteins titin

and nebulin, studying these proteins and their interactions at every scale, from individual molecules to the entire heart. His multi-disciplinary research includes developmental and cellular biology, engineering, biophysics and physiology. His total funding portfolio of more than \$7.5 million consists of multiple NIH grants, a Transatlantic Networks of Excellence Program grant from the Leducq Foundation, a Muscular Dystrophy Association grant and funding from private organizations.



Ghassan Mouneimne, PhD, and graduate student Marco Padilla-Rodriguez

Kris Hanming, UAHS BioCommunications

Chemistry and Biochemistry

With faculty members in both the University of Arizona College of Medicine – Tucson and the UA College of Science, the UA Department of Chemistry and Biochemistry (CBC) is multidisciplinary and highly collaborative.

Both biochemistry and chemistry provide a solid foundation for the medical and pharmaceutical sciences, as well as agriculture and chemical engineering. The department's expertise in biomedical research and education is essential to the education and research programs of the UA College of Medicine – Tucson.

With a strong emphasis on state-of-the-art research capabilities aimed at drug discovery and distinguished faculty members dedicated to teaching excellence in the biomedical and precision-medicine sciences, the department trains undergraduate and graduate future physician-scientists, often providing aspiring students their first research experience before they are accepted to medical school.

The department participates in the teaching of medical students at various points in their first two years. Teaching focuses not only on core biochemical principles but also on how these principles apply to endocrinology, physiology, nutrition and medicine. The department is home to the NIH-funded Maximizing Access to Research Careers (MARC) program, a training program to prepare underrepresented undergraduate students from a variety of majors for biomedical PhD or MD/PhD programs. Funded consecutively for 16 years, MARC is considered one of the most successful programs of its type in the nation.

CBC's state-of-the-art research capabilities include research support services accessible to the UA community and outside clients. These capabilities include mass spectrometry, nuclear magnetic resonance spectroscopy and many surface analysis methods.

NEW FACULTY RESEARCH

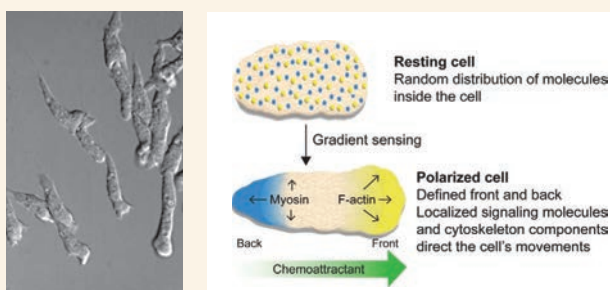
Goal of Cell Migration Research: To Prevent Cancer Metastasis

Pascale Charest, PhD, assistant professor, is studying the process by which cells detect and migrate toward certain chemicals, called chemoattractants. This directed migration of cells is important to normal physiology and is involved in the onset and progression of cancer and other disease processes. The Charest lab is working to identify the key molecular mechanisms that control directed cell migration, how the cell detects the chemoattractants and what makes them migrate. Their findings will guide the development of therapeutic strategies to



Kris Hanning, UAHS BioCommunications

Pascale Charest, PhD



The Charest lab is working to identify the key molecular mechanisms that control directed cell migration.

prevent cancer metastasis. Dr. Charest currently collaborates with Ghassan Mouneimne, PhD, assistant professor in the Department of Cellular and Molecular Medicine and an associate member of the UA Cancer Center. Dr. Charest's research is funded by the American Cancer Society.

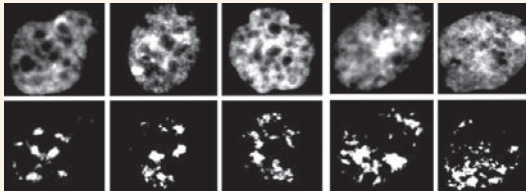
TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Lai, Li-Wen	Pharmaceutical Recruitment of Regulatory T Cells for Treating Acute Kidney Injury	NIDDKD	\$1.61 M



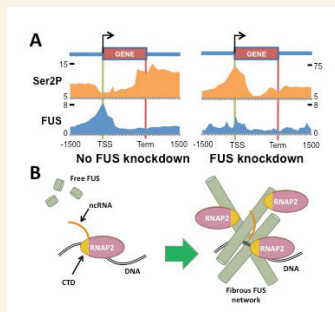
Kris Hamming, UAHHS BioCommunications

Jacob Schwartz, PhD



Microscopic view of the RNA-binding proteins the Schwartz Lab is studying.

Diagram depicting the FUS protein the Schwartz Lab is studying to understand Lou Gehrig's disease (ALS).



RNA-Binding Proteins May Hold Key to Understanding Lou Gehrig's Disease

Assistant Professor Jacob Schwartz, PhD, is studying the RNA-binding proteins in Lou Gehrig's disease (amyotrophic lateral sclerosis, ALS). Numerous genetic mutations have been shown to cause or closely associate with ALS over the past few years. Several of these mutations are in RNA-binding proteins. Many RNA-binding proteins play roles in neurodegenerative diseases and cancer. Long noncoding RNAs are important for normal cellular biology, but the specific functions for the vast majority of these proteins remain unknown. Dr. Schwartz's team collaborates with Daniela Zarnescu, PhD, associate professor of molecular and cellular biology and neurology, and Ross Buchan, PhD, assistant professor of molecular biology. Dr. Schwartz's research is funded by the National Institutes of Health.

Outstanding Students

"We are proud of all of our students and celebrate in their future successes," said R.L. Miesfeld, PhD, head of the UA Department of Chemistry and Biochemistry. Approximately 700 undergraduate students and 150 graduate students are enrolled in CBC; each year, 100 or more students graduate with bachelor's degrees in chemistry or biochemistry. Of these students, about 35 percent will attend medical, dental or pharmacy schools; 40 percent will attend graduate school; 15 percent will work in industry; and 10 percent will start new career paths.



Zhiping Zheng, PhD, associate head for research
Roger Miesfeld, PhD, department head
Andrei Sanov, PhD, associate head for education

Peer Empowerment

Shannon Collins is an MD-PhD student in the Department of Chemistry and Biochemistry and was awarded the Initiative to Maximize Student Development Fellowship by the National Institutes of Health for 2013-2014. Since starting the MD-PhD Program in fall 2014, Collins has been a strong supporter for underrepresented students in the health and science fields, particularly dedicating time to support the African Americans in Life Sciences Club (AALS). He attends and assists with AALS club meetings and events, dedicating time to speak and engage with its members and recently coordinated a College of Medicine – Tucson tour and medical student panel for the undergraduate students. He, along with members of AALS, have developed a mentorship/tutoring program for underrepresented college students, which is open to individuals interested in the health and science fields. He also has helped MARC undergraduate students prepare for graduate

school interviews, conducting interviews and providing critiques to help them improve their interview skills.



Kris Hamming, UAHHS BioCommunications

Shannon Collins, MD-PhD student (right) and biochemistry undergraduate student Matthew O'Mara.

Emergency Medicine

The University of Arizona Department of Emergency Medicine's 57 clinical faculty members practice at Banner – University Medical Center Tucson and Banner – University Medical Center South emergency departments, with 120,000 combined patient visits annually.



Kris Hamming, UAHS BioCommunications

Department head **Sam Keim, MD**, (right) and second-year resident **Moses Mhayamaguru, MD**, discuss a patient scan on a portable ultrasound system. The department has been a leader in identifying and promoting the use of bedside ultrasound, both diagnostically and procedurally. Point-of-care ultrasound routinely is used by residents and faculty for patient evaluation in the emergency department.

The UA Department of Emergency Medicine strives to be interdisciplinary and highly integrated within modern health-care networks. EMS personnel, trained and directed by EM physicians, initiate life-saving resuscitations prior to reaching the hospital. Evidence-based diagnostics and interventions, once only known to intensive care units, now are initiated in the emergency departments and are dramatically improving outcomes.

The department's center of excellence, the UA Emergency Medicine Research Center in Tucson and Phoenix, brings together multidisciplinary teams of experts to achieve critical impact in areas affecting lives in Arizona. Minimally interrupted CPR for cardiac arrest, innovative therapy for traumatic brain injury, prehospital diagnosis of acute myocardial infarction and rapid "split-flow" evaluation and triage of ambulatory patients are examples of patient-care interventions and research initiatives led by the department.

In addition to electives in toxicology, emergency ultrasound, CPR teaching and training and research, the UA Department of Emergency Medicine offers UA medical students two outstanding fourth-year clinical emergency medicine rotations. The department's three residency programs, one of which

is combined with pediatrics, have 83 slots. With more than 50 applicants for every residency opening, the department attracts some of the nation's best and brightest medical student graduates.

The department continues to embrace the triad of state-of-the-art clinical care, creative and passionate teaching and innovative research and is well-positioned for the future.

Dr. Cairns, Nationally Renowned Emergency Medicine Physician, Joins Department, Leads College

In November 2014, Charles B. "Chuck" Cairns, MD, FACEP, FAHA, a recognized leader in emergency and critical care research, joined the Department of Emergency Medicine as professor. He also serves as interim dean of the UA College of Medicine – Tucson and assistant vice president for clinical research and clinical trials at the University of Arizona Health Sciences.

Department Enhances Education with New Fellowships

The UA Department of Emergency Medicine established two new fellowships – Clinical Informatics and Hospice and Palliative Medicine – and is one of just a few emergency departments in the nation to offer these fellowships. Department faculty members leading the fellowships are among a small number of emergency medicine physicians nationwide to earn board certification in these areas. These new offerings augment the existing competitive post-residency EM fellowships in critical care, emergency medical services, emergency ultrasound, medical toxicology, sports medicine and academic research.



Emergency Medicine Research Ranks 17th in NIH Funding

In 2014, the Department of Emergency Medicine and the UA Emergency Medicine Research Center ranked 17th among emergency medicine

Frank G. Walter, MD, professor of emergency medicine, professor of pharmacy practice and science at the UA College of Pharmacy, and medical toxicologist for the Arizona Poison and Drug Information Center, received the Arizona Medical Association and Arizona Department of Health Services 2014 Public Health Service Award, Arizona's highest award for public health service to the people of Arizona.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Bobrow, Bentley J	HeartRescue Flagship Program	Medtronic Foundation	\$2.50 M

departments nationwide in National Institutes of Health-funded research. Initiatives such as having clinical research nurses stationed around the clock for clinical trials enrollment, as well as expansion of NIH-funded prehospital research in Phoenix, are essential to the quality of emergency medicine research.

Improving Outcomes for Cardiac Arrest

Ben Bobrow, MD, and Daniel Spaite, MD, professors of emergency medicine and associate directors of the UA Emergency Medicine Research Center – Phoenix, led a study that showed emergency dispatchers providing life-saving CPR instructions to 9-1-1 callers prior to first responders arriving on scene dramatically increases survival from cardiac arrest, the leading cause of death. The research was presented at the American Heart Association’s Scientific Sessions in Chicago in November 2014.

Another study by Dr. Bobrow and Dr. Spaite, who holds the endowed Virginia Piper Distinguished Chair of Emergency Medicine, found that a new system that sent patients to designated cardiac-



Ben Bobrow, MD



Daniel Spaite, MD

receiving centers in Arizona dramatically increased the survival rate of victims of sudden cardiac arrest. The study, published in the *Annals of Emergency Medicine* in July 2014, showed that by implementing the latest cutting-edge guidelines for post-cardiac arrest care in hospitals, the survival rate increased by more than 60 percent during the four-year study period, 2007 through 2010. In addition, the likelihood of surviving with good neurological status more than doubled.



John C. Sakles, MD

Kris Hanning, UAHS BioCommunications



Kris Hanning, UAHS BioCommunications

UA Emergency Medicine Research Center researchers are co-directors of the National Institutes of Health-funded Excellence in Prehospital Injury Care (EPIC) Project. Via this program, they have partnered with the Arizona Department of Health Services and more than 120 emergency medical services (EMS) agencies throughout Arizona to implement the international evidence-based guidelines to improve treatment of traumatic brain injury (TBI) in the EMS system. Because of the EPIC Partnership, more than 90 percent of all Arizona TBI patients receive care from EMS providers using these state-of-the-art guidelines.

Expert on the ‘Difficult Airway’ Elected to International Airway Faculty

John C. Sakles, MD, professor of emergency medicine, was elected to the Society for Airway Management (SAM) International Airway Faculty. Dr. Sakles’ career focuses on the clinical, educational and research aspects of emergency airway management, with an emphasis on the “difficult airway.” A world-renowned expert, his papers have become some of the most cited works in the field.

Family and Community Medicine

The University of Arizona Department of Family and Community Medicine (FCM) is known for outstanding pre-doctoral and post-doctoral education, ground-breaking research and innovative community outreach programs designed to improve the health of individuals, families and communities in our region and beyond.

In 2014, FCM ranked 19th nationally among family medicine programs receiving funding from the National Institutes of Health. FCM typically ranks among the top 20. For the fourth consecutive year, the American Academy of Family Physicians has ranked FCM's medical student-oriented Family Medicine Interest Group among the top 10. FCM offers two family medicine residencies, one of which focuses on family practice in rural and underserved areas. The department also offers two fellowship programs, in sports medicine and integrative medicine.



UAFHS BioCommunications

Judith Gordon, PhD

Developing New Ways to Help Smokers Quit

FCM researchers Judith Gordon, PhD, and Myra Muramoto, MD, MPH, (also department chair) are recognized leaders in smoking-cessation research. With grants from the National Cancer Institute and other major funders, Dr. Muramoto has developed the “Helpers” program that teaches “concerned others” how to help their loved ones stop smoking. The training has been offered to friends and family members, and to complementary and alternative medicine providers, including acupuncturists, chiropractors and massage therapists – the providers who smokers often turn to to relieve their pain, which is only exacerbated by nicotine.

Dr. Gordon's current research involves developing and testing a smart phone-guided imagery app to help women quit smoking without gaining weight. Previous studies have shown women are more likely than men to gain weight when they stop smoking – 5 to 10 pounds, on average.

The app includes guided-imagery messages designed to boost positive body image and persuade a woman that she can and will be stronger, healthier and happier by eating well, being physically active and not smoking.

Health Disparities Research:

Health Risks Among Native American Youth

Francine Gachupin, PhD, assistant director of FCM's Native American Research and Training Center, is conducting the first comprehensive assessment of health-risk behaviors in Native American youth in Arizona. Her research, funded by the American Cancer Society, is based on youth risk behavior surveys conducted every two years by the U.S. Centers for Disease Control and Prevention, in collaboration with the Arizona Department of Health Services and the Arizona Department of Education.



Francine Gachupin, PhD

Resident Dr. Esther Johnston, Nationally Honored For Global Health Work and Commitment to Underserved

As a first-year medical student at Virginia Commonwealth University, Esther Johnston traveled to Ecuador to help develop the country's trauma systems. Over the next five years, she completed her MD and earned an MPH from Johns Hopkins, while continuing her global health work. With a CDC student fellowship she went to Nairobi in 2011 to work on a measles outbreak in Kibera Slum, home to 1 million people. She returned to Kibera Slum twice during her UA



family medicine residency to develop and evaluate a school nutrition program.

She completed her residency in 2014, honored by the American Academy of Family Physicians as one of the Top 12 Family Medicine Residents in the nation. The academy's Arizona chapter named her the top family medicine resident in the state. After residency, she spent a year

in Tanzania with the Global Health Service Partnership (GHSP), a non-profit run by the Peace Corps and SEED Global Health.



Kris Hamming, UAHS BioCommunications

Myra Muramoto, MD, MPH, became interim head of Family and Community Medicine on Oct. 1, 2014, and was made permanent head of the department March 30, 2015. A Wildcat for Life, Dr. Muramoto earned her bachelor's degree, MD, and master's degree in public health at the UA, where she also completed a fellowship with the UA Center for Integrative Medicine.

"We need children and youth to be healthy," said Gachupin, a member of New Mexico's Jemez Pueblo. "If they develop diabetes early in life, that threatens the quality of life they will have as adults."

Collaboratory Seeks to Reverse Obesity Epidemic

The Collaboratory for Metabolic Disease Prevention and Treatment is a joint research initiative by the College of Medicine – Tucson Departments of Family and Community Medicine and Medicine, in collaboration with the College of Agriculture and Life Sciences, and the Mel and Enid Zuckerman College of Public Health. The Collaboratory will support translational research in several areas, including obesity, diabetes, physical activity, nutrition and tobacco cessation. Collaboratory researchers expect to win designation as a National Obesity Research Center.

Integrating Family Medicine With Behavioral Health Care

Family and Community Medicine and the Department of Psychiatry are set to provide a new model of integrated health care for individuals living with serious mental illness. In December 2014, the Arizona Department of Health Services awarded the Regional Behavioral Health Authority (RBHA) contract for Southern Arizona to Cenpatico of Arizona, which partnered with FCM and Psychiatry to provide an integrated model of behavioral and primary medical care. The RBHA contract took effect Oct. 1, 2015.

Helping Patients Obtain the Benefits to Which They're Entitled

The Tucson Family Advocacy Program (TFAP) is a medical-legal partnership that trains health-care and legal providers to identify and collaboratively address social and legal needs – including access to health care and disability benefits – of patients with limited income. Started in 2005 by attorney Anne Ryan, TFAP is a member of the National Center for Medical-Legal Partnership. From July 1, 2013, through Dec. 31, 2014, TFAP handled 332 cases. Funding partners include the Arizona Foundation for Legal Services and Education, and Southern Arizona Legal Aid. In 2014, the Arizona Office of Refugee Resettlement and International Rescue Committee awarded TFAP \$40,000 to increase capacity to help refugees.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Bassford, Tamsen L	Health Promotion & Wellness Center	CMMS/Community Partnership of Southern Arizona	\$5.86 M
Moreno, Francisco	Centers of Excellence	HRSA	\$2.79 M
Kutob, Randa M	UA RISE - Health & Wellness Center/Camp Wellness	Cenpatico of Arizona	\$1.83 M

**WITH THANKS:
Honoring Tammie Bassford, MD**

When Tammie Bassford, MD, was named head of the Department of Family and Community Medicine in 2002, she was the first woman to chair a department in the College of Medicine. Since then, her contributions to the department – and the College – have been extraordinary. Her passion for research, and the quality of research that FCM has produced under her leadership, is uncommon. Dr. Bassford was the Arizona director of the Women's Health Initiative, a nationwide NIH study of heart disease, breast cancer and osteoporosis in women. She also has served as principal investigator of FCM's Sonoran University Center for Excellence in Developmental Disabilities, funded since 2006 by the U.S. Administration on Developmental Disabilities.

Dr. Bassford stepped down from her role as department head at the end of September 2014, and now is devoting more of her time to patient care and working more closely with the Sonoran UCEDD, a program for which she has great passion. We thank Dr. Bassford for her leadership, for her ongoing contributions to our students, our residents and our College.



Tammie Bassford, MD

Immunobiology

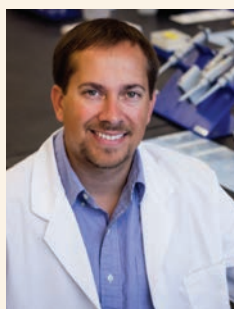
The University of Arizona Department of Immunobiology stands at the forefront of biomedical research. Vast areas of modern medicine cannot progress without adequate understanding of the microbial and immunological aspects of diseases and the discovery of new modalities to treat them. In addition to autoimmune disease, cancer, infectious diseases, allergies, and organ, tissue and stem cell transplantation, UA research on human commensal flora and its impact upon health and disease addresses another exciting front in the field.

The department is emerging as a nationally and internationally recognized research and educational center that strives to blend the excitement of fundamental immunological research with the training of medical students, residents and fellows.

Seeking to Prevent Post-Stroke Dementia

Kristian Doyle, PhD, assistant professor of immunobiology, came to the department from Stanford University in September 2013.

A native of England, he received his PhD at Oregon Health & Science University in 2007. His most recent achievement is the development of a new animal model of stroke. He also has shown that the damage to neuronal brain cells after stroke is mediated by the immune system. His goal is to develop new biomedical imaging technology, to better detect post-stroke auto-immune responses, and to develop new immune-modifying drugs that can be tailored to meet the needs of each individual patient.



Jason Ryder

Kristian Doyle, PhD



Jason Ryder

Janko Nikolich-Zugich, MD, PhD

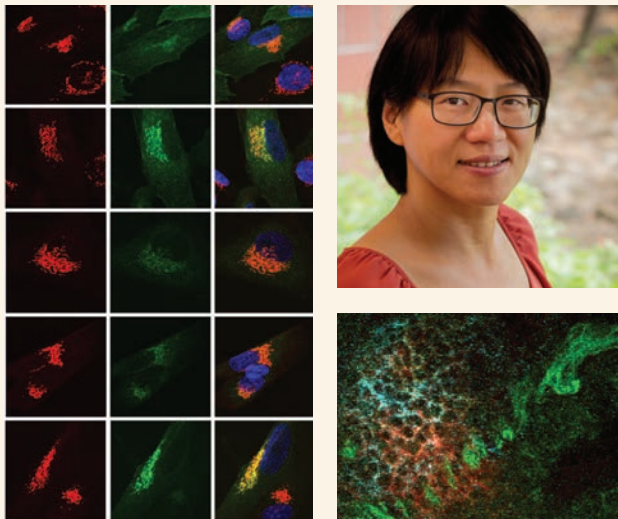
\$2.3 million NIH Grant for Study of Aging and Immunity

Janko Nikolich-Zugich, MD, PhD, professor and department head, Department of Immunobiology, co-director, UA Center on Aging, and Elizabeth Bowman Professor in Medical Research, received a five-year NIH grant to study why our immune systems decline as we age. He also is looking at cytomegalovirus (CMV), which

can remain harmless indefinitely or cause enough disturbance to the human immune system that it's worn out by the time an individual reaches older adulthood. Dr. Nikolich theorizes that the wearing down of the immune system as people age explains why vaccines are less effective in older adults. His research is driven largely by the Baby Boom generation; by 2020, the number of Americans 65 and older is expected to top 53 million.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Nikolich-Zugich, Janko	Pacific North West Regional Center of Excellence (PNWRCE)	NIAID/Oregon Health and Science University	\$1.78 M
Frelinger, Jeffrey A	Immune Evasion by <i>F. tularensis</i>	NIAID	\$1.63 M
So, Magdalene Yh	Type IV Pilus as a Switch that Determines Consequences of Neisseria Colonization	NIAID	\$1.50 M
Kuhns, Michael S	Probing the Mechanistic Basis for T Cell Fate Decisions (Ro1)	NIAID	\$1.49 M
Harris, David T	Role of Extrinsic and Intrinsic Factors Responsible for Aging of Immune System	NIA	\$1.14 M



Hsin-Jung Joyce Wu

Commensal Bacteria May Be Key to More Effective Therapy for Rheumatoid Arthritis

Hsin-Jung Joyce Wu, PhD, assistant professor of immunobiology, is continuing research on her groundbreaking discovery that a specific kind of commensal bacteria living in the gut can interact with the immune system to trigger the development of rheumatoid arthritis (RA). Dr. Wu's goal is to identify the bacterial molecule(s) that triggers the autoimmune response up or down, and to modulate the molecule to dampen the autoimmune response. She hopes this will lead to an effective new therapy for RA. "It would be a very natural kind of therapy," she said. "It's not creating something that's very strange to the immune system. It would be something we already have in our bodies."

Research Team Identifies Genes that Control CMV's Passive and Aggressive Behavior

While CMV infects most individuals early in life, most never know they have it. But while the virus can remain latent indefinitely, it also can wreak havoc, causing everything from devastating birth defects to heart disease and frailty in older adults. Felicia Goodrum, PhD, associate professor of immunobiology, and her research team have published their discovery of the genes responsible for CMV's passive or destructive

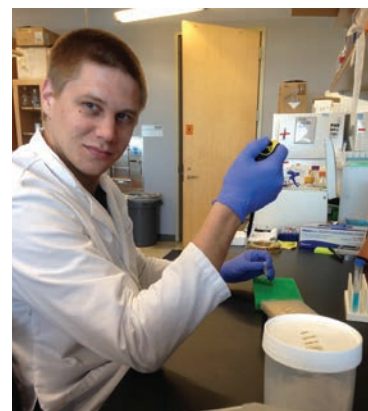


Felicia Goodrum, PhD

behavior. Said Dr. Goodrum: "I would like to get to where we can control and prevent CMV's reactivation from latency via therapeutics that protect transplant patients, babies and older individuals."

Graduate Program in Immunobiology: Training the Future Leaders

The Graduate Program in Immunobiology awards PhDs in immunobiology to the new generation of scientists trained to find solutions to the most perplexing and dangerous microbe-host relationships, which sicken and kill hundreds of thousands of people across the globe each year. Trainees typically continue their scientific journey as postdoctoral fellows, going to some of the most prestigious laboratories in the country. In the past 18 months, graduate



Unlocking papilloma virus mysteries in the fight against cancer – In the laboratory of Sam Campos, PhD, **Matthew Bronnimann** studies how papilloma virus, one of the cancer-causing viruses, enters the cell and how this process can be blocked by vaccines.

Emily Goldberg, who worked on metabolic and nutritional intervention to improve immune fitness, went to Yale for her post-doctoral research; Kristin Renkema, who studied how older adults maintain their immune cells and how that process can be improved, went to the University

of Minnesota; and Jason Pugh, who investigated how ionizing radiation impacts aging of the immune system, went to Stanford.



Understanding immune defense and immune maintenance – Under the supervision of Michael Kuhns, PhD, **Neha Deshpande** is tracking virus-specific T cells to learn how they are maintained over long periods of time, and what makes them effective defenders of the organism against infection.

Medical Imaging

The University of Arizona Department of Medical Imaging is a national leader in innovation, cost-effective diagnostic and minimally invasive therapeutic technologies, applications and research.

The department provides the very latest radiology services throughout Arizona, serves as a destination site for groundbreaking medical imaging research and educates the next generation of leaders in imaging science and its applications.

The department's research program includes the Center for Gamma Ray Imaging, three MRI research units, the Southwest Animal Imaging Resource, the Advanced Research Institute for Biomedical Imaging, the Ultrasound Research Laboratory, the Medical Image Perception Laboratory and the Biomedical Imaging Laboratory.

"Our guiding philosophy is that quality in medical imaging largely is defined by making the correct diagnosis, leading to the correct therapy with the fewest number of procedures, with the lowest risk, the greatest patient comfort and the best cost-outcome ratio," said Diego Martin, MD, PhD, department chair since 2011 and an internationally recognized leader in magnetic resonance imaging (MRI).

"Imaging has revolutionized medicine; it represents a new perspective on 'internal medicine and virtual pathology' – we can look at vital biological processes such as a beating heart, measure tissue levels of disease biomarkers in the liver, view functional changes in the brain and make diagnostic and prognostic decisions that can lead to improved outcomes at lower overall cost of care to our patients and the community. We seek to reduce the number of tests, such as biopsies, that now can be done 'virtually' with imaging technologies. The impact on our patients is measurable – the liver biopsy rates at our two hospitals has plummeted in the past two years, for example."

The department's clinical and research faculty members are working collaboratively to develop bench-to-bedside strategic initiatives to drive down costs through improved outcomes using advanced technology. In addition, the department is making MRI and other imaging technologies more cost-effective, with adaptive and

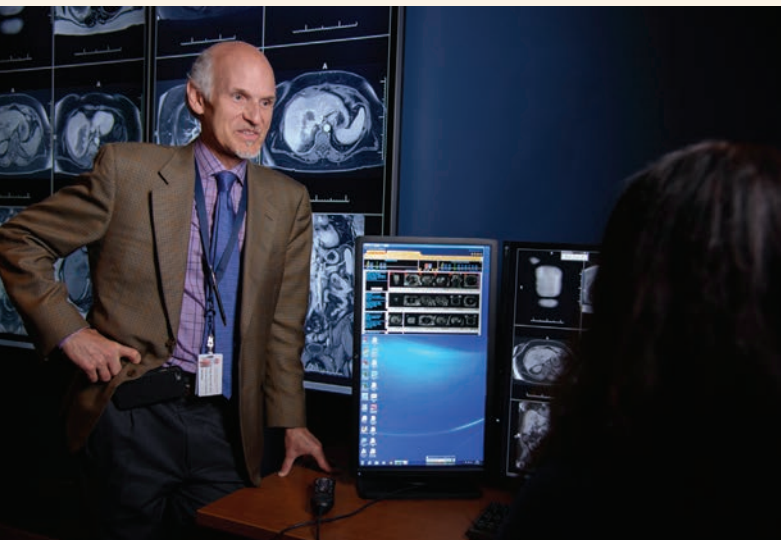


Radiologists and imaging scientists from around the world come to the department's state-of-the-art training center to learn about key advancements in image processing and presentation.

automated technologies, conducting more exams in less time with better diagnostic results. A strong emphasis also has been placed on quantitative imaging that can lead to more precise diagnoses.

State-of-the Art Equipment Enhances Training, Clinical Care and Research

In 2014, to further enhance its clinical practice and research and innovation, the department continued to acquire and develop bench-to-bedside technologies, with a focus on applications related to brain and spine, oncology, obesity and metabolic disorders, and orthopaedics and rheumatology. A concurrent strategy focuses on measuring outcomes and the value of technology in health-care applications and delivery. Examples include use of improved motion-correction and motion-resistant MRI techniques, development of quantitative disease biomarkers and other new technologies across modalities that have been applied to an array of clinical applications such as the 6-minute MRI stroke protocol, detection of early quantifiable changes of mild-to-moderate traumatic brain injury, a 10-minute protocol for accurate diagnosis of acute abdominal pain, an array of CT and nuclear technologies for rapid assessment of acute chest pain to reduce invasive angiograms and emergency room length-of-stay, among others.



Diego Martin, MD, PhD

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Barrett, Harrison H	Center for Gamma-Ray Imaging	NIBIB	\$2.57 M
Pagel, Mark D	Detection of In Vivo Enzyme Activities with CEST MRI	NCI	\$2.01 M
Barrett, Harrison H	SPECT Imaging and Parallel Computing	NIBIB	\$1.93 M
Pagel, Mark D	Measuring Extracellular pH in Pre-clinical Tumor Models with CEST MRI	NCI	\$1.60 M

Learning Center Will Provide a Platform for Technology Dissemination, Training, Reduction in Variability, Improved Outcomes and Reduced Cost of Care

Adjacent to its research scanners, the department is constructing a Learning Center (LC), comprised of an array of computer workstations that will house simulation software and educational content. The LC will serve as a training center for technologists and radiologists, as well as undergraduate and graduate students.

Breast Cancer Imaging Offers Latest Advances

The department’s breast cancer imaging offers the most advanced and comprehensive medical services available in the Southwest. In 2014, the department converted its mammography systems exclusively to state-of-the-art 3D imaging technology (digital breast tomosynthesis) that shows the fine details of the breast tissue more clearly without any added radiation. This technology reduces the number of times a woman is called back for additional imaging, reduces the additional application of other tests, and reduces patient anxiety and stress.



The department has identical advanced MRIs in the clinic and in the research unit where, under a master research agreement with Siemens, new advances in imaging protocols are developed and translated directly to use in patient care.

Partnering with Industry

The department developed and expanded several vital industry research agreements leading to industry-supported research efforts with such companies as Siemens, Philips, GE, Eizo and Canon, strengthening its research foundation by expanding its funding support beyond the traditional federal sources. These partnerships have been vital for introducing and accessing pre-commercial advanced clinical imaging technologies in MRI, CT, ultrasound, interventional radiography, multi-modality integration and imaging informatics systems.



Dorothy Gilbertson-Dahdal, MD

Residents, Fellowships

Under the leadership of Dorothy Gilbertson-Dahdal, MD, program director of the Radiology Residency Training Program, and James Costello, MD, PhD, associate director of the residency

program, the department transitioned to a focused approach to recruit residents interested in leadership positions and research careers by giving special attention to candidates with MD-PhDs. These efforts have increased the size of the residency program and the department competes successfully with California and Midwest universities, continuing to fully “match” during Match Day, with 600 candidates vying for nine positions – at a time when residencies at some other major institutions failed to fill all of their radiology positions. The department’s four-year

Radiology Residency Training Program is accredited for 36 total residents (nine per year of residency), who practice at Banner – University Medical Center Tucson, the Southern Arizona VA Health Care System and Banner – UMC Tucson Medical Imaging.

The department also boasts outstanding fellowships in body imaging, breast imaging, neuroradiology, nuclear medicine and vascular/ interventional radiology. It also offers undergraduate, graduate and post-doctoral opportunities in imaging research.



James Costello, MD, PhD

Medicine

The University of Arizona Department of Medicine is an innovative academic health-care leader focused on developing, advancing and delivering cutting-edge medical research, high-quality education and unsurpassed excellence in patient care. Medicine is the largest department in the College, with 13 divisions. The department trains more than 220 internal medicine residents, as well as fellows, in all its medicine sub-specialties.



Monica Kraft, MD

**Dr. Monica Kraft
Named Chair of the UA
Department of Medicine**

In December 2014, Monica Kraft, MD, an internationally renowned physician-scientist who specializes in translational asthma research, became chair of the Department of Medicine and the Robert and Irene Flinn Professor of Medicine at the UA

College of Medicine – Tucson. Her research interests include the mechanisms of innate immune dysfunction, inflammation and airway remodeling in asthma, as well as evaluation of new therapies through clinical trials. Dr. Kraft also serves as the principal investigator for SP-A as an Innate Immune Modulator and co-principal investigator for AZ-Duke AsthmaNet Clinical Center. With her strong track record in program development, mentorship and administration, she works to advance the department's educational presence, research opportunities and the training of physician-scientists. She is past president of the American Thoracic Society (2012-2013).

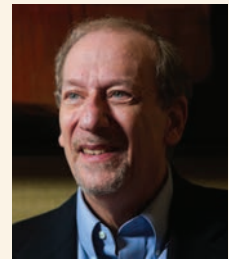
Strategic Recruitments

▶ Stephen Black, PhD, is director of the new Center for Lung Vascular Pathobiology and a professor in the Department of Medicine. Dr. Black's research focuses on the cellular aspects of lung injury and pulmonary hypertension. His work is funded by the National Institutes of Health. The center will investigate pathogenic mechanisms underlying the development of human lung disease and develop novel therapeutic interventions based on basic, translational and clinical investigations, provide a research environment that will enhance multi- and interdisciplinary research and scientific collaborations among basic and clinician investigators, and train and cultivate the next generation of basic researchers and physician-scientists.



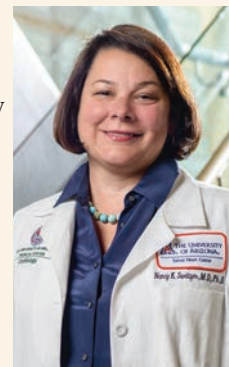
Stephen Black, PhD

- ▶ Pradeep V. Kadambi, MD, MBA, FASN, is associate professor in the Department of Medicine and chief clinical affairs officer at Banner – University Medical Center Tucson.
- ▶ Andrew S. Kraft, MD, a nationally recognized prostate cancer physician-scientist and cancer center administrator, was appointed director and the Sydney E. Salmon Endowed Chair of the UA Cancer Center, and associate vice president for oncology programs at the University of Arizona Health Sciences. Dr. Kraft also serves as senior associate dean for translational research in the UA College of Medicine – Tucson. In 1990, the UA Cancer Center was one of the first in the Southwest designated as a comprehensive cancer center by the National Cancer Institute.



Andrew S. Kraft, MD

- ▶ C. Kent Kwok, MD, an internationally recognized expert in osteoarthritis, rheumatoid arthritis and other joint diseases, is director of the UA Arthritis Center; professor of medicine and medical imaging at the UA College of Medicine – Tucson; the Charles A.L. and Suzanne M. Stephens Chair of Rheumatology; and chief of the Division of Rheumatology, UA Department of Medicine.
- ▶ Nancy K. Sweitzer, MD, PhD, is director of the UA Sarver Heart Center, Allan C. Hudson and Helen Lovaas Endowed Chair in Cardiovascular Medicine, professor of medicine and chief of the Division of Cardiology. A board-certified advanced heart failure and transplant cardiologist and clinical researcher specializing in mechanical circulatory support and heart transplant patient care, Dr. Sweitzer is part of the team that renewed the focus on excellence of Banner – UMC Tucson's heart transplant and mechanical circulatory support programs. Nationally recognized for her leadership and experience in clinical trials, Dr. Sweitzer established a cardiology clinical research core focused on increasing the number of clinical trials at the UA Sarver Heart Center.



Nancy K. Sweitzer, MD, PhD

- ▶ Jason X.-J. Yuan, MD, PhD, an internationally recognized leader in pulmonary vascular disease research, is associate vice president for translational health sciences at UAHS; professor of medicine with a joint appointment as professor of physiology at the UA College of Medicine – Tucson; and chief of the Division of Translational and Regenerative Medicine.

Reducing Skin Biopsies, Advancing Skin Cancer Early Detection

Arizona has one of the highest incidences of skin cancer in the United States. According to the U.S. Agency for Healthcare Research and Quality, nationally about 4.9 million adults are

treated for skin cancer each year. Skin biopsies typically are done to study suspicious cells. While most biopsies turn out to be noncancerous, patients must undergo an invasive and scarring procedure to get results. Clara Curiel, MD, associate professor of medicine in the Division of Dermatology, is leading a research team studying the

latest optical science technology, particularly in vivo reflectance confocal microscopy, to advance the detection and treatment of skin cancers while reducing the number of unnecessary, painful biopsies. Using advanced three-laser microscopic technology, Dr. Curiel analyzes skin cells instantly, without cutting or scarring the skin unnecessarily, and she is studying the effectiveness in diagnosing and monitoring actinic keratoses treatment. Dr. Curiel's research is funded by the National Cancer Institute "Skin Cancer Chemoprevention" Program Project Grant, Arizona's Technology and Research Initiative Fund and the Diamond Foundation.

Health Disparities: Supporting Diabetes Prevention and Self-Management

The Division of Endocrinology, Diabetes and Hypertension continues to grow and expand its partnerships through its Diabetes Prevention and Education Center at Banner – University Medical Center South. The Diabetes Program, directed by Merri Pendergrass, MD, PhD, provides free self-management educational sessions in Spanish and English to prevent and manage diabetes for patients and members of the community. Programs include cooking demonstrations, classes about healthful food choices, exercise and medications.

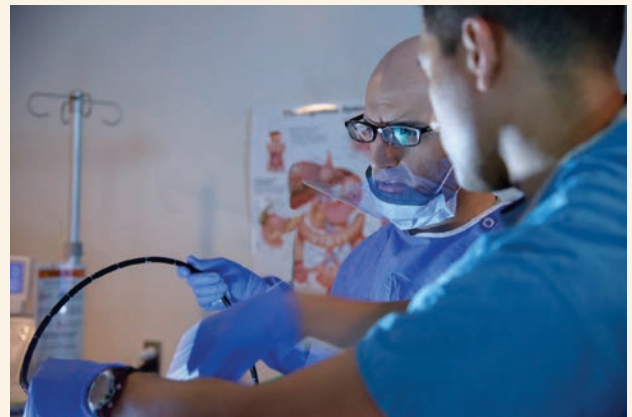
Turning Up Decibels on Baby Boomer Silent Killer

The Baby Boomer cultural revolution created a silent killer – hepatitis C, a virus that often carries no symptoms until serious health problems arise, including liver damage, cirrhosis, liver cancer, liver transplantation and even death. The U.S. Centers for Disease Control and Prevention recommend hepatitis C screening for people born between 1945-1965. Thomas D. Boyer, MD, the



Laurie Judge, RN, Jo McClain, RN, Thomas D. Boyer, MD, and Archita Desai, MD

John Lee Professor of Medicine, director of the UA Liver Research Institute and a nationally recognized liver disease researcher, established the first free hepatitis C walk-in screening clinic in Arizona. The new hepatitis C treatment is oral-based, versus injection, and the treatment time is shorter and more effective with minimal side effects. Since the clinic was established in July 2014, more than 300 people have been screened and three cases have been detected and referred for treatment.



Sasha Taleban, MD

Optimizing Care for Inflammatory Bowel Disease Patients

Sasha Taleban, MD, assistant professor of medicine and a fellowship-trained inflammatory bowel disease (IBD) gastroenterologist, joined the Department of Medicine in 2013 and established a multi-disciplinary IBD Program to improve care of patients with Crohn's disease (CD) and ulcerative colitis (UC). IBD, a systemic chronic inflammatory process, affects 1.5 million people in the United States. Inadequately controlled CD and UC cause significant morbidity and can have substantial social, psychological and economic impact on patients. The complexity of managing these disease, especially in light of emerging diagnostic tests and therapies, requires multidisciplinary teams. The UA IBD team meets routinely for case conferences and conducts a weekly IBD clinic as part of the fellowship education program. The IBD program also is a study site for multiple drug trials.

Medicine

Teaching Doctors and Future Doctors to Care for Older Adults

The health-care needs of Arizona's aging population are complex and considerable. Training physicians to provide high-quality care for older adults in an understandable, collaborative and compassionate manner could go a long way toward improving care and reigning in health-care costs. This is a passion of Mindy Fain, MD, co-director of the UA Center on Aging, division chief for geriatrics, general internal medicine and palliative medicine. She also holds the Anne and Alden Hart Endowed Chair in Medicine. A nationally recognized geriatrician, Dr. Fain leads numerous programs that focus on training physicians and other health-care professionals who work with older adults. The Donald W. Reynolds Foundation supports the UA's Reynolds Program in Applied Geriatrics



Mindy Fain, MD

and the Reynolds Scholars. These outstanding physicians, from all medical and surgical specialties, are selected to implement and extend new, high-value geriatric programs. The Arizona Geriatric Education Center, co-directed by Jane Mohler, PhD, MSN, MPH, provides critically important interprofessional geriatric education and training throughout the large and highly rural state of Arizona. Here, access to health care is challenging, as a majority of areas are designated Primary Care Health Professional Shortage Areas and Medically Underserved Areas. Older, frail adults are particularly vulnerable. The overarching goal is to help seniors age independently and safely at home, and avoid unnecessary hospitalizations that are costly in terms of dollars as well as patients' long-term health and quality of life.

Securing Success of Minority Students through Recruitment, Retention and Collaboration

The Partnership for Native American Cancer Prevention – a collaboration between the UA Cancer Center and Northern Arizona University – was awarded \$13 million from the National Cancer Institute to continue bringing prevention and biomedical research training to Native American communities in Arizona. NACP first was funded in 2002 and focuses on the Hopi Tribe, Tohono O'odham Nation and Navajo Nation. One of the partnership goals is to develop programs that facilitate the successful transition of Native American undergraduate students into college programs that enhance retention and graduation in biomedical science. In the past five years, 275 Native American students from the UA and NAU have participated in training activities. NACP participants have received their bachelor's degrees at a rate of 63 percent, compared to a national rate of 38 percent for Native American graduates.

Integrative Medicine: Leading the Transformation of Health Care

The Arizona Center for Integrative Medicine established the Institute on Place and Wellbeing. AzCIM created IPW in partnership with the UA College of Architecture, Planning, and Landscape Architecture to study the effects of built and natural environments on human health, with the potential to impact productivity, wellness and policy.

The Distance-Learning Fellowship in Integrative Medicine teaches a new way of caring for patients with emphases on the individual, prevention and wellness – rather than disease and treatment. The program is open to MDs, DOs, PharmDs, nurse practitioners, physician assistants and certified nurse midwives.

Increasing Underrepresented Researchers in Biomedical Sciences

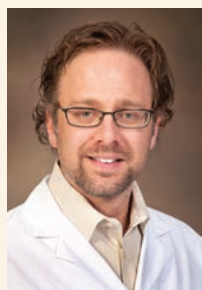
The \$1.25 million NIH grant, "Arizona Pride-25 Advanced Health Disparities Training Program in Heart, Lung, Blood and Sleep Conditions," will enhance diversity and capacity for health disparities research in clinical and translational health sciences by training and mentoring early-career academics who come from under-represented minority backgrounds, including people living with disabilities. Joe G.N. "Skip" Garcia, MD, UA senior vice president for health sciences and internationally recognized for his genetic-based research on lung disease and development of novel therapies for critically ill



Kris Hamming, UAHS BioCommunications

Francisco A. Moreno, MD, and Joe G.N. "Skip" Garcia, MD

patients with acute inflammatory lung disease, is the program's director and principal investigator. Francisco A. Moreno, MD, assistant vice president for diversity and inclusion at UAHS, will serve as co-director and co-principal investigator.



Kenneth S. Knox, MD

HIV-Related Lung Diseases Study to Help Understand Pulmonary Immunity and Vaccine Responses

Kenneth S. Knox, MD, and his research team aim to understand the causes of HIV-associated chronic obstructive pulmonary disease, pulmonary hypertension and immune reconstitution inflammatory syndrome. The study, "Genomic Analysis of Immunity and Chronic Lung Inflammation in HIV Infection," is funded

by a grant from the National Heart, Lung, and Blood Institute. Dr. Knox is associate professor of medicine and immunobiology, chief of the Division of Pulmonary, Allergy, Critical Care and Sleep Medicine, the Murray and Clara Walker Memorial Endowed Chair in Emphysema, and is the PI on this new study.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Kraft, Andrew	Arizona Cancer Center – Cancer Center Support Grant	NCI	\$26.92 M
Alberts, David S	The Partnership for Native American Cancer Prevention (2 of 2)	NCI	\$6.80 M
Alberts, David S	Chemoprevention of Skin Cancer Program Project	NCI	\$6.79 M
Chow, Hsiao-Hui	Cancer Prevention Agent Development Program: Early Phase Clinical Trials	NCI	\$4.30 M
Kwoh, Chian K	Risk of Incident Knee OA & Clinical Outcomes Based on Imaging Biomarkers	NIAMSD	\$2.93 M
Alberts, David S	Cancer Prevention and Control Translational Research	NCI	\$2.74 M
Parthasarathy, Sairam	Peer-driven Intervention as an Alternate Model of Care Delivery and Coordination for Sleep Apnea	PCORI	\$2.08 M
Fain, Mindy J	Geriatric Education Centers	HRSA	\$2.03 M
Guerra, Stefano	Serum Biomarkers of COPD: A Population-Based Prospective Study	NHLBI	\$1.87 M
Lebensohn, Patricia	National Coordinating Center for Integrative Medicine	HRSA	\$1.70 M
Alberts, David S	GOG Chair Support (Gynecologic Oncology Group)	NCI/Gynecologic Oncology Group	\$1.60 M
Futscher, Bernard W	Epigenetic Features of Pregnancy-Associated Breast Cancer in Hispanic Women	NCI	\$1.64 M
Meuillet, Emmanuelle J	Inhibition of Novel Molecular Targets of Prostaglandin Formation for Antitumor Activity	NCI	\$1.62 M
Alberts, David S	GOG Chair Support (Gynecologic Oncology Group)	NCI/Gynecologic Oncology Group	\$1.60 M
Garcia, Joe GN	nmMLCK Contributes to Genetic and Environmental Asthma Susceptibility	NHLBI	\$1.57 M
Galgiani, John N	Pacific-Southwest Regional Centers for Excellence for Biodefense and Emerging Infectious Disease Research	NIAID/University of California, Irvine	\$1.53 M
Tardiff, Jil C	A Molecular Study Linking cTnT Dynamics to Genetic Cardiomyopathy	NHLBI	\$1.46 M
Sternberg, Esther M	Indoor Environment and Stress Study - GSA 1800F Street	General Services Administration	\$1.41 M
Alberts, David S	The Partnership for Native American Cancer Prevention	NCI	\$1.37 M
Chow, Hsiao-Hui	Metformin for Reduction of Obesity Associated Breast Cancer Risk	NCI	\$1.34 M
Garcia, Joe GN	Arizona Pride-25: Advanced Health Disparities Training Program in Heart, Lung, Blood, and Sleep Conditions	NHLBI	\$1.33 M
Klotz, Stephen A	HIV Care and Services	HRSA/Arizona Department of Health Services	\$1.11 M
Klotz, Stephen A	HIV Care and Services (Ryan White Part B)	HRSA/Arizona Department of Health Services	\$1.11 M
Tardiff, Jil C	Integrative Approach to Divergent Remodeling in Thin Filament Cardiomyopathies	NHLBI	\$1.10 M
Klotz, Stephen A	Ryan White Part C Outpatient EIS Program	HRSA	\$1.05 M

Neurology

The University of Arizona Department of Neurology is known for interdisciplinary collaborations that lead to better understanding of neurological disease and pursuing novel treatments for a number of morbidities, including Parkinson's disease, Alzheimer's disease, epilepsy, traumatic brain injury and stroke. Its educational mission includes clinical fellowships in behavioral neurology, cerebrovascular disease, epilepsy, headache, movement disorders, neuromuscular disease and clinical neurophysiology, as well as lab-based research fellowships.



Stem Cells and Parkinson's Disease

Lalitha Madhavan MD, PhD, assistant professor of neurology, directs a research program focused on stem cells, with the goal to develop rational therapeutics for Parkinson's disease (PD). In addition to studying the potential of stem cells in preclinical models of PD and in the context of aging, a major effort in the Madhavan lab has been to establish induced pluripotent stem cell (iPSC) lines from unaffected individuals, as well as those affected with PD. "This technology will make in-roads to understanding PD etiology, while creating a powerful future platform to test promising drugs and generate specific cell types to be implanted into patients, to develop personalized medicine solutions to Parkinson's disease,"



Scott Sherman, MD

Kris Hamming, UAHS BioCommunications



Lalitha Madhavan, MD

Kris Hamming, UAHS BioCommunications

Dr. Madhavan said. She and Scott Sherman, MD, associate professor of neurology and physiology, collaborated on the initial collection of patient samples for establishing the iPSC lines, and are working toward translating these efforts to the clinic.

'Toxo' Parasite May Lead to Better Treatments for Alzheimer's

Anita Koshy, MD, assistant professor of neurology and immunobiology, is researching the protective neuro-inflammatory effects of chronic toxoplasma gondii infection. Her research grants include a National Institutes of Health Career Development Award, an Arizona Alzheimer's Disease Core Center Pilot Grant and funding from the Arizona Biomedical Research Commission. As Dr. Koshy notes, "Toxo" can persist without having deleterious effects on the



Anita Koshy, MD

brain, but it also can dampen the brain's immune response.

"I have no doubt that understanding how Toxo and the brain interact will lead to a new understanding about the brain itself, and how it responds to immune challenges," Dr. Koshy said. "To understand that has potentially big implications, and I'm determined to figure this out."

Diversity in Epilepsy

David Labiner, MD, head of the Department of Neurology and director of the Arizona Comprehensive Epilepsy Program, and neurology Research Professor Jenny Chong, PhD, have received \$1.25 million from the CDC to develop and evaluate an electronic self-management tool for Spanish-speaking individuals with epilepsy. MINDSET – for Management Information and Decision Support Epilepsy Tool – is expected to make a significant contribution to the CDC's Managing Epilepsy Well (MEW) initiative, while addressing the Healthy People 2020 Health Care/Health Information Technology objectives. The CDC previously awarded Drs. Labiner and Chong \$1.6 million to study epilepsy prevalence in Southwest border communities. In August 2013 they reported their unexpected finding that border Hispanics were half as likely to develop epilepsy as non-Hispanic whites.

Stroke Research: Predicting Risk, Improving Outcomes

Chelsea Kidwell, MD, a 1992 graduate of the UA College of Medicine, joined the Department of Neurology in August 2013 as professor of neurology and medical imaging, vice chair for research in neurology, co-medical director of the Banner – University Medical Center Tucson's Primary Stroke Center and as a member of the UA BIO5 Institute and UA Sarver Heart Center. She heads a renowned stroke research team that includes Bruce Coull, MD, professor of neurology and medicine, and Kendra Drake, MD, associate professor of neurology and pharmacy practice and co-medical director of the Stroke Center, as well as colleagues from other UA departments. The team is pursuing several areas of research.

Chelsea Kidwell, MD
Bruce Coull, MD
Kendra Drake, MD



David Labiner, MD, and Jenny Chong, PhD

- ▶ An NIH-funded collaboration with Georgetown University seeks to identify barriers to stroke prevention and care in underserved African Americans and Hispanics. Participants are given tablet computers to see if that increases their medication compliance and social support.
- ▶ Dr. Kidwell leads the MRI imaging core for a multicenter NIH-funded study of racial and ethnic genetic variations in intracerebral hemorrhage. The core employs multimodal imaging techniques to evaluate the impact of microbleeds, white matter disease and other imaging findings on outcomes.
- ▶ Dr. Kidwell also is a co-investigator on an NIH grant to the UA Department of Speech, Language and Hearing Sciences, to better understand the process of language recovery in post-acute stroke patients.
- ▶ The team also is involved in multiple multi-center trials, funded by the NIH or private industry, to test new therapies for acute stroke and secondary stroke prevention.



Obstetrics and Gynecology

The University of Arizona Department of Obstetrics and Gynecology provides comprehensive clinical care for women, while conducting state-of-the-art research and outreach to local, rural and international communities. In addition, its faculty members deliver outstanding educational programs through five specialty divisions.



Setsuko K. Chambers, MD, (center) and research team

Established in 1971, the department's residency program is a fully accredited four-year program that offers training in obstetrics and gynecology, reproductive endocrinology, gynecologic oncology, pelvic reconstruction, urogynecology and maternal and fetal medicine. The Division of Maternal-Fetal Medicine includes an accredited fellowship training program.

Faculty members educate other physicians, nationally and internationally, in medical and surgical advances and are active in the education of medical, nursing, pharmacy and public health students.

The department boasts nationally recognized leaders in women's health care, with clinical expertise in general gynecology, gynecologic oncology, urogynecology, female pelvic medicine and reconstructive surgery, general obstetrics, prenatal care, genetic counseling, prenatal diagnosis, delivery, fetal ultrasound, fetal cardiac disease detection and management, high-risk pregnancy management and other diagnoses and treatments affecting women.

Setsuko K. Chambers, MD: Leading the Fight Against Women's Cancers

Dr. Chambers is the Bobbi Olson Endowed Chair for Ovarian Cancer Research, director of women's cancer at the UA Cancer Center, vice-chair of the UA Department of Obstetrics and Gynecology, and professor and division director of gynecologic oncology. She was elected to the Institute of Medicine in 2009.

Dr. Chambers is one of the few gynecologic oncologist physician-scientists in the nation, active as both a researcher and clinical gynecologic oncologist, evaluating oncology patients at the UA Cancer Center. Her research laboratory, funded by the National Cancer Institute and the U.S. Department of Defense, is devoted to understanding the molecular basis for breast and ovarian cancer invasion and metastasis. One of Dr. Chambers' current studies is focused on the early detection of ovarian-fallopian tube cancer through the use of novel imaging. The project is being done in collaboration with the UA Departments of Biomedical Engineering, Obstetrics and Gynecology and Pathology.

Another collaborative research project looks to identify biomarkers in women at high risk for cancer. Her lab is partnering on this work with the UA Departments of Molecular and Cellular Biology, Pathology, Medicine and Mathematics, and the Division of Epidemiology and Biostatistics in the UA Mel and Enid Zuckerman College of Public Health.



Kathryn Reed, MD, professor and department head, (front row, fourth from left) with a group of residents, fellows and faculty members of the department. "The finest obstetrics and gynecology specialists in the nation are trained here at the UA, thanks to our outstanding faculty who continuously educate other physicians, nationally and internationally, in medical and surgical advances, and are active in the education of medical, nursing, pharmacy and public health students," Dr. Reed said.

'Loved and Needed' in Ghana

The 123-bed Baptist Medical Centre in Nalerigu, Ghana, West Africa, is a vital health resource for the area, each year conducting 60,000 outpatient visits; 10,000 inpatient visits; 1,200 major operations and as many as 3,000 minor procedures. The hospital depends on volunteers to treat its patients, many of whom come from vast distances throughout the northern part of Ghana for care because there is no other option. Volunteers from the UA College of Medicine – Tucson community and other volunteers from throughout the world share their specialty skills while gaining experience practicing medicine in a resource-limited region. The hospital's need for expertise in obstetrics and gynecology led to the opportunity to create a one-month rotation for OB/GYN residents.

OB/GYN residents who complete rotations at the Baptist Medical Centre are greatly affected. "Ghana was an incredible experience," said OB/GYN chief resident Lisa Carbonell, MD. "It was a lot of hard work, laced with a combination of frustration and love. There were days when we had to decide who needed the oxygen most, because there was only one oxygen tank in the hospital. Most days someone died, one day it might be an older woman with congestive heart failure or a 1-year-old child with malaria. But despite the frustration



Baptist Medical Centre, Nalerigu, Ghana, West Africa



Elizabeth Murrill, MD, OB/GYN chief resident (right) with patients at the Baptist Medical Centre in Ghana

this caused, never in my medical career have I ever felt as loved and needed as I did by these patients. It made all the hard work worth it! These people depend on doctors to come and volunteer at this hospital and I can't imagine what the mortality in this area of the nation would look like if this hospital did not exist."

OB/GYN third-year resident Lydia Wester, MD, remarked, "I thoroughly enjoyed my time in Ghana. It reminded me of why I went into medicine and the need for medical providers in Third-World settings. One of the biggest challenges I saw was the lack of quality medical equipment and access to laboratory tests. It makes you realize how much we take for granted in the United States, even something as simple as reliable electricity. However, I learned from the staff's creativity and resourcefulness."

Elizabeth Murrill, MD, OB/GYN chief resident, said: "The challenges of working in Northern Ghana with minimal resources was quite the learning experience, but overall it was a true pleasure learning from and providing care for the people of Nalerigu."

Ophthalmology and Vision Science

The University of Arizona Department of Ophthalmology and Vision Science is dedicated to preventing blindness and preserving eyesight through innovative research and comprehensive eye care for all patients whose vision is threatened by eye disease or injury.



The department is a major Southwest referral center known for offering state-of-the-art diagnostic and therapeutic interventions for patients and has a very active clinical studies program, with special emphasis on Hispanic and Native American eye conditions. Clinical research includes dry eye disease, myopia, amblyopia, glaucoma and ophthalmic optics.

The department's basic research includes the cell biology of age-related macular degeneration, optics and visual development, and involves cross-campus collaborations with the UA Colleges of Engineering, Optical Sciences and Public Health.

Established as a section of the Department of Surgery in 1973, it became the Department of Ophthalmology in July 1982 and was renamed the Department of Ophthalmology and Vision Science in 2005 to better reflect its mission of eye care and vision research.

The Evolution of Instrument-based Vision Screening

A lot has changed in instrument-based vision screening of infants and children since the ophthalmology section was founded.

That year, the isotropic photorefractor was invented by Howard and Bradley Howland to determine where babies' eyes were

focused, based on the "red eye" effect in flash photographs. By analyzing the information in the glow produced when a flash reflected light from the retina at the back of the eye, researchers could determine if a child's eye was out of focus. Slide photographs would be taken, projected on a screen and measured to determine if a child needed glasses to see clearly.

"As a research tool, it allowed the first studies of the interaction between focus accuracy and vision development in infancy," said Joseph Miller, MD, MPH, professor and head of the UA Department of Ophthalmology and Vision Science, professor of optical sciences and public health, and the Murray and Clara Walker Memorial Endowed Chair in Ophthalmology.

Fast forward 40 years, and the technique has evolved from a laboratory method to recommended clinical practice. Today, Dr. Miller and Kimberly Gerhart, MD, UA assistant professor and chief of the Division of General Pediatrics and medical director of the Arizona Elks Clinic for Children and Young Adults at Banner Children's Diamond Children's Medical Center, use The Spot™ Vision Screener, a video photorefractor manufactured by Welch-Allyn Inc. The Spot™ uses infrared light (no annoying bright flash!) to record the red eye glow and immediately determine if a child should be referred for an eye exam. Drs. Miller and Gerhart use this technology to rapidly and economically screen infants and young children for refractive errors. Early diagnosis and treatment of amblyopia and other eye conditions has been shown to yield better visual outcomes.

Visual Development Laboratory Proves Instrument-based Screening's Effectiveness

The department's Visual Development Laboratory has for 20 years developed and evaluated instrument-based screening

methods. These efforts have culminated in the recognition that instrument-based screening is the most effective vision screening method for young children with insurers now paying for the procedure. The laboratory is headed by Erin Harvey, PhD, associate professor of ophthalmology with a joint appointment in the UA Mel



Kris Hamming, UAHS BioCommunications

Drs. Gerhart, left, and Miller show the old and the new at work while screening Santiago Estrada for glasses, as parents Luis and Lisa look on. Dr. Miller is holding one of the isotropic photorefractors invented in 1973; Dr. Gerhart is holding The Spot™ Vision Screener used today.



Erin Harvey, PhD

and Enid Zuckerman College of Public Health. She also is director of the department's Tohono O'odham Vision Screening Program that began in 1997 as a five-year study of astigmatism and amblyopia in Tohono O'odham preschool children and continues today, sponsored by the Tohono O'odham Nation and funded by the National Institutes of Health/National Eye Institute.

Introducing Medical Students to Ophthalmology

Recruited to the UA College of Medicine in 1973 to develop a clinical and graduate education program in ophthalmology, Harold E. Cross, MD, PhD, also served as ophthalmology section head until 1980 and has directed the department's Medical Student Teaching Program since 1998.

The program's elective clinical and research rotations provide extensive one-on-one time with department faculty and residents and introduce students to all aspects of the practice of ophthalmology at the Alvernon Physician Offices, the Southern Arizona VA Health Care System (SAVAHCS) and other local clinics.

Clinical courses include opportunities to learn ophthalmology skills with an emphasis in caring for Native American patients



Dr. Cross with medical student Kimberly Hill.

at the Phoenix Indian Medical Center Eye Clinic, and for preceptorships at hospitals in the United States or abroad. Research courses encourage in-depth study of an aspect of ophthalmologic disease seen in clinical practice, with a focus on applying basic principles and techniques of ophthalmologic investigation. Faculty mentors also guide students in preparing and making oral presentations of research findings to scientific audiences.

Training the Next Generation of Ophthalmologists

The department offers two ACGME-accredited, three-year residencies in environments unique for their diverse patient populations. Admission is extremely competitive, with more than 200 qualified applicants each year applying for training. Residents are attracted by the UA's population diversity, the quality of the education as evidenced by where graduates go for further subspecialty training, and the quality of the associated Veterans Administration hospital.

The department has offered a residency program since December 1973. Residents receive extensive clinical and surgical experience in the subspecialties of glaucoma, strabismus, retina, external disease and oculoplastic surgery, with training at Banner – University Medical Center Tucson, SAVAHCS and other major health-care institutions in Tucson. The program was re-accredited in 2012 for six years. To date, 84 physicians have graduated.

In July 2009, a second residency program was established, based primarily at Banner – UMC Tucson and Banner – UMC South, where it provides a special focus on rural and underserved areas. To date, 10 physicians have graduated.

Many residency graduates have pursued further subspecialty training, including fellowships at such prestigious institutions as Duke University School of Medicine, New York Eye and Ear Infirmary, Tufts University, University of California-Irvine, UCLA/Jules Stein Eye Institute and USC/Doheny Eye Institute. Graduates have entered general ophthalmology practice in Tucson, Phoenix and rural or underserved communities in Arizona as well as throughout the country, including Alaska and Hawaii.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Harvey, Erin M	Amblyopia in Astigmatic Children: Development and Treatment	NEI	\$3.44 M
Miller, Joseph M	Ophthalmic Research	Research to prevent Blindness	\$1.20 M

Orthopaedic Surgery

The University of Arizona Department of Orthopaedic Surgery has a robust record of research leading to innovations in technology, teaching and patient care. Formerly a division of the Department of Surgery, Orthopaedic Surgery was granted department status in 2000. Orthopaedic faculty include fellowship-trained surgeons in the areas of adult and pediatric trauma and fracture care, spine surgery, hand and microsurgery, sports medicine, foot and ankle and major joint arthroplasty. The department provides 24/7 inpatient trauma, spine and hand coverage for both Banner – University Medical Center hospitals in Tucson, and outpatient care at Banner – University Medicine’s Alvernon, North Hills and South Campus Sports Medicine clinics.

Innate Stem Cells and Mini Sensors to Repair Knee Joints: A Personalized Medicine Approach

The Orthopaedic Research Lab is progressing rapidly toward the day when a patient’s own adult stem cells, a dime-sized polymer scaffold and a tiny wireless sensing system, will provide patients a new alternative to total knee-replacement surgery. The lab, under the direction of John A. Szivek, PhD, professor of orthopaedic surgery and William and Sylvia Rubin Endowed Chair for Orthopaedic Research, is one of only a handful of labs worldwide working to perfect the use of adult stem cells derived from fat tissue, then transformed into cartilage cells, to restore normal function to knees.

But Dr. Szivek’s lab is a step ahead of the others. It’s the only lab to implant miniature sensors into joints where the new cartilage is growing to provide real-time feedback on joint loads, making it possible to structure rehab for each patient’s individual needs and to allow patients to monitor the healing of their own joint using their smart phone.

Google Glass: Advancing Patient Care and Teaching

Orthopaedic surgeons Jordan Smith, MD, and Jason Wild, MD, are researching the potential of Google Glass as a step ahead of telemedicine in collaborating with providers in remote communities, and as a valuable teaching aid.

Orthopaedic Surgery has long been a member of the UA-based Arizona Telemedicine Program, which covered the cost of the Google Glass. But the Glass is the first technology capable of sharing in real time a surgical procedure from the surgeon’s perspective, while maintaining the sterile field.



John A. Szivek, PhD



Jason Wild, MD

Because it can link to the hospital’s Wi-Fi, Google Glass made possible an especially teachable moment, when students were able to view up close a surgery in which Drs. Smith and Wild performed an uncommon patellar reconstruction on a patient whose breast cancer had metastasized to her knee. The procedure also was stored for future viewing by faculty, students and residents. Another didactic opportunity occurred when Dr. Wild and Tolga Turker, MD, used Google Glass in another case in which a woman lost a segment of her femur in a car accident. The surgeons took a section of free vascularized fibula from the patient and connected it to the blood supply in her thigh to replace the missing section of femur.

Multi-Disciplinary Project Designed to Improve Care of Older Patients

The Department of Orthopaedic Surgery is working with the UA Center on Aging to teach best practices in geriatric care to medical students, residents and practicing physicians who are not specialists in gerontology. Since 2006, the Arizona Reynolds Program of Applied Geriatrics has received \$2.9 million from the Donald W. Reynolds Foundation, which focuses most of its philanthropy on improving the health of older patients. Leading Orthopaedic Surgery’s efforts are assistant professors Dr. Wild and Michael Dohm, MD.

Dr. Wild also is leading the development of a multi-disciplinary geriatric fracture service that will seek to optimize care through



John Ruth, MD
Department head

collaboration among geriatricians, hospitalists, anesthesiologists and orthopaedists. One outcome will be a hip-fracture protocol to maximize opportunities to educate patients about osteoporosis and fall prevention while patients are hospitalized and after they are discharged to outpatient care.

Outcomes Research: The Key to Improving Quality of Care

Michael P. Dohm, MD, got his MD and completed his orthopaedic surgery residency at the UA, then joined a private practice in Grand Junction, Colo. Twenty-one years later, on July 1, 2013, he returned to the UA as assistant professor of orthopaedic surgery. What attracted Dr. Dohm to the department – and vice versa – was their shared interest in outcomes research. Dr. Dohm was founder of Grand Junction’s Western Slope Study Group, a non-profit orthopaedic surgery outcomes data bank. With fellow surgeons and students, he has established an outcomes research data bank in the Department of Orthopaedic Surgery, which now is an associate member and contributor to the International Society of Arthroplasty Registers (ISAR). At the ISAR meeting in Sweden in May 2015, Dr. Dohm presented two papers on the UA orthopaedic surgery department’s work with outcomes data gathering. The department also now is a member of the American Joint Replacement Registry, which gathers data on total hip and knee replacement surgery. “Now with data,” Dr. Dohm said, “we can improve patient outcomes and quality of care.”

Stanford and UCSF Graduate Comes Home to Tucson for UA Orthopaedics Residency

Melissa Esparza, MD, got her bachelor’s degree in human biology from Stanford, where she played on the women’s soccer team, and her MD from the University of California, San Francisco, before coming home to Tucson for her orthopaedics residency.



Melissa Esparza, MD

Between her undergraduate years and medical school, she spent a year working at a community health center, then lived for a year in South Africa, working for an organization that uses soccer as a platform to teach kids about HIV and AIDS.

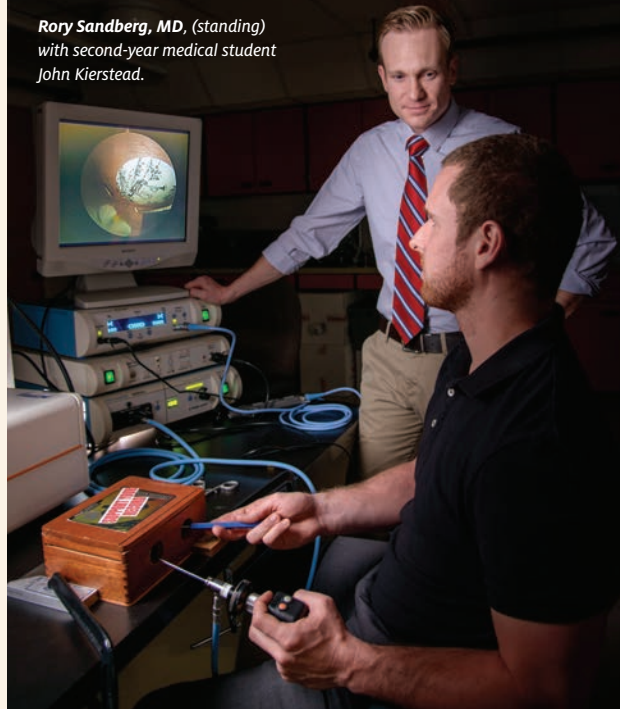
Dr. Esparza found her calling when she did a two-week rotation in

*Resident Research:
The Cigar Box Approach to
Arthroscopy Training*

The American Council of Graduate Medical Education’s requirement that orthopaedic surgery residents receive arthroscopy training before they operate on patients comes with a price tag. The traditional “sawbone” knee model costs about \$300. Orthopaedic surgery resident Rory Sandberg, MD, is testing a less expensive alternative: an empty cigar box. As an intern, Dr. Sandberg – a non-smoker – developed a hobby of collecting cigar boxes and attaching strings to create guitars. More recently, he decided to test the cigar-box model as a cheaper alternative to the sawbone, which has proven its ability to fine-tune students’ arthroscopy skills, prior to operating on humans.

He’s measuring medical students’ results with cigar-box training against data collected on students with no pre-operative training, and those who train on the sawbone. “I think the cigar box will fall in the middle,” Dr. Sandberg says. “If we can reach the same level of efficacy using the cigar box model, then we have a trainer for about \$30, instead of \$300.”

Rory Sandberg, MD, (standing)
with second-year medical student
John Kierstead.



Kris Hanning, UAHHS BioCommunications

orthopaedic surgery in her third year of medical school. “Seeing patients who had some injury or disabling condition, and being able to do something to make them better was really rewarding,” she said. In starting her orthopaedics residency in 2014, she was adding to the diversification of her field. About 5 percent of orthopaedic surgeons are Hispanic, and about 1.5 percent are women, according to a 2014 survey of the American Association of Orthopaedic Surgeons.

Otolaryngology – Head and Neck Surgery

The University of Arizona College of Medicine – Tucson’s newest department is the UA Department of Otolaryngology – Head and Neck Surgery, which was a division of the Department of Surgery from 2010 until October 2014 when it was granted department status.



Alexander Chiu, MD

Alex Chiu, MD, who served as division chief of Otolaryngology – Head and Neck Surgery, and as interim head of the Department of Surgery, was named head of the new department. Dr. Chiu is known nationally for his work with sinus and skull-base surgery.

The department’s reputation for clinical excellence in sinonasal surgery and surgical treatment of head and neck cancer draws patients from throughout the Southwest, including California, Colorado and Texas. Otolaryngology has ranked in the top 40 nationally in NIH funding, and in the top 30 in *U.S. News & World Report’s* annual “Best Hospitals” ratings.

Another widely known faculty member is Abraham Jacob, MD, director of the UA Ear Institute and associate professor and vice chair of otolaryngology. Dr. Jacob specializes in diseases of the ear, facial nerves and base of the skull, with expertise in cochlear implants, acoustic neuromas and implantable hearing aids.

Otolaryngology – Head and Neck Surgery started its residency program in 2012, while still a division of the Department of Surgery. With a starting capacity of five residents, the program admitted its fourth resident and first post-graduate fellow in July 2015.

A New Role for Cochlear Implants: Halting Cognitive Decline

Seniors who suffer from hearing loss are at risk for cognitive decline, studies have shown. As director of the UA Ear Institute, Dr. Jacob has designed a research project that he expects will lead to improvement in both hearing and cognition. In addition to the Department of Otolaryngology, Dr. Jacob’s research involves collaboration with experts with the UA Departments of Psychology and Speech, Language and Hearing Sciences.

As a surgeon who specializes in cochlear implants, Dr. Jacob has heard from family members of older patients how cochlear implants have improved the patients’ cognitive function as well as their hearing. For example, a father in his 70s and his son go on an annual hunting trip that includes hours of driving – hours in which the two had long ago stopped conversing with one another. After the father’s cochlear implant surgery, he and his son now can look forward to long conversations.

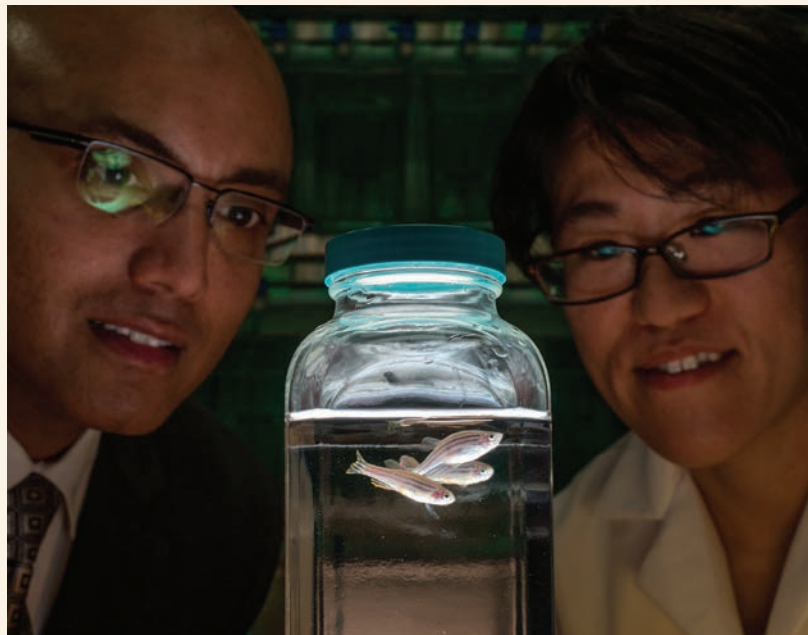
While a link between hearing loss and cognitive impairment has been established in earlier studies, the intervention study by Dr. Jacob and colleagues could be the first to show that seniors who have endured prolonged hearing loss not only will regain their hearing with cochlear implants, but their decline into senility will be halted and, possibly, reversed.

Betty Glisky, PhD, professor and head of the UA Department of Psychology, recently explained her department’s interest in the cochlear implant study. “Psychology is interested in ways to maintain cognitive function with age, or to slow cognitive decline,” she said, “and social interaction – including meaningful conversation – helps maintain cognitive function in older adults.”



UAHS BioCommunications

Abraham Jacob, MD



Abraham Jacob, MD, and postdoctoral research associate Maki Niihori, PhD

Tiny Zebrafish Holds Big Clues to Hearing Loss in Cancer Patients

Hearing loss is one of the most common side effects of cancer chemotherapy, and one for which Dr. Jacob is looking for ways to treat, or better yet, prevent. His research involves the humble zebrafish, which measures 2 to 4 inches when fully grown and is heavily endowed with the same type of cilia that are essential to hearing in humans, making the zebrafish an excellent model for testing new therapies to treat chemo-induced ototoxicity.

Dr. Jacob's research involves collaboration with the UA Cancer Center, where he is a member; with the UA College of Pharmacy, to develop clinical trials of treatments that may save a patient's hearing; and with the UA College of Engineering, for assistance with data analysis.

"This study will involve 100,000 zebrafish larvae, which will allow us to vet large numbers of drugs," Dr. Jacob said, "to find a way to prevent chemo-induced hearing loss or reverse it once it occurs."



Eugene H. Chang, MD, and Kwang Chul Kim, PhD

Seeking More Effective Treatments for Cystic Fibrosis, Chronic Sinusitis, Other Airway Disorders

The link between cystic fibrosis and sinusitis is well-documented, with chronic sinusitis further complicating the lives of many children and adults with CF. Recently appointed faculty members Eugene Chang, MD, the department's director of rhinology and skull-base surgery, and Kwang Chul Kim, PhD, director of the department's mucus research program, will collaborate on research to learn more about why people with CF develop chronic sinus disease.

"Then we can broaden our understanding of non-CF-related chronic sinusitis, one of the most common medical conditions in adults," said Dr. Chang. From a translational standpoint, their goal is to develop innovative therapies to "treat chronic sinusitis in generations to come," he said.

A native of South Korea, Dr. Kim has researched the role and regulation of lung mucus to find a way to control excessive mucus in patients with CF, asthma and chronic obstructive pulmonary disease. He discovered the anti-inflammatory role of a protein called MUC1, and now is studying a mimetic peptide that may prevent the development of COPD and other chronic inflammatory diseases.

Dr. Chang came to the UA Department of Otolaryngology in October 2014 from the University of Iowa Carver School of Medicine. Dr. Kim came to the department in December 2014, after serving as professor of physiology at Temple University in Philadelphia, where he also was director of lung mucus research at Temple's Center for Inflammation, Translational and Clinical Lung Research.

"The recruitment of Drs. Kim and Chang is another step toward building a world-class sinonasal and airway program here," Dr. Chiu said. "It's our goal to become a national destination for clinical care and an international thought leader in sinusitis research."

Pathology

The University of Arizona Department of Pathology bridges basic science and patient care in Arizona’s unique multicultural environment, and plays a key role in the development of personalized medicine in coordination with the Banner – University Medical Centers in Tucson, the UA Cancer Center, the UA Sarver Heart Center and other UA centers of excellence, as well as the Southern Arizona Veterans Administration Health Care System.

The department provides consultations and diagnoses in anatomic and clinical pathology and is almost entirely sub-specialized. With a strong commitment to tertiary patient care, the department provides diagnostic support in transplantation pathology, including cardiac, renal, pulmonary, liver, pancreas, intestine and bone marrow programs. The department also provides advanced diagnostic services, including tailored measurement of genes and proteins, needed for cancer prevention and treatment.

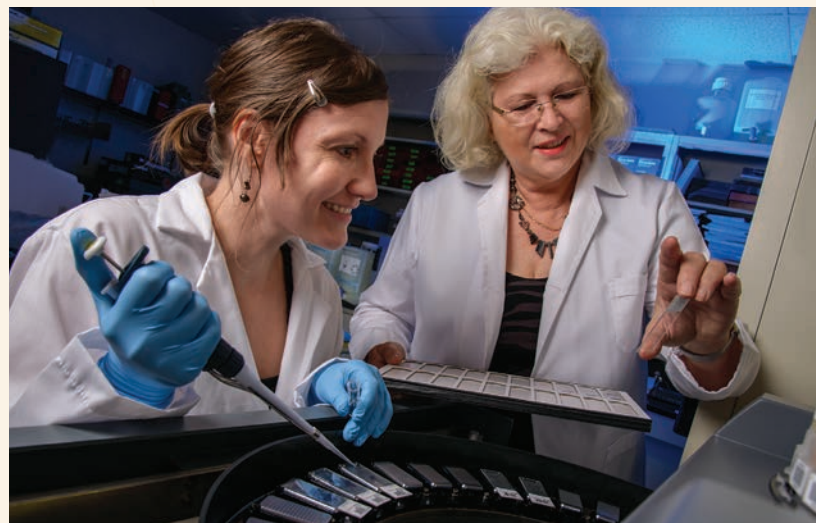
The department also balances basic science and clinical research. Programs include National Cancer Institute-funded SPORE grants in lymphoma, the microbiology of aging, the neurobiology of aging, mechanisms of treatment resistance in lymphoma, and melanoma research. In the last two years, the department’s federal research funding has grown from \$1.3 to \$2.5 million.

NIH Funds Translational Research on Cause of Hot Flashes

In 2014, Naomi Rance, MD, PhD, professor and associate head of pathology, received a \$1.5 million, five-year R01 grant from the National Institute on Aging, to study the role of preoptic NK3R neurons in the estrogen modulation of body temperature during hot flashes, one of the most common and distressing symptom of menopause, and to ultimately use this information to design targeted therapies. Dr. Rance also is a professor of neurology and cellular and molecular medicine and a member of the UA Evelyn F. McKnight Brain Institute.



Naomi Rance, MD, PhD



Kris Hanning, UAHS BioCommunications

Samantha Kendrick, PhD, and Monika Schmelz, PhD

Mentoring Tomorrow’s Leaders in Pathology

Many of the department’s junior faculty and graduate students show great promise as researchers. They include cell biologist Monika Schmelz, PhD, associate professor of pathology, who has extensive experience in tissue collection and “biobanking,” and is interested in the biology of diffuse large B cell lymphoma. Dr. Schmelz also is a member of the UA Cancer Center’s Lymphoma Consortium. In 2014, she obtained a \$4.8 million

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Schmelz, Monika	Anal Cancer/HSIL Outcomes Research Study	NCI/The EMMES Corporation, LLC	\$1.25 M



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Achyut Bhattacharyya, MD
Department head

collaborative grant to host the biorepository for anal cancer/HSIL outcomes research (ANCHOR), a phase III multi-site clinical trial focused on malignancy in immunosuppressed individuals and sponsored by the National Cancer Institute's Office of HIV and AIDS Malignancy. The biorepository will process and store an estimated 320,000 biospecimens during an eight-year clinical trial for future NCI-approved research studies. Graduate student

Samantha Kendrick, PhD, is pursuing a post-doctoral fellowship in lymphoma research. In 2014, she was awarded \$10,000 from the Arizona Area Health Education Centers intramural program for concurrent targeting of BCL2 and MYC in diffuse large B-cell lymphoma in vivo. A member of the lymphoma research team since January 2011, Dr. Kendrick's research interests include the study of mechanisms for chemotherapy resistance and relapse in aggressive lymphomas.

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From Medical Students to Residents and Fellows, a Program in Demand
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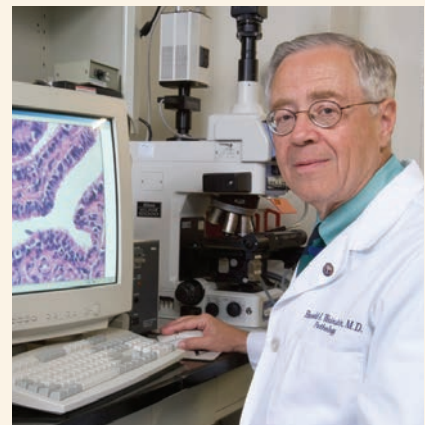
The department's residency and fellowship programs attract applicants from around the nation. In 2014, there were 450 applicants for three residency positions. About one-third of the department's residents were members of Alpha Omega Alpha Honor Medical Society in medical school. For the last six years, all residents successfully passed their boards – an extraordinary achievement.

The department offers accredited fellowships in hematopathology and molecular genetics pathology and a non-accredited fellowship in gastrointestinal pathology. The department also has been accredited for a forensic pathology fellowship to start in 2016.

Telepathology: Extending Pathology's Reach across Arizona

Telepathology continues to play a central role in the department's teaching, patient care and research. Under the leadership of Ronald S. Weinstein, MD, the Arizona Telemedicine Program (ATP) serves

rural and urban sites across the state. Since 1995, when ATP connected to its first rural sites, the department's outreach program has handled approximately 4,000 diagnostic telepathology cases.



Ronald S. Weinstein, MD

Pediatrics

The University of Arizona Department of Pediatrics has a long history of excellence in teaching, healing and discovery. The department was established in 1969, and the UA Steele Children's Research Center – the research arm of the department – was completed and dedicated in 1992. The department offers a residency program in pediatrics and one in combined emergency medicine and pediatrics – one of only three such programs in the nation – as well as fellowships in pediatric endocrinology and pediatric pulmonology. Research conducted at the UA Steele Center focuses on pediatric cancer, type 1 diabetes, neonatology, gastroenterology and nutritional disorders, heart defects, allergy and asthma, critical care, infectious diseases and developmental pediatrics.

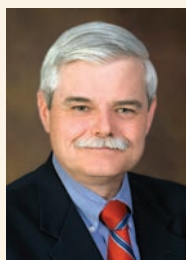


Faye K. Ghishan, MD

Dr. Ghishan Receives Prestigious Award from American Physiological Society

In April 2014, Faye K. Ghishan, MD, head of the Department of Pediatrics, director of the UA Steele Center and Horace W. Steele Endowed Chair in Pediatric Research, was the first pediatric gastroenterologist to receive the "Horace W. Davenport Distinguished Lectureship" award. This honor is the most prestigious recognition

given by the Gastrointestinal and Liver Section of the American Physiological Society (APS). The award recognizes distinguished lifetime achievement in gastrointestinal and liver physiological research, including accomplishments in research, teaching, training and activities within the APS.



Wayne Morgan, MD

Cystic Fibrosis Foundation Honors Dr. Morgan with Major Award

Professor Wayne Morgan, MD, received the prestigious "Richard C. Talamo Distinguished Clinical Achievement Award" from the Cystic Fibrosis Foundation in October 2013. The award is given to individuals who have spent their careers in the research and care of patients with cystic fibrosis and whose

contributions have had significant influence on the course of the disease.

UA Steele Center Opens in Phoenix

In September 2014, the UA Steele Center opened a site in Phoenix. This second location enables researchers to collaborate on clinical research projects with pediatric facilities in Greater Phoenix. For example,



neonatology researchers are working with St. Joseph's Hospital and Medical Center on a study of necrotizing enterocolitis.

Pediatric Sports Medicine Program a First for Tucson

Pediatric sports medicine physician Mo Mortazavi, MD, joined the department in August 2014 and established the first dedicated pediatric sports medicine program in Tucson.



Mo Mortazavi, MD

CDC Grant Continues Arizona Developmental Disabilities Surveillance

In December 2014, the UA Steele Center received a four-year, \$2 million grant from the U.S. Centers for Disease Control and Prevention to continue the Arizona Developmental Disabilities Surveillance Program (ADDSP), part of a multi-site effort to track autism spectrum disorders and intellectual disabilities among U.S. school children. Sydney Pettygrove, PhD, is the principal investigator, and Margaret Kurzius-Spencer, MPH, MS, PhD, and Sydney Rice, MD, are co-investigators.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Martinez, Fernando	Arizona/Duke Clinical Center for AsthmaNet	NHLBI	\$4.66 M
Martinez, Fernando	Childhood Predictors of Airway Structure, Function, and Disease in Adult Life	NHLBI	\$4.36 M
Rice, Sydney A	Leadership Education in Neurodevelopmental and Related Disorders Training Program	HRSA	\$2.78 M
Pettygrove, Sydney D	Enhancing Current Capacity for Surveillance of Autism Spectrum Disorders & Other Developmental Disabilities	Centers for Disease Control and Prevention	\$2.44 M
Daines, Michael O	Alternaria Proteases and Protease Defenses in Asthma	NIAID	\$1.81 M
Brown, Mark A	Training Long Term - Pediatric Pulmonary Centers	HRSA	\$1.75 M
Morgan, Wayne J	Data Safety Monitoring Board	Cystic Fibrosis Foundation Therapeutics, Incorporated	\$1.75 M
Ghishan, Fayez K	Regulation of a Novel Intestinal NHE Isoform (NHE 8)	NIDDKD	\$1.64 M
Ghishan, Fayez K	Development of Intestinal Ion Transport	NIDDKD	\$1.32 M
Ghishan, Fayez K	Development of Intestinal Transport of Ca ⁺⁺ and Pi	NIDDKD	\$1.02 M



Pawel Kiela, PhD, Faye K. Ghishan, MD, and Vijay Radhakrishnan, PhD

Turmeric Linked to Suppression of Colon Cancer Metastasis

Researchers Faye K. Ghishan, MD, Pawel Kiela, PhD, and Vijay Radhakrishnan, PhD, discovered one of the mechanisms by which curcumin – the bioactive molecule derived from turmeric – can prevent cancer cell metastasis in colon cancer.



Katri Typpo, MD

Research Aims to Improve Nutrition for Critically Ill Children

Katri Typpo, MD, assistant professor, Division of Critical Care, received a two-year NIH grant to conduct the first randomized trial of IV nutrition (known as TPN, or total parenteral nutrition) for pediatric critical illness.

“There are significant gaps in knowledge regarding timing, route, dose and type of nutritional support needed for critically ill infants and children,” said Dr. Typpo.

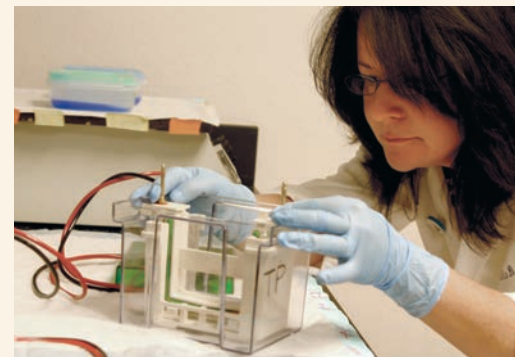
The study seeks to discover the best way to feed children during critical illness. The study is titled, “Supplemental Parenteral Nutrition in Pediatric Respiratory Failure,” or “The Supper Study,” for short.

Researchers Discover Potential Cause of Dry Eye Disease

Faye K. Ghishan, MD, and Hua Xu, PhD, made an unexpected discovery regarding the role of NHE8, a sodium/hydrogen exchanger protein, leading to insight about a potential cause of dry eye disease. They collaborated with Mingwu Wang, MD, PhD, from the UA Department of Ophthalmology and Vision Science. Their study, “Loss of NHE8 expression impairs ocular surface function in mice,” was published in the *American Journal of Physiology—Cell Physiology* in January 2015.

NIH Funds Study to Predict and Prevent Necrotizing Enterocolitis

Melissa Halpern, PhD, received an NIH grant in April 2014 to measure bile acid levels in premature infants to predict and prevent Necrotizing Enterocolitis (NEC), a potentially deadly intestinal disease.



Melissa Halpern, PhD

Pharmacology

Excelling in the science of the interactions of drugs and chemicals with living systems, the University of Arizona Department of Pharmacology is rated by the National Research Council among the top two pharmacology programs nationally in terms of student support, including scholarships and completion rates. It also ranks among the top four in research, including grants, awards and faculty publications. The Medical Pharmacology Graduate Program is ranked in the top five.

The department provides preclinical and clinical education in pharmacology and therapeutics for medical students; educates and trains graduate and postdoctoral biomedical scientists; and carries out basic research of recognized excellence. The department collaborates with a wide range of University of Arizona Health Sciences research scientists, physicians, pharmacists, nurses and public health professionals. Pharmacology faculty are active in independent research and partner in scientific collaborations with members in the UA Cancer Center, the UA Sarver Heart Center, the UA Respiratory Center and Departments of Anesthesiology, Medicine, Neurology, Ophthalmology and Vision Science, and Surgery, as well as the Department of Chemistry and Biochemistry in the UA College of Science.

Faculty research expertise includes cancer pharmacology/biology; cardiovascular pharmacology; clinical pharmacology; immunopharmacology; molecular/biochemical pharmacology; neuroscience and pain; and toxicology.

Pain Research Group Seeks New Treatments for Acute and Chronic Pain

The UA Pain Research Group is a multidisciplinary team of experts who encompass a spectrum of molecular, neuroanatomical, neurochemical and neuropharmacological techniques in studying the underlying causes of acute and chronic pain in search of new targets that will lead to drug development and improved pain management.

Frank Porreca, PhD, professor of pharmacology and anesthesiology, is principal investigator of the UA Pain Research Group. His research focuses on the mechanisms of chronic pain states, including neuropathic, inflammatory, visceral, headache and cancer pain and mechanisms of opioid-induced hyperalgesia, a clinical phenomenon characterized by worsening pain, despite increasing doses of opioids. A new collaboration with Michael Heien, PhD, assistant professor of analytical chemistry, will focus on chronic pain at the molecular level, and why it is more difficult to treat by developing measurements of chemical and electrical signals in the brain.

Patrick W. Mantyh, PhD, JD, investigates the molecular and cellular mechanisms involved in cancer-related pain, especially bone pain, caused by advanced breast, prostate and sarcoma cancers. His work on bone cancer led to an understanding of



UAHS BioCommunications

The UA Pain Research Group: **Frank Porreca, PhD, Thomas P. Davis, PhD, Patrick W. Mantyh, PhD, JD, and Todd Vanderah, PhD**

the multiple mechanisms involved in the generation of pain, including allogeneic substances released from the cancer and its associated stromal cells, as well as the destruction and sprouting of nerve fibers near the tumor. Now, he and his team are focusing on developing more targeted therapies to relieve cancer pain.

“We also are attempting to understand whether unique mechanisms drive cancer pain in different types of cancer. For example, do the same mechanisms that drive bone cancer pain also drive head and neck cancer pain? Another area we are exploring is whether novel therapies developed to relieve cancer pain also have significant effects on disease progression,” Dr. Mantyh said.

Thomas P. Davis, PhD, professor of pharmacology, is investigating the molecular changes that occur to the endothelial cells of the blood brain barrier under conditions of acute and chronic pain to better deliver drugs to the central nervous system.

And Todd Vanderah, PhD, pharmacology department head and professor of pharmacology and anesthesiology, is conducting research focused on the advantages of a non-psychotropic cannabinoid and its beneficial effects on metastatic bone cancer pain, bone remodeling and the inhibition of cancer proliferation.

Reputation and Ranking Attract Graduate Students to Pharmacology

Well-funded research programs and their strong multidisciplinary nature offer students an interactive approach to medical research and education in pharmacology. The department emphasizes individual creativity and state-of-the-art, hands-on research to prepare students for careers in advanced science, technology, education or industry. Graduates have a track record of excellent placement in leading pharmaceutical and biotech companies, universities and government agencies.

The department offers a medical pharmacology PhD program, medical pharmacology MS program, and a medical pharmacology – perfusion sciences graduate program.

The Hank Yamamura Endowed Fellowship in Pharmacology was established by students and colleagues to honor Henry I. “Hank” Yamamura, PhD, a beloved Regents’ Professor and eminent neuropharmacologist who died in 2008. Karissa Cottier and Lauren Marie Slosky are Yamamura Fellowship awardees in the medical pharmacology PhD graduate program.

Reputation and national ranking drew Cottier from Ohio to the UA Department of Pharmacology. The department provides



Karissa Cottier

Kris Hanning, UAHS BioCommunications

the variety of research and specialty opportunities that she was looking for. “The degree is a blend of biology, physiology, chemistry, neurology and other biomedical fields, and the UA is well known for its research on pain, so it was a perfect fit for me and my interests,” said Cottier, who has focused her research on neuropathic pain. A graduate fellowship from Science Foundation Arizona gave her the opportunity to assist in teaching science to third-grade students at Manzo Elementary School in Tucson. The fellowship also solidified her decision to pursue academia and a post-doc position.

An interest in finding root causes and solutions to medicine’s most challenging illnesses inspired UA alumna Slosky, who majored in molecular and cellular biology and psychology, to focus on biomedical research. She is focusing on the study of bone cancer pain to further understand and provide solutions for its neurological causes. Her research efforts focus on treatments to eliminate pain at the cellular level by using inhibitors to block chemicals that induce pain associated with tumors in cancer patients. She credits Todd Vanderah, PhD, her mentor, for her interest in teaching and post-doctoral work in academic medicine.



Lauren Marie Slosky

Kris Hanning, UAHS BioCommunications

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Davis, Thomas P	Blood-to-CNS Drug Uptake in Pain	NIDA	\$2.50 M
Davis, Thomas P	Blood Brain Barrier Changed Induced by Pain	NINDS	\$2.34 M
Porreca, Frank	Mechanism of Medication Overuse Headache and Chronic Migraine Pain	NINDS	\$2.33 M
Porreca, Frank	Brain Reward Circuits and Relief of Ongoing Pain	NIDA	\$1.67 M
Mantyh, Patrick W	Preventive Analgesia for Bone Cancer Pain	NCI	\$1.64 M
Porreca, Frank	Mechanisms of Spontaneous Neuropathic Pain	NINDS	\$1.61 M
Vanderah, Todd W	Cannabinoid CB2 Agonists for Treatment of Breast Cancer-Induced Bone Pain	NCI	\$1.59 M
Mantyh, Patrick W	Metastatic Prostate Cancer-Induced Bone Pain	NCI	\$1.54 M
Dussor, Gregory O	The Role of ASICs in Migraine Pathophysiology	NINDS	\$1.04 M

Physiology

The University of Arizona Department of Physiology conducts a wide range of research on how the human body works – from the molecular level to whole systems. Physiology courses are offered to undergraduates, graduate students and medical students.

Physiology is the second most popular undergraduate major at the UA, and the only undergraduate major offered through the UA College of Medicine – Tucson. Undergraduate enrollment has more than quadrupled from 467 students in 2000 to 2,064 students in 2014, making it one of the largest undergraduate physiology programs in the nation.



E. Fiona Bailey, PhD

Sleep Apnea Research at the Motor-Neuron Level

E. Fiona Bailey, PhD, associate professor of physiology, is a former speech pathologist who is researching motor-neuron physiology – how the body tells its muscles what it wants to do – specifically relating to the musculature of

the mouth and neck. A major focus of her research is the tongue and soft palate, and how they function – or malfunction – in patients with sleep apnea. Her research has led her to collaborate with a biotechnology firm on a nerve stimulator suitable for implantation in individuals with moderate to severe sleep apnea. In addition, she is working with Georgia Tech researchers to develop a tongue-drive system for use by individuals with spinal cord injury.

Gender Differences and Environmental Factors in Cardiac Disease

John Konhilas, PhD, associate professor of physiology and a member of the UA Sarver Heart Center, has focused his career on the cellular and molecular mechanisms of human cardiac function and disease. His lab is researching how women and men differ in their response to hypertension, myocardial infarction and cardiomyopathies. Faced with these challenges, a woman's heart is more likely to maintain adequate cardiac function, while men typically exhibit progressive cardiac deterioration. Dr. Konhilas's lab has found that, compared with female hearts, male hearts are less able to handle the increased energetic demands brought on by cardiac disease. Dr. Konhilas's lab also is studying how environmental factors, including an individual's microbiome, affect that person's heart function, particularly in response to acute coronary syndrome (ACS). The gut microbiome is known to play a key role in inflammatory response, with harmful gut



John Konhilas, PhD

Preventing and Treating Diabetic Retinopathy

Erika Eggers, PhD, assistant professor of physiology, is studying how a single photon of light is transmitted through two or three cells of the retina to the brain – and how synapses allow those cells to “talk” to one another. This translational research could have a significant impact on the prevention and treatment of diabetic retinopathy, for which there presently is no cure. Because of the increased incidence of diabetes in this nation alone, there is increased risk of the retinal damage that results from diabetes – particularly among the 9 million Americans who are unaware they have diabetes.

Once diabetes is present, a cascade of damage begins to occur – and to date, it can't be repaired. But Dr. Eggers has discovered that the synapses in the eye are one of the earliest mechanisms in the eye to show signs of change in people with diabetes. Her finding could lead to new ways to test people's vision early, before those changes progress. Drugs could be developed to suppress abnormal cells before retinopathy takes hold.

Erika Eggers, PhD



bacteria triggering inflammation. Therefore, his lab also is looking at the potential of beneficial gut bacteria to prevent and treat ACS.

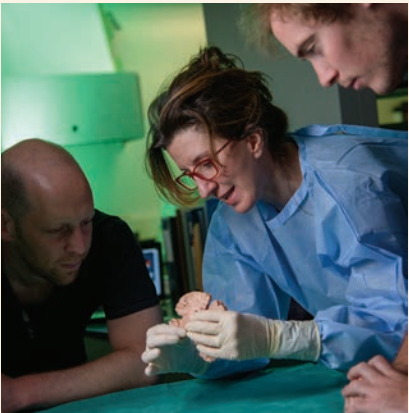
Kris Hanning, UAHS BioCommunications

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Kris Hanning, UAHS BioCommunications

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Wright, Stephen H	Molecular Organization of the Organic Cation-Proton Exchanger, MATE1	NIDDKD	\$2.48 M
Burt, Janis M	Interdisciplinary Training in Cardiovascular Research	NHLBI	\$2.06 M
Konhilas, John P	Impact of AMP-Activated Kinase on Sex Differences in Hypertrophic Cardiomyopathy	NHLBI	\$1.92 M
Bailey, Elizabeth F	Neuromuscular Control of the Human Tongue	NIDOC	\$1.80 M
Wright, Stephen H	Molecular Organization of Renal and Hepatic Organic Cation Transporters	NIDDKD	\$1.77 M
Pannabecker, Thomas L	Integrated Tubular and Vascular Structure and Function in Renal Inner Medulla	NIDDKD	\$1.69 M
Granzier, Hendrikus L	Function of Giant Sarcomere Matrix Proteins in Muscle (HL62881)	NHLBI	\$1.62 M
Boitano, Scott A	PAR2 Targeted Drug Discovery for the Treatment of Pain	NINDS	\$1.62 M
Burt, Janis M	Gap Junctions in Vascular Smooth Muscle: Growth Control	NHLBI	\$1.49 M
Granzier, Hendrikus L	Roles of Nebulin in Structure and Function of Striated Muscle	NIAMSD	\$1.39 M
Granzier, Hendrikus L	Myofilament-Based Mechanisms of Diastolic Dysfunction in HFpEF	NHLBI	\$1.23 M
Fregosi, Ralph F	Chronic Nicotine and Synaptic Transmission in Brainstem Respiratory Neurons	Eunice Kennedy Shriver NICHD	\$1.22 M
Delamere, Nicholas A	Regulation of Transport Mechanisms in Lens Cells	NEI	\$1.14 M
Bao, Shaowen	Developing TNF-Alpha-Mediated Treatment for Blast-Induced Tinnitus	United States Army Medical Research Acquisition Activity	\$1.13 M
Makino, Ayako	Cellular and Molecular Mechanisms of Coronary Endothelial Dysfunction in Diabetes	NHLBI	\$1.04 M



Kris Hamming, UAHHS BioCommunications

Mike X. Cohen, PhD, **Katalin Gothard, MD, PhD**, and graduate student Jeremiah Morrow

Vision, Stress and Social Interaction

Katalin Gothard, MD, PhD, associate professor of physiology, was a neurosurgeon in Romania before she became interested in the neural basis of emotion. Her current research focuses on the connection between vision and emotion, and motor and neural control of stress and social interaction. Her research records neural activity in different areas of the brain, particularly the amygdala – the brain’s emotion “switchboard,” in which a single cell can, for example, recognize a face. As a result, humans have social interactions programmed into cells of the amygdala, such that an angry face can convey danger, resulting in a fight-or-flight response. Cardiovascular and other autonomic parameters of emotion are monitored simultaneously. Her experiments reveal the real-time dynamic interaction of multiple systems implicated in emotion regulation, as well as the mechanisms by which emotional responses result in immediate behavioral effects.

WITH THANKS:

Honoring Dr. Anne E. ‘Betty’ Atwater

Intrigued by the biomechanics of human movement – from synchronized swimming to pitching a baseball – Professor Emerita Betty Atwater, PhD, has devoted her career to researching and teaching physiology.

In 2014, Dr. Atwater established an undergraduate scholarship fund to help cover tuition costs for students who share her fascination with how the body works.

“Even for those students who aren’t going into medicine or other health fields, an understanding of physiology is still good to have,” she said. “You can understand what your doctor is talking about. That can be of help to you and the people close to you.”

With a PhD in kinesiology and biomechanics from the University of Wisconsin, Dr. Atwater came to the UA in 1969 as associate professor of physical education. From 1991 to 2003, she served as director of the School of Health Professions. In 1991, the physiology undergraduate major was established, and in 1995, the exercise sciences portion of the school joined the Department of Physiology.

From 1995 until her retirement in 2003, Dr. Atwater was associate head of physiology and director of the physiology undergraduate major program.

“Betty Atwater has guided this program with a love and respect for this field that always came across to her students and the faculty,” said Nicholas Delamere, PhD, head of the Department of Physiology. “She kept the enthusiasm for this program going.”



Anne “Betty” Atwater, PhD, and Physiology Department Head **Nicholas Delamere, PhD**

Psychiatry

The University of Arizona Department of Psychiatry is dedicated to finding new approaches to treating mental illness and raising awareness of the need for timely and effective behavioral health care. Outpatient services are offered at the two Banner – University Medical Centers in Tucson, and at the Southern Arizona Veterans Administration Hospital, with inpatient services offered at Banner – University Medical Center South and the VA Hospital. The department sponsors two fully accredited residency programs, a fellowship program in pediatric and adolescent psychiatry and a psychology internship program.



Kris Hanning, UAHS BioCommunications

William "Scott" Killgore, PhD

Neuropsychologist William "Scott" Killgore Joins Psychiatry

Clinical neuropsychologist William "Scott" Killgore, PhD, whose research focuses on understanding the brain systems involved in emotional processes and cognitive performance, was appointed professor in the Department of Psychiatry in July 2014. His groundbreaking work combines neuro-cognitive assessment with state-of-the-art neuro-imaging methods, including functional and structural MRI, to study the role of emotion in complex cognitive processes, such as moral judgment, decision-making and risk-taking. He also is interested in how these brain-behavior systems may be affected by environmental and lifestyle factors, such as insufficient sleep, physical activity and stimulants, such as caffeine. He also is studying methods for accelerating recovery from mild traumatic brain injury and post-traumatic stress disorder. His research involves collaborations with UA researchers in medical imaging, neuroscience and psychology.

Psychiatry Has Leading Role in Regional Behavioral Health Care

Under a new Regional Behavioral Health Authority (RBHA) contract finalized in December 2014, the Departments of Psychiatry and Family and Community Medicine are the lead providers of integrated behavioral and primary health care for the

more than 15,000 individuals in Southern Arizona who are living with serious mental illness. The contract, which went into effect Oct. 1, 2015, creates a new partnership between Banner University Medical Group and the behavioral health network Cenpatco of Arizona. The contract calls for inpatient and outpatient care, including 24/7 coverage at the Crisis Response Center adjacent to Banner – University Medical Center South.

An integral part of this new behavioral health model will be the Department of Psychiatry's EPICenter program, a collaboration of psychiatrists and psychologists to provide early identification of psychosis and personalized treatment for individuals ages 15 to 35, when most serious mental illness surfaces but often is misdiagnosed. EPICenter is expected to reduce the risk of mental illness interrupting anyone's life.



Dean Knuth

Psychiatry provides outpatient services at the Herbert K. Abrams Public Health Center, adjacent to Banner – University Medical Center South.

Psychiatry and UA Cancer Center Create Supportive Care for Healing Program

Psychiatry Professor Karen Weihs, MD, is founder of the Supportive Care for Healing Program for patients of the UA Cancer Center. Physicians with the UA Departments of Family and Community Medicine and Psychiatry work with a multidisciplinary team model that includes social work, nursing, nutrition, navigation, financial counseling and complementary treatment providers. This team works with the oncology disease-site teams to address the physical, psychosocial, emotional and



Karen Weihs, MD



Ole Thienhaus, MD, MBA, FACPsych, department head

spiritual issues that arise around diagnosis and treatment and into survivorship for patients and their loved ones.

In addition, a \$3.68 million National Cancer Institute grant is supporting a five-year study of emotion and depression in women with breast cancer. Dr. Weihs and co-principal investigator Annette Stanton, PhD, of UCLA's Jonsson Comprehensive Cancer Center, want to identify factors that will lead to high risk of depression for some women, while others cope more easily with the emotional distress that follows a diagnosis of cancer.

NIH Awards \$3.1 Million to Study Effects of Job Loss

In September 2014, Patricia Haynes, PhD, assistant professor of psychiatry and psychology and associate professor of public health, was awarded a five-year R01 grant from the National Heart, Lung and Blood Institute, to study obesity, sleep and other daily behaviors in people who have involuntarily lost their jobs. The study will be conducted in partnership with the Arizona Unemployment Insurance Administration and the UA Mel and Enid Zuckerman College of Public Health.

Insufficient sleep is known to increase risk of increased caloric intake and decreased physical activity. Stress also is an important factor for obesity, and stress and sleep deficiency exacerbate one

another; however, very little is known about how stress and sleep interact and manifest behaviorally. This research will contribute to our scientific understanding by providing data about the interrelationships between social rhythms, sleep and weight gain after involuntary job loss, a stressful life event that is disrupting to an individual's daily routine.



Patricia Haynes, PhD

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Killgore, William	A Nonpharmacologic Method for Enhancing Sleep in PTSD	United States Army Medical Research Acquisition Activity	\$3.82 M
Lane, Richard D	Typical Daily Emotion, Ischemia and Repolarization in Coronary Artery Disease	NHLBI	\$3.00 M
Killgore, William	A Model for Predicting Cognitive and Emotional Health from Structural and Functional Neurocircuitry Following Traumatic Brain Injury	United States Army Medical Research Acquisition Activity	\$1.89 M
Killgore, William	Bright Light Therapy for Treatment of Sleep Problems following Mild TBI	United States Army Medical Research Acquisition Activity	\$1.85 M

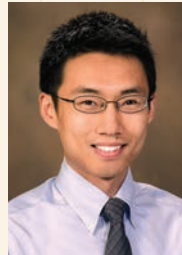
Radiation Oncology

The University of Arizona Department of Radiation Oncology provides personalized treatment conducted by an internationally renowned team of specialists. Under the leadership of Department Head Baldassarre “Dino” Stea, MD, PhD, FASTRO, the department strives to uphold the three pillars of the UA College of Medicine – Tucson’s mission: the highest-quality patient care, thorough resident education and training, and advanced research initiatives.

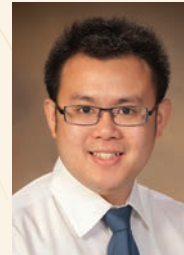
Recently, the department welcomed physicists Wen Li, PhD, and Junhan Pan, MD, along with medical residents Tijana Skrepnik, MD, and Justin Suszko, MD. Chief resident Michael Cheung, MD, has been a standout oncologist, alongside Joel Grow, MD, and Steven Sckolnik, MD – both of whom will take over as co-chief residents in 2016.



Wen Li, PhD



Junhan Pan, PhD



Michael Cheung, MD



Joel Grow, MD

Dr. Stea was the senior author on several research projects using multi-parametric MRIs to distinguish tumor re-growth from radiation necrosis, and he contributed to a paper authored by Daniel Persky, MD, on a treatment regimen for aggressive lymphomas for the medical journal, *Blood*. In addition, Dr. Stea was chosen from among the nation’s top radiation oncologists to

serve as a national board examiner at the annual American Board of Radiology’s upcoming board session.

The UA Department of Radiation Oncology is among the first to use Intra-Operative Radiation Therapy (IORT) as part of a safety and efficacy clinical trial for early-stage breast cancer. This is

an exciting new tool in the fight against breast cancer. The department also is preparing to launch a Phase III clinical trial to treat high-risk prostate cancer, alongside its active trials targeting brain, esophageal and liver cancers.



Baldassarre “Dino” Stea, MD, PhD, FASTRO, and year-four radiation oncology resident Joel Grow, MD, analyze tumor images.



Steven Sckolnik, MD, demonstrates the kind of precision, non-invasive radiotherapy treatment available at the UA Department of Radiation Oncology with radiation therapist, Amber Labbe.

Resident Aiming for ‘Paradigm Shift in Radiation Community’

Two things drew Steven Sckolnik, MD, to the University of Arizona: the chance to further his cutting-edge research and the opportunity to root for Arizona’s basketball team. Interestingly, both medicine and basketball appeal to Dr. Sckolnik for similar reasons. Both require teamwork, collaboration and trust to succeed.

“At the University of Arizona, you have specialists in every field and you’re on a first-name basis with your referring doctors,” Dr. Sckolnik said. “You’re often collaborating with internationally renowned scientists, which forces you to approach your own research from angles you might not have previously considered.”

A Phoenix native, Dr. Sckolnik obtained his undergraduate degree from Northwestern University and attended medical school at the UA from 2007-11. He is in the fourth year of

the Department of Radiation Oncology’s five-year residency program and hopes to make Tucson his long-term home. He decided to pursue cancer care in large part due to the unique long-term relationships doctors can form with their patients.

In 2014, Dr. Sckolnik won the 56th Annual ASTRO Meeting Resident Poster Viewing Award in the clinical category for his abstract titled, “Frameless LINAC Image Guided Radiosurgery for Primary and Recurrent Trigeminal Neuralgia.” Trigeminal neuralgia is a devastating nerve disorder that results in sharp pains running across the patient’s face. “It’s often been described as feeling like an ice pick,” Dr. Sckolnik said. Treatment for this disease involves a lengthy, complicated framing process, coupled with doses of radiation. Dr. Sckolnik’s research is helping lead the way toward a “frameless” procedure that is much simpler, much more effective and with far fewer side effects for sufferers of trigeminal neuralgia.

“We hope for this to become a paradigm shift in the radiation community,” Dr. Sckolnik said.

Surgery

With more than 52 faculty members and nine divisions – abdominal transplantation, cardiothoracic surgery, general surgery, neurosurgery, reconstructive surgery, surgical oncology, trauma, critical care, burn and emergency surgery, urology and vascular surgery – the University of Arizona Department of Surgery is one of the largest multispecialty surgical groups in the state.

UA surgeons provide patient-focused, multidisciplinary care for complex cases in many specialty areas, including: robot-assisted heart and esophageal surgery; ventricular-assist heart devices; minimally invasive and laparoscopic procedures; neurosurgery; solid organ transplants; advanced surgical treatment of pancreatic, liver and upper gastrointestinal cancers; breast cancer; colorectal disease; urologic and pelvic floor disorders; integrated vascular surgery and diabetic wound care; trauma and burns; and metabolic and bariatric surgery.

The department offers residency programs in general surgery, neurosurgery, urology and vascular surgery. Its fellowship programs include cardiothoracic surgery, trauma/critical care, international trauma research, minimally invasive and bariatric surgery, spine surgery and vascular surgery.

UA surgeons not only are clinicians and educators, but also physician-scientists who are pioneering and advancing medical treatments. The department is home to basic science and clinical research laboratories, with programs in stem cells and regenerative medicine, diabetic wound care, human motion and fall prevention, breast cancer, traumatic injuries, donor organ preservation, prostate cancer and quality-of-life issues and survivorship. Department researchers collaborate with biomedical engineers, optical scientists and physicians from many other medical specialties to identify new solutions to current and future health-care challenges.



Leigh A. Neumayer, MD, MS

First Female Head of UA Surgery

Leigh A. Neumayer, MD, MS, internationally known for her expertise in breast cancer surgery and research, advocacy for women's health issues and leadership in surgical education, was named the UA Department of Surgery's first female chair and the Margaret E. and Fenton L. Maynard Endowed Chair in Breast Cancer Research in August 2014.

First in World Robot-Assisted LVAD Surgery

UA surgeons in September 2013 became the first in the world to implant a left ventricular assist heart device using the da Vinci surgical robot. A ventricular-assist device is implanted in the chest to pump blood for a dying heart while waiting for a heart transplant.

Study on Drug Treatment for Spinal Cord Injury

The UA Department of Surgery was selected in September 2014 to participate in an international multi-center clinical trial of a new investigational drug that could help people with acute spinal cord injuries (ASCI) experience less spinal cord damage and have improved function. Researchers are evaluating the safety and efficacy of an investigative new drug called SUN13837 to determine whether it can protect and regenerate the spinal nerves in ASCI patients.



Zain Khalpey, MD, and Annalisa Medina

Seeking a Bioartificial Solution to the Long Wait for Transplant

Research led by cardiothoracic surgeon Zain Khalpey, MD, PhD, FETCS, associate professor surgery, and Tony Marnell, chair for research in cardiothoracic surgery, focuses on reconditioning hearts and lungs that are deemed unsuitable for transplant and making them transplantable. He has been creating "ghost" (decellularized) hearts and lungs so that nothing but the organ's matrix – essentially its skeleton – remains, and then seeds the organs with stem cells. The organs next are regenerated inside a special bioreactor developed by Dr. Khalpey in collaboration with NASA engineers (Synthecon). Every day, an estimated 18 people die waiting for transplants because of a shortage of donated organs. Dr. Khalpey's research aims to lead to new bioartificial options for people who now are not getting the transplants they need.

TOP RESEARCH GRANTS/AWARDS

Lead Investigator	Award Title	Sponsor	Total Amount
Krouse, Robert S	HR-QOL in Colorectal Cancer Survivors with Stomas	NCI	\$2.07 M
Larson, Douglas F	Blocking Hypertension by Regulatory T-Lymphocytes	NHLBI	\$1.48 M
Witte, Marlys H	Short-Term Training to Increase the Diversity Pipeline in Heart/Lung/Blood Research	NHLBI	\$1.18 M
Okeeffe, Terence S	Pragmatic, Randomized Optimal Platelets and Plasma Ratios (PROPPR)	NCI/University of Texas Health Science Center at Houston	\$1.14 M
Witte, Marlys H	Translating Translation and Scientific Questioning in the Global K-12 Community	NIH	\$1.13 M

Burn Care Program Expands

The UA Department of Surgery in December 2014 expanded its Burn Care Program with the opening of a new state-of-the-art hydrotherapy room that provides new capacity to treat burn



Gary Vercruyse, MD

patients from Southern Arizona. With enhanced capabilities, seriously injured patients may remain in Tucson for trauma burn care and follow-up treatment, instead of being transported to Maricopa Burn Center in Phoenix.

New Technology Research to Improve Islet Transplantation

Klearchos Papas, PhD, professor of surgery in the Division of Abdominal Transplantation and

scientific director of the Institute for Cellular Transplantation, was awarded in September 2013 more than \$500,000 as part of a \$2.7 million Small Business Innovation Research (SBIR) Phase IIB (clinical translation) collaborative grant for a study on new technology to improve islet transplantation for patients with type 1 diabetes. Dr. Papas is working on a new cell purification process that preferentially (selectively) magnetizes the islet clusters in pancreatic tissue and uses powerful magnets to separate those



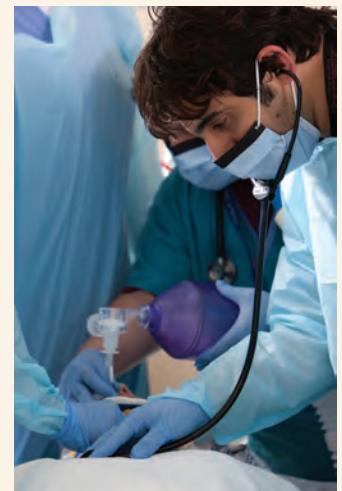
Klearchos Papas, PhD

clusters from other cells, increasing the number of viable islet cells that can be used for transplant.

In September 2014, Dr. Papas also received \$500,000, as part of a \$2 million NIH/NDDK Phase IIB SBIR (clinical translation) grant in collaboration with Giner, Inc., for his research on pancreas preservation prior to islet isolation and transplantation. Dr. Papas is co-principal investigator, with Linda Tempelman, PhD, director of biomedical research and development for Giner. This technology not only could preserve and transport pancreata used to isolate and purify islet cells, but also other organs, allowing for more critically needed transplants.

UA Surgery Research: Aggressive Treatment for Gunshot Wounds Increases Survival

Nine of 10 people with gunshot wounds to the brain usually die. University of Arizona trauma surgeons, using a new aggressive resuscitation protocol for patients with gunshot head injuries, have increased survival to nearly five of 10 patients, according to a study published in *The American Journal of Surgery* in January 2014.



Bellal Joseph, MD

Military reports on the use of aggressive operative procedures for gunshot wounds to the brain have shown higher survival rates, said Bellal Joseph, MD, UA assistant professor of surgery and the study's lead author. Peter M. Rhee, MD, professor and chief of the UA Division of Trauma, Critical Care, Burn and Emergency Surgery, and the study's senior author, used this aggressive management protocol while serving as a military trauma surgeon in Iraq and Afghanistan. Drawing from Dr. Rhee's experience, UA researchers in 2008 began aggressively resuscitating all patients with gunshot wounds to the brain regardless of the severity of the injury.

"After starting the new resuscitation methods, the survival rates started to improve immediately. There was an increase year after year and during the last year of the study, 46 percent of those patients survived," Dr. Joseph said.



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