These are exciting times in the Department of Biological Sciences at UT, with changes and new faces in both senior leadership at the University and the department.

In July 2016, Dr. Andrew Hsu was named Provost, and we are eager to work with both President Sharon Gaber and Provost Hsu as the new Strategic Plan is finalized and implemented. Biological Sciences is well positioned to make significant contributions toward UT’s overall strategic goals in the coming years. The President has identified research excellence and scholarship as major priorities, and both are at the core of our undergraduate and graduate programs. We strongly believe that research and scholarship energize teaching at all levels.

We welcomed several new members to the department, and said goodbye to a few old friends. In August 2015, Dr. Heather Conti joined our faculty from the University of Pittsburgh. Heather studies oral immunity, focusing on fungal infections of the mouth in patients with compromised immune systems, especially cancer patients undergoing radiation therapy or chemotherapy.

In January 2016, Dr. Qian Chen joined our faculty from Yale University. Qian studies cell division, focusing on the role of the actin cytoskeleton in cytokinesis.

In August 2016, Dr. Scott Crawley from Vanderbilt University and Dr. Jianyang Du from the University of Iowa/HHMI joined our faculty. Scott studies the development of intestinal microvilli and has focused on the protein complexes that link neighboring microvilli to maintain their orderly arrangement, critical for proper nutrient uptake. Jianyang studies neurotransmission, focusing on the role of protons at synapses within the neuronal circuitry governing fear and anxiety. These four new Assistant Professors bring boundless energy and are already well integrated into the research and teaching life of the department.

Amanda Seabolt-Martin also recently joined the department as Academic Adviser. She meets the advising needs of more than 650 Biological Sciences majors, yet still finds time to coordinate our two undergraduate student organizations (Tri-Beta and BUGS), and contribute to the department in many other crucial ways. Finally, Sheila Willis has just accepted a Business Services Officer position within the department. Welcome, Sheila!

Sadly, we must say goodbye to Dr. Douglas Leaman, Professor and former Department Chair, who has accepted a Dean’s position at Wright State’s College of Science and Mathematics. Congratulations, Doug! We must also bid farewell to Donna Braswell, our Business Services Officer, Donna is moving up to take a college-level BSO position. The department thanks Donna for many years of invaluable service and wishes her all the best in her future endeavors. Finally, we celebrate the retirements of Patsy Komuniecki and Rick Komuniecki, two longtime faculty members whose vision and hard work have profoundly shaped our department. Patsy became a full Professor in 1994 with a highly productive research program, and has served in numerous other roles, including Director of the Salford Exchange Program, Chair of Biological Sciences, Associate Dean in the former College of Arts and Sciences, Dean of the College of Graduate Studies and Vice Provost for Graduate Affairs, garnering many honors and awards along the way. Rick Komuniecki earned the rank of Distinguished University Professor in 1998, and leaves a 35-year legacy of outstanding research, teaching and mentoring students, post-docs and junior faculty. Rick’s distinctions include holding the Joan L. and Julius H. Jacobsen II Professorship in Biomedical Sciences, twice chairing the NIH Tropical Medicine study section, serving as Editor of Molecular and Biochemical Parasitology and winning the Henry Baldwin Medal from the American Society of Parasitology. Fortunately for us, Rick maintains an active presence in the department, and still runs a productive research program. Rick is always willing to provide his expert advice to faculty and students alike, and we hope he will stick around for a long time!

In terms of professional development, congratulations are due to Dr. Tomer Avidor-Reiss, who was awarded tenure beginning in 2015, and Dr. Malathi Krishnamurthy, who was promoted to
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Associate Professor with tenure beginning in 2016.
The past two years have seen tremendous success in Biological Sciences. In faculty research, we have made significant contributions in the fields of cancer cell growth and regulation, virus biology and innate immune mechanisms, male infertility, nervous system development and signaling, and the discovery of novel antiparasitic drugs. We have published numerous papers in high-profile journals, and we have brought in external funding from Ohio Cancer Research, NSF, NIH, USDA and Ohio 3rd Frontier (detailed below). Several of our faculty are also pursuing research commercialization with an eye toward local job creation and strengthening the Ohio biotechnology industry.
We continue to enjoy strong enrollment in our undergraduate programs, with nearly 700 majors in 2016. Many of these include pre-med students, and Biological Sciences enjoys considerable success placing qualified students in medical schools.
Finally, our BA and Medical Technology degree programs are also experiencing robust growth and contributing significantly to student job placement upon graduation. We look forward to even more success in the next few years as we expand our research programs, and explore innovative teaching strategies and training programs for our students.

New faculty members

**DR. HEATHER CONTI**

Dr. Heather Conti started in the Department of Biological Sciences at The University of Toledo in fall 2015 after a post-doc at the University of Pittsburgh’s School of Medicine in the Division of Rheumatology and Clinical Immunology.

Dr. Conti studies the immune response to opportunistic oral fungal infections caused by the commensal *Candida albicans*. Her interest in oral immunity began as a student at the University at Buffalo School of Dental Medicine, where she studied the role of pro-inflammatory cytokine, interleukin-17 (IL-17), in protection against oral candidiasis using a mouse model of disease. IL-17 is pathogenic in autoimmune disorders, but is protective against oral candidiasis. Her group described the role for OEC-specific IL-17RA expression in oral candidiasis, culminating in a recent manuscript accepted by the high-impact journal *Cell Host & Microbe*. Dr. Conti is also interested in the pathogenic role of IL-17 in the oral cavity during oral mucositis, which is the damage to the mucosa caused by chemotherapy and radiotherapy. The work investigating IL-17 in a mouse model of oral mucositis induced by head-neck irradiation is funded through a grant from Ohio Cancer Research.

**DR. QIAN CHEN**

Dr. Qian Chen started in the Department of Biological Sciences at The University of Toledo in winter 2016 after a post-doctoral position at Yale University. Dr. Chen’s primary area of interest is in the role of the Actin cytoskeleton in cell division. Specifically, his research goal is to understand the molecular mechanism governing cell division. A cell divides by duplicating its contents, then separating itself into two daughter cells, one of the most important processes in biology! Hundreds of different molecules participate in cell division through many signaling pathways. His lab is primarily focused on studying the last stage of cell division, cytokinesis, where two daughter cells physically separate from each other. Failure of cytokinesis leads to multiploid cells and cancer in humans.

Dr. Chen uses the fission yeast, *Schizosaccharomyces pombe*, as his model, and the cell division processes occurring within this organism are very similar to those of human cells. He employs yeast genetics, fluorescence microscopy, quantitative image analysis and protein biochemistry in his work. He is currently pursuing three lines of research to answer major questions regarding cell division:
1) How does a dividing cell initiate cytokinesis?
2) How does a cell assemble the cytokinetic machinery from millions of molecules?
3) How does the cytokinetic machinery disassemble at the end of cell division? To answer the first question, he is examining the role played by a conserved signaling mechanism, the Hippo tumor suppressor pathway. To answer the second question, he is studying the assembly of two cellular structures required for cytokinesis, the contractile ring and the cleavage furrow. To answer the third question, he is identifying the mechanism by which the turnover of actin, a key component of the cytokinetic machinery, is regulated during cell division.
**IN THE NEWS**

**COLLEGE OF NATURAL SCIENCES AND MATHEMATICS • DEPARTMENT OF BIOLOGICAL SCIENCES**

**DR. WILLIAM SCOTT CRAWLEY**

Dr. William Scott Crawley started in the Department of Biological Sciences at The University of Toledo in August 2016 after a post-doctoral position at Vanderbilt University. Dr. Crawley’s lab explores how cells in a person’s body create and maintain their unique shapes. It has long been known that the shape of a cell is often intimately linked with its physiological function. A striking example of this can be seen with the epithelial cells that line your intestinal tract. These cells, known as enterocytes, are responsible for absorbing nutrients from the food you eat. To do this, enterocytes form hundreds of finger-like membrane protrusions known as microvilli, which are specifically enriched in nutrient-transporting enzymes. The presence of microvilli maximizes the surface area of the enterocyte to increase the efficiency of nutrient absorption. Together, all of these microvilli on the enterocyte cell surface resemble a scrub brush; hence, the common name of this structure: the brush border.

Presently, Dr. Crawley is trying to understand how enterocytes change their shape to create the brush border. He is particularly interested in how defects in this process result in human disease. To investigate these questions, his team uses a diverse array of techniques, including molecular biology, genetics, structural biology and high-resolution cellular imaging. The long-term goal is to understand the fundamental aspects of how epithelial cells found throughout your body create their unique shapes. Furthermore, Dr. Crawley wishes to translate this knowledge into practical therapeutics for individuals with genetic diseases that perturb this biology.

**DR. JIANYANG DU**

Dr. Jianyang Du started in the Department of Biological Sciences at The University of Toledo in August 2016, after completing post-doctoral work at the University of Iowa/Howard Hughes Medical Institute.

Dr. Du’s long-term goal is to understand how protons regulate brain circuits and behaviors. Ultimately, this focus will significantly impact the field of neuroscience, and lead to the development of novel therapeutic targets for treating emotional disorders such as anxiety, depression, post-traumatic stress disorder (PTSD) and schizophrenia.

Currently, Dr. Du is addressing three fundamental questions: 1) How do protons function as a neurotransmitter to control synaptic transmission in the brain? 2) How do protons amend and reshape neural circuits? 3) Can protons and their receptors function as a new therapeutic target for the treatment of neurological illnesses? Addressing the first question in a multidisciplinary fashion will significantly contribute to the understanding of neurotransmission and the potential roles of protons. Answering the second question will address one of the fundamental issues in neuroscience, which is to understand how neural circuits drive and modify behaviors. Exploring the role of protons in neural circuits will provide important insight into this complex and challenging area. Studying the third question will shed light on the properties of proton receptors. The major proton receptors, the ASIC ion channels, appear to be involved in many neuronal diseases, including anxiety, depression, seizure, stroke and Parkinson’s disease. Developing therapeutics targeting proton signaling may significantly benefit many individuals and improve the quality of life for countless people.

**Recently tenured faculty members**

**DR. TOMER AVIDOR-REISS**

Dr. Tomer Avidor-Reiss joined our department as Associate Professor in 2012. He was awarded tenure in 2015. His major area of research examines the role of centrioles and cilia in fertility, development and other biological functions.

We humans start our life as a single cell produced when the sperm fertilizes the egg. This cell contains all the information to create a human made of trillions of cells. Most of these cells must have two structures known as the centrioles, which are essential for building the cell’s antenna (the cilium) and organizing the cell skeleton (cytoskeleton), as well as for proper cell division. How the first cell acquired its two centrioles is a mystery and a focus of Dr. Avidor-Reiss’ research.

The egg does not provide centrioles, so centrioles originate from the sperm of the father. However, the sperm is thought to possess only a single centriole, which implies the newly fertilized egg also will possess only a single centriole. Somehow, the fertilized egg gains a second centriole before it divides, but the origin of this second centriole is mysterious because new centrioles are formed only during cell division. Using fruit flies (Drosophila melanogaster) as a model animal, Dr. Avidor-Reiss’ team has discovered that the sperm contains a new type of centriole that may solve this mystery. They named this atypical centriole the “Proximal Centriole Like,” or PCL.

Recently, they found that the PCL is much...
Recent faculty continued from page 3.

smaller and quite different in its morphology from the canonical centriole, explaining why it was not discovered previously. They hypothesize that the PCL matures into the “missing” second centriole, and that a similar PCL-like structure is present in the sperm of other animals, including humans. Dr. Avidor-Reiss and his team are currently searching for PCL-like structures in humans and other animals. This work is significant, as this atypical centriole may help provide an explanation for why some embryos develop abnormally. Furthermore, it may help explain why some couples are infertile even though the reason behind the infertility is unclear. This work might lead to a treatment for infertility.

In memoriam

DR. CHARLES CREUTZ

The department mourns the loss of our good friend and colleague, Charles Creutz.

Dr. Creutz joined The University of Toledo in 1971 after earning his PhD at the University of Pennsylvania. He retired from UT in 2010. During that year, Dr. Creutz was honored with membership to the UT Emeritus Faculty.

Dr. Creutz was a dedicated teacher, illustrated by the fact that he continued to teach until 2012. He cared a great deal about our students, making sure they really learned the material he was teaching. Dr. Creutz was honored multiple times as a Master Teacher at UT, and earned UT’s Outstanding Teacher Award.

In addition to his excellent teaching skills, Dr. Creutz was also a teaching innovator. He pioneered the Writing Across the Curriculum course, shaping it into the form used today in the Department of Biological Sciences. He also was one of the first professors in the department to use computer-aided instruction, and served as a teaching mentor to junior faculty. Charlie, you will be sorely missed.

DR. MALATHI KRISHNAMURTHY

Dr. Malathi Krishnamurthy joined the Department of Biological Sciences at The University of Toledo in 2011 as Assistant Professor. In 2016, she was awarded tenure and promotion to Associate Professor.

Research in Dr. Krishnamurthy’s lab focuses on host responses during viral infections. The innate immune pathway is the first line of defense against viruses, and functions to limit viral replication and spread. Pattern-Recognition Receptors recognize conserved microbial features (Pathogen-associated Molecular Patterns) and provide signals to initiate immune responses by producing type-I interferons and cytokines. Ribonuclease L (RNase L) is a regulated endoribonuclease that is activated during viral infections via the interferon pathway. RNase L activity generates small, duplex RNAs (sdRNAs) that initiate cellular signaling pathways to amplify interferon production, promote inflammasome activation and promote the switch from autophagy to apoptosis. Studies in Dr. Krishnamurthy’s lab are aimed at investigating how the sdRNAs produced by RNase L cleavage of viral and cellular RNAs initiate cellular defense pathways. She is also examining the expanding roles of RNase L in innate immunity. Her recent studies identified a novel role of RNase L, independent of its nucleolytic activity, in regulating viral entry by modulating actin dynamics. Her future studies will address the nuclease-independent role of RNase L in restricting a broad range of viral infections in different cell types.

Interestingly, the RNase L gene (RNASEL) has been identified as a Hereditary Prostate Cancer (HPC) susceptibility gene, and her studies have identified a novel role of RNase L as a tumor suppressor by regulating androgen signaling and cell migration.
Medical technology program grows

Recognizing a need to produce more medical laboratory scientists due to a predicted, acute shortage, the UT/ProMedica Academic Affiliation has redefined, developed and established a Medical Technology/Medical Laboratory Science (MT/MLS) program at The University of Toledo.

Bob Tjan, past director of professional support at the former ProMedica St. Luke’s Hospital, and Catherine Shaffner, education coordinator of ProMedica Laboratories at the time, accepted the charge of developing the program in conjunction with the University’s Chairman of the Department of Biological Sciences at that time, Dr. Douglas Leaman, and MT/MLS adviser Dr. John Plenefisch.

UT became the program’s sponsoring institution, with UTMC and ProMedica laboratories serving as its clinical sites. The program is structured as a 3 + 1, university-based degree housed in the Department of Biological Sciences. The initial plan, which began in summer 2013, was to enroll up to 15 students into the clinical externship class each year. Students must apply to enter the clinical externship program during their fourth years of study. The classes are taught by a combination of UT professors and medical laboratory scientists. This program offers a great opportunity for laboratory employees from both affiliates to showcase their talents and dedication to the profession, while at the same time enriching their professional development.

With the retirement of Bob Tjan, the program is led by Catherine Shaffner, who brings much to the table. Shaffner was interim director of a similar program at Bowling Green State University has been involved with placements of medical technology students at ProMedica, and has served in roles with the same accrediting agency that examined UT’s program.

The program earned a five-year accreditation from the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) in April 2015, with a progress review upcoming in September 2017.

To date, the program has graduated three classes, with graduates passing certification exams within the first years of graduation and landing jobs at area hospitals. There also has been a significant growth in the number of students who have shown interest in the profession and declared medical technology as a major. The program has shown a steady increase, from a relatively small group of 12 initial students in 2013, to 61 currently declared MEDT majors.
Selected publications


Selected publications continued on page 7.


### Selected publications continued from page 6.

### Selected grants

**T. Avidor-Reiss:** The Mechanism of Pericentriolar Material Assembly During Centrosome Biogenesis, National Institutes of Health, $1,651,244

**T. Avidor-Reiss:** Quantitative Diagnosis of Sperm Quality, National Science Foundation, $50,000

**T. Avidor-Reiss:** A Genome-wide Drosophila RNAi Screen for Regulators of Centrosome Reduction, National Institutes of Health, $144,500

**B. Bamber:** New Anthelmintic Drugs for Veterinary Medicine, Ohio Third Frontier Technology Validation Startup Fund, $100,000

**B. Bamber:** Wormbusters: Improving Agricultural Yields, National Science Foundation I-Corps, $50,000

**D. Chadee:** Regulation of MLK3 by Oxidative Stress in Colon Cancer Cells, National Institutes of Health, $300,000

**H. Conti:** Pro-inflammatory Cytokines IL-23 and IL-17 in Radiotherapy-induced Oral Mucositis, Ohio Cancer Research, $60,000

**M. Diakonova:** Role of JAK2-PAK1 Interaction in Prolactin-dependent Signaling, National Institutes of Health, $1,080,000

**F. Dong:** ELANE and CSF3R Mutations in Severe Congenital Neutropenia, National Institutes of Health, $436,500

**J. Du:** Acid-sensing Ion Channel 1a Contributes to Synaptic Transmission and Plasticity in Ischemia, American Heart Association, $214,500

**R. Garcia-Mata:** RhoG Signaling during Invadopodia Formation, National Institutes of Health, $224,098

**R. Garcia-Mata:** Regulation of Invadopodia Formation by RhoG-specific GEFs and GAPs, National Institutes of Health, $279,940

**R. Garcia-Mata:** A Novel RhoG Protein Interaction Network in Invadopodia, National Institutes of Health, $100,000

**M. Krishnamurthy:** Novel Role of RNA Signaling in Cross-talk between Autophagy and Apoptosis, National Institutes of Health, $442,500

**R. Komuniecki and B. Bamber:** Locomotion in Parasitic Nematodes, National Institutes of Health, $235,000

**S. Leisner:** Analysis of Mechanisms Involved in Induction of Abiotic and Biotic Stress Tolerance in Horticulture Crops, U.S. Department of Agriculture, $100,000

**G. Liu:** Microtubule Dynamics in Axon Outgrowth and Guidance, National Institutes of Health, $432,000

**S-T. Liu:** TRIP13 AAA-ATPase Over-expression in Chromosomal Instability and Breast Cancer, National Institutes of Health, $1,224,252

**L. Shemshedini:** A Novel Nuclear Interaction between Androgen Receptor and TM4SF3, U.S. Department of Defense, $600,000

**W.R. Taylor:** Regulation of the Mitotic Checkpoint by Gsk3, National Institutes of Health, $442,500
Graduate student corner

CHRISTOPHER S. FLORA (PHD STUDENT)

The scientific method shapes our technologically advanced society, permitting us to understand reality. However, many factors affect our ability to conduct science quickly, efficiently and ethically. Some of these factors are out of our immediate control, such as government policy, funding and job opportunities. What can be done to encourage biologists to innovate in an ever-changing scientific environment? Graduate students and faculty within the Department of Biological Sciences formed the Biology Graduate Student Association (BGSA) and the Careers in Sciences Committee (CiS) to support young scientists in their studies and careers.

BGSA’s main goal is representation of graduate student opinion, and this organization works closely with the Biological Sciences Graduate Affairs Committee to address issues that influence the quality of our research environment. The BGSA is open to all graduate students, and meetings are held monthly to serve as open discussions about graduate student opinions and ideas.

CiS seeks to inform graduate and undergraduate students about careers in biological sciences that lie beyond academia. CiS accomplishes this by reaching out to biotechnology companies and by organizing a career fair. CiS also helps students create career networks. Students who join CiS shake hands with industry leaders, providing potential employment opportunities. By working with faculty, our students can pursue successful careers in the biological sciences, and ultimately improve the human condition.