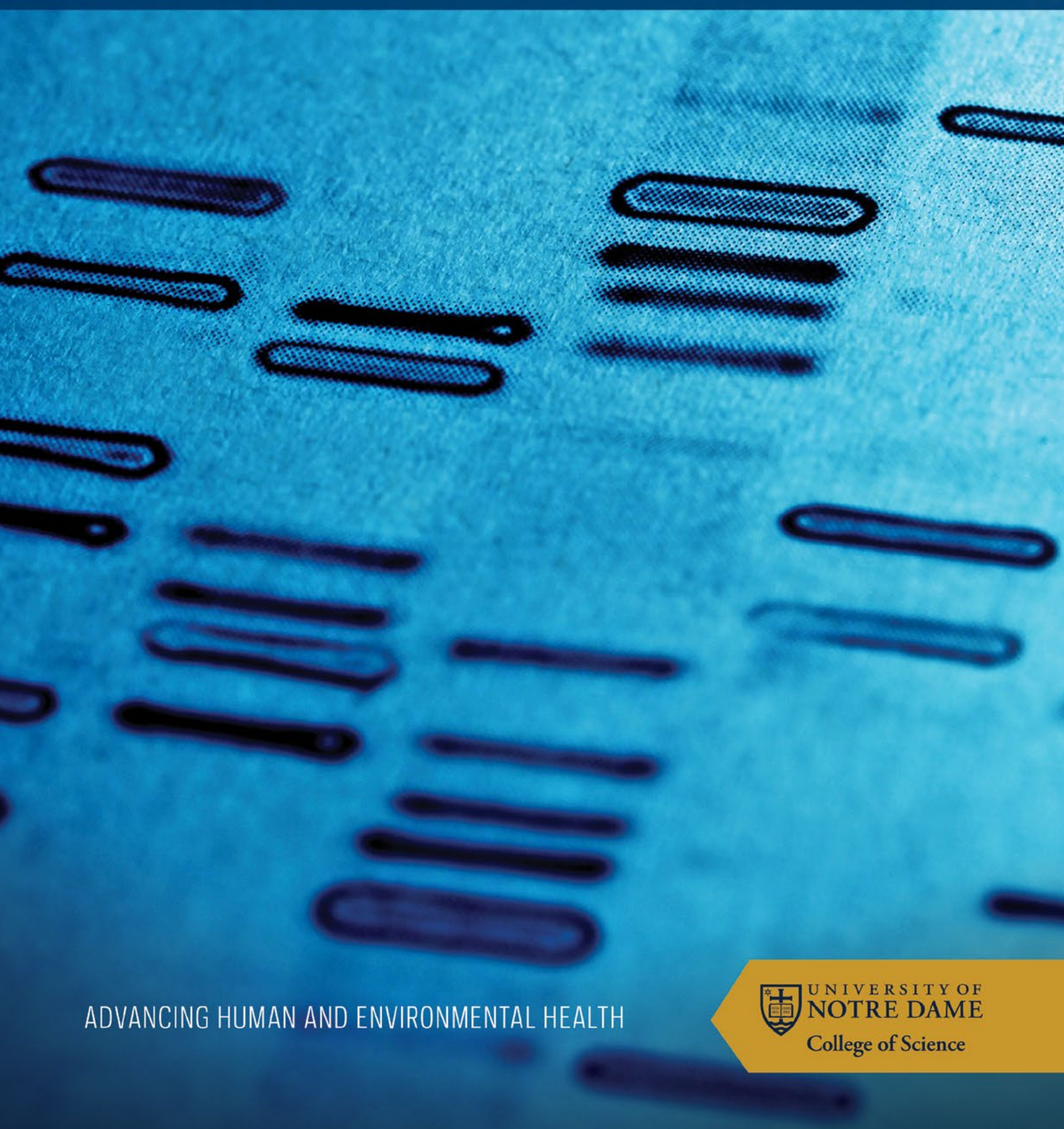




DEPARTMENT OF

BIOLOGICAL SCIENCES

||||| 2017-2018 ACADEMIC YEAR HIGHLIGHTS



ADVANCING HUMAN AND ENVIRONMENTAL HEALTH



UNIVERSITY OF
NOTRE DAME
College of Science

The Department of Biological Sciences at Notre Dame seeks to understand the fundamental mechanisms by which living systems operate, and employs a wide range of cutting edge and innovative experimental approaches and systems. The Department is highly interdisciplinary and well positioned to fulfill the promise of the new integrative approach to biology. Diverse disciplines and programs in the life sciences converge here to catalyze the development of new knowledge and groundbreaking ideas. Foundational research is at the center of our endeavors and fuels and inspires our teaching and training efforts.

Our overall mission is to conduct research at the forefront of 21st century integrative biology and to cultivate leaders who will make a difference to the future of human health and the environment. We continually strive for improvement through investments in our people; in growing and transforming our research enterprise; in enhancing our educational programs; in cultivating intramural and extramural partnerships; and in improving our operational efficiencies. We commit to ensuring diversity of all forms in the pursuit of excellence in learning and discovery.

DEPARTMENT LEADERSHIP

Crislyn D'Souza-Schorey
Pollard Professor and Department Chair

Nora Besansky
O'Hara Professor and Associate Department Chair

Michelle Whaley
Teaching Professor and Assistant Department Chair



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EVOLUTIONARY BIOLOGY
CANCER
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GLOBAL HEALTH
VECTOR-BORNE DISEASES
CELL BIOLOGY
ENTOMOLOGY
GENETICS & GENOMICS
DEVELOPMENT
MICROBIOLOGY & IMMUNOLOGY
ND
DEPARTMENT OF BIOLOGICAL SCIENCES

WELCOME ABOARD!

The Department of Biological Sciences welcomes the following new faculty in the coming academic year.



Ana Flores-Mireles

Ana Flores-Mireles joins the department as the Janet C. and Jeffrey A. Hawk Assistant Professor in Life Sciences. Dr. Flores-Mireles obtained her B.S. in Marine Biology from Autonomic University of Baja California in Sur, Mexico in 2002, and went on to complete an M.A. in Marine Biotechnology from the Northwest Center of Biological Research in Mexico. She received a Ph.D. in Microbiology from Cornell University in Ithaca, NY in 2011. Since 2012, she has been a postdoctoral researcher with Dr. Scott Hultgren at Washington University School of Medicine in St. Louis. Dr. Flores-Mireles is developing ways to block the adhering mechanisms in catheter-associated urinary tract bacterial infections, a common hospital-acquired infection



Cristian Koepfli

Cristian Koepfli joins the department as Assistant Professor in Biological Sciences, through the Global Health Strategic Research Initiative of the Eck Institute for Global Health (EIGH). Dr. Koepfli obtained his B.S. in Biology in 2005 from the University of Zurich, Switzerland, where he then completed an M.S. in Developmental Biology in 2006. He received a Ph.D. in Molecular Epidemiology at the Swiss Tropical and Public Health Institute (SwissTPH), Basel, in 2012. He completed postdoctoral training at the Walter and Eliza Hall Institute of Medical Research (WEHI) in Parkville, Australia with Dr. Ivo Mueller from 2012 – 2016. Since 2016, he has been working as an Assistant Project Scientist in the Program in Public Health at the University of California Irvine with Dr. Guiyun Yan. Dr. Koepfli's overall research interests are in the molecular epidemiology of malaria and the development of genetic markers for disease surveillance.



Felipe Santiago-Tirado

Felipe Santiago-Tirado joins the department as Assistant Professor in Biological Sciences. Dr. Santiago-Tirado obtained his B.S. in Industrial Biotechnology at the University of Puerto Rico at Mayagüez from 1997-2003. He earned his Ph.D. in Molecular and Cellular Biology from Cornell University in Ithaca, NY, conducting research on cell polarization with a world-renowned cell biologist, Anthony Bretscher. Since 2012, he has been conducting postdoctoral research in the laboratory of Tamara Doering at Washington University in St. Louis. Dr. Santiago-Tirado's research program focuses on the cell biology of the fungal pathogen, *C. neoformans*. His work has identified the mechanisms by which this pathogen manipulates the blood-brain barrier.

FACULTY PROMOTIONS



Nicole Achee; To Research Professor

Dr. Nicole Achee was recruited as Research Associate Professor in the Department of Biological Sciences and the Eck Institute for Global Health in 2013. Her research program focuses on the utilization of spatial repellents for control of vector-borne diseases. Dr. Achee is an international researcher. She was co-PI (with Dr. Neil Lobo) on a \$23,000,000 grant from the Bill and Melinda Gates Foundation. Dr. Achee completed her B.S. degree in Biology in 1992 at St. Louis University and M.S. degree in 1995 at Texas A&M University. She earned her Ph.D. at the Uniformed Services University of Health Sciences (USUHS). In 2007, she became a Research Assistant Professor at USUHS, and in 2009, moved into a tenure-track role as Assistant Professor at USUHS.



Michael Pfrender; To Professor

Dr. Michael Pfrender joined the Department of Biological Sciences at the University of Notre Dame as Associate Professor with tenure in 2009 and also assumed the role of Director of the Genomics Core Facility at Notre Dame. Dr. Pfrender's research program investigates the link between genes and the patterns of gene regulation that allow natural populations to fit into their habitats and respond to environmental change. Through this line of investigation and utilizing the crustacean, *Daphnia*, as a model system, Pfrender's laboratory has developed a suite of genomic tools that derive from foundational work in molecular genetics and adaptive evolution. Dr. Pfrender received his B.S and M.S. degrees in biological sciences from the University of Michigan at Ann Arbor and his Ph.D. in biology from the University of Oregon in 1998. He pursued postdoctoral training at Oregon State University and was appointed Assistant Professor in 2001 and then Associate Professor with tenure in 2007 in the Department of Biology at Utah State University.



Siyuan Zhang; To Associate Professor with Tenure

Dr. Siyuan Zhang was recruited as Assistant Professor of Biological Sciences and member of the Harper Cancer Research Institute in 2012. Dr. Zhang has developed a thriving research program which investigates how tumor cells and their microenvironments change over time. He subsequently leverages this knowledge to identify novel cancer therapeutics. Dr. Zhang holds an M.D. from Peking University Beijing, China and a Ph.D. in Cancer Biology National University of Singapore. After completing his Ph.D., he served for a year as a Research Associate in the Department of Community, Occupational and Family Medicine at the National University of Singapore. In 2007, he became a Postdoctoral Fellow and instructor in the Department of Molecular and Cellular Oncology at the University of Texas M.D. Anderson Cancer Center in Houston.



NOTRE DAME, THE BEAUTIFUL

TREE SURVEY MARKS 175 YEARS OF NATURAL BEAUTY AT NOTRE DAME

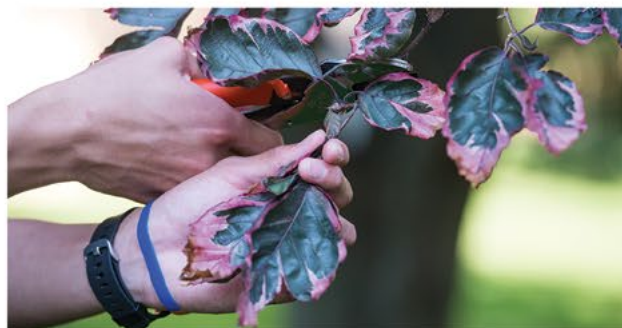
After trekking through the biting South Bend cold on Nov. 26, 1842, Rev. Edward Sorin, C.S.C., first laid eyes on the 524 acres bequeathed to the Congregation of Holy Cross to build a Catholic university. He admired its two lakes and surrounding forest and started planning his ideal landscape.

But taming this “savage wilderness,” as one newspaper account in 1844 described the property, was necessary in order to create the pedestrian-friendly, academic utopia Father Sorin envisioned.

The flora on campus remains integral to its beauty. As the 175th anniversary of the University’s founding approached, leaders of several administrative departments recognized the opportunity to expand the survey to include information on the condition of each planting, as well as the location of donor memorial tree plaques.

“This is one of the most comprehensive surveys of trees and plants on any campus,” said Ronald Hellenthal, Director of the Museum of Biodiversity and Biological Sciences Professor Emeritus. **“Notre Dame is certainly one of the first universities to develop a project of this magnitude.”**

Pictured above: Barb Hellenthal (second to left) and students



A gift to Landscape Services from Tom and Lucy Korth for campus beautification made the data collection process possible by covering the cost for summer undergraduate researchers.

Rev. P.E. Hebert, C.S.C., completed the first survey of plantings on campus in 1966, listing 482 trees, vines and shrubs and documenting 2,380 different plant locations. The second survey was completed in 1992 as part of the 150th anniversary of the University’s founding.

During that survey, Barbara Hellenthal, associate professional specialist of Biological Sciences and curator of the Museum of Biodiversity, along with students working under her direction, updated and expanded upon the information collected by Father Hebert. They documented 4,782 plant locations that survey, which was the basis for the book *“Trees, Shrubs and Vines on the University of Notre Dame Campus”* published by the University of Notre Dame Press in 1993.

The most recent survey began in May 2016. Each rain-free morning for two summers, Barbara Hellenthal and her student assistants, Stacie Skwarcan, now a fifth-year student, junior Justin Peek and sophomore Ben Dowd, filed out of the Museum of Biodiversity in Jordan Hall carrying clipboards, resealable plastic bags, tape measures, a camera, GPS recorders and clinometers — instruments used to measure tree height.

The students snipped small samples of twigs, flowers or fruits from shrubs or trees, placing them in the plastic bags for further identification back in the museum. There they combed through botanical books with Barbara Hellenthal to pinpoint the precise species and variety. Sometimes the group compared its samples with specimens already stored in the floor-to-ceiling cabinets that contain the 213,000-specimen Greene-Nieuwland Herbarium. The collected campus plant samples were then dried, mounted and integrated into the museum's herbarium collection for future reference.

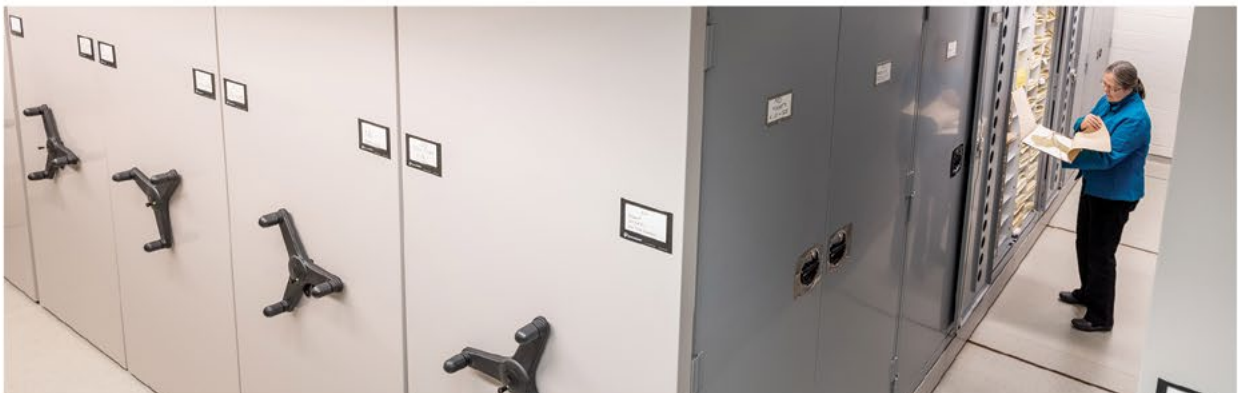
Completing the survey gave the students an appreciation for the diversity of plants around campus, some of which they learned are edible. During one recording trek, Peek plucked a blue-black berry off an apple serviceberry tree and popped it in his mouth. The tree, which blooms with white flowers in the spring, isn't native to South Bend but tolerates its severe winters well. "These are good, and there are quite a few around campus too," he noted, adding that sometimes the team had to dodge cedar waxwings that flocked to the trees' fruit.



After the team recorded each tree, plant and vine, they entered all the information into a database. Ron Hellenthal converted their data into protocols used by the University's work-order system, called AiM, while Woolley and Dana Schrader, a business intelligence analyst in the Office of Information Technology, worked together to develop Tableau reports to turn the data into accessible, visual information.

Because GPS information is occasionally inaccurate, Barbara Hellenthal and the students then verified several entries using Google Earth and compared that with the University's GPS benchmarks. Knowing the exact location of trees is important when making campus landscaping and management decisions that include preserving, relocating or removing trees during building construction.

In all, the 2016-17 campus tree survey yielded more than 10,000 plantings. This information will be included in a new publication that will expand and update Hellenthal's out-of-print 1993 book.



Adapted from the original article by Deanna Csomo McCool

Many faculty in the department of Biological Sciences lead in their disciplines through scholarship. Here is a sampling of faculty and student accomplishments and honors in the past academic year.



Mapping the burden of cholera in sub-Saharan Africa.

Sean Moore, Research Assistant Professor in the Department of Biological Sciences and his colleagues published a paper in *The Lancet* on March 1, 2018. The study mapped the incidence of cholera in Africa, which will enable targeted intervention strategies to control and elimination cholera in high-incidence areas. Moore and his colleagues concluded that, given limited access to the cholera vaccine, targeting districts that account for less than 4 percent of the population could eliminate half the cholera in the region.

As climate changes, so could the genes of the Eastern tiger swallowtail butterfly

A collaborative study, led by **Sean Ryan**, graduate student and co-authored by Biological Sciences faculty, **Michael Pfrender, Stuart Jones and Jessica Hellmann** (now at Minnesota) was published in the *Proceedings of the National Academy of Sciences*. The study examines the movement of two species of tiger swallowtail butterflies over a 32-year period in the hybrid zone, the geographic region where the two species mate. The study found that climate fluctuations can influence the geographic range of a species as well as affect the evolutionary trajectories of interbreeding species.



Researchers discover novel mechanism linking changes in mitochondria to cancer cell death

A study published in *Nature Cell Biology* by **Zachary Schafer**, Coleman Foundation Associate Professor of Cancer Biology, and colleagues found that the enzyme RIPK1 can decrease the number of mitochondria in the cell, creating an oxidative stress that can potentially kill cancer cells. The team hopes to design strategies to determine which cancer types are most vulnerable to this approach, with the ultimate goal of halting cancer metastasis.





New study finds mycobacteria can sense presence of proteins that cause disease

A new study published by **Patricia Champion**, Associate Professor of Biological Sciences and her colleagues, in the *Proceedings of the National Academy of Sciences*, reveals that TB-causing mycobacteria can sense the presence of molecular machines, a microscopic gateway that promotes the survival of bacteria in the host. This discovery may assist researchers in identifying ways to hinder the ability of mycobacteria in cause disease and ultimately assist in treating infections.

The Power of Computational Modeling to Combat Diseases

Alex Perkins, Eck Family Assistant Professor in the Department of Biological Sciences, and a member of the Eck Institute for Global Health, published a recent "Commentary" in the *Proceedings of the National Academy of Sciences* (PNAS) on his perspective on the Zika epidemic of 2016, and the lab's use of computational models to determine the timeline and spread of the disease.



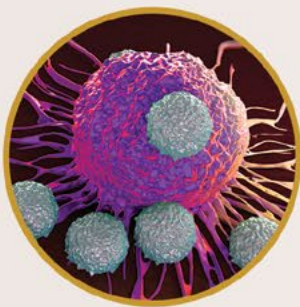
Jennifer Tank elected President of the Society for Freshwater Science

In May, 2018, **Jennifer Tank**, Galla Professor in the Department of Biological Sciences at the University of Notre Dame and director of the Environmental Change Initiative, began her year as president of the Society for Freshwater Science (SFS). The SFS is an international scientific organization serving to promote further understanding of freshwater ecosystems, as well as those ecosystems at the interface of aquatic and terrestrial habitats

Joyce Awards

Two biological sciences faculty members were among a group of twenty faculty campus-wide recognized by the Office of the Provost with the Rev. Edmund P. Joyce, C.S.C., Awards for Excellence in Undergraduate Teaching. **T. Mark Olsen**, Associate Teaching Professor, and **Kevin Vaughan**, Associate Professor, as well as all recipients, were selected for the Joyce awards through a process that includes peer and student nominations.



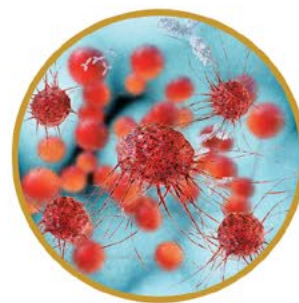


Undergraduate students spend summer conducting cancer research at MD Anderson

Two students from biological sciences, **Colin Sheehan** and **Shane Davitt**, were among the participants in a 10-week program completing undergraduate research projects at MD Anderson Cancer Center in Houston, Texas. The UND Summer Undergraduate Research Program at MD Anderson is a competitive program designed for outstanding and highly motivated undergraduate students interested in pursuing a career in cancer research. Sheehan is a junior biological sciences major and pursues research in the laboratory of Crislyn D'Souza-Schorey. He worked in the Department of Cancer Systems Imaging at MD Anderson. Davitt, also a junior in biological sciences, and in the laboratory of Siyuan Zhang, studied tumor-mediated immune responses in MD Anderson's Clinical Cancer Prevention-Research Department.

Biological Sciences graduate student selected to attend National Graduate Student Symposium at St. Jude Children's Research Hospital

Mark Hawk was one of 41 students selected from more than 1500 applicants. The Symposium is held for the nation's top Ph.D. students to present their work and learn more about St. Jude's advanced research and facilities, which is located in Memphis, Tenn. A member of Zachary Schafer's lab, Hawk's research, which was recently published in *Nature Cell Biology*, focuses on how cancer cells avoid cell death during extracellular matrix (ECM)-detachment.



FORMER DEPUTY DIRECTOR OF PRESIDENT'S MALARIA INITIATIVE LEADS ECK INSTITUTE FOR GLOBAL HEALTH

Bernard Nahlen, former deputy director of the President's Malaria Initiative, joined the University of Notre Dame as Professor of Biological Sciences in the College of Science and Director of the Eck Institute for Global Health.

In addition to his extensive experience serving the PMI, Nahlen's career, which began as an undergraduate at Notre Dame, has been committed to recognizing health as a fundamental human right and serving those most in need. A medical school graduate of the University of Arkansas, Little Rock, he completed his residency in family practice at the University of California, San Francisco, as well as a second residency in preventive medicine at the Centers for Disease Control and Prevention (CDC). His career has been spent working to address the many diseases that disproportionately impact people in low- and middle-income countries, including AIDS, malaria and tuberculosis.



Bernard Nahlen

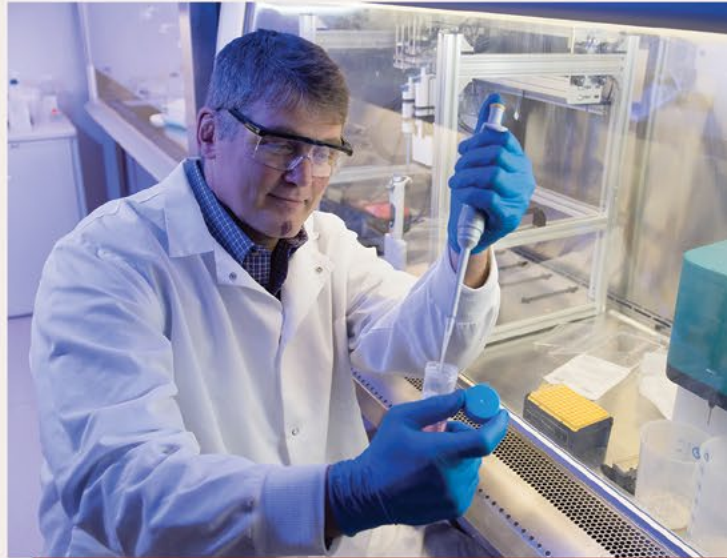
COMBATING DRUG RESISTANCE IN MALARIA

The World Health Organization (WHO) recognizes malaria as a major global health threat that disproportionately affects middle- and low-income countries. Malaria is preventable and curable, and the widespread use of the drug artemisinin (ART) has been a key factor in significant reductions in infections and death. However, a recent rise in resistance to ART in Southeast Asia poses an imminent risk to ongoing global efforts to combat malaria.

The spread of resistant strains to sub-Saharan Africa, where malaria remains endemic, with the highest mortality rates worldwide, would have devastating impact. Such catastrophic drug failure would replicate a similar disaster seen in the late '50s and early '60s with the drug chloroquine (CQ).

University of Notre Dame biologist **Michael Ferdig, Ph.D.**, is leading a new \$11.5 million program project (PO1) grant from the National Institutes of Health (NIH). Ferdig and his team at Notre Dame are partnering with researchers at the Center for Infectious Disease Research (CID Research) in Seattle and Texas Biomedical Research Institute (TBRI) to better understand the genes in the malaria parasite that are responsible for drug resistance and virulence in order to reduce and ultimately eliminate the often deadly disease.

Ferdig and his collaborators have outlined an innovative approach to study the single-celled malaria parasite *P. falciparum*. Their project titled "Harnessing The Power of Experimental Genetic Crosses and Systems Genetics to Probe Drug Resistance in Malaria" leverages their novel method for conducting experimental genetic crosses of the malaria parasite. A genetic cross is the result of breeding two different individuals, for instance, one parasite known for drug resistance and one known for drug sensitivity. The resulting offspring, individual siblings, inherit unique combinations of genes from each parent parasite, allowing researchers to identify the genes causing the drug resistance. This information can lead them to devise better methods to combat the parasite.



Mike Ferdig

Now, for the first time, it will be possible to generate crosses rapidly from emerging malaria outbreaks. Ferdig explains, "This will allow us to speed the rate of discovery using genetic crosses by up to ten-fold—we've generated more genetic crosses in the past three years than were generated in the 30 years prior. This positions us to catch drug resistance as it is emerging so that we can devise ways to stop it in its tracks."

The ultimate goal of this research program is to share methods, resources, and data with the broader malaria research community to enhance understanding of the genetic mechanisms of drug resistance and virulence. This effort will be enhanced by a Data Analysis Core centered at Notre Dame and led by Scott Emrich in Computer Science and Engineering. Ferdig says the successful execution of this grant will empower the field of malaria research and have a significant impact on the ability to combat malaria further positioning Notre Dame to be a leader in this area.



IN MEMORIAM

Professor Emeritus Morton S. Fuchs

Morton S. Fuchs, Professor Emeritus in the Department of Biological Sciences at the University of Notre Dame, died Dec. 31 in Surprise, Arizona, after a long illness. His career at Notre Dame spanned more than four decades and his influence can still be felt in the department.

Fuchs came to Notre Dame in 1966, initially as an Assistant Professor of Biology, eventually rising to Full Professor. From 1981 to 1984, Fuchs served as chair of the Department of Microbiology and in 1984 he accepted additional responsibilities as chair of the Department of Biology. The following year, Fuchs was instrumental in guiding the merger of the two departments into one, unified Department of Biological Sciences. In 2001, Fuchs earned emeritus status.

Fuchs was an internationally recognized expert in insect reproduction, especially on the reproduction of disease-carrying mosquitoes. An article he co-authored in 1975, which was published in the Proceedings of the National Academy of Sciences (*PNAS*) has been cited by researchers as recently as November 2017. He was a popular teacher of large undergraduate courses in genetics and introductory biology.

His accomplishments include more than 18 years of funding from the National Institutes of Health to study the physiology and endocrinology of mosquito reproduction. In 1992, he received the Shilts/Leonard Teaching Award for overall excellence in teaching at the undergraduate and/or graduate level over a number of years, the highest teaching honor bestowed by the College of Science. Fuchs was author or co-author on 40 peer-reviewed articles in periodicals including *PNAS*, *Journal of Insect Physiology*, *Journal of Cell Biology* and *Insect Biochemistry*, among others.

Fuchs was active in the South Bend community during his tenure at Notre Dame. He was a member and past president of the Organization for Visually Impaired Children, a volunteer group that was dedicated to lobbying to make available the best educational facilities for blind or visually impaired children.

Professor Emeritus Harald E. Esch

Harald E. Esch, Professor Emeritus of Biological Sciences, passed away peacefully on October 7, 2017, at the age of 85 in Farragut, TN. Dr. Esch was born in 1931 in Dusseldorf, Germany. Originally trained as a physicist and mathematician Harald shifted to biology for his doctoral studies, earning a doctorate in 1960 in Zoology and Mathematics for his work on insect chemosensory physiology. Esch remained in Germany until 1964 as an Assistant Professor in the Radiation Research Laboratory at the University of Munich Medical School, where he worked on the effects of ionizing radiation on cell membranes. About that time, Esch's physiological work caught the attention of Professor Rev. Cletus Bachofer, CSC, then the acting head of Biology at Notre Dame. On a trip to Europe, Fr. Bachofer urged Harald to consider coming to Notre Dame, to which Harald eventually agreed following a planned research deployment in Brazil in 1964 to study tropical bees.

In 1965, Esch officially joined the faculty of the University of Notre Dame, rising to the rank of Full Professor, where he would spend the remainder of his academic career. In his scholarship, Esch went on to become an international authority on honeybee communication in his own right. He conducted ground-breaking research and taught popular courses until he retired in 2005.

Over his remarkable career, Esch trained over 20 M.S. and Ph.D. students in his laboratory. Innumerable undergraduate students also engaged in research under his mentorship, many of which went on to graduate school themselves. He greatly enjoyed working with and inspiring students in his laboratory. For example, he and Ph.D. student Steven Kogge conducted seminal work on the physiology of asynchronous flight muscles in hornets, showing how neural inputs enabled these muscles to power the wings at frequencies of a stunning and unappreciated 200-300 beats per second. With Ph.D. student Franz Goller, Esch illustrated how temperature-induced malfunction of synapses between motor neurons and flight muscles of several insect species accounted for the inability of the insects to fly at certain temperature extremes.

Esch had a keen sense of humor and was a renowned story teller, often related with a wry smile on his face. A passionate and legendary teacher, Dr. Esch taught the extremely popular course Animal Behavior to legions of undergraduate students. His teaching prowess was recognized with the 1998 Father James L. Shilts/Doris and Gene Leonard Teaching Award.

Professor Emeritus Robert P. McIntosh

Robert P. McIntosh, a renowned ecologist and historian of ecology and wonderful husband, father and grandfather, died at 3:45 pm July 7, 2017.

He was born Sept. 24, 1920, in Milwaukee, Wis., and was a football star there at East Side High School. McIntosh attended the University of Wisconsin where he received a Doctorate of Science.

From 1950 to 1987, McIntosh worked in higher education as a professor of biology and plant ecology. He taught from 1950 to 1953 at Middlebury College and from 1953 to 1958 at Vassar College. He moved to the University of Notre Dame in 1959, where he taught until retiring in 1987, thereafter becoming a Professor Emeritus. He edited a scientific journal for many years, the *American Midland Naturalist*, beginning in 1970 until 2002.

His book, *The Background of Ecology: Concept and Theory*, was published in 1985 and provided an unprecedented historical review of the development of ecology. An awards citation from the American Institute of Biological Sciences in 1998 said these articles contained "conceptual and methodological breakthroughs in the study of terrestrial plant ecology" that "changed the way in which ecologists look at plant communities."

McIntosh authored and co-authored papers published in scientific journals including *Science*, *American Scientist*, *The Botanical Review* and others. One article titled "Plant Communities", published in a 1958 issue of *Science*, highlighted McIntosh's ability to succinctly and accurately summarize developments in the field of ecology. McIntosh drew from the work of numerous scientists as well as his own work and experience. He had a keen ability to summarize studies in ecology, describe sampling methods and provide a critical voice to analyze study results and techniques. In a 1963 paper published in *American Scientist*, McIntosh astutely reminded his audience that "reduction for the sake of simplification loses its point if the end is to delineate and demonstrate complexity. "Later during his stint as editor of the *American Midland Naturalist*, he wrote mostly historical reviews and general articles on theoretical ecology. With his writing, McIntosh thoughtfully summarized and contributed significantly to active debates within the world of community ecology.

In 1992, he was awarded the Lucia R. Briggs Distinguished Achievement Award by the Lawrence University Alumni Association.

A REMARKABLE LEGACY

Professor John G. Duman ("Jack") retired in June 2018. He served as a faculty member in the Department of Biological Sciences for an astounding 44 years. During this tenure at Notre Dame, Jack has had an exceptionally influential scholarly career encompassing stellar contributions to the Department, College and University, through his teaching, research, and service.

Jack joined the faculty in the Department of Biological Sciences in 1974 soon after he received his Ph.D. from Scripps Institution of Oceanography in the then "Department of Biology". His research program specialized in environmental physiology and biochemistry, in particular that of 'antifreeze' proteins in invertebrates. His research contributions to this area have been vast, and he is widely recognized as a world leader in the biology of antifreeze proteins. Jack rose through the academic ranks, was promoted to full professor in 1987, and later honored with the Martin J. Gillen Endowed Professorship, in recognition of his high achievement in research.

Jack served as a devoted teacher at Notre Dame for four decades. He made substantial contributions to the educational mission of the department by teaching flagship courses such as Physiology and the introductory biology course, General Biology, frequently with enrollments that exceeded 200 students. He also successfully taught upper division courses such as Integrative Comparative Physiology. He consistently provided strong mentorship and was well respected by his students.

Jack's service to the Department, College, and University has been exemplary. After establishing himself as a research leader at Notre Dame, Jack was recruited by then Dean Frank Castellino in 1982 to serve as Assistant Dean for Research, and then elevated to Associate Dean in 1987, to oversee a period of rapid research growth in the College of Science - a post he held until 1993. He was then selected to serve as Department Chair, a role he ably fulfilled for three consecutive terms from 1993 to 2002.

Jack presided over several building expansion projects in his time at Notre Dame including the addition of the Freimann Animal Facility in 1985. Today, the Freimann Center administers care to laboratory mice, rabbits, frogs, and other laboratory animals that serve the entire Notre Dame research community, and also houses the Center for Zebrafish Research, which opened in 2000. Additionally, Jack was instrumental in building a research facility at the University of Notre Dame Environmental Research Center (UNDERC) "East" located in Michigan's Upper Peninsula. Finally, the Hank Family Environmental Science extension to the Galvin Life Sciences Center opened in 1998 to accommodate the expanding research programs of the ecology and evolution faculty, and currently houses the majority of the ecology and environmental science faculty and researchers.

During his tenure as department chair, Jack guided Biological Sciences during a period of considerable faculty growth, graduate program expansion, and undergraduate enrollment. Jack oversaw the hiring of some of the department's prominent senior faculty as well as several junior faculty, many of whom are now tenured and hold the rank of full professor. Further, during Jack's time as chair, a mentoring program for junior faculty was initiated with a formal committee structure and annual review process that is still an important practice today. The mentoring program has been invaluable to the department in supporting, enabling and promoting its junior faculty.

Over the years, Jack gained and held the respect and trust of his faculty and students. He was often elected by his colleagues to serve on the Departmental Committee on Appointments and Promotions (CAP). In addition, he served as Chair of the College of Science Honesty Committee, a position requiring fairness, objectivity, and sensitivity - all hallmark qualities of Jack.

We are better because of the innumerable contributions of Professor Jack Duman over these past four decades. Jack's exceptional devotion to his teaching and research, and his astute leadership in diverse administrative roles leaves a remarkable legacy for generations to come.

Happy Retirement, Jack, and Thank You!



THANK YOU DR. DUMAN
— **FOR 44 YEARS OF** —
DEDICATED SERVICE TO
— **NOTRE DAME!** —

