DEPARTMENT OF

BIOLOGICAL SCIENCES

2015-2016 ACADEMIC YEAR HIGHLIGHTS

ADVANCING HUMAN AND ENVIRONMENTAL HEALTH

UNIVERSITY OF NOTRE DAME

College of Science

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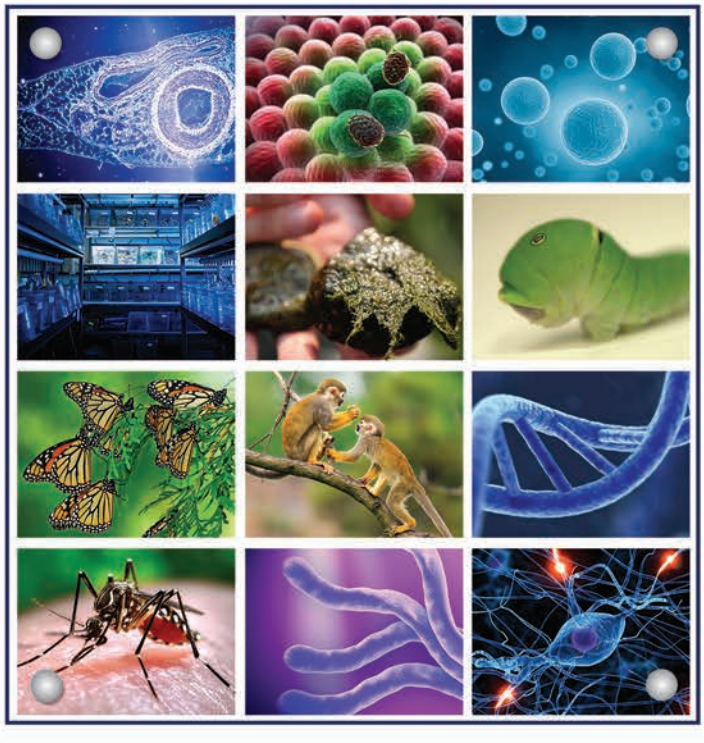
The **Department of Biological Sciences at Notre Dame** seeks to understand the fundamental mechanisms by which living systems operate and employs a wide range of cutting edge and innovative experimental approaches and systems. Basic research is at the center of our endeavors and fuels and inspires our teaching and training mission.

Solutions to the grand challenges facing our society—such as finding treatments, cures and preventions for human diseases, maintaining biodiversity on land and the ocean, and ensuring an adequate food supply—require advancing the boundaries of biological knowledge. Developing and implementing solutions to these societal problems will depend not only on a detailed understanding of how cells and individual organisms function, but on being able to characterize and predict the function of entire biological systems and ecosystems.

Our **mission and priorities** are to advance biological knowledge by demonstrable excellence in research, educate the next generation of leaders in the life sciences, and apply our findings to solve the grand challenges that will shape the future of human health and the environment.

The following pages provide examples of how the Department of Biological Sciences is in excellent position to fulfill the promise of the new integrative approach to biology.



WELCOME ABOARD!

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

XIN LU

Xin Lu, Ph.D., will join the Department of Biological Sciences as the John M. and Mary Jo Boler Assistant Professor. Dr. Lu obtained his B.S. degree in Biological Sciences from Tsinghua University in Beijing, China, in 2004, and his Ph.D. in Molecular Biology from Princeton University in 2010 under the guidance of Dr. Yibin Kang. He joined the laboratory of Dr. Ronald DePinho, at the Dana Farber Cancer Center in Boston, and moved with the laboratory to the M.D. Anderson Cancer Center in Texas. In 2014, Dr. Lu was promoted to Instructor in the Department of Cancer Biology at MD Anderson Cancer Center. His research is focused on developing novel insights into the genomic, genetic, and molecular mechanisms of cancer progression and resistance to therapy. In particular, he has established the first genetically engineered mouse model of penile cancer, a rare cancer that is characterized by a poor patient prognosis.His work is supported by an Idea Award from the Department of Defense.

XUEMIN (SHERYL) LU

Xuemin (Sheryl) Lu, Ph.D., will join the department as an Assistant Teaching Professor. Dr. Lu earned her B.S. in Math & Physics from Tsinghua University in Beijing, China in 2004 and then conducted her Ph.D. studies at Princeton University under the guidance of Dr. Eric Wieschaus. Following the completion of her Ph.D., Dr. Lu began work as a postdoctoral associate in the Department of Biology at the Massachusetts Institute of Technology where she worked in the laboratory of Dr. Robert Horvitz. Dr. Lu relocated to Texas and began work in the Department of Biochemistry at Baylor College of Medicine. While at Baylor, she accumulated additional experience as an intern in Technology Transfer and Business Development and in 2014, accepted a position at Admera Health, LLC in New Jersey, where she currently works as a Product Lead in the cardiovascular division.

DAVID MEDVIGY

David Medvigy, Ph.D., an internationally recognized scientist, will join the department as Associate Professor with Tenure. Dr. Medvigy obtained his B.S. in Physics from Rutgers in 1996 and his Ph.D. in Applied Physics from Harvard University in 2006, under the guidance of Dr. Paul Moorcroft. He completed postdoctoral research at Harvard and also at Duke University and began his independent career in 2009 as an Assistant Professor in the Department of Geosciences at Princeton University. Supported by grants from the National Science Foundation, the U.S. Department of Agriculture, and the Department of Energy, Medvigy's research combines global change biology and atmospheric science, allowing him to construct global-scale ecosystem models to forecast the impact of environmental change.

CODY SMITH

Cody Smith, Ph.D., will join the department as the Elizabeth and Michael Gallagher Family Assistant Professor. Dr. Smith obtained his B.S. in Biology in 2007 from Mercyhurst University, and earned his Ph.D. in Cell and Developmental Biology from Vanderbilt University in 2012 under the guidance of David Miller. Since 2012 he has been working as a Postdoctoral Fellow in the lab of Dr. Sarah Kucenas, in the Department of Biology at the University of Virginia. He was honored as "Graduate of the Year in Biology" as an undergraduate student and "Graduate Student of the Year in Cell and Developmental Biology" while in graduate school. He is also the recipient of a NIH F31 and F32 predoctoral and postdoctoral fellowships, respectively. Smith's research integrates a variety of molecular approaches and organismal biology to examine development and regeneration in the nervous system using Zebrafish as a model system.

PREPARING TO LEAD

Biology majors lead! The Biology senior student leadership committee (SLC) is comprised of approximately twenty highly motivated upperclassmen. Most have embraced leadership opportunities within the Biology and Environmental Science majors. The SLC serves the department to improve the overall undergraduate experience in many ways. For example, they have proposed new courses, offered feedback on curriculum, founded a seminar course on applying to graduate school and pioneered the creation of UPLIFT, a vertical peer-mentoring program. "Many of these activities are made possible by the generosity of long time donors, Mr. and Mrs. Frank McDonald" according to Faculty advisor, Professor Michelle Whaley.

In 2015-16, SLC accumulated more than 600 hours of service in the form of meetings, events, and projects. One outstanding example was the proposal to develop "Tracks" within the Biology major *(see next page for full description)*. Other significant undertakings included developing a Leadership and Innovation Certificate program, a Lab Shadowing program, and spearheading alumni mentoring opportunities.

The Biology **Leadership & Innovation Certificate** program provides an opportunity for Notre Dame undergraduate biology majors and biology graduate students to develop and enhance their leadership skills, preparing them for entrepreneurship and successful careers– *before* they enter the workplace. In its inaugural year (2015-2016), twenty five undergraduate and graduate students attended presentations led by faculty and staff from several departments throughout campus. Topics included– the Hallmarks and Ethics of Leadership, Design Thinking, and the Intersection of Biology Careers and Business. For example, a Design Thinking project led to the creation of a student study lounge in Jordan Hall--a common space designed to support anything from a continuous coffee supply fueling late-night study sessions, to an inviting meeting space for student organizations. Keon Schmidt, a Senior and one of the key architects of this project, described the outcome as "practically and effectively contributing to a strong sense of community, connecting members of the biology major outside the classroom".

One of the best resources for **career mentorship** are our **Biological Sciences alumni** who have transitioned to successful careers both, in and outside the academy. Notre Dame Biology majors pursue a variety of careers after graduation – from medicine and biomedical sciences, to the pharmaceutical industry, business ventures, law, and teaching. The SLC is developing a network of graduates to mentor aspiring students. If you are an alumnus who would like to join this program, please contact Professor Michelle Whaley at whaley.3@nd.edu.

2015-2016 SLC members

Lab Shadowing, a project chaired by Abbey Tirrell, a Junior, introduces freshmen to the realities of undergraduate research. This past year, eighteen freshmen had the opportunity to rotate through three undergraduate research labs with upperclassmen mentors. Students learned about the dedication, work ethic and passion that can accompany original laboratory research, through observation and discussion. The students felt that the opportunity allowed them to make choices that would maximize the undergraduate research experience. This pilot program will expand its offerings and capacity in the 2016-2017 academic year.

"Our committee members are dedicated leaders who prioritize SLC in their busy schedules and take the initiative to improve the student experience. We are extremely appreciative of this opportunity to work directly with Biology administration and faculty" said Mark Brahier, chair of the SLC.

And, anyone who has met these articulate young people will attest to their motivation and abilities. They are forging programs and experiences that enable them to feel confident and take charge of their futures.

For more information on student leadership in the Department of Biological Sciences, please visit biology.nd.edu/student-leadership.

Contributed by Mark Brahier, Michelle Whaley, and Crislyn D'Souza-Schorey

TRACKS IN THE BIOLOGY CURRICULUM

Students spoke, and the department listened. The student led Senior Leadership Committee (SLC), proposed several groupings of courses, or Tracks, to enhance the learning experience of Biology student majors. The Department of Biological Sciences now offers the BS degree with Tracks. Students can tailor their academic goals by selecting Tracks in specialized areas of the life sciences alongside core competencies. "Tracks allow students to take a deep dive into one of eight foci in Biological Sciences. We believe that all students can benefit from this increased scholarly engagement – particularly in research and preparation for graduate studies" said Mark Brahier, chair of the SLC. Each Track requires 14 credits in addition to the Core requirements of the major, so students achieve both the breadth of the Core and the depth of a Track. Students who prefer courses that span the full spectrum of the life sciences may select the Integrative Biology Track.

The development of Tracks in the Biology major came from thoughtful consideration of student needs and a joint effort between Biology majors and the department's faculty. The process began with a survey of Biology undergraduate programs across the country by the SLC and the department's leadership, and continued with generating lists of courses for proposed Tracks. A student subcommittee met weekly for months to develop a proposal. The student proposal was vetted and further developed by the department's Undergraduate Curriculum committee and discussed at faculty meetings. In the summer of 2015, the department's faculty voted unanimously to implement the program for the 2015-16 school year. In its first year, 73 of 91 graduating seniors elected to earn degrees in Biological Sciences with an associated Track.

The Eight Tracks of the Biology Major

The full listing of courses that fulfill the requirements of the Core and each Track can be found at: biology.nd.edu/biology-tracks.

Contributed by Mark Brahier, Michelle Whaley, and Crislyn D'Souza-Schorey

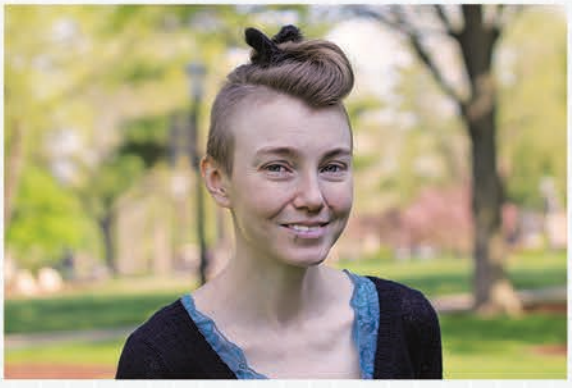
GRADUATE STUDENTS EARN RESEARCH FELLOWSHIPS

The National Science Foundation recently announced the winners of the 2016 Graduate Research Fellowship Program (GRFP), with 24 current Notre Dame students winning the prestigious award and another 17 earning honorable mention. Overall, there were 41 students recognized by the NSF. This doubles the number of Notre Dame awardees from 2015, and nearly doubles the previous Notre Dame record of 26, set last year, for total students recognized by the NSF.

The fellowship provides three years of support for the graduate education of students who have demonstrated the potential for significant achievements in science and engineering research. Past NSF Fellows include individuals who have made significant breakthroughs in science and engineering research, as well as some who have been honored as Nobel laureates.

In addition, a US EPA STAR Graduate Fellowship was awarded to **Arial Shogren** (Tank Lab) and **Francisco Fields** (Lee Lab) won a 2016 National GEM Consortium Fellowship.

Biological Sciences continues on its strong trajectory of garnering NSF fellowships. **The department leads the university in the total number of awarded fellowships over the past five years.**



First- year biological science Ph.D. student **Heather Forrest Fruscalzo** studies mosquito neurophysiology and behavior in the laboratory of Zain Syed, PhD. She is seeking to discover a universal mosquito attractant using volatile compounds emitted by their host plants. Plants are the main source of energy for both adult male and female mosquitoes, which means these traps would hypothetically have a greater population impact than current traps. Researching what plants are most commonly fed upon has both basic and applied science value.

> **"As a veteran I have seen more of the effects of neglected tropical diseases than most Americans. Studying the physiology of mosquitoes allows me to both satisfy my scientific curiosity and my drive to have a direct impact on global health."**

Forrest Fruscalzo graduated in 2015 from Eastern Washington University with a bachelor of science in general biology with honors.

Bridgette Drummond is a second-year graduate student in Rebecca Wingert's lab. Currently, she is investigating how genetic components affect cell fate decisions in the development and regeneration of the zebrafish kidney. Due to the strong genetic conservation between the zebrafish and human kidney, Drummond's work could provide novel information about the onset of kidney diseases and how to more accurately treat them.

> **"I have always been interested in understanding animal physiology and how it connects to humans. As an undergraduate marine biology major, I studied the lipid composition of sea turtles in order to improve the wildlife rehabilitation process for sick and injured sea turtles. When I realized that physiological findings in aquatic animals could be used to advance human health, I decided to pursue my Ph.D. in this research area."**

Drummond graduated in December 2013 from the University of North Carolina Wilmington with a bachelor in science in marine biology and a minor in chemistry. She is originally from the Chicago area.

Francisco "Pancho" Fields is a second-year graduate student in the lab of Dr. Shaun Lee. Fields's work focuses on the discovery of new bacteriocins, antimicrobial peptides made by bacteria. Many of these antimicrobial peptides are amphiphilic helices containing both cationic and hydrophobic amino acids. These peptides target the anionic bacterial membrane through electrostatic interactions followed by association of their hydrophobic side chains with the lipid tails. Using bioinformatics techniques, new bacteriocins can be identified, cloned, and synthesized. Finally, these peptides can then be engineered for enhanced activity against target organisms. With the current rise of antibiotic resistant bacteria, bacteriocins are an attractive avenue of antimicrobial discovery.

> **"Freshman year of college I was diagnosed with a methicillin-resistant Staphylococcus aureus (MRSA) infection in my right leg. This life threatening experience sparked my interest in microbiology. I wanted to use my skills to develop ways to combat antibiotic resistance."**

Fields graduated from Newman University in 2014 with a bachelor of science in Biology.

Originally published by the College of Science

IN THE NEWS

Many faculty in the department of Biological Sciences lead their disciplines by serving as officers of societies, on journal editorial boards, study sections, scientific advisory boards and as consultants for various organizations. Here is a sampling of faculty accomplishments and honors in the past academic year.

At the 2016 BIO International Convention in San Francisco (June 2016), ND Technology Transfer highlighted licensed or trademarked enterprises and product designs cultivated from various Notre Dame research projects. Two such commercialization opportunities were from the Department of Biological Sciences. These included exosomes from body fluids as a platform for TB diagnostics, research by **Jeff Schorey**, George B. Craig Jr. Professor of Biological Sciences, as well as accelerated penetration systems for staining tissues research by **Siyuan Zhang**, Dee Assistant Professor of Biological Sciences and HCRI-affiliated faculty member. Zhang's research has lead to Reveal3D™, an all-in-one platform that automatically processes tissue biopsies.

A study published in *Nature Communications* (April 2016) finds that wild baboons that experience multiple challenges when young, have a much shorter life expectancy. Researcher **Elizabeth Archie**, in collaboration with researchers at Duke University and Princeton University published findings from a long-term study of 196 wild female baboons monitored on a nearly daily basis between 1983 and 2013 near Amboseli National Park in southern Kenya. The study's findings are significant because they show that the links to early adversity and long-term negative effects on survival happen for baboons in the absence of factors frequently used to explain similar patterns in humans, such as differences in smoking, drinking or access to medical care.

Nora J. Besansky, O'Hara Professor in the Department of Biological Sciences and member of the Eck Institute for Global Health at the University of Notre Dame, assembled a diverse and multinational team of scientists to crack the genetic code of the Y chromosome in malaria carrying mosquitoes. The results of their research were published in the *Proceedings of the National Academy of Sciences* (March 2016). The team's study provides a greatly anticipated basis for studying the Y chromosome of mosquito biology and evolution and also lays the groundwork for exploiting the Y chromosome to control transmission of deadly diseases.

Glen R. Hood, a doctoral researcher in the lab of **Jeffrey Feder**, has observed three species of wasps evolving into three new species, an intriguing case of rapid evolution in action. In a report published in the *Proceedings of the National Academy of Sciences* (November 2015), Hood and colleagues note that speciation may not be an isolated process, as the origin of one species may open new niche opportunities for associated organisms in higher levels of the food chain, leading to the sequential origin of many other new species. Their study shows 'sequential divergence' or 'cascading speciation' for three species of parasitic wasps attacking Rhagoletis fruit flies.

According to a study by **Siyuan Zhang**, the Nancy Dee Professor of Cancer Research, and his colleagues at MD. Anderson Cancer Center, if a tumor is like a seed, the soil around it can significantly affect its growth. The results of a study published in *Nature* (October 2015) indicate that the tumor microenvironment impacts the loss of a tumor suppressor allowing brain metastatic growth.

Nicole Achee, research associate professor in the Department of Biological Sciences, has been appointed by the National Academy of Sciences (NAS) to participate in an ad hoc committee for the project, "Gene Drive Research in Non-Human Organisms: Recommendations for Responsible Conduct" (September 2015). The committee is tasked with reviewing gene research that relies on genome editing to identify potential environmental and public health implications raised by individual applications of gene drive technology.

In a column published in *Nature* (July 2015) **David M. Lodge**, the Ludmilla F., Stephen J., and Robert T. Galla Professor of Biological Sciences, provided comments on Pope Francis' environmental encyclical, "Laudato Si': On the Care for Our Common Home." Lodge indicated that the Pope framed the importance of protecting the environment as protecting the welfare of humankind. He noted that the Pope offers common links between the environment and the economy that may open dialog between communities of science, faith and policymakers, groups which frequently have differences of opinion on these issues.

GLOBAL LINKAGES IN BIOLOGICAL SCIENCES

The emerging threat of Zika is a timely reminder that the most pressing challenges to human and environmental health know no political boundaries. Solutions to these problems increasingly depend on international collaborative efforts. Spanning a wide diversity of interests and expertise, an overwhelming majority of Biology faculty are engaged in at least one international enterprise involving fundamental research, training, and/or digital resource generation. Two broad research themes that illustrate our international presence are infectious diseases and environmental change.

Biology at Notre Dame has deep historical roots in vector-borne disease research. Carrying on and extending that proud tradition, the growing group of faculty working on infectious diseases (e.g., malaria, dengue, Zika, tuberculosis, streptococcus) partner with international universities, research institutes, non-governmental organizations, and ministries of health in Central and South America, India, maritime and mainland Southeast Asia, and Africa. The activities range from implementation and surveillance to epidemiological modeling and discovery-based research. Several of our faculty also lead VectorBase, an international bioinformatic resource of data and analysis tools for invertebrate vectors of human disease.

Biology at Notre Dame has an equally proud tradition in environmental research (the University of Notre Dame Environmental Research Center in Land O'Lakes Wisconsin—UNDERC—a rich natural laboratory for Biology-led research since the first publication in 1978). The Environmental Change Initiative, expanding on that historical strength, contains Biology faculty that are leading and promoting environmental research through worldwide consortia such as GLEON (the Global Lake Ecological Observatory Network, a worldwide network of lake study sites and an international community of scientists, educators, policy makers, and citizens). A recent international collaboration to study the effects of climate change in cooperation with Pontificia Universidad Catolica (PUC) de Chile is described in the boxed text below.

SPOTLIGHT ON CHILE

Biology faculty led by **Adrian Rocha** have teamed up with faculty at **Pontificia Universidad Catolica (PUC) de Chile** to identify and address issues related to **climate change impacts**. Faculty at both PUC and ND have diverse research interests in biology, ecology, agronomy, forestry, civil engineering, and environmental science. This interdisciplinary team plans to focus on the issue of water resource stress and ecology in Chile in both natural and human dominated systems. Chile is climatically and biologically rich, spanning 41° of latitude with year-round warm temperatures in the North and cold winter temperatures in the South. The majority of Chile's amphibians and reptiles are found nowhere else. Chile's climate also is very dry with an economy that relies heavily on water. Approximately 33% of Chile's energy is derived from hydroelectric generation, and agriculture is the fastest growing economic sector in Chile, comprising 8.8% of its GDP (~$20 billion USD). Chile also is sensitive to extreme climate events and undergoes El Nino cycles associated with flooding and loss of agricultural revenue. These events are expected to increase in frequency and intensity in a future warmer climate. The economic and ecological reliance of Chile on water resources make it a high priority for predicting the future consequences of climate change.

The ND and PUC collaboration received support from the Luksic family foundation. These funds have been used by both ND and PUC faculty and students to support meetings, workshops, and visiting scholar exchanges. PUC graduate student Benjamin Castro will visit UNDERC- East to learn how to monitor water stress in trees with home-made sensors developed in Rocha's lab, while Biology students Bethany Blakely and Melissa Cross will visit Chile to install these sensors in a large scale ecosystem water manipulation experiment established by faculty Aurora Gaxiola and Juan Armesto at PUC. Cross will continue to monitor tree water stress in this experiment during her international exchange program with PUC in the Spring of 2018 as part of her senior research project. An interdisciplinary faculty workshop planned for the Fall semester will set future directions for continued research and exchange. It is anticipated that these activities will foster an improved understanding of climate change impacts on society that will enhance the Catholic mission of both PUC and ND.

The biomedical community in the department is also making connections across the Globe. Faculty with programs in Cancer, Regenerative Medicine, Rare diseases and other areas of biomedical sciences are involved in discovery-based collaborations and research consortiums in several parts of Europe including Ireland, the Netherlands, the UK and Paris, France. These faculty have also participated in Study Abroad programs in London and Australia. Finally, the power of digital resources to transform both the process and the international reach of biological research and education is evidenced by Biology faculty participation in Global Plants, a community of over 300 museums from 80 countries that are building a world-wide online database that features more than two million high resolution plant type specimen images and other foundational materials from the collections of hundreds of herbaria around the world. As of the end of 2015, the Notre Dame Herbarium had captured over 10,500 high-resolution images, placing Notre Dame as 3rd largest educational institution contributor in the United States, and 42nd of all participating collections in the world.

Contributed by Nora Besansky

RESEARCH HIGHLIGHT

NEW AVENUES FOUND FOR TREATMENT OF PATHOGEN BEHIND DISEASES INCLUDING FASCIITIS, TOXIC SHOCK SYNDROME

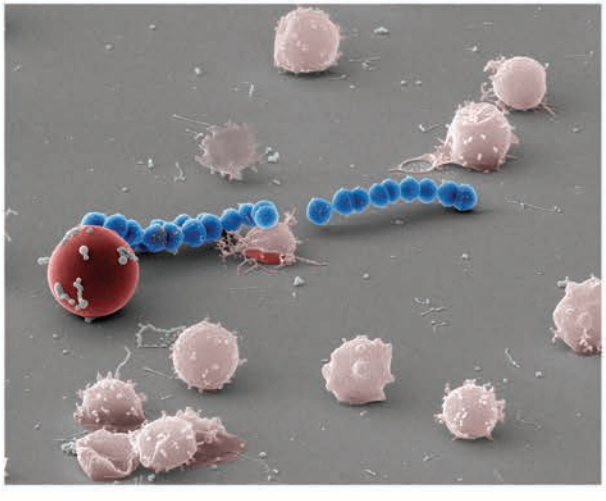
One bacterial pathogen is responsible for a range of diseases, from pharyngitis and impetigo to more severe diagnoses such as toxic shock syndrome and necrotizing fasciitis (flesh eating disease), a serious bacterial skin infection that spreads quickly and kills the body's soft tissue. The pathogen, known as Group A Streptococcus, remains a global health burden with an estimated 700 million cases reported annually, and more than half a million deaths due to severe infections.

The ability of Group A Streptococcus (GAS) to induce rapid destruction of red blood cells has been observed for more than a century and remains a clinical hallmark of GAS diagnosis. This destruction is due to the production of a small peptide toxin by GAS known as Streptolysin S (SLS).

Although it has been widely held that SLS exerts its lytic activity — the excessive destruction of red blood cells — through membrane disruption, its exact mode of action has remained unknown.

Recent molecular studies by Associate Professor, **Shaun Lee** have demonstrated that SLS is a peptide toxin linked to a broad class of bacterially produced compounds known as bacteriocins.

In a study published in ***Nature Microbiology***, Lee's research group provides the first real-time, high-resolution observation of Group A streptoccocal red cell destruction, also called beta-hemolysis.



The study demonstrated that the long-observed red blood cell hemolysis by SLS is not caused by general destruction of the red blood cell membrane, as has been previously thought, but rather that the action is due to the ability of the SLS toxin to directly target a specific outer membrane protein on the surface of the red blood cell, the major erythrocyte anion exchange protein Band 3.

Importantly, chemical inhibition of Band 3 function completely blocked the hemolytic activity of SLS, and significantly altered the pathology induced by GAS in an in vivo skin infection model.

Adapted from original news article by William G. Gilroy

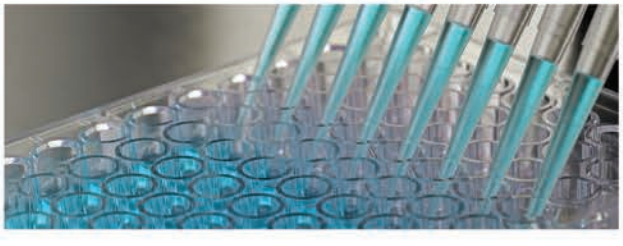
NEW FORMULATION OF FDA-APPROVED DRUG MAY HELP TREAT NIEMANN-PICK TYPE C

Niemann-Pick Type C (NPC) disease is a rare, fatal neurodegenerative disease for which there is currently no cure. NPC primarily strikes children before and during adolescence and affects one in every 150,000 children. The disease causes cholesterol and other lipids to build up in the body's cells, which results in symptoms such as delayed motor development, deterioration of memory and balance, and seizures.

Recent research published in the journal, ***Science Translational Medicine***, from the laboratory of **Professor Kasturi Haldar**, Rev. Julius A. Nieuwland, C.S.C. Professor and Parsons-Quinn Director of the Center of Rare and Neglected Diseases may lead to a therapy for NPC.

The researchers used an existing FDA-approved drug in a novel approach to treatment with promising results. The finding involves substances known as histone deacetylase inhibitors (HDACi). HDACi are a large class of compounds designed to treat many genetic diseases. They include drugs for cancers and potentially neurological disorders.

Haldar and colleagues developed and tested a new triple combination formulation that was used to deliver the FDA-approved HDACi prescription medication Vorinostat across the blood brain barrier and into brain tissue of mice with Niemann-Pick Type C disease. They also developed a long-term treatment regimen with the formulation that is safe, improves brain function, treats the symptoms of NPC and prolongs mouse survival.



Adapted from original news article by William G. Gilroy

USING MATHEMATICAL MODELS TO FIGHT ZIKA

New research from the University of Notre Dame will be used to generate maps that provide time-sensitive estimates of mosquito densities, human birth rates and Zika transmission activity across Latin America and the Caribbean. The model outputs will be available online to provide users with the ability to find reported cases and estimated incidences by location to improve disease transmission and prevalence forecasts, which is critical to making accurate predictions and translating results into effective public health strategies.

The study is being conducted by **Alex Perkins**, Eck Family Assistant Professor of Biological Sciences, who received one of nine **NSF RAPID** awards for his research proposal that focuses on enabling estimation and forecasting of Zika virus transmission. NSF created these RAPID awards in order to specifically understand the rate of spread, number of infected people and the likely persistence of Zika as a public health threat, and to help prepare for the next outbreak.

Zika is primarily transmitted to humans through the bite of an infected Aedes aegypti mosquito, a species that the University of Notre Dame has nearly 60 years of experience studying. Perkins' research will provide estimates of Aedes aegypti mosquito density across the Americas as well as updated human population data as it applies to predictions of Zika-infected microcephaly.

The Perkins lab is seeking to prioritize work related to the Zika epidemic as much as possible given the urgency of the situation.

Adapted from original news article by B. Klingerman

NOTRE DAME CANCER BIOLOGISTS PARTNER WITH PHYSICIANS AT MICHIANA HEMATOLOGY ONCOLOGY TO INITIATE CANCER GENETICS CONFERENCE SERIES

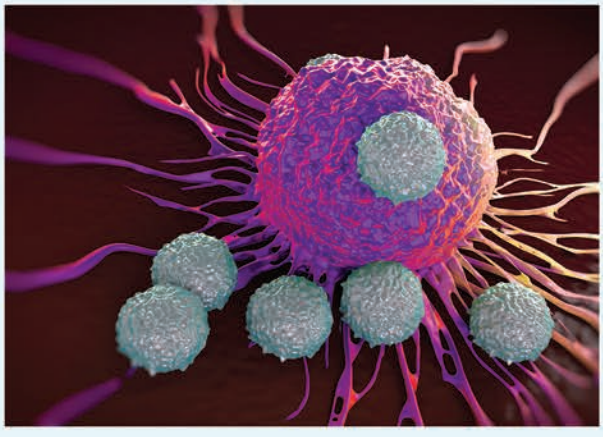
For many years, the two worlds of basic science and clinical medicine seemed like distant cousins, related by biology but coming together only for the occasional family reunion. This unfortunate estrangement is rapidly fading, especially in the field of cancer biology. As more of the molecular drivers of cancer cell growth are being identified in the lab, new and better medicines are being developed for the clinic. Two worlds - two approaches to science - are being driven together by their remarkable success, and both communities have come to realize the same thing: we need to talk!

To initiate the conversation, Jose A. Bufill, MD - a medical oncologist in practice for over 20 years at Michiana Hematology-Oncology (MHO) - approached members of the Department of Biological Sciences to develop a way for clinicians to learn about the work of Notre Dame cancer researchers and for basic scientists to become acquainted with the real-world care of cancer patients. The hope would be that both teams would be enriched by the interaction, and that area cancer patients would benefit as well.

Faculty and students in the Department of Biological Sciences work on many of the most important questions in cancer research today: cancer cell invasion, tumor cell survival, metastasis, cell cycle control, and the tumor microenvironment. Cancer specialists at Michiana Hematology-Oncology experience daily the human cost of those biological processes.

The first occasion for dialogue has taken the form of a "Cancer Genetics Conference" held on the second Wednesday of each month at the Education Center of MHO. The conferences are attended by Notre Dame faculty and students, medical, surgical and radiation oncologists, pathologists, genetic counselors, primary care physicians and other community stakeholders. To kick things off, Dr. Bufill recruited Dr. Zachary Schafer, the Coleman Foundation Associate Professor of Cancer Biology, to provide an overview of cancer genetics in December 2015.

Traditionally, cancer conferences – famously called "tumor boards" - center on a particular type of cancer.



The Cancer Genetics Conferences center on a "pathway" – a particular chain of oncogenic molecular reactions that are often shared across many different tumor types - a format which would lend itself well to an interdisciplinary conversation. In July, Dr. Crislyn D'Souza-Schorey, the Pollard Professor and department chair of Biological Sciences at Notre Dame, discussed the BRAF pathway, and MHO patients with melanoma and thyroid cancer containing BRAF mutations were presented in detail.

Cancer biologists from Notre Dame will share the podium with outside speakers throughout the year. In April, University of Chicago hematologist Dr Lucy Godley discussed her work with families with rare, inherited leukemia and lymphoma. Several local families have been referred to her research lab for study. In June, Dr. John Carethers - Chair of the Department of Internal Medicine at the University of Michigan - discussed genetic mechanisms underlying the development of colorectal cancer, and toured our campus after his talk.
Dr. Olufunmilayo Olopade - Director of the Center for Clinical Cancer Genetics at the University of Chicago - will be reviewing high risk breast cancer families from the Cancer Genetics Program based at MHO, and will review inherited predispositions to breast cancer in August. The enthusiastic participation of scientists from a wide variety of disciplines and institutions suggests that there is great potential for future collaboration.

Contributed by Dr. Jose Bufill and Professor Zachary Schafer

JENNIFER TANK RECEIVES 2016 GANEY AWARD FOR COMMUNITY-BASED RESEARCH

Jennifer Tank, Galla Professor of Biological Sciences, has received the 2016 Rodney F. Ganey, Ph.D., Community-Based Research Award for working together with Kosciusko County farmers and local conservation staff to reduce nutrient runoff in the Shatto Ditch watershed. The award is a $5,000 prize presented annually to a regular faculty member at the University of Notre Dame who has completed at least one research project that addresses a need within South Bend or the surrounding area.

For decades, farmers have added fertilizers to their soils to help maximize crop yields and profits. But nutrients that crops do not incorporate eventually run off into surrounding streams and rivers where they can cause serious problems. Excess nutrients such as nitrogen and phosphorus can change the character of water, even altering its biology so that it harms freshwater ecology and ultimately becomes undrinkable.

When Jennifer Tank began to research the problems of nutrient runoff in nearby Kosciusko County, she focused on the streams and rivers it affected.

During the winter and spring, farmers often plant what are called cover crops, which are planted in late fall to slow erosion and improve soil health over the winter and spring before the next year's cash crop planting occurs.

Although Kosciusko County farmers were using cover crops more than on average for Indiana, this planting still amounted to a very low percentage of the land in the surrounding Shatto Ditch watershed. Tank and her collaborators believed that if they increased that percentage, they might keep more nutrients in the soil, instead of having them run off into streams and rivers where they harm freshwaters and do not benefit crops.

In Indiana, cover crops are currently used on average on less than 15 percent of land that can be used for crops, and that is considered high compared to the national average. Kosciusko County farmers in the Shatto Ditch watershed are now growing winter cover crops on about 70 percent of their acreage, a rate that has already significantly reduced the amount of nutrient runoff to local waterways while increasing fertilizer nutrients in soils, which farmers hope will lead to higher crop yields.

Adapted from original news article by JP Shortall

PROMOTIONS: TO ASSOCIATE PROFESSOR WITH TENURE

STUART JONES

Stuart Jones joined the Department of Biological Sciences as Assistant Professor in 2010. With current funding from two NSF grants, his lab investigates how the physics, chemistry, and biology of lakes respond to human impacts, and how these responses alter the ability of humans to benefit from lake ecosystems. "Receiving tenure means that I can look forward to a long career collaborating with world-class environmental science faculty in the department and across campus," Jones said. He continued, "In addition, I can continue to work closely with excellent Notre Dame undergraduate and graduate students as their research mentor. Finally, tenure means that our long-term work at the University of Notre Dame Environmental Research Center (UNDERC-East) will continue for decades to come!"

REBECCA WINGERT

Rebecca Wingert was appointed Assistant Professor in 2010, and currently holds the Elizabeth and Michael Gallagher chair. The Wingert lab uses zebrafish models to study kidney development and regeneration. Her work is supported by an NIH Director's New Innovator award, an NIH R01 award and the March of Dimes Basil O'Connor Starter Scholar Research award. Wingert feels "blessed and honored to be awarded tenure in the Department of Biological Sciences at the University of Notre Dame." She stated, "I am both very thankful and utterly excited for this special opportunity to continue my research program here—it is such a tremendous privilege to work with the talented and passionate students, faculty and staff of Our Lady's University. I look forward to the coming years, to continuing to serve as just one component of our dynamic educational mission, and to continuing to craft unique research endeavors with my students to improve human health and alleviate suffering."

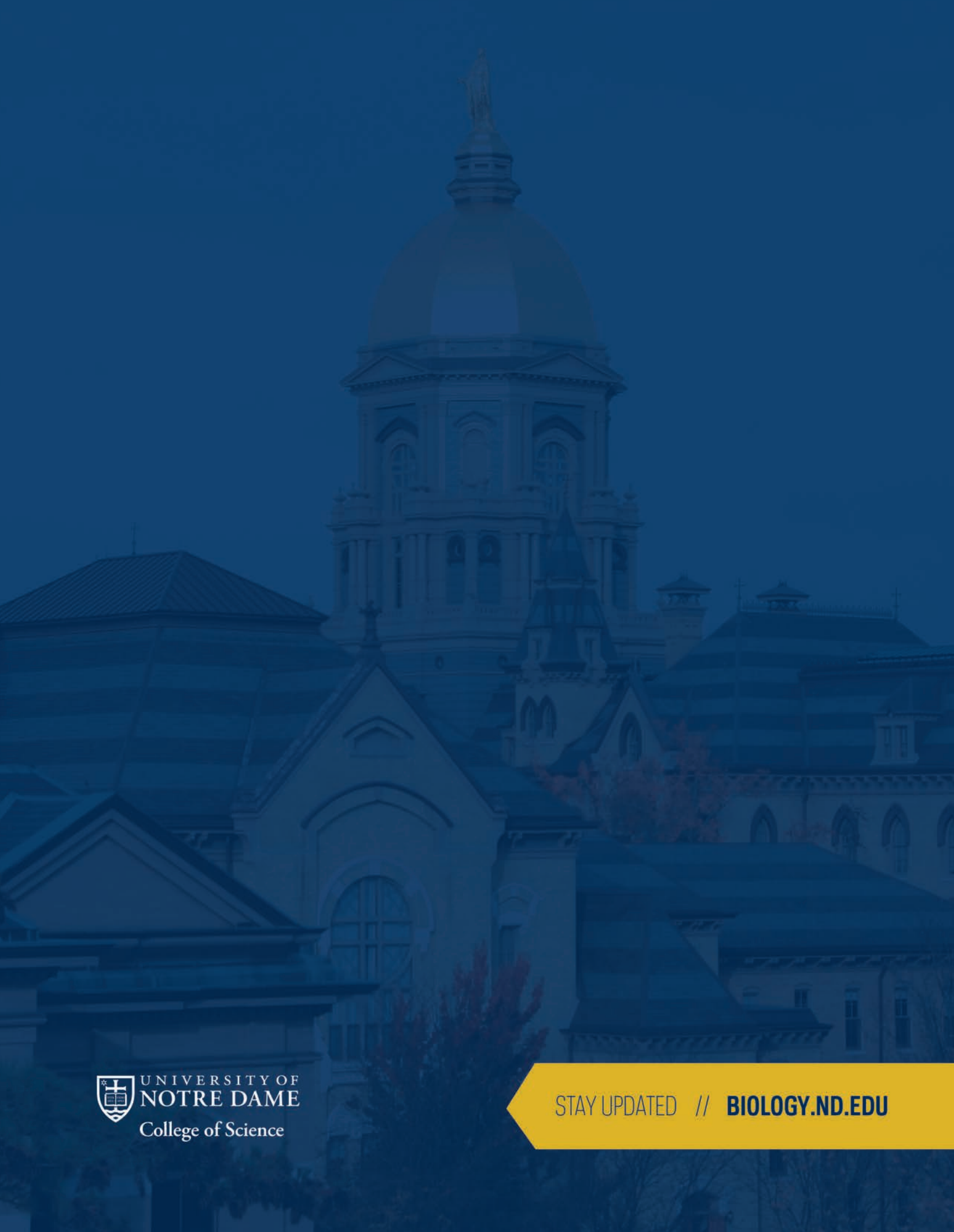
PROMOTIONS: TO ASSOCIATE TEACHING PROFESSOR

JENNIFER ROBICHAUD

Jennifer Robichaud completed her B.A. at the College of Saint Scholastica and earned a Master's of Science in Medical Microbiology from the University of Georgia. She received an Emerging Infectious Diseases (EID) Training Fellowship with the Centers for Disease Control and Prevention in Atlanta, and continued there with an ORISE Fellowship and joint appointment with Emory University School of Medicine. Robichaud was appointed an Assistant Teaching Professor/ Professional Specialist at Notre Dame in 2010, after serving two year as a visiting faculty member. She states, "The Department of Biological Sciences has provided me an environment and opportunities to reach my goals as a Teaching Professor. I am delighted and appreciative that I have been recognized for my work within the department."

DAVID VESELIK

David Veselik earned his bachelor degree from the University of Notre Dame in 1996. He completed his Master of Science (1998) and Ph.D. (2006) in Biochemistry & Molecular Biology at Georgetown University in Washington, D.C. Veselik returned to Notre Dame as a Postdoctoral Research Associate Department of Biological Sciences, was appointed as a Visiting Assistant Professor in 2007, and then to Assistant Teaching Professor in 2009. Since 2013, he has served as Academic Advisor and the Director of Undergraduate Studies in the Department of Biological Sciences. "It is a privilege to work with our great faculty, tremendous staff, and our amazing students," says Veselik.



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