Breakthroughs

Feinberg School of Medicine Research Office

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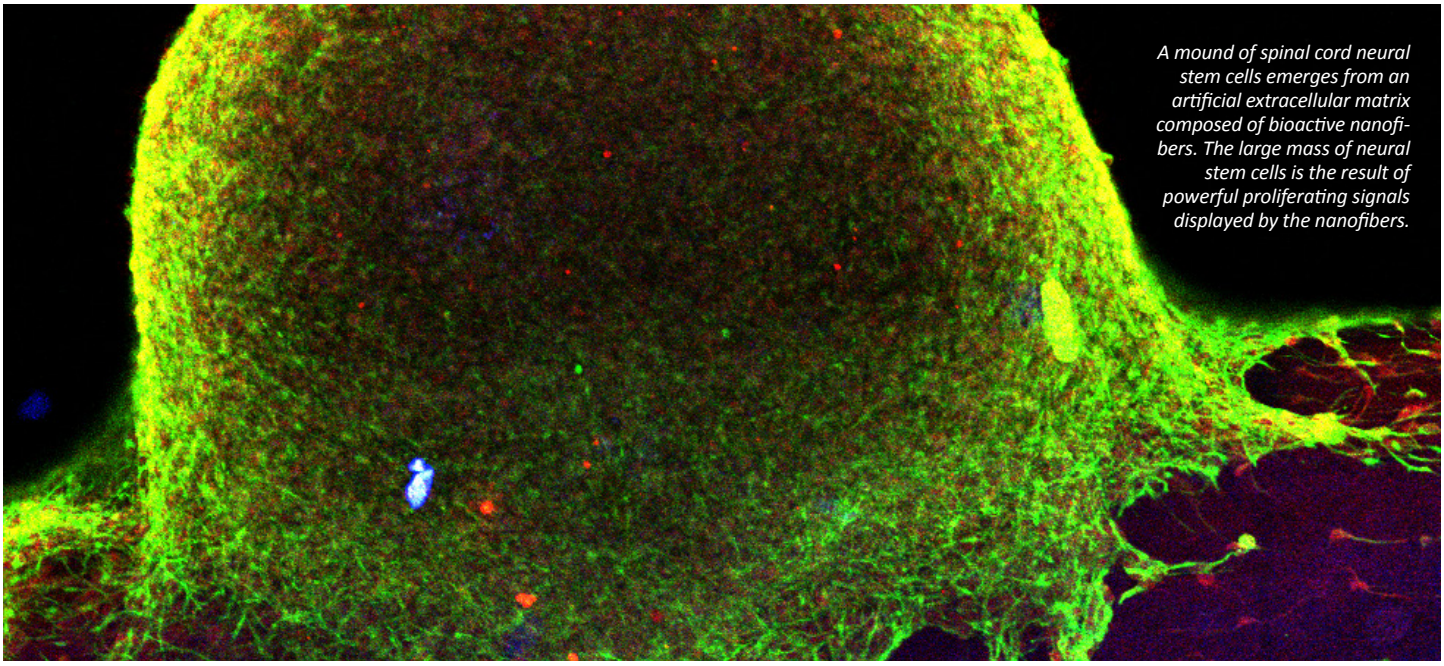

A mound of spinal cord neural stem cells emerges from an artificial extracellular matrix composed of bioactive nanofibers. The large mass of neural stem cells is the result of powerful proliferating signals displayed by the nanofibers.

On the Forefront of Regenerative Medicine

While the use of non-biological materials in science dates back thousands of years, Northwestern's biomaterials labs are developing the next generation of materials in medicine, called supramolecular biomaterials – molecules designed in a way to mimic cell structures and functions of biological signaling.

Supramolecular biomaterials have the potential for many applications, including regenerative medicine, gene and drug delivery, tissue engineering and immunology.

Samuel Stupp, PhD, director of the Louis A. Simpson and Kimberly K. Querrey Institute for BioNanotechnology (SQI), is at the forefront of developing supramolecular biomaterials that can promote regeneration of tissues and organs, from bone and cartilage to muscle and brain tissues. Earlier this year, he received the Royal Society of Chemistry's Soft Matter and Biophysical Chemistry Award for his research.

"What makes it exciting is you get to use cutting edge science – it's new for everybody in the field – and it's having an impact on lifespan and quality of life for people," said Stupp, also a professor of Medicine in the Division of Endocrinology, Metabolism, and Molecular Medicine at Feinberg, of Materials Science and Engineering and Biomedical Engineering at the McCormick School of Engineering and of Chemistry at the Weinberg College of Arts and Sciences.

The field of supramolecular materials is based on supramolecular chemistry, a rapidly developing area in chemistry that studies the interactions among molecules and the way they can self-assemble into functional structures. The beginning of this field was recognized in 1987 when Donald J. Cram, Jean-Marie Lehn and Charles J. Pedersen received the Nobel Prize in Chemistry.

Part of Stupp's work focuses on developing materials that mimic the nanoscale architecture of extracellular matrices surrounding mammalian cells, which have the ability to display biological signals that can interact with receptors and trigger signaling pathways. The signals from the artificial matrix can be used to amplify the potency of these pathways and also to promote cell proliferation and differentiation.

The artificial nanofibers that Stupp has engineered resemble fibers of the cytoskeleton, collagen and extracellular filaments such as fibronectin and laminin fibers. They are built from a

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Northwestern Medicine®

Regenerative Medicine

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combination of amino acids, nucleic acids, lipids and sugars, which allows them to degrade into nutrients for cells without causing any harm. The scientists believe they can incorporate any biological signal in these nanofibers to achieve a specific therapeutic target.

This feature of the nanofibers has allowed Stupp to establish collaborations across the medical school including with John Kessler, MD, Ken and Ruth Davee Professor of Stem Cell Biology, on regenerating the nervous system in the spinal cord, Susan Quaggin, MD, chief of Nephrology, and Guillermo Oliver, PhD, Thomas D. Spies Professor of Lymphatic Metabolism, on targeting vascular regeneration, as well as Melina Kibbe, MD, adjunct professor of Surgery, on repairing vascular damage and targeting nanostructures to specific sites to reduce hemorrhage. Other successful collaborations with former Feinberg faculty involved cancer therapies, peripheral arterial disease and islet transplantation with Vincent Cryns, MD, currently at the University of Wisconsin, Douglas Losordo, MD, adjunct professor of Medicine, and Dixon Kaufman, MD, PhD, at the University of Wisconsin.

"One of the exciting ongoing projects is the possibility of using supramolecular materials to target plaque in arteries to reverse plaque formation," Stupp said. This NIH-funded project involves collaborations with both Kibbe and Shad Thaxton, '04 MD, '07 PhD, assistant professor of Urology.

The nanomedicine research in Stupp's lab currently advances to new unprecedented levels. In work published this year in *Nature Materials*, the group "demonstrated that the length of chemically identical nanofibers can determine whether mammalian cells survive and proliferate or not," Stupp said.

In a paper published in *Science* earlier this year, Stupp's lab described the development of new forms of the nanofibers that

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combines two types of polymers, those formed with covalent bonds and others formed with non-covalent bonds, also known as supramolecular polymers. The weaker covalent bonds in the new hybrid polymer gave it the ability to incorporate removable parts from the rigid stability of polymers with covalent bonds.

"These new unprecedented materials could be used as therapeutic agents to deliver drugs to cells over long periods of time or to affect cell behavior," he said.

Stupp's group used super resolution microscopy to illustrate that nanofibers are capable of rearranging their structures dynamically and could adapt to the receptor patterns on cells, work published recently in *Nature Communications*.

"This particular finding implies that highly bioactive nanoscale filaments will be possible in the future to address the most difficult regenerative and disease targets," Stupp said.

They also discovered the nanofibers could interact with scaffolds on cell membranes to amplify BMP-2 signaling – critical in the regeneration of bone – by growth factors, in a paper published in *Nanoletters*.

Stupp is currently working in collaboration with Wellington Hsu, MD, Clifford C. Raisbeck, MD, Professor of Orthopaedic Surgery, and Erin Hsu, PhD, research assistant professor of Orthopaedic Surgery, on using these nanofibers in BMP-2 signaling in spinal fusion animal models.

"Innovation is essential to developing non-iterative solutions to clinical challenges," Erin Hsu said. "Our work with the Stupp group has made such solutions a legitimate possibility. Because the platform for this technology is so broad, the prospect for its application in a wide variety of clinical settings is very exciting for us."

In future work, Stupp's group is developing new materials capable of displaying signals that can be turned on and off by adding certain molecules to cell cultures.

"This means that stem cells could be manipulated with one signal to promote their proliferation," Stupp said. "That signal could be turned off when the cells are ready to differentiate and a new signal could be introduced for differentiation."

CONTENTS

Jumpstarting Drug Discovery for Hearing Loss

Donna Whitlon, PhD, Otolaryngology – Head and Neck Surgery

Since joining Feinberg's faculty in 2002, Donna Whitlon, PhD, research associate professor of Otolaryngology – Head and Neck Surgery, has aimed to find new interventions to prevent and repair damage to spiral ganglion neurons in the cochlea, a cavity in the inner ear essential for hearing. Through her research, she works to uncover new mechanisms of spiral ganglion neurite elongation in hopes of informing drug discovery. Currently, there are no drugs specifically approved by the FDA to protect against or reverse hearing loss.

Whitlon's work has been funded by the National Institutes of Health, American Hearing Research Foundation, Knowles Leadership Fund and is presently supported by two grants from the Office of Naval Research.

Q&A

What are your research interests?

The anatomy of the cochlea, particularly the wiring of the local spiral ganglion neurons, captured my imagination over 30 years ago. I spent the early part of my career studying the anatomy, protein expression and development of the spiral ganglion nerve fibers. Now, in the Department of Otolaryngology, I am interested in a critical clinical question: How can we help to protect against or repair hearing loss? I would like to be able to intervene to protect damaged spiral ganglion neurons and encourage regeneration of their fibers and innervation. Overall, my laboratory aims to jumpstart drug discovery for hearing research using skills including biochemistry, cell biology and cell culture together with knowledge we have accumulated over the years about spiral ganglion development and morphology. We are now working toward identifying compounds that will stimulate neurites to regenerate their length in vitro, then advancing the most promising compounds to in-depth evaluation in a hearing impaired animal model.

How does your research advance medical science and knowledge?

According to the National Institute on Deafness and Other Communication Disorders (NIDCD), disabling hearing loss increases with age until nearly 50 percent of those aged 75 and older are affected. The NIDCD also estimates that about 15 percent of Americans between the ages of 20 and 69 (about 26 million people) have high frequency hearing loss due to noise exposure. In the armed forces, exposure to high decibel noise (aircraft carriers, machinery, weapons fire) is virtually unavoidable, and, as a result, the Veteran's Affairs reports that its major expenditures for service-related injuries are for problems related to hearing and balance. Personal protective devices and sound dampening engineering can only go so far, and we are left with a problem of hearing loss that has no solution other than hearing aids and cochlear implants, neither of which can return the user to normal hearing.

The spiral ganglion neurons in the cochlea are bipolar neurons that connect the primary auditory receptor cells, the hair cells, with corresponding cells in the cochlear nucleus. Because auditory information, such as frequency, intensity and timing, passes from the cochlea to the brain via these neurons, any interruption in their connections to the hair cells (neuron or hair cell death, loss of synapses, neuron or hair cell dysfunction) results in hearing loss.

High decibel noise, certain antibiotics, aging or toxic insults to the cochlea can cause damage to the spiral ganglion neurons and/or hair cells and cause hearing loss. Spiral ganglion neurons retract their peripheral fibers and eventually neurons can die. Spontaneous regrowth of the peripheral fibers is very limited, but the organized connections of the fibers connected to the brain can be generally retained. It is because of these connections that cochlear implants, whose action bypasses the synaptic connection between hair cells and neurons, can send hearing-related electrical information from the cochlea to the brain. Regeneration of the peripherally oriented fiber back to the hair cell region is one way to begin to reconnect neurons with surviving hair cells, or to improve the function of cochlear implants.

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One Year of Progress on the Simpson-Querrey Biomedical Research Center

In May 2015, Northwestern University broke ground on its largest single construction project to date, the Louis A. Simpson and Kimberly K. Querrey Biomedical Research Center. A little over a year into the construction progress, the building is beginning to take shape.

Up until a few months ago, much of the work at the site hadn't been visible to the typical passersby. This is because to-date, much of the progress has been underground work on the foundation of the building.

"The foundation system is very extensive to accommodate the scientific equipment being installed in the building. Things like cell injections require a very precise base, and all the microscopes need a vibration-free environment, so having a very stable base is very important," Jay Baehr, senior project manager at Northwestern University said.

Watch a video *about the Simpson-Querrey Biomedical Research Building construction progress.*

Creating this elaborate foundation system has been no easy task. Crews have spent the last year excavating between 40 and 60 feet down into the site to clear any existing foundation from the previous structure and drilling large support beams called caissons into the earth to anchor the building to the ground.

"Many times we hear about other high-rises moving in the wind, but because this is a research building, we needed to prevent this. To do so, we put in some of the largest caissons ever poured in the city of Chicago. They have a 10-foot diameter shaft with a 25-foot diameter bell that will house the structural steel as construction progresses," Baehr said.

An added challenge to the process has been the first stages of connecting the Robert H. Lurie Medical Research Building with the new Simpson-Querrey Biomedical Research Center. In order to do so, crews had to excavate 60 feet down into the construction site to align the two foundations.

"This is a unique project because of the scale and size, but what makes it really interesting is building it as an addition to the Lurie building. We're taking a structure that was built in 2001 and building on top of and alongside it. It makes for a creative approach to the construction process," Baehr said.

Joining the two buildings together will support collaborations between affiliates and other schools at Northwestern with medical school scientists. In its first phase alone, the building is expected to create an additional 600,00 square feet of space and 2,000 full-time positions.

"This building represents the expansion of research for the whole university. There is very little expansion available for the sciences on the Evanston campus. By building this large building, the university is continuing to grow its research enterprise," Baehr said.

In coming months, crews will finish installing the caisson system and begin pouring concrete for the structural system. For the remainder of the year and into next spring, concrete for the basement floors will be poured and the basement structure will be framed. The team expects to begin adding structural steel and framing work on the ground floor in winter 2017.

"This is one of the biggest medical research buildings ever attempted. When the University finishes the second phase, it will be 600 feet tall, so it's quite a unique challenge. It is not like your typical everyday building," Baehr said.

Using Quantitative Methods to Understand Complex Human Experiences

Alexandra Apple, Clinical Psychology, PhD Program

Alexandra Apple, a fourth-year student in the Clinical Psychology PhD Program, uses neuropsychological and imaging neurosciences techniques to study mechanisms of cognitive decline in clinical populations, in the laboratory of Lei Wang, PhD, assistant professor of Psychology and Behavioral Sciences and Radiology.

Apple earned her undergraduate degree from the University of California, Berkley. After four years of working in cognitive science and medical imaging, she grew to appreciate the variety of approaches needed to understand the brain and was drawn to Northwestern's Clinical Psychology Program.

Q&A

Where is your hometown?
I grew up in Palo Alto. It wasn't until I moved to Chicago that I realized how spoiled I was by the California weather. Living here has definitely made me adjust my definition of winter.

What are your research interests?
Overall, my research interests lie in the application of quantitative methods to understand complex human experiences. Specifically, my focus is on combining neuropsychological and imaging neurosciences to elucidate mechanisms of cognitive decline in clinical populations. In the past, I have studied dementia populations with Parkinson's, Huntington's and dementia of the Alzheimer type, and currently I am focusing on cancer patients who undergo cognitive changes as a result of their treatments.

What exciting projects are you working on?
My dissertation research aims to better understand the neural basis of cancer-related cognitive impairment (CRCI). CRCI is thought to be caused by neurological damage resulting from cancer treatment; however, the specific brain networks targeted in this condition are unknown. I am using multi-modal MRI techniques to explore a promising candidate network, the hippocampal-prefrontal network and its impact on cognition in a breast cancer population. The overarching aim of my study is to examine the structural integrity and functional connectivity of this hippocampal-prefrontal network in CRCI. I hypothesize that impairments in this network contribute to the cognitive deficits reported by cancer patients. Hopefully, results from this study may lead to noninvasive tests for CRCI and aid in the development of treatments to alleviate these cognitive symptoms. This project is of particular interest to me as my mother has experienced cognitive impairments during and after her chemotherapy treatment for ovarian cancer. I feel very fortunate and grateful to have recently received a Ruth L. Kirschstein Institutional National Research Service Award predoctoral fellowship from the National Institutes of Health to complete this work.

What attracted you to the PhD program?
Although my Bachelor's degrees were in psychology and social welfare, upon graduating I worked mostly in the medical imaging and neuroscience fields as a research assistant. After almost four years of working at the San Francisco VA and at UCSF, I gained an interdisciplinary view of cognitive science. Through collaborations with bioengineers, psychologists and radiologists, I came to appreciate the variety of approaches needed to understand the brain. In order to gain the skills needed to tackle the questions that interest me most – those at the interface of brain function and behavior – I sought out doctoral programs that combine neuroimaging and clinical psychology. I am so happy to have found my home at Northwestern University's Clinical Psychology PhD program. I was drawn to the program in part due to my mentor Dr. Wang's expertise in the development of neuroimaging tools, specifically subcortical morphometry, as well as his extensive collaborative network and access to clinical populations. I feel incredibly lucky to also be able to be practicing clinical skills and working directly with patients, which helps give more meaning to my imaging research.

What has been your best experience at Feinberg?
All of my classmates, teachers and mentors are what have made my experience at Feinberg so wonderful. I would be nowhere without their support and friendship.

What do you do in your free time?
In my free time I like to run by the lake, stalk my friends' puppies (kidding, sort of) and swing dance. I am also planning my wedding for next summer, which feels less like a hobby and more like a part-time job.

What are your plans for after graduation?
I hope to work at an academic medical center like Northwestern's (possibly back in sunny California), where I would be able to combine neuropsychological clinical practice and imaging research involving cognitive decline in clinical populations.

Advocating for Women and Underrepresented Groups in Science

Nicole Woitowich, Director of Science Outreach and Education, Women's Health Research Institute

Where are you originally from?
I am a lifelong Chicagoan, born and raised on the Northwest side in the Edgebrook neighborhood.

What is your educational background?
I received my Bachelor of Science in biological sciences from Purdue University, my Master of Science in biology from Northeastern Illinois University and my PhD in biochemistry and molecular biology from Rosalind Franklin University of Medicine and Science.

Please tell us about your professional background.
I was trained as a research scientist with a background in reproductive physiology, but discovered early on that my true passion lies in science outreach and education. I have experience developing outreach programming on both the local and national level, as a member of the Public Outreach Committee for the American Society for Biochemistry and Molecular Biology, and the founder of Women in Scientific Discovery or Medicine (WISDOM), a Lake County-based organization that promotes the advancement of women and underrepresented groups in the basic and health sciences.

Why did you choose to work at Northwestern?
Northwestern values and recognizes the importance of diversity in biomedical research on many levels. The fact that the Women's Health Research Institute (WHRI) exists is a true testament to that. I am delighted to be an advocate for sex and gender inclusion in biomedical and clinical research as well as a champion for women in science and medicine.

How do you help scientists and/ or research students at the medical school?
The WHRI has many tools for investigators and trainees interested in incorporating sex or gender considerations into their research portfolio. I have hands-on experience developing experimental protocols that incorporate sex as a biological variable and can act as a resource for investigators or students who are interested in evaluating their current research methods or developing new ones. Also, I am the research coordinator for the Illinois Women's Health Registry, a platform designed to increase the visibility and participation of women in clinical research. Investigators can utilize this database of over 7,000 women as a recruitment tool for clinical research or conduct epidemiological studies.

What is your favorite part of the job?
I enjoy making science accessible. This may mean translating a scientific journal article into a blog article that is easy for non-scientists to understand or discussing current advances in women's health research with community partners. On the other hand, it might be fostering collaboration between interdisciplinary scientists and clinicians, or developing mentorship opportunities for students, post-docs and faculty. Together, I find these activities very rewarding.

What exciting projects are you working on?
In January of 2017, the WHRI in collaboration with NUCATS will be hosting a workshop which will highlight sex-inclusive research and provide training on the NIH policy to include sex as a biological variable in biomedical and preclinical research. We have a pretty exciting agenda planned and look forward to bringing you additional details in the near future.

What do you like to do in your spare time?
I love to travel! I have been fortunate enough to visit every continent with the exception of Antarctica.

Anything else we should know about you?
I am more than happy to act as a resource and mentor for students or post-docs interested in careers beyond the bench. Additionally, please don't hesitate to contact me at nicole.woitowich@northwestern.edu or at (312) 503-1385 if there is any type of programming you would like to see hosted by the WHRI! I'd love to hear from you!

Connect with Nicole on LinkedIn.

Research in the News

The New York Times, August 1

Rediscovering the Kitchen, and Other Tips for Heart Health
Donald Lloyd-Jones was quoted.

HealthDay, August 1

Eczema's Effects More Than Skin Deep
Jonathan Silverberg was quoted.

The New York Times, August 8

Dementia Patients Hold On to Love Through Shared Stories
Northwestern's Cognitive Neurological and Alzheimer's Disease Center was mentioned.

BBC News, August 8

New Study on Female Fertility
Francesca Duncan was quoted.

Crain's Chicago Business, August 8

Zika and the 2016 Olympics: Looking for transparency and not finding it in Rio
Written by Kelly Michelson.

NPR, August 12

Could Worms In Your Gut Cure Your Allergies
Stephen Hanauer was quoted.

Crain's Chicago Business, August 12

She wants to make an autonomous wheelchair
Brenna Argall was quoted.

The New York Times, August 17

How Periods Might Affect Women's Athletic Performance
Lynn Rogers was quoted.

Fox News, August 18

Most antipsychotic drugs not tied to birth defects
Katherine Wisner was quoted.

► This research was also featured in *Reuters*

More media coverage available online.

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Request a consultation with Center for Community Health

From clinical trials targeting a specific demographic to those focused on a specific health condition, the Center for Community Health (CCH) is able to offer insights on working with specific populations.

To help facilitate this process, CCH offers free consultations to investigators. Consultation support is available for research teams at any point in the research process. While engagement early in the research process is preferred, CCH can assist and/or connect research teams with the appropriate stakeholders that can inform adaptations in study design, recruitment strategies and/or dissemination strategies that best meet the needs of diverse communities. CCH can help investigators connect to key stakeholders through the strong relationships they have established with more than 55 community organizations and 140 community healthcare practice sites throughout Chicagoland. These organizations, in partnership with the CCH staff, are able to offer insight into habits, customs or patterns of behavior of specific populations that should be considered when designing or implementing a research study. By focusing on the unique characteristics of the target population, at all stages of the research process, CCH can help investigators overcome common research barriers and make it easier to translate the findings into daily life.

If you are interested in working with CCH or learning more about the ways in which CCH can support your research, please click here to request a consultation.

Sponsored Research

PI: Amy Paller, MD, Walter J. Hamlin Professor and chair of Dermatology

Sponsor: National Institute of Arthritis and Musculoskeletal and Skin Diseases

Title: "Glycosphingolipids Mediate Diabetic Wound Healing Impairment"

Poor wound healing is a major health issue in insulin-resistant diabetes. Improved understanding of wound pathology and new interventions for impaired wound healing are needed. Paller's laboratory recently discovered evidence that a glycolipid found on skin cell membranes is increased in diabetic skin; depleting it in diabetic mice leads to normal wound healing. Using novel gene suppressive and biochemical interventions to deplete the glycolipid, Paller's team will test the reversal of the wound healing defect in diabetic mice and explore how this glycolipid leads to the poor wound healing of diabetes. Through a series of experiments, the scientists will also explore the membrane-based dynamics that impact insulin and insulin-like growth factor-1 receptor signaling in skin. Accelerating wound healing, whether by nano-delivery of gene suppression or small molecule inhibition of GM3 synthesis, could be fast-tracked towards translational application as a new treatment approach for diabetic wounds.

Read more about this project.

PI: Stephen Persell, MD, MPH, associate professor of Medicine in the Division of General Internal Medicine and Geriatrics

Sponsor: Health Resources and Services Administration

Title: "Academic Units for Primary Care Training and Enhancement"

Working with Deborah Clements, MD, the Nancy and Warren Furey Professor and chair of Family and Community Medicine, Persell will establish an academic program within the Center for Primary Care Innovation. The program will support system-level research to advance primary care training to produce a workforce that can effectively address the behavioral, social, cultural and economic factors that impact health. Professional medical educators and experienced researchers will formally evaluate the existing state of the field, including how to best teach medical students, physician assistant students and primary care residents to care for diverse populations, promote equity in healthcare and learn the skills necessary to become outstanding primary care clinicians in the 21st century health system.

The academic program will span all primary care specialties – family medicine, general internal medicine and general pediatrics.

Read more about this project.

Welcome New Faculty

Ryan Drenan, PhD, joins as associate professor of Pharmacology. His area of expertise includes examination of the processes regulated by native acetylcholine receptors and how they apply to cognitive processing and neurological disease. Previously, he was assistant professor at Purdue University in the Department of Medicinal Chemistry and Molecular Pharmacology. Drenan earned his PhD in Molecular Cell Biology from Washington University. He then completed postdoctoral training at the California Institute of Technology in the Division of Biology. He is the principal investigator on two National Institutes of Health R01 grants and has published more than 26 peer-reviewed journal articles.

Drug Discovery for Hearing Loss

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Because screening compounds for hearing loss in deaf animal models is prohibitive in time and resources, we focused on developing an in vitro screening approach that would allow us to narrow down a library of compounds to a few of the most promising that could be elevated to more in-depth analysis in deaf animal models. To do this, my lab developed the first dissociated primary cultures for mouse spiral ganglion, characterized it, quantified neurite growth under various conditions and miniaturized it for use in 384 well plates. We have used these cultures to carry out the first small molecule screen for spiral ganglion neurite elongation and found that inhibitors of the HMG-CoA reductase, the first step in the mevalonate pathway, stimulates neurite elongation by a non-cholesterol dependent branch of the pathway. We elevated the most promising inhibitor to evaluation in noise exposed guinea pigs and found that delivery of the drug directly to the cochlea before or at the time of noise exposure protected against noise induced hearing loss.

What types of collaborations are you engaged in across campus?

Auditory research has to be multidisciplinary. My key collaborator is Claus-Peter Richter, MD, PhD. He is a recognized expert on whole animal auditory experiments, including surgery, electrophysiology and cochlear imaging. Together we have been able to identify promising compounds by cell culture and biochemistry, then elevate them to in vivo analyses in deafened animals and image the soft tissue in whole cochleas with a novel technique using hard X-rays. Jing Zheng, PhD, has the expertise in molecular biology and Kazuaki Homma, PhD, contributes the expertise in patch clamp recordings for our neurons.

What resources at Northwestern have been helpful for your research?

We collaborate with the High Throughput Analysis Laboratory of Northwestern University for imaging our cultures and we consistently use the confocal microscopes in the Cell Imaging Facility to image immunolabeled

cochleas from experimental guinea pigs. The Genomics Core has also been helpful. Importantly, Northwestern University is a well-known center for audiology and auditory research. Richter, Zheng, Homma and I with others in Feinberg and the Evanston campus are very fortunate to be fellows of the Knowles Hearing Center, a cross-campus, interdepartmental group dedicated to the prevention, diagnosis and treatment of hearing disorders. It is an active group that meets regularly, brings in well-known auditory seminar speakers and presents symposia on timely hearing topics.

Funding

BRAIN Initiative: Development and Validation of Novel Tools to Analyze Cell-Specific and Circuit-Specific Processes in the Brain (R01)

More information

Sponsor: National Institutes of Health

Submission deadline: November 2

Upper amount: $5 million to fund 4-7 awards for up to 3 years

Synopsis: This opportunity invites investigators to develop and validate novel tools to facilitate the detailed analysis of complex circuits and provide insights into cellular interactions that underlie brain function. Developing new genetic and non-genetic tools for delivering genes, proteins and chemicals to cells of interest or approaches that are expected to target specific cell types and/or circuits in the nervous system with greater precision and sensitivity than currently established methods are encouraged.

Predictors and Determinants of Age-Related Changes in Resiliencies to Physical Stressors in Humans (UH2/UH3)

More information

Sponsor: National Institute on Aging

Submission deadline: November 3

Upper amount: $1.8–$2.7 million per year for up to 5 years

Synopsis: This phased innovation initiative, involving an interdisciplinary research team, aims to enhance clinical tools to assess resiliencies and advance our understanding of age-related changes in resiliencies to physical stressors in humans. Resilience is defined here as the dynamic ability to maintain or recover appropriate function in response to a physical stressor, such as hip fracture, infections, or surgical procedures.

Human Heredity and Health in Africa (H3Africa): Ethical, Legal, and Societal Issues (ELSI) Collaborative Centers (U54)

More information

Sponsor: National Institutes of Health

Submission deadline: November 15

Upper amount: $500,000 per year for up to 5 years

Synopsis: This funding opportunity encourages applications to establish Collaborative Centers to study ethical, legal and societal issues of human genome research across the African continent. Of particular interest are projects that propose bioethical, legal, and social science analyses of new or emerging issues that affect multiple communities across the continent of Africa.

View more funding opportunities

Understanding Citation-Related Metrics

Investigators are often curious about citation-related metrics and where to find the best data available. It's good practice to understand the data sources and the strengths and shortcoming of the most commonly discussed metrics.

Data sources: Quantity and Quality

When thinking about most citation-related metrics, you'll need to find a data source that tracks not only articles, but their references sections as well. There are a handful of databases that do this: Elsevier's Scopus, Thomson Reuter's Web of Science and Google Scholar.

Keep data quantity and quality in mind. A database that indexes more articles has access to more reference sections, and therefore counts more citations. Scopus counts citations from its large pool of 21,500 peer-reviewed journals. Web of Science has around 12,000 peer-reviewed journals. While the journal count looks significantly different, keep in mind that Web of Science has a large index of conference proceedings and a strong list of indexed books.

Though quantity seems to trump quality, that isn't always so. For example, Google Scholar pulls their citations from the vast scholarly web, yielding higher citation counts than you might expect, but their definition of scholarly is sometimes less than rigorous. They've improved their coverage over the years, but some citations come from odd places, such as websites or online guides.

Name disambiguation seems to be a data quality issue, too. Scopus provides authors with a numeric author identifier, which means authors with common names are less likely to find their data lumped together. Web of Science and Google Scholar don't have this option, though there are ways to clean up your data in both.

Galter Library tip: Use the database you feel most comfortable with, but make sure you cite your data source. Consider using two databases (like Scopus and Web of Science) to confirm the accuracy of the numbers you've found. Also consider signing up for an ORCiD to lessen name disambiguation issues in the future.

Metrics and Measures: Understanding Their Purpose

The two most commonly discussed metrics these days are the h-index and the Journal Impact Factor. The h-index was introduced by J.E. Hirsch in 2005 to measure the impact of scientists' work. A researcher with an h-index of 10 has 10 papers with at least 10 citations. The h-index measures cumulative impact (so you shouldn't limit your documents or citations to specific years) and controls for documents with disproportionally high citation counts. Keep in mind that a single number cannot tell the story of an entire career. The h-index should not be used to compare across fields because of variant publishing practices, and it can disadvantage early career researchers whose work is too new to gather many citations.

Galter Library tip: Your h-index is provided by Scopus, Web of Science and Google Scholar. If you need help finding the h-index, contact your Liaison Librarian. Consider pairing your h-index with a narrative describing your contributions to your field of study.

The Journal Impact Factor (JIF) is produced by Thomson Reuters. It was originally developed by Eugene Garfield in 1975 for librarians to identify important journals to include in library collections. Occasionally you'll see the JIF misused to evaluate the impact of a research article; it is important to note that JIF should be used to evaluate the relative importance of a journal within its field.

Galter Library tip: Use the JIF to help you decide which journal to publish in. If you want to evaluate the quality of an individual article, consider article-level metrics, like Scopus's Field-Weighted Citation Impact or NIH iCite's Relative Citation Ratio.

If you have any further questions on this topic, feel free to contact the Metrics and Impact Core at Galter Library.

High Impact Factor Research

July 2016

Blizinsky KD, Diaz-Castro B, Forrest MP, Schurmann B, Bach AP, Martin-de-Saavedra MD, Wang L, Csernansky JG, Duan J, Penzes P. Reversal of dendritic phenotypes in 16p11.2 microduplication mouse model neurons by pharmacological targeting of a network hub. *Proceedings of the National Academy of Sciences of the United States of America.* 2016 Jul 26;113(30):8520-8525.

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Help Feinberg Track Journals

The Feinberg Research Office regularly tracks research published by Feinberg investigators. The citations are used on web pages, in newsletters and social media, for internal reporting and more. To more accurately track these journals, the Research Office asks that Feinberg investigators use the following institution name in the address field when publishing in peer-reviewed journals: "Northwestern University Feinberg School of Medicine."

Calendar

Tuesday, September 13

Seven Minutes of Science

Seven Minutes of Science will showcase graduate students and postdocs presenting their current research. The goal of the symposium is to share the ideas and research taking place at Northwestern in a way accessible to individuals from any background.

Time: 3 p.m. to 5 p.m.

Location: Robert H Lurie Medical Research Center
Hughes Auditorium
303 E. Superior

Contact: Michelle Paulsen RSG@northwestern.edu
More information

Monday, September 26

Third Annual Narahashi Lecture

Lily Yeh Jan, PhD, the Jack and DeLoris Lange Professor of Physiology and Biophysics and Howard Hughes Medical Institute investigator at the University of California San Francisco School of Medicine, will speak on "Studies of Ion Channels in the Potassium Channel Family and the TMEM16 Family."

Time: 4 p.m. to 5 p.m.

Location: Robert H Lurie Medical Research Center
Baldwin Auditorium
303 E. Superior

Contact: Liz Barrera liz.barrera@northwestern.edu

Thursday, September 29

Center for Community Health presents "Innovative Approaches to Engaging Community across the Translational Research Continuum"

Consuelo H. Wilkins, MD, MSCI, co-director of the Meharry-Vanderbilt Community-Engaged Research Core in the Vanderbilt Institute for Clinical and Translational Science, brings together academic researchers and community members to improve community health and healthcare through community-engaged research.

Time: Noon – 1 p.m.

Location: Robert H Lurie Medical Research Center
Baldwin Auditorium
303 E. Superior

Contact: cch@northwestern.edu
More information

NIH News

Criterion Scores on Impact Score and Funding Outcomes

In an analysis of over 123,000 competing R01 applications, a group of authors from the NIH Office of Extramural Research described the correlations of individual component peer review scores – significance, investigators, innovation, approach and environment – with subsequent overall impact score and funding outcome.

They found that an application's approach score and the significance score were the most important predictors of overall impact score in deciding if an application is funded. The authors suggest that the description of the experimental approach is the most important predictor of funding, followed by the significance of the study.

NIH to Host Second Regional Seminar in Chicago

The 2016 NIH Regional Seminar in Chicago will take place October 26-28 at the Palmer House. This two-day seminar on program funding and grants administration will have various workshops and sessions on more than 40 different topics including preparation and submission, research integrity, policy updates and compliance. Pre-seminar workshops are offered on topics such as human research protections, electronic research administration and intellectual property.

Next Steps on Research Using Animal Embryos Containing Human Cells

NIH has published, in the Federal Register and the NIH Guide to Grants and Contracts, a proposal to make changes to policy in the NIH Guidelines for Human Stem Cell Research and is seeking public comment.

NIH is also proposing to slightly expand the current prohibition on the introduction of human pluripotent cells into non-human primate embryos to include the preblastocyst stage, and to clarify that NIH will not fund research involving the breeding of animals where the introduction of any type of human cell may result in human egg or sperm development.