Breakthroughs

Feinberg School of Medicine Research Office

March 2023

How ChatGPT Has, And Will Continue To, Transform Scientific Research

Feinberg experts answer audience questions during a ChatGPT panel discussion hosted by I.AIM and IPHAM, moderated by Yuan Luo, PhD (not in this picture). From left to right: Faraz Ahmad, MD, MS, Ngan MacDonald; Kristi Holmes, PhD; David Liebovitz, MD; Abel Kho, MD; Alexandre Carvalho, MD; Mohammad Hosseini, PhD; and Catherine Gao, MD.

By Melissa Rohman

Within just a matter of months, ChatGPT — the AI-powered chatbot created by Silicon Valley startup OpenAI — has taken the world by storm with its easy-to-use and accessible interface (at the time this story is published, free and paid subscription versions of ChatGPT are available) and human-like responses that, until now, have remained unheard of with most AI tools.

On paper, ChatGPT (the GPT stands for "Generative Pre-trained Transformer") is a large language model (LLM) built from OpenAI's GPT-3 family of LLMs. It uses an advanced learning algorithm called a neural network to absorb large amounts of information and data to generate a human-like text responses to users' prompts.

In what's seemed like a lighting round of recent developments, OpenAI has made ChatGPT and their other LLMs available to developers to integrate into their own apps and products, and on March 14 the startup released its successor to ChatGPT: GPT-4, a multimodal large language model, meaning it can respond to both text and images given by users.

Needless to say, ChatGPT's quick rise into mainstream popularity has also ignited new competition among big tech companies, with many launching their own AI chatbots, such as Bard from Google, and Microsoft's new ChatGPT-powered Bing browser.

ChatGPT has also caught the attention of professionals across fields, including academia, healthcare and scientific research. In an anonymous Twitter poll administered to Feinberg faculty, staff and students on February 13, almost 50 percent of respondents said that ChatGPT could "prove useful" in their own work and lives.

Still, the potential of ChatGPT has been met with concern. Shortly after OpenAI released ChatGPT to the public, investigators led by Catherine Gao, MD, instructor of Medicine in the Division of Pulmonary and Critical Care, sought to examine the quality of scientific abstracts produced by AI compared to those written by humans.

In the study, the team gave blinded human reviewers a mix of real and ChatGPT-generated abstracts and found that the reviewers could only identify the fake abstracts 68 percent of the time. The reviewers also incorrectly identified 14 percent of the real abstracts as being written by ChatGPT.

The findings, which are published on the open access pre-print server bioRxiv and currently under peer review, show how ChatGPT can successfully produce realistic and convincing scientific abstracts.

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Chat GPT *(continued from cover page)*

"Even though the reviewers found 68 percent of the fake abstracts, that's not very good differentiation despite knowing they were being given generated abstracts and were being so skeptical." Gao said.

Benefits, Risks and Room for Improvement

Like any new technology, ChatGPT is far from perfect and has much room for improvement. While it provides users with very confident-sounding answers within seconds, the sources of its information aren't currently disclosed to the user.

Fact-checked or not, the chatbot uses web-scraped data to generate its responses and prompts, which could increase the risk of spreading misinformation and promote bias, according to Yuan Luo, PhD, associate professor of Preventive Medicine and of Pediatrics, and chief AI officer for the Northwestern Clinical and Translational Sciences (NUCATS) Institute and the Institute for Augmented Intelligence in Medicine (I.AIM).

"I think the biggest disadvantage is this authoritative appearance without substantiation," Luo said. "If you are not familiar with certain content, you might be led to believe whatever is written, which could be entirely false, and this has implications regarding the spread of misinformation."

Despite the potential risks, Luo believes the tool can also be used for good. For example, it could help non-native English speakers write grammatically-correct scientific abstracts — more than 95 percent of all scientific abstracts are written in English. In healthcare, physicians could use ChatGPT to compose patient notes more efficiently, potentially reducing burnout. However, using it to diagnose disease and recommend treatments is still questionable.

"If you think about the whole process of industrialization, it keeps automating and standardizing human jobs so that we can focus on ourselves with more higher-level activity. Once you internalize those fundamental things into your own muscle memory, I think this integration can free up a lot of human brain power to focus on the next level of exploration," Luo said.

Feinberg's Institute for Augmented Intelligence in Medicine (I.AIM) and Institute for Public Health and Medicine (IPHAM) hosted a panel discussion about ChatGPT for Feinberg faculty, staff and students on February 16.

In January, the World Association of Medical Editors published its recommendations in response to the use of ChatGPT and other chatbots in research publications. Many high-impact journals have also followed suit by releasing their own statements about using the tool in research, some requiring investigators to disclose the use of ChatGPT in their work but prohibiting listing the chatbot as an author, and others banning the tool altogether.

According to Mohammad Hosseini, PhD, a postdoctoral scholar in the Department of Preventive Medicine's Division of Health and Biomedical Informatics, who is based at Northwestern's Galter Health Sciences Library, banning the tool is not only controversial but also unenforceable.

"The way that we work together right now is a result of decades, if not centuries, of trial and error in academia. We have tried so many things, and this is the best thing we have come up with. Now we have this new entity that is challenging every single aspect with it," Hosseini said.

When using ChatGPT in research, transparency, accountability and disclosure must be top priority, according to Hosseini, who is the author of a recent editorial that suggests the following ethical guidelines for using LLMs such as ChatGPT in research:

- Content generated by LLMs should be checked by a domain expert.

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- In the instance of errors or biases, co-authors should be held accountable.
- Investigators should disclose the use of LLMs and indicate text written or co-written by LLMs.
- When content of a publication is impacted, even in the absence of using AI-generated text, the aforementioned should be disclosed.
- Investigators should not use LLMs to fabricate or falsify data.

Hosseini's editorial was cited in *JAMA* in another editorial, which argues that the responsible use of AI language models and transparent reporting can help maintain the integrity of scientific research and trust in medical knowledge.

"The aim is to ensure that disclosure is happening and people who use these systems are transparent, providing as many details as possible," Hosseini said. "The recommendations we've provided, they're just the beginning."

Getting Ahead of the Game

Having discussions right now about ChatGPT can help inform new regulations that also ensure the tool remains both accessible and equitable, said Abel Kho, MD, director of I.AIM and the Institute for Public Health and Medicine (IPHAM)'s Center for Health Information Partnerships.

"If you look at the way technology is distributed in society today, it's not equal," Kho said. "One of the risks of technology advancement is that novel technology tends to be driven by people and institutions with the most resources. This can contribute to an environment where people without the means, or who may not be seen as having the same consumer value, can be marginalized."

In addition to access, it's also important to determine how ChatGPT will impact larger ecosystems complicated by issues related to information literacy, said Kristi Holmes, PhD, director of Northwestern's Galter Health Sciences Library and chief of Knowledge Management for I.AIM.

"We need to carefully understand how people find, evaluate and make use of information. Whether we consider students, researchers, or members of the public, we must thoughtfully and thoroughly investigate how this kind of technology can intersect with their work and the way they're living their lives," Holmes said.

Recently, I.AIM and the Institute for Public Health in Medicine (IPHAM) hosted an open panel discussion inviting Feinberg faculty, staff and students to discuss ChatGPT with Northwestern experts. The panelists, included Kho, Gao, Luo, Hosseini, Holmes and others, acknowledged the community's shared hesitation surrounding ChatGPT while also highlighting potential benefits of the tool and, ultimately, how ChatGPT has democratized the use of AI and why that's a good thing.

A few weeks later, I.AIM hosted another panel discussion titled "Navigating the Legal Landscape of AI in Medicine" which included medical and legal experts to discuss clinical and ethical perspectives and potential direction for future regulation of tools like ChatGPT.

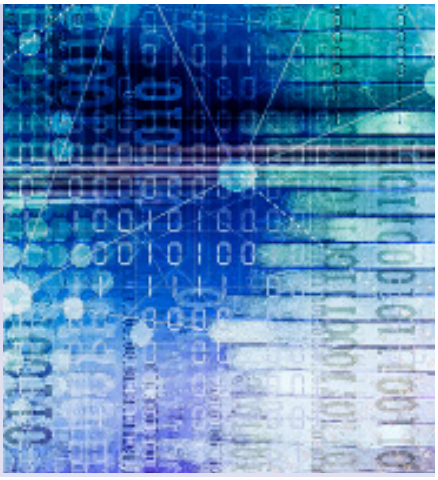
"It has brought a lot of attention to the potential for machine learning and artificial intelligence methods," Kho said. "The most important thing right now is to engage as many different types of parties as we can in these discussions so that we can get ahead of it and project what the implications are and what policies or protections are necessary to put in place so we can have widespread and equitable impact."

Breakthroughs Podcast

Can ChatGPT Support Biomedical Research? with Catherine Gao, MD, and Yuan Luo, PhD

Northwestern scientists Yuan Luo, PhD, and Catherine Gao, MD, discuss a study they conducted using ChatGPT. The results showcase the artificial intelligence chatbot's ability to produce convincing medical research abstracts. They also discuss the tool's potential to help with writing-intensive tasks in healthcare and medical research.

Listen to the episode.



Medical School Faculty Named AAAS Fellows

By Olivia Dimmer

Luisa Iruela-Arispe, PhD, Murali Prakriya, PhD, Linda A. Teplin, PhD and Teri Odom, PhD, have been selected as 2022 fellows of the American Association for the Advancement of Science (AAAS), the largest general scientific society in the world.

The 2022 class of AAAS Fellows includes 508 scientists, engineers and innovators spanning 24 scientific disciplines, recognized for their scientifically and socially distinguished achievements.

Luisa Iruela-Arispe, PhD, is chair of Cell and Developmental Biology and the Stephen Walter Ranson Professor of Cell Biology.

Her research focuses on signaling pathways that regulate vascular morphogenesis and vascular dysfunction in diseases. She has published more than 200 peer-reviewed articles and is recognized as a leader in the field of vascular biology.

Murali Prakriya, PhD, is the Magerstadt Professor of Pharmacology and of Medicine in the Division of Allergy and Immunology.

Research in his laboratory is focused on the molecular and cellular mechanisms of intracellular calcium (Ca2+) signaling, especially in the brain and lung tissues.

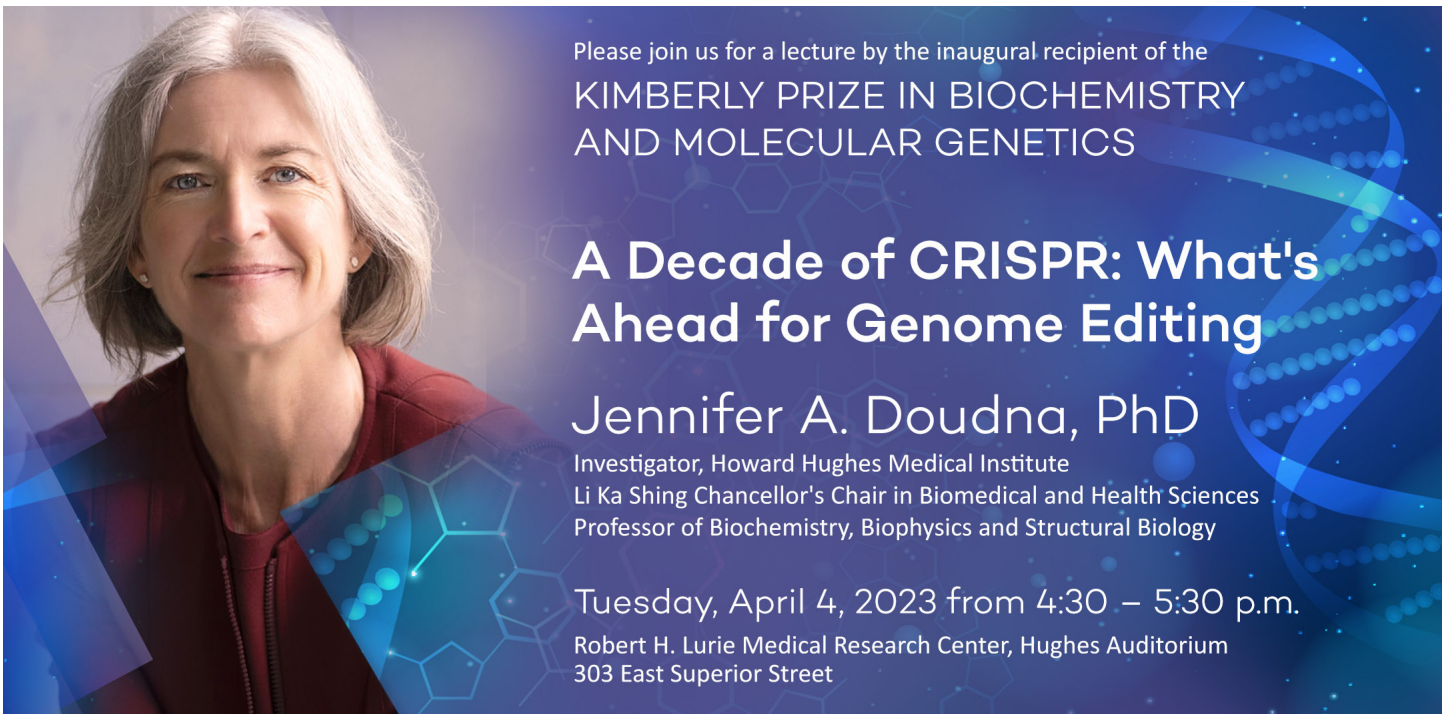
Linda Teplin, PhD, is vice chair for research in the Department of Psychiatry and Behavioral Sciences, the Owen L. Coon Professor of Psychiatry and Behavioral Sciences, and professor of Medicine in the Division of Infectious Diseases.

Teplin has conducted the first large-scale epidemiologic studies of psychiatric disorders in jails, prisons and juvenile detention centers, examining both women and men.

Teri Odom, PhD, is chair of the Department of Chemistry at Northwestern University Weinberg College of Arts and Sciences.

Odom's laboratory focuses on designing structured nanoscale materials with exceptional properties.

Read the full story



Graduate Student/Post-Doc Events and Opportunities

Inaugural Kimberly Prize in Biochemistry and Molecular Genetics Lecture: A Decade of CRISPR: What's Ahead for Genome Editing

April 4, 4:30 to 5:30 p.m.

Please join us for a lecture from the winner of the Inaugural Kimberly Prize in Biochemistry and Molecular Genetics Lecture. Jennifer Doudna, PhD, is the inaugural recipient of The Kimberly Prize, given by Kimberly Querrey in honor of her late husband, Lou Simpson. Hear Douda discuss CRISPR technology and discuss the direct demonstrated link of her discovery into the world for the betterment of humankind.

Robert H. Lurie Medical Research Center
Hughes Auditorium
303 E. Superior St., Chicago
More information

The Heart's Knowledge: Science and Empathy in the Art of Dario Robleto

Now through July 9, Noon to 8:00 p.m. on weekdays, noon to 5:00 p.m. on weekends

The Heart's Knowledge concentrates on the most recent decade of Robleto's creative practice, a period of deepening engagement with histories of medicine, biomedical engineering, sound recording and space exploration. The exhibition organizes the artist's conceptually ambitious, elegantly wrought artworks as a series of multisensory encounters between art and science. Each work seeks to attune viewers to the material traces of life at scales ranging from the intimate to the universal, returning always to the question: Does empathy extend beyond the boundaries of time and space?

Block Museum of Art, Mary and Leigh
40 Arts Circle Drive, Evanston
More information

BMG Seminar: Gary H. Karpen, PhD, University of California, Berkeley

April 20, 10:00 to 11:00 a.m.

The possibility that dynamic biophysical mechanisms, in particular liquid-liquid phase separation (LLPS), regulate formulation and function of chromatin domains is exciting, because it can explain previously enigmatic observations about nuclear structure and function. In this seminar, Karpen will describe recent progress on elucidating the critical components and interactions responsible for heterochromatin condensate formation in vivo. He will also discuss recent progress in understanding the interplay between heterochromatin and nucleoli, two condensates with distinct but linked cellular functions, with respect to their de novo formation and functions in early Drosophila embryos.

Simpson Querrey Biomedical Research Center
Simpson Querrey Auditorium
303 E. Superior St., Chicago
More information

Why Don't White Parents Talk to Their Children About Race?

April 26, 7:00 to 8:15 p.m.

Racism continues to permeate society. Though many white parents believe that racism is still a problem, it can be difficult for them to talk about race honestly with their white children. In this talk Sylvia Perry, PhD, associate professor of psychology, will discuss three common reasons why egalitarian-minded White U.S. parents avoid honest parent-child discussions about race and racism. In this talk Perry will discuss and present suggestions for how White parents can honestly discuss race and racism with their children.

Location to be determined
More information

Research in the News

Associated Press, February 8
How long can people survive in the rubble of an earthquake?
George Chiampas, DO, was featured.

NBC 5 Chicago, February 14
Data-tracking necklace helps smokers kick habit
Nabil Alshurafa, PhD, was featured.

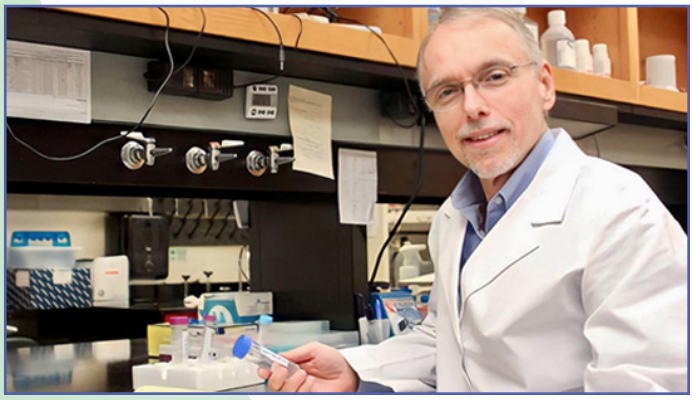
NPR, February 15
New childhood obesity guidance raises worries over the risk of eating disorders
Thomas Inge, MD, PhD, was featured.

The Washington Post, February 17
Depression risk rises after a stroke. What that means for John Fetterman.
Will Cronenwett, MD, is featured.

New York Times, February 17
Every woman can benefit from this pelvic floor workout
Lauren Streicher, MD, was featured.

CBS, February 22
Racism and Sleep: Why researchers say Black Americans are less likely to get a good night's sleep
Mercedes Carnethon, PhD, was featured.

New Director of the Mesulam Center: Robert Vassar, PhD



By Hana Ahmed

On January 1, Robert Vassar, PhD, assumed the role of director of the Mesulam Center, after Marsel Mesulam, MD, stepped down from the position following 28 years of leadership. Vassar has been with Northwestern University since 2001. He is currently the Davee Professor of Alzheimer Research and professor of Neurology and of Cell and Developmental Biology, the scientific director of Behavioral Neurology, and the director of the NIH-funded Northwestern Alzheimer's Disease Research Center.

What have you learned from Marsel Mesulam, the previous director of the center? What do you intend to carry forward with you as you assume this new role?

It's a great honor for me to be now assuming directorship from Dr. Mesulam, who started the Mesulam Center almost 30 years ago. He built it from the bottom up. He was the first person to identify the dementia called Primary Progressive Aphasia (PPA) and he's been studying it ever since. He is a giant of our field.

Dr. Mesulam has been a great mentor to me. I come from a more molecular and genetic background whereas Marsel is a superlative clinician, cognitive neurologist, neuroanatomist, and neuropathologist. We're approaching dementia from opposite poles of the spectrum and meeting in the middle.

I have learned much about the clinical phenotypes of these devastating dementias and how they manifest pathologically. The theme that has emerged from the studies of Dr. Mesulam is that there is deep heterogeneity in aging and dementia. Different types of pathology can lead to the same type of dementia. For example, you can have PPA because of different problems at the molecular level, but they all are within the language center, hence the problem with speech. On the other hand, you can have the same pathology creating different types of clinical output. For example, the pathology that we know causes the memory problems in Alzheimer's patients can also cause degeneration in the language centers to produce the clinical symptoms of PPA. The theme of heterogeneity that runs through our work is what made the Mesulam Center famous, and I fully intend on keeping that theme.

I view my role as supporting the really wonderful research that's going on in the center and nurturing it to grow and flourish. We have a project here that is led by Emily Rogalski, PhD, about people known as "SuperAgers," who are individuals above the age of 80 with cognitive abilities that are equal to much younger individuals. These SuperAgers often lead a full life without having any dementia at all. Dr. Rogalski was recently awarded a very large NIH grant to study the SuperAgers further, and she's going to be connecting the phenotype of these individuals with their brain anatomy and their genetics. Most of them donate their brains to research after they pass away, which allows us to look at their histopathology. We're hoping to understand what makes their brain so resilient or resistant to the age-related pathologies that we see in individuals that have Alzheimer's disease.

Can you explain a discovery that you've made – one that you feel is a highlight of your dedication?

I designed what's called an expression cloning strategy, which I used as a way to identify the enzymes that make amyloid plaques, one of the hallmark pathologies in the Alzheimer's brain. Using that strategy, in 1999 we discovered an enzyme that's called BACE, which is essential for the generation of the problematic amyloid plaques. Back then, there was enormous excitement, because that discovery meant that we could design drugs to inhibit BACE and reduce the accumulation of amyloid plaques.

Tell us a little bit about your journey to this position.

I had graduated from the University of Chicago in biological sciences and I didn't really know what I wanted to do for a career. But I knew I loved research, so I became a technician. That was fine for a few years. Then, my mother was diagnosed with Alzheimer's disease, and watching her go downhill slowly, to the point that she was bedridden and comatose, really devastated me. It was terribly heart-wrenching for me and changed my perspective. At that point, I made the decision that I wanted to devote the rest of my career to understanding Alzheimer's, because back then, in 1983, there was very little known about the disease. Not even the first Alzheimer's genes had been discovered yet.

That spurred me to go on to graduate school at the University of Chicago. I got my PhD in molecular genetics and cell biology in 1992. My first step was to gain technical skills. Making transgenic mice was a hot new technology back then, but no one was doing it at the University of Chicago. So, my advisor, Dr. Elaine Fuchs, sent me to a lab that made transgenic mice so I could learn it and bring it back. Then, Elaine recommended that I go to Dr. Richard Axel's Lab at Columbia University for my postdoc where they studied the molecular biology of olfaction, or smell. With that step, I could start making my move back into neuroscience.

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Pursuing Further Exploration of the Unknown

Celeste Rosencrance, third-year PhD student, Driskill Graduate Program

Celeste Rosencrance graduated from West Viriginia University, where she studied wildlife genomics. In her work in the laboratory of Derek Walsh, PhD, professor of Microbiology-Immunology, she investigates how beta-herpesvirus interacts with host cell processes.

Where is your hometown?
I grew up in a small, rural town among the rolling hills of West Virginia. I am a WVU Mountaineer Alum, where I started my science journey in the Wild Genomics Lab.

What sparked your interest in science or medicine?
Studying the unknown and understanding more about the world around us has always been a passion of mine. Science is that pursuit of knowledge, and the field of biology held so many mysteries about life that captured my interest. My interest in science began with studying wildlife genetics and evolved into the complex subject of human genomics.

What are your research interests?
I've always been fascinated by the genetic code and the manipulation of DNA in various systems. Studying viruses that co-opt host cell processes can not only help us understand the biology of infection, but it can elucidate basic host cell principles the virus controls. By bridging the gap between genomics and virology, I hope to contribute my gained knowledge to the scientific community and decipher outstanding biological mysteries.

What are you currently working on?
My current project focuses on how a beta-herpesvirus controls host nuclear dynamics during the viral life cycle. I study the highly prevalent, large dsDNA virus known as Human Cytomegalovirus. Specifically, I am interested in the relationship between the viral-induced cytoplasmic and nuclear remodeling and host cell processes such as transcriptional regulation. I use microscopy and various genomic approaches to study HCMV infection, and I enjoy the many different techniques I'm able to use in my research.

Please tell us about a defining moment in your education at Feinberg thus far.
I first joined the Feinberg community as a research technologist and was inspired by the magnitude and ambition of the institution. This community motivated me to think about my scientific career and the path I could pursue if I chose to attain a PhD. By being accepted into the Driskill Graduate Program at Feinberg, I am grateful to have been initially inspired at Feinberg and to be actively working towards my passions.

What do you hope to do with your degree?
By obtaining the research experience and accumulated knowledge that comes with this degree, I hope to inspire others in the pursuit of science. From outreach programs to college classes, I aim to share and offer my knowledge with young scientists. Whether I achieve this by becoming a university professor or a senior biotechnologist, all paths lead to further exploration of the unknown.

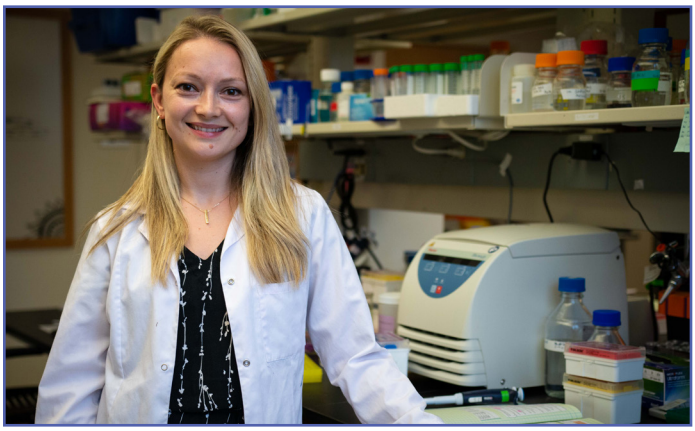
Breakthroughs Podcast

How the Brain Regulates Aggressive Behavior with Ann Kennedy, PhD

A theoretical neuroscientist, Ann Kennedy, PhD, is investigating neural computation and the structure of behavior. In this episode, she talks about her recent research around aggression and how it's regulated in the brains of animals. She was recently named the winner of the 2022 Eppendorf and Science Prize for Neurobiology and a recipient of the Sloan Research Fellowship in Neuroscience.

Listen to the episode.

Understanding the Role of Long-Lived Mitochondrial Proteins



Ewa Bomba-Warczak, PhD, research associate in the laboratory of Jeffrey Savas, PhD, assistant professor in the Ken and Ruth Davee Department of Neurology's Department of Behavioral Neurology.

By Olivia Dimmer

For Ewa Bomba-Warczak, PhD, pursuing a career in science once seemed like a distant dream.

Growing up in a small village in Poland surrounded by farmland, Bomba-Warczak never expected that her decision to pursue undergraduate studies at the University of Illinois at Chicago would set her on a path toward investigating the role of long-lived mitochondrial proteins in neurons as a postdoctoral research associate in the laboratory of Jeffrey Savas, PhD, assistant professor in the Ken and Ruth Davee Department of Neurology's Division of Behavioral Neurology.

Bomba-Warczak's previous research revealed a subset of mitochondrial proteome persists for months in mammalian brains.

"These long-lived mitochondrial proteins caught my attention because we generally think of mitochondria as highly-dynamic organelles that are continually remodeled and refreshed," Bomba-Warczak said. "Since neurons are post-mitotic, they must survive the lifespan of the animal. Therefore, this continuous replenishment of mitochondria has been considered as essential in maintaining a healthy organelle network that can support lifelong neuronal homeostasis. So, to see that some of these proteins persist in the brain for months was unexpected."

Currently, Bomba-Warczak is employing metabolic stable isotope pulse-chase labelling and high-resolution shotgun mass spectrometry to track and characterize the mitochondrial long-lived proteins throughout their lives in mice brains.

"Since mitochondrial dysfunction contributes to myriad of neurodegenerative diseases, better understanding of the mitochondrial long-lived proteins may lead to new potential therapeutic targets for several neurological disorders including Alzheimer's and Parkinson's diseases," Bomba-Warczak said.

Bomba-Warczak was recently awarded the Maximizing Opportunities for Scientific and Academic Independent Careers (MOSAIC) award to continue her work characterizing these extremely long-lived proteins in mouse brains and investigating whether current pharmacological treatments known to affect mitochondrial function also affect the long-lived proteins.

The MOSAIC award, given by the NIH's National Institute of General Medical Sciences, is designed to facilitate the transition of promising postdoctoral investigators from diverse backgrounds into independent, tenure-track or equivalent research-intensive faculty positions. She will receive up to two years of postdoctoral funding, followed by three years of funding after she secures a full-time faculty position.

"This award is really an honor," she said. "I'm an immigrant, a first-generation college graduate, and a mom of two kids. This award is a validation that my work is interesting and impactful to the field of mitochondrial biology and underscores that you can be a scientist and a mom at the same time – even if it takes a little bit more time to get there."

New Faculty

Katherine Wright, PhD, MPH, joined as associate professor of Family and Community Medicine and director of research in the Department of Family and Community Medicine in September 2022. Wright's research examines the effectiveness of health and education policy measures while considering the mediating and moderating factors that influence population metrics. Within this context, she has also developed new methodological approaches to account for missing data and has extensively analyzed large scale data such as the Youth Risk Behavior Survey (YRBS) and the National Health and Nutrition Examination Survey (NHANES). Wright received her doctoral degree from Loyola University and her Master of Public Health from University of Illinois at Chicago.

NUCATS Corner
Clinical and Translational Sciences Institute

NUCATS Members Make National Impacts

KL2 Scholar Research Highlighted as a Part of TED Talk-style Event

Every day the equivalent of a classroom full of children is diagnosed with cancer. One in five will not survive five years.

"When I talk about my research, I try to give people perspective on why what I do matters," says Kyle MacQuarrie, MD, PhD, instructor of Pediatrics in the Division of Hematology, Oncology, and Stem Cell Transplantation. "There are about 40 newly diagnosed cases of pediatric cancer in the United States every day, but for every $24 spent on investigating adult cancers, pediatric cancers receive just $1 in funding."

MacQuarrie was one of three current and past NUCATS KL2 scholars who recently participated in a TED Talk-style event. Read the full story.

COVID-19 Exacerbated Inclusion Issues in Biomedical Research

As COVID-19 disrupted the way we live, the pandemic also magnified barriers to inclusion of representative populations in biomedical research.

While the exclusion of "special populations" has ensued for decades, a collaborative and diverse team of health professionals — that included 21 authors at Clinical and Translational Science Award (CTSA) Program hubs throughout the United States — further identified and confronted inequity barriers via investigation of a structural competency framework.

"We included medical doctors, nurses and epidemiologists from a range of fields from OB/GYN to pediatrics to geriatrics and gerontology, psychologists, etc. Diversity in geography, age and personal attributes also contributed greatly," says Susanna McColley, MD, director of The Multidisciplinary Training Program in Child & Adolescent Health (TL1) at the NUCATS Institute. "This multidisciplinary team exemplifies the importance of translational research activities that cross traditional biomedical science boundaries."

The research, supported by a Synergy Paper mechanism through the CTSA Center for Leading Innovation and Collaboration, was recently published in the *Journal of Clinical and Translational Science*.

Read the full story.

NIH News

Recommendations for Proactively Addressing Authorship Disputes
Sometimes disagreements about authorship cannot be avoided, and many have seen it up close. They can be handled thoughtfully and appropriately. But when they are not, they may lead to serious consequences for the people and research involved. There are typically three main ways authorship disputes happen. Sometimes a researcher (usually more junior) feels they should have been included as an author on the manuscript but were not. In other disputes, someone is included on a paper but never agreed to its content. Then there are disagreements about authorship order. Resolutions to these issues include developing publishing committees. These committees would allow information and rules regarding all matters related to authorship to be laid out and negotiated in advance. These committees could also address issues that come up due to changing circumstances once a project is underway. Individual labs can also write and disseminate their own authorship policies and procedures. Being proactive can help mitigate the risk of possible authorship disputes.

FY 2022 By the Numbers: Extramural Grant Investments in Research
In FY 2022, NIH spent $33.3 billion of its total $45.2 billion appropriation for competing and noncompeting grant awards. This is a 3.1 percent (or $1.02 billion) in spending over the previous year. NIH supported 1,576 additional new and renewed extramural grants in FY 2022, for a total of 58,368 competing and non-competing awards (2.8 percent more than FY 2021). NIH issued grants to 2,707 academic universities, hospitals, small businesses and other organizations throughout the U.S. and internationally. The success rate for new research project grants (RPGs) increased 1.6 percentage points from 19.1 percent in FY 2021 to 20.7 percent in FY 2022. Most RPGs are R01-equivalent grants, and they showed similar trends. We spent $19.1 billion on average on R01-equivalent grants in FY 2022 compared to $18.1 billion spent in FY 2021, a 5.4 percent increase. Like RPGs, the R01-equivalent grant success rate also increased (0.5 percentage points), going from 21.1 percent in FY 2021 to 21.6 percent in FY 2022. We spent 2.4 percent more in average nominal costs on R01-equivalents in FY 2022 ($585,307) compared to $571,561 spent in FY 2021.

NIH software assembles complete genome sequences on-demand
National Institutes of Health researchers have developed and released an innovative software tool to assemble truly complete genome sequences from a variety of species. This software, called Verkko, which means "network" in Finnish, makes the process of assembling complete genome sequences more affordable and accessible. Verkko starts by putting together the small, detailed pieces, creating many partially assembled but disconnected segments of sequence. Then, Verkko compares the assembled regions with the larger, less precise pieces. These larger pieces serve as a framework to order the more detailed regions. The final product is an accurate and complete genome sequence.

Sponsored Research

PI: Lirong Yan, PhD, **associate professor of** Radiology (Basic and Translational Radiology Research)

Sponsor: National Institute on Aging

Title: Quantitative cerebral blood vessel imaging biomarkers for AD and VCID

Alzheimer's disease (AD) and Vascular Cognitive Impairment and Dementia (VCID) are two leading causes of cognitive decline and dementia in the elderly and are both associated with cerebrovascular disease (CVD). Postmortem findings show that the underlying type of vascular pathology differs in AD and VCID. In AD, Aβ often accumulates in leptomeningeal and cortical arterioles (known as cerebral amyloid angiopathy (CAA)), while in VCID, atherosclerosis or arteriolosclerosis (ASCVD) affects large feeding and small perforating arteries (e.g., lenticulostriate arteries (LSA)), respectively. However, to complicate matters, mixed AD/VCID pathologies are common, especially with increasing age.

To date, the investigations of vascular pathology in AD/VCID are mainly limited to indirect measures of vascular brain injury in brain parenchyma (e.g., white matter hyperintensity, infarcts, and microbleeds), which lack specificity vis a vis the severity and type of underlying vascular pathology. Arterial stiffness and arterial pulsatility are important indicators of blood vessel dysfunction. Increased arterial stiffness or elevated arterial pulsatility can result in transmission of excessive pulsatile energy into downstream microvasculature, and lead to endothelial dysfunction and vascular inflammation.

Currently, these assessments are mostly carried out on central or major cerebral arteries. Cerebral vascular morphology also reflects the health of brain vessels, but individual variation in branching of cerebral vessels has made it difficult to provide reliable quantitative morphological metrics across subjects. Therefore, directly assessing the health and functional status of cerebral blood vessels (e.g., arterial stiffness, pulsatility, and morphology) at various levels of the cerebral vascular tree could provide a more comprehensive understanding of the vascular pathology in AD/VCID and help differentiate CAA/ASCVD.

The goal of this application is to develop a class of cerebral blood vessel hemodynamic and morphological metrics and to characterize cerebral blood vessel dysfunction in AD and VCID. Aim 1 will develop and validate quantitative hemodynamic and morphological vascular metrics (VM) using advanced MRI technologies and novel image- processing algorithm pipelines at different levels of cerebrovascular tree. Aim 2 will derive these vascular metrics in a sample of 100 elderly subjects enriched for apoE genotype and cardiovascular risk factors. In Aim 2a, we will correlate VM with cerebral blood flow, vascular brain injury, and cognitive impairment. In Aim 2b, we will correlate VM in leptomeningeal arteries or lenticulostriate arteries with uptake of amyloid PET ligands and cardiovascular risk profile to determine whether alterations in site-specific VM can help differentiate CAA vs. ASCVD. Successful completion of the proposed research would deliver a class of reliable cerebral vascular biomarkers to characterize and differentiate vascular pathology in AD/VCID.

Read more about this project.

PI: Carson Ingo, PhD, **assistant professor of** Physical Therapy and Human Movement Sciences **and** Neurology - Ken and Ruth Davee Department

Sponsor: National Institute of Neurological Disorders and Stroke

Title: Post-stroke normal appearing white matter diffusion properties and cognitive trajectories across age

Post-stroke cognitive impairment is common, particularly in older individuals. Existing knowledge gaps about mechanisms underpinning poor outcomes, particularly in the aged, have been the most significant barriers to developing novel therapeutic targets and approaches to prevent cognitive decline and progression to Alzheimer's disease and related dementias (ADRD). This is especially relevant to health disparity populations, specifically women and Black demographics. Previous studies of Alzheimer's disease and mild cognitive impairment suggest that the morphological changes of the corpus callosum are related to cognitive measures.

Existing data show that classical neuroimaging biomarkers such as acute infarct volume, location and white matter hyperintensity burden have modest prognostic predictive utility in models of post-stroke cognitive function. We have recently used diffusion tensor imaging in acute stroke patients to show that decreased fractional anisotropy of the ipsi- and contra-lateral hemispheric normal appearing white matter, as well as the corpus callosum, are associated with higher stroke scale impairment severity. Additionally, we have also used advanced diffusion imaging to examine white matter microstructure in midlife individuals with significant vascular risk factors, as well as Black and women demographics at risk for stroke and cognitive impairment.

Our preliminary results suggest that the corpus callosum and other white matter structures involved in cognition manifest specific diffusion changes that not only relate to vascular risk factor burden exposure, but also to post-stroke outcome. Our laboratory has pioneered diffusion MRI acquisition and modeling approaches that are sensitive to not only white matter anisotropy, but also white matter complexity. As such, we are well poised to comprehensively characterize the diffusion properties of normal appearing white matter across time and age, in acute stroke patients and their post-stroke cognitive trajectories. Our established expertise in diffusion imaging and modeling that is sensitive to white matter complexity in relation to the presence of age-related vascular risk profiles, allows us to longitudinally examine the unique microstructural properties of the corpus callosum, infarcted and non-infarcted tissue, and more remote structures on the contralateral non-lesioned hemisphere and their relationship to post- stroke recovery. It is therefore possible that a deeper understanding of white matter microstructure in the acute stage after ischemic stroke and its change over time, will enhance prediction models of post-stroke cognitive recovery and identify novel target for therapeutic interventions.

This knowledge will also help our clinicians provide much needed bed-side prognosis to patients and their families. Our central hypothesis is that after unilateral ischemic stroke, temporal changes in the diffusion properties of normal appearing white matter of the corpus callosum specifically, and the white matter across both hemispheres in general, are associated with the differential patterns of post-stroke age-related cognitive trajectories.

Read more about this project.

Funding

The Feinberg School of Medicine has increased seed funding up to $50,000 for application preparation to initiate new multi-investigator program project or center grant applications involving Feinberg faculty. Learn more on the website here.

NIMH Short Courses for Mental Health-Related Research (R25 – Independent Clinical Trial Not Allowed)

More information

Sponsor: National Institutes of Health and National Institutes of Mental Health
Submission deadline: May 26, 2025
Upper amount: $200,000 over a maximum of five years

This funding opportunity will support the development, implementation and evaluation of innovative and interactive short courses for scientists interested in learning state-of-the-art skills needed to conduct cutting-edge mental health research. The conceptual and methodological topics included in each short course must be clearly related to the mission of the NIMH and are expected to reflect one or more aspects of the current Strategic Research Priorities of the NIMH. The interests of the NIMH are broad, spanning from basic neuroscience, human genetics/genomics and translational research to interventions and mental health services research across the lifespan.

Mental Health Award: Finding the right treatment, for the right people, at the right time for anxiety and depression

More information

Sponsor: Wellcome Trust
Submission deadline: June 7
Upper amount: Up to $5 million over five years

As part of our new strategic focus, Wellcome aims to drive a transformative change in the ability to intervene as early as possible in the course of anxiety and depression, broadly defined, in ways prioritized by the people who experience them. This work involves advancing scientific understanding of how brain, body and environment interact in the course and resolution of these conditions; finding new and improved ways to predict, identify, and stratify groups of people so that we can provide more timely and personalized interventions; and finding new and improved ways of intervening. Current mental health diagnostic categories are imperfect, and rely on subjective measures, resulting in significant heterogeneity of people within each diagnostic category, which in turn impacts the development and provision of effective interventions. Stratified medicine aims to identify sub-groups of individuals within a heterogenous disease population based upon unique characteristics of each sub-group (strata) such as underlying mechanisms, risk factors, course of disease, or treatment responses.

Evaluating the Impact of Pandemic Era Related Food and Housing Policies and Programs on Health Outcomes in Health Disparity Populations (R01 Clinical Trial Optional)

More information

Sponsor: National Institutes of Health
Submission deadline: May 1
Letter of intent: April 1
Upper amount: Maximum of $500,000 per year for up to five years

The purpose of this funding opportunity announcement is to identify and evaluate the ongoing and long-term health impacts of disruptions of food and housing security experienced during the pandemic era and the role of targeted policy and programmatic actions in mitigating those impacts. For this opportunity, the pandemic era is defined as the period from 2020 to present, which includes ongoing widespread adverse social, behavioral and economical disruptions. This funding opportunities requests applications that propose examinations of how governmental (local, state, tribal, federal) food/nutrition and housing policies and programs aimed at reducing disruptive impacts of the pandemic era, influence health equity in individuals, families and communities from health disparity populations.

Research Grants and Fellowships for SCI/D

More information

Sponsor: Paralyzed Veterans of America Foundation
Submission deadline: July 5
Upper amount: Up to $150,000

The Paralyzed Veterans of America Research Foundation is focused on funding projects grounded in basic laboratory science and the education of scientists working on breakthroughs directed toward a cure for paralysis or the secondary medical conditions and technologies associated with spinal cord injury or disease (SCI/D). Funding is available for laboratory research, clinical and functional studies of the effects of SCI/D, design and development of assistive technology, and fellowships for postdoctoral scientists, clinicians and engineers.

Read more about the highlights of our educational programs, innovative research and discoveries, and our outstanding students, faculty, and staff in the Feinberg News Center.

Information Literacy and Generative AI

Supporting the responsible use of AI in biomedical research

OpenAI's ChatGPT and other systems based on large language models (LLM) including Elicit, SciNote, Writefull and Galactica have created major debates in academic circles. These systems are not only deft at writing text in responses to prompts, some of them like Elicit, Med-PaLM and Galactica can also search the literature and suggest research questions or insights about available knowledge in relation to a certain topic or question.

Different scholarly domains are actively discussing various opportunities and implications of using LLM in academia. For example, the potential impact of LLM on the future of student essays, medical education, MBA examination and LLM implications for the fields of law and mental healthcare are just a few of these discourses. Furthermore, journal editors have deliberated the repercussions of using LLM for the communication of research results, highlighting how they challenge existing publication standards and have accordingly suggested guiding principles or drafted policies on how LLM should be used.

What comes next?

Given how quickly LLM captured the attention of the world and seeped into daily workflows in academia, institutions and administrators are challenged to prepare their communities and reflect on how these tools could change the existing norms and relationships. The absence of a clear understanding about the data and methods that were used to train LLM combined with a lack of transparency around how LLM render results to a query aggravates the suspicion that they are prone to various ethical issues. In academic contexts, where being unbiased is not only valued and encouraged, but is a prerequisite to reliability and objectivity, these ethical issues could threaten the integrity of research as well as institutional reputation. For example, conflating LLM output and factual/unbiased information may lead to incorrect conclusions or recommendations based on false information, resulting in research waste and exacerbation of misinformation.

Overreliance on LLM output can result in deprecation of critical thinking and skepticism, which are hallmarks of academic work. This can be dangerous in fields with major real-life implications (e.g., on how societies function and organize themselves), including medicine and engineering where mistakes could have significant consequences. This is not to say that using LLM in other areas is risk-free though. Since using data driven research is prone to propagate and amplify existing biases and reinforce societal prejudices, employing LLM in social science disciplines such as psychology or sociology could result in discrimination and heighten existing injustices and inequities.

As adoption and use of various AI and LLMs in different contexts (e.g., commerce, media) increases, it is reasonable to consider the impact of these technologies on universities' missions of promoting and encouraging discovery, education, service to the community and personal and intellectual growth. We believe that education is one of the most effective ways to keep up with new technologies and promote their responsible use, nurturing community and capacity building.

What to Expect from Galter

Motivated by fruitful discussions in a recent webinar entitled "Let's ChatGPT", our team at Galter Health Sciences Library, is partnering with the Institute for Augmented Intelligence in Medicine (I.AIM) to launch hands-on training for the biomedical research community about responsible use of AI and LLM. These sessions will be taught by Mohammad Hosseini, PhD, to provide attendees with an in-depth understanding of these technologies, their application, and strategies for responsible use. Industry partnerships will enable access to different technologies and support collaborative ongoing development of training materials. To motivate and support students toward interdisciplinary learning and responsible use of LLM in research, we will offer research opportunities to investigate and enable equitable use of generative AI and LLM in research. Stay tuned, and reach out if you would like to ChatGPT!

High-Impact Factor Research

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Faculty profile: Robert Vassar

You've been a part of research in this space for over 20 years. Given what you've seen in the last 20 years, what do you think is possible 20 years from now?

I've seen the field come a very long way from the initial discovery of genes that cause Alzheimer's disease to a biological understanding of the pathogenesis of the disorder.

I think what we'll find is that Alzheimer's disease does not have a single cause but a spectrum of causes with multiple genetic and environmental factors. We're working on other potential therapeutic approaches in the lab based on this premise. Individuals with Alzheimer's may have different pathways that lead to disease, which means that we need to understand all these pathways and develop drugs against each of them. That way, in the future we can do individualized precision medicine for people that come into the clinic. No single "silver bullet" is going to cure all of Alzheimer's disease. We need a whole tool kit of different drugs that attack the Alzheimer's disease process at different points. That kind of approach has worked well for disorders like AIDS and heart disease.

Ultimately, that's what I want my research to do: to identify new targets in Alzheimer's disease that we can design drugs against. That's where I see the future of Alzheimer's research going, and I'm just happy to contribute to that, even in just a small way.

Read the full Q&A.

Featured Core

Pathology Core Facility

The Pathology Core Facility, part of the Robert H. Lurie Comprehensive Cancer Center of Northwestern University, provides histology, immunohistochemistry, molecular analysis and microscopic evaluation services for human tissue-based basic, translational and clinical research at Northwestern. In addition to laboratory services, the core performs procurement of fresh biospecimens for clinical trials and biobanking.

The Pathology Core Facility is accredited by the College of American Pathologists (CAP) and CLIA-certified with the capability to serve integral marker studies that require biomarker-based treatment arm assignment.

In conjunction with the Lurie Cancer Center's Clinical Trials Office (CTO), the Pathology Core Facility›s Clinical Trials Unit participates in both industry sponsored and investigator initiated clinical trials.

Core services include:

- Histology Lab
- Tissue Microarray Technology
- Immunohistochemistry Lab
- Molecular Lab
- Microscopy Lab
- Biorepository

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