COLUMBIA | COLUMBIA UNIVERSITY IRVING MEDICAL CENTER

Viewpoint

A publication of
The Edward S. Harkness Eye Institute
and The Department of Ophthalmology in the
Vagelos College of Physicians and Surgeons

FALL 2024/WINTER 2025

Charting a Course for the Scientific Future

An ambitious new, multi-year scientific strategic plan for the Department of Ophthalmology, developed during a series of collaborative faculty discussions and a research retreat, sets out four key goals to maintain Columbia's position as a world-leading institution in ophthalmic research and action steps to achieve those goals. Xin Zhang, PhD, Herbert and Florence Irving Professor of Ophthalmic Science (in Ophthalmology) and Professor of Pathology & Cell Biology) and newly appointed Vision Science Research Director, introduced the strategic plan during a "fireside chat" with Department Chair G.A. (Jack) Cioffi, MD, at the CUIMC Faculty Club on Tuesday, December 3, 2024.

Xin Zhang, PhD and G.A. (Jack) Cioffi, MD

"Ultimately, we want Columbia to be the world's leading research institution in vision science," says Dr. Zhang, who was named Vision Science Research Director in October 2024, succeeding Rando Allikmets, PhD, who led the research division for more than 20 years through a period of unparalleled growth. "Under the leadership of Dr. Allikmets, Dr. Cioffi, Dr. Stanley Chang, and others, we have become pre-eminent in the field, but to sustain that position over the next 10 to 20 years, we need a clear plan for the future. I believe that the most successful places have one thing in common: they recruit the best people, give them the most support they can and set high expectations to bring out the best in them."

To achieve that aim, the scientific strategic plan begins with goal #1: establishing future directions for Columbia vision science, through self-governance and forward-thinking recruit-

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INSIDE

In Our DNA: Precision Ophthalmology 2025

In Our DNA: Precision Ophthalmology 2025, a one-of-a-kind conference focusing on the latest research and clinical advances in precision medicine for ophthalmologists, vision scientists, ophthalmic geneticists, and trainees of every level, will be held on the Columbia University Irving Medical Center campus from June 12-14. The first day of the three-day program will feature the Department of Ophthalmology's annual John T. Flynn, MD Resident and Fellow Research Day; the second day spotlights challenging clinical cases and presentations; and the third and final day focuses on basic and translational science. "The conference title has multiple meanings," said G.A. (Jack) Cioffi, MD, Jean and Richard Deems Professor, Edward S. Harkness Professor and Chairman of the Department of Ophthalmology. "It refers not only to the genetic basis of precision ophthalmology. but also to the three foundational missions that are 'in our DNA' as a world-class ophthalmology program at a leading academic medical center: teaching, with the celebration of our graduates on day one; outstanding clinical care, with the toughest cases in the clinical realm on day two; and research, as we present the highest-level scientific program on day three."

"We've never done anything quite like this before," says Royce Chen, MD, the Jean Sheng Associate Professor of Ophthalmology at CUIMC and Vice Chair of Education. "It will be the largest conference our Department has ever put on, with an entire three-day weekend dedicated to showcasing our work and presenting the science of precision ophthalmology to the community in New York and guests from around the world. The agenda will include mentorship and

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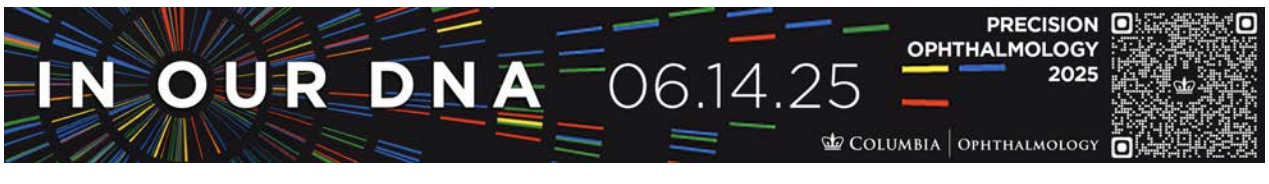

VIEW FROM THE CHAIR

Dear Friends,

From our earliest days, the Columbia University Department of Ophthalmology and the Harkness Eye Institute have been renowned for world-class research in vision science and ophthalmology. Over nearly a century, since John Martin Wheeler, MD, became the first Director of the newly opened Eye Institute in 1933, giants in the field have come here to define the first therapies for retinoblastoma, modernize cataract surgery, pioneer laser therapies, and revolutionize vision care through gene therapy, among many other contributions. Our vision science faculty now comprises more than 50 full-time scientists and clinician-scientists, and the Department has consistently ranked in the top 10 institutions for NIH funding support directed toward vision science research.

We are committed to sustaining and building on this proud history. I am delighted to share the goals outlined in our new, multi-year Scientific Strategic Plan. Developed through collaborative faculty discussions and a dedicated research retreat, a process led by our outstanding new Director of Vision Science Research, Xin Zhang, PhD, this roadmap will guide us toward maintaining Columbia's preeminence in vision science for decades to come. The strategic plan emphasizes shared governance, building a robust pipeline of junior faculty, enhancing collaboration and fostering innovative partnerships both within and beyond our department.

We are now making plans for In Our DNA: Precision Ophthalmology 2025, a groundbreaking conference dedicated to the latest research and clinical advances in our field. Spanning three days in June leading up to our residency graduation, the event will include the 25th annual Flynn Resident and Fellow Research Day, challenging surgical case discussions, and sessions on cutting-edge topics such as artificial intelligence, regenerative medicine, and patient-specific therapies. This ambitious event exemplifies our commitment to sharing knowledge, mentoring the next generation, and pushing the boundaries of what is possible in basic, translational, and clinical science in ophthalmology.

In this issue of *Viewpoint*, we also explore the vital role of philanthropy in fueling innovative and transformative research, as philanthropic contributions make possible the high-risk, high-reward projects that traditional funding sources often overlook.

Our faculty profiles feature Nan-Kai Wang, PhD, Assistant Professor of Ophthalmic Science (in Ophthalmology), whose research focuses on understanding and developing treatments for inherited retinal diseases through the study of mitochondrial function, and Jason Horowitz, MD, recently promoted to Professor of Ophthalmology, who leads both our retinopathy of prematurity service and our Ambulatory Care Network Eye Clinic.

A photo feature highlights the presentation of the American Academy of Ophthalmology's Laureate Recognition Award, its highest honor, to the legendary Stanley Chang, MD, the K.K. Tse and Ku Teh Ying Professor of Ophthalmology and the former Edward S. Harkness Professor and Chairman of the Department of Ophthalmology. It is on Dr. Chang's shoulders that so many of our Department's modern achievements in vision science rest. We round out this issue with a look back at the history of the Malcolm P. Aldrich Research Professorship and exciting new developments with the endowment of that position.

As we reflect on the progress we've made together, I invite you to continue this extraordinary journey with us. Your support not only makes it possible for us to pursue innovation, but also brings hope to individuals and families facing vision loss. On behalf of the entire Department, thank you for your generosity and trust.

Sincerely,

G.A. (Jack) Cioffi, MD
Jean and Richard Deems Professor
Edward S. Harkness Professor
Chairman, Department of Ophthalmology

In Our DNA: Precision Ophthalmology 2025

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education of trainees, complex clinical care, and visionary basic and translational science."

The 25th annual Flynn Resident and Fellow Research Day, a hallmark of the Department, kicks off the conference. It will feature research presentations from trainees at all levels of the Department, from residents to postdoctoral fellows, as well as a keynote address from scholar, surgeon and innovator M. Roy Wilson, MD, President Emeritus and Distinguished Professor of Ophthalmology at Wayne State University in Detroit, Michigan. Flynn Day honors John T. Flynn, MD, a nationally recognized leader in pediatric ophthalmology and former chief of the Division of Pediatric Ophthalmology, who passed away in 2019. Topics will include anterior and posterior segment, glaucoma, neuro-ophthalmology, ocular oncology, public health, and oculoplastic and orbital surgery.

"Not Your Normal Phenotypes: Solving Conundrums by Collaboration" is the theme of the conference's second day, featuring a collection of challenging cases that require collaboration between multiple surgeons. "One of the best parts of practicing at a quaternary academic institution like ours is that we see the fascinating, difficult cases that are often turned away from other places because of the multidisciplinary expertise they require," says Aakriti "Aaki" Garg Shukla, MD, MSc, the Leonard A. Lauder Associate Professor of Ophthalmology.

"At meetings, people often present their best work. Here, we are presenting surgical cases during which things did not necessarily go as planned," says Danielle Trief, MD, MSc, Associate Professor of Ophthalmology.

"These situations often involve collaboration between multiple subspecialties in ophthalmology." Cases will include such situations as complications of trabeculectomy, uncommon infections, choroidal hemorrhage, and other unique situations, each illustrated with a surgical video and followed by a panel discussion.

During lunch, groups at roundtables will focus on different "clinical pearls," with topics including lifelong surgical growth, practice growth and management, thriving as a clinician-educator, navigating evolving practice models in ophthalmology, non-traditional ophthalmology careers, and the rewards and challenges of academia and private practice.

"This meeting will give us the chance to talk about cases and challenges we don't always come across, and share tools for

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RESEARCH INSIGHT

"To Be Forward-Looking, You Have to Have Philanthropy Behind You":

Funding Vision Science in the 21st Century

At Columbia University Irving Medical Center, our philanthropic partners serve an absolutely crucial role in advancing our science and patient care missions. Nowhere is that more evident than in the Department of Ophthalmology in the Vagelos College of Physicians and Surgeons, where the support of our friends has never been more important.

G.A. (Jack) Cioffi, MD, Jean and Richard Deems Professor, Edward S. Harkness Professor and Chair of the Department of Ophthalmology, recently observed, "Given the enormous burden of vision impairment and blindness, which costs an estimated $190 billion in the U.S. every year, there is critical importance for philanthropic partnerships."

We are at an extraordinary moment in Ophthalmology in our understanding of the origins and expressions of glaucoma, cataracts, ocular cancers, retinal disorders, and many other ophthalmological diagnoses. As our researchers glean new knowledge, we are translating their findings into earlier and more precise diagnoses, and better, more effective courses of treatment, to slow, stop, and even prevent vision disorders.

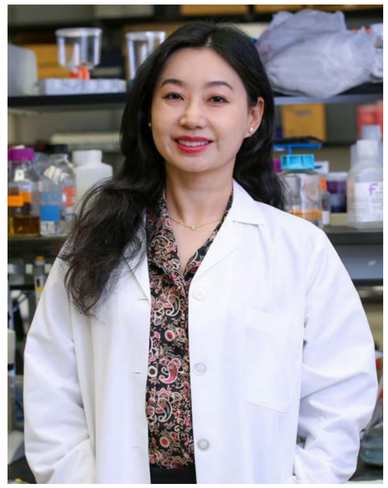
Left to right: Alec Kittredge, PhD candidate, Aaron Owji, PhD, Tingting Yang, PhD, and Yu Zhang, PhD, examine E. coli colonies while cloning a gene in the Yang Lab.

Philanthropy allows the work of our investigators to proceed at a much faster pace than that dictated by the traditional grant-based funding process. "You can jump-start a project very quickly with the support of philanthropy," notes Jeffrey Liebmann, MD, Shirlee and Bernard Brown Professor of Ophthalmology, Vice Chair of the Department of Ophthalmology and Director of the Glaucoma Service.

For example, when the Department of Ophthalmology recruited noted geneticist and glaucoma researcher Simon John, PhD, the Robert L. Burch III Professor of Ophthalmic Science (in Ophthalmology) in 2020, substantial funds were required to equip his laboratory. "To bring someone of Dr. John's stature to the department was a major investment, one that required significant philanthropic commitment from the Burch Family Foundation," says Dr. Liebmann. This private philanthropy facilitated the rapid launch of a collaborative project between Dr. Liebmann's and Dr. John's laboratories, proving that vitamin B3 could be used for glaucoma neuroprotection in humans.

Part of the mission of the Department of Opthamology is to identify, recruit, and train the brightest and most promising scientists in our field. Under the guidance of our experienced and pioneering faculty, these young physicians are being prepared to take on leadership roles in the field. Investing in the work of our promising young scientists will help them become self-sustaining, revenue-generating investigators. Philanthropy can be transformative in this respect—and as the work of our faculty is disseminated, its impact will be felt well beyond our institution.

The generosity of our friends also makes it possible for our scientists to test their hypotheses and to take advantage of extraordinary new technologies at our disposal—such as gene editing and AI—that were unimaginable even just a few years ago. Our goal is to help our scientists assemble pilot data that will demonstrate proof of concept, facilitating their eligibility for more traditional sources of funding.



Tingting Yang, PhD

"To be forward-looking, you have to have philanthropy behind you," says Dr. Cioffi. "We view our philanthropic partners as very much a part of the Department. It's all interconnected, and we are very appreciative."

FACULTY SPOTLIGHT

Scientific Faculty Profile

From Orthopedics to Ophthalmology: Nan-Kai Wang, MD, PhD

Growing up in Taiwan, Nan-Kai Wang, MD, PhD, thought he might like to be an orthopedic surgeon like his brother, but his parents encouraged him to pursue a different path. "In Taiwan, it's not easy to have a private orthopedics practice," he says. "My parents are very traditional Asian parents, and their dream was to have a son with a big private practice and lots of patients."

After he finished medical school at National Taiwan University Dr. Wang's parents urged their son to follow in his uncle's footsteps and pursue a residency in ophthalmology, which they thought would lead him to large private practice. Initially, Dr. Wang resisted. "I thought ophthalmology wouldn't be very interesting," he says. "There are only two eyeballs and they're so small! I wanted to do surgery, and I assumed that there would be many more surgical opportunities in orthopedics."

So, he applied to both National Taiwan University's orthopedics residency, and to the ophthalmology residency at Chang Gung Memorial Hospital, and was accepted to both. Ultimately, he decided to follow his parents' encouragement and pursued the ophthalmology residency at Chang Gung Memorial. "Once I began the residency, I soon realized how fascinating this field is, with all the new technology, especially in the vitreoretinal field. I've never once regretted it. It turned out that my parents' idea was a good one, although it is 20 years later and I still don't have a private practice!"

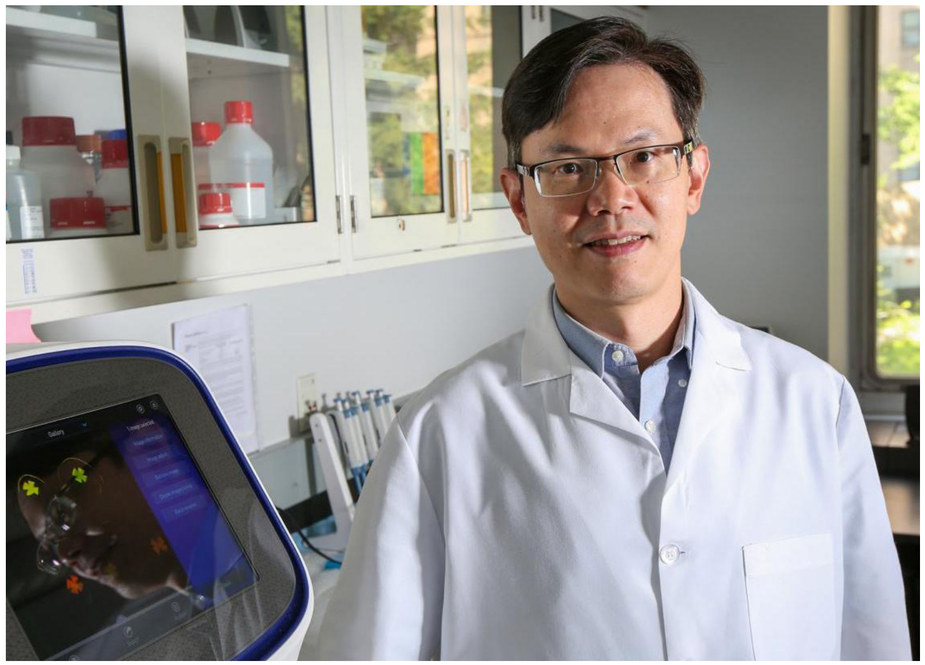
Now an Assistant Professor of Ophthalmic Science (in Ophthalmology) at Columbia, Dr. Wang's research focuses on mitochondrial function, with the goal of developing therapies for retinitis pigmentosa (RP) and retinal ganglion cell (RGC) degeneration through mitochondrial reprogramming.

Dr. Wang's relationship with Columbia began after he joined the vitreoretinal faculty at Chang Gung Memorial, where he established himself as an independent physician-scientist. Before completing his PhD in Taiwan, he was required to receive additional external training, so he spent two years as a postdoctoral fellow under the guidance of Stephen H. Tsang, MD, PhD, Laszlo Z. Bito Professor of Ophthalmology and Professor of Pathology & Cell Biology. "He's a master in this field, and an excellent mentor," Dr. Wang says.

While at Columbia, Dr. Wang developed expertise in genetics, inherited retinal dystrophies, mouse and human electrophysiology, and embryonic stem cells. During that time—before the era of induced pluripotent stem cells--he became the first to report functional rescue in a mouse model of RP using differentiated mouse embryonic stem cells. He also discovered that macrophages, not retinal pigment epithelium (RPE), contribute to fundus autofluorescence (AF) in patients and mice with NR2E3 mutations.

After returning to Taiwan in 2009 to complete his doctoral degree in cell and molecular biology at National Taiwan University, Dr. Wang worked as an independent physician-scientist, treating as many as 250 patients per week with high myopia, inherited retinal dystrophy, age-related macular degeneration, diabetic retinopathy, retinopathy of prematurity (ROP), and other retinal diseases. "Because we had the largest neonatal intensive care unit in Taiwan, we saw a significant number of premature infants, and I identified ROP in approximately 20 premature babies" he says. (For more about ROP, see the clinical faculty profile of Jason Horowitz, MD, page 5.) In addition to performing vitreoretinal surgeries on retinal detachments, open globe trauma, intraocular foreign bodies, and diabetic retinopathy, he also conducted genetic research in hereditary retinal dystrophies, juvenile-onset diabetes, and myopia.

"In Asia, we have many patients with high myopia, also called pathologic myopia, a severe form of myopia in which the eyes are significantly elongated, so the retina is stretched and predisposed to tearing," Dr. Wang says. The prevalence of myopia among schoolchildren in Taiwan has grown from 5.8% in 1983 to 21% in 2000 and 25.41% in 2017, according to a study published in *Ophthalmology* in 2021, and the prevalence of high myopia in teens has also increased. Even when they receive appropriate refractive correction, people with high myopia face a significant risk of vision-threatening conditions including open-angle glaucoma, cataracts, retinal tears and retinal detachment,



Nan-Kai Wang, MD, PhD

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Clinical Faculty Profile

Jason Horowitz, MD

Vitreoretinal specialist Jason Horowitz, MD, has recently been promoted to Professor of Ophthalmology at Columbia University Irving Medical Center. Dr. Horowitz, who manages complex vitreoretinal disorders such as retinal detachments and diabetic eye disease, joined Columbia in 2011 after spending more than two decades delivering retinal care in Waterbury, Connecticut.

During his time at Columbia, Dr. Horowitz has led the growth of the retinopathy of prematurity (ROP) service, which is a critical component of the Neonatal Intensive Care Unit of the Morgan Stanley Children's Hospital of New York. Normally, the blood vessels of the retina start to develop in the fourth month of pregnancy and finish developing around the time of delivery, but in very premature infants, the blood vessels of the eye are not fully developed at birth. This can prevent sufficient oxygen from reaching the retina, causing the eye to produce excess levels of the vascular endothelial growth factor (VEGF) protein and resulting in the formation of abnormal blood vessels. In severe cases, ROP can lead to partial or complete retinal detachment and other structural damage to the eye, causing visual impairment or blindness. Although in absolute numbers it is a rare disease, ROP is one of the primary causes of childhood blindness and its impact is devastating as it can lead to loss of vision throughout a person's life.

"Columbia's world-renowned NICU [neonatal intensive care unit] is one of the largest in the tri-state area," Dr. Horowitz says. "The more premature the infant, the more likely it is that they will have ROP. As the ability to care for micropreemies has evolved, with about 20% of infants born even as early as 22 weeks now surviving, we are managing an increasing number of ROP cases."

The primary treatments for ROP are laser therapy and the medications known as anti-VEGF agents that reduce and even reverse the formation of abnormal blood vessels, thereby preventing the development of sight-robbing retinal detachments. "If the retina is partially or completely detached, surgery may be required," Dr. Horowitz says. Surgical options for severe ROP include scleral buckle surgery, in which a flexible band is placed around the sclera to support the detached retina until the eye starts growing normally, and vitrectomy, in which small openings are made in the eye wall to remove most of the vitreous fluid of the eye and replace it with saline solution, while the surgeon ablates the scar tissue on the retina.

Dr. Horowitz also specializes in adult retinal conditions such as diabetic retinopathy and macular degeneration. Over the past decade, Dr. Horowitz notes, techniques for assessing and managing macular degeneration have matured significantly. "Some of the most exciting developments have involved telemedicine," he says. "I have been involved in projects utilizing telemedicine platforms to reach more vulnerable populations who may not have easy access to a major medical center like Columbia, and screen them for diabetic eye disease and other retinal conditions remotely. The use of artificial intelligence has also facilitated our ability to diagnose these conditions, with more accurate and efficient analysis of ocular imaging."

Jason Horowitz, MD

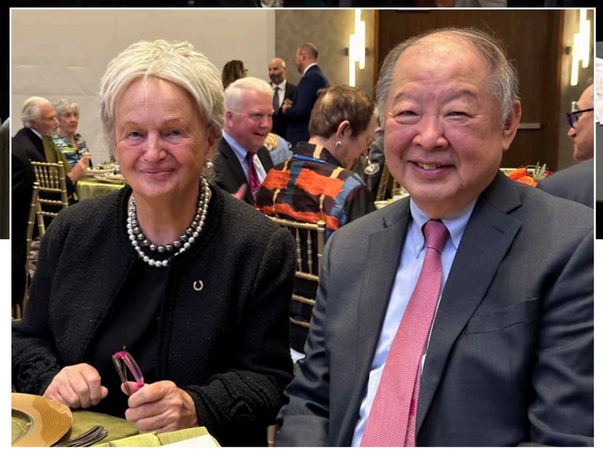
In addition, Dr. Horowitz serves as the medical director of the Ambulatory Care Network Eye Clinic, where some of the most complicated and diverse patients in the world are evaluated and treated for a wide variety of ocular diseases. He works closely with Ives "Tony" Valenzuela, MD, the Helen and Martin Kimmel Assistant Professor of Ophthalmology and a former chief resident in the Department. "We conduct a daily morning session with the residents during which we review all of the previous day's late and emergent cases and on-calls," Dr. Horowitz says. "I have been very excited by the expansion of the residency program from 12 residents to 16 in recent years. It is very stimulating to work in such an environment of growth."

Jason Horowitz, MD

After working with residents in the early morning, Dr. Horowitz sees his own patients in the faculty practice on Monday mornings, Tuesday afternoons, and all day Friday. "On Tuesday mornings, I do ROP rounds, and the rest of the time I am working with the residents or performing surgery," he says.

When not in the clinic, the operating room or his practice, Dr. Horowitz enjoys spending time with his wife, the director of breast imaging at Mount Sinai Medical Center, and his grandchildren, ages six, 12 and 16. "I also play a little golf and a little piano, but the grandchildren are my biggest focus right now. Fortunately, they all live in New York, so I get to see them quite often."

VISIONARIES & LUMINARIES

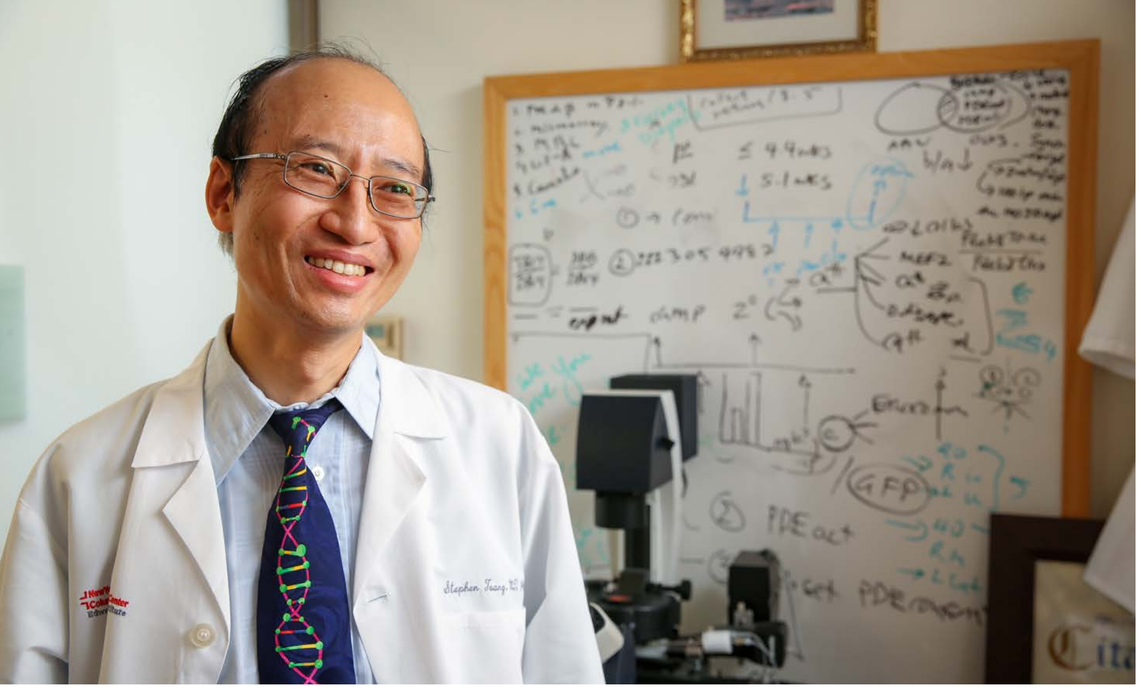


Stanley Chang, MD, Honored by AAO

Stanley Chang, MD, the K.K. Tse and Ku Teh Ying Professor of Ophthalmology and the former Edward S. Harkness Professor and Chairman of the Department of Ophthalmology, has received the Laureate Recognition Award, the American Academy of Ophthalmology's (AAO) highest honor. The award recognizes individuals who have made exceptional contributions to the betterment of eye care, leading to the prevention of blindness and the restoration of sight worldwide.

Above: AAO President Jane Edmond, MD, and CEO Stephen McLeod, MD, presented Dr. Chang with the award at the opening session of the AAO's Annual Meeting on October 19, 2024.

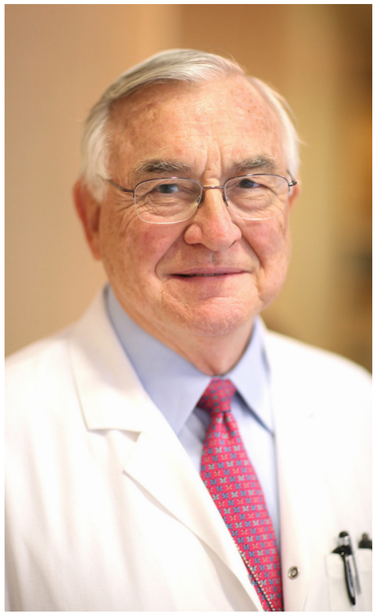
Left: At the Columbia Ophthalmology reception, Dr. Chang joined J. Bronwyn Bateman, MD, Chair Emeritus of Ophthalmology at the University of Colorado and an alumnus of the Columbia University Vagelos College of Physicians and Surgeons, and Irene Maumenee, MD, Professor of Ophthalmology and Director of Applied Genetics at Columbia and a previous Laureate Recognition Award winner.



Stephen H. Tsang, MD, PhD

Awards, Grants and Milestones

A project led by Stephen H. Tsang, MD, PhD, László Z. Bitó Professor of Ophthalmology and Professor of Pathology & Cell Biology, has been selected for the 2024 Columbia Stem Cell Initiative (CSCI) Seed Fund Program, an annual competition designed to jumpstart new stem cell research projects and promote collaboration among CSCI members that is now in its 7th year. Dr. Tsang's project, "Mutation-Agnostic Stem Cell-Based CRISPR Therapy for Dominant Retinal Degenerations," aims to harness the power of stem cell biology by using stem cell-derived retinal pigment epithelial (RPE) cells to model macular degeneration, which affects over 12 million Americans. These stem cell models will enable the development of innovative treatments targeting metabolic dysfunctions like cholesterol buildup and drusen formation. By leveraging gene-agnostic strategies such as epidermal growth factor receptor (EGFR) pathway activation, his research seeks to address the root causes of macular degeneration and offer new hope for halting or reversing disease progression.



Donald J. Coleman, MD

The Department of Ophthalmology has been named the coordinating center for a new five-year grant from the Center for Disease Control's Vision Health Initiative (VHI). Principal investigators are Lisa Hark, PhD, MBA, Professor of Ophthalmic Science (in Ophthalmology) and Aakriti "Aaki" Garg Shukla, MD, MSc, Associate Professor of Ophthalmology. The 2024-2029 grant, "Effectiveness of Telehealth-Based Programs to Detect Glaucoma Among High-Risk Populations in Community Health Settings through Innovative Outreach and Service Delivery Models," also includes the University of Alabama at Birmingham, University of Michigan, Massachusetts Eye and Ear, and University of California-San Francisco. The VHI conducts and supports studies aimed at developing interventions to prevent vision loss, promote eye health, and address the social determinants of health in order to improve the health of underserved communities.

Donald J. Coleman, MD, Professor of Ophthalmology, has announced his retirement from active clinical and research work after a storied five-decade career. He will remain on the Department of Ophthalmology faculty as an emeritus professor. A pioneer of vitreoretinal surgical techniques, Dr. Coleman performed the first vitreoretinal surgery in New York.

Dr. Coleman is also a renowned international leader in ophthalmic ultrasound, and has been involved in many important advances in the use of ultrasound technologies to examine and treat the eye. In collaboration with the late Frederic L. Lizzi, EngScD, research director of the biomedical engineering laboratory at Riverside Research Institute in Manhattan, he developed the first commercially available B-scan ultrasound equipment for the eye. He also holds many other patents related to ultrasound and the eye, including an ultrasonically vibrated surgical knife and ultrasonic diagnostic and therapeutic transducer assembly and method of use, a system of therapeutic ultrasound and real-time ultrasonic scanning, and an ultrasound system for corneal biometry. Using an ultrasound that he developed, he demonstrated that operating at an earlier stage in ocular trauma can dramatically improve the prognosis for recovery. "Dr. Coleman's contributions to ophthalmic ultrasound and vitreoretinal surgery are unmatched," says G.A. (Jack) Cioffi, MD, Jean and Richard Deems Professor, Edward S. Harkness Professor and Chairman of the Department of Ophthalmology.

Lisa Hark, PhD, MBA

Aakriti "Aaki" Garg Shukla, MD, MSc

In Our DNA: Precision Ophthalmology 2025

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how to handle them," says Dr. Trief. "Part of what makes an excellent surgeon is being prepared for when things don't go as you expect them to."

Day three of the conference will begin with an opening address from Michael F. Chiang, MD, Director of the National Eye Institute, National Institutes of Health, speaking on "Data Science, Artificial Intelligence, and the Future of Ophthalmology: Perspectives from the National Eye Institute." The agenda focuses on basic and translational science and will be organized into four sections, each beginning with a keynote presentation from a world-renowned expert. These include:

• *Artificial Intelligence in Precision Medicine:* Cecilia Lee, MD, MS, Professor, Klorfine Family Endowed Chair and Director of Clinical Research in the Department of Ophthalmology at University of Washington Medicine

• *Regenerative Biology and Medicine:* Thomas A. Reh, PhD, Professor of Biological Structure in the Institute for Stem Cell & Regenerative Medicine (ISCRM) at the University of Washington

• *Complex Genetics and Inheritance in Ophthalmology and Medicine:* Janey L. Wiggs, MD, PhD, Associate Chief of Ophthalmology Clinical Research, Associate Director of the Howe Laboratory at Massachusetts Eye & Ear, and Paul Austin Chandler Professor of Ophthalmology, Co-Director of Glaucoma Center of Excellence, Vice Chair of Clinical Research, Associate Director of Ocular Genomics Institute at Harvard Medical School

• *Patient-specific Therapies:* Andrea Califano, PhD, Clyde '56 and Helen Wu Professor of Chemical Biology (in Systems Biology), Professor of Biomedical Informatics and Biochemistry and Molecular Biophysics, and Professor of Medicine in the Institute for Cancer Genetics, Department of Systems Biology, at CUIMC

"We start with the idea that everyone should leave the meeting feeling that they have been pushed to their upper limit, a point where they didn't know something," says Irene Maumenee, MD, Professor of Ophthalmology and Director of Applied Genetics. "As you advance in your career, too often you attend meetings just to meet your friends, not really to learn. It can be a waste of time. We want this meeting to spur attendees to want to learn more and reach higher. It should be a very intensive learning experience, so I hope everyone goes home tired!"

Precision Ophthalmology 2025 will provide scientists and clinicians alike with something to think about for years to come! More information on this exciting conference, and options for registration, is available online at https://www.vagelos.columbia.edu/departments-centers/ophthalmology/research/precision-ophthalmology/precision-ophthalmology-2025-our-dna

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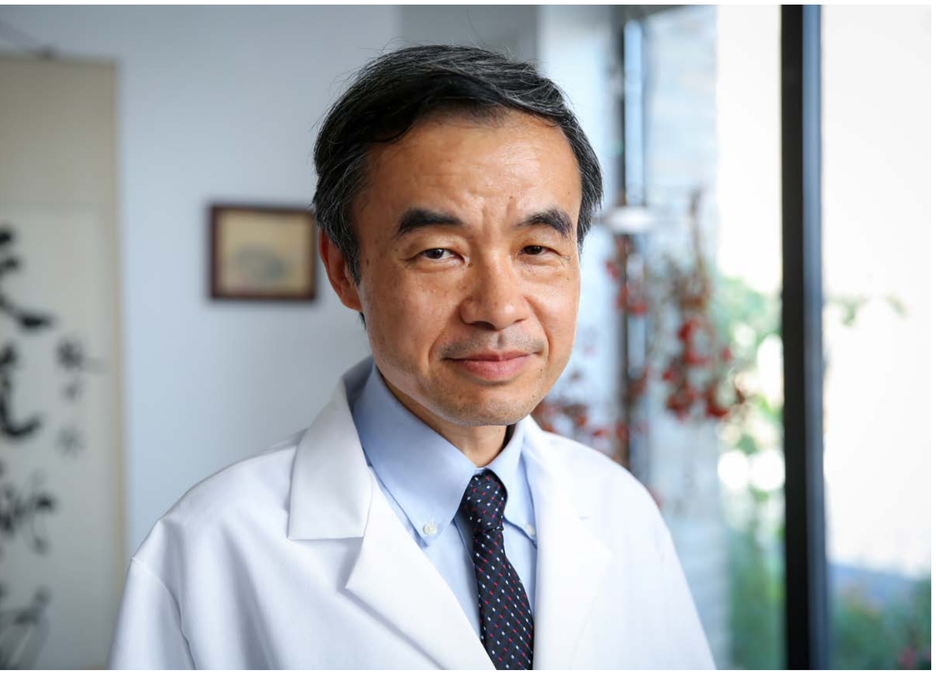
ment. A five-member steering committee, with rotating membership from both junior and senior scientific faculty, will lead a collective decision-making process. In addition to Dr. Zhang, the initial committee includes:

• Simon John, PhD, Robert L. Burch III Professor of Ophthalmic Science (in Ophthalmology)



Xin Zhang, PhD

• Janet Sparrow, PhD, Anthony Donn Professor of Ophthalmic Science (in Ophthalmology) and Professor of Pathology & Cell Biology

• Nan-Kai Wang, Assistant Professor of Ophthalmic Science (in Ophthalmology)

• Tingting Yang, PhD, Associate Professor of Ophthalmic Science (in Ophthalmology)

"The idea is to create a more democratic decision-making process, and build consensus as we move forward," Dr. Zhang says.

On the faculty recruitment front, the strategic plan stresses building a strong pipeline of junior research faculty who will become leaders in their respective fields. "We will establish a recruiting committee that will screen future candidates and gather input from the full scientific faculty," Dr. Zhang said. "We also plan to develop an enhanced, formal mentoring program for junior faculty members, because many young scientific faculty just came from postdoctoral training and did not necessarily receive education in how to run a laboratory, how to navigate the processes of tenure and promotion at a university, and most importantly, how to fund their own research over the long term."

The second goal of the scientific strategic plan, "enhancing our environment through strengthening interactions," emphasizes collaboration. "First, we will foster interactions among the scientific faculty," Dr. Zhang says. "We plan to start a monthly informal research seminar series to learn about one another's work, in which people can present their research, grant ideas, and other topics, with the goal of establishing new partnerships and collaborations. We will also organize a journal club on research projects that will allow our trainees to interact more closely with each other."

To encourage more partnerships between the scientific and clinical groups, the strategic plan proposes establishing an internal seed grant program, funded by the Department, that would seek joint proposals from clinical and basic science faculty.

"We also want to make ophthalmic science more generally visible at Columbia and to support interactions with other departments," Dr. Zhang says. "One proposal is to create an 'afternoon of science,' a half-day symposium at which different faculty members showcase their vision science research for the entire school."

The strategic plan's third goal centers around exploring, leveraging and sharing both internal and external resources to strategically support scientific research efforts. Dr. Zhang would like to create an internal catalog of equipment and other resources that can be shared among the scientific faculty. "Now that most of us are located in the Hammer Health Sciences Center, it is easier to pull our equipment together," he says. "But although we are all willing to share, many of us may not necessarily be familiar with the capabilities of equipment from other labs. By organizing and cataloging these internal resources in a uniform list, and providing basic training in what is available, we can make better use of what we have."

The final and overarching goal is to fund the vision science of the future, through focused research philanthropy as well as grant funding opportunities. With that in mind, the Department will be creating a new research endowment for vision science laboratories, named in honor of Stanley Chang, MD, the K.K. Tse and Ku Teh Ying Professor of Ophthalmology and former Edward S. Harkness Professor and Chairman of the Department of Ophthalmology. "The Chang Vision Science Laboratories will commemorate Dr. Chang's career and provide a vehicle for funding the big, transformative research efforts that are essential to precision ophthalmology," Dr. Zhang says.

The strategic plan also sets a goal of consistently ranking in the top 5 in National Institutes of Health and National Eye Institute grant rankings, while at the same time focusing on internal and external foundation funding opportunities. "Federal grant funding for research is unlikely to see any large increases in the near future, so we need to streamline our efforts to make the most of what is available to us," Dr. Zhang says. "For example, there are multiple foundations supporting vision research, all with different programs and requirements, some geared toward junior faculty and some toward senior postdocs. Not everyone is familiar with the range of opportunities available. Sometimes we may have inadvertently two investigators submit applications for the same grant, creating unnecessary internal competition. We would like to create an organized funding resource database that will help faculty quickly learn which programs are better suited for their research and how they can more effectively apply for those grants."

The unifying aim for the strategic plan, Dr. Zhang says, is to support the Department's scientific faculty in maximizing their own potential. "While our physical environment is obviously important, far more crucial are the people who make up this Department, and their initiative, passion and ingenuity. We have one of the best ophthalmology research programs in the nation, and we must take advantage of our own uniqueness."

MAKING HISTORY AT HARKNESS

This Viewpoint column will spotlight milestones in ophthalmic care that have taken place at Columbia, from the early "firsts" to the latest achievements.

The Aldrich Professorship

One of the closest friends of Edward S. Harkness, the great Columbia benefactor and founder of the Edward S. Harkness Eye Institute, was Malcolm Pratt "Mac" Aldrich. In 1922, after a stellar college football career at Yale as a consensus All-America halfback and team captain, Aldrich joined the Commonwealth Fund, where fellow Yale alumnus Harkness was its first president. They worked closely together until Harkness' death in 1940, when Aldrich became the executor of his estate and the second president of the fund. During World War II, Aldrich also served in the Navy as a special assistant to the Assistant Secretary of the Navy. In 1963, he became chairman of the board of the Commonwealth Fund.

Aldrich shared Harkness' dedication to the advancement of medical education, and to ophthalmology in particular. In partnership with Harkness' widow, Mary Stillman Harkness, Aldrich contributed to new scientific laboratories in the Department of Ophthalmology and ultimately funded the Eye Institute's research wing in the 1960s.

In 1969, with an endowment from the Commonwealth Fund, the Malcolm P. Aldrich Research Professorship was created in his honor, to be held by the Department's Director of Research. The first Aldrich Professor was George Keiser Smelser, PhD, a renowned expert on the anatomy of the eye and a major contributor to the Harkness Eye Institute Basic Science Course in Ophthalmology, which began in 1941 and presented its 84th continuous year of teaching in January, 2025.

Malcolm P. Aldrich

After Dr. Smelser's death in 1973, the position of Director of Research, as well as the Aldrich Professorship, passed to Endré Balazs, MD. Dr. Balazs devoted decades to studying the potential uses of hyaluronic acid, a viscoelastic substance discovered at Columbia in 1934 by Karl Meyer, MD, PhD. Dr. Balazs and his company received a patent for a hyaluronan derivative called Healon, which transformed cataract and corneal surgery.

Dr. Balazs held both positions until his retirement in 1985, after which the Aldrich Professorship remained vacant for more than a decade until 1996, when Abraham Spector, PhD, one of the world's leading researchers in protein aggregation and cataract formation, was named Malcom P. Aldrich Professor and Director of Research.

George J. Florakis, MD

When Dr. Spector retired in 2004, Rando Allikmets, PhD, the William and Donna Acquavella Professor of Ophthalmic Science (in Ophthalmology) and Professor of Pathology & Cell Biology, succeeded him as Director of Research; however, a logistical barrier prevented Dr. Allikmets from being named to the Aldrich Professorship. "He already had an endowed professorship, and university rules prevent one individual from having two such positions," explains G.A. (Jack) Cioffi, MD, Jean and Richard Deems Professor, Edward S. Harkness Professor and Chairman of the Department of Ophthalmology. "As a result, for a number of years, the Aldrich Professorship again remained vacant, and the income from the endowment was not distributed to the Department, but instead continued to accumulate."

As a result, by 2024, thanks to the multiple periods where the annual income was re-invested, the endowment has more than doubled in size, and Dr. Cioffi hit upon the idea of creating two Aldrich Professorships: the Malcolm P. Aldrich Research Professor and the Malcolm P. Aldrich Clinical Professor. Xin Zhang, PhD, who in 2024 succeeded Dr. Allikmets as Vision Science Research Director, has been nominated as the Aldrich Research Professor, and his current position as Herbert and Florence Irving Professor of Ophthalmic Science (in Ophthalmology) and Professor of Pathology & Cell Biology) will be reassigned. Meanwhile, George J. Florakis, MD, Professor of Ophthalmology at CUIMC and the Director of Columbia Ophthalmology in Westchester, has been named as the first Malcolm P. Aldrich Clinical Professor of Ophthalmology.

"This accumulation of funds has allowed us to turn one eminent position into two, further honoring Malcolm P. Aldrich as well as elevating two of our most outstanding faculty members," Dr. Cioffi says.

Scientific Faculty Profile
From Orthopedics to Ophthalmology: Nan-Kai Wang, MD, PhD

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and myopic maculopathy/ macular degeneration.

In 2012, Dr. Wang pioneered the use of optical coherence tomography (OCT) to classify "dry type" myopic maculopathy based on choroidal thickness and predict the development of "lacquer cracks," which are a crucial step before patchy chorioretinal atrophy and choroidal neovascularization (CNV), when abnormal blood vessels begin to grow in the back of the eye due to physical stress, leading to sudden-onset, progressive loss of central vision.

Dr. Wang also served as the principal investigator of Chang Gung Juvenile Diabetes Eye Study (CGJDES), a clinical cohort study including more than 400 patients with juvenile onset diabetes. He and his group identified several risk factors for the development of retinopathy and nephropathy in patients with juvenile-onset type 1 diabetes (T1DM). He also created an individualized risk-prediction model to aid in screening non-proliferative diabetic retinopathy (NPDR) in T1DM, publishing the first study to use a nomogram to predict the risks of NPDR development based on individual factors such as the age of diabetes onset, duration, gender, and HbA1C.

Despite his research success in Taiwan, by the mid-2010s Dr. Wang found himself yearning for the advanced resources that had been available to him at Columbia, particularly in genetics and gene therapy. He recalls one Taiwanese patient in particular whose case continues to inspire his genetic research. "A 10-year-old boy presented to us with both optical atrophy and retinal degeneration. It is very unusual to have a patient with both conditions," he says. "His parents wanted to understand what had happened to their son, and what he could expect in the future. We were limited in the information that we could give them, because at the time, we could only do standard gene sequencing, and testing proved negative for all the genes that we thought might be involved."

When he returned to Columbia in 2017, Dr. Wang continued to think about that patient. With access to whole exome sequencing, he was finally able to identify the gene involved as the SSBP1, (a "housekeeping" gene that is essential for the replication and maintenance of mitochondrial DNA), and the condition, known as optic atrophy-13 with retinal and foveal abnormalities (OPA13).

Because the boy's parents had no known vision problems, the treatment team had originally assumed that his condition was *de novo*. With additional genetic studies, however, Dr. Wang discovered that the patient's mother carried the same SSBP1 variant in her peripheral blood, a condition known as mosaicism (in which a person has two or more genetically separate sets of cells in their body). Published in *Orphanet Journal of Rare Diseases* in 2023, it was the first known case of OPA13 caused by maternal mosaicism in that gene.

Supported by funding from the Gerstner Philanthropies, Dr. Wang is now developing research programs using mouse models to study the role of mitochondria in inherited retinal dystrophies, which include a unique patient-specific OPA1 mouse model. These models may prove to be important for the exploration of cellular metabolism in retinal cells, and for testing therapeutic strategies to preserve vision in mitochondrial eye diseases. "Here at Columbia, we have such a large multidisciplinary team with extraordinary expertise, as well as an extremely large cohort of patients with inherited retinal dystrophies, so this is the perfect institution to be doing this work," he says.

Dr. Wang and his wife are recent empty nesters, as their two sons are now in college, with one a junior at the University of Miami and the other a freshman at George Washington University, both studying biology. Near their home in northern New Jersey is a freshwater reservoir where he enjoys bass fishing. "I find fishing very relaxing," he says.

Even during his "free time," Dr. Wang is often focused on the needs of patients with vision disorders. "My previous colleagues in Taiwan will often send me images and genetic testing results for patients with inherited retinal dystrophies to seek my opinion," he said. "Because we have a 12-hour time difference between Taiwan and New York, I spend many evenings collaborating with them on case reports, case series and clinical studies."

Viewpoint

IMPORTANT PATIENT CARE INFORMATION

Specialties:
Cornea/External Ocular Disease
Glaucoma
Pediatric Ophthalmology and Strabismus
Refractive Surgery/LASIK
Vitreoretinal and Uveitis

For inquiries and appointments, please call 212.305.9535

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