

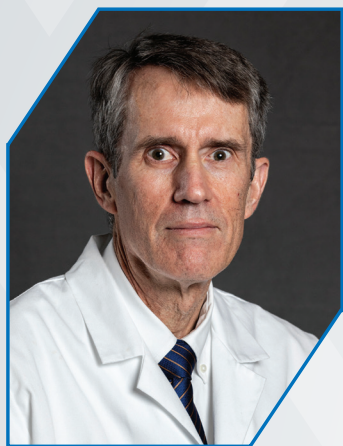
INSIGHTS

2021

 **WVU**EyeInstitute

 West Virginia University
DEPARTMENT OF OPHTHALMOLOGY
AND VISUAL SCIENCES

Letter from The Chairman



THOMAS MAUGER, M.D., Department of Ophthalmology and Visual Sciences chairman

Academic departments, like most organizations, are really about the people.

Since arriving in Morgantown in 2018, I have been impressed by the excellence found in our clinical and research faculty, administration, staff and trainees. Their commitment to helping the people of West Virginia through their efforts in direct patient care, research and the creation of opportunities

for enhanced service is evident daily. Their can-do spirit and teamwork have been evident during the historic COVID-19 pandemic. I have witnessed small acts of kindness and heroism by this group on a daily basis.

The department has made a number of advances and expansions over the past three years, which are described in the following pages of this report. They include important discoveries by our research team, along with additions of faculty, space and funding to that effort. Our clinical enterprise has also grown in depth and breadth. Clinical research has increased significantly with the addition of a large multicenter glaucoma trial led by Tony Realini, M.D., M.P.H. Our residency and fellowship programs have both grown recently and continue to be very competitive for recruits. Our residency program has expanded to four residents per year and we have active fellow positions in glaucoma, retina, oculoplastics and cornea.

Our faculty ranks have grown with the addition of researchers Wen Tao Deng, Ph.D.,

and Michael Robichaux, Ph.D. Recent additions to our clinical faculty include Cornea Specialist Annahita Amirescandari, M.D., Pediatric Ophthalmologist Ryan McGuire, M.D., Glaucoma Specialists Joel Palko, M.D., Kevin Halenda, M.D., and Sumeet Gupta, M.D., Vitreoretinal Surgeons Nicole Pumariega, M.D., and Mona Singh, M.D., Uveitis Specialist Grace Levy-Clarke, M.D., Optometrist Jordan Gjolberg, O.D. and Neuro-Ophthalmologist and Pediatric Ophthalmologist Praveen Jeyaseelan, M.D.

We have also made significant strides in better serving the entire state by opening outreach clinics in Summersville, Buckhannon and Bridgeport. These have all been in collaboration with each area's local WVU Medicine Hospital — including Summersville Regional Medical Center in Summersville, St. Joseph's Hospital in Buckhannon, and United Hospital Center in Clarksburg. Each of these facilities have provided local resources for patients who receive specialty eye care.

Our core facility in Morgantown has also expanded. Our research team moved to expanded Vision Research space in the Erma Byrd Research Building, while our clinical services have expanded into the third floor of the Eye Institute, which previously housed neuroscience services.

I hope you enjoy reading about our department in the following pages and get a feeling for our commitment to providing the very best eye care to the people of West Virginia and providing outstanding experiences to the future ophthalmologists of our state and creating new knowledge that will lead to better understanding of eye function and disease.

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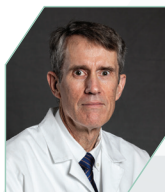
24 Department of Ophthalmology and Visual Sciences At-A-Glance

Education in Ophthalmology

By **GEOFF BRADFORD, M.S., M.D.**, vice chair of Education and residency program director

Education Leadership

The Education Leadership for the Department of Ophthalmology and Visual Sciences consists of:



THOMAS MAUGER, M.D.
Department Chairman



GEOFF BRADFORD, M.S., M.D.
Vice Chair of Education and Residency Program Director



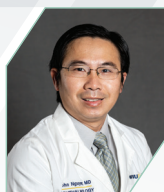
BRADLEY THURO, M.D.
Associate Residency Program Director



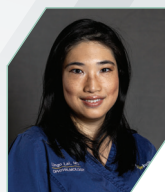
BRIAN MCMILLAN, M.D.
Director of Medical Student Education



GHASSAN GHORAYEB, M.D.
Vice Chair of Clinical Affairs and Vitreoretinal Fellowship Director



JOHN NGUYEN, M.D.
Oculoplastics Fellowship Director



LINGO LAI, M.D.
Cornea Fellowship Director



TONY REALINI, M.D., M.P.H.
Vice Chair of Clinical Research and Glaucoma Fellowship Director

Resident selection process

Each year the Department of Ophthalmology and Visual Sciences receives approximately 400 medical student applications for four residency positions. Of these, the committee selects 56 candidates to interview in December, with four students matching with us in January. They start training in July, initially as hospital interns, but then transitioning to full-time residents in ophthalmology for the next three years. We are fortunate to continuously attract talented medical school graduates throughout the country to our residency program.

Expanding training opportunities

The department also supports five clinical fellows in the areas of cornea, glaucoma, oculoplastic surgery and retina. These trainees work closely with their subspecialty faculty on rotations both at J.W. Ruby Memorial Hospital in Morgantown and at the Louis A. Johnson VA Medical Center in Clarksburg.

Within the WVU Eye Institute, residents and fellows have the benefit of learning how to perfect their surgical techniques on the EyeSi surgical simulator before moving to the operating room.

400 CANDIDATES ⇒ 56 INTERVIEWEES ⇒ 4 RESIDENTS

In 2020, we established a joint transitional year program that enables all of our ophthalmology interns to have experiences in ophthalmology while they train at WVU. Each intern has three months of ophthalmology training during the course of their first year, helping to further advance their clinical acumen and ocular knowledge base before the start of their residency training the following year.

Quality training and care

While the COVID-19 pandemic had a major effect on the educational programs in 2020, the program has rebounded and once again maintains a very large volume of patient encounters, both in our clinics and in the operating rooms, providing excellent clinical care and hands-on training.

The residency program continually maintains the highest standards set by the Accreditation Council of Graduate Medical Education and our Association of University Professors of Ophthalmology-compliant fellowship programs attract trainees from across the nation to further their subspecialty training with us.

The program's first-time pass rate on the American Board of Ophthalmology's certification exams consistently exceeds the national average.

A breadth of experience

Each member of the clinical faculty in the department is also teaching faculty, which offers residents and fellows both a wide breadth and sound depth of clinical experience and teaching through didactic sessions, flipped classroom opportunities, wet-lab sessions, hands-on

5 **CLINICAL FELLOWS** in the areas of: **CORNEA** **GLAUCOMA** **OCULOPLASTIC SURGERY** **RETINA**

teaching in both the clinic and operating room settings and mentoring scholarly work and research projects.

The department also fosters an active ophthalmology interest group for medical students that participate in research and community outreach projects, while also sharing in patient care activities.

Continuing a trend over the years of half of our graduates pursuing subspecialty training, two of our four residency graduates in 2021 went on to fellowships, one at the University of Michigan for medical retina, the other at the University of Southern California for surgical retina. The other two graduates have entered private practice, one in Buffalo, New York and one in Oklahoma City, Oklahoma. In wishing our graduates well, we also welcome our newly matched interns, who this year hail from Ohio, Oklahoma, New York and Florida.

To learn more about graduate medical education opportunities in the department, visit medicine.hsc.wvu.edu/eye.

Residents have the benefit of perfecting their surgical techniques on the EyeSi surgical simulator before moving to the operating room.



FACULTY

C Clinical Faculty

R Research Faculty



**ANAHITA
AMIRESKANDARI M.D.**
Assistant Professor



**HASAN
UL BANNA PH.D.**
Postdoctoral Research Assistant



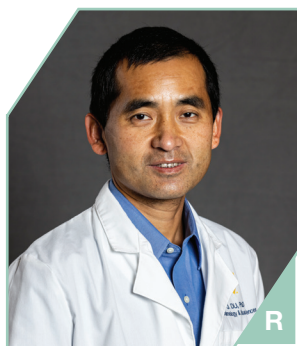
**GEOFFREY
BRADFORD M.D., M.S.**
Professor, Residency Program
Director, Vice-Chair of Education



**JUDIE
CHARLTON M.D.**
Professor



**WEN TAO
DENG PH.D.**
Assistant Professor | Additional
Appointment: Assistant Professor,
Department of Biochemistry



**JIANHAI
DU PH.D.**
Assistant Professor | Additional
Appointment: Assistant Professor,
Department of Biochemistry



**BRIAN
ELLIS M.D.**
Associate Professor



**GHASSAN
GHORAYEB M.D.**
Associate Professor, Vitreoretinal
Fellowship Director, Vice-Chair of
Clinical Affairs



**JORDAN
GJOLBERG O.D.**
Assistant Professor



**SUMET
GUPTA M.D.**
Assistant Professor



**KEVIN
HALEND M.D.**
Assistant Professor



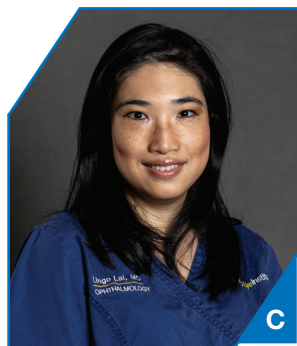
**ALISON
HIXENBAUGH O.D.**
Assistant Professor



PRAVEEN
JEYASEELAN M.D., M.B.B.S.
Assistant Professor



SARAVANAN
KOLANDAIVELU PH.D.
Assistant Professor | Additional
Appointment: Assistant Professor,
Department of Biochemistry



LINGO
LAI M.D.
Assistant Professor



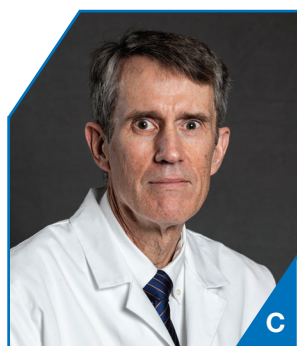
L. CAROL
LAXSON M.D., PH.D.
Assistant Professor, Diabetic
Retinopathy Program Director



GRACE
LEVY-CLARKE M.D.
Associate Professor



MONIQUE
LEYS M.D., E.B.O.
Professor



THOMAS
MAUGER M.D.
Jane McDermott Shott Chair, Professor,
Assoc. Dean for Practice Plan Integration,
Assoc. CMO for Ambulatory Care



RYAN
MCGUIRE M.D.
Assistant Professor



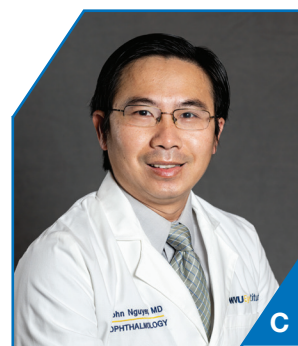
BRIAN
MCMILLAN M.D.
Associate Professor, Director of
Medical Student Education



CHARLES
MOORE M.D.
Assistant Professor, Medical Director



BRITTANY
NEWMAN O.D.
Assistant Professor



JOHN
NGUYEN M.D.
Professor, Ophthalmic Plastic Surgery
Fellowship Director

FACULTY

C Clinical Faculty

R Research Faculty



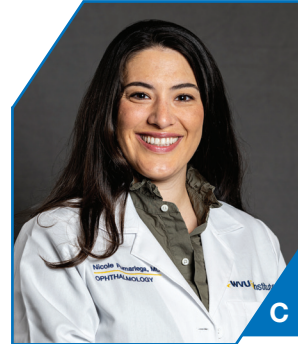
**J. VERNON
ODOM PH.D.**

Professor | Additional Appointment:
Professor, Department of
Neuroscience



**JOEL
PALKO M.D.**

Assistant Professor



**NICOLE
PUMARIEGA M.D.**

Assistant Professor



**VISVANATHAN
RAMAMURTHY PH.D.**

Professor, Vice Chair of Research |
Additional Appointments: Chairman,
Professor, Department of Biochemistry



**TONY
REALINI M.D., M.P.H.**

Professor, Glaucoma Fellowship
Director, Vice Chair of Clinical
Research



**MICHAEL
ROBICHAUX PH.D.**

Assistant Professor | Additional
Appointment: Assistant Professor,
Department of Biochemistry



**EZEQUIEL
SALIDO M.D., PH.D.**

Research Assistant Professor | Additional
Appointment: Research Assistant
Professor, Department of Biochemistry



**EMILY
SECHREST**

Postdoctoral Associate



**MONA
SINGH M.D., M.P.A.**

Assistant Professor



**MAXIM
SOKOLOV PH.D.**

Professor | Additional Appointments:
Professor, Dept. of Biochemistry;
Professor, Dept. of Neuroscience;
Professor, Rockefeller Neuroscience
Institute



**BRADLEY
THURO M.D.**

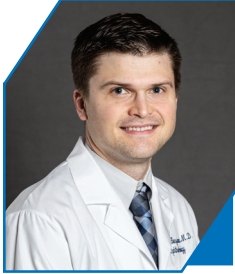
Assistant Professor, Associate
Residency Program Director



**EBRU
TOKER M.D.**

Research Associate Professor

FELLOWS



**JAMES
BENJAMIN M.D.**
Fellow, Retina Service



**SARA
DEACON M.D.**
Fellow, Cornea Service



**JASON
JENSEN M.D.**
Fellow, Glaucoma Service



**PHILIP
KUROCHKIN M.D.**
Fellow, Retina Service



**ANTHONY
LEONARD M.D.**
Fellow, Oculoplastics Service

RESIDENTS



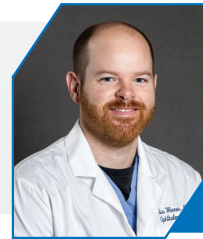
**ANDREW
BEAN M.D.**



**JUSTIN
HARVEY M.D.**



**MARY
KUNESH M.D.**



**CHRISTIAN
WARNER M.D.**

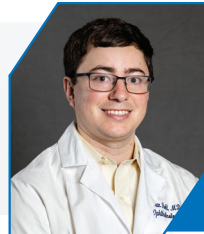
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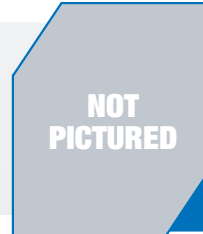
**MICHAEL
CHANG M.D.**



**JAMIE
DIETZE M.D.**

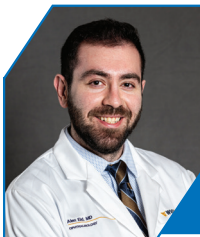


**EVAN
FIELD M.D.**



**IVAN
LEE M.D.**

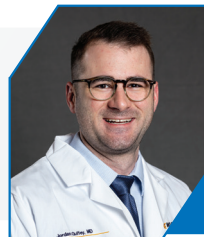
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**ALEN
EID M.D.**



**EVAN
FRIGOLETTO M.D.**



**JORDAN
GUFFEY M.D.**



**CLINTON
JORDAN M.D.**

PGY
2

**ANDREW
BEITER M.D.**

**PARKER
CAIN M.D.**

**APRIL
ENGER M.D.**

**AMI
PATEL M.D.**

PGY-1

Rejuvenating Eye Health of West Virginians with an Emphasis on Basic Science Eye Research

West Virginia has the second highest rate of visual disability in the nation, and the incidence is projected to double by 2050, according to the CDC's Vision and Eye Health Surveillance System. The team of basic science researchers at the West Virginia University Department of Ophthalmology and Visual Sciences is rapidly growing its academic research program to uncover the cause of eye diseases and discover new eye therapies that could rescue sight.

This passionate group of eight active teams perform cutting-edge research in the fields of retina biochemistry, metabolism and genetics.

The retina is the light-sensitive neural tissue in the eye that is susceptible to disease stressors. The neurons in the retina are highly specialized for vision and are necessarily complex. As such, the efforts of basic research scientists are needed to unravel this complexity for a better and more complete understanding of how eye diseases work and how they may be treated and cured in the future.

"The fundamental discoveries by our young scientists are important for designing novel therapies and diagnoses to prevent visual disability. In addition, we train the next generation of scientists and contribute to

the growth and economy of our state," said Visvanathan Ramamurthy, Ph.D., director of the Department of Ophthalmology's Basic Research program and chair of the Department of Biochemistry.

The Basic Science Research team is comprised of eight investigators and 14 research trainees that are funded by seven, five-year R01 grants, a student F31 grant from the National Eye Institute and several grants from foundations for a total of more than \$3 million annually.


The labs use numerous research techniques to discover the basic mechanisms of vision and eye health, such as metabolomics, retinal explant cultures and super-resolution

fluorescence microscopy. The team also studies animal models for prevalent human eye diseases, including retinitis pigmentosa, age-related macular degeneration, achromatopsia and glaucoma.

Despite the ongoing COVID-19 pandemic, the Basic Research laboratories have expanded into a new and state-of-the-art research space. The team also added two new faculty investigators, Wen-Tao Deng, Ph.D., from the University of Florida and Michael Robichaux, Ph.D., from Baylor College of Medicine.

"We train the next generation of scientists and contribute to the growth and economy of our state."

VISVANATHAN RAMAMURTHY, PH.D.



Dr. Deng uses adeno-associated vectors to mediate gene replacement therapies that treat color vision deficiencies.

Dr. Robichaux uses “nanoscopies”, which are powerful microscopes capable of capturing cellular events on a molecular scale. His laboratory uses nanoscopy imaging to investigate the effect of disease-related mutations on single cells in the retina.

The Basic Research team is also heavily invested in the future of eye health in West Virginia and beyond. The department endeavors to foster translational research amongst the basic science laboratories that are geared toward future research collaborations with the physician and clinical research teams.

2021 Active Grants: Faculty

Wen-Tao Deng, Ph.D.

Title: Disease mechanisms of cone opsin mutants and treatment strategies. *Source:* US DHHS-NIH-National Eye Institute

Jianhai Du, Ph.D.

Title: Mitochondrial Pyruvate Transport in Retinal Health and Disease. *Source:* US DHHS-NIH-National Eye Institute

Title: Targeting proline metabolism in AMD. *Source:* Bright Focus Foundation

Title: Regulators of Retinal Metabolism in Healthy and Degenerating Retinas

Title: US DHHS-NIH-National Eye Institute (Sub-award: University of Florida)

Title: Human RPE Metabolism and Metabolite Transport. *Source:* US DHHS-NIH-National Eye Institute (Sub-award: University of Washington)

Title: Nutritional Strategies in Age-Related Macular Degeneration. *Source:* International Retinal Research Foundation

Title: Physiologically Relevant in vitro Modeling of RPE Disease. *Source:* US DHHS-NIH-National Eye Institute (Sub-award: University of Washington)

Saravanan Kolandaivelu, Ph.D.

Title: Mechanisms Behind Retinal Photoreceptor Cells Outer Segment Biogenesis. *Source:* US DHHS-NIH-National Eye Institute

Visvanathan Ramamurthy, Ph.D.

Title: Biosynthesis and Trafficking of Phosphodiesterase in the Retinal Photoreceptors
Source: US DHHS-NIH-National Eye Institute

Title: Importance of Small GTPases in Photoreceptor Function. *Source:* US DHHS-NIH-National Eye Institute

Title: Photoreceptor neuron specific alternative splicing messenger RNA (Multi-PI grant with Dr. Peter Stoilov). *Source:* US DHHS-NIH-National Eye Institute

Michael Robichaux, Ph.D.

Title: Subcellular Analysis of Photoreceptor Cell Health in Mouse Models for Retinitis Pigmentosa and Retinal Gene Therapy. *Source:* Knights Templar Eye Foundation Inc

Peter Stoilov, Ph.D.

Title: Photoreceptor neuron specific alternative splicing messenger RNA (Multi-PI grant with Dr. Visvanathan Ramamurthy). *Source:* US DHHS-NIH-National Eye Institute

Title: Genetics of Early Onset Retinal Diseases (Co-I) grant with Dr. Rui Chen, Baylor College of Medicine. *Source:* US DHHS-NIH-National Eye Institute

Maxim Sokolov, Ph.D.

Title: Protein-Unfolding Chaperones for the Treatment of Blindness. *Source:* US DHHS-NIH-National Eye Institute



2021 Publications: Vision

Zhu P, Dyka F, Ma X, Yin L, Yu H, Baehr W, Hauswirth WW, **Deng WT**. [Disease mechanisms of X-linked cone dystrophy caused by missense mutations in the red and green cone opsins](#). FASEB J. 2021 Oct;35(10):e21927. doi: 10.1096/fj.202101066R. PMID: 34547123; PMCID: PMC8462070.

Du J, Zhu S, Lim RR, Chao JR. [Proline metabolism and transport in retinal health and disease](#). Amino Acids. 2021 Apr 19:1–18. doi: 10.1007/s00726-021-02981-1. Epub ahead of print. PMID: 33871679; PMCID: PMC8054134.

Shen W, Lee SR, Mathai AE, Zhang R, **Du J**, Yam MX, Pye V, Barnett NL, Rayner CL, Zhu L, Hurley JB, Seth P, Hirabayashi Y, Furuya S, Gillies MC. [Effect of selectively knocking down key metabolic genes in Müller glia on photoreceptor health](#). Glia. 2021 Aug;69(8):1966-1986. doi: 10.1002/glia.24005. Epub 2021 Apr 9. PMID: 33835598.

Greenwald SH, Brown EE, Scandura MJ, Hennessey E, Farmer R, **Du J**, Wang Y, Pierce EA. [Mutant Nmnat1 leads to a retina-specific decrease of NAD⁺ accompanied by increased poly\(ADP-ribose\) in a mouse model of NMNAT1-associated retinal degeneration](#). Hum Mol Genet. 2021 May 17;30(8):644-657. doi: 10.1093/hmg/ddab070. PMID: 33709122; PMCID: PMC8127407.

Xu R, Wang Y, Du J. [Tracing Nitrogen Metabolism in Mouse Tissues with Gas Chromatography-Mass Spectrometry](#). Bio Protoc. 2021 Feb 20;11(4):e3925. doi: 10.21769/BioProtoc.3925. PMID: 33732812; PMCID: PMC7952953.

Sinha T, **Du J**, Makia MS, Hurley JB, Naash MI, Al-Ubaidi MR. [Absence of retbindin blocks glycolytic flux, disrupts metabolic homeostasis, and leads to photoreceptor degeneration](#). Proc Natl Acad Sci U S A. 2021 Feb 9;118(6):e2018956118. doi: 10.1073/pnas.2018956118. PMID: 33526685; PMCID: PMC8017963.

Zhang R, Engel AL, Wang Y, Li B, Shen W, Gillies MC, Chao JR, **Du J**. [Inhibition of Mitochondrial Respiration Impairs Nutrient Consumption and Metabolite Transport in Human Retinal Pigment Epithelium](#). J Proteome Res. 2021 Jan 1;20(1):909-922. doi: 10.1021/acs.jproteome.0c00690. Epub 2020 Sep 25. PMID: 32975122.

Groover SE, Beasley M, **Ramamurthy V**, Legleiter J. [Phosphomimetic Mutations Impact Huntingtin Aggregation in the Presence of a Variety of Lipid Systems](#). Biochemistry. 2020 Dec 15;59(49):4681-4693. doi: 10.1021/acs.biochem.0c00788. Epub 2020 Nov 30. PMID: 33256402.

Sundar J, Matalkah F, Jeong B, Stoilov P, **Ramamurthy V**. [The Musashi proteins MS1 and MS2 are required for photoreceptor morphogenesis and vision in mice](#). J Biol Chem. 2021 Jan-Jun;296:100048. doi: 10.1074/jbc.RA120.015714. Epub 2020 Nov 22. PMID: 33168629; PMCID: PMC7948980.

Wensel TG, Potter VL, Moye A, Zhang Z, **Robichaux MA**. [Structure and dynamics of photoreceptor sensory cilia](#). Pflugers Arch. 2021 Sep;473(9):1517-1537. doi: 10.1007/s00424-021-02564-9. Epub 2021 May 28. PMID: 34050409.

Potter VL, Moye AR, **Robichaux MA**, Wensel TG. [Superresolution microscopy reveals photoreceptor-specific subciliary location and function of ciliopathy-associated protein, Cep290](#). JCI Insight. 2021 Sep 14;145256. doi: 10.1172/jci.insight.145256. Epub ahead of print. PMID: 34520396.

Multidisciplinary team at West Virginia University combines expertise to provide treatment for uveal melanoma

Uveal melanoma is a rare cancer with only 5.1 cases per million people per year, yet it remains the most common primary intraocular tumor in adults, according to the American Academy of Ophthalmology.

In 2014, Ghassan Ghorayeb, M.D., vice-chair of Clinical Affairs and a retina specialist at the West Virginia University Eye Institute, formed the first multidisciplinary team in West Virginia focused on providing treatment for uveal melanoma and other eye cancers. Prior to Dr. Ghorayeb establishing the service in 2014, West Virginians had to travel to surrounding states to receive treatment for these diseases.

“The need to bring this essential, lifesaving treatment to West Virginia was the primary drive in assembling this team,” Ghorayeb said. “We had the talent and experience here — we just had to bring the team together to service the need of this wonderful state.”

Led by Ghorayeb, the team is comprised of a radiation oncologist, medical oncologists who specialize in the treatment of melanomas, physicists, radiation safety officers and orbital surgeons.

The team’s work is complimented by a CT-based 3D tumor model that helps deliver a patient-specific treatment with Iodine-125 radioactive plaques. This work has helped treat patients with such tumors more effectively, while preserving the patient’s vision as much as possible.

Uveal melanoma multidisciplinary team



Ghassan Ghorayeb, M.D. —
Ophthalmologist;
Vice Chair of Clinical Affairs;
Director of Vitreoretinal
Fellowship; Retina Specialist;

Associate Professor, Department of
Ophthalmology and Visual Sciences



Ann Morris, M.D. — Radiation
Oncologist; Residency Program
Director; Assistant Professor,
Department of Radiation Oncology



Danh Pham, M.D. — Oncologist;
Melanoma Specialist; Assistant
Professor, Section of Hematology/
Oncology Head & Neck, Melanoma



Joanna Kolodney, M.D. — Oncologist;
Melanoma Specialist; Assistant
Professor, Section of Hematology/
Oncology GI & Melanoma



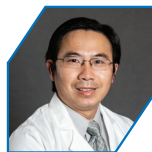
*Ramon Alfredo Siochi, Ph.D.,
D.A.B.R. —* Physicist; Director of
Medical Physics; Associate Chair,
Department of Radiation Oncology



Joshua Hack — Physicist; Chief
Medical Physicist, Department of
Radiation Oncology



Bradley Thuro, M.D. —
Ophthalmologist; Orbital Surgeon;
Assistant Professor, Department of
Ophthalmology and Visual Sciences



John Nguyen, M.D. —
Ophthalmologist; Orbital Surgeon;
Director of Ophthalmic Plastic and
Reconstructive Surgery Fellowship;
Assistant Professor, Department of

Ophthalmology and Visual Sciences

Glaucoma Research Driven by Curiosity

What drives a physician to re-invent himself as a scientist? One word: Curiosity.

“I was always a curious kid,” said Tony Realini, M.D., M.P.H., a glaucoma specialist at the WVU Eye Institute. “I always wanted to know stuff: how things worked, what was hiding behind closed doors, why the word knife starts with a ‘K’. I drove my parents crazy.”

He grew into a curious adult who saw a career in medicine as a way of using his curiosity to make a difference in the world.

“My high school yearbook says I planned to become a pathologist,” he said. “I really liked the idea of gleaning knowledge from the dead to benefit the living.”

But what seemed a good idea in the abstract failed to translate into reality.

“After the first hour in the pathology lab in medical school, I was less than enthralled and knew I’d need a new plan.”

A few weeks later, lessons on the human eye grabbed his attention, and his future as an ophthalmologist was decided.

A few years in private practice left his curiosity stifled, and in 2003, Dr. Realini decided to join the WVU faculty with the goal of building a research program. If he could function as both a physician and a scientist, he realized he could both ask and answer important questions and improve our understanding of glaucoma and its treatments. “Unfortunately, I had no research skills to speak of — they don’t teach that in medical school,” he said. So, he spent two years at the University of Pittsburgh completing a Master’s degree in research design.

“That made all the difference,” he said. As part of his coursework, he designed a

research study to evaluate the use of a new glaucoma laser treatment — called selective laser trabeculoplasty, or SLT — in the Caribbean, where glaucoma is rampant and limited resources make daily medical therapy financially impractical for many patients. Before he’d finished his degree, the study had earned funding from the American Glaucoma Society and later by the National Institutes of Health (NIH), and for nearly a decade he commuted back and forth between West Virginia and Saint Lucia and Dominica, two small islands in the southern Caribbean. He performed SLT on hundreds of patients and after following their course for nearly eight years, he found that most patients never needed to use medications to treat their glaucoma.

“We saved those patients thousands and thousands of dollars in medication costs over the years,” he said. And they repaid him however they could, bringing baked goods and seasonal fruit to their appointments. “Some trips we’d end up with 50 pounds of mangos. We gave



Dr. Realini performs SLT on a patient in the Caribbean.

\$15.2 MILLION

grant awarded by
NIH to conduct
the COAST trial

them to the bar man at our hotel and mango daquiris became the drink special on those days.”

Now he is turning his attention to sub-Saharan Africa, where the glaucoma burden is even greater. “Saint Lucia is a small island — about 12 miles wide and 25 miles long — so most people with glaucoma have fairly easy access to the handful of eye doctors on the island,” he explained. In Africa, there are far more people suffering from glaucoma and far too few doctors to care for them. Few patients can afford to see doctors — or travel a day or more to reach them — and even fewer can afford the cost of daily medical therapy.

“SLT could be a significant part of the solution to Africa’s glaucoma problem,” Realini said. “The challenge is logistics: how do we get the lasers and the expertise to run them into the region, and how do we get the patients to the health centers for treatment?”

He is teaming up with a consortium of stakeholders to identify and implement solutions to these significant barriers to care. And in West Virginia, he is exploring novel techniques to further improve the benefits of SLT therapy for long-term glaucoma management.

“SLT’s effect wears off over time, and there are a limited number of times it can be repeated before it stops working and medical therapy is necessary,” he explained. “Which got me thinking: Is there a different way to perform the

treatment that can make it last longer? Maybe long enough that most patients can go their whole lives without needing to use eye drop medications every day?”

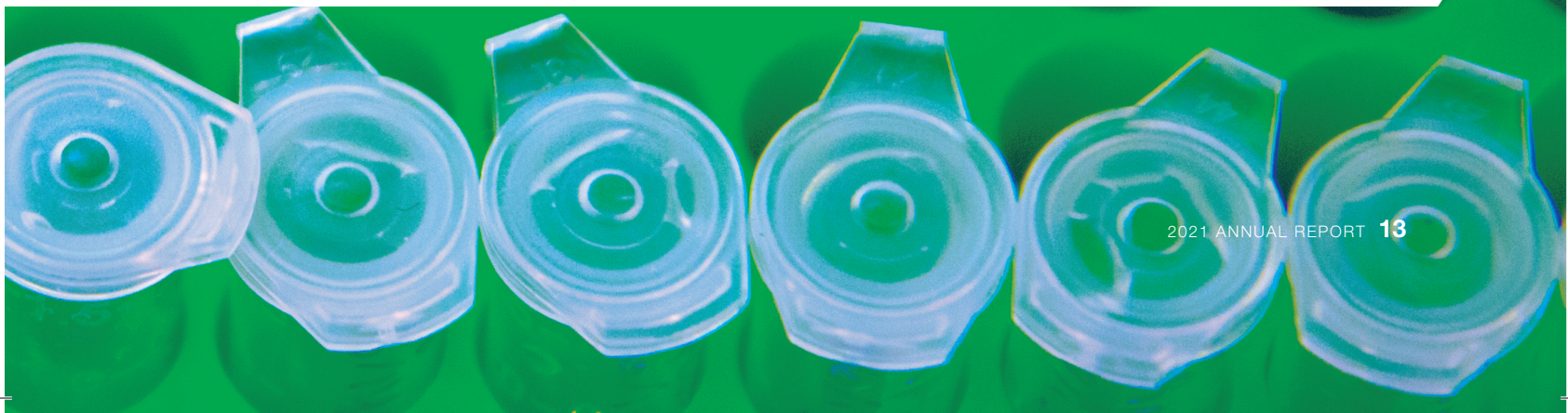
Teaming up with his mentors at the University of Pittsburgh as well as the inventor of SLT therapy and several other prominent clinician-scientists, Realini developed a research study to explore new SLT techniques. In late 2020, the team was awarded a \$15.2 million grant by NIH to conduct the COAST trial (Clarifying the Optimal Application of SLT Therapy). In his role as the Principal Investigator and Study Chair, Realini will oversee the enrollment of more than 600 participants at 15-20 research centers around the world. The four-year study will explore both different laser energy settings and different time intervals at which SLT is repeated to determine the optimal energy and interval for maximum effect.

“The primary goal of glaucoma therapy is to preserve our patients’ quality of life,” he said. “One of the most effective ways to do

this is to control their glaucoma and prevent vision loss while simultaneously freeing them from the hassles and side effects of putting eye drop medications into their eyes one or more times daily for the rest of their lives. The COAST trial is a step in that direction.”

“The primary goal of glaucoma therapy is to preserve patients’ quality of life. One of the most effective ways to do this is to control their glaucoma and prevent vision loss ... The COAST trial is a step in that direction.”

TONY REALINI, M.D., M.P.H.





History of the WVU Eye Institute

By GEOFF BRADFORD, M.S., M.D.

In 2021, the West Virginia University Eye Institute celebrated the 20th anniversary of its foundation, which occurred on April 16, 2001. However, decades before the opening of the Eye Institute, the WVU Department of Ophthalmology and Visual Sciences had already begun its proud tradition of excellence in patient care, clinical research and medical education.

Robert Trotter, M.D., initially founded the department at the WVU Health Sciences Center in 1961, and in 1963, the department began training its first residents. The program began training just a single resident each year until 1971, when the program expanded to two residents per year.

From these roots, the department steadily grew and in 1980, welcomed its second chairman, George Weinstein, M.D., who had recently served as President of the American Academy of Ophthalmology. During his tenure, the number of faculty members and breadth of ophthalmology services offered to patients continued to expand to further the department's mission to care for the people of West Virginia and the surrounding regions.

By 1995, the department's growth had again outpaced its clinical space and one of the distinguished faculty members, John Linberg, M.D., assumed the Chairman's position.

Dr. Linberg understood that the best way to continue bringing together talented people to provide world-class patient care, advance cutting-edge research and educate future ophthalmologists and researchers, was to design WVU's own Eye Institute, modeled after similar programs already established at some of the country's other leading universities.

Linberg's vision and tireless advocacy ultimately led to the grand opening of the



Dr. John V. Linberg, founder of the WVU Eye Institute as it celebrates its 20th anniversary.

WVU Eye Institute in 2001, a 35,000 square-foot, multimillion-dollar state-of-the-art facility providing both the equipment and space necessary for all the clinical specialties in ophthalmology, laboratories to advance research to prevent blindness and educational space devoted to medical students, residents and fellows in ophthalmology.

Now, more than twenty years later, the WVU Eye Institute remains the premier site in West Virginia and the surrounding region for ophthalmic care, education and research. With continued leadership from subsequent department chairs, Judie Charlton, M.D., Ron Gross, M.D., and currently, Tom Mauger, M.D., the Eye Institute and the Department of Ophthalmology and Visual Sciences continues to flourish, now with 23 clinical faculty in nine subspecialties, seven research faculty with more than \$2 million in National Institutes of Health-funded grants, 12 residents and five fellows per year, the recent addition of 14,000-square-feet of clinical space and a newly established vision research facility.

As a valued faculty member and mentor, Linberg continues his dedication to caring for veterans and the people of West Virginia while continuing to train residents and fellows for their future careers in ophthalmology.

The WVU Eye Institute maintains its prominent position on the WVU Health Sciences campus and serves as testimony to Linberg's successful dream to provide and broaden high-quality ophthalmology care to the people of West Virginia and across Appalachia for generations to come.

Where we are today:

23 **CLINICAL FACULTY**
in nine subspecialties

7 **RESEARCH FACULTY**
with more than \$2 million
in National Institutes of
Health-funded grants

12 **RESIDENTS**
per year

5 **FELLOWS**
per year

14,000 **SQ. FT**
newly added clinical
space and a newly
established vision
research facility

Department of Ophthalmology and Visual Sciences Publications (2020 – 2021)

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* Artemis 1 Study Group includes Brian McMillan

** EyeArt Study Group includes Grace Levy-Clarke

Funding Jan 1 - Dec 31, 2021

Basic Science Grants

Wen-Tao Deng, Ph.D., Assistant Professor

Additional Appointment: Assistant Professor, Department of Biochemistry
[Disease mechanisms of cone opsin mutants and treatment strategies](#)

US DHHS-NIH-National Eye Institute

Duration: 8/1/2021 - 7/31/2024

Total Award Amount: \$1,512,000

Jianhai Du, Ph.D., Assistant Professor

Additional Appointment: Assistant Professor, Department of Biochemistry
[Proline metabolism in retinal health](#)

US DHHS-NIH-National Eye Institute

Duration: 6/1/2021 - 3/31/2026

Total Award Amount: \$1,900,000

[Mitochondrial Pyruvate Transport in Retinal Health and Disease](#)

US DHHS-NIH-National Eye Institute

Duration: 1/1/2021-11/30/2024

Total Award Amount: \$1,520,000

[Targeting proline metabolism in AMD](#)

BrightFocus Foundation

Duration: 9/1/2020-8/31/2022

Total Award Amount: \$185,000

[Human RPE Metabolism and Metabolite Transport](#)

US DHHS-NIH-National Eye Institute

Sub-award University of Washington

Duration: 7/1/2016 - 12/31/2021

Total Award Amount: \$686,284

[Nutritional Strategies in Age-Related Macular Degeneration](#)

International Retinal Research Foundation

Duration: 1/1/2021 - 12/31/2021

Total Award Amount: \$103,000

[Regulators of Retinal Metabolism in Healthy and Degenerating Retinas](#)

Sub-award University of Florida

Duration: 9/1/2020 - 6/30/2025

Total Award Amount: \$67,281

[Physiologically Relevant in vitro Modeling of RPE Disease](#)

Sub-award University of Washington

Duration: 1/1/2020 - 12/31/2022

Total Award Amount: \$13,253

Saravanan Kolandaivelu, Ph.D., Assistant Professor
Additional Appointment: Assistant Professor, Department of Biochemistry
[Mechanisms Behind Retinal Photoreceptor Cells Outer Segment Biogenesis](#)
US DHHS-NIH-National Eye Institute
Duration: 5/1/2018 - 4/30/2023
Total Award Amount: \$1,488,750

Michael Robichaux, Ph.D., Assistant Professor
Additional Appointment: Assistant Professor, Department of Biochemistry
[Subcellular Analysis of Photoreceptor Cell Health in Mouse Models for Retinitis Pigmentosa and Retinal Gene Therapy](#)
Knights Templar Eye Foundation Inc.
Duration: 4/1/2021 - 11/30/2021
Total Award Amount: \$34,355

Maxim Sokolov, Ph.D., Professor
Additional Appointments: Professor, Department of Biochemistry;
Professor, Department of Neuroscience; Professor, Rockefeller Neuroscience Institute
[Protein-Unfolding Chaperones for the Treatment of Blindness](#)
US DHHS-NIH-National Eye Institute
Duration: 6/1/2019 - 5/31/2023
Total Award Amount: \$1,410,750

Visvanathan Ramamurthy, Ph.D., Professor
Additional Appointments: Chairman & Professor, Department of Biochemistry
[Biosynthesis and Trafficking of Phosphodiesterase in the Retinal Photoreceptors](#)
US DHHS-NIH-National Eye Institute
Duration: 4/1/2020 - 3/31/2025
Total Award Amount: \$1,921,805

Clinical Research Funding

Ghassan Ghorayeb, M.D., Associate Professor, Vitreoretinal Fellowship Director & Vice-Chair of Clinical Affairs
[Randomized, Double-Masked, Active-Controlled, Phase 3 Study of the Efficacy and Safety of High Dose Aflibercept in Patients with Neovascular Age-Related Macular Degeneration](#)
Regeneron Pharmaceuticals, Inc.
Duration: 9/2/2020 - 5/27/2023
Total Award Amount: \$31,135

[GR41986 A Phase III, Multicenter, Randomized, Double-Masked, Active Comparator Controlled Study to Evaluate the Efficacy and Safety of Faricimab in Patients with Macular Edema Secondary to Central Retinal or Hemiretinal Vein Occlusion](#)
Hoffmann-La Roche Inc
Duration: 10/27/2020 - 1/18/2024
Total Award Amount: \$5,412

[A Phase 2, Randomized Multi-center Study to Assess the Dose level of Multiple THR-149 Injections and to Evaluate the Efficacy and Safety of THR-149 Vs. Aflibercept for the treatment of diabetic macular edema](#)
Oxurion NV
Duration: 10/19/2020 - 3/31/2023
Total Award Amount: \$10,768

[A Multicenter, Open-Label Extension Study To Evaluate the Long-Term Safety And Tolerability of Faricimab in Patients With Diabetic Macular Edema](#)
Genentech Incorporated
Duration: 12/3/2020 - 8/18/2023
Total Award Amount: \$43,489

[A Randomized, Single-Masked, Active-Controlled Phase 2 Study of the Safety, Tolerability, and Efficacy of Repeated Doses of High-Dose Aflibercept in Patients with Neovascular Age-related Macular Degeneration](#)
Parexel International Corp
Duration: 2/5/2020 - 5/4/2021
Total Award Amount: \$40,771

[Randomized, Controlled, Multi-Center Study to Assess the Efficacy, Safety and Tolerability of Intravitreal Aflibercept Compared to Laser Photocoagulation in Patients with Retinopathy of Prematurity](#)
Parexel International Corp
Duration: 10/7/2019 - 10/1/2022
Total Award Amount: \$167,861

KINGFISHER
Novartis Pharmaceutical Corporation
Duration: 7/1/2019 - 7/30/2022
Total Award Amount: \$38,277

GTSCOPE
Medpace Inc.
Duration: 10/23/2019 - 1/8/2023
Total Award Amount: \$12,966

[A Phase 3, Multicenter, Randomized, Double-Masked, Active Comparator-Controlled Study to Evaluate the Efficacy and Safety of RO6867461 In Patients With Diabetic Macular Edema \(YOSEMITE\)](#)
Genentech Incorporated
Duration: 11/27/2018 - 2/28/2022
Total Award Amount: \$211,199

[A Multicenter, Double-Masked, Randomized, Dose-Ranging Trial to Evaluate the Efficacy and Safety of Conbercept Intravitreal Injection in Subjects with Neovascular Age-Related Macular Degeneration](#)
Syneos Health
Duration: 12/10/2018 - 1/29/2022
Total Award Amount: \$309,517

A Multi Center, Randomized, Double-Masked, Active- Controlled, Comparative Clinical Study to Evaluate the Efficacy and Safety of MYL-1701P and Eylea in Subjects with Diabetic Macular Edema
Icon Clinical Research, Inc.

Duration: 6/12/2018 - 6/30/2022

Total Award Amount: \$77,316

David Hinkle, M.D.*, Associate Professor

A Phase III Multicenter, Sham-Controlled, Randomized, Double-Masked Study Assessing the Efficacy and Safety of Intravitreal Injections of 440(u)m DE-109 for the Treatment of Active, Non-Infectious Uveitis of the Posterior Segment of the Eye
PRA International Inc.

Duration: 2/19/2019 - 4/17/2021

Total Award Amount: \$53,641

Lingo Lai, M.D., Assistant Professor

A Phase 2 Open Label Trial of ST266 Eye Drops in the Treatment of Persistent Corneal Epithelial Defects (PED)

Noveome Biotherapeutics, Inc.

Duration: 2/5/2020 - 4/21/2030

Total Award Amount: \$10,905

Brian McMillan, M.D., Associate Professor & Director of Medical Student Education

An Extension Trial to Evaluate the Long-term Safety and Efficacy of Bimatoprost SR in Patients with Open Angle Glaucoma or Ocular Hypertension

Allergan Inc.

Duration: 9/6/2019 - 1/21/2024

Total Award Amount: \$6,000

Field Test of Glaucoma Outcomes Survey

The Emmes Corporation

Duration: 2/4/2021 - 1/30/2031

Total Award Amount: \$150

John Nguyen, M.D., Professor & Ophthalmic Plastic Surgery Fellowship Director

A Phase 2b, Multicenter, Randomized, Double-blind, Placebo-controlled Study of RVT-1401 for the Treatment of Patients with Active, Moderate to Severe Graves' Ophthalmopathy

Synteract, Inc.

Duration: 2/7/2020 - 2/28/2022

Total Award Amount: \$21,167

Tony Realini, M.D., M.P.H., Professor, Glaucoma Fellowship Director & Vice-Chair for Clinical Research

Clarifying the Optimal Application of SLT Therapy (COAST) Trial

US DHHS-NIH-National Eye Institute

Duration: 9/30/2020 - 8/31/2025

Total Award Amount: 2,667,572

Service Grant Funding — State Awards

Becky Coakley, Director of Outreach, West Virginia University Eye Institute

West Virginia Department of Education

State of West Virginia

Duration: 7/1/2019 - 11/30/2021

Total Award Amount: \$135,230

Orientation and Mobility Grant

State of West Virginia

Duration: 7/1/2019 - 9/30/2021

Total Award Amount: \$45,230

West Virginia Department of Vision Rehabilitation

State of West Virginia

Duration: 2021

Total Award Amount: \$300,000

Service Grant Funding — Foundation Awards

Greater Kanawha Valley Foundation

Duration: 2021

Total Award Amount: \$103,950

Benedum Foundation

Duration: 2021

Total Award Amount: \$100,000

Teubert Foundation

Duration: 2021

Total Award Amount: \$66,000

Pallottine Foundation

Duration: 2021

Total Award Amount: \$49,500

Alcon Foundation

Duration: 2021

Total Award Amount: 80,000

Beckley Area Foundation

Duration: 2021

Total Award Amount: \$3,300

Mansbach Foundation

Duration: 2021

Total Award Amount: \$1,885

Parkersburg Area Foundation

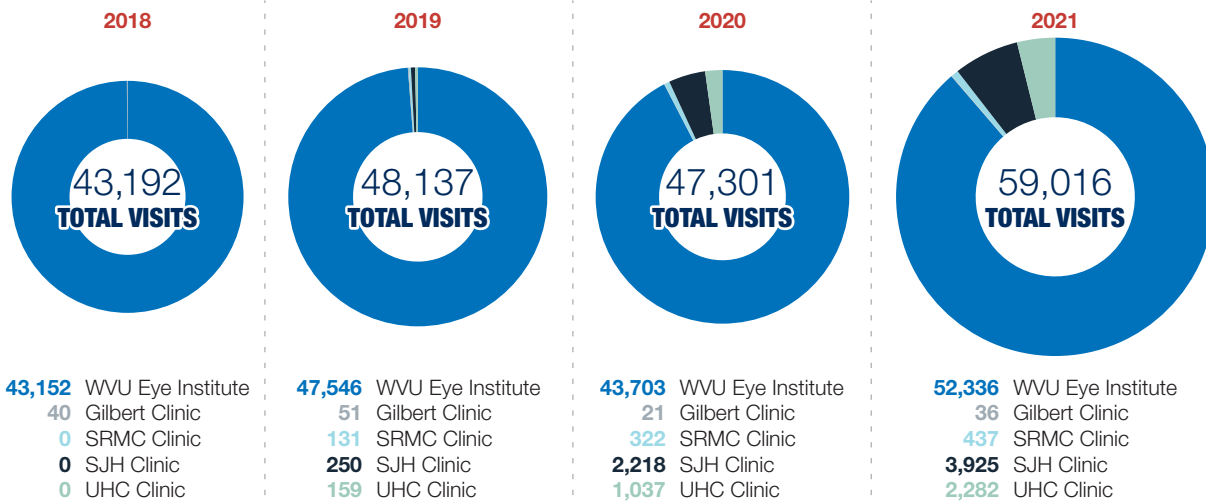
Duration: 2021

Total Award Amount: 5,250

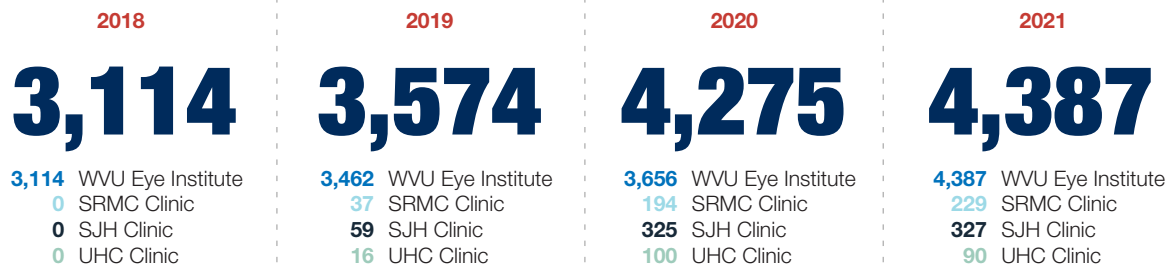
\$15+
MILLION
in total funds

* David Hinkle, M.D., left the Department of Ophthalmology and Visual Sciences in December 2020

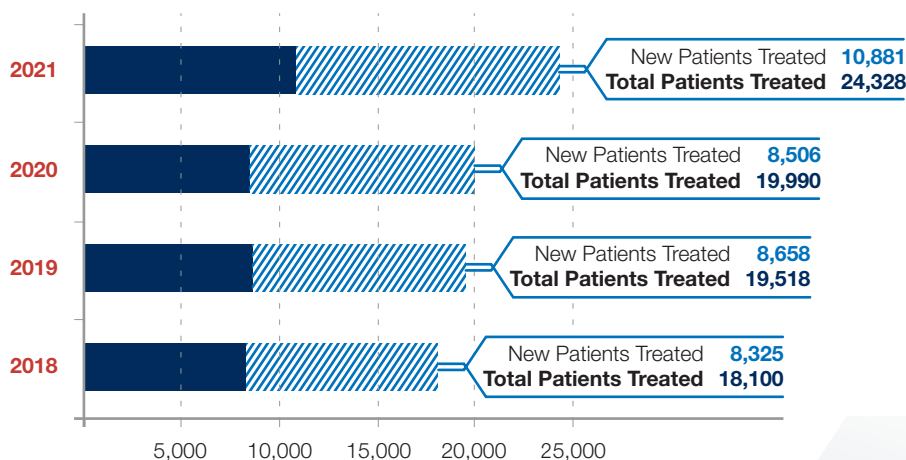
Department of Ophthalmology and Visual Sciences **At-A-Glance**



Total Surgeries



Patients Treated





Ophthalmology Clinics

1

MORGANTOWN

West Virginia University Eye Institute
1 Medical Center Drive
Morgantown, WV 26506

2

BRIDGEPORT

Ophthalmology Medbrook Medical
at United Hospital Center
327 Medical Park Drive
Bridgeport, WV 26330

3

BUCKHANNON

St. Joseph's Hospital
1 Amalia Drive
Buckhannon, WV 26201

4

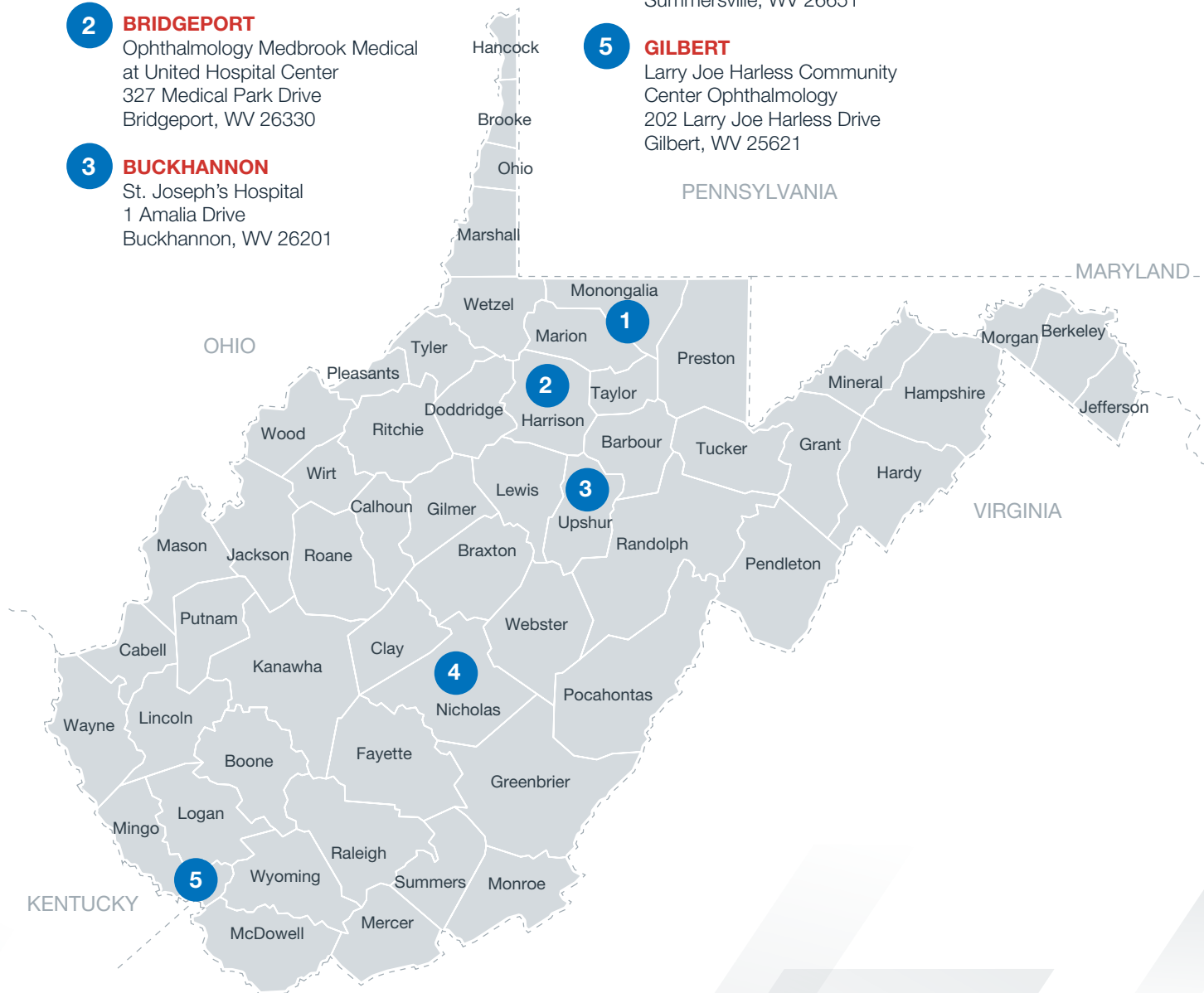
SUMMERSVILLE

Summersville Regional Medical Center
Ophthalmology
400 Fairview Heights Road
Summersville, WV 26651

5

GILBERT

Larry Joe Harless Community
Center Ophthalmology
202 Larry Joe Harless Drive
Gilbert, WV 25621





1 Medical Center Drive
P.O. Box 9100
Morgantown, WV 26506-9600

medicine.hsc.wvu.edu/eye

