

Vision *for the* Future

UNIVERSITY OF ROCHESTER

FLAUM EYE INSTITUTE

WINTER 2019 NEWSLETTER

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FEI CHAIR EYES NEW ROLE

Steven Feldon, M.D., M.B.A., founding director of the David and Ilene Flaum Eye Institute and longtime Ophthalmology chair, will step away from those roles to take a new position that will support translational research efforts at the University of Rochester Medical Center.

"The Eye Institute is well-positioned for the future. We have a solid team in place and a change in leadership will bring new ideas for continued success in all aspects of our mission," Feldon said.



The talented surgeon, scientist and inventor, who led a dramatic transformation of the Flaum Eye Institute into a leading clinical and academic ophthalmology program, will transition to a position

helping URMC researchers and clinicians accelerate development and commercialization of their discoveries.

Feldon has a strong record of bringing medical discoveries to market, having invented the Tonopen® electronic tonometer, the most commonly used portable tonometer for measuring intraocular pressure in the world. He was a pioneer of the transition to electronic medical records with introduction of the OcuChart™ 25 years ago, and in 2011, he helped develop the Excubator to bring URMC technologies to local high-tech firms.

"As a chair, Steve Feldon has embodied the spirit of Meliora; he is always driven to make things better," said **Mark Taubman, M.D.**, Medical Center CEO. "That spirit, along with his entrepreneurial and creative talents, has driven remarkable growth in both volume and scope of the clinical program, the development of new technology and the expansion into new areas of research."

Under Feldon's leadership, clinical and research operations relocated into expanded space at the Medical Center and the institute was named for

(CONTINUED ON PAGE 11)

A clean start

Cathi Wallwork loves working with kids. The administrative assistant at Geneva City Schools has six grown children of her own and grandchildren whom she adores. In July 2017, she was helping her sister clean out an unused building that had been inhabited by nesting birds. She wore gloves but didn't think about protective eyewear. As a person with an existing eye condition called keratoconus, she wears specialized contact lenses.

"There were lots of droppings and dander," she said. "My eyes were itchy for a couple of days. Then I woke up one morning with my eyes swollen and closed. The light sensitivity was like a red-hot poker. The pain was incredible. My son first took me to urgent care where they gave me some salve to put in my eyes. But the next morning, I knew that I had to see my eye doctor. He took one look and told my son to take me to Strong immediately."

When Wallwork arrived, she had developed corneal ulcers in both eyes. It was likely that something in the building she was cleaning got in her eyes and incubated under her contact lenses. At this point, her vision in both eyes was "count-fingers" at a distance of one foot or less. Her eye care team, which included then ophthalmology resident **Brittany Simmons, M.D.**, cultured the infection. She was started on high doses of anti-viral and potent antibiotic medications because they wouldn't know whether the infection was viral, bacterial or fungal until the culture yielded results.

When she returned the next day, her vision was even worse. She was seen in the resident clinic and FEI cornea specialist **Naveen Mysore, M.D., Ph.D.**, reviewed her case. Her condition remained stable and the antibiotic and antiviral medications were maintained. When she returned a day later, the culture revealed that *Pseudomonas* was present in her eyes. *Pseudomonas* is a family of bacteria



(CONTINUED PAGE 6)

DIRECTOR'S MESSAGE

Happy New Year from the Flaum Eye Institute!

2019 brings change to our operations and near limitless possibilities to the aspirations of FEI. On or around May 1st, I plan to change my responsibilities from that of Chair of the Department of Ophthalmology and Director of FEI, to working with the Medical Center on technology development.

I hope that in my new position I will be able to help develop nascent technologies throughout the Medical Center, offering the same kind of entrepreneurship that is helping FEI scientist **Geunyoung Yoon, Ph.D.**, develop and ultimately commercialize an invention that will have great therapeutic benefit to keratoconus patients (page 7).

A nationwide search for a new chair is underway. I am excited to say that whoever takes the reins will find a vital and growing organization that he or she may guide to new heights in clinical care, research, education and community stewardship.

With the recent acquisition of Family Eye Care of Webster (page 3) we welcome **Therese Farugia, O.D.**, to the faculty. With increasing opportunities to expand our reach through acquisition and contractual services, we may soon exceed more than 100,000 yearly interactions with patients across the region. As part of our population health strategy, we hope to prevent and treat eye disease before permanent vision loss occurs.

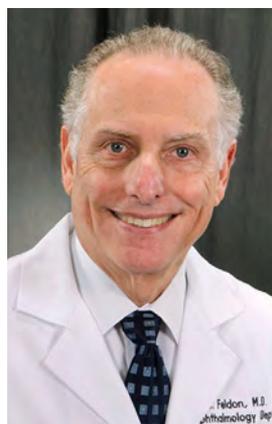
Our educational mission continues to expand as we launched North America's first eye care ECHO (page 11). This revolutionary training concept, spearheaded by **Rajeev Ramchandran, M.D.**, and **Anthony Dell'Anno, O.D.**, improves regional healthcare by sharing advanced medical knowledge with providers.

We additionally welcome a new group of residents who began their training in July (page 10). And, our research trainees continue to distinguish themselves through publications and awards as their faculty mentors prepare them to solve the mysteries underlying eye disease (page 8).

As the transition takes place, I am excited that the incoming chair will be supported by a faculty recognized for its excellence. This includes **Richard Libby, Ph.D.**, and **Shakeel Shareef, M.D.**, who were recently promoted to full professor (page 3). They along with all of our faculty and staff make FEI a unique environment that is able to provide incredible care to patients like Cathi Wallwork (cover) and to the broader community through outreach programs.

Sustaining our current mission and creating our vision for the future has always relied on the support from our advisory board, donors, patients, faculty and staff, and others. I can't thank you enough for the encouragement that you have provided me during these past 17-plus years. I am confident that you will sustain and accelerate your generosity as FEI moves forward in its efforts related to research, education, technology transfer, patient care, population health, and community outreach.

Sincerely,



A handwritten signature in blue ink that reads "Steven E. Feldon". The signature is fluid and cursive.

Steven E. Feldon, M.D., M.B.A.

Director, David and Ilene Flaum
Eye Institute
Chair, Department of Ophthalmology
University of Rochester School of
Medicine & Dentistry

FEI in the Community

FEI continues to provide important information about eye care and community services through live educational programs, support groups and screenings. Future events can be found on our Friends of The Eye Institute Web page at www.foei.urmc.edu or by visiting our Facebook page.

It was a busy summer and fall for FEI's outreach team and doctors. The focus was to continue to educate the general public on eye health, prevention and treatment of eye disease:

July 31: David DiLoreto, M.D., Ph.D., was highlighted at an FEI macular degeneration support group meeting. This recently formed organization helps to inform people about current best practices for treating both dry and wet age-related macular degeneration. It also provides patients a forum to share what is happening with their eye health and to offer each a shoulder to lean on as they face challenges caused by their disease.

November 7: FEI Senior Instructor of Clinical Ophthalmology **Brooke Donaher, O.D.**, presented a lecture at FF Thompson Hospital about diabetes and eye health. She shared information

about the impact the disease has and offered strategies for improving health to prevent vision loss.

November 10 & December 1

The Glover-Crask sponsored *Eyeglasses for Kids* program continued to provide free Saturday screenings for children. The program's mission is to improve the confidence and academic performance of school-aged children who have routine vision problems, like nearsightedness or farsightedness, by providing them with free eyeglasses. If other vision problems are detected during the screenings, children are appropriately referred to FEI's pediatric ophthalmology team for care. Special thanks go to the faculty and residency program physicians, who provide the screenings, and to the opticians and staff who make the glasses and make the families welcome.

IF YOU ARE INTERESTED IN...

*inviting one of our faculty members to speak about eye health topics, starting a support group related to eye disease or scheduling a screening, please contact **Meghan King** at 585-276-7311.*

We'll do our very best to accommodate your request.

PROMOTIONS



Libby promotion

FEI's **Richard Libby Ph.D.**, who was recently promoted to Professor of Ophthalmology, has been named Senior Associate Dean for Graduate Education and Postdoctoral Affairs (GEPA) at the University of Rochester School of Medicine and Dentistry. He will direct the School's Ph.D., postdoctoral and master's degree programs.

Libby arrived in Rochester in 2006, coming from the Jackson Laboratory in Bar Harbor, Maine. His laboratory is focused on understanding the cell signaling pathways that lead to vision loss in glaucoma.

His work has been recognized and funded numerous times by the National Institutes of Health and several private research foundations.

Libby is director of the Cell Biology of Disease Graduate Program and has served on numerous academic committees integral to research activities and graduate education. He is a respected mentor and teacher. He has published, as author or coauthor, more than 60 peer-reviewed scientific articles and numerous reviews, book chapters and commentaries, and has presented internationally on a range of topics in eye and vision research. He was recently honored by the Glaucoma Research Foundation, receiving the Shaffer Prize for Innovative Glaucoma Research in 2017.

University of Rochester School of Medicine and Dentistry Dean, and Medical Center CEO **Mark Taubman, M.D.**, offered high praise for Libby.

"Rick understands that excellence in a research enterprise is essential to attracting the best and brightest talent and has articulated a vision for further improving the experience here, making it clear to the outside world that Rochester is the best place to learn and study. He is a passionate scientist whose experience in a clinical department

will bring valuable insight to graduate programs in basic and clinical research – a true asset to his role."

"I am excited to be a part of this team. I look forward to further developing GEPA's missions of providing world-class training for our graduate students and postdoctoral fellows, and to helping our trainees continue their important work focused on understanding human health and disease," Libby said. Libby will maintain his appointment in ophthalmology and direct his laboratory's team as they continue to unravel the basic biology of glaucoma.

Shareef promotion

Shakeel Shareef, M.D., was recently promoted to Professor of Ophthalmology by the University of Rochester School of Medicine and Dentistry. Shareef joined FEI's glaucoma service in 2005. As a member of the faculty he has been recognized for his clinical and surgical acumen and is actively involved in the training of residents, medical students and technical staff. He has also built a growing international reputation lecturing about complex glaucoma surgical procedures and has established the world's first Website for angle surgery. In addition, he has



been honored numerous times by the American Glaucoma Society, the American Academy of Ophthalmology and the American Society for Cataract and Refractive Surgery for his video presentations demonstrating advanced surgical techniques. Shareef is a graduate of New York Medical College where he also received residency training in Ophthalmology. He completed both research and clinical fellowships in glaucoma at Washington University, St. Louis.

Family Eyecare joins FEI

The Webster, New York, optometry practice of Family Eyecare Associates recently joined FEI, bringing to seven the number of patient care locations in the Finger Lakes region. This continued growth strategy supports FEI's population health model that integrates well eye care with specialty services to detect and treat eye disease before it becomes symptomatic. It additionally reflects a growing trend of consolidation of care in order to share patients across medical specialties and improve outcomes while reducing costs.



Therese Farugia, O.D., who founded Family Eyecare, will continue to provide exceptional primary eye care to her patients and patients from FEI's network who find the new location more convenient. In addition to the medical practice, the new location has an optical shop. Joining Farugia are two staff persons and an optician.

"Dr. Farugia has a sparkling reputation as an optometrist who has taken excellent care of her patients over decades and joining the faculty is a perfect fit," Steven Feldon, said. "This acquisition improves access to care to forward our population eye health initiative for prevention and early detection of eye disease. Often, early treatment directly translates into preservation or restoration of vision."

FEI subspecialists will rotate through the office to provide advanced care to patients locally and reduce the number of trips they might make to FEI's Strong Memorial Hospital location.

"Being part of FEI has many benefits for our patients. It has the best of instrumentation and technology, research and education, all of which serve patients well," Farugia said. "In addition it gives us access to a state-of-the-art medical record. The transformation to electronic medical record keeping will allow us to better manage patients who may have conditions that affect the eyes – like diabetes – requiring the coordination of primary care doctors and other specialists."

The David and Ilene Flaum Eye Institute is most grateful to its donors for their generous gifts and ongoing support. We are especially appreciative to the friends, patients, alumni and faculty who contributed to our Annual Fund. The Annual Fund is an essential source of support that helps us to continue our groundbreaking work in vision care and research. This year, your donations had a direct impact on our mission, helping us recruit new faculty and purchase new equipment for our clinic and research laboratories. The following donors have contributed in meaningful ways to FEI between May 1, 2018 and September 30, 2018. Gifts can be designated to the Ophthalmology Annual Fund and mailed to: FEI, 300 E. River Road, PO Box 278996, Rochester, NY 14627.

Or make a gift online by going to eyeinstitute.urmc.edu and clicking on "Ways to Help".

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 Dr. Marciana Nicolas-Dollard
 Wilmer P. O'Connell '61
 Rebecca S. Olsen '80 and Dr. Robert L. Olsen '81 (MD), '85 (Res)
 Dr. Robert H. Osher '76 (MD)

Annemarie Palmer '69 (DPL)
 Dr. Seth M. Pantanelli '03, '04 (MS), '09 M (MD), '13 (Res) and Valerie Pantanelli
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*We offer special thanks to:
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to Prevent Blindness,
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James & Catherine Aquavella,
and Lynn & Walter Lutz
for their sustaining support.*

Symposium honors long time preceptor and announces endowed lecture

June marked the first of what is hoped to be an annual research day at FEI. Common at many medical schools, research days give an opportunity for faculty, fellows and residents to present clinical and basic scientific work they have been doing during the academic year. The inaugural event featured 14 speakers who discussed topics ranging from population health to understanding photoreceptor function in different disease models.

Frederick Dushay, M.D., who has been part of the FEI faculty for more than a quarter of a century was guest of honor. He is primarily responsible for resident training. During the symposium, establishment of an endowed lecture bearing Dushay's name was announced. The lecture will now be an annual feature at the Rochester Ophthalmology Conference and complement

the Albert Snell Memorial Lecture. The endowment was made possible by a fundraising campaign spearheaded by FEI's Resident Alumni Council. Council co-Presidents **Mithra Gonzalez, M.D.**, and **Christine Platt, M.D., Ph.D.**, led the initiative to contact former students and colleagues of Dushay.

More than 40 alumni and friends of FEI donated raising more than \$115,000. Twenty classes were represented, including the class of 1949. A special gift was made by the Billitier Family whose annual Vision Dinners, held from 2009 to 2014, raised

more than \$30,000 to be contributed to an education endowment.

Capping the day off was the annual resident graduation ceremony and celebratory dinner. To commemorate the special occasion, resident graduates from as far away as Utah and California attended. The successful completion of residency training by **Brandon DeCaluwe, M.D.**, **Joon-Boom, Kim, M.D.**, **Kevin Kirk, M.D.**, and **Brittany Simmons, M.D.** were celebrated, and all expressed their gratitude to Dushay for his guidance and friendship.

"It was a very special day and I am deeply grateful for the opportunity to work with such bright young people at the beginning of their careers," Dushay said. "I look forward to more years of helping our residency program and being a part of the next generation of ophthalmologists."

Members of Dushay's family including Mrs. **Miriam Dushay Bergman** and **Ronald Bergman, M.D.**, and **Paul Gompers** and **Jody Dushay** and Family were also present.

The first annual Dushay lecture will be held during the Rochester Ophthalmology Conference, March 29-30, 2019. It will be presented **David Wilson, M.D.**, who is the Margaret Thiele Petti and August Petti Chair of Ophthalmology and Director of Casey Eye Institute at Oregon Health Sciences University.



DUSHAY LECTURE ANNOUNCED

FACULTY PRACTICE

Comprehensive Eye Care

Jessica daSilva, O.D.
Anthony Dell'Anno, O.D.
Michael DePaolis, O.D.
Brooke Donaher, O.D.
Christian Klein, M.D.
Sarah Klein, O.D.
Jennifer Krech, O.D.
Anand Rajani, D.O.
Harold Ross, M.D.
Robert Ryan, O.D.
Chester Scerra, O.D.
Melanie Shearer, O.D.
Tara Vaz, O.D.
Cathy Yuen, O.D.

Contact Lens Services

Jessica daSilva, O.D.
Anthony Dell'Anno, O.D.
Michael DePaolis, O.D.
Brooke Donaher, O.D.
Sarah Klein, O.D.
Jennifer Krech, O.D.
Robert Ryan, O.D.
Chester Scerra, O.D.
Melanie Shearer, O.D.
Tara Vaz, O.D.
Cathy Yuen, O.D.

Cornea and External Disease

James V. Aquavella, M.D.
Naveen Mysore, M.D., Ph.D.
Ronald Plotnik, M.D., M.B.A.
Rachel Wozniak, M.D., Ph.D.

Glaucoma/Anterior Segment

Shakeel Shareef, M.D.
Regina Smolyak, M.D.

Neuro-Ophthalmology and Orbit

Steven Feldon, M.D., M.B.A.
Zoë Williams, M.D.

Oculofacial Plastics

Steven Feldon, M.D., M.B.A.
Mithra Gonzalez, M.D.

Pediatric Ophthalmology

Matthew Gearing, M.D.
Benjamin Hammond, M.D.

Refractive Surgery

Kenneth Dickerson, O.D.
Scott MacRae, M.D.
Naveen Mysore, M.D., Ph.D.
Rachel Wozniak, M.D., Ph.D.

Retina and Vitreous

Angela Bessette, M.D.
Mina Chung, M.D.
David DiLoreto, M.D., Ph.D.
David Kleinman, M.D., M.B.A.
Ajay Kuriyan, M.D., M.S.
Rajeev Ramchandran, M.D., M.B.A.

Uveitis

Angela Bessette, M.D.

Veterans Services

Anand Rajani, D.O.
Regina Smolyak, M.D.

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Silvia Sørensen, Ph.D.
Duje Tadin, Ph.D.
David Williams, Ph.D.
Geunyoung Yoon, Ph.D.
Jim Zavislan, Ph.D.

A clean start

found in nature that is resistant to many antibiotics.

"This type of infection is common in people who wear contact lenses," Mysore said. "Cathi's infection was severe. She had bilateral ulcers and the infection had spread deep into her cornea. Large corneal ulcers like these generally require fortified antibiotic drops and may take one to three weeks to clear."

For the next three weeks, Wallwork stayed in Rochester with her son because she couldn't drive. She came to FEI frequently where Mysore tracked the infection's resolution. Within a month her pain was nearly gone, but her vision fluctuated and she was sensitive to light.

"I could not wear contacts and my stand-by glasses were a very old prescription," she said. "It was incredibly frustrating not being able to drive or look at a computer monitor. I could obviously not work."

Within two months of the initial infection, her eyes stabilized and the pain was mostly gone. In her left eye she saw 20/40, but heavy damage in the right limited vision in that eye to counting fingers at just three feet.

At this point, Mysore recommended that she have a corneal transplant in her right eye.

"The scarring was very extensive," Mysore said. "A normal cornea is clear due to the precise arrangement of protein fibers in it. After an infection like this, the orderly arrangement is lost and opacity occurs. Once the infection was cleared up, we could proceed with a corneal transplant to improve the optics of her eye."

"I was not scared," Wallwork said. "With all of the amazing work Dr. Mysore did, I was so prepared to have a well-behaved eye. His hands already proved amazing at clearing the infections, and I trusted him to put in a new cornea."

The procedure was scheduled for Halloween.

Mysore performed a penetrating keratoplasty on her right eye. In this type of procedure, the entire cornea is replaced, versus lamellar transplants, where only certain layers of the cornea are transplanted. Mysore carefully sutured Wallwork's new cornea into place. She spent another night in Rochester and returned to visit Mysore the next day.

"To say that I cried would be an understatement," Wallwork said. "I tried not to because I didn't want to mess everything up," she said. "Of course, I didn't have clear vision, but that I could see anything was a miracle, performed by the miraculous hands of Dr. Mysore. Even the 16 perfect stitches looked beautiful and I took pictures of them. I was so proud to show everyone."

During the next five months, Mysore would see Wallwork multiple times, taking out a stitch or two as the transplanted cornea became part of her eye. As her vision improved, Mysore referred her to FEI's **Tara Vaz, O.D.**, who is an expert in contact lens fitting. She is experienced in working with patients who have corneal disease or injuries. At this point, Wallwork's best corrected vision was 20/60 in the transplant eye and 20/30 in her left eye; an incredible outcome, but with room for further improvement.

Vaz fit Wallwork with a pair of trial scleral lenses. These devices are more therapeutic than typical contacts. The edge comes into contact

with the white part of the eye and the rest of the lens vaults over the cornea, creating a tear filled chamber that provides optical correction and protects the eye. They made an immediate difference.

"I cried again! The first pair was not even a perfect fit," Wallwork said. "It was still better than I had ever seen in my life. Dr. Vaz is a perfectionist, so I came back and forth to the Eye Institute for adjustments. But now I was able to drive myself."

As of September, with the help of her lenses, she is seeing 20/25 with the right eye that was almost blind when she developed the infection. She returned to work where she can see her students and read the computer screen.

"I could not have come back to work if it weren't for my newly restored vision," she said. "Most importantly, I can see the same things my two little grandgirls see. I can read them books; we look at birds. I have a grandson due in May and can't wait to see him at Strong when he is born; I can see very well now to get to the hospital to see the cutest baby!"

"Dr. Mysore has the most professional, kind bedside manner," she continued. "His work changed my life, and Dr. Vaz has an unbelievable knowledge of lenses. Everyone was so helpful at each and every visit, from the technicians to the schedulers to the parking lot attendants. We are so lucky to have Dr. Mysore and Flaum Eye Institute in Rochester. I lived in New Jersey for 20 years and was sent to medical specialists when I was there. No one offered the answers like Flaum has done time and time again."



"Cathi's infection was severe. She had bilateral ulcers and the infection had spread deep into her cornea."

Excubator poised to make research dream a reality

FEI Professor of Ophthalmology **Geunyoung Yoon, Ph.D.**, has been an innovator during his 18 years at the University of Rochester. He has been awarded multiple patents and was part of the team that made customized vision correction – LASIK – as good as it is today. But one of his first inventions at the University got stuck. His idea? Improve the vision of people suffering from keratoconus by customizing soft contact lenses. Keratoconus is a condition that warps the eye's cornea, making it almost impossible to see well. It affects hundreds of thousands of people across North America. Current treatment involves using rigid contact lenses and "forcing" the cornea into shape. This takes getting used to and the resulting vision is not as good as it could be.

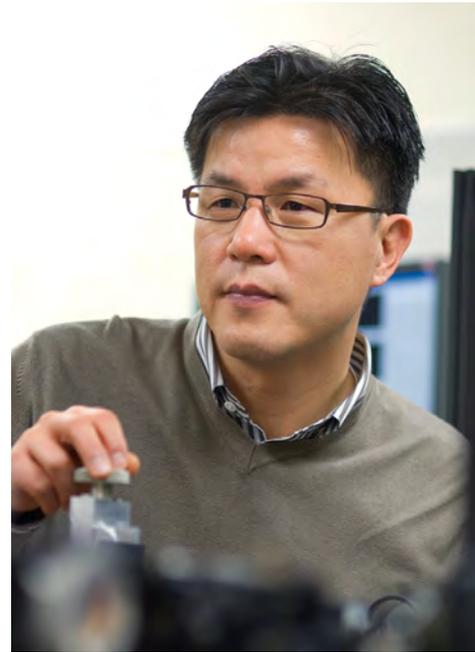
Yoon's idea uses specialized technology to measure all the imperfections in the cornea – called aberrations. These measurements are then transferred to customized soft contact lens that correct the effect of the aberrations. This method delivers vastly improved vision. Early tests of the lenses on study subjects demonstrated that they saw much better than they did with their rigid lenses. Unfortunately, the project bogged down.

"I presented the idea to a couple of companies," Yoon said. "There was enthusiasm for it but it didn't go anywhere. I'm a scientist and not an expert in product commercialization, so things got stalled."

Years went by until FEI Chair **Steven Feldon, M.D.**, developed the FEI Excubator. It is a for-profit venture that is partially owned by the University of Rochester and a group of investors, including FEI Advisory Board member **Aaron Klein**, who is managing partner. The Excubator's purpose is to introduce area optics and technology companies to new product opportunities invented by FEI faculty. Small Business Innovation Research (SBIR) grants from the National Institutes for Health – obtained through a joint venture between the local company and the Excubator – provide funding for individual projects. This lessens the financial risks for these small firms and gives them research expertise that would be too expensive to maintain in-house.

The customized lenses used by Yoon in his research were made by Alden Optical, located in the suburbs of Buffalo, New York. A joint venture was eventually formed between Alden and the Excubator resulting in Aldenex, LLC. The spin-off company filed an application for a Fast-Track SBIR grant. Funding was approved and work began on a proof of concept. Recently, SBIR awarded nearly one million additional dollars to develop engineering level prototype lenses and a working prototype of an inexpensive desktop device able to measure patients' eyes for the customized lenses. The president and SBIR Principal Investigator for Aldenex is **Ian Cox, O.D., Ph.D.** Cox is a senior research scientist and an adjunct professor at the University of Rochester's Center for Visual Science.

"There are up to 800,000 people in the United States and Canada suffering from keratoconus," Cox said. "This technology advances how we can treat them. Customized soft contact lenses will be more comfortable for patients and give them vastly improved optical performance. We feel that this technology could become the standard in vision correction for keratoconus."



GEUNYOUNG YOON, PH.D.

Yoon is building a working prototype of the tabletop instrument to image patient eyes. Called an aberrometer, the device will record information and send it to Alden where the specialized lenses will be made. Because of the level of precision that is needed to measure a keratoconic eye, Yoon believes that the device will have uses far beyond the current project.

"It is likely better technology than what optometrists and ophthalmologists currently have in

their offices," Yoon said. "It could be used in the treatment of dry eye, to screen patients prior to LASIK surgery, or to help evaluate cataract patients."

Cox believes that custom lens manufacturing could top 600,000 units per year. Because keratoconus is a progressive disease, patients will need to be re-measured and re-fit at intervals, making it a sustainable market with potential to grow as patients are newly diagnosed. The project should add 15 well-paying precision manufacturing jobs to the region, and other business may be approached to build the aberrometers, further increasing the economic impact of the project.

"Our patience is paying off," Feldon said. "This is exactly how the Excubator is supposed to work. Aaron Klein's business acumen has been instrumental in lifting this project off the ground. His expertise has put us on the threshold of bringing this exciting technology to patient care."

As part of the Excubator agreement, the University of Rochester, the Excubator investors, and the inventors will receive royalties from sales of the contact lenses and aberrometers.

Main Campus Patient Care:
(585) 273-3937 (EYES)

LASIK: (585) 273-2020 ■ **Clinical Trials:** (585) 276-8734 ■ **Research Laboratories:** (585) 273-2609

Brighton: (585) 271-2990 ■ **Geneva:** (315) 788-4922 ■ **Webster:** (585) 671-3300 ■ **Collegetown:** (585) 273-3937

www.EyeInstitute.urmc.edu

Combination therapy shows promise against eye infections

Multi drug-resistant bacterial infections of the cornea are a leading cause of blindness and cannot be effectively managed with current ophthalmic antibiotics. A team of investigators including FEI's **Rachel Wozniak, M.D., Ph.D.**, has devised a combination therapy that largely overcomes this resistance. In a pre-clinical model, Wozniak's therapy effectively eradicated bacterial keratitis 70 percent of the time. The results of this research were recently published in *Antimicrobial Agents and Chemotherapy*, a journal of the American Society for Microbiology.

Staphylococcus aureus and *Pseudomonas aeruginosa* are the leading causes of bacterial keratitis, an infection of the cornea. Fast, effective antimicrobial treatment is required to prevent scarring, corneal perforation, and/or endophthalmitis. All these conditions can cause blindness and lead to corneal transplantation or result in the loss of an eye.

"I have witnessed first-hand patients that have failed all commercially available antibiotic therapies," Wozniak said. "In the face of rapidly deteriorating vision, patients are desperate for effective therapies. Unfortunately, current antibiotic treatments fail all too often as resistance to levofloxacin, the latest antibiotic approved for bacterial keratitis, can be as high as 72 percent."

Wozniak and University of Rochester microbiologist **Paul Dunman, Ph.D.**, collaborated to develop a combination therapy using existing antimicrobials rather than making a new drug because they anticipated that doing so would be considerably faster.

"Our idea is based on using polymyxin B/trimethoprim (PT), a currently available antibiotic for treating mild ocular infections like conjunctivitis," Wozniak said. "Using high throughput screening of FDA approved drugs in combination with PT, we identified that PT and the drug rifampicin are a lethal antibacterial combination against drug-resistant *S. aureus* and *Pseudomonas aeruginosa*."

The improved effectiveness of the combination is likely due to each



RACHEL WOZNIAK, M.D., PH.D., SCREENING COMBINATION ANTIBIOTICS.

component having an independent mechanism of antimicrobial action. The bacterium have shown a low rate of development of spontaneous resistance. This is likely because there needs to be simultaneous mutations of bacteria to evade the combination's multiple modes of attack. This common strategy has been used against disease resistance in HIV, malaria, and tuberculosis.

"While there may be unforeseen effects of combination drugs with respect to toxicity, both rifampicin and PT are currently FDA-approved with favorable safety profiles," Wozniak said. "This may provide a significant advantage for further drug development. We are hoping to move this new therapy into clinical trials as soon as possible."

Globally, bacterial keratitis affects more than two million people annually and is a leading cause of blindness. In the United States, overnight contact lens wear is responsible for an estimated 30,000 new cases each year.

Innovative method measures corneal biomechanics

The cornea provides about two-thirds of the eye's focusing power. The shape of its surface – topography – plays an important role in how well we see. A complex structure beneath the surface of the cornea determines the quality of the cornea's shape and provides mechanical strength. Certain diseases, injury and surgical procedures can compromise the cornea's inner structure. Accordingly, vision scientists want to be able to measure these biomechanical properties to better inform doctors in the treatment of patients. However, measurements of the mechanical and structural properties of the cornea have been limited. Most studies are performed on cadaver eyes or are done on live subjects by pushing against the cornea. There are inherent problems in either case, including deforming the cornea from its natural curvature.

University of Rochester graduate student **Mengchen Xu**, who works in FEI's Advanced Physiological Optics lab with **Professor Geunyoung Yoon, Ph.D.**, recently published results of a study in *Experimental Eye Research* that details a new way to measure corneal biomechanics in the living eye.

Understanding that intraocular pressure (IOP) affects the shape of the cornea, the team devised a method to control study subjects' IOPs while measuring surface properties of their corneas. To do this they used an inversion table to tip subjects downward. This action was able to consistently and reproducibly raise their IOPs. Attached to the table was a device called a topographer that can accurately and non-invasively measure the corneal surface. The pressure elevations that they created on study subjects caused significant changes to topographer readings based on how much the IOP was raised. The team believes that these data can be correlated to biomechanical properties of the internal cornea and provide useful information about its structure to vision scientists and eye doctors.

Investigators search for genetic cause of glaucoma

The gene BMP4 plays a major role in development of the eye. When BMP4 is not correctly expressed, the integrity of the delicate structures that form the front of the eye is compromised, often with unfortunate consequences. Abnormal development of the front of the eye is called anterior segment dysgenesis (ASD), and it leads to a number of blinding congenital abnormalities. For example, high intraocular pressure may result when the drainage apparatus adjacent to the iris and cornea does not develop properly. This causes glaucoma, with vision loss from optic nerve damage. Retinal and vascular problems may also be found in the presence of defective BMP4.

University of Rochester neuroscience doctoral graduate **Rebecca Rausch** recently published the results of a study in the journal *PLOS One*. She conducted experiments with FEI collaborators **Richard Libby, Ph.D.**, and **Amy Kiernan, Ph.D.**, to determine the specific role of BMP4 in the developing eye. BMP4 is expressed in the ciliary margins of the optic cup which gives rise to anterior segment structures such as the ciliary body

and iris. This makes it a good candidate for where to look for the required source of BMP4 in anterior segment development.

The team tested whether ciliary margin-derived BMP4 is required for ocular development using two genetic models. By eliminating the gene in each, they surmised that certain characteristics of ASD would be present. Surprising to them, abnormal development related to mutations in ciliary BMP4 didn't appear. These results indicate that ciliary margin-derived BMP4 does not play a major role in ocular development, although subtle alterations could not be ruled out.

In the search for the underlying causes of genetically-related diseases, results like this are important to our basic understanding of biology. Although BMP4 mutations could still be involved in ASD, future researchers now know where not to look and can instead focus on other areas where the gene is expressed. Understanding how ASD develops may eventually lead to targeted therapies.

New insights to corneal wound healing

The human cornea – the clear, front part of our eye – is densely packed with nerves. This is why our eyes can be so sensitive. The intricate sensory network is designed to protect us, signaling discomfort and pain, while stimulating the blink reflex, tear production and tear secretion when anything other than our perfectly formed eyelids sweep across the ocular surface. Disease, infection and surgery can all damage corneal nerves and result in long-term consequences that include pain, dry eye and, in

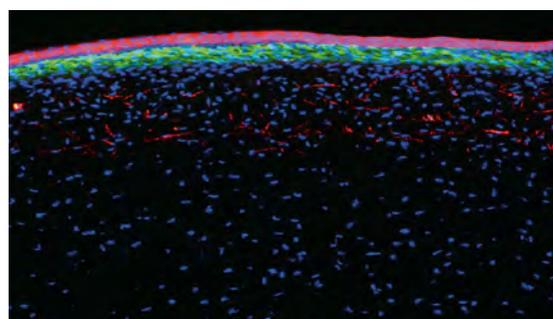
extreme cases, a corneal transplant or blindness.

FEI Research Assistant Professor, **Kye-Im Jeon, Ph.D.**, Canandaigua corneal surgeon **Holly Hindman, M.D.**, and James V. Aquavella Professor in Ophthalmology, **Krystal Huxlin, Ph.D.**, recently published the results of some important research in the journal *Scientific Reports* from the publisher of *Nature* that shines a light on the complex process of corneal wound healing and its impact on nerve regeneration after injury.

The team developed an innovative model to unravel the complex biology that takes place when corneal wounds heal. They discovered that regenerating nerves avoid a certain cell type called a myofibroblast. These cells occur during the healing process. The number of them present affects the number of nerves that regenerate, limiting these nerves' ability to repopulate the surface of the central cornea

where they serve important protective functions for the eye. Myofibroblasts are a main component of scar tissue. Jeon, and her collaborators think that a growth factor called TGFβ1 secreted by the myofibroblasts is a key molecule controlling nerve behavior and regeneration. When they introduced a drug, called Mitomycin-C, to decrease the number of myofibroblasts that formed in their model, much faster nerve regeneration occurred.

Understanding the complex interactions that take place in the microenvironment of a corneal wound has many practical and clinical implications. The research performed at FEI not only guides our current approach to treating fresh corneal wounds, but may ultimately lead to new therapies that allow corneal nerves to regenerate even after scarring has occurred. This could be helpful for patients long after their initial injuries.



MICROSCOPY OF WOUND HEALING

PUBLICATIONS: FEI faculty and residents share their findings with colleagues across ophthalmology and vision science. Scholarly publication is at the heart of making new discoveries and education. A recent sampling of FEI publications include:

"Mkk4 and Mkk7 are important for retinal development and axonal injury-induced retinal ganglion cell death." S. Syc-Mazurek, et. al. *Cell Death & Disease*, Volume 9, Article number: 1095, September 2018

"Assessment of intrinsic and extrinsic signaling pathway in excitotoxic retinal ganglion cell death." Berkeley K. Fahrenthold, et al. *Scientific Reports*, Volume 8, Article number: 4641, March 15, 2018

"Trabecular meshwork morphogenesis: A comparative analysis of wildtype and anterior segment dysgenesis mouse models." Rebecca Rausch, et al. *Experimental Eye Research*, Volume 170, May 2018

"Through focus optical characteristics of monofocal and bifocal soft contact lenses across the peripheral visual field." J. Qiuzhi, et al. *Ophthalmic & Physiological Optics*, 24 April 2018

"The Relationship Between Optic Disc Volume, Area, and Frisén Score in Patients With Idiopathic Intracranial Hypertension." C. Shiels et. al. *American Journal of Ophthalmology*, Volume 195, November 2018

"Development of a broad-spectrum antimicrobial combination for the treatment of Staphylococcus aureus and Pseudomonas aeruginosa corneal infections." M. Chojnacki et. al. *Antimicrobial Agents and Chemotherapy*, December 2018

"Acute Vision Loss in Young Adult." M. Weiss, et. al. *JAMA Ophthalmology Clinical Challenge*, 136(3), March 2018

"Retinal vessel detection in wide-field fluorescein angiography with deep neural networks: A novel training data generation approach." L. Ding, et. al. *IEEE Explore*, 06 September 2018

New Residents

FEI's four new residents went straight to work in July, guided by faculty preceptors and the third- and second-year residents. They were welcomed at a reception where they were presented with the thirteen volumes of the American Academy of Ophthalmology's Basic and Clinical Science Course, a gift from the Alumni Endowed Fund.

This year's group of exceptional ophthalmologists-in-training reflects a western influence, with three of them completing their medical training in California:



Alexander Chen, M.D., received his undergraduate degree in biology at Stanford University. He earned his medical degree from UCLA's Keck School of Medicine and went on to complete a one-year internship in internal medicine at UCLA Medical Center. Chen has been a mentor and tutor to other students throughout his academic career and has traveled to Panama as part of a medical

mission to better understand barriers to vaccination. He speaks Spanish and enjoys hiking and swimming.



Matthew Haynie, M.D., is a graduate of Brigham Young University where he studied physiology and developmental biology. He received his medical training at the University of California San Diego School of Medicine and returned to Utah to complete his internal medicine internship at Intermountain Medical Center. Haynie is a lifelong soccer player, helping his intramural team

to four consecutive championships at UCSD. He is also co-founder of "White Coat Noise", a medical student musical group that performed primarily for children hospitalized by traumatic brain injury.



Xu (Sophie) He, M.D., studied biological basis of behavior as an undergraduate at the University of Pennsylvania. She completed her medical degree at Case Western University School of Medicine and stayed in Cleveland, completing her internal medicine rotation at Metro Health Medical Center. She was President of the Case Western chapter of the Asian Pacific American Medical Student

Association. There she championed a collaboration to provide annual health screenings and influenza immunizations to an underserved population of Asian immigrants/refugees.



Jack Tian, M.D., completed his BS in cell biology at the University of California at Berkeley. He subsequently received his medical Degree from UCLA's Geffen School of Medicine and came to the University of Rochester to complete his one-year internal medicine rotation. Tian has been an active volunteer and spent a great deal of time helping out in emergency medicine departments

at hospitals throughout the Oakland area. He is an accomplished violinist and balances his artistic side as a motorcycle enthusiast.

During their training FEI residents are exposed to patient care through their own autonomous clinic, participation in FEI's faculty clinic and throughout the VA system. They also volunteer for screenings and programs like Glasses for Kids. To complement their clinical and surgical training as ophthalmologists, FEI residents are provided protected time where they are required to perform scientific or clinical research under the tutelage of basic science or clinical faculty.

Pilot program address technician shortages

Ophthalmic technicians – who assist eye doctors in treating patients – are in high demand and limited supply. To address this concern, FEI and Monroe Community College (MCC) recently established an internship to introduce interested students to a career that is expected to grow by almost 20% through 2026. Nearly a dozen students came to FEI to learn by observing ophthalmologists, optometrists, and certified ophthalmic technicians as they treated patients with a variety of conditions. Students also attended weekly lectures about general ophthalmology, specialty ophthalmology, and were introduced to diagnostic testing and photography.

"We are pleased that MCC was willing to partner with us and happy to welcome energetic group of learners," FEI Associate Chair of Education **Matthew Gearinger, M.D.**, said.

"There is a critical shortage of skilled technicians throughout the region; by increasing their numbers this program has the potential to improve patient care."

If the internship proves successful, it may expand it into an associate's degree at MCC. The program awarded students who completed their internships 3 hours of college credit.

Young Investigator Award

The Optical Society of America (OSA) recently recognized University of Rochester Research Associate, and FEI Collaborator, **Juliette McGregor** with its Young Investigator Award. OSA each year gives this award to the student(s) with the best research poster or platform presentation at its annual conference. McGregor works in the laboratory of FEI researcher, **William Merigan, Ph.D.**, where she is part of a team using special imaging techniques in pre-clinical models to investigate pathways into restoring vision to people who have lost their photoreceptors.

Eye ECHO to democratize general and subspecialty ophthalmic knowledge to regional optometrists

An FEI team organized by **Rajeev Ramchandran, M.D.**, and chaired by **Anthony Dell'Anno, O.D.**, and **Anand Rajani, D.O.**, will help eye doctors throughout the region gain more confidence in caring for complex patients. They are accomplishing this by launching the first ophthalmology ECHO in North America, called Eye ECHO.

Extension for **Community Healthcare Outcomes (ECHO)** was started at the University of New Mexico by **Sanjeev Arora, M.D.**, to combat a regional hepatitis-C epidemic he was facing. Using interactive teleconferencing and telementoring, Arora was able to transfer his specialty knowledge and share pearls of wisdom with generalists and provider extenders in caring for patients with hepatitis C. This allowed thousands to be treated near their homes. Arora's success caught fire and now more than 3,000 ECHO-trained care givers across New Mexico provide specialty care to hepatitis-C sufferers. Buoyed by his local success, Arora then launched this concept nationwide, with groups forming in more than 30 states using

ECHOs to address more than 100 areas of medicine or complex medical conditions. The University of Rochester is a national leader in using ECHO with nearly 20 ECHO based programs currently offered or in development.

"ECHO democratizes knowledge," Ramchandran stated. "As the region's major center for treating eye disease, we want to improve access for regional providers to the latest information and trends. We believe that this will improve the level care for patients closer to their homes while resulting in more appropriate referrals to FEI specialists who have limited capacity."

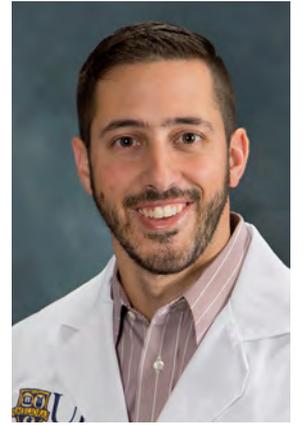
FEI is initially targeting optometrists. As primary care practitioners for eye disease, they are usually the first to detect vision problems that could become worse. "We're on the front line," Dell'Anno said. "I think this is a great opportunity for optometrists to sharpen their skills and improve their abilities to diagnose and treat patients."

During each ECHO session, participants submit patient cases and present them via a user-friendly teleconferencing platform. Subspecialty ophthalmologists, selected for their particular expertise, review each case and a session moderator helps facilitate discussion around key teaching points. During discussions, all participants offer commentary and are encouraged to ask questions to reinforce

their understanding and maximize their ability to follow best practices. Following the case presentations, one of the panel of experts presents a short didactic lecture related to the ECHO session to further disseminate knowledge. Ophthalmic technicians, nurses, and other allied healthcare personnel are encouraged to offer their perspective in improving patient care.

"It's like an online grand rounds," Dell'Anno said. "But it's a little different since experienced optometrists are presenting cases. It's an excellent way for working doctors to keep their skills up-to-date while receiving real-time feedback about patient problems."

For each ECHO, participants receive continuing professional credit for optometry from the New York State Board of the Professions. All patient information presented in cases is de-identified to protect privacy. Credit is currently limited to optometry. To participate or learn more, contact eyemanagers@urmc.rochester.edu



ANTHONY DELL'ANNO, O.D.

FEI CHAIR EYES NEW ROLE (CONTINUED FROM COVER)

David and Ilene Flaum in 2009.

He also launched an aggressive recruitment effort, moving from eight faculty members 17 years ago to more than 45 full- and part-time physicians and scientists, to accommodate expansion of the programs.

Clinical growth, which has surpassed 70,000 visits and 4,000 surgeries annually, has led to double-digit increases in annual clinical revenues since 2002. Feldon led development of a population-management strategy for vision care, fueled by acquisition of ophthalmology and optometry practices with retail optical shops. These acquisitions currently provide comprehensive and subspecialty care at five locations in Monroe and Seneca counties. The subspecialty care available at FEI attracts patients from across upstate New York for advanced therapies and technology.

The Institute is currently ranked in the Top 25 for National Institutes of Health research funding, having grown from a single \$400,000 National Eye Institute Grant in 2001 to more than \$4.5 million in current annual grant revenue. Partnerships with the

University's Center for Visual Sciences and other scientists across the University, industry leaders, and the LV Prasad Eye Institute in India have created a dynamic research portfolio.

Ophthalmology training has changed dramatically under Feldon's leadership – shifting from evening classes led by community ophthalmologists to a daily program overseen by full-time academic faculty. This highly selective program receives over 400 applications annually for four residency positions, attracting top-ranked graduates from around the country and world-wide.

During his tenure, Feldon has been exemplary for his support of faculty and staff development. Many faculty have been promoted within FEI and the greater University community because of his efforts.

He has also encouraged faculty and senior staff to serve leadership positions in external organizations and associations such as the National Institutes for Health, ARVO and AUPO. With the establishment of FEI's Learning organization, he set a precedent by providing faculty and staff at all levels with clear paths for advancement and career enrichment.

*A search is in process
for a New Chair and
Feldon has targeted
May 1, 2019
for his transition.*

Flaum Eye Institute

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Rochester, NY 14642

www.EyeInstitute.urmc.edu
585 273-EYES

NEW FACULTY

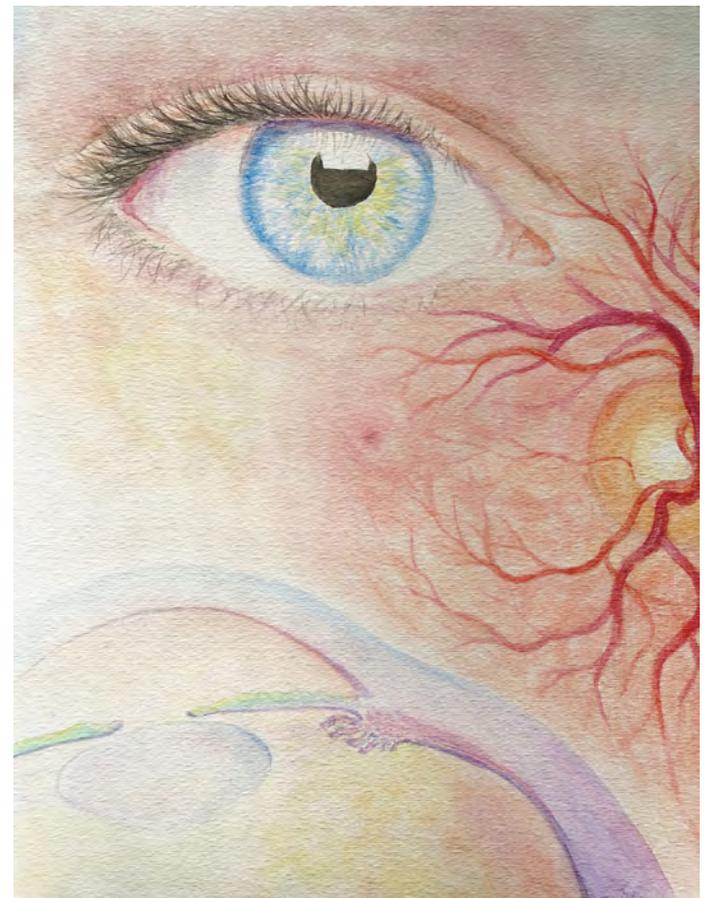


Therese Farugia, O.D., joined the faculty as Senior Instructor of Clinical Ophthalmology. Farugia was part of the Family Eye Care of Webster acquisition and is an experienced optometrist. Besides providing skilled primary eye care, she manages complex medical patients and co-manages cataract patients with FEI's surgical team. She has a specific interest in contact lens and has participated in numerous contact lens clinical research studies. She received her bachelor's in biochemistry from Niagara University and completed her optometry training at the Pennsylvania College of Optometry.



Jennifer Krech, O.D., joined the faculty as Senior Clinical Instructor of Ophthalmology. As part of the Flaum Eye Institute optometry team, she is responsible for routine and medical eye evaluations and co-manages surgical and complex patients with FEI's subspecialists. Krech sees patients at FEI's College Town and UR Medical Center locations. She comes to FEI with experience in both private practice and the VA system. She has a particular interest in patients suffering from complications of traumatic brain injury.

Krech received her undergraduate degree in biology from the State University of New York at Plattsburgh. She completed her Doctorate of Optometry at the Pennsylvania College of Optometry at Salus University. In addition to her clinical skills, she is an accomplished artist doing portraiture, landscape and medical illustration related to the eye.



COURTESY JENNIFER KRECH, O.D.

FEI imaging staff shines again – anything but routine

FEI's ophthalmic imaging staff was once again recognized for excellence. In July, **Brittany Richardson's** gonioscopy photograph of double glaucoma stents made the cover of *Ophthalmology*, the world's leading clinical ophthalmology publication and journal of the American Academy of Ophthalmology.

In October, the team was well represented at the American Academy of Ophthalmology's annual meeting where half a dozen images placed in a juried competition. Taking home honors were:

1st Place Slit Lamp Biomicroscopy
Corneal Dystrophy
Amber Kates, COA, CRA, OCT-C

1st Place Gonio Photography
Neovascularization of the Iris
Amber Kates, COA, CRA, OCT-C

2nd Place Gonio Photography
High Mag Cypass
Brittany Richardson, CRA, OCT-C, COA

2nd Place Monochromatic Photography
CME
Brittany Richardson, CRA, OCT-C, COA

3rd Place Composite
POHS
Jenny Kellogg, CRA, COMT

3rd Place Surgical Photography
Argus 2 Implantation
Jenny Kellogg, CRA, COMT



HIGH MAG CYPASS
BRITTANY RICHARDSON, CRA, OCT-C, COA



MONOCHROMATIC
PHOTOGRAPHY CME
BRITTANY RICHARDSON, CRA, OCT-C, COA



POHS
JENNY KELLOGG, CRA, COMT