

ARVO News

Spring 2017

**Tips on a
successful
peer review
process**

6

**Collaborating
beyond
borders: An
ARVOConnect
success story**

8

**Clayton to
keynote
9th Annual
WEAVR
Luncheon**

18



New glaucoma therapies in the works

Research findings target the
trabecular meshwork

14

2016 – 2017 Officers

Emily Y. Chew, MD, FARVO
President

Paul S. Bernstein, MD, PhD, FARVO
Vice President

Peter D. Lukasiewicz, PhD, FARVO
Vice President

Claude F. Burgoyne, MD, FARVO
President-elect

Sarah E. Coupland, MBBS, PhD, FARVO
Vice President-elect

John I. Clark, PhD, FARVO
Immediate Past President

Craig E. Crosson, PhD, FARVO
Executive Vice President

Justine R. Smith, MBBS, PhD, FARVO
Executive Vice President-elect

ARVONews team

Joanne Olson
Deputy Executive Director

Katrina Norfleet, MA
ARVONews Editor
Director of Communications

John Saville
Senior Graphic Designer

Julene Joy
Manager, Digital Communications

Contributors

Anna Boyum, PhD
Debbie Chin
Gayle Claman, CAE
Cathy Conley
Stacy De La O
Amanda Johnson
Kerin Miller
Matt Windsor, PhD

Advertising

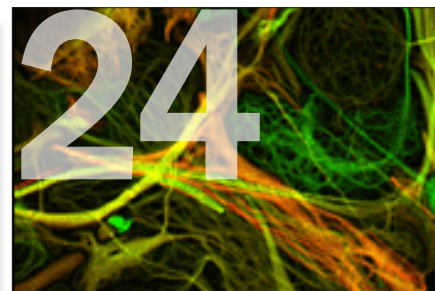
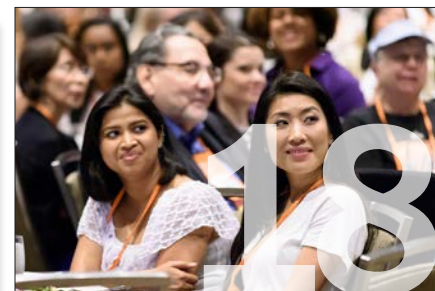
Katherine Madison
National Trade Productions
kmadison@ntpshow.com

ARVO office

Iris M. Rush, CAE
Executive Director

1801 Rockville Pike, Suite 400
Rockville, MD 20852-5622
Phone: +1.240.221.2900
Fax: +1.240.221.0370

arvo.org



3 President's message
Annual Meeting anchors us in changing times

4 Leaders and volunteers
Getting to know ARVO President-elect Claude F. Burgoyne, MD, FARVO

6 Spotlight on members
Five members in five minutes: What makes peer review helpful

Collaborating beyond borders: An ARVOConnect success story

ARVO Achievement Awardees

A startup company's unique business model

Robert Ritch, MD, to receive the Joanne G. Angle Award

11 Around the globe
ISVER: Targets clinical research collaborations

12 Women in research
Francine Behar-Cohen, MD, PhD: Outcomes through new discoveries

14 Trending topics
New glaucoma therapies in the works

17 Advocacy and outreach
21st Century Cures Act

18 ARVO Foundation
Janine Austin Clayton, MD to keynote WEAVR Luncheon

Catching up with former travel grantee

Message from the chair

Making the most of funding

22 NEI director's message
Update on key initiatives

NEI: Celebrating 50 years

24 Journals
EICs report on progress

Annual Meeting anchors us in changing times

by Emily Y. Chew, MD, FARVO

With the challenges vision researchers face in this year filled with many changes, both here in the U.S. and in other countries, the ARVO Annual Meeting remains a vitally important anchoring event for all of us. As a community of vision researchers, we need to remember our strengths as a group and to remain dedicated and focused on our goals to improve the lives of people with impaired vision throughout the world.

As Dr. Peter McDonnell suggested in his post on ARVOConnect on Dec. 1, 2016, it is time for us to reflect on why ARVO is important to all of us. At that time, many of our colleagues, ranging from those still in training to very seasoned researchers, responded with reasons to attend the 2017 ARVO meeting in historic Baltimore, an important center for vision research. We were reminded that the collaborations that take root or are further nurtured from the interactions that occur during the ARVO meeting serve to encourage our creativity and innovation. Many commented on the ability of these opportunities to energize our work.

With the current challenges of uncertain and possibly diminishing research funding, these global connections and collaborations among different labs and disciplines have never been more essential in keeping our young investigators, the rising stars of the vision community, engaged. Attending the ARVO Annual Meeting strengthens these ties and creates new bonds. I personally feel that my mentor, Brenda Gallie, who brought me to my first ARVO Annual Meeting as a first-year ophthalmology resident, changed the path of my career markedly. I hope you will take this opportunity to attend ARVO 2017 and to bring young trainees.

In the words of Fred Fitzke from University College London, the ARVO meeting is “the unique opportunity to meet and discuss the latest ideas with the most amazing gathering of people in the field of vision research. There is no comparable meeting.” We do not build walls around our community; everyone is welcome. My esteemed fellow ARVO Trustee Sarah Coupland emphasized how welcoming ARVO is to “trainees, clinicians and scientists of all ages, genders and ethnicities.”

I am looking forward to connecting with you and having a very lively and productive meeting in the vibrant city of Baltimore.



Emily Y. Chew, MD, FARVO

“Collaborations that take root or are further nurtured from the interactions that occur during the ARVO meeting serve to encourage our creativity and innovation.”

Don't miss!
ARVO/Alcon Keynote Sessions

Sunday, May 7, 12 – 1:15pm
 Mary-Claire King, PhD

Thursday, May 11, 1:30 - 3:15pm
 Panel: What's next in the investigation of genetics of age-related macular degeneration?

Left to right:
 Pamela Sklar, MD, PhD;
 Terri Manolio, MD, PhD;
 Nancy J. Cox, PhD

ARVO 2017
 GLOBAL CONNECTIONS IN VISION RESEARCH | MAY 7 - 11 | BALTIMORE

Register at arvo.org/am

Getting to know ARVO President-elect Claude F. Burgoyne

Claude F. Burgoyne, MD, FARVO, is a glaucoma clinician and surgeon, senior scientist, Van Buskirk Chair for Ophthalmic Research, director, Optic Nerve Head Research Laboratory, Devers Eye Institute and clinical professor of ophthalmology at Oregon Health and Science University. Burgoyne shares his research background, how he overcame a natural disaster and his vision for the organization as he prepares for his role as the next ARVO president.



Claude F. Burgoyne, MD, FARVO

ARVONews: What research or projects are you currently working on?

Burgoyne: My lab is studying the effects of aging and experimental glaucoma on the neural and connective tissues of the monkey optic nerve head using 3D histomorphometric reconstruction, optical coherence tomography (OCT), and quantitative immunohistochemistry. We are also translating our OCT imaging techniques to the human optic nerve head through collaborations with the Portland Progression Project, and work closely with industry in the development of OCT platforms for human glaucoma imaging.

We have used 3D histomorphometric reconstruction to detect and characterize the early optic nerve head connective tissue deformation and remodeling that underlie the phenomenon of glaucomatous cupping in the monkey eye. Through collaborations, we are now extending our studies to the mechanisms of axonal

A conversation with the new MIT Trustee

Philip Ruzycski was recently selected as the new At-large Member-in-Training (MIT) ARVO Trustee. Recently, he took some time from preparing for his penultimate thesis committee meeting to talk about his experience in multiple research labs and goals for his new role with ARVO.

deemed impossible. I think the retina is a very tractable system to answer many general questions about gene regulation in development and disease.

How have you been involved with ARVO since joining?

Ruzycski: I first joined ARVO in 2010 and have since been to multiple ARVO Annual Meetings — twice in Ft. Lauderdale and then in Denver and Seattle.

Why did you express interest in joining the ARVO Board of Trustees?

Ruzycski: I was interested in it because several of my mentors have been very involved in ARVO leadership over the years. Watching them lead this global organization, I wanted to see how it worked. How do you bring all these very different groups of people together to make a cohesive, useful meeting that people really want to be a part of? I think it will be a great learning experience, but also a way for me to use what I've learned in my experiences at three different labs and institutions to bring multiple trainee points of view to the Board.

What are you hoping to accomplish during your time on the Board?

Ruzycski: In my year on the Board, I hope to ensure that ARVO is giving the Members-in-Training the opportunities they need, whether that be career advice, opportunities for collaboration or a platform from which to launch their careers. **MW**

Tell us a little bit about yourself.

Ruzycski: I am currently a sixth year graduate student at Washington University in St. Louis, Missouri in the lab of Shiming Chen, PhD. I didn't immediately go to graduate school after completing my undergrad at Davidson College in North Carolina, I spent a few years in the lab of Mark Petrush,

PhD, FARVO, at the University of Colorado as a technician and at NIH with Anand Swaroop, PhD, as an Intramural Research Training Award fellow. I've had a lot of different vision research experiences that really helped clarify what I wanted to do in my own career.

What are your plans after you graduate?

Ruzycski: I'm starting to think about postdocs with the goal of becoming a professor. I like the self-driven motivation of the lab and ability to do what I'm most passionate about. I enjoy adapting or even developing new cutting-edge techniques to ask questions previously



insult within the aging and glaucomatous monkey optic nerve head using finite element modeling, proteomic and electron microscopic techniques. In this work, we hypothesize that understanding why an aged optic nerve head is more susceptible to glaucoma should provide important insights into optic nerve head susceptibility to glaucoma in eyes of all ages.

The long-term goal of my work is to build a clinical science for predicting how an individual optic nerve head will respond to a given level of intraocular pressure that includes the tools to detect and treat that response.

ARVONews: What have been some of the highlights of your career to date?

Burgoyne: My 12 years at Louisiana State University (LSU) in New Orleans provided rich interactions with complicated glaucoma patients that were formative to my development as a clinician and surgeon and remain meaningful to me today. Through my patients I not only experienced the challenges of clinical and surgical glaucoma, but also the complexity of race, class and cultural diversity in a city in which these societal components have robustly interacted for 300 years. I was fortunate to begin a collaboration with Rich Hart, the chair of Biomechanical Engineering at Tulane University that led to grants from the Whitaker Foundation, BrightFocus and, in 1998, our first NIH R01. The work that followed allowed our labs to contribute to the emerging field of optic nerve head biomechanics.

In 2005, my laboratory lost 24 monkeys in the flooding that followed Hurricane Katrina. Their horrible deaths were but a small part of the devastation suffered by the research communities at LSU and Tulane. I was able to rebuild my laboratory with the support of Jack Cioffi, then director of the Devers Eye Institute, in Portland, which has remained a safe haven for my work since then. My lab's recognition, in collaboration with Crawford Downs, that early glaucomatous cupping in the monkey optic nerve head involves profound remodeling of the lamina cribrosa connective tissues continues to hold important implications for the staging of the neuropathy and its treatment. Our work with Balwantray Chauhan has supported the use of Bruch's membrane opening as the foundation for OCT optic nerve head rim assessment and has contributed to a strategy for OCT optic nerve head phenotyping that is being incorporated to varying degrees in commercial OCT instruments.

ARVONews: Tell us about your involvement with ARVO through the years.

Burgoyne: My involvement with ARVO began with attendance at the 1991 Annual Meeting during my final year of residency. I have attended the Annual Meeting every subsequent year. I served the Glaucoma Section on the Annual Meeting Program Committee (2006 – 2008), have been an *IOVS* editorial board member since 2008 and was elected to serve as the Glaucoma Section Trustee in 2013.

ARVONews: What are you looking forward to as ARVO president? What is your vision or hope for 2017 – 18?

Burgoyne: ARVO's strength and vitality as an organization is of central importance to the community it serves. In this ever-changing world, funding priorities are shifting and these uncertainties create apprehension for all of us. I ask all ARVO members to recommit themselves to ARVO and the scientific interactions that can only occur at our Annual Meeting. Do this as a show of solidarity and to demonstrate that in the face of adversity, we are a community strong enough to commit to the institutions and practices that are most important in our lives. These include the advancement of science as it pertains to the preservation of vision in all countries of the world. Come to the ARVO 2018 meeting in Hawaii. I promise we will make it an extraordinary opportunity to energize your science by expanding your international visibility, interactions and collaborations. **JJ**



ARVO
ONLINE
EDUCATION

Research essentials — Core knowledge and skills for eye and vision scientists

Foundational knowledge

- Guide to scientific method and experimental design
Lead author: Subhabrata Chakrabarti, PhD
- Guide to eye and vision research techniques
Lead author: Francine F. Behar-Cohen, MD, PhD
- Guide to human subjects research
Lead author: M. Elizabeth Hartnett, MD, FACS, FARVO
- Guide to scientific publishing
Lead author: Steven J. Fliesler, PhD, FARVO

Next-step skills

- Guide to scientific peer review
Lead author: Jeffrey H. Boatright, PhD, FARVO
- Strategies for effective grant writing
Lead authors: ARVO 2015 Grant Writing Course faculty

Certificates of completion available

To learn more, visit arvo.org/online_education.

Five members in five minutes

Members share advice on what does and doesn't make a peer review helpful

Radwan Ajlan, MBBCh

Surgical Retina Fellow
University of Montreal

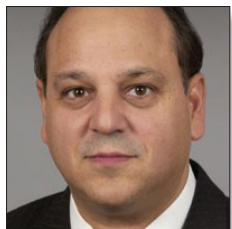


“Reviewers feedback on submitted manuscripts has been very helpful and highly important to me. It offers the opportunity to learn the point of view of other experts in the field and helps further enhance

one’s manuscript. In my experience, whether the submission gets accepted, rejected or needed further work, the peer review is a great plus for me — as long as I know the reason behind the decision or what I need to work on to improve my manuscript.”

Martin B Wax, MD, FARVO

Chief Medical Officer and Executive Vice President of
Research and Development
PanOptica, Inc.



“Helpful responses include specific items that can be addressed. This includes clarifications to help the reader better understand the text, additions and subtractions to content, request for additional

experiments to support the hypothesis being tested, suggestions for editing and streamlining the discussion section for readability and omissions of critical literature.”

Seang-Mei Saw, MD, PhD, FAMS, FARVO

Saw Swee Hock School of Public Health
National University of Singapore



“I am grateful to my reviewers who have trained and taught me good paper writing skills over the years. I have received many good reviews with thoughtful suggestions especially on additional statistical analyses

that should be performed to further highlight interesting findings, accurate interpretation of our

results in light of a well-balanced review of the available evidence, and interesting suggestions for the biological plausibility of our conclusions.

“Sometimes the reviews were not helpful if the suggestions did not substantially improve the manuscript. For example, if the reviewer provided only minor comments on references and formatting or if the reviewer was not familiar with the field and asked questions for clarifications.”

Tien Y. Wong, MD, PhD

Professor, Medical Director, Chair of Ophthalmology
and Visual Science Program
Singapore National Eye Center
Vice-Dean of Clinical Sciences
Duke-NUS Medical School, National University of
Singapore

“A recent particular reviewer took great pains

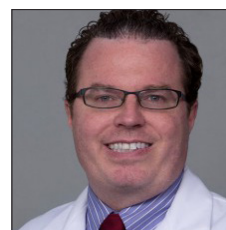


to suggest alternative statistical methods to a meta-analysis paper — we learned something new! One of the most frustrating aspects is when the editors request a revision but

then subsequently rejects the paper (when all the comments have been adequately addressed) because the paper “does not meet the journals priority for publication.” The decision could have been made earlier, and saved everyone time and effort.”

William J. Foster, MD, PhD

Professor, Ophthalmology
Lewis Katz School of Medicine, Temple University



“I often hear colleagues complain about anonymous peer reviewers who seem to miss the point of a publication because they lack the appropriate expertise. The most helpful feedback that I have received is written in a

collegial way, where the reviewer has taken the time to explain why a person with an interest in the field but who possesses a different scientific background may have difficulty understanding our findings or our description of our approach.” **CC**

Creating opportunities for researchers in developing countries

Robert Ritch to receive the 2017 Joanne G. Angle Award

Robert Ritch, MD, FARVO, of the New York Eye and Ear Infirmary of Mount Sinai, has been selected as the 2017 Joanne G. Angle Award recipient. This award is the highest honor bestowed by ARVO to recognize outstanding leaders who have made significant, continuous contributions to ARVO in support of its mission. The award recognizes members that show significant personal involvement and commitment to ARVO and the eye and vision research community.

This award “means a great deal” to Ritch as he and Angle “were friends and colleagues for more than 20 years and traveled on teaching missions together in developing countries.”

Ritch has established a record of continuous service to ARVO since 1991, including leading the ARVO Host-a-Researcher Program initiative to enable researchers from developing countries attend the ARVO Annual Meeting. “Travel awards went to people who had abstracts accepted, but what about developing countries — those who didn’t know how to write abstracts? They needed an opportunity to learn how and where to start,” says Ritch.

The first person chosen for the Host-a-Researcher program was Olasola Olowoye, who became the first researcher from Nigeria to present at ARVO. Olowoye is now studying early detection glaucoma screening programs in her native Nigeria. The program, now known as the Developing Country Eye Researcher Travel Fellowship (DCERF), has brought 106 researchers from 42 different countries to the Annual Meeting — a legacy of Ritch’s leadership.

Ritch has served in numerous leadership roles over the years, as a member of the Board of Trustees, Annual Meeting Program Committee, Continuing Medical Education Committee, Global Members Committee, *TVST* journal editorial board and as a DCERF mentor.

When asked about his years of volunteer service to ARVO along with mentorship, Ritch says, “Volunteering can be fun. It can be very rewarding to the people you are teaching.” **JJ**



Robert Ritch, MD, FARVO, will be presented with the 2017 Joanne G. Angle Award during the General Business Meeting at the ARVO 2017 Annual Meeting in Baltimore, Md.

ARVO Achievement Awardees: Recognizing exceptional contributions to the field

During the ARVO 2017 Annual Meeting, in Baltimore, Md., attendees will have the opportunity to attend the lectures of the 2017 ARVO Achievement Award recipients.



Gustavo D. Aguirre, VMD, PhD, FARVO, is being awarded the Proctor Medal for his unique canine models of retinal degeneration, which has provided us invaluable basic information about their counterpart human diseases.



Much of our current understanding of the aqueous humor outflow system in the eye, and the mechanisms of many known and novel drugs, have been the direct result of Paul Kaufman, MD, FARVO’s work. He is receiving the Friedenwald Award for his contributions.

Achievement Awards continued on page 8

Achievement Awards continued from page 7



Weisenfeld Award.

Johanna Seddon, MD, MS, FARVO, a pioneer in ophthalmic epidemiology, particularly the study of nutritional, environmental and genetic risk factors for AMD, is receiving the Mildred



that have changed the future of eye care for patients.

The Kupfer Award recognizes someone who has demonstrated distinguished public service with national or global impact, on behalf of eye and vision research. Donald Everett, MA, has served as the government representative for many clinical trials



Andrew Huberman, PhD, with more than 15 years of experience studying the development, function and repair of mammalian visual circuits, is being honored with the Cogan Award.

Specific session times and dates are available at www.arvo.org/am. **KM**

Collaborating beyond borders: An ARVOConnect success story



Finding good collaborators often requires looking beyond one's institution.

For Araniko Pandey, MD, remote collaboration has always been more of a necessity. A clinician-scientist working in rural Nepal, he felt limited by the resources available in his region. To pursue cutting-edge science and build a sustainable research environment in Nepal, he turned to ARVOConnect — the online community of ARVO members — for support.

Pandey's post and member responses on ARVOConnect about the feasibility of remote collaboration led to a live meeting at ARVO 2016 with Sarah Coupland, MBBS, PhD, FARVO, and others to discuss practical approaches. Pandey outlined his role in Nepal, the daily problems he faced as both a clinician and eye researcher and described the kind of support he and those in similar situations need.

"I found his ideas innovative, and we encouraged him to continue his search for collaborators, suggesting particular people, groups and organizations," says Coupland.

Over the few months following the meeting, Pandey took advantage of ARVOConnect's ready-to-use communication tools and audience of 11,000 vision

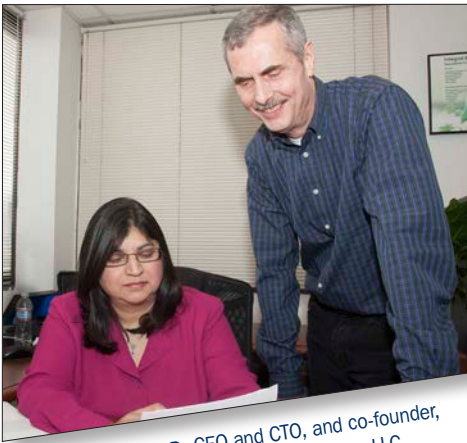
researchers to share his work — epidemiology research, clinical research training for junior colleagues and fundraising to sustain these efforts. He invited members to participate. Of the many helpful responses, one from Delia DeBuc, PhD, research assistant professor at Bascom Palmer Eye Institute, has evolved into an ongoing relationship. DeBuc has since started to co-mentor one of Pandey's colleagues and expressed interest in collaborating with the group from Nepal.

"I have always believed in the power of collaboration," says DeBuc. "I am excited to work with [them] and contribute to Nepal's self-sustaining programs for restoring sight. Our research collaboration with the Lumbini Eye Institute will provide a pathway for sharing our resources and knowledge to address vision problems in the region."

"Dr. DeBuc has been very helpful, and her support has provided hope for a generation of early-career clinicians in my region who are looking for opportunities to contribute to research on a global scale," says Pandey. "This can be regarded as our very first initiative in global collaboration, and all of this seems to be possible because of the platform for collaboration provided by ARVO." **AB**

Building an ophthalmic drug delivery company one contract at a time

Since 2011, Shikha Barman, PhD, has been co-founder, CEO and CTO of her startup company, Integral BioSystems, LLC, based in Bedford, Mass. Barman describes her company's unique business model and how Small Business Innovative Research (SBIR) grants from the National Eye Institute (NEI) have helped to grow Integral Biosystems.



Shikha Barman, PhD, CEO and CTO, and co-founder, Dave Karasic, Esq., of Integral BioSystems, LLC

ARVONews: How would you describe your startup, Integral BioSystems?

Barman: Integral BioSystems has been operating on a hybrid “contract services/innovation” business model since its inception in 2009 and been in full operations since 2011. I founded the company with Boston-area patent attorney Dave Karasic, Esq. Our goal was

to take on highly challenging issues in drug delivery, specifically pertaining to low solubility compounds, compounds that are highly susceptible to degradation or those that need a sustained release mechanism.

Due to the company's reputation as an ophthalmic drug delivery company with niche expertise in sustained release systems, Integral BioSystems has been able to leverage technical “know-how” to generate a healthy revenue stream by providing quality R&D services as a contract research organization (CRO) in formulation development, process engineering and IND-enabling CMC (chemistry, manufacturing and control) expertise. The company has developed internal subject area expertise in nanocrystallization and microsphere formulation development, which is difficult to find at CROs. In fact, I recognized this market need during my 23 years of work experience in biotech and pharmaceutical start-ups in the Boston area.

At Integral BioSystems, the mission is to serve as a nimble and highly efficient R&D laboratory to

start-ups, virtual companies, small biotechnology companies or pharmaceutical companies outsourcing their formulation, analytical, process development and CMC needs.

With a strong focus on innovative ophthalmic drug delivery, the company has been investing in the innovative development of OcuSurf™ and the NanoM™ technologies, with dedicated staff and equipment allocated to these corporate objectives. Both OcuSurf and NanoM technologies have patent protection strategies in place for multiple countries, including Asia, Europe, Canada and the U.S. The company has received a Phase I SBIR grant from NEI to develop a 30-day sustained release of prostaglandin via the NanoM™ technology.

As a long-time strategy, Integral BioSystems hopes to partner with ophthalmic pharmaceutical companies to enter joint IND-enabling programs that will either utilize Integral's licensable drug delivery systems for the ocular surface or leverage Integral's internal subject matter expertise to develop sustained release dosage forms for back-of-the-eye indications.

ARVONews: What was the biggest challenge you faced in starting and growing your business?

Barman: As with any start-up, the biggest challenge and hurdle, of course, was finding the financial resources necessary to develop a sustainable business that is both IP-based and service-oriented. As part of our corporate strategy, we sought non-dilutive funding through SBIR grants and family funds/gifts. One contract at a time and one HPLC (high-performance liquid chromatography) at a time, we worked feverishly to build our analytical and process laboratories, foregoing our pay for the first two years so that we could build our staff of technical experts while offering competitive pay, benefits and a passionate, vibrant work environment.

In 2016, we moved to our state-of-the-art 10,000 square foot facility with segregated analytical and process engineering laboratories. At present, we have a healthy revenue stream from CRO servicing with a diversified client base and strong innovation-based technologies and trade know-how ripe for

Startup continued on page 10

Startup continued from page 9

co-development and licensing strategies. Our current client base has gotten to know our abilities and our work ethic, and as such, we receive their appreciation through repeat projects and recommendations.

ARVONews: Did SBIR grants from NEI supply some of those early resources?

Barman: Yes. We were able to secure Phase I SBIR support from the National Eye Institute to develop a novel bioengineered drug delivery system releasing Travoprost over 30 days. The product is biodegradable and self-administered to the conjunctival fornix as a flexible, mucoadhesive, biodegradable insert, every 30 days. We are also developing additional products based on this innovation to address other indications. For example, we are developing a sustained release peptide delivery system for the ocular surface, to obviate the need for multiple daily doses via eye-drops. The NanoM™ delivery system as it applies to the ophthalmic space, is designed to improve upon eye-drop administration. We are currently completing grant objectives for Phase I and preparing for the Phase II grant application for the glaucoma product.

In addition to the glaucoma product (NanoM-TP) we are also developing a sustained release steroid product to prevent or treat inflammation post-cataract surgery. We plan to seek Phase I grants to develop OcuSurf, our second innovative drug delivery system. Conceptualized to enhance bioavailability of poorly soluble compounds, Ocusurf eye-drops rapidly absorb into tissues. This offers a marked quantifiable improvement over suspension-based eye drops that need to dissolve, prior to absorption. This has been demonstrated via *in vivo* preclinical experiments in a rabbit model.

ARVONews: What other products is Integral Biosystems offering?

Barman: We consider ourselves specialists in ophthalmic drug delivery. Our products are our trade expertise and “know-how” in developing sustained

release systems as in injectable PLG microspheres or nano-suspensions for delivery to the posterior segment of the eye or in stabilizing degradation-prone compounds as eye drops. We routinely assist pharmaceutical companies to develop their formulations, as their outsourced R&D lab.

On the innovative end, Integral BioSystems is developing and expanding its IP to include other ophthalmic indications that can benefit from these innovations.

ARVONews: What is the next big step for you and your company?

Barman: A spin-off of Integral BioSystems is in the making: NanoM Therapeutics, also to be based in Bedford, Mass. This company will be focused on developing the NanoM IP for ophthalmic and other route-specific indications.

ARVONews: Integral Biosystems will be six years old in 2017. What advice would you give to someone who is thinking about starting their own company?

Barman: Starting and establishing a start-up is not for the faint-hearted nor for those who need predictability. While knowledge and a clear plan is necessary to succeed, it is well recognized that start-up CEOs have to be flexible; operate on a tight-fisted, lean financial model; wear multiple hats in operations and leave “no stone unturned” when it comes to advancing the company’s objectives and agenda. **MW**

“Starting and establishing a start-up is not for the faint-hearted nor for those who need predictability.”

International Chapter Affiliate news

ISVER: The first ICA focuses on clinical research collaborations

This is part of a series of articles that highlight members and activities of ARVO's 13 International Chapter Affiliates (ICAs).

The Israeli Society of Vision and Eye Research (ISVER) was founded in 1979 to support ophthalmic research in Israel. In April 2006, ISVER became ARVO's first international chapter affiliate. We spoke with Dror Sharon, PhD, ISVER president and professor at the Hadassah-Hebrew University Medical Center in Israel. Sharon is also chair-elect of the ARVO International Chapter Affiliate Committee (ICAC). He shared insights on his vision for increasing collaboration among ARVO's chapter affiliates.

ARVONews: What are some of ISVER's greatest successes?

Sharon: In our 37-year history, we have brought ophthalmologists in close contact with highly-advanced research labs studying ocular development, diseases and therapy in our small country. This combination makes clinical research collaborations highly efficient, allowing ISVER to provide the opportunity for the two groups to meet annually, share data and seek collaborators.

ARVONews: How similar or different is ISVER's annual meeting to ARVO's?

Sharon: ISVER is proud of its successful annual meeting, gathering together 200 – 220 clinicians, researchers and students. As I mentioned, a key component of our mission is to enhance collaborations between ophthalmologists and basic researchers in Israel, and I think our annual meeting has met this goal. About 100 projects are presented. ISVER used to hold poster sessions but found these were not as successful as they are at the ARVO Annual Meeting, so now we allow five-minute oral presentations. The meeting features two keynote sessions and alternately brings in international and local speakers.

ARVONews: What are some of the ways ISVER supports and promotes young researchers?

Sharon: ISVER is passionate about supporting the next generation of eye and vision researchers in Israel. About 30% of our membership is under the age of 40 years old. As ISVER president, I am working hard to increase that number. We are a small, close-knit community and I visit each Israeli university several times a year to offer support to our young researchers. In addition, ISVER selects four or five young

researchers each year to receive travel grants to attend the ARVO Annual Meeting.

ARVONews: Does ISVER lobby for eye and vision research in Israel?

Sharon: The Israeli Health Ministry and a handful of other organizations, such as the Israeli Science Foundation, support research in Israel but the funding amounts are relatively low. ISVER campaigns for research funds from private institutions. And we fund our annual meeting through low-cost membership dues and sponsorships from ophthalmological companies who exhibit new equipment and drugs at our meetings. We are able to fund ARVO Annual Meeting travel grants through the generous support from families of former ISVER members and grants from ARVO and the ARVO Foundation (supported by the Alcon Foundation).

ARVONews: How will collaborations with other ARVO chapter affiliates be initiated?

Sharon: I am a big advocate for finding common interests across chapter affiliates, sharing ideas and collaborating on meetings. For example, my expertise is in genetic eye disease research, and I think it would be beneficial to host a joint meeting with a few other chapter affiliates and explore monogenetic and more complex genetic research of eye diseases. As incoming chair of the ICAC, I intend to focus on practical steps toward more cross-collaboration, such as promoting the invitation of speakers from other chapter affiliates as a first step.

ARVONews: What is on the horizon for ISVER?

Sharon: ISVER is very proud of its successful annual meeting and our goal is to expand the meeting and expand interactions with the other chapter affiliates in the near future. I also want to explore supporting an annual workshop organized by and for our young researchers by looking to other chapter affiliates as examples. **SO, JJ**



More than 200 clinicians, researchers and students attended the ISVER annual meeting.

Achieving positive outcomes through new discoveries

Francine F. Behar-Cohen, MD, PhD, is professor in ophthalmology at Paris Descartes University, France, and Lausanne University, Switzerland. She is director of



Francine F. Behar-Cohen, MD, PhD

France's national institute of health and medical research (INSERM) UMR1138, team 17: From physiopathology of retinal diseases to clinical applications, at the Centre de Recherche des Cordeliers in Paris. Behar-Cohen has been researching ocular drug delivery systems and pharmacology for more than 10 years.

Most recently, she served as an author of ARVO's new online education module, ARVO's Guide to Eye and Vision Techniques.

ARVONews: What was your inspiration for becoming a researcher in the field of ophthalmology?

Behar-Cohen: I wanted to be a clinician-scientist since I was six years old, when my mother became very ill with leukemia while pregnant with my younger sister. I met my mother's incredible doctor, Jean Bernard, an early pioneer in chemotherapy. He was more than a doctor; he was a humanist. I determined that if my mother was cured, I would become like him. Dr. Bernard and I stayed in touch for years, and when I was ready to begin my studies he told me that the previous century had been focused on genetics but the next would be on biology. So I began studies in both medicine and biology. However, there were no MD/PhD programs at the time. I was juggling two programs and have kept both going ever since.

Miraculously both my mother and sister survived during a time when chemotherapy was new. This is why I advise clinician-scientists to study both areas simultaneously. It is important to be fully emerged in both from the start; it deepens the understanding.

With respect to choosing ophthalmology, my primary motive was not very glorious. During medical school, I was already a mother of two. I was interested in internal medicine but thought ophthalmology would be more

compatible for family life. Although this was not the case as I went into retina surgery and have emergencies all the time.

ARVONews: What have been some of the highlights of your work?

Behar-Cohen: To be able to go from a clinical question with a single patient and achieve a positive outcome through a new discovery is the highlight for a clinician-scientist. Even if the efforts are useful for only one single patient, it is worth it.

From a scientific point of view, some work my team and I did was important but so hard to publish at that time that we did not pursue it, like the supra choroidal delivery that we developed more than 15 years ago. We also showed that nanoparticles were able to travel through ocular tissues without rupturing the barriers.

I have applied several of my projects to the clinic and I am very proud of this because it is a really difficult task, like transcleral iontophoresis or mineralocorticoid receptor antagonists and non-viral gene transfer to the eye. I also have funded two startup companies.

ARVONews: What can you tell us about the project(s) you are working on now?

Behar-Cohen: After having worked for years on animal models, I recognize that for retinal diseases, we need to be closer to human pathology. For this reason, one of my main objectives is to create a clinic-biological correlation bank. I also am very interested in understanding more about how drugs that we use in our daily practice work, what are their downstream molecular targets and also off targets. My work on the understanding of corticoids and their receptors in retinal physiology and pathology is part of it.

Finally, I remain interested in ocular drug delivery, my very first love, because this is still one of the unmet needs in modern ophthalmology.

ARVONews: This year's ARVO Annual Meeting theme is Global Connections in Vision Research. How have global collaborations played a role in your career?

Behar-Cohen: All my projects are performed through international collaborations. My first interest was drug delivery, which requires interdisciplinary work, and is only

possible through collaborations from various expertise and regions — with chemists, biomaterialists from all over the world. This is what is nice about science; you can find someone in another part of the world and easily work together.

Some of my collaborations have been long-term. This includes projects with ARVO past president Jeffrey Boatright and his lab at Emory University, Robert Gurny with Geneva-Lausanne School of Pharmacy and Jean-Marie Parel, director of ophthalmic biophysics and engineering at Bascom Palmer Eye Institute in Miami. The key is to have a real human connection that drives your collaborations.

ARVONews: You recently authored the ARVO online

education module, ARVO's Guide to Eye and Vision Techniques for ARVO's Global Research Education Training Initiative. What insights can you share?

Behar-Cohen: Being part of this project has been a great opportunity for me and has been interesting for those of us working on it. It pushed us to really think about what we routinely do on a daily basis. The details are not in published papers and therefore it's difficult for others to replicate. This initiative will help improve reproducibility. Of course, this module is a good start but only the beginning. But what is most important is to get these techniques and protocols in eye and vision science documented and out to a wider audience. **GC**

May 15, 2017 - Late registration deadline
Visit our booth #4610 at ARVO Baltimore

THE GLOBAL GLAUCOMA NETWORK
www.worldglaucoma.org



Join us for the
7th **WORLD
GLAUCOMA
CONGRESS**
JUNE 28–JULY 1, 2017
HELSINKI

New glaucoma therapies in the works

Research findings target the trabecular meshwork



“If I have seen further, it is by standing on the shoulders of giants.”

Attributed to Sir Isaac Newton, this famous quote describes the nature of scientific discovery as a buildup of knowledge to new insights. In the glaucoma field, new heights of understanding are about to unleash a wave of drugs aimed at a previously unreachable target — the trabecular meshwork.

Glaucoma medications aimed at lowering intraocular pressure (IOP) have been around for decades. In 1978, the beta-blocker timolol was approved in the U.S. for lowering IOP by reducing aqueous humor production (fluid inflow). The mid-1990s brought blockbuster prostaglandin analogues that increased the outflow of aqueous humor via uveoscleral (non-trabecular meshwork) pathways.

While these drugs and their surgical counterparts all provide ways to lower IOP, a primary risk factor for developing glaucoma, none of them target the root cause of elevated IOP — reduced fluid drainage through the trabecular meshwork.

“When I was a student 25 years ago, very little was known about [the tissue],” said W. Daniel Stamer, PhD, FARVO, of Duke University. “The vision research community has put a lot of work into understanding this complicated system enough to make these trabecular meshwork-targeting drugs possible.”

Three companies pursuing different mechanisms of action on the trabecular meshwork are simultaneously pushing their drug candidates through the last steps of the clinical and regulatory pipeline.

The role of nitric oxide

Nicox, an ophthalmology-focused pharmaceutical company headquartered in Sophia Antipolis, France, was founded on the idea of appending nitric oxide (NO) donating groups to existing drugs in an effort to improve those drugs’ efficacy or safety profile. NO, the subject of the 1998 Nobel Prize

in Physiology and Medicine, is a signaling molecule understood to relax muscle cells and play a role in numerous biological systems. Research in the 1980s by Volker Witzemann, MD, of Justus Liebig University Giessen and James Nathanson, MD, PhD, of Harvard Medical School found that patients exposed to NO-donating molecules, like nitroglycerine (used to treat a number of cardiovascular conditions), experienced a reduction in their IOP. Further research by many others, including Stamer, Fernando Galassi, MD, of the University of Florence, Italy and Louis Pasquale, MD, FARVO, of Harvard Medical School, contributed to understanding the role NO signaling plays in the eye in regulating IOP and vascular function.

“The vision research community has put a lot of work into understanding this complicated system enough to make these trabecular meshwork-targeting drugs possible.”

W. Daniel Stamer, PhD, FARVO

This body of work led Nicox chemists in the early 2000s to append NO-donating groups to anti-glaucoma prostaglandin analogs. “Specifically for glaucoma, considering the scientific evidence led us to a hypothesis that adding an NO-donating moiety to an existing IOP-lowering agent could result in a new compound with improved IOP-lowering activity,” said Francesco Impagnatiello, PhD, head of new research projects at the Nicox research facility in Milan, Italy. “The objective was then to demonstrate superior IOP-lowering activity, which would be based on the contributions of both the NO donation and the established potency of the prostaglandin metabolite.”

Shortly after filing the patent for the concept, Nicox entered into a research collaboration with Pfizer. “Our first meeting with Pfizer was at ARVO 2004, where the interaction with their research team was established,” said Ennio Ongini, PhD, vice president and research advisor at Nicox.

The Nicox-Pfizer collaboration quickly identified latanoprostene bunod, which consists of Pfizer’s prostaglandin analog latanoprost modified with an attached NO-donating group. The drug progressed through Phase 2a trials until Pfizer made a strategic decision to discontinue participation in the program in 2009, returning the drug to Nicox. Bausch + Lomb (B + L) licensed the molecule in 2010, successfully completing the Phase 2 clinical program and launching the drug’s Phase 3 program. Upon completion of the pivotal Phase 3 studies, B+L filed a New Drug Application (NDA) for latanoprostene bunod with the U.S. Food and Drug Administration in 2015. Nicox and B + L are expecting a mid-2017 launch of the drug, under the provisionally approved commercial name, Vyzulta™.

Inhibiting ROCK

Founded in 2005, Aerie Pharmaceuticals grew out of Duke University — based on research targeting the trabecular meshwork by the late David Epstein, MD. Aerie originally focused their work on ethacrynic acid, a diuretic used to treat high blood pressure and swelling. That project was abandoned after efforts to improve ocular tolerability failed.

Work then shifted toward inhibiting Rho kinase (ROCK). P. Vasantha Rao, PhD, of Duke University and others had previously shown that inhibiting ROCK can relax the trabecular meshwork by regulating the cytoskeleton’s ability to contract. Targeting the cytoskeleton as a way to lower IOP has been an idea pursued since the late 1970s by Epstein, Paul Kaufman, MD, FARVO, of the University of Wisconsin School of Medicine and Michael Wiederholt, of Charité Medical University of Berlin, Germany.

“We made over 1,500 ROCK inhibitors and tested 100-plus in animals,” said Casey Kopczynski, PhD, chief scientific officer at Aerie Pharmaceuticals. Some of the initial lead compounds were too

specific. During a three-month clinical trial, the first compound that was tested lost its IOP-lowering capability. “We think the trabecular meshwork compensated for our ROCK inhibitors by increasing the activity of protein kinase C, which, like Rho kinase, can induce contractions in the trabecular meshwork,” explained Kopczynski.

Fortunately, the company had kept up its discovery efforts and found another ROCK inhibitor that also showed activity against protein kinase C. This compound, netarsudil, successfully maintained its IOP-lowering efficacy for the full

duration of a 12-month clinical trial. Mechanism of action studies in animals and humans have confirmed netarsudil’s ability to increase trabecular outflow and unexpectedly identified two additional IOP-lowering mechanisms — a reduction of aqueous humor production and decreased episcleral venous pressure.

Aerie is also exploring the effect of adding latanoprost to its formulation of netarsudil. Latanoprost complements netarsudil by increasing drainage through the alternative uveoscleral pathway, potentially providing four mechanisms of action in a single eye drop.

Netarsudil will be sold under the trade name Rhopressa and will have its NDA resubmitted to the FDA near the end of the first quarter of 2017. Roclatan, the commercial name of the combined netarsudil and latanoprost eye drops, is currently being tested in Phase 3 clinical trials.

Targeting adenosine receptors

Inotek Pharmaceutical’s approach to lowering IOP in glaucoma patients stems from changing the resistance in the conventional outflow pathway. This remodeling is induced by the introduction of trabodensin, an A₁-specific adenosine receptor agonist and the company’s lead compound in this area.



New glaucoma therapies, continued from page 15

Targeting the adenosine receptors to lower IOP started in 1990s research demonstrating that adenosine receptor agonists could produce complex changes in IOP depending on the dose and the agonist being tested. As a result, the development of adenosine receptor agonists as anti-glaucoma medications was relatively slow. “We had a lot of adenosine agonists, but their selective toward the four receptor subtypes (A_1 , A_{2a} , A_{2b} , A_3) limited their development,” said Craig Crosson, PhD, FARVO, of the Medical University of South Carolina. “Some receptors appeared to raise IOP, while others lowered it.”

It took decades of work by a small community of vision researchers to tease out the role of each of the adenosine receptors in regulating IOP. Mortimer Civan, MD, FARVO, of the University of Pennsylvania School of Medicine was a primary investigator responsible for describing the changes in IOP in response to A_3 receptor activation. Several labs evaluated the ocular actions of A_{2a} receptors and Crosson concentrated on the A_1 receptor. Of the four receptors subtypes, selectively targeting the A_1 receptor proved to be the most effective in lowering IOP to date.

In 2008, Inotek approached Crosson to do some

preclinical screening of their lead compounds targeting adenosine receptors. While some compounds were exhibiting limited efficacy in lowering IOP, trabodendoson proved to be efficacious — likely due to its A_1 -selectivity. Inotek has since advanced the drug to Phase 3 clinical trials and is currently awaiting further trial data.

What's next?

As these first-generation trabecular meshwork-targeting drugs start hitting patient's medicine cabinets, glaucoma researchers are already laying the foundation for the next potential wave of therapies to manipulate a now unreachable target — the optic nerve.

“Much of the research done today focuses on neuroprotection and retinal ganglion cell survival,” said Ellen Liberman, PhD, glaucoma program director at the National Eye Institute (NEI).

Like the work into altering IOP via aqueous fluid inflow and outflow channels, neuroprotective strategies to treat glaucoma will take years to develop. Fortunately, the patience and laser-like focus necessary to achieve such a goal is a hallmark of the vision research community. **MW**



EUROPEAN ASSOCIATION FOR VISION AND EYE RESEARCH

SEPTEMBER 27-30

www.ever.be

EVER 2017

NICE in France

17/02/2017

21st Century Cures Act boosts NIH funding, generates regulatory action

Thanks in large part to an unceasing advocacy campaign by the entire research advocacy community, the 21st Century Cures Act has provided a much-needed boost to National Institutes of Health (NIH). One of the last pieces of legislation signed into law in 2016, the bill provides \$4.8 billion over 10 years to specific NIH programs, including the cancer “moonshot,” BRAIN and Precision Medicine initiatives. Additional funding for the BRAIN Initiative is of particular interest to vision researchers as numerous grants have been awarded for retina-centered research.

Other highlights from the law include reducing the regulatory burden related to NIH grants, creating a new “Next Generation of Researchers Initiative” and improvements to the Loan Repayment Program.

“The 21st Century Cures Act has given us a rare opportunity to lower some of the unnecessary hurdles facing animal research, while still maintaining strict ethical oversight,” says J. Crawford Downs, PhD, chair of ARVO’s Animals in Research Committee. On behalf of ARVO, Downs has been invited to be part of a working group of leading scientific societies involved in animal research to craft consensus recommendations to reduce regulatory burden at NIH, and the U.S. Department of Agriculture and the Food and Drug Administration.

ARVO supported the drumbeat for the legislation’s passage through multiple events in 2016, including the annual ARVO Advocacy Day, the “Revealing the back of the eye with OCT” public outreach campaign and co-sponsorship of multiple Capitol Hill briefings organized by the Alliance for Eye and Vision Research. **MW**



Assistant Professor Ritwick Rajagopal, MD, PhD, of Washington University sits at the desk of Representative Lacy Clay after meeting with Legislative Director Pauline Jamry to discuss funding for NIH and NEI during the 2017 ARVO Advocacy Day in Washington, D.C.

Where imaging is going

 **ARVO**[®]

IMAGING IN THE EYE
CONFERENCE

May 6, 2017
Baltimore, Md.

**Register by
April 28 to save**

arvo.org/Imaging/

Clayton to keynote WEAVR Luncheon

Highlighting gender as a biological variable in research



Janine Austin Clayton, MD, FARVO, director of the Office of Research on Women's Health at the National Institutes of Health

Janine Austin Clayton, MD, FARVO, director of the Office of Research on Women's Health at the National Institutes of Health, will be the keynote speaker at the Ninth Annual Women in Eye and Vision Research (WEAVR) Luncheon on Tuesday, May 9. Clayton, an ophthalmologist and an ARVO Silver Fellow, will speak on the topic of sex as a biological variable (SABV).

Clayton is leading the NIH's new SABV policy initiative that took full effect in January 2016, requiring scientists to account for SABV across the research continuum, from basic to clinical research. The policy is part of NIH's initiative for enhancing reproducibility through rigor and transparency. In its first year of implementation, Clayton says she was surprised to learn just how heavily reliant pre-clinical research has been on male animal models and how entrenched this practice was.

"Science is about discovery and the potential influences of sex was not being examined to a great extent," she says. "It has been exciting to work with stakeholders within NIH and all of its Institutes and Centers to help orient them to the value of accounting for SABV in the context of their science and their disciplines."

Such a big change across such a large institution does not come without its challenges. One big challenge Clayton notes is applying the SABV policy in all scientific disciplines, all of which are at different stages of progress. To lead the way, she is currently chairing a trans-NIH SABV research working group with representation from senior leadership from the NIH Institutes and Centers. Her office is also working with journals and scientific societies to help expand awareness around the reporting of sex-disaggregated data.

She reports, "We have made tremendous progress and are receiving insightful questions from scientists as they implement the policy."

In addition to considering SABV, Clayton encourages ARVO members to consider gender in their research design as well. Look for her November 2016 article "Reporting Sex, Gender, or Both in Clinical Research?" in the *Journal of the American Medical Association* that highlights the importance of considering both sex and gender in the design of clinical research, as well as the analysis and reporting of experimental results. The article includes explanations of sex and gender terminology that might be of assistance to vision researchers.

"Examining data through the sex/gender lens has the power to convert data into useful information that expands our knowledge base," says Clayton. "We also help to ensure that our research is rigorous, as well as relevant to both men and women." **AJ**

Ninth Annual WEAVR Luncheon

May 9, 1 – 2:30pm

Hilton Baltimore (connected to the Baltimore Convention Center)

Attendees of all genders are welcome to attend. For tickets and table sponsorships, visit arvofoundation.org/weavrluncheon

Where is she now?

ARVO catches up with former travel grantee Erika Eggers



Erika Eggers, PhD, associate professor at University of Arizona

A 2007 travel grant recipient, Erika Eggers, PhD, credits her participation in the ARVO Annual Meeting early in her career with helping to lay the foundation for where she is now: an associate professor at the University of Arizona with her own lab, the Eggers Laboratory of Retinal Neurophysiology.

Eggers has always been interested in a research career, but she didn't start her academic pursuits in eye and vision science. She earned her undergraduate degree in physics, and she later became interested in the interaction of physics and biology. She earned a PhD in physiology and biophysics studying the modulation of activity in the brainstem motor neurons that control the tongue muscle.

"During my PhD program, I learned about the retina," she says. "I decided that I wanted to work in that area for my postdoctoral research and I've been working there ever since."

Eggers, who now studies retinal changes early in diabetes, attended her first ARVO Annual Meeting in 2003. Her career has bloomed with support and connections fostered by ARVO and the ARVO Foundation. "Attending meetings as a young scientist is crucial to understanding the diversity of the field you are working in and to meet other scientists who can be potential mentors or collaborators," she says. "My Scientific Section [Visual Neuroscience] is a good community of people, and I have gotten to know many of them. This has resulted in me being asked to moderate talks and poster sessions, being selected for multiple talks and in finding reviewers for my papers and grant applications."

In 2016, Eggers was awarded the prestigious National Science Foundation (NSF) CAREER Award for junior faculty, which was used to establish the Arizona RETINAL Project. She also recently received her first R01 grant. She attributes her connection to ARVO as an influencing factor in her work for both awards. For example, the idea of studying retinal changes in early diabetes was something she was introduced to by attending ARVO meetings.

"The NSF grant subject matter is closer to what I was working on in my postdoctoral work, but attending the ARVO meetings did allow me to keep up with new developments in the field and meet the people doing the work." **AJ**

To learn more about her lab, visit eggerslab.sites.arizona.edu.

ARVO Foundation and Dowling Society Gala Awards Ceremony and Dinner

Saturday, May 6, 2017 | 7pm
Hilton Baltimore

2017 ARVO Foundation Honorees

Sally Atherton,
PhD, FARVO

William J.
Brunken,
PhD, FARVO



Ticket and table sponsorship information available at arvofoundation.org/gala



With your pledge of \$10,000 or more to the ARVO Foundation, you can join an elite group of individuals within the ARVO community who share Dr. John Dowling's passion for vision research.

Contact Amanda Johnson at ajohnson@arvo.org for information.

Message from the chair

Supporting sight-saving, sight-restoring discoveries



J. Mark Petrash, PhD, FARVO

What a year 2016 was for the ARVO Foundation! Thanks to hundreds of donors, we met and exceeded our \$25,000 end-of-year campaign goal. In total, we raised a record-breaking \$34,891 from 484 individuals — the vast majority of whom are ARVO members. The breadth of support from across ARVO's global membership is incredible, with gifts coming from members in 32 countries.

I am humbled and grateful that the ARVO Foundation has such generous support from its members — from you — who understand best the value of what ARVO brings to careers, particularly those of young scientists. This incredible investment in the ARVO Foundation makes it possible for us to encourage and support the next generation of eye and vision scientists. In this way, we deliver on our mission to support the careers of vision researchers so that they can make sight-saving discoveries.

While all of the gifts made to the ARVO Foundation are special, I am always

particularly moved when I learn of donations made in someone's honor or memory. In our field, where mentorship and collaboration are so important to the development of our own careers, giving a gift to the ARVO Foundation to honor a peer or remember the legacy of a colleague is such a meaningful way to make a donation. I was inspired by several notable gifts this year: a generous first-time donation made by the proud parents of an MIT in his honor, a gift from a researcher in Japan to honor a long friendship with an American colleague and gifts from around the world in memory of a young colleague.

Thank you to all of the ARVO Foundation's generous donors over the past year. I look forward to another great year ahead where the ARVO Foundation will invest in smart, hardworking young people worldwide to make discoveries that can bring sight-saving and sight-restoring therapies to the clinic.

ARVO Foundation for Eye Research 2016 – 2017 Officers

J. Mark Petrash, PhD, FARVO
Chair

Cheryl Mae Craft, PhD, FARVO
Vice Chair

Paul Sternberg, Jr., MD, FARVO
Treasurer

ARVO Foundation office

Iris M. Rush, CAE
Executive Director

Amanda Johnson
Foundation Manager

1801 Rockville Pike, Suite 400
Rockville, MD 20852-5622
Phone: +1.240.221.2900
Fax: +1.240.221.0370
arvofoundation.org



2016 by the numbers

118

Young researchers supported by a travel grant to attend the Annual Meeting

10

Research fellows from developing countries funded to attend the Annual Meeting

\$215,000

Dollars invested in research fellowships

\$48,500

Cash awards recognizing significant contributions to research

8

New Dowling Society members who committed \$10,000 or more to the ARVO Foundation

100%

ARVO Board of Trustees supporting the ARVO Foundation

Learning to make the most of funding

Each year, the ARVO Foundation awards two Collaborative Research Fellowships — up to \$10,000 to a researcher in a developing country to work with a collaborator in the U.S. Damián Dorfman, MD, PhD, a visual neuroscience postdoctoral fellow at the University of Buenos Aires in Argentina, received one of the 2015 fellowships to work with Alejandra Bosco, DSc, of the University of Utah School of Medicine.

Dorfman had started his career as a medical doctor when he became interested in vision, specifically its neural basis. While completing his residency in ophthalmology, he began his PhD studies with a focus on retinal ischemia and the neuroprotective effects of enriched environment. As his medical residency concluded, he couldn't resist the pull of the lab.

"There I learned the fascinating world of neurons, synapses and neurochemistry, among others," he says. "Clinical practice and surgery couldn't fulfill the desire that I found in the lab."

Now devoted to research full-time, Dorfman continues to study the effect of enriched environment. His Collaborative Research Fellowship project seeks to find if providing a more stimulating social and sensory environment to lab rats can enhance their protection against damage caused by glaucoma. The project, which began in June 2016 and will conclude in May, has returned some results. He hopes to present them at the ARVO 2018 Annual Meeting.

Dorfman has had to overcome challenges of working in a lab in a developing country. He explains, "Lab consumables, reagents and antibodies are expensive and take a long time to get to the lab in Argentina. Moreover, science policies and budget have recently changed with the new government's administration," he says. "This forces us to do fewer experiments and widely discuss them beforehand, limiting the pace and capacity of work."

Bosco, his collaborating researcher in the U.S., is originally from Argentina and understands these challenges. She has helped Dorfman troubleshoot when difficulties have arisen and provided guidance to increase the pace of their work. She has also played the role of encourager. "She has pushed me at the right time to do the best experiments and make the most of the funding we had," says Dorfman.

In looking ahead, Dorfman sees a career where he continues working in glaucoma and visual neuroscience. A past recipient of an ARVO Foundation travel grant, he has attended the ARVO Annual Meeting for the last six years and offers advice to other researchers from developing countries. "Apply for grants!"

he says. "I had little confidence that I could win this award because I'm young, and my work is not well known."

In the end, according to Dorfman, the ARVO Foundation's Collaborative Research Fellowship gave him the opportunity that would otherwise be difficult at his career stage in his country where financial resources are limited. **AJ**



Damián Dorfman, MD, PhD, from the University of Buenos Aires in Argentina received a 2015 Collaborative Research Fellowship.



What's new with key initiatives?



Paul A. Sieving, MD, PhD, FARVO
Director, National Eye Institute,
National Institutes of Health

The Federal government's budget is in a holding pattern until April 2017 when the continuing resolution expires. Passage of the 21st Century Cures Act on Dec. 13 leaves me cautiously optimistic that the National Institutes of Health will continue to enjoy bipartisan support during the new administration. The Cures Act increases support for early-stage investigators. The majority of funds to NIH goes to major programs including the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative (\$1.5 billion), the Precision Medicine Initiative (\$1.45 billion) and a new regenerative medicine initiative (\$30 million).¹

BRAIN Initiative

The third annual BRAIN investigators meeting took place in Bethesda, Dec. 12 - 14. Vision continues to be well represented. Among vision-related findings was a report classifying mouse bipolar cells into 15 subtypes based on transcriptomics. The findings were reported by Karthik Shekhar of Broad Institute and Massachusetts Institute of Technology, and were generated using the high-throughput, single-cell analysis technique called DROP-seq.² Sebastian Seung of Princeton presented 3-D digital constructions of mouse retinal ganglion cells. Based on this work, he estimates that there are about 40 different ganglion cell types, some of which can be seen at [museum.Eyewire.org](http://museum.eyewire.org). For the latest BRAIN news and information about funding opportunities, visit braininitiative.nih.gov.

NEI Audacious Goals Initiative (AGI)

The AGI is a sustained research effort toward regenerating retinal neurons and their connections to the brain. In October, the *Journal of Neuroscience* published "Reconnecting Eye to Brain," a state-of-the-science assessment of what we know about optic nerve development, regeneration and reconnection.³ Authors, Michael Crair of Yale University and Carol Mason of Columbia University, based the report on the October 2015 AGI-sponsored panel discussion that engaged two

dozen leading experts on factors that guide axons to brain targets. For more information, visit nei.nih.gov/audacious/events_and_reports. To hear a fascinating AGI seminar talk by Carla Shatz of Stanford University titled, "Saving the Synapse: Developmental Critical Periods and Amblyopia," visit bit.ly/NEI_Carla_Shatz.

Stem cells

In December, NEI convened scientists and stakeholders to discuss clinical applications of stem cells. Topics included concerns about "rogue" clinics offering untested therapies, sometimes leading to disastrous consequences that threaten to undermine the progress of legitimate stem cell research. Most clinical trials underway are directed at cell replacement. An alternative approach that requires more research is the use of stem cell-derived cells to repair diseased tissues by an unidentified paracrine effect. Continued support for research into the cellular mechanisms of disease is important, as is the development of novel endpoints that take into consideration function and quality of life for assessing treatment response. Meeting participants also identified the need for a reference dataset to facilitate the authentication of cell types.

NEI Retina Organoid Challenge

Do you have a concept for developing a retina organoid, but need a bioengineer to make it happen? Hold that thought, because this spring NEI will launch a challenge to build a physiologically-relevant 3-D human retina organoid system for use by the research community to model retinal diseases and develop treatments. NEI hopes to foster collaboration across diverse scientific disciplines to accelerate development of organoids that faithfully recapitulate human tissue. For more information, go to nei.nih.gov/3droc.

References

1. Hudson KL, Collins FS. The 21st Century Cures Act - A View from the NIH. *N Engl J Med*. Dec.13 2016.
2. Shekhar K, Lapan SW, Whitney IE, et al. Comprehensive Classification of Retinal Bipolar Neurons by Single-Cell Transcriptomics. *Cell*. Aug 25 2016;166(5):1308-1323 e1330
3. Crair MC, Mason CA. Reconnecting Eye to Brain. *J Neurosci*. Oct. 19 2016;36(42):10707-10722.

NEI prepares to celebrate 50 years: Share your stories

The National Eye Institute will celebrate its 50th anniversary during 2018 and in the message below invites ARVO members to help commemorate the milestone with a timeline of vision research accomplishments through the decades.

This is an exciting milestone for us as we look back at the progress made in diagnosing and treating eye diseases and vision impairment since NEI was established in 1968.

Our mission continues to be to protect and prolong vision. During our anniversary year we will be collaborating with organizations including ARVO to inform the research community and the broader public of accomplishments in vision research and eye health over the decades.

You are an important part of the story, and we want you to be a part of our celebration. We are interested in hearing stories from your perspective about vision research; education and training; and diagnosis and treatment over the last 50 years.

For example, we know that diabetic retinopathy patients once filled waiting rooms with their seeing-eye dogs and treatments included removing pituitary glands. Today, cutting-edge treatments include anti-VEGF injections and laser surgery.

Do you have a story like this to tell? Do you have a picture showing vision research, diagnosis or treatment in earlier times? Send an email to our historian, Mary Beth Corrigan, at corriganme@nei.nih.gov. She is also available to answer any questions you may have about what to send or how to send it.

Thank you for sharing your stories and pictures. We look forward to celebrating together!



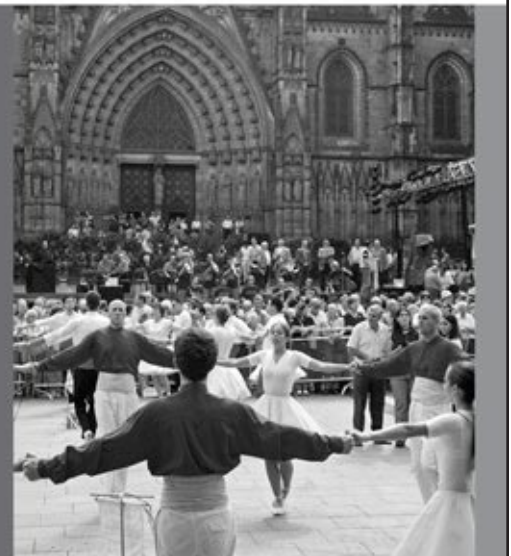
Be a part of NEI's 50th anniversary celebration by sharing stories about vision research accomplishments.

SOE2017



**EUROPEAN SOCIETY OF OPHTHALMOLOGY
10-13 JUNE 2017 | BARCELONA, SPAIN**

**SEE YOU IN
BARCELONA**
www.soe2017.org



In review: EICs report on progress

Investigative Ophthalmology & Visual Science

by Thomas Yorio, PhD, FARVO, Editor-in-chief

IOVS publishes special issues, builds base of new reviewers

Investigative Ophthalmology & Visual Science released two special issues and has a new one underway entitled, “Biomarkers and surrogate endpoints in ophthalmic clinical research” with Edoardo Villani, MD, (University of Milan) and Stela Vujosevic, MD, (University of Padua) serving as guest editors for this special issue. In addition to the release of this issue later this year, we continue to promote the Reviewer in Training program that provides new investigators the opportunity to gain experience in the peer review process. We are excited that a number of new investigators have sought entry into this program, allowing us to train excellent reviewers for the future. Finally, as my tenure as editor-in-chief ends this year, I want to take this time to express my deepest appreciation to the number of reviewers, editorial board members and associate editors as well as the *IOVS* staff who spent countless hours making sure the best quality papers are being published in *IOVS*. You certainly made my life as EIC much easier and I look forward to another successful year for *IOVS*.

Journal of Vision

by Dennis M. Levi, OD, PhD, Editor-in-chief

JOV celebrates sweet 16, offers topical collections

Journal of Vision will be 16 years old in 2017. The first issue was published in May 2001, fulfilling the realization of a dream — to have a top quality online journal covering all aspects of functional vision, freely available to anyone, anywhere, at any time. At 16, *JOV* is a mature journal well integrated into the ARVO family of journals, with approximately 500 submissions per year and a superb international board of editors.

One advantage of online journals is that they need not be bound by the same constraints as print journals, where articles appear in specific issues and volumes that are forever fixed. Online journals can link related articles into a “collection,” no matter when they were published, offering readers a wide range of

articles on a specific theme or topic. Examples include the “Perceptual Learning Collection,” the “Crowding Collection” and the “Ensemble Encoding in Vision Collection” available from our homepage: jov.arvojournals.org.

arvojournals.org.

And coming soon is the “Dress Rehearsal for Vision Science” collection, which will feature articles that leverage measurements and understanding of how “The Dress,” and related images that appear to be different colors to different people, are perceived to identify and clarify general principles of color vision. In the coming year, we anticipate creating a number of new topical collections, enabling readers to find related articles with a single click.

Translational Vision Science and Technology

by Marco Zarbin, MD, PhD, FARVO, Editor-in-chief

TVST to achieve Impact Factor, expand audience

With acceptance into Web of Science, Science Citation Index Expanded, *TVST* will be listed with an Impact Factor this year. This means articles published in *TVST* will be fully recognized by funding agencies and academic institutions that place importance on the Impact Factor. *TVST* also benefited in 2016 from the move of ARVO publications to full open access, ensuring the widest possible dissemination of its multidisciplinary content that is helping to bridge the gap between basic research and clinical care. In addition, we are expanding representation on the editorial board to include more editors from outside the U.S., with the aim of widening our authorship and readership bases geographically. With these positive developments in mind, I look forward to completing my first term as editor-in-chief in 2017, accompanied by an outstanding board of associate editors and editorial board members, to whom I am sincerely grateful for their dedicated service. Thanks are also due to our reviewers, authors and readers whose trust and support have allowed *TVST* to prosper. For all those looking for a home in which to publish their translational work, please consider *TVST*, and contact me at any time with your thoughts, questions and suggestions.