

Doctoral Program in Vision Science

2020-21



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Overview

If you aspire to a career in vision research the Doctoral Program in Vision Science at SUNY College of Optometry provides the comprehensive training needed for professional success. Our Program combines a rigorous, intellectual platform of course study and research within an interactive, collegial community. We have developed a flexible curriculum that can be tailored to the needs of our individual students. Students come to our program with a broad range of interests and from diverse educational backgrounds including biology, psychology, optometry, mathematics, and engineering. Courses stress analysis and discussion of the primary literature and provide training in key skills necessary for a research career in academia or industry.

The labs of our top-ranked faculty study areas that push the boundaries of vision science, ranging from pure basic research to important clinical applications. Graduate students can find expert mentorship in molecular and cellular biology, ocular structure and function, retinal and cortical neurophysiology, attention, eye movements, neural plasticity, color, shape, motion, space, and 3D perception, visual cognition, development, disease processes, and a wide variety of clinically important topics. Students attend regular colloquia given by visiting scientists, participate in journal clubs, and

are encouraged to take full advantage of our location in New York City, which has the largest vision research community in the world.

On the next page is a complete list of our Program's research faculty,



which includes links to their individual or lab web pages.

Doctoral Research Mentors

Jose-Manuel Alonso, MD, PhD

Functional circuitry of the thalamus and visual cortex.

Alexandra Benavente-Perez, PhD, McOpt, MS

Visual control of eye growth. Changes in vision function in Alzheimer's disease and glaucoma. Biometric and physiological factors in human ocular perfusion.

Stewart Bloomfield, PhD

Functional roles of gap junctions in retinal physiology and pathology. Noval targets for neuroprotection in glaucoma, ROP, and ischemic retinopathy.

Robert McPeek, PhD

Neural mechanisms underlying attention and visually-guided actions.

<u>Tracy Nguyen, OD, PhD</u> Mechanisms of corneal diseases.

Mark Rosenfield MC Optom, PhD Myopia and retinal defocus.

Miduturu Srinivas, PhD

Gating and pharmacology of lens gap junction channels.

<u>David Troilo, PhD</u>

Visual development, accommodation, refractive error, and myopia.

Suresh Viswanathan, OD, PhD

Visual dysfunction in glaucoma and mild traumatic brain injury.

<u>Stefanie Wohl, Ph.D.</u> Roles of microRNAs in cell degeneration and regeneration.

<u>Qasim Zaidi, PhD</u>

Color and three-dimensional shape perception.



Key Components of the Doctoral Program

Our approximate 5-year program provides intensive training in vision research. All students take a year-long proseminar for breadth, followed by small group tutorials and seminars in which the student reads, thinks, writes, presents, and discusses important questions in vision science with our research faculty. Research training begins with two independent rotations in the first year, followed by concentrated work on a doctoral thesis project. The Program is well suited for students who want to master two areas of expertise under the joint mentorship of two faculty members.

From first year lab rotations, the qualifying exam, and the thesis defense, students receive regular guidance and mentoring and are evaluated at important milestones to ensure that they progress successfully through the Program. In addition, students attend journal clubs, weekly research colloquia, and additional community events, such as the VisioNYC seminar series, which brings together dozens of vision scientists in the New York metropolitan area. Key components of our Program include:

- One-on-one training with faculty for tutorials and research.
- Systematic development of a skillset necessary for career success as a scientist, including oral presentations, publication writing, grants applications and research technology.
- Two laboratory rotations in the first year, with opportunity for externships.
- Graduate stipend support currently at \$33,000 per year with full tuition remission.
- Students are expected to become accomplished teachers. This is accomplished through regular oral presentations and serving as teaching assistants.
- Access to the University Eye Center, one of the largest on-campus vision care clinics in the country.
- Support for travel expenses to present research at scientific conferences and meetings.
- Access to seminars and courses offered within the larger vision research community in New York City (Downstate, Stony Brook, NYU, Columbia University, Rockefeller University, Weill Cornell, Einstein).

Timeline of Study

Year

- 1 2-3 Laboratory Rotations (Sept Aug) Proseminar: Introduction to Vision Science Journal Club Annual Oral Presentation
- 2 Select Dissertation Advisor & Committee Tutorials/Seminars Journal Club Annual Oral Presentation
- 3 Submission of Dissertation Proposal Tutorials/Seminars Journal Club Qualifying Exam Conference Presentations Annual Oral Presentation
- 4 Annual Dissertation Committee Meeting Journal Club Conference Presentations
- 5 Dissertation & Oral Defense Ph.D. in Vision Science



General Areas of Current Research

Cell Biology and Ocular Pharmacology

This group studies the functioning of various components of the eye, using primarily cell and molecular biology approaches. Research interests of this group include: cornea and cell signaling pathways, gap junctions and the interactions of tear proteins and the cornea.

Visual Optics

This group studies accommodation, wave front aberrations of the eye, pupil dynamics, optics and composite prismatic, binocular vision, optical visual control of eye growth and emmetropization, and development of refractive errors.

Visual Neuroscience

This group studies the neural basis of visual function using electrophysiological and computational methods. Research interests include

synaptic transmission in the retina, gap junctions in the eye, color processing by retinal and cortical neurons, evolution of color vision, 3-D shape extraction by cortical neurons, neural connectivity, cortical feedback to thalamus, effective state of neural responses, neural effects of glaucoma



and myopia, and the control of eye movements.

Psychophysics and Visual Perception

This group focuses on functional aspects in human vision ranging from lowlevel detection to high-level perception. Research interests include color vision, visual adaptation, spatio-temporal vision, space perception, 3-D shape perception, visual learning, visual rehabilitation, reading, eye movements, and visual deficits due to retinal diseases such as glaucoma, myopia and diabetes.

Clinical Research

Clinician scientists and researchers at the college conduct research studies of our patient population at the University Eye Center. Areas of research include vision rehabilitation, binocular vision, imaging, disease, contact lenses, presbyopia, myopia, amblyopia, glaucoma, and traumatic brain injury.

SUNY College of Optometry

The State University of New York State College of Optometry, founded in 1971 by legislative act, is dedicated to the education of optometrists, the advancement of eye and vision care through research and graduate education, and to the care of communities through the provision of comprehensive visual health services. The College is a Center of Excellence within the State University of New York (SUNY) system and is the only institution of its kind in New York State and the surrounding region. The College of Optometry attracts highly talented students with leadership potential, interested in optometry and in the health sciences, from across North America and abroad.

The SUNY College of Optometry is located in the heart of New York City at 33 West 42nd Street, opposite the historic New York Public Library and beautiful

Bryant Park. The College's home is an 18-story facility. The newly renovated three-floor, 20,000 square-foot Center for Student Life and Learning opened in 2013. This dynamic new space includes a large preclinical procedures laboratory, classroom and study space, a large seminar room, lounges, event space and a fitness center.

The College's academic, professional and research programs are characterized by innovation, defined by their impact and are supported by a faculty of high quality and dedication. As an urban campus, the College strongly embraces its public service mission of clinical care by providing routine, medical and



specialized eye care services to tens of thousands of patients each year. The <u>University Eye Center</u> (UEC), the College's patient care facility, provides nearly 75,000 patient visits each year. In addition to primary eye care, the UEC is well known for its unique clinical services including traumatic brain injury, infant vision, pediatrics, visually related learning disabilities, vision rehabilitation, ocular disease and special testing, vision therapy, specialty contact lenses and laser refractive surgery. The UEC is a unique resource for the New York metropolitan area and the nation.

A hallmark of the SUNY College of Optometry is its commitment to discovery leading to the advancement of vision care through research. SUNY Optometry has an internationally recognized faculty engaged in cutting-edge research in eye and vision science. Research at the college is organized under the Graduate Center for Vision Research (GCVR). The GCVR oversees all programs supporting basic, translational, and clinical research at the college including the different graduate programs leading to the following single and combined degrees: Ph.D., OD/MS, OD-Ph.D, Residency-MS and Residency-Ph.D.



Mentors

Jose-Manuel Alonso, MD, PhD

Alonso JM (2016). The geometry of visual cortical maps. *Neuron.* 91(4):716-8.

Kremkow J, Jin J, Wang Y, Alonso JM (2016). Principles underlying sensory map topography in primary visual cortex. *Nature* 533(7601):52-7.

Alonso JM, Swadlow HA (2015). Thalamus controls recurrent cortical dynamics. *Nat Neurosci.* 18(12):1703-4.

Wang Y, Jin J, Kremkow J, Lashgari R, Komban SJ, Alonso JM (2015). Columnar organization



of spatial phase in visual cortex. *Nat Neurosci*. 18(1):97-103.

Komban SJ, Kremkow J, Jin J, Wang Y, Lashgari R, Li X, Zaidi Q, Alonso JM (2014). Neuronal and perceptual differences in the temporal processing of darks and lights. *Neuron* 82(1):224-34.

Benjamin Backus, PhD

Sternberg S, Backus BT. (2015). Sequential processes and the shapes of reaction time distributions. *Psychol* Oct;122(4):830-7

Caziot B, Valsecchi M, Gegenfurtner KR, Backus BT. (2015). Fast perception of binocular disparity. *J Exp Psychol Hum Percept Perform*. Aug;41(4):909-16.

Caziot B, Backus BT. (2015). Stereoscopic Offset Makes Objects Easier to Recognize. *PLoS One*. 2015 Jun 16;10(6):e0129101

Jain A, Fuller S, Backus BT. (2014). Cue-recruitment for extrinsic signals after training with low information stimuli. *PLoS One*. May 7;9(5):e96383.

Harrison SJ, Backus BT. A trained perceptual bias that lasts for weeks. (2014). *Vision Res*. 2014 Jun;99:148-53.

Jain A, Backus BT. (2013). Generalization of cue recruitment to non-moving stimuli: location and surface-texture contingent biases for 3-D shape perception. *Vision Res*. 2013 Apr 19;82:13-21.

Alexandra Benavente-Perez, PhD, McOpt, MS

Ansel TV, Nour AK, Benavente-Perez A. (2016). The Effect of Anesthesia on Blood Pressure Measured Noninvasively by Using the Tail-Cuff Method in Marmosets (Callithrix jacchus). *J Am Assoc Lab Anim Sci*. 55(5):594-600.

Benavente-Pérez A, Nour A, Troilo D. (2014). Axial eye growth and refractive

error development can be modified by exposing the peripheral retina to relative myopic or hyperopic defocus. *Invest Ophthalmol Vis Sci.* Sep 4;55(10):6765-73.

Benavente-Perez A, Nour A, Troilo D. (2012). The effect of simultaneous negative and positive defocus on eye growth and development of refractive state in marmosets. *Invest Ophthalmol Vis Sci.* Sep 21;53(10):6479-87.



Stewart Bloomfield, PhD

Akopian A, Kumar S, Ramakrishnan H, Viswanathan S, Bloomfield SA. (2016). Amacrine cells coupled to ganglion cells via gap junctions are highly vulnerable in glaucomatous mouse retinas. *J Comp Neurol*. Jul 13. Pan F, Toychiev A, Zhang Y, Atlasz T, Ramakrishnan H, Roy K, Völgyi B, Akopian A, Bloomfield SA. (2016). Inhibitory masking controls the threshold sensitivity of retinal ganglion cells. *J Physiol*. Jun 28.

Akopian A, Atlasz T, Pan F, Wong S, Zhang Y, Völgyi B, Paul DL, Bloomfield SA. (2014). Gap junction-mediated death of retinal neurons is connexin and insult specific: a potential target for neuroprotection. *J Neurosci*. Aug 6;34(32):10582-91.

Völgyi B, Pan F, Paul DL, Wang JT, Huberman AD, Bloomfield SA. (2013). Gap junctions are essential for generating the correlated spike activity of neighboring retinal ganglion cells. *PLoS One*. Jul 23;8(7):e69426.

Osterhout JA, Josten N, Yamada J, Pan F, Wu SW, Nguyen PL, Panagiotakos G, Inoue YU, Egusa SF, Volgyi B, Inoue T, Bloomfield SA, Barres BA, Berson DM, Feldheim DA, Huberman AD. (2011). Cadherin-6 mediates axon-target matching in a non-image-forming visual circuit. *Neuron.* 2011 Aug 25;71(4):632-9.

Kenneth Ciuffreda, OD, PhD

Rosenfield M, Ciuffreda KJ. (2016). Evaluation of the SVOne Handheld Autorefractor in a Pediatric Population. *Optom Vis Sci*. Sep 23.

Lin Z, Vasudevan B, Fang SJ, Jhanji V, Mao GY, Han W, Gao TY, Ciuffreda KJ, Liang YB. (2016). Eye exercises of acupoints: their impact on myopia and visual symptoms in Chinese rural children. *BMC Complement Altern Med*. Sep 6;16:349.

Truong JQ, Ciuffreda KJ. (2016). Comparison of pupillary dynamics to light in the mild traumatic brain injury (mTBI) and normal populations. *Brain Inj.* 2016 Aug 19:1-12.



Lin Z, Vasudevan B, Mao GY, Ciuffreda KJ, Jhanji V, Li XX, Zhou HJ, Wang NL, Liang YB. (2016). The influence of near work on myopic refractive change in urban students in Beijing: a three-year follow-up report. *Graefes Arch Clin Exp Ophthalmol.* Jul 26.

Fimreite V, Willeford KT, Ciuffreda KJ. (2016). Effect of chromatic filters on visual performance in individuals with mild traumatic brain injury (mTBI): A pilot study. *J Optom*. Oct-Dec;9(4):231-9.



Philip B. Kruger, OD, PhD

Wang Y, Kruger PB, Li JS, Lin PL, Stark LR. (2011). Accommodation to wavefront vergence and chromatic aberration. *Optom Vis Sci*. May;88(5):593-600.

Robert McPeek, PhD

Khan AZ, Munoz DP, Takahashi N, Blohm G, McPeek RM. (2016). Effects of a pretarget distractor on saccade reaction times across space and time in monkeys and humans. *J Vis.* May 1;16(7):5.

Song JH, McPeek RM. (2015). Neural correlates of target selection for reaching movements in superior colliculus. *J Neurophysiol*. Mar 1;113(5):1414-22.

Lee BT, McPeek RM. (2013). Reprint of: The effects of distractors and spatial precues on covert visual search in macaque. *Vision Research*, 76, pp. 43-9. Vision Res. Jun 7;85:73-9.

Song JH, Rafal RD, McPeek RM. (2011). Deficits in reach target selection during inactivation of the midbrain superior colliculus. *Proc Natl Acad Sci USA*. Dec 20;108(51):E1433-40

Song JH, Rowland J, McPeek RM, Wade AR. (2011). Attentional modulation of fMRI responses in human V1 is consistent with distinct spatial maps for chromatically defined orientation and contrast. *J Neurosci*. Sep 7;31(36):12900-5.



Li S, Nguyen TT, Bonanno JA. (2014).

CD147 required for corneal endothelial lactate transport. *Invest Ophthalmol Vis Sci*. Jun 26;55(7):4673-81.

Nguyen TT, Bonanno JA. (2012). Lactate-H⁺ transport is a significant component of the in vivo corneal endothelial pump. *Invest Ophthalmol Vis Sci.* Apr 18;53(4):2020-9.

Nguyen TT, Bonanno JA. (2011). Bicarbonate, NBCe1, NHE, and carbonic anhydrase activity enhance lactate-H+ transport in bovine corneal endothelium. *Invest Ophthalmol Vis Sci*. Oct 17;52(11):8086-93.

Jordan Pola, PhD

Pola J. (2011) An explanation of perisaccadic compression of visual space. *Vision Res.* Feb 23;51(4):424-34.

Kathryn Richdale, OD, PhD

Chalmers RL, Wagner H, Kinoshita B, Sorbara L, Mitchell GL, Lam D, Richdale K, Zimmerman A. (2016). Is purchasing lenses from the prescriber associated with better habits among soft contact lens wearers? *Cont Lens Anterior Eye.* Aug 12.

Richdale K, Lam DY, Wagner H, Zimmerman AB, Kinoshita BT, Chalmers R, Sorbara L, Szczotka-Flynn L, Govindarajulu U, Mitchell GL. (2016). Case-



Control Pilot Study of Soft Contact Lens Wearers With Corneal Infiltrative Events and Healthy Controls. *Invest Ophthalmol Vis Sci.* Jan 1;57(1):47-55.

Richdale K, Bullimore MA, Sinnott LT, Zadnik K. (2016). The Effect of Age, Accommodation, and Refractive Error on the Adult Human Eye. *Optom Vis Sci*. Jan;93(1):3-11.

Chao C, Golebiowski B, Stapleton F, Richdale K. (2016). Changes in Tear Cytokine Concentrations Following Discontinuation of Soft Contact Lenses-A Pilot Study. *Eye Contact Lens*. Jul;42(4):237-43.

Kinoshita BT, Chalmers RL, Mitchell GL, Richdale K, Lam DY, Sorbara L, Jansen ME, Wagner H; CLAY Study Group. (2015). Rate of change and predictive factors for increasing minus contact lens powers in young myopes. *Clin Exp Optom.* Jul;98(4):323-9.



Mark Rosenfield, MCOptom, PhD

Rosenfield M, Ciuffreda KJ. (2016). Evaluation of the SVOne Handheld Autorefractor in a Pediatric Population. *Optom Vis Sci*. 2016 Sep 23.

Ciuffreda KJ, Rosenfield M. (2015). Evaluation of the SVOne: A Handheld, Smartphone-Based Autorefractor. *Optom Vis Sci*. Dec;92(12):1133-9. León A, Estrada JM, Rosenfield M. (2016). Age and the amplitude of accommodation measured using dynamic retinoscopy. *Ophthalmic Physiol Opt.* Jan;36(1):5-12.

Chu CA, Rosenfield M, Portello JK. (2014). Blink patterns: reading from a computer screen versus



hard copy. *Optom Vis Sci.* Mar;91(3):297-302.

Portello JK, Rosenfield M, Chu CA. (2013). Blink rate, incomplete blinks and computer vision syndrome. *Optom Vis Sci*. May;90(5):482-7.

Harold A. Sedgwick, PhD

Nolan A, Delshad R, Sedgwick HA. (2012). Compression of perceived depth as a function of viewing conditions. *Optom Vis Sci.* Dec;89(12):1757-67.

Gillam BJ, Sedgwick HA, Marlow P. (2011). Local and non-local effects on surface-mediated stereoscopic depth. *J Vis.* May 10;11(6). pii: 5.

Miduturu Srinivas, PhD

Sanchez HA, Slavi N, Srinivas M, Verselis VK. (2016). Syndromic deafness mutations at Asn 14 differentially alter the open stability of Cx26 hemichannels. *J Gen Physiol*. Jul;148(1):25-42.

Slavi N, Rubinos C, Li L, Sellitto C, White TW, Mathias R, Srinivas M. (2014). Connexin 46 (cx46) gap junctions provide a pathway for the delivery of glutathione to the lens nucleus. *J Biol Chem*. Nov 21;289(47):32694-702.



Levit NA, Sellitto C, Wang HZ, Li L, Srinivas M, Brink PR, White TW. (2015). Aberrant connexin26 hemichannels underlying keratitis-ichthyosis-deafness syndrome are potently inhibited by mefloquine. *J Invest Dermatol*. Apr;135(4):1033-42.

Srinivas M. (2014). Delivery of glutathione to the lens nucleus. *J Ophthalmic Vis Res.* Jan;9(1):148-9.

Sanchez HA, Bienkowski R, Slavi N,

Srinivas M, Verselis VK. (2014). Altered inhibition of Cx26 hemichannels by pH and Zn2+ in the A40V mutation associated with keratitis-ichthyosis-deafness syndrome. *J Biol Chem*. Aug 1;289(31):21519-32.

David Troilo, PhD

Lu Q, Ganjawala TH, Ivanova E, Cheng JG, Troilo D, Pan ZH. (2016). AAVmediated transduction and targeting of retinal bipolar cells with improved mGluR6 promoters in rodents and primates. *Gene Ther*. Aug;23(8-9):680-9.

Benavente-Pérez A, Nour A, Troilo D. (2014). Axial eye growth and refractive error development can be modified by exposing the peripheral retina to relative myopic or hyperopic defocus. *Invest Ophthalmol Vis Sci*. Sep 4;55(10):6765-73.

Benavente-Perez A, Nour A, Troilo D. (2012). The effect of simultaneous negative and positive defocus on eye growth and development of refractive state in marmosets. *Invest Ophthalmol Vis Sci*. Sep 21;53(10):6479-87.

Suresh Viswanathan, OD, PhD

Akopian A, Kumar S, Ramakrishnan H, Viswanathan S, Bloomfield SA (2016). Amacrine cells coupled to ganglion cells via gap junctions are highly vulnerable in glaucomatous mouse retinas. *J Comp Neurol.* [Epub ahead of print]

Gupta SK, Lewis G, Rogers KM, Attia J, Rostron K, O'Neill L, Skillen A, Viswanathan S. (2014). Quantitative (99m)Tc DTPA renal transplant scintigraphic parameters: assessment of interobserver agreement and correlation with graft pathologies. *Am J Nucl Med Mol Imaging.* 4(3):213-24.

Caldwell MD, Hu SS, Viswanathan S, Bradshaw H, Kelly ME, Straiker A. (2013). A GPR18-based signalling system regulates IOP in murine eye. **Br J Pharmacol.** 169(4):834-43.

Bach M, Brigell MG, Hawlina M, Holder GE, Johnson MA, McCulloch DL, Meigen T, Viswanathan S. (2012). ISCEV standard for clinical pattern electroretinography (PERG). *Doc Ophthalmol.* 126(1):1-7.



Schallek JB, McLellan GJ, Viswanathan S, Ts'o DY (2012). Retinal intrinsic optical signals in a cat model of primary congenital glaucoma. *Invest Ophthalmol Vis Sci.* 53(4):1971-81.

Qasim Zaidi, PhD

Wool LE, Komban SJ, Kremkow J, Jansen M, Li X, Alonso JM, and Zaidi Q. (2015). Salience of unique hues and implications for color theory. *Journal of Vision*, 15 (2): 10.

Zaidi Q, Marshall J, Thoen H and Conway BR. (2014). Evolution of neural computations: Mantis shrimp and human color decoding. *i-Perception*, 5 (6): 492-496.

Ennis R, Cao D, Lee BB and Zaidi Q. (2014). Eye Movements and the Neural Basis of Context Effects on Visual Sensitivity. *The Journal of Neuroscience*, 34 (24): 8119-8129.

Bachy R. and Zaidi Q. (2014). Troxler fading, eye movements, and retinal ganglion cell properties. *i-Perception*, 5 (7): 611-612.

Bachy R. and Zaidi Q. (2014).Factors governing the speed of color adaptation in foveal versus peripheral vision. *Journal of the Optical Society of America A*, 31 (4): A220-A225.



Applying to the Doctoral Program

Requirements for Admission

To apply, applicants must submit an online application using the following web link:

https://www.sunyopt.edu/education/admissions/graduate_programs/phd_in_vision_science_application

An applicant must have completed the following requirements to be considered for admission to the Doctoral Program in Vision Science:

- Baccalaureate or
 professional degree
- Graduate Record
 Examination (general



aptitude tests **institutional code 2897**). For information about GRE test locations and dates please visit the <u>Education Testing</u> <u>Service</u> website.

- Competence in both written and spoken English. Applicants whose native language is not English must submit Scores on the Test of English as a Foreign Language (TOEFL) or the Test of Spoken English.
- Three letters of recommendation emailed directly from the recommender as a pdf file with a valid signature to <u>gradadmissions@sunyopt.edu</u> or mailed directly from the recommender to:

The Office of Graduate Admissions SUNY College of Optometry 33 West 42nd Street, Room 1134 New York, NY 10036

• Official transcripts of all college and postgraduate courses sent to the above address.

Important Dates for Admission

- The deadline for completed applications for fall admission to the Doctoral Program in Vision Science is **February 15**.
- Applicants are notified no later than **April 1** and are required to respond with a decision no later than **April 15**.

Application Fee

There is a \$75 <u>application fee</u> for the Doctoral Program in Vision Science.

Admissions and Financial Aid

All doctoral PhD students receive a full tuition waiver and a graduate stipend currently at \$35,676 per year. The application process is highly competitive and both U.S. and international students are encouraged to apply. As vision

science encompasses a broad area of disciplines, our students come from many different educational backgrounds including: biology, neuroscience, psychology, mathematics, physics, engineering, and optometry.



Contact Information

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