10th ANNIVERSARY

A Virtual Interactive Event

Prevent Blindness

Focus on Eye Health National Summit

OUR CHANGING VISION

July 14–15, 2021

Aging Eye Summit

Financial Disclosures 2021 – 2022

None relevant to presentation

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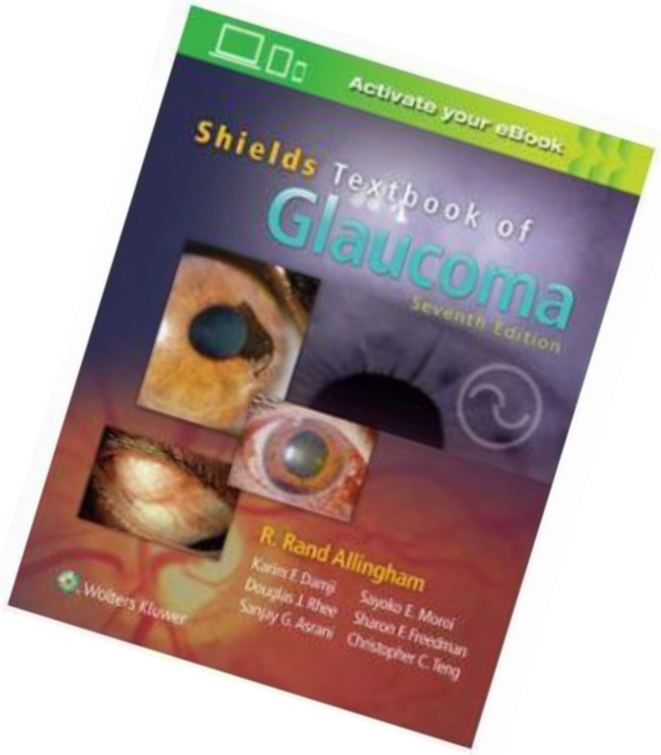
- Wolters Kluwer Health
- NSF AWD010114 (MPI Argento & Moroi)
- R01 EY022124 (PI Moroi)
- R21 EY030363 (MPI Musch & Moroi)
- R01 EY025752 (PI Komaromy)
- US Patent #10575723 Larry Kagemann, Joel Schuman, Sayoko Moroi, U Pitt & UM (application #15/550,021initiated 5/29/2000; notified 2/12/2020)



Strategic Vision: Where are we? What are the key challenges & opportunities?

Sayoko Moroi, MD, PhD

Chair & William H. Havener, MD Endowed Professor

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Eric Miller
Georgina Newbold

NATIONWIDE CHILDREN'S HOSPITAL

Other Research Support:
Julie Racine+
David Rogers+

Biomechanics & Imaging

Cynthia J. Roberts, PhD

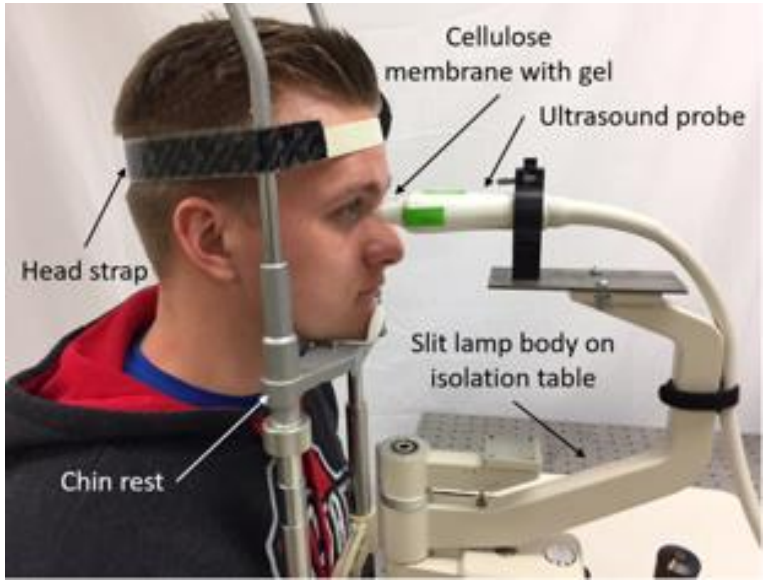
Biomechanics

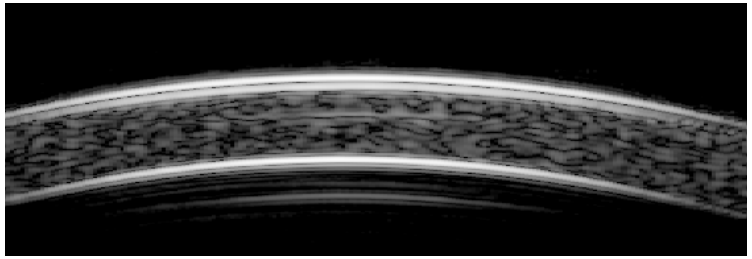
- Cornea biomechanics: develop biomechanical markers of disease (glaucoma, ocular hypertension, diabetes, keratoconus vs normal)
- Model optic nerve damage by combing intraocular pulsations with cerebrospinal fluid pressure across the lamina cribrosa

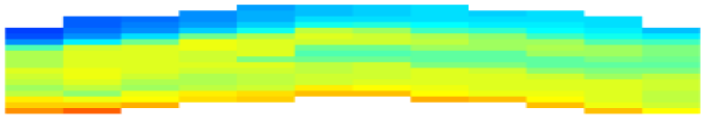
Imaging with

- ANTERION (anterior segment OCT with axial length measurement) provide reference markers for imaging that can be used to calculate biomechanics
- Flex Arm OCT with acquisition in sitting, supine, and Trendelenburg provide measurement of translaminar cribrosa gradient
- Corneal and Ocular Wavefront Analysis with high spatial resolution to assess index of refraction
- Corneal Tomography and Topography provide precision to assess keratoconus treatment outcomes

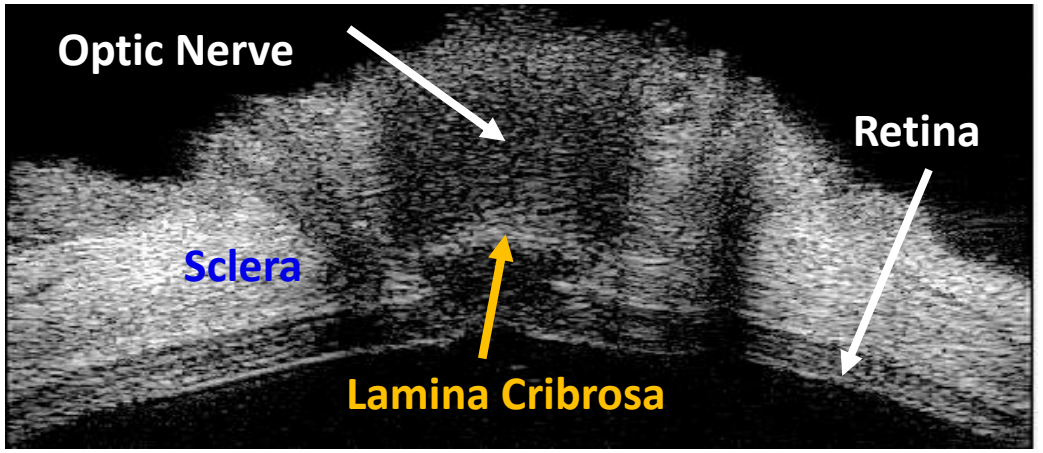
Biomechanical Imaging -- PI: Jun Liu, PhD



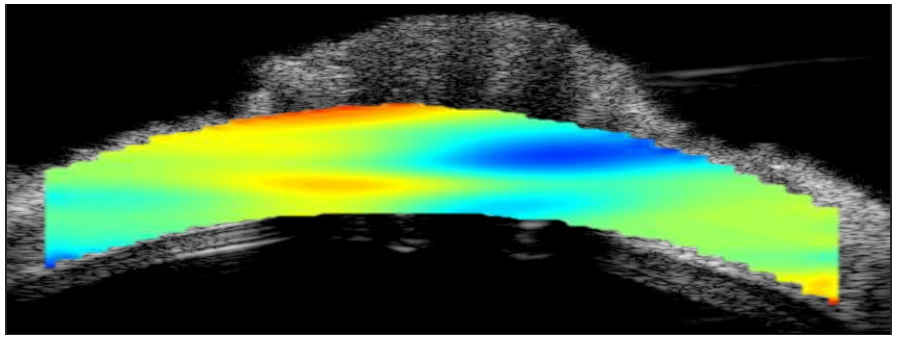


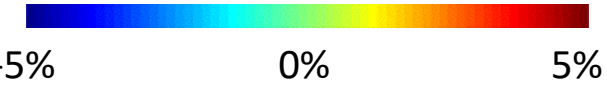


Displacement



Out-of-Plane Shear





Genetics & biology Mohamed Abdel-Rahman, MD, PhD

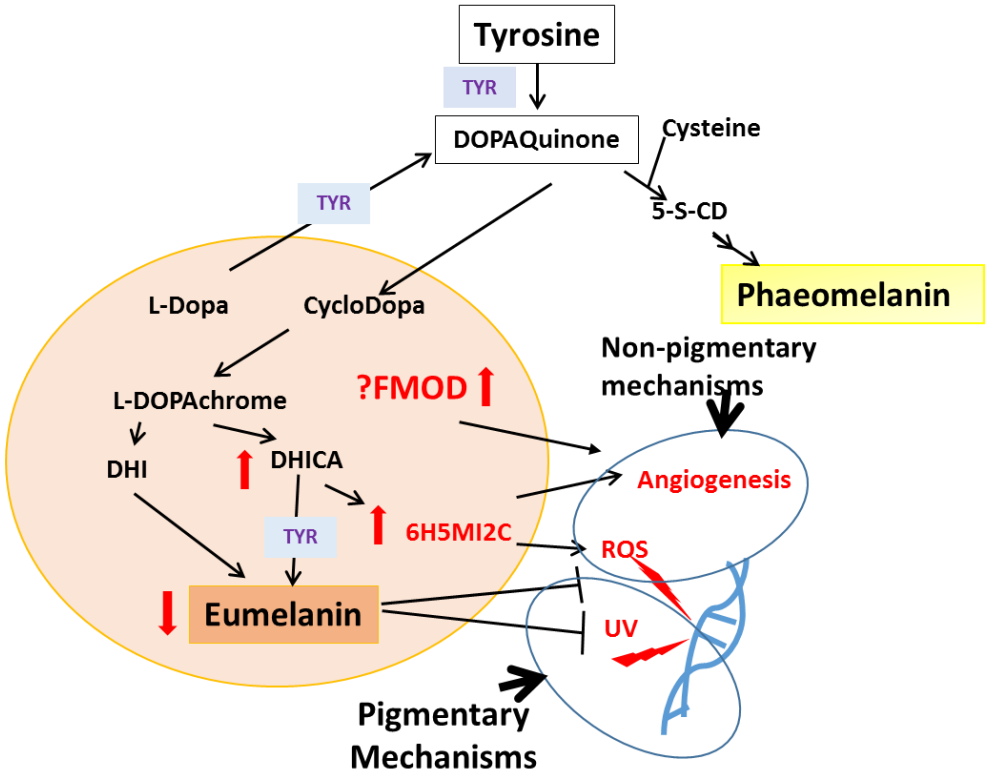
Ocular cancer genetics

1- Identify genes associated with hereditary predisposition to uveal melanoma.

2- Clinical spectrum & management of BAP1-tumor predisposition syndrome (co-leader of the BAP1 international consortium).

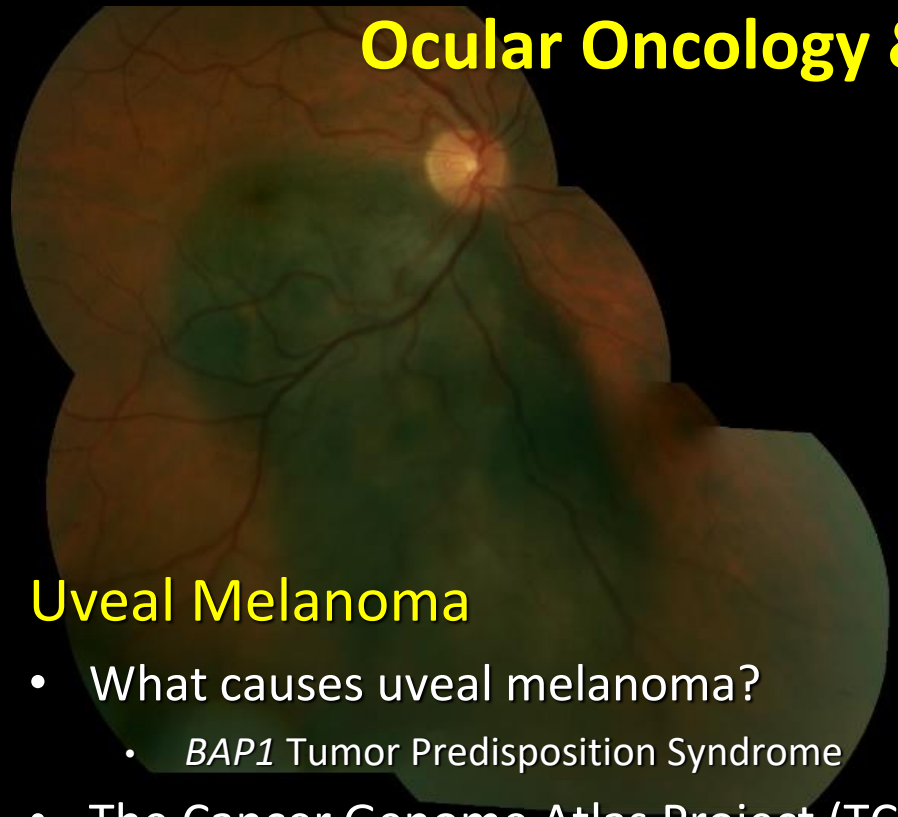
3- Role of BAP1 in tumorigenesis of different cancers.

4- Molecular mechanisms of sexual dimorphism in cancer.



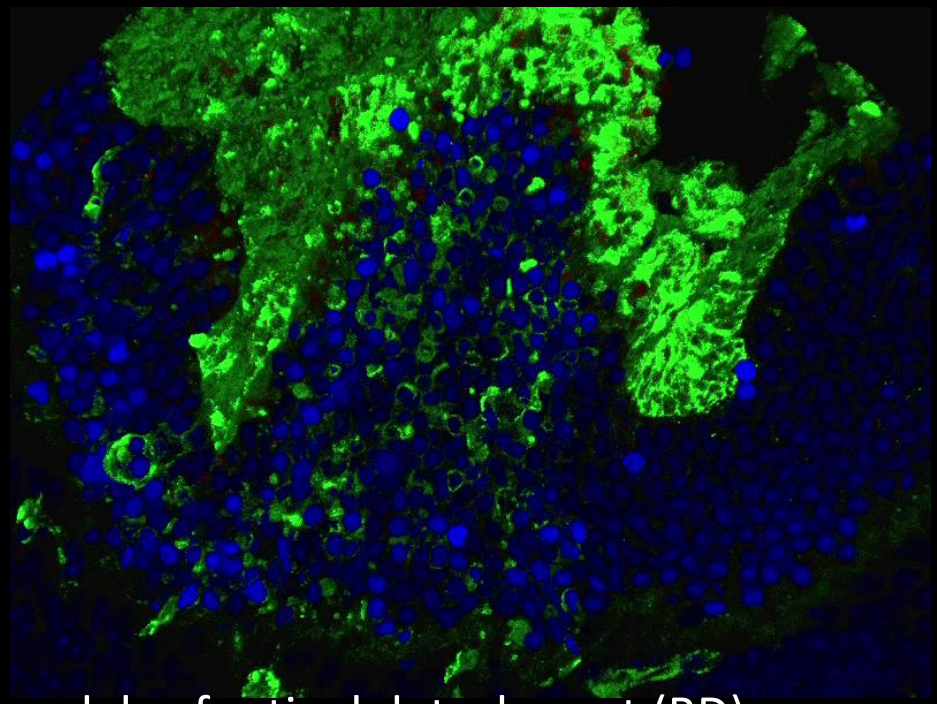
Molecular mechanisms of ocular pigmentation in various eye diseases (uveal melanoma, AMD, toxic retinal injury and retinal detachment).

Ocular Oncology & retina cell biology, Colleen M. Cebulla, MD, PhD



Uveal Melanoma

- What causes uveal melanoma?
  - *BAP1* Tumor Predisposition Syndrome
- The Cancer Genome Atlas Project (TCGA) for Uveal Melanoma
- How can we better treat metastatic disease?
  - Crizotinib adjuvant clinical trial
- Long vs short survivors – why?
  - Genetic and inflammatory mechanisms
- OSU – Ocular Oncology Study Group
- BIG Consortium



Animal models of retinal detachment (RD):

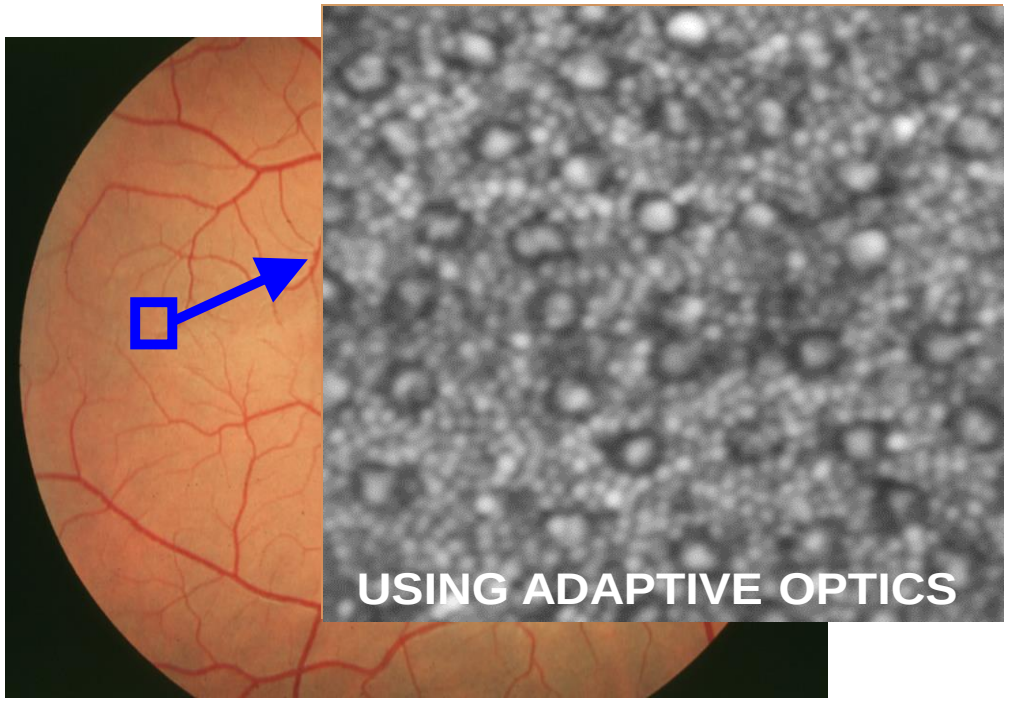
- Mouse & chick
- Inflammatory mechanisms of retinal cell death / scarring
- Targets for therapy (proteins & genes)

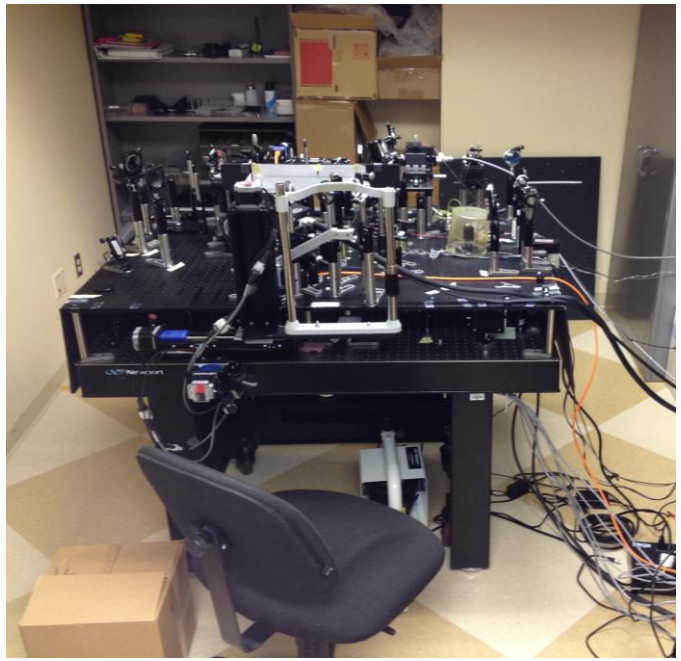
Macrophage migration inhibitory factor (MIF):

- Neuroprotection of photoreceptors & reduces scarring
- MIF gene variations of epiretinal membrane vs proliferative vitreoretinopathy

High Resolution Optical Imaging of the Human Retina

- No dyes or contrast agents
- Pupil dilation / paralyze accommodation only
- Visible imaging wavelengths
- Use Adaptive Optics (AO) to correct for all of the optical distortions in the eye





AO-OCT-SLO in Rm. 5011 Havener

Precision Medicine

PI: Xiaoyi Raymond Gao, PhD

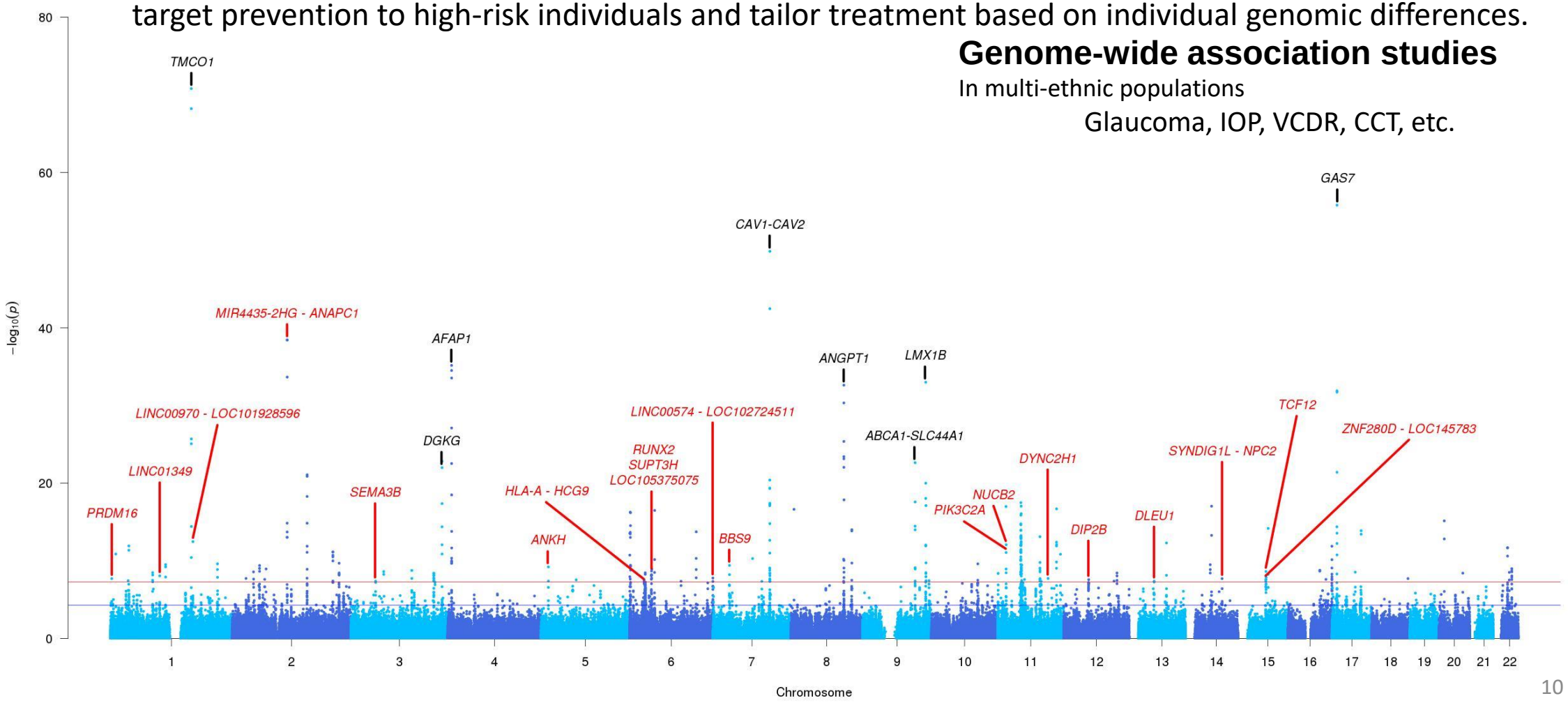
Raymond.Gao@osumc.edu

Our research goals are to advance our understanding of the genetic architecture of complex human diseases / traits, e.g. glaucoma and intraocular pressure, and to improve our ability to predict disease, target prevention to high-risk individuals and tailor treatment based on individual genomic differences.

Genome-wide association studies

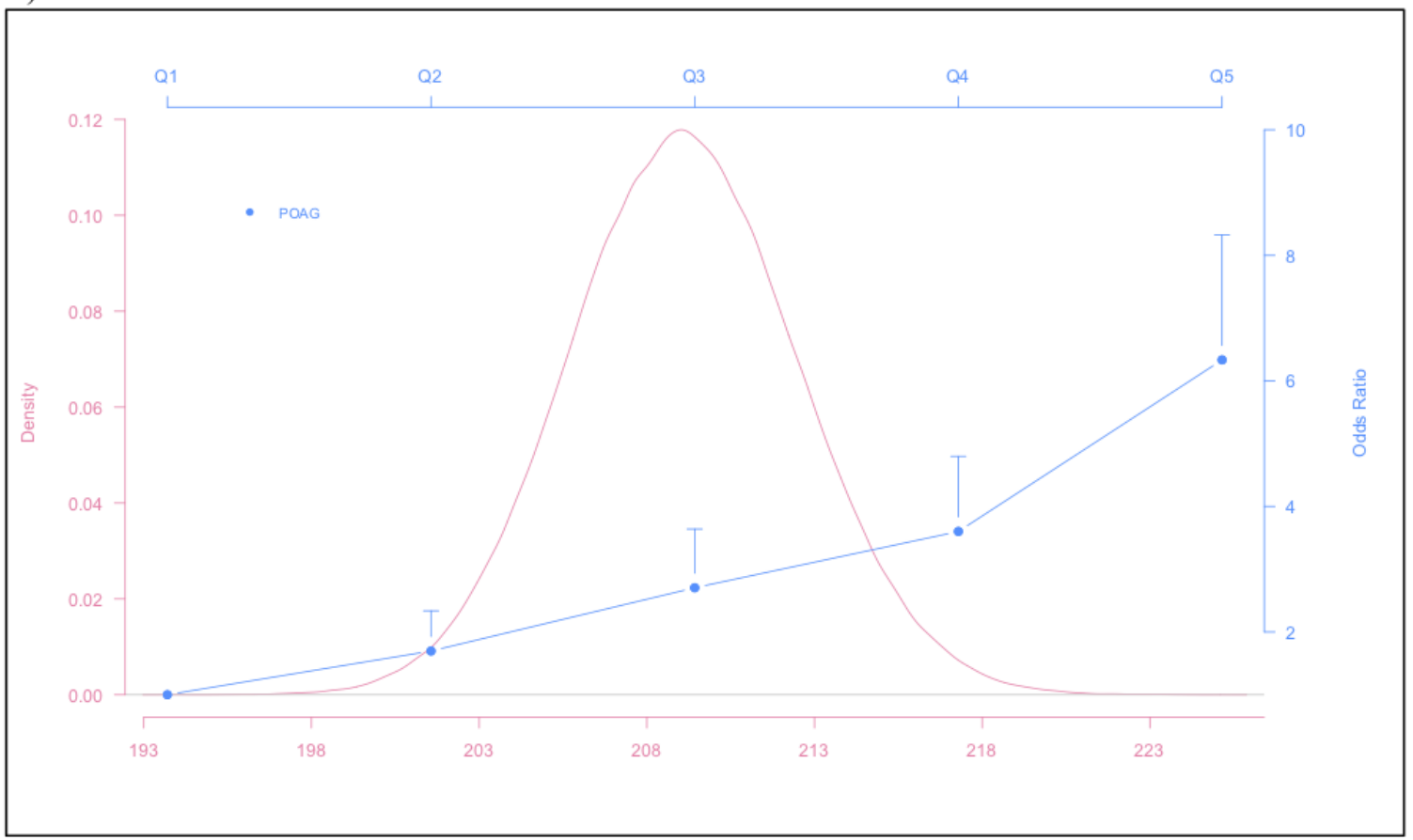
In multi-ethnic populations

Glaucoma, IOP, VCDR, CCT, etc.



Genetic risk prediction

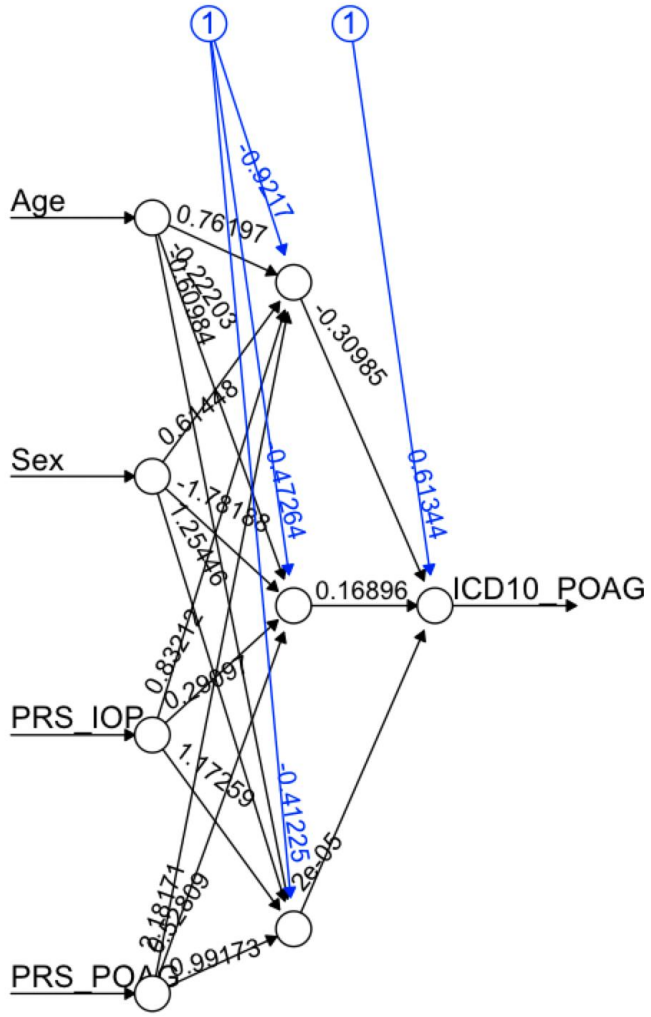
A)



B)

	Q1	Q2	Q3	Q4	Q5
POAG, n (%)	60 (6.70)	100 (11.16)	160 (17.86)	212 (23.66)	364 (40.62)

Machine learning / AI



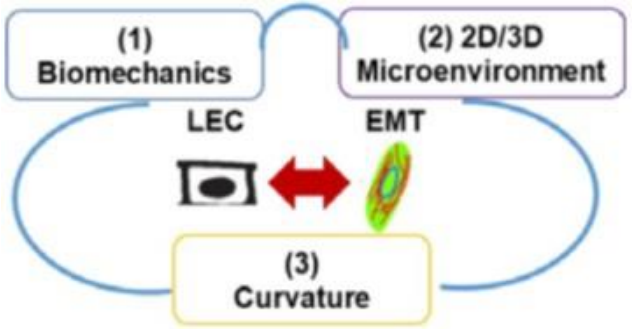
THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

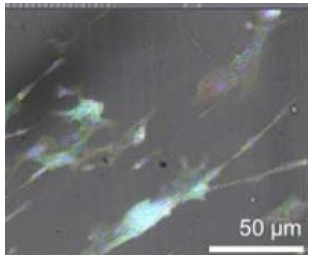
Department of Biomedical Engineering
William G. Lowrie Department of Chemical and Biomolecular Engineering
Department of Ophthalmology and Visual Science

Swindle-Reilly Lab for Biomimetic Polymeric Biomaterials

Ocular Biomaterials Research:

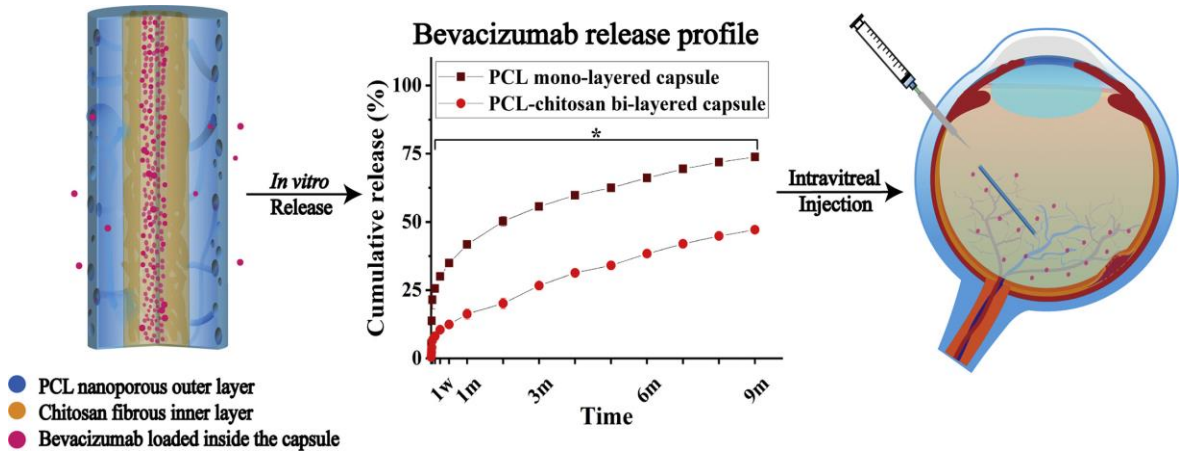
- Age-related vitreous liquefaction
- Injectable hydrogel biomimetic vitreous substitutes
- Controlled release of therapeutic agents to prevent oxidative damage
- Lens epithelial cell (LEC) response to biomaterials
- IOL design to prevent posterior capsule opacification





Ocular Drug Delivery Research:

- Biodegradable injectable implants
- Drug delivery systems for macular degeneration
- Corneal drug delivery
- Treatments for traumatic optic neuropathy



Katelyn Swindle-Reilly, Ph.D.
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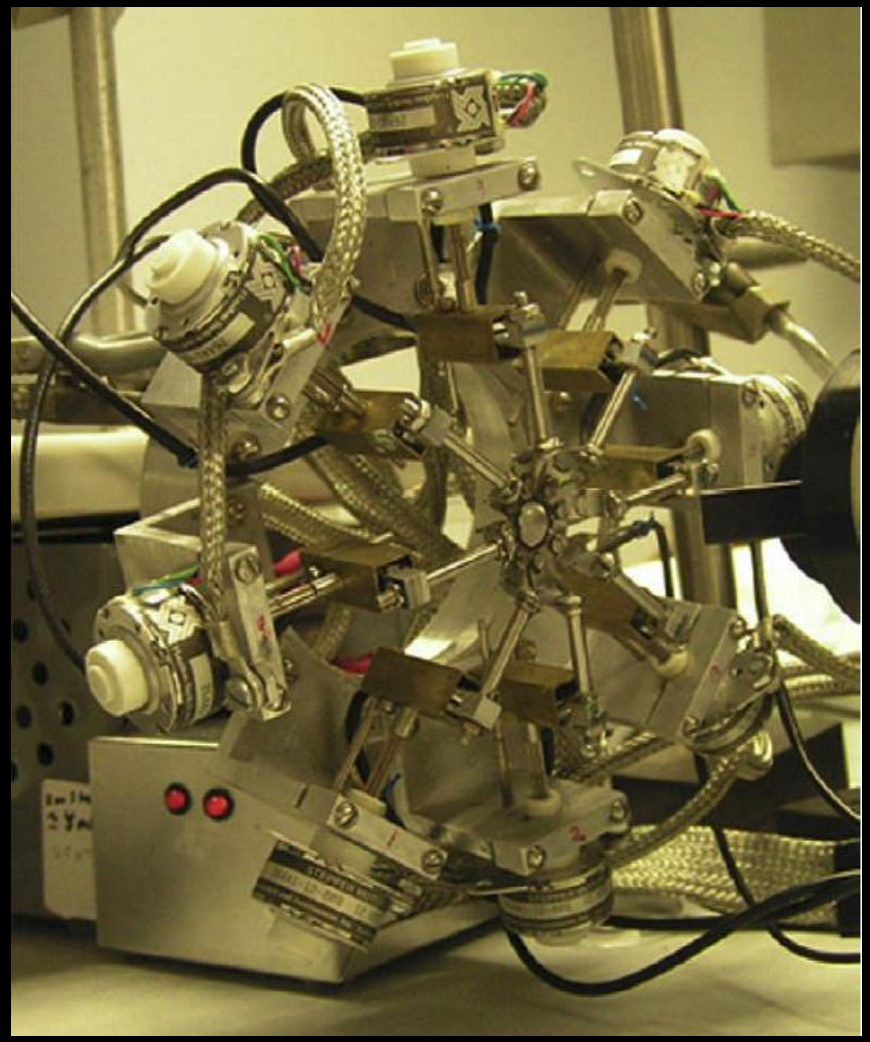
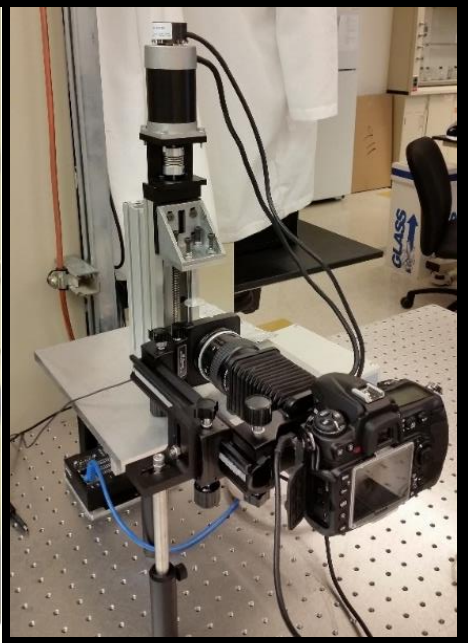
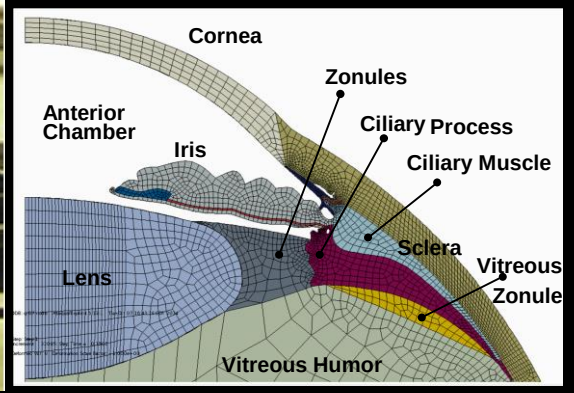
Ocular Aging and Trauma Laboratory

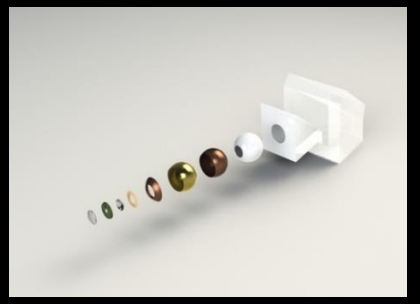
PI: Reilly; Applying engineering principles to prevention, diagnosis, and treatment of visual problems arising from age or trauma

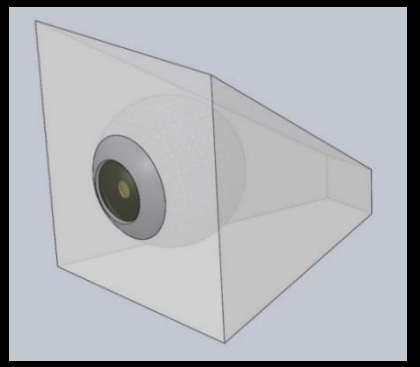
Biomechanics, Mechanobiology, and Biochemistry of the Aging Lens

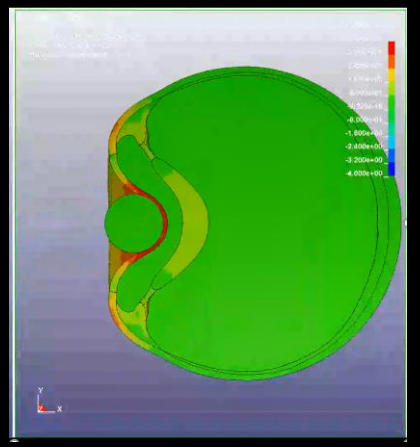










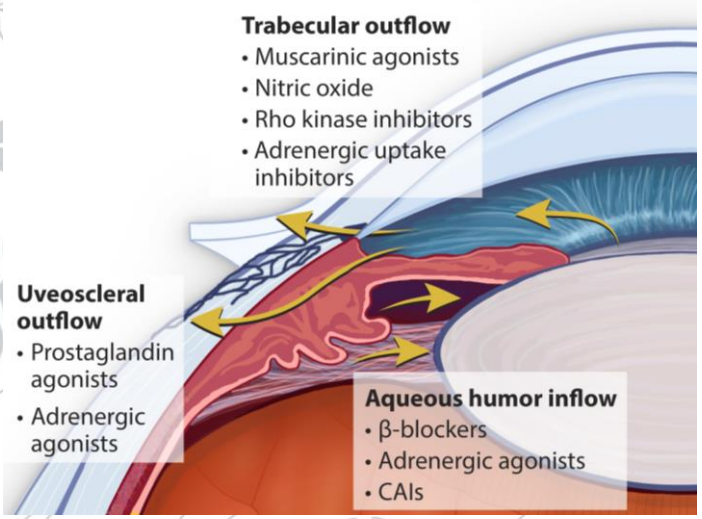


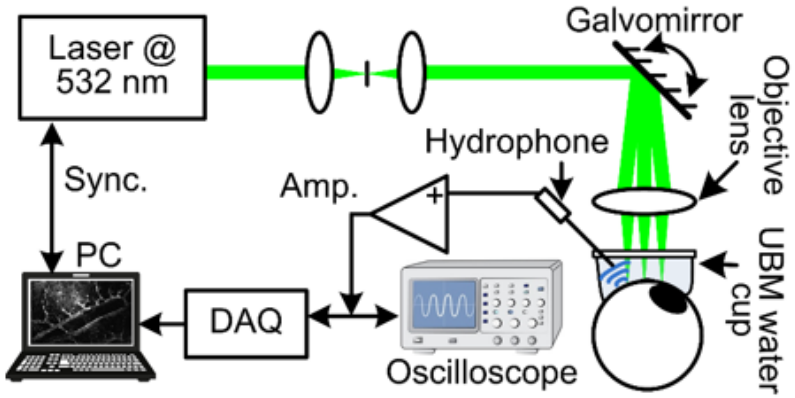
Precision Medicine

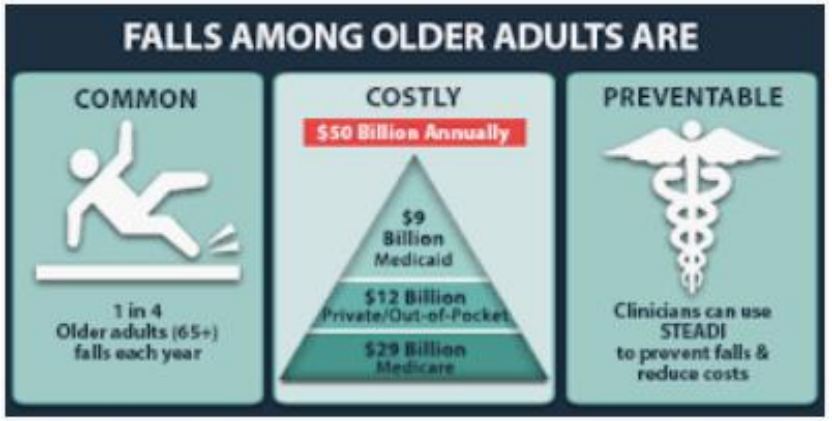
PI: Sayoko Moroi, MD, PhD

Goals:

1) variations in eye pressure and glaucoma drug response (EY022124)
2) gene therapy approaches for the trabecular meshwork (EY025752)
3) the biomechanics of peri-limbal scleral and aqueous veins (NSF 1760291)
4) interplay between vision, fear of falling, and falls in 'SWAN' (EY030363)

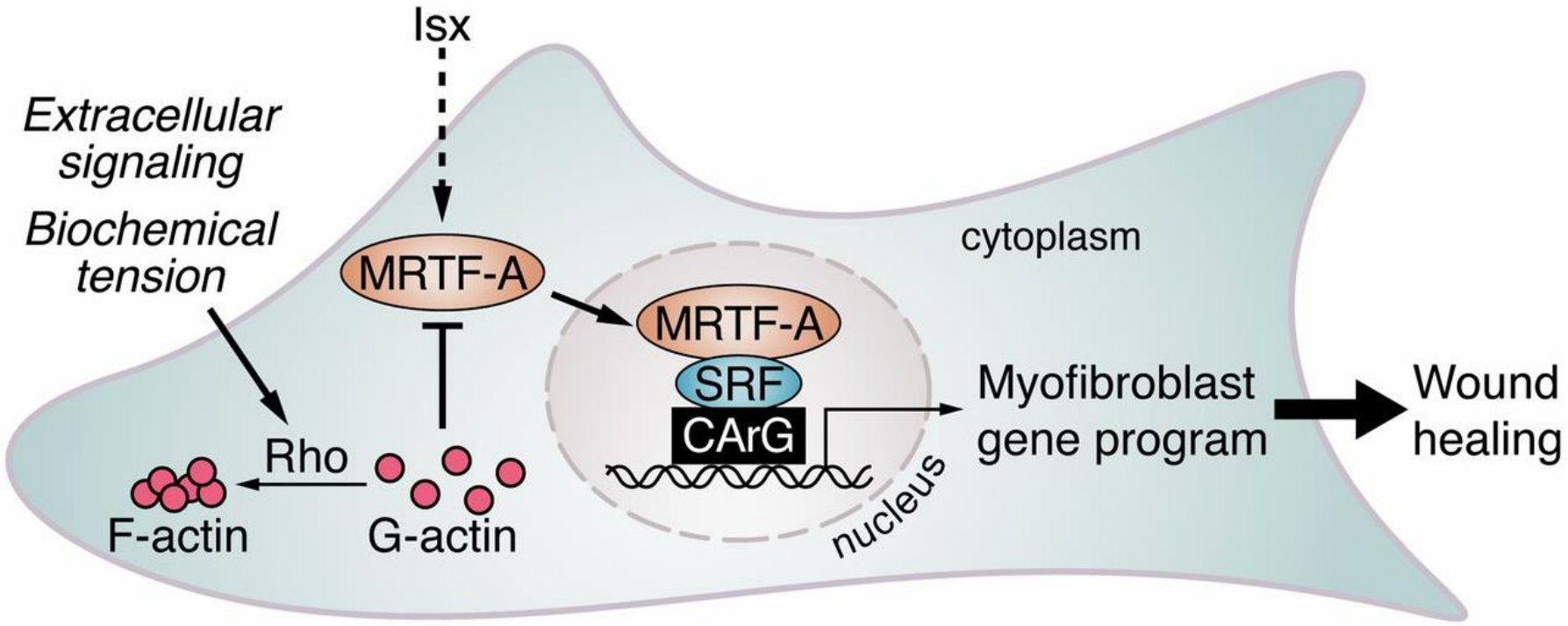




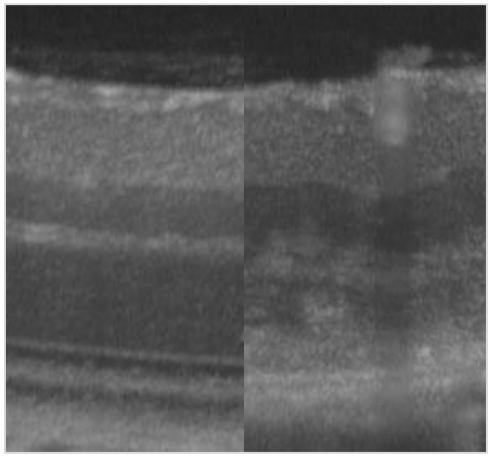
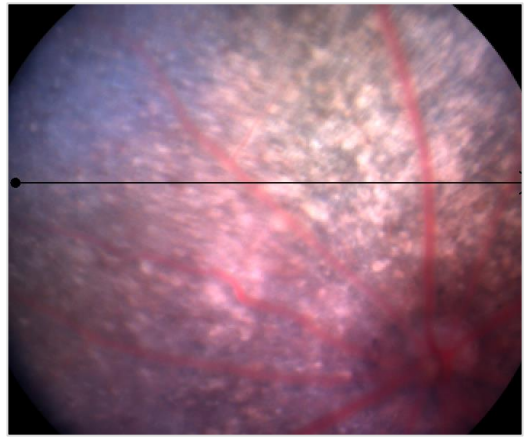


Molecular pathways of retina scarring – Shigeo Tamiya, PhD

- Cell studies on fibroblast cells and myocardin-related transcription factor (MRTF) [cartoon from Velasquez LS et al, PNAS 110:16850, 2013]
- 'Druggable targets' for proliferative vitreoretinopathy

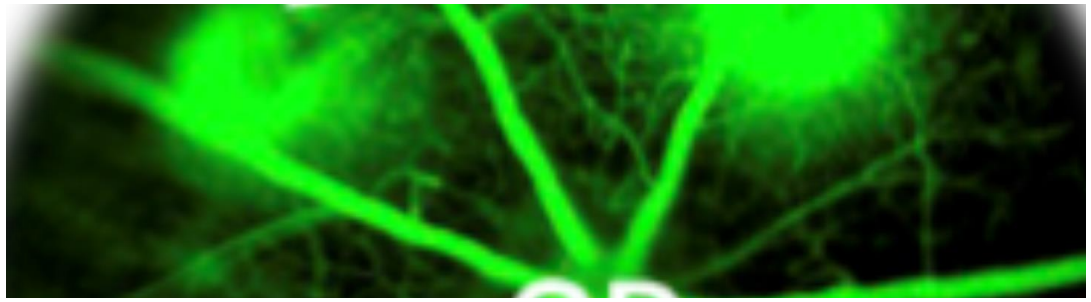


Age-related Macular Degeneration – Nagaraj Kerur, PhD

Innate Immune Pathways:

- Inflammasome
- DNA sensor cGAS
- ‘druggable’ targets NLRP3 & cGAS
- telomerase



Laser model of neovascularization:

- VEGF & telomerase cross talk
- Angiogenesis transcriptome profiling
- ‘druggable’ anti-oligos or small molecules

One of the nation's largest, most collaborative and diverse academic health care centers

$300M
in research funding

3rd
largest cancer hospital

340+
cancer researchers

1.87M
outpatient visits

3rd
largest university in the country

20
research centers

25
core labs

- Harness data
- Analyze data (artificial intelligence/machine learning) BRIDGE2AI
- Break barriers of health disparities
- Prevent blindness

Thank you for your attention