

**BIOGRAPHICAL SKETCH**

Provide the following information for the Senior/key personnel and other significant contributors. Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: ARUN KUMAR KRISHNAN

eRA COMMONS USER NAME (credential, e.g., agency login): akrishnan

POSITION TITLE: Research Fellow, Envision Research Institute

**EDUCATION/TRAINING:**

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Birla Institute of Technology and Science & Elite School of Optometry, Madras, India.	B.S	06/2007	Optometry
University of Houston - College of Optometry, Houston, TX.	Ph.D.	05/2016	Physiological Optics & Vision Science
Envision Research Institute, Wichita, KS & University of California, Berkeley, CA	PostDoctoral	06/2018	Low Vision and Visual Impairment

**A. Personal Statement**

As an early career vision scientist, the primary goals of my research are: a) to understand the relation between the visual function and retinal structure in people with visual impairment; b) to assess the impact of vision loss in activities including reading, facial recognition; c) to develop strategies/methods to utilize the residual vision in people with various levels of visual impairment. I have a broad background in the field of clinical optometry and vision science, which includes optometric practice in pediatric optometry, binocular vision and low vision care clinics. The training that I received during my dissertation research on central vision loss enables me to conduct collaborative research on several issues related to visual impairment. My current research focusses on understanding reading and fixational stability in people with macular degeneration.

**B. Positions and Honors****Positions and Employment**

2007 - 2008 Pediatric Optometrist - Sankara Nethralaya - Madras, India  
 2009 - 2010 Low Vision Care Optometrist - Sankara Nethralaya - Madras, India  
 2010 - 2011 Teaching Assistant in General Anatomy, College of Optometry, UH, Houston, TX  
 2010 - 2016 Teaching Assistant for Optics, College of Optometry, UH, Houston, TX  
 2014 - 2015 Teaching Assistant for Visual Perception, College of Optometry, UH, Houston, TX  
 2010 - 2016 Graduate Researcher, College of Optometry, UH, Houston, TX  
 2016 - Research Fellow, Envision Research Institute, Wichita, KS  
 2016 - Visiting Scholar, University of California, Berkeley, CA

**Awards and Honors**

2007 'Best Out Going Student' of the year (Elite School of Optometry, 19<sup>th</sup> Batch)

2010	Presidential Fellowship – University of Houston, TX
2012	Best Teaching Assistant (TA) Award – College of Optometry. (Joint Winner)
2012-2015	Student Vision Science Grant to advance Research (SVGR, Houston)
2012	Minnie Laura Turner fund for impaired vision research
2013	Fight for sight: Summer student fellowship
2014	AAO-ARVO: Student travel fellowship to attend ARVO meeting 2016 ARVO publications grant.

### **Professional Activities**

2010	‘Qualitative Research Methodology’ Workshop at CMC Vellore, India
2012 -	Member - Association for Research in Vision and Ophthalmology (ARVO)
2012 - 2016	Member - American Academy of Optometry
2015	Participant – Professional Development Program (PDP) – Institute for Scientist and Engineer Educators (ISEE)

## **C. Contribution to Science**

### **1. Enhancing Clinical Care**

Fresnel prisms are widely used in the management of adult strabismus. However, when both horizontal and vertical misalignments exist, the management becomes tricky. As an optometrist, I guided student interns in exploring the novel idea of oblique fitting of Fresnel prisms, which provides a feasible solution to manage both horizontal and vertical strabismus in a single prescription. I was also involved in a retrospective study of factors that predict the prognosis in ocular trauma. This involved inspecting hundreds of clinical records to document the presence of comorbid factors. Although several factors are known to influence prognosis, the effect of time lag was never documented for ocular trauma. We found that ‘time lag’ between the trauma and the first expert visual care foretells prognosis. Both the studies illustrate how clinical vision research can be applied to enhance the patient care.

- a. Ayisha Atiya, Raj Kumar and **Arunkumar. K** (2009) *Oblique Fresnel prism fitting in managing strabismus*. Dr. E. Vaithilingam memorial scientific session, Madras (Poster)
- b. Bipasha Mukherjee, **Arunkumar Krishnan** and Siddhart Srivatsav (2009) *Determinants of prognosis in Ocular Trauma*. ASIA-ARVO, Hyderabad (Poster)

### **2. Visual Impairment: Education and Outreach**

Low vision is an area that is often poorly understood by many clinicians and students. Several misconceptions and controversies exist starting from the very definition of low vision to the use of low vision devices by the blind. Through invited talks and a book chapter, the low vision clinic team educated both the budding and established clinicians and teachers of visually impaired. The book chapter in particular serves as a handbook for the optometry interns.

- a. **Arunkumar. K** (2009) *Low Vision Definitions Revisited: Are we managing the whole or part?* Aravind Eye Hospital, Madurai (Talk)
- b. **Arunkumar. K** (2009) *Role of low vision devices in rehabilitating visually impaired school children*. Little Flower Convent for the Blind, Madras (Talk)
- c. **Arunkumar. K** and Sarika. G (2012) *Low Vision Care*, In: Krishna Kumar. R and Anuradha. N (Eds). *ESO’s Optometry Question Bank (with rational reasoning)*. Chennai. Jaypee Brothers Publication. Pg. 56-67. ISBN: 9350257661 ([Book](#) Chapter)

### **3. Central Vision Loss and Micro-perimetry**

Unlike conventional perimeters, a micro-perimeter can potentially compensate for the fixational eye movements (FEMs) and hence is pivotal for the assessment of central field loss. Although the technique has been widely used in various treatment trials and studies, claims regarding the compensation of FEMs and repeatability of fixation testing were never confirmed. We assessed the validity of such claims and we now know that a commercially available microperimeter (NIDEK MP-1) can reliably compensate the increased FEMs and register retinal image pairs between

initial and follow-up examinations. This enables reliable assessment of fixation, reading and local probing of the preferred retinal locus to better characterize the central field loss.

- a. **Arunkumar Krishnan** and Harold E Bedell (2013) *Compensation of fixational stability by the NIDEK MP-1 micro-perimeter*. Invest Ophthalmol Vis Sci.; 54: E-Abstract 5035. ([Poster](#))
- b. **Arunkumar Krishnan**, Nimesh B Patel, Scott B Stevenson and Harold E Bedell (2014) *Registration accuracy of NIDEK-MP1 micro-perimeter in 'follow-up' testing*. Invest Ophthalmol Vis Sci.; 55: E-Abstract 6113. ([Poster](#))
- c. **Arunkumar Krishnan** and Harold E Bedell (2015) *Comparing reading performance in central field loss using MNREAD charts and the MP-1 micro-perimeter*. Optom Vis Sci.; 92: E-abstract 155260. ([Poster](#))
- d. Bedell HE, Pratt JD, **Krishnan A** et al. (2015) *Repeatability of NIDEK MP-1 fixation measurements in patients with bilateral central field loss*. Invest Ophthalmol Vis Sci.; 56(4), 2624-30. ([Article](#))

#### 4. Local Changes at Preferred Retinal Locus (PRL) and its Impact

The retinal region used by people with central vision loss, for day-to-day visual tasks like word-fixation, reading or facial recognition is generally believed to be relatively healthy, as it is usually outside the region of central retinal atrophy. Surprisingly this region never has been probed in detail. We determined that the word-fixation PRL can exhibit local functional losses in sensitivity (micro-scotomas), which together with reduced contrast sensitivity can impair reading performance. Our findings provide a clue to understanding the impaired reading in central vision loss. We propose that screening the PRL for local sensitivity changes can be incorporated into the eccentric viewing training to better rehabilitate millions of individuals with central vision loss.

- a. **Arunkumar Krishnan** and Harold E Bedell (2014) *Sensitivity around the word-fixation PRL in subjects with bilateral central field loss*. Optom Vis Sci.; 91: E-abstract 145066. ([Poster](#))
- b. **Arunkumar Krishnan**, Hope M Queener and Harold E Bedell (2015) *Impact of simulated micro-scotomas on foveal and non-foveal RSVP reading speed*. Invest Ophthalmol Vis Sci.; 56: E-Abstract 2619. ([Talk](#))
- c. **Arunkumar Krishnan**, Nimesh B Patel, and Harold E Bedell (2016) *Relating structural and functional changes at the preferred retinal locus in macular degeneration*. Invest Ophthalmol Vis Sci.; 57: E-Abstract 6100. (Talk)
- d. **Arunkumar Krishnan** and Harold E Bedell (2016) *Functional changes at the preferred retinal locus and reading in central field loss*. Envision Conference, Denver, CO (2016). (Talk)

**\*complete list of published work available on Google Scholar**

#### **D. Research Support**

##### **Ongoing Research Support**

Metric for Fixational Stability

06/2016 – 06/2017

##### **Envision Research Fellowship**

The study aims to develop a metric for quantifying fixational stability in the presence of varying factors such as assessment duration, sampling rate and number of data points. Role: PI

Functional Changes at the Preferred Retinal Locus for Reading

06/2016 – 06/2017 **Envision**

##### **Research Fellowship**

The study aims to assess the people with central field loss and probe the retinal region used for reading, for local functional changes.

Role: PI

Fixational Eye Movements and Defocus

06/2016 – 06/2017

### **Envision Research Fellowship**

The study will simulate varying levels of defocus in subjects with normal vision and assess its impact on fixational eye movements using a micro-perimeter and an eye tracker. Role: PI

### **Completed Research Support**

Characterizing the Functional Changes at Preferred Retinal Locus

07/2013 – 09/2013

### **Fight For Sight (FFS) – Summer Student Fellowship (\$2100)**

The word-fixation PRL of people with bilateral central field loss was probed for local functional changes in retinal sensitivity.

Role: PI

Relationship between micro-scotomas and retinal structure around the preferred retinal locus in patients with bilateral central field loss.

05/2013 – 12/2013

### **University of Houston College of Optometry – Student Vision Science Grants to advance Research**

The study related the local functional changes (micro-scotomas) at the PRL to the retinal structure assessed using a spectral domain optical coherence tomography.

Role: PI

Simulated micro-scotomas and their impact on word recognition and reading speed in normal peripheral retina.

05/2014 – 12/2014

### **University of Houston College of Optometry – Student Vision Science Grants to advance Research**

The study assessed the rapid serial visual presentation (RSVP) reading speed with simulated micro-scotomas in the peripheral retina of younger and older subjects with normal vision. Role: PI

Impact of simulated micro-scotomas and contrast on the RSVP reading speed 05/2015 – 12/2015

### **University of Houston College of Optometry – Student Vision Science Grants to advance Research**

The study was an extension of the simulation study mentioned above, where in we investigated the impact of reduced contrast and micro-scotomas on the RSVP reading speed. A linear mixed model was used to predict the impact of age, contrast, retinal eccentricity and extent of micro-scotoma.

Role: PI