



RESEARCH AND DEVELOPMENT PROGRAM

INVESTIGATOR'S BIOGRAPHICAL SKETCH
(Not to Exceed Four Pages)

NAME Randy H. Kardon M.D. Ph.D.	POSITION TITLE Professor of Ophthalmology
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EDUCATION / TRAINING

(Begin with Baccalaureate or other initial professional education, such as nursing, and include post-doctoral training. Do not include Honorary Degree.)

NAME, LOCATION OF INSTITUTION	DEGREE (if applicable)	YEAR AWARDED	FIELD OF STUDY
University of Iowa, Iowa City, Iowa	B.S	1975	General Science
University of Iowa, Iowa City, Iowa	M.D./Ph.D.	1982	Pharmacology
Gunderson Clinic and Lutheran Hospital, La Crosse, WI	Internship	1983	Internal Medicine
University of Iowa, Iowa City, Iowa	Fellowship-Research	1984	Ocular Blood Flow
University of Iowa, Iowa City, Iowa	Residency-Clinical	1987	Ophthalmology
University of Iowa, Iowa City, Iowa	Fellowship-Clinical	1989	Neuro-ophthalmology

NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-pages.

A. Positions and Honors

(List in chronological order previous positions, concluding with your present position. List any honors, professional memberships or present membership on any Federal Government public advisory committee.)

Positions and Employment:

- 1989 – 1994 Assistant Professor of Ophthalmology, University of Iowa College of Medicine, Iowa City, IA
- 1989 – Present Staff, Ophthalmology, Surgery Division, Veterans Administration Medical Center, Iowa City, IA
- 1990 – 1999 Research Associate, Career Development Award, Veterans Administration Medical Center, Iowa City, IA
- 1994 – 2004 Associate Professor of Ophthalmology, University of Iowa, College of Medicine, Iowa City, IA
- 2002 – Present Director of Neuro-ophthalmology, Department of Ophthalmology
- 2004 – Present Professor with Tenure of Ophthalmology, University of Iowa College of Medicine, Iowa City, IA

Other Experience and Professional Memberships:

- 1983 – Present Member, Association for Research and Vision in Ophthalmology (ARVO)
- 1988 – Present Fellow, American Academy of Ophthalmology (AAO)
- 1993 – Present Fellow North American Neuro-ophthalmology Society
- 1990 – Present Member, International Perimetric Society
- 1995 – 1999 Fight For Sight Fellowship Grant Review Committee
- 1997 – Present Editorial Board, Journal of Clinical Neuro-ophthalmology
- 1999 – Present Chairman, Scientific Review Committee for Fight For Sight Grant Program
- 2001 – Present Reviewer for Neuroscience VA Merit Review Grant committee and Rehab Research and Development
- 2006 – Present NEI Grant Review Committee
- 2007 – 2008 Chair, VA Merit Grant Review Committee (Rehabilitation Division)
- 2008 – Present Editorial Board, Archives of Ophthalmology

Honors:

- 1975 Phi Beta Kappa; B.S. Degree with Honors and High Distinction
- 1990 – 1999 Recipient of Career Development Award (VAMC)
- 1993 – Present Listed in The Best Doctors in America
- 1994 Recipient of Carver Trust Fund Research Seed Grant (\$14,000)
- 1994 Recipient of Research to Prevent Blindness James S. Adams Scholar Award (\$30,000)
- 1994 Recipient of University of Iowa College of Medicine Collegiate Teaching Award (\$3,000)
- 1997 – 1998 Recipient of Research to Prevent Blindness Lew R. Wasserman Scholar Award (\$50,000)
- 2006 Senior Honor Award, American Academy of Ophthalmology
- 2007 Awarded the Pomerantz Family Chair in Ophthalmology
- 2010 Association for Research in Vision and Ophthalmology (ARVO) Fellow Award

B. Selected peer-reviewed publications (in chronological order)

(Do not include publications submitted or in preparation)

- 1:** Haeker M, Abramoff M, **Kardon R**, Sonka M. Segmentation of the surfaces of the retinal layer from OCT images. *Med Image Comput Comput Assist Interv.* 2006;9(Pt 1):800-7. PubMed PMID: 17354964.
- 2:** Haeker M, Wu X, Abramoff M, **Kardon R**, Sonka M. Incorporation of regional information in optimal 3-D graph search with application for intraretinal layer segmentation of optical coherence tomography images. *Inf Process Med Imaging.* 2007;20:607-18. PubMed PMID: 17633733.
- 3:** Hood DC, Anderson SC, Wall M, **Kardon RH**. Structure versus function in glaucoma: an application of a linear model. *Invest Ophthalmol Vis Sci.* 2007 Aug;48(8):3662-8. PubMed PMID: 17652736.
- 4:** Hood DC, Anderson S, Rouleau J, Wenick AS, Grover LK, Behrens MM, Odel JG, Lee AG, **Kardon RH**. Retinal nerve fiber structure versus visual field function in patients with ischemic optic neuropathy. A test of a linear model. *Ophthalmology.* 2008 May;115(5):904-10. Epub 2007 Sep 17. PubMed PMID: 17870170.
- 5:** Hood DC, **Kardon RH**. A framework for comparing structural and functional measures of glaucomatous damage. *Prog Retin Eye Res.* 2007 Nov;26(6):688-710. Epub 2007 Aug 21. Review. PubMed PMID: 17889587; PubMed Central PMCID: PMC2110881.
- 6:** Kawasaki A, **Kardon RH**. Intrinsically photosensitive retinal ganglion cells. *J Neuroophthalmol.* 2007 Sep;27(3):195-204. Review. PubMed PMID: 17895821.
- 7:** Grozdanic SD, Matic M, Sakaguchi DS, **Kardon RH**. Evaluation of retinal status using chromatic pupil light reflex activity in healthy and diseased canine eyes. *Invest Ophthalmol Vis Sci.* 2007 Nov;48(11):5178-83. PubMed PMID: 17962471.
- 8:** Grozdanic SD, Matic M, Betts DM, Sakaguchi DS, **Kardon RH**. Recovery of canine retina and optic nerve function after acute elevation of intraocular pressure: implications for canine glaucoma treatment. *Vet Ophthalmol.* 2007 Nov-Dec;10 Suppl 1:101-7. PubMed PMID: 17973841.
- 9:** Haeker M, Abramoff MD, Wu X, **Kardon R**, Sonka M. Use of varying constraints in optimal 3-D graph search for segmentation of macular optical coherence tomography images. *Med Image Comput Comput Assist Interv.* 2007;10(Pt 1):244-51. PubMed PMID:18051065.
- 10:** Costello F, Hodge W, Pan YI, Eggenberger E, Coupland S, **Kardon RH**. Tracking retinal nerve fiber layer loss after optic neuritis: a prospective study using optical coherence tomography. *Mult Scler.* 2008 Aug;14(7):893-905. Epub 2008 Jun 23. PubMed PMID: 18573837.
- 11:** Garvin MK, Abramoff MD, **Kardon R**, Russell SR, Wu X, Sonka M. Intraretinal layer segmentation of macular optical coherence tomography images using optimal 3-D graph search. *IEEE Trans Med Imaging.* 2008 Oct;27(10):1495-505. PubMed PMID: 18815101; PubMed Central PMCID: PMC2614384.
- 12:** Costello F, Hodge W, Pan YI, Metz L, **Kardon RH**. Retinal nerve fiber layer and future risk of multiple sclerosis. *Can J Neurol Sci.* 2008 Sep;35(4):482-7. PubMed PMID: 18973066.
- 13:** Ostojić J, Grozdanić SD, Syed NA, Hargrove MS, Trent JT 3rd, Kuehn MH, Kwon YH, **Kardon RH**, Sakaguchi DS. Patterns of distribution of oxygen-binding globins, neuroglobin and cytoglobin in human retina. *Arch Ophthalmol.* 2008 Nov;126(11):1530-6. PubMed PMID: 19001220.
- 14:** Schallek J, **Kardon R**, Kwon Y, Abramoff M, Soliz P, Ts'o D. Stimulus-evoked intrinsic optical signals in the retina: pharmacologic dissection reveals outer retinal origins. *Invest Ophthalmol Vis Sci.* 2009 Oct;50(10):4873-80. Epub 2009 May 6. PubMed PMID: 19420331.
- 15:** Schallek J, Li H, **Kardon R**, Kwon Y, Abramoff M, Soliz P, Ts'o D. Stimulus-evoked intrinsic optical signals in the retina: spatial and temporal characteristics. *Invest Ophthalmol Vis Sci.* 2009 Oct;50(10):4865-72. Epub 2009 May 6. PubMed PMID: 19420337.
- 16:** Hood DC, Anderson SC, Wall M, Raza AS, **Kardon RH**. A test of a linear model of

glaucomatous structure-function loss reveals sources of variability in retinal nerve fiber and visual field measurements. Invest Ophthalmol Vis Sci. 2009 Sep;50(9):4254-66. Epub 2009 May 14. PubMed PMID: 19443710.

17: Kardon R, Anderson SC, Damarjian TG, Grace EM, Stone E, Kawasaki A. Chromatic pupil responses: preferential activation of the melanopsin-mediated versus outer photoreceptor-mediated pupil light reflex. Ophthalmology. 2009 Aug;116(8):1564-73. Epub 2009 Jun 5. PubMed PMID: 19501408.

18: Wall M, Johnson CA, **Kardon RH**, Crabb DP. Use of a continuous probability scale to display visual field damage. Arch Ophthalmol. 2009 Jun;127(6):749-56. PubMed PMID: 19506193.

19: Grozdanic SD, Kecova H, Harper MM, Nilaweera W, Kuehn MH, **Kardon RH**. Functional and structural changes in a canine model of hereditary primary angle-closure glaucoma. Invest Ophthalmol Vis Sci. 2010 Jan;51(1):255-63. Epub 2009 Aug 6. PubMed PMID: 19661222.

20: Ts'o D, Schallek J, Kwon Y, **Kardon R**, Abramoff M, Soliz P. Noninvasive functional imaging of the retina reveals outer retinal and hemodynamic intrinsic optical signal origins. Jpn J Ophthalmol. 2009 Jul;53(4):334-44. Epub 2009 Sep 8. Review. PubMed PMID: 19763750.

21: Kawasaki A, Miller NR, **Kardon R**. Pupillographic investigation of the relative afferent pupillary defect associated with a midbrain lesion. Ophthalmology. 2010 Jan;117(1):175-9. PubMed PMID: 19923003.

22: Grozdanic SD, Lazic T, Kuehn MH, Harper MM, **Kardon RH**, Kwon YH, Lavik EB, Sakaguchi DS. Exogenous modulation of intrinsic optic nerve neuroprotective activity. Graefes Arch Clin Exp Ophthalmol. 2010 Mar 13. [Epub ahead of print] PubMed PMID: 20229104.

C. Research Support

List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.

Current Support

2009-2014 Department of Veterans Affairs Center of Excellence for “The Prevention and Treatment of Visual Loss”. Role: Principle Investigator and Director of Center Goal is to direct scientists and clinicians in a research program directed towards diagnosis and treatment of visual manifestations of traumatic brain injury (TBI), development of imaging tools to further telemedical diagnosis of retinal and optic nerve diseases using computerized image analysis and low cost portable eye cameras, and to test the use of neurotrophic growth factors and neuro-protectants in the prevention and reversal of vision loss from optic nerve disorders..

2009-2012 1R01EY018853-01A2 NIH (NEI) “Focal Structure-Function Relationships in Macular Layers from 3D Spectral OCT” Role: Co-PI. Goal is to develop computerized image analysis tools to relate the structure and function in layers of the retina using automated computerized segmentation of retinal layers in volume optical coherence tomography of the macula in human retina.

2008-2011 Veterans Administration Rehab Grant “Rehabilitation of Glaucoma Using Computer-Analyzed Eye Images”. Role: PI. This study’s goal is to show that automated computerized feature analysis of the human optic nerve photographed digitally can be used to detect glaucoma and stage it, validated by comparison with visual field deficits and optical coherence tomography of the retinal nerve fiber layer for telemedical application.

2010-20012 National Eye Institute (NEI) Subcontract R009040554 “Optical Coherence Tomography (OCT) Substudy for Idiopathic Intracranial Hypertension Treatment Trial (IIHTT). Role: Co-investigator. Goal is to demonstrate levels of alteration in retina and optic nerve due to papilledema.

2010-2013 DOD Vision Research Program VRP09 “Objective Methods To Test Visual Dysfunction in the Presence of Cognitive Impairment” Role: PI. Goals are to develop objective tests of vision for testing of cognitively impaired patients, with special reference to traumatic brain injured patients. The three objective modalities of visual testing to be

measured are a) pupil light reflexes (to focal and diffuse light), b) evoked potentials to focal and diffuse light elicited from the retina and visual cortex, and c) eye position correlated with moving visual targets varying in spatial properties.

2010-2014 Department of Veterans Affairs Rehabilitation Division grant application, “Novel Treatment Modalities for Hemorrhage in Traumatic Blast Injury” Role: Co-PI The overall research objectives are to thoroughly characterize effects of blast injury on the function of brain and visual system, and evaluate the efficacy of novel polymer-based synthetic platelet aggregators administration on reduction of blast-induced hemorrhage and neurological deficits

2010-2113 Veterans Administration Rehab Grant “Cholinergic Drugs For Reversal Of Visual Deficits In Glaucoma” Role: PI. Goal is to show that topical and systemic cholinergic agents reduce optic nerve damage and in some cases, reverse it in a dog form of inherited progressive glaucoma.

2007-2010 Veterans Administration Rehab Grant “Growth Factor Treatment of Visual Loss in Comprehensive Optic Nerve Injury” Role: PI. The major goal is to use a model of compressive optic neuropathy that we developed in canines (saline-inflatable orbital implant) to test the effectiveness of slow release intravitreal nerve growth factors in preventing permanent functional and structural visual loss.

2010-2013 Veterans Administration Career Development Award for Mathew Harper Ph.D.; Characterization of a Novel Model of Traumatic Brain Injury. Role: Primary Mentor for Mathew Harper. This Career Development Award for Mathew Harper focuses on a mouse model of traumatic blast injury to the brain and visual system and its treatment with neurotrophic growth factors delivered by engineered stem cells that produce BDNF and take up residence in the eye.

2008-2011 Department of Defense (DOD) Peer Reviewed Medical Research Program (PRMRP PR064674) “Treatment of Laser-Induced Retinal Injury and Visual Loss Using Sustained Release of Intra-vitreous Neurotrophic Growth Factors” Role: PI. This study’s goal is to test the effectiveness of sustained release intravitreal growth factors in limiting the amount of retinal damage after laser burns to the retina in a dog model of damage. There is no budgetary, scientific or committed effort overlap

2010-2012 University of Iowa Carver Collaborative Pilot Grant, “Is the Neuropeptide CGRP involved in the pathogenesis of Photophobia in Traumatic Brain Injury?” Role: Co-PI. Goal is to show an increase in salivary CGRP and amylase in photophobic patients in response to light stimuli compared to non-photophobic control subjects.

Pending Support:

2011-2016 National Eye Institute (NEI) Subcontract as a part of R01 application by Don Hood (PI), “Studying Models and Mechanisms of Diseases of the Optic Nerve”

Role: Co-investigator Goals are to better understand glaucomatous damage in the macular region in the context of a proposed anatomical framework that includes arcuate bundles. Also, the relationship between local macular damage to retinal ganglion cells and their corresponding loss of visual sensitivity will be modeled and tested and compared to structure-function relationships of the retinal nerve fiber layer. A linear structure-function model will be applied towards improving the ability to detect glaucomatous damage and its progression and to understand how different clinical tests can be better utilized and interpreted.

D. Time and Effort Statement

Indicate percentage of time spent on research, clinical, teaching/mentoring, and administration. List persons mentored in last 3 years and type of mentoring awards.

Research: 50%

Clinical: 40%

Teaching/Mentoring: 5%

Administration: 5%

Persons mentored in last 3 years:

2006-2007 Reid Longmuir, MD (Neuro-ophthalmology Fellow)

2006-2007 Jacinthe Rouleau, MD (Neuro-ophthalmology Fellow)

2007-2008 Nathan Troy Tagg, MD (Neuro-ophthalmology Fellow)

2007-2008 Colin Scott, MD (Neuro-ophthalmology Fellow)

2007-2008 Michael Johnson, MD (Neuro-ophthalmology Fellow)

2008-2009 Fabiana Policeni, MD (Neuro-ophthalmology Fellow)
2008-2009 Mansoor, Mughal, MD (Neuro-ophthalmology Fellow)
2007-present Mathew Harper Ph.D. (VA Research Scientist, new CDA)
2009-2010 Yinjun Chen M.D. Ph.D. (Neuro-ophthalmology Fellow)