Application

01962 - The GEM Challenge 2015

02047 - GEM Challenge - Phase I Application: Intraocular Pressure Sensor

Collaborative awards with IEM

Status:	Submitted
Submitted Date:	11/21/2014 10:34 AM

Primary Contact

First Name*	Robert First Name	N Middle Name	Weinreb Last Name	
Degree	MD			
Faculty Rank*	Full Professor			Faculty Rank - Other
Email:	rweinreb@ucsd.edu			
eRA Commons Name	WEINREB			
Area of Specialty	Ophthalmology			

*(If you are not currently a CTRI member, please fill out a membership application by **clicking here.**)*

Are you a CTRI member?	*Yes*			
Address:	*9500 Gilman Drive* *MC 0946*			
*	*La Jolla* *City*	*92093* *Postal Code/Zip*	*California* *State/Province*	
Fax:				
Phone:*	*858-534-8824* *Phone*			*Ext.*

Organization Information

Name:	*UCSD*

Instructions for Individuals registering for WebGrants access*: The organization name should be your affiliated organization, i.e. UCSD, SDSU, etc.*

Organization Type:	*University*
Phone:	*858-657-5165*
Ext.	
Fax:	

Information

PI Name (Last Name, First Name)	*Weinreb, Robert*
CO-PI Name (Last name, First name)	
Project Title	*GEM Challenge - Phase I Application: Intraocular Pressure Sensor*
PI Contact information - include email and campus phone number	*Robert N. Weinreb, MD* *rweinreb@ucsd.edu* *858-534-8824*

PI Biosketch

File Name	Description	File Size
Weinreb_GEM_Nov2014.doc	*Robert N. Weinreb MD biosketch*	

Narrative

File Name	Description	File Size
GEM Project Proposal final.docx	*GEM Project Proposal*	

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Robert N. Weinreb, MD	Chairman and Distinguished Professor of Ophthalmology
eRA COMMONS USER NAME (credential, e.g., agency login) WEINREB	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Massachusetts Institute of Technology	S.B.	1971	Electrical Engineering
Harvard Medical School	M.D.	1975	Medicine

NOTE: The Biographical Sketch may not exceed four pages. Follow the formats and instructions below.

A. Positions and Honors

Positions and Employment

1966-1971 Massachusetts Institute of Technology.
1971-1975 Harvard Medical School.
1977-1982 Postdoctoral Fellow in Ophthalmology. Resident in Ophthalmology, and Fellow in Glaucoma, University of California, San Francisco.
1984-2005 Professor of Ophthalmology, University of California, San Diego.
2005-present Distinguished Professor of Ophthalmology and Director, Hamilton Glaucoma Center, University of California, San Diego.
2011-present Chairman Department of Ophthalmology, University of California, San Diego
2014-present Distinguished Professor of Bioengineering (Affiliated), University of California, San Diego

Other Positions

National Eye Institute: Member, Vis A Study Section (1989-1990); Vis A Conflict Review Section (2009); Vis A Special Study Section (1992-1995, 2001, 2003); Ad hoc member, Vis A (1991, 1997, 1998, 2003-2005, 2011), Vis C Study Section (1993), MERIT Reviews (1994); Challenge Grant Review Panel (2009); NEI Panel for 5 years strategic plan (2010-2012)

Selected Honors and Awards (Abbreviated for this C.V.)

1971 National Science Foundation Fellowship. Sigma Xi, Tau Beta Pi and Eta Kappa Nu honor societies
1971-1975 National Scholar, Harvard Medical School
1975 President, Boylston Medical Society - Harvard Medical School
1984 Alcon Research Institute Award for Outstanding Contributions to Research in Visual Sciences
1992 Alcon Research Institute Award for Outstanding Contributions to Research in Visual Sciences
1997 Heed Ophthalmic Foundation Award
1998-2003 ARVO Glaucoma Trustee and Board of Trustees
2002-2003 President, Association for Research in Vision and Ophthalmology (ARVO)
2003 Research to Prevent Blindness Physician-Scientist Award
2004-2006 President, World Glaucoma Association (WGA)
2007-present Co-Chair, NEI-FDA panel on Glaucoma Clinical Endpoints
2007-2009 President, American Glaucoma Society (AGS)
2009 Moecyr E. Alvaro Medal, Universidade Federal de Sao Paulo, Brazil
2010 American Academy of Ophthalmology, Lifetime Achievement Award

2010 Watson Medal, Cambridge University, presented at the XL Cambridge Symposium, Cambridge, England
2010 Lifetime Achievement Award for contributions to Ophthalmology, American Academy of Ophthalmology
2012 President, American Glaucoma Society Foundation
2013 President, Pan American Glaucoma Society

Current Editorial Board Appointments

- Investigative Ophthalmology and Visual Science
- Journal of Glaucoma (Co-Editor)
- International Glaucoma Review (Chief Editor)
- Survey of Ophthalmology (Current Research Section Editor)
- Graefe's Archive for Clinical and Exp. Ophthalmology (Co-Editor)
- Current Eye Research
- Canadian Journal of Ophthalmology

B. Selected Peer-reviewed Publications

Books (from 24 total)

1. Weinreb RN, Liebmann J, Goldberg I, Susanna R, Araie M (eds). Medical Treatment of Glaucoma. Amsterdam: Kugler Publications. 2010.
2. Weinreb RN, Garway-Heath D, Leung C, Crowston J, Medeiros FA (eds). Progression of Glaucoma. Amsterdam: Kugler Publications. 2011.
3. Weinreb RN, Grajewski A, Papadopoulos M, Grigg J, Freedman S (eds). Childhood Glaucoma. Amsterdam: Kugler Publications. 2013.

Selected Peer Reviewed Publications (from 1353 total)

h-impact factor = 91
#1 in Ophthalmology
#1 in Glaucoma

Allison Bishop 11/17/14 10:14 AM
Deleted: 0

1. Medeiros FA, Zangwill LM, Bowd C, Weinreb RN. The structure and function relationship in glaucoma: Implications for detection of progression and measurement of rates of change. *Invest Ophthalmol Vis Sci.* 2012;53:6939-46. [PMCID: PMC3466074]
2. Medeiros FA, Zangwill LM, Anderson DR, Liebmann JM, Girkin CA, Harwerth RS, Fredette M-J, Weinreb RN. Estimating the rate of retinal ganglion cell loss in glaucoma. *Am J Ophthalmol.* 2012;154:814-24. [PMCID: PMC3787830]
3. Lee EJ, Kim T-W, Weinreb RN. Improved reproducibility in measuring the laminar thickness on enhanced depth imaging SD-OCT images using maximum intensity projection. *Invest Ophthalmol Vis Sci.* 2012;53:7576-82.
4. Zhang K, Zhang L, Weinreb RN. Ophthalmic drug discovery: novel targets and mechanisms for retinal disease and glaucoma. *Nat Rev Drug Discov.* 2012;11:541-59.
5. Lisboa R, Weinreb RN, Medeiros FA. Combining structure and function to evaluate glaucomatous progression: Implications for the design of clinical trials. *Curr Opin Pharmacol.* 2013;13:115-22. [PMCID: PMC3784261]
6. Lee EJ, Kim TW, Weinreb RN, Kim H. Reversal of lamina cribrosa displacement after intraocular pressure reduction in open-angle glaucoma. *Ophthalmology.* 2013;120553:59.

7. Medeiros FA, Lisboa R, Zangwill LM, Liebmann JM, Girkin C, Weinreb RN. Retinal ganglion cell count estimates associated with early development of visual field defects in glaucoma. *Ophthalmology.* 2013;120:736-44. [PMCID: PMC3804164]

8. Lisboa R, Chun YS, Zangwill LM, Weinreb RN, Rosen PN, Liebmann JM, Girkin CA, Medeiros FA. Association between rate of binocula visual field loss and vision-related quality of life in patients with glaucoma. *JAMA Opht.* 2013;131:486-94. [PMCID: PMC3804264]

9. Tatham AJ, Weinreb RN, Zangwill LM, Liebmann JM, Girkin CA, Medeiros FA. The relationship between cup to disc ratio and estimated number of retinal ganglion cells. *Invest Ophthalmol Vis Sci.* 2013;54:3205-14. [PMCID: PMC3648225]

10. Lisboa R, Paranhos A Jr, Weinreb RN, Zangwill LM, Leite MT, Medeiros FA. Comparison of different spectral domain OCT scanning protocols for diagnosing preperimetric glaucoma. *Invest Ophthalmol Vis Sci.* 2013;5:3417-25. [PMCID: PMC3653374]

11. Meira-Freitas D, Lisboa R, Tatham A, Zangwill LM, Weinreb RN, Girkin CA, Liebmann JM, Medeiros FA. Predicting progression in glaucoma suspects with longitudinal estimates of retinal ganglion cell counts. *Invest Ophthalmol Vis Sci.* 2013;54:4174-83. [PMCID: PMC3687961]

12. Weinreb RN, Aung T, Medeiros FA. The pathophysiology, genetics and treatment of glaucoma: a review. *JAMA.* 2014;311:1901-11.

13. Chi W, Li F, Chen H, Wang Y, Zhu Y, Yang X, Zhu J, Wu F, Ouyang H, Ge J, Weinreb RN, Zhang K, Zhuo Y. Caspase-8 promotes NLRP1/NLRP3 inflammasome activiation and IL-1β production in a acute glaucoma model. *Proc Natl Acad Sci U S A.* 2014;111:11181-6. [PMCID: PMC4121847]

14. Luo N, Conwell MD, Chen X, Cantor LB, Wells CD, Kettenhofen CI, Westlake CJ, Weinreb RN, Corson TW, Spandau DF, Gattone V II, Iomini C, Obukhov AG, Sun Y. Primary cilia signaling mediates intraocular pressure sensation. *Proc Natl Acad Sci USA.* 2014;111:12871-6. [PMCID: PMC4156748]

C. Research Support

Ongoing Research Support

R01EY0023704 Weinreb (PI) 07/01/13-06/30/18
National Institutes of Health, National Eye Institute
ADAGES III: Contribution of genotype to glaucoma phenotype in African Americans
To conduct a Genome Wide Associate Study (GWAS) for primary open angle glaucoma (POAG) in African Americans. To apply genetic tools to the structural and function testing in order to improve understanding of the genetics of POAG in the African American population.
Annual Direct Costs: $1,324,218

K12EY024225 Weinreb (PI) 04/01/15-03/31/20
National Institutes of Health, National Eye Institute
Ophthalmology and Visual Sciences Career Development K12 Program
To develop well qualified new clinician scientists to effectively contribute to eye and vision research, to successfully compete at the national level for NIH grants, and to emerge as leaders in academic Ophthalmology
Annual Direct Costs: $222,328

R01EY0021818 Medeiros (Co-I) 09/01/11-08/31/16
National Institutes of Health, National Eye Institute
Diagnostics Innovations in Glaucoma Study: Functional Impairment
To improve understanding and develop methods to identify patients at risk for disability from glaucoma.
Annual Direct Costs: $410,107

R01EY011008 Zangwill (Co-I) 05/01/11-04/30/16
National Institutes of Health, National Eye Institute
Diagnostics Innovations in Glaucoma Study: Structural Assessment
Goals: To evaluate and compare photographic and imaging techniques to detect optic nerve or retinal damage or change in normal and glaucoma eyes.
Annual Direct Costs: $358,168

R01EY019869 Zangwill (Co-I) 02/01/10-01/31/15
National Institutes of Health, National Eye Institute
African Descent and Glaucoma Evaluation Study (ADAGES) II: Glaucoma Progression
Major Goals: To systematically assess new diagnostic techniques for detection of progression in glaucoma patients of European descent and African descent.
Annual Direct Costs: $255,546

Allison Bishop 11/17/14 10:14 AM
Deleted: In July 2010 Dr. Zangwill's role changed from co-Investigator to Principal Investigator with the retirement of Dr. Pamela Sample. Dr. Zangwill oversees all aspects of the multi-center study.

R01EY018658 Ju (Co-I) 09/01/09-08/31/18
National Institutes of Health, National Eye Institute
Mitochondrial Dysfunction in Glaucomatous Optic Neuropathy
Major Goals: To characterize elevated intraocular pressure-mediated alterations of mitochondrial structure and function, and to identify new mitochondria-associated therapeutic targets that could protect against neuronal death and their axon damage in glaucoma and other neurodegenerative diseases.
Annual Direct Costs: $250,000

R01EY022039 Bowd (Co-I) 02/01/12-01/31/16
National Institutes of Health, National Eye Institute
Predicting and Detecting Glaucomatous Progression Using Pattern Recognition
Major Goals: To improve glaucoma management by applying novel pattern recognition techniques to improve the accurate predication and detection of glaucomatous progression.
Annual Direct Costs: $245,000

Completed Research Support

R01EY019692 Weinreb (PI) 12/01/10-11/30/13
National Institutes of Health, National Eye Institute
Sirtuins i*n Gl*aucomatous Optic Neuropathy
Goals: To confirm whether caloric restriction or dietary supplement with resveratrol will protect retinal ganglion cells, lateral geniculate nucleus neurons, and visual function in mouse models of glaucoma. Also, to determine the effects of caloric restriction or resveratrol on endogenous responses that mitigate oxidative stress, mitochondrial function, protein acetylation, and global gene expression.

Aim: To develop a pressure sensor that allows continuous and direct intraocular pressure (IOP) monitoring.

Rationale: Even with timely diagnosis and treatment, patients with glaucoma often lose vision and can become blind due to optic nerve damage. And even though it varies from moment to moment, IOP (the leading risk factor for glaucoma) is measured at a single time point during the course of usual clinical care. Continuous IOP data obtained throughout the entire day can provide a better understanding about the relationship between IOP and optic nerve damage. It can also provide insights to the mechanisms of optic nerve damage in glaucoma.

Challenge/Need and Significance: There are more than 65 million people worldwide and 3 million Americans living with glaucoma, a neurodegenerative disease of the optic nerve and central visual pathway. Worldwide, it is the leading cause of irreversible blindness. For these individuals, careful monitoring and lowering of IOP are essential to mitigate further deterioration of vision. Current standard treatment involves doctor visits and an eye pressure measurement using a tonometer. Tonometry technique, however, can only provide a snapshot of the patient IOP profile, which can fluctuate over seconds, throughout the day and also day to day. There is a compelling need for obtaining more frequent IOP measurements in order to improve glaucoma treatment and patient care.

Innovation: Currently there is no device that can capture accurately throughout the day a patient's IOP profile. The development of a continuous IOP sensor would significantly improve the diagnosis and treatment of glaucoma. A continuous IOP profile would be used to establish a target eye pressure for each individual patient and to better adjust treatment to achieve therapeutic goals. Personalizing the management of glaucoma with continuous IOP data would be a major landmark advance for glaucoma management.

UC San Diego is an ideal research institute for this project. The university has an outstanding team of physicians and scientists at the Hamilton Glaucoma Center and the Shiley Eye Center. UCSD has been ranked as the leading institution worldwide for glaucoma research and impact (Expertscape, 2014). The deep knowledge of glaucoma and clinical studies by the UCSD glaucoma team enhances the likelihood that the conduct of the project successfully achieves its goals. Also, the elite engineering faculties at UC San Diego would provide excellent technical inputs and pioneering sensor designs. Collaboration between these two groups of experts will lead to the development of an innovative IOP sensor that will benefit those suffering from glaucoma and prevent glaucoma blindness.

Feasibility: Recent advancement in MEMS fabrication technique allows for many technological advancements, including many breakthroughs in the medical device field. This provides the possibility of developing a biocompatible pressure sensor that is small enough to be implanted in the eye. Prototype development and animal study can be accomplished in a 12-to 18- month time frame.

Investigator Qualifications: Dr Weinreb is a clinician and scientist. He also is an engineer with a degree in electrical engineering from MIT. He has considerable experience in the design and conduct of clinical trials. During the past 3 decades at UCSD, he also has invented and developed several novel technologies that are used throughout the world for diagnosing glaucoma, monitoring the effects of treatment and also treating glaucoma. His h-impact factor (91) was cited in October 2014 has the highest in the world in ophthalmology.