CURRICULUM VITAE

Personal Contact Information:

Name in Full	**Mark S. Humayun, MD, PhD**
Business Address	University of Southern California 1441 Eastlake Avenue MC 9175, NTT 4436 Los Angeles, CA 90033
Business Phone	(323) 865-3092
Citizenship	USA
E-mail Address	humayun@usc.edu humayun@med.usc.edu

Education:

High School	Georgetown Preparatory, Rockville, MD 1980
College or University	Georgetown University, BS 1984
Medical School	Duke University Medical School, MD 1989
Graduate School	University of North Carolina, PhD in *Biomedical Engineering*, 1994
Internship	Roanoke Memorial Hospital, 1990
Residency	Duke Eye Center, 1990-1993, Ophthalmology
Fellowships	Wilmer Ophthalmological Institute, 1994 *Retinovascular Surgery* Wilmer Ophthalmological Institute, 1994-1995 *Vitreoretinal Surgery*
Licensure	California, 1993 Florida, 1994
Board Certificate	American Board of Ophthalmology, 1995 National Board of Medical Examiners (Diplomat)

Professional Background:

Academic Appointments

University of Southern California

- University Professor
- Cornelius J. Pings Chair in Biomedical Sciences
- Professor of Ophthalmology, Biomedical Engineering, Cell and Neurobiology *2001-Present*
- Interim Chair, Department of Ophthalmology *2013-2014*
- Inaugural Co-Director, USC Eye Institute *2013-Present*
- Director, Institute of Biomedical Therapeutics *2013-Present*
- Director, USC Sensory Science Institute *2013-Present*

California Institute of Technology

- Visiting Associate in Medical Engineering *2014-Present*

Johns Hopkins University

- Associate Professor 2000-2001
- Assistant Professor 1995-1999

Duke University

- Clinical Preceptor 1993

Society Memberships

- The National Academies Institute of Medicine (IOM)
- The National Academy of Engineering (NAE)
- Institute of Electrical and Electronics Engineers (IEEE) in Medicine and Biology Society, Fellow
- The American Academy of Ophthalmology (AAO)
- The American Society of Retinal Specialists (ASRS)
- The Association for Research in Vision and Ophthalmology (ARVO)
- American Medical Association (AMA)
- Club Jules Gonin
- American Ophthalmological Society (AOS)
- Biomedical Engineering in Medicine and Biology Society
- The Macula Society
- The Retina Society
- Society for Neuroscience
- American Institute for Medical and Biological Engineering (AIMBE), Fellow

Board Memberships

- Board of Directors, American Society of Retina Specialists
- Board of Directors, Replenish, Inc

Awards

- Richard S. Ross Clinical Scientist Award, 1997-1998
- William & Mary Greve Scholars Award: Research to Prevent Blindness, 1997
- Jules Stein Living Tribute Award, 2002
- PCOOS Honorary Member, 2003
- Los Alamos Director's Colloquium, 2003
- Senior Honor Award of the American Society of Retina Specialists, 2004
- Innovator of the Year award, R&D Magazine, 2005
- Strathmore's Who's Who Award, 2005-2006
- Best Doctors of America Award, 2005-2007
- Neurotechnology Researcher of the Year, 2007
- The Association for Retinopathy of Prematurity and Related Diseases (ROPARD) Children's Vision Award, 2008
- National Medical Fellowships, Distinguished Service Award, 2009
- Retina Research Foundation Award of Merit, 2009
- Foundation Fighting Blindness Visionary Award Honoree, 2009
- Best Doctors in Southern California Award, 2009
- Alcon Research Institute Award, 2009
- R&D 100 - Editor's Choice Award, 2009
- Popular Mechanics Breakthrough Award, 2010
- American Academy of Ophthalmology (AAO) Senior Achievement Award, 2011
- 2011 List of America's Top Doctors (Compiled by Castle Connolly Medical, Ltd.)
- Top 1% of Doctors by US News and World Report, 2011
- Pasadena Magazine Top Doctors in Ophthalmology, 2013
- Richard Ellis Award; Wills Eye Institute, 2014
- Innovator's Lecture; DOC, 27th International Congress of German Ophthalmic Surgeons, 2014
- The McCollough Award; University of Texas Medical Branch Health, Ophthalmology and Visual Sciences, 2014

Research Activities:

Major Areas of Research Interest

- Basic and clinical studies on the neural retina. This includes treatments of retinal neurodegenerative diseases through the use of prosthetic devices, stem cell therapy and improvements in surgery and drug delivery.

- Electrical stimulation of the retina, retinal prosthesis (micro and nanoelectronics), and instrumentation for vitreoretinal surgery.

Research in Progress

- Development of an intraocular retinal prosthesis, bioelectronics for drug pump and physiological sensors, synthetic membrane nanoparticle integration into retinal cells, stem cell delivery and integration in retinal tissue, microsurgical instrumentation.

Research Grants:

Active Research Grants

1. CIRM Disease Team Grant: Stem Cell Based Treatment Strategy for Age-Related Macular Degeneration — $18,904,916
2010-2014, Principal Investigator
Grant number: DR1-01444

2. CIRM Disease Team Therapy Development III: Phase 1 Safety Assessment of CPCBRPE1, hESCderived RPE Cell Coated Parylene Membrane Implants, in Patients with Advanced Dry Age-Related Macular Degeneration — $18,922,665
2014-2018, Principal Investigator
Grant number: DR3-07439

3. A Novel Treatment for Retinal Ischemia — $4,864,188
National Institutes of Health/National Eye Institute
2013-2016, Principal Investigator
Grant number: 1R01EY022059-01A1

4. Retinal Nanophotoswitch — $900,000
National Science Foundation
2014-2019, Principal Investigator
Grant number: CBET-1404089

5. Thermoresponsive Reversibly Attachable Patch for Temporary Intervention in Ocular Trauma — $814,117
Department of Defense
2012- 2014, Principal Investigator
Grant number: W81XWH-12-1-0314

6. Engineering Medical Therapeutic Technologies Research Experience for Teachers ($EMTT^2$) — $372,465
National Science Foundation
2013-2016, Principal Investigator
Grant number: EEC-1301502

7. A Novel Early Treatment for Neurological Diseases — $3,000,000
W.M. Keck Foundation
2013-2016, Principal Investigator

8. A Novel Treatment for Major Blinding Diseases — $100,000
Harrington Discovery Institute
2014-2015, Principal Investigator

9. OXYGENATOR – A Novel Treatment for Retinal Ischemic Diseases — $166,000
L.K. Whittier Foundation
2013-2014, Principal Investigator

10. Metabolic Prosthesis — $130,000
Jean Perkins Foundation
2013-2014, Principal Investigator

11. Nanotechnology Applications for Atrophic Age-Macular Degeneration — $150,000
Arnold and Mabel Beckman Foundation
2012-2013, Principal Investigator

12. Alcon Research Institute Grant: Retinal Research — $200,000

13. Retina Society Research Grant: Retinal Research — $45,000

Past Research Grants

1. An Engineering Research Center for Biomimetic Microelectronic Systems — $29,997,999
National Science Foundation
2003-2013, Principal Investigator
Grant number: EEC-0310723

2. Bioelectronics Research Laboratory — $15,728,701
U.S. Department of Energy
2004-2010, Principal Investigator
Grant number: DE FCO2 04ER63735

3. A High Density Microelectronic Tissue Hybrid Sensor For Imaging (4000011732) — $139,770
Oak Ridge National Laboratory, Department of Energy
2001-2004, Principal Investigator

4. A High Density Microelectronic Tissue Hybrid Sensor For Imaging (4000011733) — $80,276
Oak Ridge National Laboratory, Department of Energy
2001-2004, Principal Investigator

5.	Imaging Via the Adaptive Optics Imaging System Lawrence Livermore National Laboratory, Department of Energy 2001-2004, Principal Investigator	$252,658
6.	Human Testing of a High-Density, Massively-Parallel Neural Stimulator Office of the Naval Research 2002-2004, Principal Investigator	$30,798
7.	Biocompatible Technology for a High-Density Retinal Prosthesis National Science Foundation 2002-2005, Principal Investigator	$269,950
8.	Wireless Intraocular Pressure Sensor California Institute of Technology 2002-2004, Principal Investigator	$60,000
9.	Development/Testing of Artificial Retinas for the Blind Second Sight, National Eye Institute 2001-2004, Principal Investigator	$731,757
10.	Biocompatible Technology for a High-Density Retinal Prosthesis National Science Foundation 2002-2004, Principal Investigator	$190,000
11.	Photosynthesis Based Light Transduction on a Retinal Prosthesis Chip: Interfacing Molecular Retina National Science Foundation 2001-2004, Principal Investigator	$329,348
12.	Retinal Electrical Stimulation in Photoreceptor Loss National Institute of Health/National Eye Foundation 1997-2000, Principal Investigator	$500,000
13.	Multi-electrode Stimulation and Recording from Mammalian Retina	$203,000
14.	The Realization of a Retinal Prosthesis for the Totally Blind National Science Foundation 1998-2001, Principal Investigator	$427,476
15.	Photosynthesis Based Light Transduction on a Retinal Prosthesis Chip, Interfacing Molecular Reactions Centers, Nano-channel Glass and the Retina National Science Foundation 1999-2002, Principal Investigator	$520,000

16. Towards a Retinal Prosthesis: Integration of Microchannel Glass and Photosynthetic Structures into Photoelectrode Array Implants — $350,958
U.S. Department of Energy
1999-2002, Principal Investigator

17. Electrical Stimulation of the Retina with a High Density Electrode Array (APL) — $80,123
Office of Naval Research/DARPA
1998-2000, Principal Investigator

18. Development of a Retinal Prosthesis (First Year Plan) — $295,838
Mann Fund (APL)
1999-2000, Principal Investigator

Patents Issued (United States and Europe)

1. de Juan, Jr. E, **Humayun MS,** Phillips DH. *Retinal microstimulation.* Patent # US 5109844 (App # 07/595,442). Filed: Oct. 11, 1990. Issued: May 5, 1992.

2. **Humayun MS,** de Juan, Jr. E, Greenberg RJ. *Visual prosthesis and method of using same.* Patent # US 5935155. (App # 09/041,933). Filed: March 13, 1998. Issued: Aug. 10, 1999.

3. Greenberg RJ, **Humayun MS,** de Juan, Jr. E. *Method for preferential outer retinal stimulation.* Patent # US 5944747 (App # 09/041,932). Filed: Mar. 13, 1998. Issued: Aug. 31, 1999.

4. Varner SE, de Juan, Jr. E, Shelley T, Barnes AC, **Humayun MS.** *Devices for intraocular drug delivery.* Patent # US 6719750 (App # 09/888,092). Filed: Jun. 22, 2001. Issued: Apr. 13, 2004.

5. Ok J, Greenberg RJ, **Humayun MS.** *Visual prosthesis including enhanced receiving and stimulating portion.* Patent # US 7103416 (App # 09/761,270). Filed: Jan. 16, 2001. Issued: Sep. 5, 2006

6. Fink W, Yang EH, Hishinuma Y, Lee C, George T, Tai YC, Meng E, **Humayun MS.** *Optically powered and optically data-transmitting wireless intraocular pressure sensor device.* Patent # US 7131945 (App # 10/686,492). Filed: Oct. 14, 2003. Issued: Nov. 7, 2006.

7. Greenberg R, Williamson R, **Humayun MS.** *Variable pitch electrode array.* Patent # US 7149586 (App # 10/112,801). Filed: March 28, 2002. Issued: December 12, 2006.

8. **Humayun MS,** Jensen PS, Shelley TH, Fujii GY, Hamza HS, Barnes AC, de Juan Jr. E. *Device and method for manual retinal vein catheterization.* Patent # US 7217263 (App # 09/754,094). Filed: Jan. 3, 2001. Issued: May 15, 2007.

9. Greenberg RJ, Chang DY, Agrawal R, Mech BV, **Humayun MS**, Little JS, Wilkin K. *Retinal prosthesis with side mounted inductive coil*. Patent # US 7228181 (App # 10/820,240). Filed: Apr. 6, 2004. Issued: Jun 5, 2007.

10. Tai YC, Meng E, Chen PJ, Rodger DC, **Humayun MS**. *Implantable mechanical pressure sensor and method of manufacturing the same*. Patent # US 7252006 (App # 11/148,124). Filed: Jun. 7, 2005. Issued: August 7, 2007.

11. Fink W, **Humayun MS.** *Method and system for training a visual prosthesis.* Patent # US 7321796 (App # 10/837,163). Filed: Apr. 30, 2004. Issued: Jan. 22, 2008.

12. Rodger DC, **Humayun MS,** Tai YC, Weiland JD. *Parylene-based flexible multi-electrode arrays for neuronal stimulation and recording and methods for manufacturing the same.* Patent # US 7326649 (App # 11/130,814). Filed: May 16, 2005. Issued: Feb. 5, 2008.

13. Greenberg R and **Humayan MS**. *Transretinal implant and method of implantation.* Patent # US 7483750 (App # 10/393,887). Filed: Mar. 21, 2003. Issued: Jan. 27, 2009.

14. Humayun MS. *Soft tip cannula and methods for use thereof.* Patent # US 7537593 (App # 10/934,050). Filed: Sep. 4, 2004. Issued: May 26, 2009.

15. Larsen CE, Hillstead RA, Trip R, de Juan Jr. E, **Humayun MS,** Fritz E, Pintaske R. *Methods and apparatus for intraocular brachytherapy.* Patent # US 7563222 (App # 11/228,030). Filed: Sep. 15, 2005. Issued: Jul. 21, 2009.

16. Roy A, Greenberg RJ, **Humayun MS**, McClure KH. *Neural stimulation for increased persistence.* Patent # US 7571004 (App # 11/044,761). Filed: Jan. 26, 2005. Issued: Aug. 4, 2009.

17. Tai YC, Chen PJ, Rodger DC, Humayun MS. *Microfluidic valve having free-floating member and method of fabrication.* Patent # US 7600533 (App # 11/837,450). Filed: Aug. 10, 2007. Issued: Oct. 13, 2009.

18. Bhadri P, Lescoulie J, Fang S, McCormick M, Kerns R, **Humayun MS**, Barnes A. *Enhanced visualization illumination system.* Patent # US 7654716 (App # 11/938,233). Filed: Nov. 9, 2007. Issued: February 2, 2010.

19. Tai YC, Rodger DC, Li W, **Humayun MS**, Weiland JD. *Microfabricated devices for wireless data and power transfer.* Patent # US 7684868 (App # 11/272,382). Filed: Nov. 10, 2005. Issued: Mar. 23, 2010.

20. Tai YC, Rodger DC, Li W, **Humayun MS**, Weiland JD, Ameri H, Tanguay, Jr. AR. *Method of fabricating an integrated intraocular retinal prosthesis device.* Patent # US 7774931 (App # 11/414,139). Filed: Apr. 28, 2006. Issued: Aug. 17, 2010.

21. Humayun MS, De Juan E. *Reservoirs with subretinal cannula for subretinal drug delivery.* Patent # US 7794437 (App # 10/543,083). Filed: Jan. 26, 2004. Issued: Sep. 14, 2010.

22. Krulevitch P, Polla DL, Maghribi MN, Hamilton J, **Humayun MS**, Weiland JD. *System of fabricating a flexible electrode array.* Patent # US 7810233 (App # 11/545,190). Filed: Oct. 10, 2006. Issued: Oct. 12, 2010.

23. **Humayun MS** and Phillips H. *Implants based on bipolar metal oxide semiconductor (MOS) electronics.* Patent # US 7831309 (App # 11/951,955). Filed: Dec. 2, 2007. Issued: Nov. 9, 2010.

24. Behrmann S, De Juan E, Fritz E, Hillstead RA, **Humayun MS**, Larsen CE, Phillipps GT, Pintaske R, Trip R. *Apparatus for intraocular brachytherapy.* Patent # EP 1720608 B1 (App # EP20050722965). Filed: Feb 11, 2005. Issued: Nov 17, 2010.

25. Agrawal R, Chen PJ, **Humayun MS**, Kuwahara K, Li PY, Lo R, Meng E, Rodger D, Shih J, Tai YC. *Mems device for delivery of therapeutic agents.* Patent # EP 1998829 B1 (App # EP20070753177). Filed: Mar. 14, 2007. Issued: Feb. 9, 2011.

26. Meng E, Tai YC, **Humayun MS**, Agrawal R, Lo R, Shih J, Kuwahara K, Li PY, Rodger D, Chen PJ. *MEMS device and method for delivery of therapeutic agents.* Patent # US 7887508 (App # 11/686,310). Filed: Mar. 14, 2007. Issued: Feb. 15, 2011.

27. Tai YC, Chen PJ, Rodger DC, **Humayun MS**. *Microfabricated implantable wireless pressure sensor for use in biomedical applications and pressure measurement and sensor implantation methods.* Patent # US 7900518 (App # 11/847,262). Filed: Aug. 29, 2007. Issued: Mar. 8, 2011.

28. Greenberg RJ and **Humayun MS**. *Retinal prosthesis with separate central electrode array and peripheral electrode array.* Patent # US 7904163 (App # 11/418,677). Filed: May 4, 2006. Issued: Mar. 8, 2011.

29. Greenberg RJ, **Humayun MS**, Little JS, Neysmith JM. *Electrode array for even neural pressure.* Patent # US 7912556 (App # 12/397,974). Filed: Mar. 4, 2009. Issued: Mar. 22, 2011.

30. Shah S, Greenberg RJ, Hines ACP, **Humayun MS**, Weiland JD, Zhou DM. *Method of improving electrode tissue interface.* Patent # US 8010202 B2 (App # 11/943,487). Filed: Nov. 20, 2007. Issued: Aug. 30, 2011.

31. Greenberg RJ, Guven D, **Humayun MS**, Little J, Mech B, Neysmith J, Talbot N. *Flexible circuit electrode array.* Patent # US 8014878 B2 (App # 11/207,644). Filed: Aug. 19, 2005. Issued: Sep. 6, 2011.

32. Caffey S and **Humayun MS**. *Methods and systems for enhanced medical procedure visualization.* Patent #US 8050745 B2 (App # 11/508,734). Filed: Aug. 22, 2006. Issued: Nov. 1, 2011.

33. Greenberg RJ and **Humayun MS.** *Visual prosthesis for improved circadian rhythms and method of improving the circadian rhythms.* Patent # US 8068913 B2 (App # 11/293,400). Filed: Dec. 1, 2005. Issued: Nov. 29, 2011

34. **Humayun MS**, Cheng X, Ratner BR, Tunc M, Weiland JD. *Reversible thermoresponsive adhesives for implants.* Patent # US 8080593 B2 (App # 11/947,770). Filed: Nov. 29, 2007. Issued: Dec. 20, 2011.

35. Humayun M, Ahuja A, Tai YC, Hinton D, Grubbs R, Clegg D. *Biocompatible substrate for facilitating interconnections between stem cells and target tissues and*

methods for implanting same. Patent No. US20120009159 A1 (App # 13/181,279) Filed: Jul. 12, 2011. Issued: Jan. 12, 2012.

36. Bhadry P, Barnes A, DeBoer, C, **Humayun MS**, Kerns R, Lue JC, McCormick M. *Portable handheld illumination system.* Patent # US 8172834 B2 (App # 12/237,110). Filed: Sep. 24, 2008. Issued: May 8, 2012.

37. DeBoer C, Barnes A, Bhadry P, **Humayun MS**, Kerns R, McCormick M. *Selectable stroke cutter.* Patent # US 8172865 B2 (App # 12/240,101). Filed: Sep. 29, 2008. Issued: May 8, 2012.

38. McCormick M, Chong L, DeBoer C, **Humayun MS**, Kerns R. *Surgical pack and tray.* Patent # US 8177064 B2 (App # 12/106,962). Filed: Apr. 21, 2008. Issued: May 15, 2012.

39. Humayun MS, Bhadri P, Chong L, McCormick M. *Independent surgical center.* Patent # US 8177776 B2 (App # 12/107,038). Filed: Apr. 21, 2008. Issued: May 15, 2012.

40. Humayun MS. *Soft tip cannula and methods for use thereof.* Patent # US 8177777 B2 (App # 12/427,345). Filed: Apr. 21, 2009. Issued: May 15, 2012.

41. Greenberg RJ, Dai R, Fine I, Hines A, Horsager AM, **Humayun MS,** McMahon MJ, Roy A, Weiland JD, Yadav S, Zhou DM. *Fitting a neural prosthesis using impedance and electrode height.* Patent # US 8180454 B2 (App # 11/607,201). Filed: Dec. 1, 2006. Issued: May 15, 2012.

42. Ameri H, Weiland, JD, Eckhard H, Ufer S, Ratanapakorn T, **Humayun MS**. *Wide-field retinal prosthesis.* Patent #US 8190266 B2 (App # 11/355,094). Filed: Feb. 15, 2006. Issued: May 29, 2012.

43. Whalen III JJ, Weiland JD, **Humayun MS**. *Microelectrode systems for neuro-stimulation and neuro-sensing and microchip packaging and related methods.* Patent # US 8195266 B2 (App # 11/540,087). Filed: Sep. 29, 2006. Issued: Jun. 5, 2012.

44. Nasiatka P, Hauer MC, **Humayun MS**, Stiles NRB, Tanguay Jr. AR. *Intraocular camera for retinal prostheses.* Patent # US 8197539 B2 (App # 11/744,714). Filed: May 4, 2007. Issued: Jun. 12, 2012.

45. Greenberg RJ and **Humayun MS**. *Flexible circuit electrode array for improved layer adhesion.* Patent # US 8200338 B2 (App # 11/331,625). Filed: Jan. 13, 2006. Issued: Jun. 12, 2012.

46. Greenbaum E and **Humayun MS**. *Method and apparatus for treating ischemic diseases.* Patent # US 8209024 B2 (App # 12/523,990). Filed: Jan. 22, 2008. Issued: Jun. 26, 2012.

47. Tanguay Jr. AR and **Humayun MS**. *Ocular imaging system.* Patent # US 8210680 B2 (App # 12/429,964). Filed: Apr. 24, 2009. Issued: Jul. 3, 2012.

48. Pang C, Caffey S, **Humayun MS**, Jiang F, Shih J, Tai YC. *Drug-delivery pumps and methods of manufacture.* Patent # US 8231608 B2 (App # 12/463,251). Filed: May 8, 2009. Issued: Jul. 31, 2012.

49. Greenberg RJ, **Humayun MS**, McClure K, McMahon MJ. *Visual prosthesis*. Patent # US 8239033 B2 (App # 11/875,724). Filed Oct 19, 2007 - Issued Aug 7, 2012

50. Horsager AM, Boynton GM, Fine I, Greenberg RJ, Greenwald SH, **Humayun MS,** McMahon MJ. *Apparatus and method for electrical stimulation of human retina.* Patent # US 8244364 B2 (App # 11/926,054). Filed: Oct. 28, 2007. Issued: Aug. 14, 2012.

51. Chen PJ, Meng EF, Rodger D, Tai YC, **Humayun MS.** *Implantable intraocular pressure drain.* Patent # US 8246569 B1 (App # 11/205,757). Filed: Aug 16, 2005. Issued: Aug 21, 2012.

52. Agrawal R, Chen PJ, **Humayun MS**, Kuwahara K, Li PY, Lo R, Meng E, Rodger D, Shih J, Tai YC. *MEMS device and method for delivery of therapeutic agents.* US 8308686 B2 (App # 12/790,240). Filed: May 28, 2010. Issued: Nov. 13, 2012.

53. Brennan J, Caffey S, **Humayun MS.** *Device for treatment of consumption disorders with biostimulation.* Patent # EP 2114522 B1 (App # EP20080713394). Filed: Feb 4, 2008. Issued: Nov. 21, 2012.

54. Shih J, Pang C, Jiang F, Caffey S, **Humayun MS**, Tai, YC, Peck R. *Implantable drug-delivery devices, and apparatus and methods for filling the devices.* Patent # US 8348897 B2 (App # 12/463,247). Filed: May 8, 2009. Issued: Jan. 8, 2013.

55. Lu S, Madhukar A, **Humayun MS**. *Functional abiotic nanosystems.* Patent # US 8399751 B2 (App # 12/138,289). Filed: Jun. 12, 2008. Issued: Mar. 19, 2013.

56. Woo Lee C, Grubbs RH, **Humayun MS**. *Antimicrobial materials*. Patent # US 8512722 (Serial Number 12/842,593). Filed: July 23, 2010, Issued: Aug. 20, 2013.

57. **Humayun MS**, Xu X, Zhou Q, Shung KK, Ameri H, Chader G. *Intraocular ultrasound doppler*. Patent # US 8684935 (Serial Number 12/102,293). Filed: Apr. 14, 2008, Issued: Apr. 1, 2014.

58. DeBoer C, Tai YC, **Humayun MS**. Accommodating Intraocular Lens. Patent No. US 8715345 B2 (App # 13/761,024). Filed: Feb. 6, 2013. Issued: May 6, 2014.

Patent Applications Pending

1.	20130046179	Ocular Ultrasound Probe
2.	20130018412	Surgical implantation instrument
3.	20120330102	Scanning endoscopic imaging probes and related methods
4.	20120330101	Scanning endoscopic imaging probes and related methods
5.	20120296423	Filling and Implanting Accommodative Intraocular Lenses
6.	20120172668	Adjustable cannula systems and devices
7.	20120041427	Electronically driven drug pump devices
8.	20120016244	Methods and systems for enhanced medical procedure visualization
9.	20110282331	Optical coherence tomography with multiple imaging instruments

10.	20110282191	Optical coherence tomography for neural-signal applications
11.	20110282190	Combined endoscopic surgical tools
12.	20110282161	Enhanced visualization illumination system
13.	20110282160	Self contained illuminated infusion cannula systems and methods and devices
14.	20110279821	Optical coherence tomography with multiple sample arms
15.	20110270352	Encoding of size and brightness of percepts in a visual prosthesis
16.	20110206291	Combined spectral and polarimetry imaging and diagnostics
17.	20100268301	Image processing algorithm for cueing salient regions
18.	20100267647	Modulating photoreactivity in a cell
19.	20100229384	Flexible electrode array for artificial vision
20.	20100228238	Multi-function optical probe system for medical and veterinary applications
21.	20100228132	Systems for controlling optical probe functions during medical and veterinary procedures
22.	20100228124	Medical and veterinary imaging and diagnostic procedures utilizing optical probe systems
23.	20100228123	Multi-function optical system for medical and veterinary applications
24.	20100228119	Methods of determining motion and distance during medical and veterinary procedures
25.	20090287276	Visual prosthesis for phosphene shape control
26.	20090112287	Saliency-based apparatus and methods for visual prostheses
27.	20090030323	Ultrasound and Microbubbles in Ocular Diagnostics and Therapies
28.	20080262512	Thrombolysis in retinal vessels with ultrasound
29.	20080249412	Preoperative and intra-operative lens hardness measurement by ultrasound
30.	20050208457	Digital object recognition audio-assistant for the visually impaired

Publications

Peer Reviewed Journal Articles

1. **Humayun MS**, Pepose JS. *A Viral Etiology in Fuchs' Corneal Dystrophy.* Hum Pathol 1988; 19(2):245
2. **Humayun MS**, Presty SK, LaFrance ND, Holcomb HH, Loats H, Long DM, Wagner HN, Gordon B. *Local Cerebral Glucose Abnormalities in Mild Closed Head Injured Patients with Cognitive Impairments.* Nucl Med Commun 1989; 10(5): 335-344
3. **Humayun MS**, Yeo JH, Koski WS, Michels RG. *The Rate of Sulfur Hexafluoride Escape from a Plastic Syringe.* Arch Ophthalmol 1989; 107(6): 853-854
4. de Juan E Jr, **Humayun MS,** Hatchell DL, Wilson D. *Histopathology of Experimental Preretinal Neovascularization.* Invest Ophthalmol Vis Sci 1989; 30(7):1495-1503

5. Stone JL, Barlow WE, **Humayun MS**, de Juan E Jr, Milam AH. *Morphometric Analysis of Macular Photoreceptors and Ganglion Cells in Retinas with Retinitis Pigmentosa.* Arch Ophthalmol 1992; 110(11):1634-1639
6. **Humayun M**, Propst R, de Juan E Jr, McCormick K, Hickingbotham D. *Bipolar Surface Electrical Stimulation of the Vertebrate Retina.* Arch Ophthalmol 1994; 112(1):110-116
7. **Humayun M,** Sayo Y, Propst R, de Juan E Jr. *Can Potentials from the Visual Cortex Be Elicited Electrically Despite Severe Retinal Degeneration and a Markedly Reduced Electroretinogram?* Ger J Ophthalmol 1995; 4(1):57-64
8. **Humayun MS**, de Juan E Jr, Dagnelie G, Greenberg RJ, Propst RH, Phillips DH. *Visual Perception Elicited by Electrical Stimulation of Retina in Blind Humans.* Arch Ophthalmol 1996;114(1):40-46
9. Santos A, **Humayun MS**, de Juan E Jr, Greenberg RJ, Marsh MJ, Klock IB, Milam AH. *Preservation of the Inner Retina in Retinitis Pigmentosa. A Morphometric Analysis.* Arch Ophthalmol 1997;115(4):511-515.
10. **Humayun MS**, de Juan E Jr. *Artificial Vision.* Eye 1998; 12:605-607
11. Fekrat S, **Humayun MS.** *White Dot Fovea in an African American Patient.* Arch Ophthalmol 1998; 116(1):110-111
12. Fekrat S, **Humayun MS,** Goldberg MF. *Spontaneous Retinal Reattachment in Incotinentia Pigmenti.* Retina 1998;18(1):75-77
13. Hinz BJ, **Humayun MS,** Heriot WJ. *Neovascularization of the Optic Disc. What is the Origin of the Blood Flow?* Arch Ophthalmol 1998; 116(12):1694-1695
14. **Humayun MS**, Prince M, de Juan E Jr, Barron Y, Moskowitz M, Klock IB, Milam AH. *Morphometric Analysis of the Extramacular Retina from Postmortem Eyes with Retinitis Pigmentosa*. Invest Ophthalmol Vis Sci 1999; 40(1):143-148
15. Greenberg RJ, Velte TJ, **Humayun MS**, Scarlatis GN, de Juan E Jr. *A Computational Model of Electrical Stimulation of the Retinal Ganglion Cell*. IEEE Trans Biomed Eng 1999; 46(5):505-514
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INVITED LECTURES

Retinal Transplantation: Techniques and Results Oct 1997
American Academy of Ophthalmology: Vitreoretinal Subspecialty Days
San Francisco, CA

Artificial Retina Oct 1997
BMBF Status Seminar "Retinal Transplant"
University of Bonn, Germany

Artificial Vision Apr 1998
International Conference on Retinal Microsurgery
and Retinal Transplantation
Vienna Marriott Hotel, Austria

Chairman: Retinal Prosthesis Session May 1998
Association for Research in Vision & Ophthalmology
Fort Lauderdale, FL

Chairman: Artificial Vision June 1998
28th International Congress of Ophthalmology
Amsterdam, The Netherlands

Retinal Transplantation June 1998
Pathogenesis and Treatment of Age-Related Macular Degeneration
Johns Hopkins Medical Institute, Baltimore, MD

Artificial Vision July 1998
8th International Symposium on Retinal Degeneration
Schluchsee, Germany

Retinal Transplantation Sept 1998
Macular Disease for the Comprehensive Ophthalmologist
Baltimore, MD

Artificial Vision Oct 1998
Kresge Eye Institute: Visiting Professor
Detroit, MI

Artificial Vision Oct 1998
Oakland Eye Institute: Visiting Professor
Rochester, MI

Maryland Society for Eye Physicians and Surgeons — Nov 1998
Retinal Transplantation
Baltimore, MD

Johns Hopkins Symposium "A Woman's Journey" — Nov 1998
Medical Headlines – The Computer Eye Chip
Baltimore, MD

Milwaukee Ophthalmological Society — Feb 1999
Limited Retinal Translocation
Milwaukee, WI

Buffalo Ophthalmologic Society — April 1999
Retinal Translocation
Buffalo, NY

Association for Research in Vision & Ophthalmology — May 1999
Chairman: Retinal Prosthesis Session
Fort Lauderdale, Florida

Indiana Academy of Ophthalmology — June 1999
Limited Retinal Translocation
Indianapolis, IN

Keynote Address – Artificial Vision — June 1999
Laboratory of the Government Chemist: Workshop on
"Neglected Areas of Disease Burden- The Biomaterials Challenge"
London, England

The Vitreoretinal Specialty Career Choice: The Academic Path — Sept 1999
The Vitreous Society 17th Annual Meeting
Rome Cavalieri Hilton, Italy

What is the DRVS and When Should a Patient with a Vitreous Hemorrhage be Considered for Surgery? — Oct 1999
Wilmer Diabetes Course
Baltimore, MD

Retinal Vein Cannulation — Oct 1999
American Academy of Ophthalmology: Vitreoretinal Subspecialty Day
Orlando, FL

Artificial Vision – Retinal Implants — Oct 1999
Association for Research in Vision & Ophthalmology Symposium
Orange County Convention Center, Orlando, FL

Milestones Achieved in the Development of an Intraocular Retinal Prosthesis Dec 1999
Wilmer Current Concepts
Turner Auditorium, Baltimore, MD

Epiretinal Electrical Stimulation Feb 2000
A.E. Mann Institute for Biomedical Engineering: Inaugural Topic –
"Can We Make the Blind See?"
Davidson Conference Center, Los Angeles, CA

Intraocular Retinal Prosthesis Feb 2000
High Care 2000: Innovations in Medicine
Ruhr University Bochum, Bochum, Germany

Progress Towards an Electronic Retinal Implant March 2000
Aspen Retinal Detachment Society Meeting
Snowmass Village, Snowmass, CO

Artificial Vision: How Long Before the Availability of a Human Retinal Implant March 2000
Vail Vitrectomy 2000
Marriott's Mountain Resort, Vail, CO

Microelectric Stimulator Array April 2000
Tissue Based Biosensors Program Review
Gunter Hotel, San Antonio, TX

Retinal Prosthesis April 2000
Association for Research in Vision & Ophthalmology
Fort Lauderdale, FL

Chairman: Instrument Development April 2000
The 59th Wilmer Residents Clinical Meeting
and 75th Anniversary Wilmer Eye Institute
John Hopkins
Baltimore, MD

Artificial Vision May 2000
Artificial Sight Symposium
Albuquerque, NM

Electrical Stimulation of Blind Human Retinas: Is an Intraocular Retinal Prosthesis Feasible? May 2000
6th Mediterranean Ophthalmological Society Congress
Jerusalem, Israel

Artificial Vision June 2000
WTEC Tissue Engineering Study
Bethesda, MD

Macular Translocation & Intraocular Retinal Prosthesis June 2000
Scheie Eye Institute
Philadelphia, PA

Intraocular Retinal Prosthesis June 2000
The Eye & Chip Colloquium
LDM Technologies World Headquarters, Auburn Hills, MI

Artificial Vision Sept 2000
Minnesota Academy of Ophthalmology
Minneapolis, MN

Artificial Vision Sept 2000
Fighting Blindness
Dublin, Ireland

Seeing the Light Oct 2000
Johns Hopkins Travel Medicine and Recent
Advances in Medicine Conference
John Hopkins School of Hygiene and Public Health, Baltimore, MD

Retinal Stimulation Oct 2000
American Academy of Ophthalmology
Dallas Convention Center, Dallas, TX

Artificial Vision Oct 2000
The 3rd Annual Vision Rehabilitation Education Day
Dallas, TX

Retinal Chip Implants Oct 2000
2000 ASORN Annual Meeting
Dallas, TX

Artificial Vision Nov 2000
National Science Foundation
Arlington, VA

Walter Wright Lecturer- Artificial Vision Dec 2000
Advances in Ophthalmology and Visual Science,
Triumph and Controversy in the New Century
Toronto, Canada

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Current Concepts in Ophthalmology
Pier V Hotel, Baltimore, MD

Vitrectomy-Indications & Techniques Feb 2001
Fellows Forum
Chicago, IL

Macular-Translocation Retinal Implants – When Will They Be Available? Feb 2001
Vitreoretinal Update
Sarasota, FL

Retinal Vein Cannulation for Central Vein Occlusion Feb 2001
25th Annual Macula Society Meeting
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Microelectronic Stimulation of Retinal Tissue Feb 2001
DARPA: Controlled Biological & Biomimetic Feb 2001
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Cleveland, OH

Moderator for Visual Prosthesis Session April 2001
Association for Research in Vision & Ophthalmology Meeting
Fort Lauderdale, FL

Intraocular Retinal Prosthesis Oct 2001
Leber's Congenital Amaurosis
Baltimore, MD

Artificial Vision Oct 2001
Management of Vitreoretinal Disease in the 21st Century
Detroit, MI

Artificial Vision Nov 2001
American Academy of Ophthalmology
New Orleans, LA

Panelist- Efficiency in Ophthalmic Surgery April 2002
29th International Congress of Ophthalmology, PECS 2002
Sydney, Australia

Surgical Management of Vascular Disease May 2002
Association for Research in Vision & Ophthalmology
Fort Lauderdale, FL

Artificial Vision June 2002
25th Annual Macula Society Meeting: Progress in the Development of a Retinal Implant by the Intraocular Prosthesis Group
Barcelona, Spain

Artificial Vision June 2002
Rotary Club
Los Angeles, CA

Artificial Vision Sept 2002
Club Jules Gonin: Progress in the Development of a Retinal Implant by the Intraocular Prosthesis Group
Montreux, Switzerland

Artificial Vision Sept 2002
Advanced Innovations in Medicine
Aruba

Artificial Vision Sept 2002
Retina Congress 2002: Progress in the Development of a Retinal Implant by the Intraocular Prosthesis Group
San Francisco, CA

Clinical Studies: The Los Angeles School Oct 2002
2002 Joint Meeting American Academy of Ophthalmology
and Pan-American Association of Ophthalmology
Orlando, FL

Microelectronic Retinal Implant for the Blind Nov 2002
Ophthalmology 2002: Bekhor Seminar:
The Science and Engineering of an Implantable
Los Angeles, CA

Artificial Vision Dec 2002
Ophthalmology 2003: What's Hot and What's Not
San Francisco, CA

Retinovascular Surgery Dec 2002
Ophthalmology 2003: What's Hot and What's Not?
San Francisco, CA

Artificial Vision Feb 2003
Grand Rounds
Rocky Mountain Lions Eye Institute, Department of Ophthalmology
Aurora, CO

Artificial Vision Feb 2003
Vision Science Meeting
Doheny Eye Institute
Los Angeles, CA

Artificial Vision Mar 2003
An Update on Age-Related Macular Degeneration and Glaucoma:
Advances in the Clinic and the Lab Progress in Using Implantable
Microelectronics to Restore Vision Following Loss of Macular Photoreceptors
San Diego, CA

25-gauge TSV System April 2003
University of California – San Diego
San Diego Eye Society: Visiting Professor
San Diego, CA

The Value of Preoperative Tests in the Selection May 2003
of Blind Patients for a Permanent Microelectronic Implant
American Ophthalmological Society
Santa Barbara, CA

An Artificial Retina to Restore Sight to the Blind June 2003
Director's Colloquium
Los Alamos National Laboratory
Los Alamos, NM

Implantable Microelectronics for Restoring Vision to the Blind June 2003
Pacific Coast Oto-Ophthalmological Society
San Diego, CA

Vasculectomy for RAP June 2003
6th Annual Club Vit Meeting
Lake Tahoe, CA

Artificial Vision: Update on Model 1 Microelectronic Implant June 2003
34th Annual Doheny Days and Alumni/Residents' Day Conference
Los Angeles, CA

An Investigation of the Coupling Between Extremely Compact Microstrip Patch Antennas in a Link for Biomedical Implants June 2003
2003 AP-S/URSI Symposium
Ohio State University
Columbus, OH

Chronically Implanted Intraocular Retinal Prosthesis in Two Blind Subjects Aug 2003
2003 Vitreous Society 21st Annual Meeting
New York, NY

Visual Prostheses: Chronically Implanted Intraocular Retinal Prosthesis in Two Blind Subjects Aug 2003
2003 Conference on Implantable Auditory Prostheses
Asilomar, CA

Washington Academy of Eye Physicians & Surgeons Sept 2003
Monthly Meeting
Seattle, WA

Clinical Experience with RSV 25g Vitrectomy System and Artificial Vision: Using Microelectronics to Restore Vision Oct 2003
Ophthalmology Grand Rounds, William Beaumont Eye Institute
St. Louis, MI

Clinical Trials of First Generation Retinal Prosthesis Oct 2003
BMES 2003 Annual Fall Meeting
Nashville, TN

Opening Plenary Speaker: Artificial Vision Nov 2003
ERC 2003 Annual Meeting
Washington, D.C.

Moderator: Management of Venous Occlusive Diseases Nov 2003
Talk: Retinal Prosthesis and Artificial Vision
2003 American Academy of Ophthalmology Annual Meeting
Anaheim, CA

The Los Angeles Program: The Epiretinal Prosthesis Nov 2003
American Academy of Ophthalmology Retina Subspecialty Day 2003
Anaheim, CA

Artificial Vision Nov 2003
USC School of Engineering BOC Annual Meeting
Marina Del Rey, CA

Artificial Sight: Restoring Vision with Implantable Microelectronic Nov-Dec 2003
Chip and Sutureless Vitrectomy with the TSV 25 g System –
The Advancing Frontier
Australia Ocular Sciences Annual Meeting
Melbourne, Australia

Sutureless Vitrectomy with the TSV 25 g System- The Advancing Frontier Dec 2003
Bausch & Lomb Meeting
Sydney, Australia

Restoring Vision Using Microelectronics Jan 2004
Research Study Club
Los Angeles, CA

25g TSV Jan 2004
Bausch & Lomb: Surgical National Meeting
Dallas, TX

Artificial Vision Using Plantable Microelectronics, Drug Delivery Jan 2004
Platforms for AMD, Surgery for Retinovascular Occlusion and
Primary Sutureless 25 gauge Transconjunctival Standard Vitrectomy:
Outcomes of 140 Consecutive Cases
Retina 2004
Kauai, HI

Chronically Implanted Retinal Prosthesis in Two Blind Subjects Jan 2004
Japanese Society of Ophthalmic Surgery Meeting
Tokyo, Japan

Results of the Chronic Clinical Trial in Subjects with Epiretinal Prosthesis Feb 2004
California Institute for Telecommunications and Information Technology
University of California
Irvine, CA

Restoring Vision with a Microelectronic Retinal Implant, Clinical Experience with Bausch & Lomb TSV 25 g Vitrectomy System and Drug Delivery for the Posterior Segment Feb 2004
Hawaii Ophthalmological Mid-Winter Seminar
Honolulu, HI

Overview of the Biomimetic Microelectronics Systems Center on NSF Engineering Research Center Feb 2004
SCBC Networking Forum, University of Southern California
Los Angeles, CA

Artificial Sight: Restoring Vision with Implantable Microelectronics Feb 2004
ARDS Annual Meeting
Snowmass Village, CO

Artificial Sight: Restoring Vision with Implantable Microelectronics Feb 2004
Vail Vitrectomy 2004
Vail, CO

The Future of Biomimetic Microelectronics Mar 2004
SPIE International Symposium on Smart Structures
San Diego, CA

Biomimetic Microelectronic Implants for Blindness, Paralysis and Cognitive Dysfunction Mar 2004
Nanobio Packaging Workshop
Georgia Tech University
Atlanta, GA

Retinal Prosthesis April 2004
LCA Conference
Children's Hospital Los Angeles
Los Angeles, CA

A New 25 gauge Instrument System for Transconjunctival Sutureless Vitrectomy Surgery and Initial Experience Using the Transconjunctival Sutureless Vitrectomy System for Vitreoretinal Surgery April 2004
International Eye Health Symposium, Technology to Trends
Hyderabad, India

Drug Delivery Platforms for AMD, 25g Sutureless Vitrectomy System and Artificial Retina (Performed live surgery) April 2004
Aditya Jyot Eye Hospital
Mumbai, India

25g and Artificial Vision April 2004
Singapore National Eye Center
Singapore

Advances in Vitreoretinal Surgery, Artificial Vision and TSV25 (Live surgery) April 2004
Hospital University Kebangsaan
Malaysia

Artificial Vision and TSV25 Update April 2004
Alexandra Hospital
Singapore

Retinal Prosthesis and Drug Delivery May 2004
Taipei Activity Youth Center: Bausch & Lomb Seminar
Taiwan

Artificial Vision and Recent Advances in Treatment of AMD May 2004
Ophthalmological Society of Pakistan
Islamabad, Pakistan

Advances in the Development of Visual Prosthesis June 2004
Seoul National University Hospital
Seoul, Korea

Issues re: 25g Vitrectomy System June 2004
Korean Retinal Society Annual Meeting
Seoul, Korea

The 25g Vitrectomy System: Clinical and Product Improvement Updates and live surgery June 2004
Taipei/Chung-Hsin Municipal Hospital
China

Restoring Vision Through a Microelectronic Retinal Implant June 2004
Canadian Ophthamological Society Meeting
Vancouver, Canada

Clinical Trial of Prototype Retinal Prosthesis and Microsystems for Retinal Implants June 2004
3rd Biennial World Congress on Artificial Vision: The Eye & Chip Meeting
Detroit, MI

Microelectronic Retinal Implant, Neuroelectrodes June 2004
A National Science Foundation Engineering Research Center Site Visit, University of Washington
Seattle, WA

Clinical Results with the Model 1 IRP Implant July 2004
IJCNN International Joint Conference on Neural Networks and FUZZ-IEEE 2004 International Conference on Fuzzy Systems
Budapest, Hungary

Editorial Board Member, Springer Series in Biological and Medical Physics/Biomedical Engineering Dec 2004
Springer-Verlag USA
Los Angeles, CA

Artificial Sight Dec 2004
USC Keck School of Medicine, Faculty Lecture Series
Los Angeles, CA

Artificial Sight Dec 2004
Aspen Retinal Detachment Society Meeting
Los Angeles, CA

Intraocular Retinal Prosthesis Feb 2005
Bausch & Lomb Retina Syposium
Cairo, Egypt

25g Vitrectomy Instruments Mar 2005
Aspen Retinal Detachment Society Meeting
Aspen, CO

Surgery for Retinal Venous Occlusive Disease Mar 2005
VII Advanced Vitrioretinal Course
Antwerp, Belgium

Intraocular Retinal Prosthesis June 2005
President's Circle of National Academies
Woods Hole, MA

Intraocular Retinal Prosthesis July 2005
Western Association for Vitreoretinal Education Annual Mtg.
Maui, HI

Intraocular Retinal Prosthesis July 2005
American Society of Retina Specialists Annual Meeting
Montreal, Canada

Intraocular Retinal Prosthesis Aug 2005
Club VIT Annual Meeting
Sandestin, FL

Intraocular Retinal Prosthesis Sept 2005
National Institute of Neurological Disorders and Stroke
Neuro-Interfaces Workshop
Washington, DC

Intraocular Retinal Prosthesis Oct 2005
American Society of Ophthalmic Registered Nurses: Annual Meeting
Chicago, IL

Intraocular Retinal Prosthesis Oct 2005
American Academy of Ophthalmology Annual Meeting
Chicago, IL

Improving Technology Transfer in Biotechnology Nov 2005
National Science Foundation Engineering Research Center:
Annual Meeting
Washington, DC

Bioengineering / Intraocular Retinal Prosthesis Feb 2006
World Ophthalmology Congress
Sao Paulo, Brazil

New Concepts in Retinal Venous Occlusive Disease
April 2006
15th Duke Advanced Vitreous Surgery Course
Duke University, Durham, NC

Neural Responses Elicited by Electrical Stimulation of the Retina May 2006
American Ophthalmological Society
Half-Moon Bay, CA

Intraocular Retinal Prosthesis July 2006
Club VIT Annual Meeting
Whistler, BC, Canada

Intraocular Retinal Prosthesis July 2006
The Foundation for Retinal Research
Leber's Congenital Amaurosis Conference
Cleveland, OH

Retinal Degeneration: Understanding the Causes and Finding Cures Aug 2006
John A. Moran Eye Center Ophthalmology Symposium
Salt Lake City, UT

Improved understanding of TSV-25g Vitrectomy system: Qualitative High Speed Video Analysis of Vitreous Movement around Aperture of Vitreous Cutters Sept 2006
American Society of Retina Specialists Annual Meeting
Cannes, France

Results From a Chronically Implanted 16-Channel Epiretinal Prosthesis in Blind Subjects Oct 2006
Club Jules Gonin Annual Meeting
Cannes, France

Surgical Management of Venous Occlusive Disease Nov 2006
American Academy of Ophthalmology
Las Vegas, NV

Humans Artificial Sight: Latest Results with Microelectronic Retinal Implant in Humans Feb 2007
Foundation Fighting Blindness- New Advances in Treatments for Degenerative Retinal Disease Meeting
Salt Lake City, UT

Smart Prosthetics: Interfaces to the Nervous System Help Restore Independence Feb 2007
American Association for the Advancement of Science Annual Meeting

Intraocular Retinal Prosthesis Mar 2007
Aspen Retinal Detachment Society Meeting
Snowmass, CO

Intraocular Retinal Prosthesis Mar 2007
Vail Vitrectomy
Vail, CO

Intraocular Retinal Prosthesis Apr 2007
The American Society of Cataract and Refractive Surgery
San Diego, CA

Innovations in Vitreoretinal Diseases & Surgery May 2007
Cleveland Clinic 6th Retina Summit
Cleveland, OH

The Aging Eye May 2007
The Association for Research in Vision and Ophthalmology
Ft. Lauderdale, FL

Intraocular Retinal Prosthesis May 2007
White Night's Ophthalmology Conference
St. Petersburg, Russia

Intraocular Retinal Prosthesis May 2007
Retina Canada 2007
Dana Point, CA

Intraocular Retinal Prosthesis Jun 2007
President's Circle of National Academies
Woodshole, MA

Intraocular Retinal Prosthesis Jul 2007
Club Vit
Beaver Creek, CO

Intraocular Retinal Prosthesis Sep 2007
UCLA Lake Arrowhead
Lake Arrowhead Ranch, CA

Intraocular Retinal Prosthesis Oct 2007
Duke Medical Alumni Grand Rounds
Raleigh Durham, NC

Intraocular Retinal Prosthesis Oct 2007
Schepens International Society
Washington D.C.

A View to the Future Nov 2007
American Academy of Ophthalmology
New Orleans, LA

Intraocular Retinal Prosthesis Dec 2007
American Society of Retina Specialist
Palm Springs, CA

Developing an Interdisciplinary Institute for Dec 2007
Emerging Health Technologies
TATRC Dec 2007
Bridging the Gap between Personal and Population Health:
Honolulu, HI

Advances in Ophthalmology Jan 2008
Hawaiian Eye 2008
Waikoloa, HI

Induction Ceremony 2008 Feb 2008
American Institute for Medical and Biological Engineering
Washington, DC

Oh Vitreous Where Is Thy Humor Mar 2008
36th Annual Aspen Retinal Detachment Society Meeting
Snowmass (Aspen), CO

Snell Memorial Lecturer Mar 2008
The 53rd Annual Ophthalmology Conference
University of Rochester, Rochester, NY

Artificial Sight Mar 2008
Malloy Lecture
Georgetown University, Washington D.C

The 2nd International Innovations in Ophthalmology Course Mar 2008
Cole Eye Institute
Los Cabos, Mexico

Friends of the Petit Institute Apr 2008
Parker H. Petit Institute for Bioengineering & Bioscience (IBB)
Georgia Institute of Technology, Atlanta, GA

Eyes on Innovation Apr 2008
The Association for Research in Vision and Ophthalmology
Ft. Lauderdale, FL

ROPARD lecture & Children's Vision Award May 2008
Pediatric Retinal Disease Management
Detroit, MI

Brown University — Jun 2008
Frontiers of Health Care Conference
Providence, RI

Artificial Sight — Jun 2008
World Ophthalmology Congress
Hong Kong, China

Research into Practice — Jul 2008
The 15th Retina International World Congress
Helsinki, Finland

Extraordinary Ophthalmology Conference — Jul 2008
University of Wisconsin – Madison
Madison, WI

Artificial Sight — Jul 2008
5th Biannual LCA Family Conference
Cleveland Clinic, Cleveland, OH

Artificial Sight — Aug 2008
Blind Veterans Association 63rd National Convention
Phoenix, AZ

Blindness Prevention and Visual Rehabilitation — Sep 2008
XVIII Brazilian Meeting of Ophthalmology
Florianópolis, Santa Catarina, Brazil

Ophthalmology Grand Rounds — Sep 2008
University of California, San Francisco
San Francisco, CA

15th Anniversary of the Retina Center at Pali Momi — Oct 2008
Kapolei, Hawaii

Survivor Retina — Oct 2008
26th Annual ASRS Meeting
Maui, Hawaii

A Case Study in Medical Innovation: Bioelectronics in Ophthalmology — Oct 2008
68th Annual Convention and Scientific Sessions
American College of Osteopathic Internists (ACOI)
San Marcos Island, FL

Artificial Retina Nov 2008
American Academy of Ophthalmology Annual Meeting
Atlanta GA

Artificial Retina Dec 2008
Duke Institute for Brain Sciences
Duke University, Durham, NC

Artificial Retina Jan 2009
Hawaiian Eye 2009
Wailea, Maui, HI

Advances in Surgical Instrumentation and Diagnostic Instrumentation Jan 2009
Institutes of Ophthalmology Retina meeting
Cairo, Egypt

Bioengineering in Ophthalmology Feb 2009
Illuminating the Genetic Architecture of Common Eye Disease
Avalon, CA

Translating Medical and Biological Engineering: Feb 2009
Bringing Technologies to Life
AIMBE's 2009 Annual Event
Washington, D.C.

Artificial Retina Mar 2009
37th Annual Aspen Retinal Detachment Society Meeting
Snowmass, CO

Genetech April 2009
EyeQ Lecture Series
San Francisco, CA

Reducing Disparities in Eye Disease and Treatment May 2009
The Association for Research in Vision and Ophthalmology
Ft. Lauderdale, FL

Advanced Imaging in Ophthalmology May 2009
The American Ophthalmological Society
Half Moon Bay, CA

40th Annual Doheny Days Conference June 2009
Doheny Days
Los Angeles, CA

The Science and Engineering of Artificial Sight July 2009
SRC Board of Directors' Retreat
Palm Springs, CA

12th Annual Club Vit Meeting July 2009
Salt Lake City, Utah

Engineering the Future of Biomedicine
Sep. 2009
31st Annual Int'l Conference of IEEE Engineering in
Medicine and Biology Society
Minneapolis, MN

Retina Congress 2009: A Combined Meeting of the American Society Sep. 2009
of Retina Specialists- The Macula Society and The Retina Society
New York, NY

The Science and Engineering of Artificial Sight Oct. 2009
Italian Artificial Vision Society
University for Foreigners of Siena
Aula Magna, Italy

Translational Research Can Create New Therapeutic Modalities Oct. 2009
for Challenging Ocular Diseases
American Academy of Ophthalmology
San Francisco, CA

The Science and Engineering of Artificial Sight Oct. 2009
Lions Eye Institute for Transplant and Research
Orlando, FL

The Science and Engineering of Artificial Sight Dec. 2009
University of California Davis
Sacramento, CA

The Distinguished Speakers Series Jan. 2010
USC Emeriti Center College Speaker
Irvine, CA

Arnold and Mabel Beckman Initiative on Macular Research Jan. 2010
Irvine, CA

The Science and Engineering of Artificial Sight Feb. 2010
The University of Utah
Salt Lake City, UT

The Science and Engineering of Artificial Sight Mar. 2010
Vail Vitrectomy 2010
Vail, CO

ASCRS / ASOA Symposium and Congress Apr. 2010
Boston, MA

The Science and Engineering of Artificial Sight Apr. 2010
Vollum Institute Oregon Health & Science University
Portland, OR

The Science and Engineering of Artificial Sight May 2010
2010 ARVO Annual Meeting
Fort Lauderdale, Florida

Grand Challenges in Neuro-engineering May 2010
IEEE EMBS Forum
Bethesda, MD

The Science and Engineering of Artificial Sight May 2010
McGowan Institute Stem Cell meeting
Pittsburgh, PA

The Science and Engineering of Artificial Sight Jun. 2010
The World Ophthalmology Congress 2010
Berlin, Germany

The Science and Engineering of Artificial Sight Jun. 2010
39th Annual Neural Interfaces Conference
Long Beach, CA

Bioelectronic Devices for Ophthalmology; From Benchtop to the Clinic Jun. 2010
NEI Symposium - Translational Research and Vision
Bethesda, MD

The Foundation for Retinal Research Jul. 2010
2010 LCA Family Conference
Philadelphia, PA

ASRS 28th Annual Meeting Aug. 2010
Vancouver Convention Centre
Vancouver, BC, Canada

NAE Grand Challenges Summit — Oct 2010
Advancing the Grand Challenges of the National Academy of Engineers
USC, Los Angeles, CA

IOM Annual Meeting — Oct 2010
The National Building Museum
Washington DC

Case Western Conference — Oct 2010
2010/2011 Neural Prosthesis Seminar Series
Cleveland, OH

The Science and Engineering of Artificial Sight — Oct 2010
American Academy Ophthalmology Annual Meeting
Chicago, IL

The Science and Engineering of Artificial Sight — Nov 2010
Club Jules Gonin 2010
Kyoto, Japan

25th Anniversary Program at the 2010 NSF ERC Annual Meeting — Dec 2010
Hyatt Regency Bethesda
Bethesda, MD

Retina 2011 — Jan 2011
Westin Maui Resort & Spa
Lahaina, Maui, HI

Arnold and Mabel Beckman Initiative on Macular Research — Jan. 2011
The Science and Engineering of Artificial Sight
Irvine, CA

30th Annual Squaw Valley Retinal Symposium — Feb 2011
The Science and Engineering of Artificial Sight
Lake Tahoe, CA

Grand Challenges in Neural Computation II — Feb 2011
Neuromimetic Processing and Synthetic Cognition
La Posada de Santa Fe hotel
Santa Fe, NM

The 30th Anniversary of the Alcon Research Institute Awards Symposium — Mar 2011
Omni Hotel
Fort Worth, Texas

39th Annual Aspen Retinal Detachment Society Meeting — Mar 2011
The Viceroy Snowmass Hotel
Snowmass (Aspen), CO

ASCRS*ASOA Symposium & Congress 2011 — Mar 2011
San Diego Convention Center
San Diego, CA

2011 ARVO Annual Meeting — May 2011
Greater Fort Lauderdale/Broward County Convention Center
Fort Lauderdale, FL

2011 NEI/FDA Endpoints Symposium — May 2011
Use of Functional Vision Endpoints in Visual Prostheses Product Development
Masur Auditorium, National Institutes of Health
Bethesda, MD

Artificial Sight — May 2011

Louis J. Fox Center for Vision Restoration
The University of Pittsburgh and UPMC
Pittsburgh, PA

2011 International Conference on Spinal Cord Medicine and Rehabilitation — Jun 2011
The State of the Science in Spinal Cord Injury (SCI) Rehabilitation: Informing a New Research Agenda
Grand Hyatt Washington Hotel
Washington, D.C.

The Science and Engineering of Artificial Sight — Jun 2011
Gifford-Truhlsen Research Day
UNMC Ophthalmology/Eye Clinic, Nebraska Medical Center
Omaha, NE

4th International Conference on Femtosecond Lasers in Ophthalmology — Jun 2011
St. Regis Monarch Beach
Dana Point, CA

Cellular, Tissue and Gene Therapies Advisory Committee Meeting — Jun 2011
Food and Drug Administration Center for Biologics Evaluation and Research Cellular, Tissue and Gene Therapies Advisory Committee
Crowne Plaza Hotel
Silver Spring, MD

14th Annual Meeting of Club Vit — Jul 2011
Loews Santa Monica Beach Hotel
Santa Monica, CA

Advanced Technology Applications for Combat Casualty Care (ATACCC) 2011 Conference — Aug 2011
Marriott Harbor Beach
Ft. Lauderdale, FL

29th Annual Meeting of the American Society of Retina Specialists — Aug 2011
Sheraton Boston Hotel
Boston, MA

Stanford Institute for Neuro-Innovation and Translational Neurosciences Vision Symposium — Sep 2011
"New Approaches to Understand and Treat Vision Loss"
Stanford University School of Medicine
Palo Alto, California

California Institute for Regenerative Medicine — Sept 2011
(CIRM) 2011 Grantee Meeting
San Francisco, CA

The 10th Annual Educational Meeting the Latest in the Management of Retinal Diseases — Oct 2011
California Retina Research Foundation
Santa Barbara, California

Stem Cell Translational Report- Diseases of the Eye — Oct 2011
World Stem Cell meeting
Pasadena, California

The Science and Engineering of Artificial Sight — Oct 2011
45th National Turkish Ophthalmology Congress
Turkish Ophthalmology Society
Girne, Northern Cyprus

National Academy of Engineers 2011 Annual Meeting — Oct 2011
Washington, D.C.

Vaccines: The Science, Policy, and Practice of Immunization — Oct 2011
Institute of Medicine's 41st Annual Meeting
Crystal Gateway Marriott
Arlington, VA

The Science and Engineering of Artificial Sight Oct 2011
Vanderbilt Eye Institute 2010-2011 Academic Seminar Series
Nashville, TN

Retina 2011: The Magical World of Retina Oct 2011
AAO
Orlando, FL

Bioelectronics in Ophthalmology: External Reservoir Implant for Ocular Drug Delivery Feb 2012
World Ophthalmology Congress
Abu Dhabi, UAE

Update from Long-term Epiretinal Prosthesis Implantation; Second Sight's Argus® II Retinal Prosthesis Study June 2012
28th Club Jules Gonin Meeting
Reykjavik, Iceland

Electronic Prosthetic Devices: Replacing the Function of Photoreceptors July 2012
FRR-LCA Conference – Scientific Sessions
7th Biannual LCA Family Conference
Philadelphia, PA

Two-Year Results from the Argus® II Retinal Prosthesis System Clinical Trial Aug 2012
ASRS 2012 Annual Symposium
Las Vegas, NV

Update on ERC for Biomimetic MicroElectronic Systems Aug 2012
VSOE Retreat
Los Angeles, CA

Nanotechnology and Neurons: Applications for Neurodegenerative and Neuro-Developmental Diseases Sep 2012
USC Whittier Nanobiotechnology Initiative Annual Retreat
Los Angeles, CA

Revolutionary Impact Of The Convergence Of Engineering And Medicine Oct 2012
USC Trustees VC Luncheon
Menlo Park, CA

USC in Your Neighborhood: Giving Sight to the Blind Oct 2012
USC Alumni Association Bay Area Meeting
Palo Alto, CA

Two-Year Results From the Argus II Retinal Prosthesis System Clinical Trial Nov 2012
AAO
Chicago, IL

Retinal Prosthesis Nov 2012
AAO
Chicago, IL

The Bionic Eye Project: Restoring Sight To The Blind Jan 2013
USC NY Almuni Meeting
New York, NY

Keynote Address: Artificial Retina to Restore Sight to the Blind Apr 2013
2013 Design of Medical Devices Conference
University of Minnesota in Minneapolis
Minneapolis, MI

Drug Delivery Options for AMD May 2013
Treatment Strategies in Macular Degeneration
Doheny Eye Institute
Los Angeles, CA

Recent Results from Second Sight's Argus® II Retinal Prosthesis Study May 2013
ARVO 2013
Seattle, WA

Artificial Sight: Argus II Epiretinal Prosthesis June 2013
3rd Annual CME International Conference
"Vision Restoration: Regenerative Medicine in Ophthalmology"
Louis J. Fox Center for Vision Restoration of UPMC
and the University of Pittsburgh.
Pittsburgh, PA

Artificial Sight Restoration of Sight through Use of Argus Retinal Prosthesis Aug 2013
Lasker/IRRF Restoring Vision Meeting
Woods Hole, MA

Three-Year Results From the Argus II Clinical Trial Aug 2013
American Society of Retina Specialists' 31st Annual Meeting
Toronto, ON

A Novel Surgical Platform For Stem Cell Therapy For AMD October 2013
All I Need To Know About The ARGUS II
Development Of A Retinal Prosthesis: From Science Fiction To Reality
NHG Eye Institute 6th International Ophthalmology Congress 2013
Singapore

Retinal Prosthesis: Post Approval Applications and Outcome November 2013
Drug Treatment: Is There an Alternative Drug
FDA Approval of Argus II Implant
AAO
New Orleans, LA

Diseases of the Eye- a Progress Report December 2013
Annual World Stem Cell Summit
San Diego, CA

Update on the Argus II Retinal Prosthesis System December 2013
Retina Fellows' Forum - The Best of Retina 2013
New York, NY

Hyperspectral Imaging of Retinal Diseases January 2014
Update on Argus II
Drug Delivery for Retinal Diseases
Hawaiian Eye and Retina 2014
Kauai, HI

OCT in Stem Cell Transplantation and the Retinal Prosthesis February 2014
Frontiers of Optical Coherence Tomography
Pasadena, California

Deployment-Related Vision Trauma Research: March 2014
Development of a Thermo-Responsive
Patch for Ocular Trauma
The Alliance for Eye and Vision Research and
Blind Veterans Association
Washington, DC

Bioelectronics in Ophthalmology March 2014
The Ellis Lecture
66th Annual Wills Eye Conference
Philadelphia, PA

Artificial Retina March 2014
Stem Cells for AMD
Oxycam for Retinal Diseases
Maloney Vision Institute Symposium on
Controversies in Modern Eye
Los Angeles, CA

Thermoresponsive Reversibly Attachable Patch for March 2014
Temporary Intervention in Ocular Trauma
Joint Program Committee - 8 (JPC-8) for
Clinical and Rehabilitative Medicine
and the Telemedicine & Advanced
Technology Research Center (TATRC)
Ocular Therapies Research & Development
Program In-Progress Review (IPR)
Fort Detrick, MD

A Novel Mini Drug Pump for Ophthalmology March 2014
A Subretinal Cell Based Implant for Retinal Diseases
18th Duke Advanced Vitreous Surgery Course
Durham, NC

Bioelectronics in Ophthalmology April 2014
The McCollough Lecture
University of Texas Medical Branch Health
Ophthalmology and Visual Sciences
Galveston, TX

Bioelectronic Vision May 2014
Innovator's Lecture – Albrecht Von Graefe Lecture
27th International Congress of German Ophthalmic Surgeons
Nuremberg, Germany

An Update on the Argus II Epiretinal Implant May 2014
Genomics and Stem Cell Based Therapies: Shaping the Future
of Personalized Medicine
Zhongshan Ophthalmic Center, Sun Yat-sen University (ZOC)
Guangzhou, China

Stem Cell Treatment for Age Related Macular Degeneration June 2014
4th Annual Vision Restoration Conference
Pittsburgh, PA

Bioelectronics in Ophthalmology July 2014
9th FENS Forum of Neuroscience
Milan, Italy

Bioelectronics in Ophthalmology July 2014
Institut de la Vision
Paris, France

Advanced Implants for Ophthalmology January 2015
Distinguished Speaker Colloquium
Department of Bioengineering, University of California, Riverside
Riverside, California

UPCOMING LECTURES

Bioelectronics in Ophthalmology January 2015
Specialty Lecture Series – Retinal Therapeutics 2015: Needle vs Scalpel
USC Eye Institute, Los Angeles, California

Advanced Implants for Ophthalmology January 2015
Distinguished Speaker Department of Bioengineering Colloquium Series
University of California, Riverside, CA

OCT of Retinal Pigment Epithelial Cell Transplantation February 2015
Frontiers of Optical Coherence Tomography
Langham Huntington Hotel, Pasadena, California

Retinal Prosthesis March 2015
Bioengineering Seminar Winter 2015
UC San Diego, California

The Bionic Eye – Update on Argus II – Surgery and Results March 2015
Reservoir Systems for Drug Delivery for Intravitreal Medications
Visiting Professor Lecture Series, Retina Consultants of Hawaii

CURRENT FUNDING

ACTIVE

DR1-014444 04/01/10-12/31/14 3.6 calendar mos
CIRM $15,904,916
Stem cell based treatment strategy for Age-Related Macular Degeneration (AMD)
The major goal of this project is to replace the damaged RPE and retinal cells with healthy ones.
Role: Principal Investigator

W81XWH-12-1-0314 08/15/12-08/14/15 0.24 calendar mos
DoD TATRC CDMRP $814,117
Thermoresponsive Reversibly Attachable Patch for Temporary Intervention in Ocular Trauma
The major goal of this project is to fabricate a novel, sutureless ocular adhesive bandage and contact shield to close scleral trauma and promote healing, but also to prevent scarring between the sclera and conjunctiva/Tenon's capsule.
Role: Principal Investigator

EEC-1301502 06/01/13-05/31/16 0.12 calendar mos
NSF $372,465
Engineering Medical Therapeutic Technologies Research Experience for Teachers (EMT^2)
The overall goal of this project is to leverage the considerable resources of the University of Southern California to create long-term partnerships among world-renowned biomedical engineering and computer science researchers, K-12 teachers in Los Angeles inner-city schools, and community college educators.
Role: Principal Investigator

DR3-07438 08/01/14-07/31/15 1.2 calendar mos
CIRM $2,626,872
Phase 1 Safety Assessment of CPCB-RPE1, hESC-derived RPE Cell Coated Parylene, in Patients with Advanced Dry Age-Related Macular Degeneration (AMD)
The major goal of this project is to test the CPCB-RPE1 in phase I clinical trials in geographic atrophy (GA) in partnership with a private company, Regenerative Patch Technologies (RPT), which has been established for the purpose of developing CPCB-RPE1 through phase II studies.
Role: Principal Investigator

CBET-1404089 08/15/14-07/31/17 1.0 calendar mos
NSF $900,000
Retinal Nanophotoswitch
The major goal of this project is to fully implantable bioelectronic system specifically for small animal neuroscience research.
Role: Principal Investigator

1R01EY022059-01A1 07/01/13-06/30/16 2.4 calendar mos
NIH NEI $4,597,276

A Novel Treatment for Retinal Ischemia
The major goal of this project is to use sophisticated biological experiments, bioinformatics, biophysics and advanced bio-microelectromechanical systems (bioMEMS) engineering to develop an
OXYGENATOR system to deliver highly controlled levels of oxygen that are precisely targeted to the ischemic

retina (i.e., local oxygenation within a therapeutic window).
Role: Principal Investigator

OVERLAP

There will be no budgetary overlap. Should the pending grants be funded, Dr. Humayun will follow agency requirements to make notifications and adjust his effort accordingly.