
BIOGRAPHICAL SKETCH

NAME Dr. Douglas B. Shire Date: October, 2011		POSITION TITLE VA Research Health Scientist / Engineering Manager	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Rensselaer Polytechnic Institute	B.S.	1980 - 1984	Electrical Engineering
Cornell University	Ph.D.	1984 - 1989	Electrical Engineering
Cornell University	Postdoc.	1994 - 1997	Electrical Engineering

A. Personal Statement

Dr. Douglas Shire is a full time (8/8th) VA employee as a Research Health Scientist, and he has served as the Engineering Manager for the VA Center for Innovative Visual Rehabilitation since 2006. In this capacity, his time is divided between microfabrication research (30%), supervision of VA staff, travel to vendor and off-site research locations, and other administrative tasks (70%). He has 25+ years of experience in micro- and nano-fabrication, MEMS, and related technologies, and he was one of the first such subject matter experts to join the VA. He has served the Retinal Implant team since 1997, primarily from his station at the NSF-sponsored Cornell NanoScale Science and Technology Facility. This \$150M user facility has provided our research team with access to state-of-the-art microfabrication tools. Dr. Shire has also served as a member of a SEMATECH Project Technical Advisory Board. Dr. Shire also holds a courtesy Visiting Scientist appointment in the Electrical Engineering department at Cornell University; this carries no salary and is at 0% effort.

B. Positions and Honors:

1989-1994	Research Engineer, Hewlett-Packard Co., Optoelectronics Division, San Jose, CA
1994-present	Adjunct Associate Professor of Electrical Engineering, Syracuse University, NY
1994-1997	Postdoctoral Research Associate, Cornell University, Ithaca, NY
1997-2002	Visiting Scientist, Cornell NanoScale Facility, Ithaca, NY
2002-2006	Research Engineer, Ctr. for Innovative Visual Rehabilitation, Boston VA Medical Ctr.
2006-present	Engineering Manager, Ctr. for Innovative Visual Rehabilitation, Boston VA Medical Ctr.

Awards

1984	Eta Kappa Nu, Tau Beta Pi (Engineering Honorary Societies)
1984	IEEE Student Paper Prize
1984	Henry Nolte Prize for Outstanding Undergraduate Research
1989	HAZMACON Award for Best Hazardous Waste Reduction Program

C. Selected Patents, Invited Papers, and Journal Articles:

S. Kelly, D. B. Shire, J. Chen, P. Doyle, M. Gingerich, S. Cogan, W. Drohan, S. Behan, L. Theogarajan, J. L. Wyatt, and J.F. Rizzo 3rd, "A Hermetic Wireless Subretinal Neurostimulator for Vision Prostheses," IEEE Trans. Biomed. Eng. 2011, Accepted for Publication.

D. B. Shire, S. Kelly, J. Chen, P. Doyle, M. Gingerich, S. Cogan, W. Drohan, O. Mendoza, L. Theogarajan, J. Wyatt, and J.F. Rizzo 3rd, "Development and implantation of a minimally-invasive wirelessly-driven sub-retinal neurostimulator," IEEE Trans. Biomed. Eng. 2009 56(10) 2502-2511 (featured cover article).

S. F. Cogan, J. Ehrlich, T.D. Plante, A. Smirnov, D. B. Shire, M. Gingerich, and J. F. Rizzo 3rd, "Sputtered iridium oxide films (SIROFs) for neural stimulation electrodes," J. Biomed. Mater. Res. B: Appl. Biomater. 2009 89B(2): 353-361

Scholz C, Vayaboury W, Sweitzer R, Shire DB, Rizzo JF "Surface modification of retinal implants," Polymer Preprints, 2006 47(2) 159-160.

J. F. Rizzo, J. Wyatt, J. Loewenstein, S. Kelly, and D. Shire, "Methods and Perceptual Thresholds for Short-Term Electrical Stimulation of Human Retina with Microelectrode Arrays," Invest. Ophthalmol. Vis. Sci. 2003 44:12 5355-5361.

J. F. Rizzo, J. Wyatt, J. Loewenstein, S. Kelly, and D. Shire, "Perceptual Efficacy of Electrical Stimulation of Human Retina with a Microelectrode Array During Short-Term Surgical Trials," Invest. Ophthalmol. Vis. Sci. 2003 44:12 5362-5369.

D. Shire, J. L. Wyatt, and J. F. Rizzo, "Inflatable Retinal Prosthesis," US Patent No. 6,368,349, dated April 9, 2002

D. Shire and J. F. Rizzo, "Microfabrication Initiatives at the VA Center for Innovative Visual Rehabilitation (CIVR)," Invited Paper, in Proc. 2nd Joint IEEE EMBS-BMES Conference, vol. 3, p. 2399, 2002

J. Wyatt, D. Shire, and J. F. Rizzo, "Chronically Implantable Retinal Prosthesis," US Patent No. 6,324,429, dated November 27, 2001

D. B. Shire, C. L. Tang, M. A. Parker, C. Lei, and L. Hodge, "Bistable Operation of Coupled In-Plane and Oxide-Confined Vertical-Cavity Laser 1xN Routing Switches," Applied Physics Letters, vol. 71, no. 21, pp. 3039-3041, 1997

M. A. Parker, R. J. Michalak, J. S. Kimmet, A. R. Pirich, and D. B. Shire, "Etched-surface Roughness Measurements from an In-Situ Laser Reflectometer," Applied Physics Letters, Vol. 69, no. 10, pp. 1459-1461, 1996

D. B. Shire, C. L. Tang, and M. Hong, "Coupled In-Plane and Vertical-Cavity Laser 1xN Routing Switches," IEEE Photonics Technology Letters, vol. 8, no. 11, pp. 3039-3041, 1996

M.A. Parker, J. S. Kimmet, R. J. Michalak, H. S. Wang, D. B. Shire, C. L. Tang, and J. P. Drumheller, "Accurate Electron-Cyclotron-Resonance Etching of Semiconductor Laser Heterostructures Using a Simple Laser Reflectometer," IEEE Photonics Technology Letters, Vol. 8, no. 6, pp. 818-820, 1996

D. B. Shire, M. A. Parker, and C. L. Tang, "Multiple-Input Optical Control of Vertical Cavity Surface Emitting Lasers Using Intracavity-Coupled In-Plane Lasers," IEEE Photonics Technology Letters, Vol. 8, no. 2, pp. 188-190, 1996

P. D. Swanson, D. B. Shire, C. L. Tang, M. A. Parker, J. S. Kimmet, and R. J. Michalak, "Electron-Cyclotron Resonance Etching of Mirrors for Ridge-Guided Lasers," IEEE Photonics Technology Letters, Vol. 7, no. 6, pp. 605-607, 1995

D. Shire, "Hazardous Waste Minimization in III-V Wafer Fabrication Processes," IEEE Trans. Components, Packaging, and Manufacturing Technology, vol. 17, no. 4, p. 521, 1994

Conference Presentations:

D.B. Shire, T. Salzer, W.K. Jones, B. McKee, M.D. Gingerich, J.L. Wyatt, and J.F. Rizzo, "Bonding and Packaging Advancements to the Boston Retinal Prosthesis," Invest. Ophthalmol. Vis. Sci., 2011 52:4 4966 (in Proc. ARVO)

D.B. Shire, S.K. Kelly, M.D. Gingerich, O. Mendoza, W. Drohan, J.H. Chen, J.F. Rizzo III and J.L. Wyatt, "Long-Term in-vivo Operation of the Wireless Boston Retinal Neuroprosthesis," Invest. Ophthalmol. Vis. Sci. 2009 50:4 4596 (in Proc. ARVO).

S.K. Kelly, D.B. Shire, J. Chen, P. Doyle, M.D. Gingerich, W.A. Drohan, L.S. Theogarajan, S.F. Cogan, J.L. Wyatt, J.F. Rizzo III. "The Boston Retinal Prosthesis: A 15-Channel Hermetic Wireless Neural Stimulator." In Proc. IEEE ISABEL International Symposium on Applied Sciences in Biomedical and Communication Technologies. Invited paper, 2009 - Received Best Paper Award.

S.K. Kelly, D.B. Shire, J. Chen, P. Doyle, M.D. Gingerich, W.A. Drohan, L.S. Theogarajan, S.F. Cogan, J.L. Wyatt, J.F. Rizzo III. "Realization of a 15-Channel, Hermetically-Encased Wireless Subretinal Prosthesis for the Blind." In Proc. IEEE Engineering in Medicine and Biology Conference, 2009, pp. 200-203.

L.S. Theogarajan, D.B. Shire, S.K. Kelly, J.L. Wyatt, J.F. Rizzo. "Visual Prostheses: Current Progress and Challenges." VLSI - Design and Test Conference, Taiwan, 2009.

J.F. Rizzo III, J. Chen, D. Shire, M. Gingerich, J. Sandell, and S. Cogan, "Collective Summary of *in vivo* Experiments of Sub-Retinal Implantation of Microfabricated Electrode Arrays in Pigs," Invest. Ophthalmol. Vis. Sci. 2009 50:4 4746.

M.D. Gingerich, R. Akhmechet, O.R. Ziv, D.B. Shire, J.L. Wyatt, and J.F. Rizzo III, "Microfabricated Multi-Electrode Arrays for in vitro Study of Neural Coding in the Retina," Invest. Ophthalmol. Vis. Sci. 2009 50:4 4587.

S.K. Kelly, P. Doyle, O. Mendoza, W.A. Drohan, G.W. Swider, D.B. Shire, J.L. Wyatt, and J.F. Rizzo III, "Improved Class A Based Transmitter System for Wireless Retinal Implant Data Telemetry," Invest. Ophthalmol. Vis. Sci. 2009 50:4 4578.

D.B. Shire and S.K. Kelly, "Chronic Implantation of a Wireless Subretinal Neurostimulator in Yucatan Minipigs," in Proc. Eye and the Chip World Congress on Artificial Vision, Detroit, MI, June 12-14, 2008.

D.B. Shire, S.K. Kelly, M.D. Gingerich, O. Mendoza, G. Swider, W. Drohan, J. Chen, J.F. Rizzo, and J.L. Wyatt, "Operation of a Wirelessly Powered Subretinal Neurostimulator," Invest. Ophthalmol. Vis. Sci. 2008 49:4 3031.

J.F. Rizzo, J. Chen, D.B. Shire, S. Kelly, M. Gingerich, G. Swider, W. Drohan, and J.L. Wyatt, "Implantation of a Wirelessly Powered Retinal Prosthesis Using an ab externo Surgical Technique," Invest. Ophthalmol. Vis. Sci. 2008 49:4 3027.

M.D. Gingerich, R. Akhmechet, D.B. Shire, J.L. Wyatt, and J.F. Rizzo, "Development of a Flexible High-Density Multi-Layered Metallization Interconnect Technology for a Subretinal Prosthesis," Invest. Ophthalmol. Vis. Sci. 2008 49:4 3035.

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D. B. Shire, O. R. Ziv, M. D. Gingerich, R. Jensen, J. F. Rizzo, S. F. Cogan, and J. L. Wyatt, "Progress Toward a Platform for Studying Neural Coding of Vision: Recordings From a Flexible, Transparent Multielectrode Array," Invest. Ophthalmol. Vis. Sci. 2007 48:4 658.

S. F. Cogan, J. Ehrlich, T. D. Plante, D. B. Shire, M. Gingerich, and J. F. Rizzo, "Sputtered Iridium Oxide Films (SIROFS) for Retinal Stimulation Electrodes," Invest. Ophthalmol. Vis. Sci. 2007 48:4 660.

D.B. Shire, S. F. Cogan, M. D. Gingerich, J. L. Wyatt, and J.F. Rizzo, "Transparent Epiretinal Electrode Array for Chronic Recording to Study Neural Coding for Vision," Invest. Ophthalmol. Vis. Sci. 2006 47:4 3162.

L. Theogarajan, J. Wyatt, J. Rizzo, B. Drohan, M. Markova, S. Kelly, G. Swider, M. Raj, D. Shire, M. Gingerich, J. Loewenstein, B. Yomtov, "Minimally Invasive Retinal Prosthesis," in Proc. IEEE International Solid-State Circuits Conference (ISSCC), February, 2006.

D.B. Shire, M. Gingerich, J.F. Rizzo, and J.L. Wyatt, "Recent Developments in Inflatable Prostheses for Epiretinal Stimulation and/or Recording," Invest. Ophthalmol. Vis. Sci. 2005 46:4 1534.

J.L. Wyatt, J.F. Rizzo, L. Theogarajan, D.B. Shire, S.K. Kelly, M.D. Gingerich, S. Cogan, M. Markova, and O. Ziv, "Engineering Development of a Prototype Wireless Subretinal Prosthesis," Invest. Ophthalmol. Vis. Sci. 2005 46:4 1146.

M.D. Gingerich, D.B. Shire, K. Karcich, C. Scholz, J. Wyatt, and J.F. Rizzo, "Assembly and Packaging Developments for an Ab-Externo Retinal Prosthesis," Invest. Ophthalmol. Vis. Sci. 2004 45:4 4217.

K.J. Karcich, A. Buck, J. Wyatt, D.B. Shire, M.D. Gingerich, C. Scholz, and J. Rizzo, "A System for Leakage Testing Of Flexible Electronic Components," Invest. Ophthalmol. Vis. Sci. 2004 45:4 4183.

D.B. Shire, M. Gingerich, S. Retterer, L. Theogarajan, S. Kelly, M. Markova, M. Raj, S. Cogan, J. Wyatt, and J.F. Rizzo, "Design and Fabrication of an Ab-Externo Retinal Prosthesis," Invest. Ophthalmol. Vis. Sci. 2004 45:4 4177.

D.B. Shire, M. Gingerich, L. Theogarajan, J. Wyatt, J. Loewenstein, S. Montezuma, and J. Rizzo, "Packaging Development for Retinal Prostheses," Invest. Ophthalmol. Vis. Sci. 2003 44:4 5084.

D. Research Support: Current/Ongoing:

VA "High Density Hermetic Packaging for Next-Generation Neural Prostheses" This Merit Review grant focuses on the development of an ultra-high density hermetic package for the CIVR retinal prosthesis having 200+ inputs or outputs (I/O). Dr. Shire's role as PI is to oversee the research, lead the microfabrication effort to create cofired ceramic/titanium micropackages in collaboration with a suite of vendors, and coordinate in vitro and in vivo testing of the devices in minipig animal models with Center director, Dr. Joseph Rizzo, MD.

VA "Center for Innovative Visual Rehabilitation (CIVR)" The overall aim of the CIVR is to develop a wirelessly powered neural prosthesis to restore useful vision to patients who are blind with degenerative retinal disease. Dr. Shire's role in this program is to manage the entire engineering effort across multiple research and vendor sites, and to coordinate pre-clinical animal studies with the surgical team.

Completed Research Support:

NIH/EY016674-01 "Engineering Development of a Chronic Retinal Implant" This BRP effort aimed to solve key technical issues common to all neural prostheses in low-power circuit design, low density hermetic packaging, and biocompatible surface coatings. One primary goal was the development of a hermetic retinal prosthesis in a titanium package with conventional Pt wire feedthroughs. Dr. Shire managed this engineering effort.