## Michael I. Dorrell Ph.D.

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## Professor of Biology: Point Loma Nazarene University

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**Professional Preparation**

Institution Major Degree Year

Simpson College (IA) Chemistry / Math (3.98gpa) B.A. 1998

The Scripps Research Institute Biomedical Research Ph.D. 2003

The Scripps Research Institute Cell and Developmental Bio Post-doc 2004-2009

**Appointments**

*11/15 – present* **Full professor of Biology: Point Loma Nazarene University**

* Teaching various biology courses at all levels including GE, freshman majors, upper division requirements and electives, and graduate courses.
* Research studying targeted methods of treating glioblastoma brain cancers. Focuses on anti-angiogenic treatments and ADEP therapy.

*09/14 – present* **Staff consultant: Lowy Medical Research Institute**

- Guide ongoing studies investigating eye disease, including genetic studies, studies with induced pluripotent stem cells, and metabolic analyses

- Guide intramural and extramural studies of funded labs around the world

*08/12 – 11/15* **Associate professor: Point Loma Nazarene University**

*08/09 – 08/12* **Assistant professor: Point Loma Nazarene University**

*06/13 – 08/14* **Senior staff scientist: Lowy Medical Research Institute**

* 15 month leave from PLNU (two summers and intervening academic year)
* Established a new institute dedicated to the study of degenerative eye disease.
* Devised and tested hypotheses of the causes of MacTel based on clinical and basic research findings.
* Coordinated MacTel-based clinical and basic research around the globe.

*08/09 – present* **Adjunct professor: The Scripps Research Institute**

*2010 – 2012* **Research consultant: EyeCyte Inc.**

*2007- 2009* **Adjunct professor: University of San Diego.**

 **-** Taught 1 course per semester in conjunction with my post-doctoral work.

*04/05-08/09* **Postdoctoral fellow (Research Associate), The Scripps Research Institute**

 - Explored cell-based therapies for the treatment of vascular diseases

 - Explored combination angiostatic therapies for treating glioblastoma cancers.

*05/04-04/05* **Research Scientist, Angiosyn Inc.** San Diego, CA

 - Investigating the use of an angiostatic molecule (T2-TrpRS), characterized during my graduate work, for use in the clinic (purchased in ’05 by Pfizer)

 *09/03-05/04* **Research Consultant, Angiosyn Inc**. San Diego, CA

*05/03-05/04* **Research Associate, The Scripps Research Institute,** La Jolla, CA

 - Role of tissue factor during developmental retinal angiogenesis

 - Receptor identification, biochemical purification and characterization

*1998-05/03* **Graduate student, The Scripps Research Institute,** La Jolla, CA

 Thesis: “Endothelial Cell Guidance and Vascular Patterning during Retina Development”

* 1. **Research Consultant, Nanogen Inc.** San Diego, CA

 *-* Gene expression tools and analyses, helped implement a new qPCR program

**Teaching Experience**

*Point Loma Nazarene University*

* University Now; Outreach program to under-priveleged high school students where we teach the students Bio101 (General elective human biology) and writing.
* Human Biology and Bioethics (Bio101), General education elective
* Cell Biology and Biochemistry (Bio210), Introductory level course for Biology majors
* Research Methodology (Bio301), Biology major’s quad course. I specifically designed this course to teach students how to think like a scientist. The core project of the course is for the students to research the literature and create a novel grant proposal in biology.
* Advanced Cell Biology (Bio350), Biology major’s course. I completely re-designed this course to reflect active learning in the manner of a “flipped course” whereby the students learn and teach each other content prior to coming to class to grapple with higher level concepts and projects.
* Developmental Biology (Bio400), Biology major’s upper division elective. I added a half-semester laboratory project whereby students design and implement their own experiments studying teratogens and their effects on zebrafish development.
* Senior Seminar (Bio497), Senior capstone course in biology.
* Graduate-level Cell Biology (Bio663), 3-week intensive summer course for biology master’s students to teach in-depth topics in cell function.
* Graduate-level Developmental biology (Bio664), 3-week intensive summer course for biology master’s students: principles of development, cell differentiation, and evolution.
* Perspectives on Science (Bio695), Graduate level journal club style course.

*University of San Diego*

* Topics in human biology (Bio104), General biology course for non-majors
* Introduction to Cell Processes (Bio225), Cell and molecular biology course for biology and chemistry majors
* Genetics (Bio300), Genetics course for biology majors
* Genetics lab (Bio300L), Separate lab course designed to teach genetics lab methods
* Senior seminar (Bio495), Analysis and presentation of primary literature for senior biology majors

*The Scripps Research Institute*

* Undergraduate research supervisor
* Director of the Scripps Outreach Programs; organized curriculum for a 10 week course preparing high school students for summer internships in biomedical research, and an 8 week program presenting high school teachers with current theories and experimental methods in biomedical research
* Teacher in the Scripps Outreach Program; various courses including immunology, virology, cell and molecular biology, structural biology, and bioinformatics.

*Bowdoin College (1 semester); Assisted professors through direct lecture and lab presentations*

* Virology (Bio303), Human Genetics (Bio255), Topics in Neuroscience (Bio325), Introduction to Biology (Bio104), Cell Biology (Bio224), Biochemistry lab (Bio263)

**Synergistic Activities**

1999 - *present* **Undergraduate research mentor (TSRI and PLNU)**:

 - Mentored multiple undergraduate students in the design and implementation of independent research projects. Several undergraduates became co-authors on publications.

*2000 - present* **Member: Association for Research in Vision and Ophthalmology**

 **-** Yearly attendance and invited oral research presentations (‘02, ‘03, ’04, ‘05, ‘07, ‘08, ’09, ‘14) at the annual meeting for vision research (ARVO).

*Spring 1999 - 2003* **Director / Teacher: Scripps Outreach Programs:**

- Annually organized curriculum and taught a 10 week course preparing high school students for summer internships in biomedical research at The Scripps Research Institute.

 - Annually organized and taught an 8 week course at TSRI presenting high school teachers with current theories and experimental methods in biomedical research.

*2004 – present* ***Ad hoc* reviewer (*Nature Medicine, IOVS, Retina, Exp. Eye Research, PLoS One, Journal of Clinical Investigation*)**

**Honors and Awards**

2016 Alumni grant award; Point Loma Nazarene University

2010, 2012, 2014, 2016 RASP grant; Point Loma Nazarene University

2006 – 2009 California Institute of Regenerative Medicine (CIRM) fellowship

2000-20003 Achievement Recognition for Collegiate Scientists (ARCS) fellowship

2003 Travel Grant – Association for Research in Vision and Ophthalmology

2002 Travel Grant - International Society of Differentiation

1998 Awards for Top Student in Chemistry and Mathematics, Simpson

**Selected Volunteer Work**

*Tierresanta Lutheran Church:* Youth Sunday school teacher; 2011 – present.

*Tierresanta Lutheran Church:* Vacation bible school coordinator and volunteer; 2010 – present.

*St. Marks United Methodist Church*: Youth fellowship leader 1998 - 2007.

*St. Marks United Methodist Church:* Pastoral and church relations committee 2000 - 2004

*Youth soccer coach*: Coached youth soccer at the YMCA and in AYSO 2007 - 2012

*‘Kickin-it’ annual charity soccer event*: Co-organizer and volunteer 2005-2009; (local charity event envisioned, organized, and implemented by my co-ed soccer team to help local families in need).

**Publications:** (\* indicates undergraduate interns under my mentorship included as co-authors)

1) Usui Y, Westenskow PD, Murinello S, **Dorrell MI**, Scheppke L, Bucher F, Sakimoto S, Paris LP, Aguilar E, Friedlander M. (2015) Angiogenesis and Eye Disease. *Annu Rev Vis Sci.* Nov; 24;1:155-184.

\*2) Usui Y, Westenskow PD, Kurihara T, Aguilar E, Sakimoto S, Paris LP, Wittgrove C, Feitelberg D, Friedlander MS, Moreno SK, **Dorrell MI (co-corresponding author)**, Friedlander M. (2015) Neurovascular crosstalk between interneurons and capillaries is required for vision. *J Clin Invest*. Jun;125(6):2335-46

\*3) **Michael I. Dorrell**, Michael Marcacci, Stephen Bravo, Troy Kurz, Jacob Tremblay, Jack C. Rusing. (2012) Ex Ovo Model for Directly Visualizing Chick Embryo Development. *American Biology Teacher (ABT)*. Nov/Dec 2012;74(9): 628 – 634.

\*4) Weidemann A, Krohne TU, Aguilar E, Kurihara T, Takeda N, **Dorrell MI**, Simon MC, Haase VH, Friedlander M, Johnson RS. (2010) Astrocyte hypoxic response is essential for pathological but not developmental angiogenesis of the retina. *Glia* Aug;58(10):1177-85

\*5) **Michael I. Dorrell,** Edith Aguilar, Ruth Jacobson, Sunia A. Trauger**,** Jeffrey Friedlander, Gary Siuzdak, Martin Friedlander. (2010) Rescuing astrocytes normalizes revascularization and prevents vascular pathology associated with oxygen induced retinopathy. *Glia* Jan 1;58(1):43-54.

6) **Michael I. Dorrell,** Edith Aguilar, Ruth Jacobson, Ray Gariano, John Heckenlively, Eyal Banin, G. Anthony Ramirez, Mehdi Gasmi, Alan Bird, Martin Friedlander. (2009) Antioxidant or neurotrophic factor treatment preserves function in a mouse model of neovascularization-associated oxidative stress. *J Clin Invest*. March;119(3):611-623.

7) **Michael I. Dorrell,** Edith Aguilar, Lea Scheppke, Faith Barnett, Martin Friedlander. (2007) Combination angiostatic therapy completely inhibits ocular and tumor angiogenesis. *Proc. Natl. Acad. Sci.* Jan 16;104(3): 967-972.

8) Matthew R. [Ritter, Eyal Banin, Stacey K. Moreno, Edith Aguilar, **Michael I. Dorrell**, and Martin Friedlander.](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=17111048&query_hl=1&itool=pubmed_docsum) (2006) Myeloid progenitors differentiate into microglia and promote vascular repair in a model of ischemic retinopathy. *J Clin Invest.* Dec;116(12):3266-76.

\*9) **Michael I. Dorrell**1, Eyal Banin1, Edith Aguilar, Chris M. Aderman, Alex C. Smith, Jeffrey Friedlander, Martin Friedlander (2006) T2-TrpRS inhibits preretinal neovascularization and enhances physiological vascular regrowth in OIR as assessed by a new method of quantification. *Invest Ophthalmol Vis Sci*. May;47(5): 2125-2134.

10) Atsushi Otani, **Michael I. Dorrell**, Karen Kinder, Stacey K. Moreno, Steven Nusinowitz, Eyal Banin, John Heckenlively, and Martin Friedlander. (2004) Rescue of retinal degeneration by intravitreally injected adult bone marrow-derived lin- hematopoietic stem cells. *J* *Clin Invest* Sept;114(6):765-774.

11) **Michael I. Dorrell1,** Mattias Belting1, Staffan Sandgren, Edith Aguilar, Jasimuddin Ahamed, Andrea Dorfleutner, Peter Carmeliet, Barbara M. Mueller, Martin Friedlander, and Wolfram Ruf. (2004) Regulation of angiogenesis by tissue factor cytoplasmic domain signaling. *Nat Med*. May;10(5):502-509.

12) **Michael I. Dorrell,** Atsushi Otani, Edith Aguilar, Stacey K. Moreno, and Martin Friedlander. (2004) Targeting of bone-marrow derived hematopoietic stem cells to the developing retinal vasculature is mediated by R-cadherin. *Blood*. May 1;103(9): 3420-3427.

\*13) **Michael I. Dorrell,** Edith Aguilar, Christoph Weber,and Martin Friedlander. (2004) Global analysis of gene expression during mouse retina development. *Invest Opthalmol Vis Sci*. Mar;45(3):1009-19.

\*14) Matthew R. Ritter, Stacey K. Moreno, **Michael I. Dorrell**, *et al*. (2003) Identifying potential

 regulators of infantile hemangioma progression through large-scale expression analysis – A

 possible role for the immune system during involution. *Lymphatic Res. Biol*. April;1(4):291-300.

15) **Michael I. Dorrell**, Edith Aguilar, and Martin Friedlander (2002) Retinal vascular development is mediated by endothelial filopodia, a pre-existing astrocytic template, and Specific R-cadherin adhesion. *Invest Opthalmol Vis Sci.* Nov:43(11):3500-3510.

16) Matthew R. Ritter, **Michael I. Dorrell**, Joseph Edmonds, Sheila Friedlander and Martin Friedlander (2002) Insulin-like growth factor 2 and potential regulators of hemangioma growth and involution identified by large-scale expression analysis. *Proc. Natl. Acad. Sci.* May 28;99(11):7455-60.

17) Atsushi Otani, Bonnie M. Slike, **Michael I. Dorrell**, John Hood, Karen Kinder, Karla L. Ewalt, David Cheresh, Paul Schimmel, and Martin Friedlander (2002) A fragment of human TrpRS as a potent antagonist of ocular angiogenesis. *Proc. Natl. Acad. Sci.* Jan 8;99(1):178-83.

18) Hans E. Purkey, **Michael I. Dorrell**, and Jeffrey Kelly (2001)Evaluating the binding selectivity of transthyretin amyloid inhibitors in blood plasma. *Proc. Natl. Acad. Sci.* May 8;98(10):5566-71.

**Invited Reviews**

Edith Aguilar, **Michael I. Dorrell**, David Friedlander, et al. (2008) Ocular Models of Angiogenesis. *Methods Enzymol*. 444:115-58.

Martin Friedlander, **Michael I. Dorrell**, Matthew R. Ritter, et al. (2007) Progenitor cells and retinal angiogenesis. *Angiogenesis.* March;10(2):89-101.

**Michael I. Dorrell,** Hannele Uusitalo, Edith Aguilar, Martin Friedlander. (2007) Ocular angiogenesis; basic mechanisms and therapeutic advances. *Survey of Ophthalmology*. Jan; 52(sup. 1): S3-S19.

**Michael I. Dorrell,** Martin Friedlander. (2006) Mechanisms of endothelial cell guidance during retinal vascular development. *Progress in Retinal and Eye Research*. May;25(3):277-95.

**Book Chapters**

Yoshihiko Usui, Peter D. Westenskow, Salome Murinello, **Michael I. Dorrell**, Leah Scheppke, Felicitas Bucher, Susumu Sakimoto, Liliana P. Paris, Edith Aguilar, and Martin Friedlander. Angiogenesis and Eye Disease. *Annual Review of Vision Science*. Volume 1, 2015. J.A. Movshon and B.A. Wandall (co-editors). Annual Reviews, Palo Alto, CA. USA. 2015. Pages 155 – 184.

**Michael I. Dorrell** and Martin Friedlander. Retinal vascular and retinal pigment epithelium gene expression. *Eye, Retina, and Visual System of the Mouse.* L.M. Chalupa and R.W. Williams (Eds). MIT Press. USA. 2008. Pages 685-696.

**Michael I. Dorrell**, Martin Friedlander, Lois E. H. Smith. Retinal vascular development. *Retinal Vascular Disease.* A.M. Joussen, T.W. Gardner, B. Kirchhof, and S.J. Ryan (Eds). Springer. Germany, 2007. Pages 24-35.

**Patents:**

U.S. Provisional Patent, Serial No. 60/562,821, “Methods of Modulating Vascularization”

U.S. Provisional Patent, Serial No. 60/577,156, “Compositions and Methods for Treatment of Neovascular Diseases”

U.S. Provisional Patent, Serial No. 10/836,289.“Selective R-Cadherin Antagonists and Methods”