Michael I. Dorrell Ph.D.

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, ADEP therapy for targeted delivery of chemotherapies, and studying the tumor microenvironment.

09/14 – present **Senior staff scientist 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"

2000-2001 **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 Bio1001 (General elective human biology) and writing.
- Human Biology and Bioethics (Bio1001), General education elective
- Cell Biology and Biochemistry (Bio2010), Introductory level course for Biology majors
- Research Methodology (Bio3052), 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 (Bio3050), Biology major's course. I completely re-designed this course to reflect active learning in a "flipped course" whereby the students learn and teach each other content prior to grappling with higher level concepts and projects in class.
- Developmental Biology (Bio4000), 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 (Bio4097), Senior capstone course in biology.
- Graduate-level Cell Biology (Bio6063), 3-week intensive course for biology master's students to teach in-depth topics in cell function and laboratory techniques in cell biology.
- Graduate-level Developmental biology (Bio6064), 3-week intensive summer course for biology master's students: principles of development, cell differentiation, and evolution.
- Perspectives on Science (Bio6095), Graduate level journal club style course.

University of San Diego (adjunct from 2007 – 2009 during my post-doctoral fellowship)

- 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, and an 8 week program teaching high school teachers current theories and methodology 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, eLife*)**

Honors and Awards

2012 – 2020, 2022	Alumni grant award; Point Loma Nazarene University
2010 – 2019, 2022	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

Foster resource family: Taking long-term foster youth into our home for love and care. 2015 – present.
Tierresanta Lutheran Church: Youth Sunday school teacher; 2011 – present.
Tierresanta Lutheran Church: Vacation bible school coordinator and volunteer; 2010 – 2018.
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) * **Michael I. Dorrell**, Kast-Woelbern H, Botts R, *et. al*. (2021) A novel method of screening combinations of angiostatics identifies bevacizumab and temsirolimus as synergistic inhibitors of glioma-induced angiogenesis. *PLoS One*. 2021 Jun 2;16(6):e0252233.

2) Eade K, Gantner ML, Hostyk JA, Nagasaki T, Giles S, Fallon R, Harkins-Perry S, Baldini M, Lim EW, Scheppke L, **Dorrell MI**, Cai C, Baugh EH, Wolock CJ, Wallace M, Berlow RB, Goldstein DB, Metallo CM, Friedlander M, Allikmets R. (2021) Serine biosynthesis defect due to haploinsufficiency of PHGDH causes retinal disease. *Nat. Metabolism*. Mar;3(3):366-377.

3) Usui-Ouchi A, Usui Y, Kurihara T, Aguilar E, **Dorrell MI**, Ideguchi Y, Sakimoto S, Bravo S, Friedlander M. (2020) Retinal microglia are critical for subretinal neovascular formation. *JCI Insight*. Jun 18;5(12):e137317

4) * Gantner ML, Eade K, Wallace M, Handzlik MK, Fallon R, Trombley J, Bonelli R, Giles S, Harkins-Perry S, Heeren TFC, Sauer L, Ideguchi Y, Baldini M, Scheppke L, **Dorrell MI**, Kitano M, Hart BJ, Cai C, Nagasaki T, Badur MG, Okada M, Woods SM, Egan C, Gillies M, Guymer R, Eichler F, Bahlo M, Fruttiger M, Allikmets R, Bernstein PS, Metallo CM, Friedlander M. (2019) Serine and Lipid Metabolism in Macular Disease and Peripheral Neuropathy. *New England J Medicine*. Oct 10;381(15):1422-1433.

5) **Michael I. Dorrell** and Jennifer Lineback. (2019) Using Shapes and Codes to Teach the Central Dogma of Molecular Biology; Codons, the Genetic Code, and Mutations. *The American Biology Teacher.* March 2019. issue 81.3

6) **Michael I. Dorrell**. (2019) Hands-on activities to teach Evo-Devo using legos and drawings: It's not the genes you have, it's how you use them. *The American Biology Teacher.* February 2019 issue (81.2)

7) Murinello S, Usui Y, Sakimoto S, Kitano M, Aguilar E, Friedlander HM, Schricker A, Wittgrove C, Wakabayashi Y, **Dorrell MI (co-corresponding author)**, Westenskow PD, Friedlander M. (2018) miR-30a-5p inhibition promotes interaction of Fas_+ endothelial cells and $FasL_+$ microglia to decrease pathological neovascularization and promote physiological angiogenesis. *Glia*. Nov 28.

8) 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.

9) * 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

10) * **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.

11) 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

12) * **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.

13) **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.

14) **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.

15) Matthew R. Ritter, Eyal Banin, Stacey K. Moreno, Edith Aguilar, **Michael I. Dorrell**, and Martin

Friedlander. (2006) Myeloid progenitors differentiate into microglia and promote vascular repair in a model of ischemic retinopathy. *J Clin Invest.* Dec;116(12):3266-76.

16) * **Michael I. Dorrell**[1], Eyal Banin[1], 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.

17) 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.

18) * **Michael I. Dorrell[1],** Mattias Belting[1], 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.

19) **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.

20) **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.

21) 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.

22) **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.

23) 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.

24) * 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.

25) 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. Patent, Serial No. 60/562,821, "Methods of Modulating Vascularization"
U.S. Patent, Serial No. 60/577,156, "Compositions and Methods for Treatment of Neovascular Diseases"
U.S. Patent, Serial No. 10/836,289. "Selective R-Cadherin Antagonists and Methods"