

Michael I. Dorrell Ph.D.

Professor of Biology: Point Loma Nazarene University
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Professional Preparation

<u>Institution</u>	<u>Major</u>	<u>Degree</u>	<u>Year</u>
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

Academic and Research Appointments

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

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

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

- Teaching various biology courses at all levels including FE, freshman majors, upper division requirements and electives, and graduate courses.
- Research studying cancer including angiostatic treatments, targeted delivery of chemotherapies, the cross-talk between cancer and the immune system, and HPV.

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
- Successful completion of a phase 3 clinical trial for treatments for MacTel

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

- Currently maintain an academic research and Ph.D. mentoring appointment

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

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

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

- Performed research related to the use of stem cells for treating ocular diseases.

2006 - 2009 **Adjunct professor: University of San Diego.**

- Taught one 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.
- Discovered the role of tissue factor during developmental retinal angiogenesis

- Performed receptor identification, biochemical purification and characterization

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

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

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, Established their new qPCR program

Teaching Experience

Point Loma Nazarene University

- University Now director and instructor; Outreach program for under-privileged high school students; we teach the students Bio1001 (foundational elective) and writing.
- Human Biology and Bioethics (Bio1001), foundational elective
- Cell Biology and Biochemistry (Bio2010), Introductory level course for Biology majors
- Research Methodology (Bio3052), Biology major's quad course. I designed this course to teach students how to think like a scientist. Students create a novel grant proposal.
- 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, student-designed laboratory research project studying teratogens.
- Senior Seminar (Bio4097), Senior capstone course in biology where we discuss vocation, bioethical issues, perform department assessments, and provide practical career advice.
- Masters-level Cell Biology (Bio6063), Semester long course in cell biology (lab and lecture) for master's level students.
- Masters-level Developmental biology (Bio6064), Semester long course (lab and lecture) teaching the principles of development, cell differentiation, and evolution (Evo-Devo).
- 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
- Intro. to Cell Processes (Bio225), Cell and molecular biology course for STEM 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; Sr. Bio. majors

The Scripps Research Institute

- Undergraduate research supervisor for several undergraduate research interns

- 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)

Mentoring student research

- Over 60 students mentored in full-time summer undergraduate research since 2009
- Over 25 student research presentations at the West Coast Biological Summer Undergraduate Research Conference (National conference for undergraduate research)
- Over 30 different honors students performing a research thesis during their senior year and presenting at the honors conference
- Over 25 different undergraduate students placed in various internship opportunities at local biotech companies around San Diego during which I acted as the university mentor

Synergistic Activities

2023 – 2024 **Hadley Wood Fellowship for Excellence in Teaching (PLNU)**

- Selected amongst all my peers for excellence in teaching.
- Generated and presented multiple seminars on backwards design, active learning, and flipped classroom techniques for engaging students.

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).

2019 – 2022 **Spiritual Development Committee**

- Work with the spiritual development programs and chapel committees to provide students with a strong program that bolsters the religious and spiritual development.

2014 – 2019, *present* **Program and Assessment Review Committee**

- Review the programs on PLNU's campus for strengths, weaknesses, and areas of improvement so that programs remain strong, modern, and pedagogically sound for the sake of student learning and achievement.

2018 **Teachers Noticing Teachers Faculty Instructor**

- Chosen as the representative teacher where other faculty can come and observe my classrooms, followed by discussions related to pedagogy and course design.

2010 – 2014 **Faculty Development Committee**

- Help develop curriculum that fosters faculty development with regards to pedagogy and scholarship

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

2023	Hadley Wood Honors in Teaching Fellowship
2014, 2018, 2022	Excellence in teaching award; Point Loma Nazarene University
2012 – 2020, 2022-2025	Annual Alumni grant award; Point Loma Nazarene University
2010 – 2019, 2022-2025	Annual RASP grant; Point Loma Nazarene University
2006 – 2009 fellowship	California Institute of Regenerative Medicine (CIRM)
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 and bible school volunteer; 2011 – 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: YMCA and AYSO

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

- 1) Tzaridis S, Aguilar E, **Dorrell MI**, Friedlander M, Eade KT. Retinal pigment epithelial cells reduce vascular leak and proliferation in retinal neovessels. *Angiogenesis.* 2024 Nov 27;28(1)
- 2) * Malone M, Maeyama A, Ogden N, Perry KN, Kramer A, Bates C, Marble C, Orlando R, Rausch A, Smeraldi C, Lowey C, Fees B, Dyson HJ, **Dorrell MI**, Kast-Woelbern H, Jansma AL. (2024) The effect of phosphorylation efficiency on the oncogenic properties of the protein E7 from high-risk HPV. *Virus Res.* 2024 Aug 14;348:199446

- 3) * **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.
- 4) 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.
- 5) 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
- 6) * 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.
- 7) **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
- 8) **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*. Feb. 2019 issue (81.2)
- 9) * 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.
- 10) 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. *Annual Rev Vis Sci*. 24;1:155-184.
- 11) * 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
- 12) * **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.

- 13) 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
- 14) * **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.
- 15) **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.
- 16) **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.
- 17) 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.
- 18) * **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.
- 19) 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.
- 20) * **Michael I. Dorrell**¹, 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.
- 21) **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.
- 22) **Michael I. Dorrell**, Edith Aguilar, Christoph Weber, and Martin Friedlander. (2004) Global analysis of gene expression during mouse retina development. *Invest Ophthalmol Vis Sci.* Mar;45(3):1009-19.
- 23) 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.

- 24) **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 Ophthalmol Vis Sci.* Nov;43(11):3500-3510.
- 25) 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.
- 26) * Atsushi Otani, Bonnie M. Slike, **Michael I. Dorrell**, John Hood, Karen Kinder, Karla L. Ewalt, David Cheresch, 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.
- 27) 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 Scheppeke, 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. Jousseaume, 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"

In Preparation: Patent on ADEPT strategies for treating cancer (PLNU patent)