

Alberto Cruz-Martín
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Biology Department
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Curriculum Vitae

Education

2000-2006 Ph.D. in Neuroscience, University of California Los Angeles, David Geffen School of Medicine at UCLA, Department of Neurobiology and Interdepartmental Program for Neurosciences
1995-2000 B.S. in Biology, University of Puerto Rico, Río Piedras, Department of Biology

Positions

2015-present Assistant Professor of Biology and Pharmacology, Boston University, Boston, MA
Project: Understanding the role of schizophrenia-associated genes in cortical development
2010-2014 Postdoctoral fellow, University of California, San Diego, CA
Advisors: Anirvan Ghosh and Andrew Huberman
Project: Dissecting visual circuits involved in the detection of directional motion
2006-2010 Postdoctoral fellow, University of California, Los Angeles, CA
Advisor: Carlos Portera-Cailliau
Project: In vivo imaging of dendritic spines during early development in a mouse model of Fragile X Syndrome
2000-2006 Graduate student, University of California, Los Angeles, CA
Advisor: Felix E. Schweizer
Project: Examining the interaction of excitation and inhibition in synapses between CA3 pyramidal neurons of hippocampal organotypic cultures

Publications

Ashley L. Comer, Tushare Jinadasa, Lisa N. Kretsge, Thanh P.H. Nguyen, Jungjoon Lee, Elena R. Newmark, Frances S. Hausmann, SaraAnn Rosenthal, Kevin Liu Kot, William W. Yen, **Alberto Cruz-Martín** (2019) Increased expression of schizophrenia-associated gene C4 leads to hypoconnectivity of prefrontal cortex and reduced social interaction. *BioRxiv*. doi: <https://doi.org/10.1101/598342>

Sriram S, Li L, **Cruz-Martín A***, Ghosh A* (2019) A Sparse probabilistic code underlies the limits of behavioral discrimination. *Cerebral Cortex*, *in press*. *Co-corresponding author

Shen J, Blute TA, Liberti WA, Yen W, **Cruz-Martín A****, Gardner TJ** (2017) Songbird organotypic culture as an *in-vitro* model for interrogating sparse sequencing networks. *BioRxiv*. doi: <https://doi.org/10.1101/164228> (**equal contribution)

Cruz-Martín A, El-Danaf RN, Osakada F, Sriram B, Ghosh A, Dhande O, Nguyen P, Huberman AD (2014). A dedicated circuit linking direction-selective retinal ganglion cells to primary visual cortex. *Nature* **507**: 358-361

Cruz-Martín A, Portera-Cailliau C (2014). In vivo imaging of axonal and dendritic structures in neonatal mouse cortex. In *Imaging in Developmental Biology: A Laboratory Manual*. *Cold Spring Harb Protoc* 57-64. doi: 10.1101/pdb.prot080150

Cruz-Martín A, Huberman AD (2012). Visual cognition: Rats compare shapes among the crowd. *Curr Biol* **22**: P18-20

Cruz-Martín A, Crespo M, Portera-Cailliau C (2012). Glutamate induces the elongation of early dendritic protrusions via mGluRs in wild type mice, but not in fragile X mice. *PLoS One* **7**: e32446 Epub 2012 Feb 27

Cruz-Martín A, Crespo M, Portera-Cailliau C (2010). Delayed stabilization of dendritic spines in fragile X mice. *J Neurosci* **30**: 7793-7803

Chowdhury T, Jimenez JC, Bomar J, **Cruz-Martín A**, Cattle JP, Portera-Cailliau C (2010). Fate of Cajal-Retzius neurons in the postnatal mouse neocortex. *Front in Neuroanat.* **4**: 10. doi: 10.3389/neuro.05.010.2010

Cruz-Martín A, Schweizer FE (2008). Imbalance between excitation and inhibition among synaptic connections of CA3 pyramidal neurons in cultured hippocampal slices. *Eur J Neurosci* **27**: 1353-1363

Sippy T, **Cruz-Martín A**, Jeromin A, Schweizer FE (2003). Acute changes in short-term plasticity at synapses with elevated levels of neuronal calcium sensor-1. *Nat Neurosci* **6**: 1031-1038

Cruz-Martín A, Mercado JL, Rojas LV, McNamee M, Lasalde-Dominicci JA (2001). Tryptophan substitutions at lipid-exposed positions of the gamma M3 transmembrane increase the macroscopic ionic current response of the *Torpedo californica* nicotinic acetylcholine receptor. *J Membr Biol* **183**: 61-70

Grants

Cruz-Martín	02/15/2019-02/15/2019	0.0 academic
Biogen Inc.	\$165,000	0.1 summer

“In Vivo Dissection of the Effect of AMPA-PAM on the Excitatory/Inhibitory Balance of Cortical Neurons.”
The goal of this Biogen proposal is to elucidate the effect of an AMPA PAM on the excitatory drive of different populations of inhibitory neurons in the prefrontal cortex.
Role: PI

Cruz-Martín	01/02/2019 – 01/02/2021	0.0 academic
Biogen Inc.	\$334,774	0.3 summer

“Elucidating the Role of the Complement System in the Pathophysiology of Schizophrenia”
The overall goal of this project is two-fold: (1) to determine whether developmental overexpression of complement C4 leads to deficits in cortical connectivity and cognitive behavior consistent with the pathophysiology observed in SCZ, and (2) to determine whether knockdown of specific genes prevents and/or reverses these deficits caused by overexpression of C4.
Role: PI

Cruz-Martín	01/15/2019 – 01/14/2021	0.0 academic
Brain & Behavior Research Foundation	\$70,000	0.1 summer

The Role of Complement Component 4 in Cortical Developmental Dynamics”
The goal of this NARSAD project is to determine how C4 induces changes in neuronal connections and information processing in the prefrontal cortex, which leads to cognitive impairments observed in schizophrenic patients.
Role: PI

Bifano	09/01/2016 – 08/31/2021	0.0 academic
NRT-UtB: Neurophotonics	\$3,000,000	0.1 summer

“NRT-UtB: Neurophotonics”

The goal of this project is to create an innovative educational program within a thriving interdisciplinary research environment, using photonics as an enabler for understanding and influencing cell-scale brain function.

Role: Senior Key Personnel

Awards and Honors

2019-2021	NARSAD Young Investigator Award (\$70,000)
2015	Early Career Institute in Neuroscience Award (NIH)
2007-2009	President's Postdoctoral Fellowship Program, University of California, CA
2003-2006	NASA Harriet G. Jenkins Predoctoral Fellowship
2001-2003	Achievement Rewards for College Scientists Award
2000	Magna cum laude, University of Puerto Rico, Río Piedras, PR

Invited talks

12/2019	Department of Biology, Drexel University, Philadelphia, PA, USA
07/2019	Département de médecine moléculaire Université Laval, Quebec, Canada
06/2019	GRC on Excitatory Synapses and Brain Function, Manchester, NH, USA
05/2019	Department of Biochemistry and Molecular Medicine, University of California, Davis, CA, USA
03/2019	Ponce Health Sciences University, Ponce, PR, USA
10/2018	Department of Immunology, Biogen, Cambridge, MA, USA
08/2018	Center for Molecular Neurobiology (ZMNH), Hamburg, Germany
02/2018	Department of Pharmacology, Boston University, Boston, MA, USA
11/2016	Department of Biology, University of Puerto Rico, Río Piedras, USA
11/2016	College of Engineering, University of Puerto Rico, Mayagüez, USA
05/2016	Buck Institute for Research on Aging Research, Novato, CA, USA
03/2014	Department of Molecular, Cell and Developmental Biology, UCSC, Santa Cruz, CA, USA
03/2014	Department of Biology, University of Puerto Rico, Río Piedras, PR, USA
03/2014	Department of Neuroscience and Psychiatry, Columbia University, New York, NY, USA
03/2014	Department of Ophthalmology, Yale University, New Haven, CT, USA
02/2014	Department of Biology, Boston University, Boston, MA, USA
02/2014	Department of Anatomical Sciences and Anatomy, University of Louisville, Louisville, KY, USA
01/2014	Department of Neurobiology and Anatomy, University of Utah, Salt Lake City, UT, USA

Teaching

- NSF Research Training grant (NRT) in Neurophotonics workshop: “Monitoring Activity in Neural Circuits with Fluorescent Indicators” (4 hour workshop, 1 hour lecture with lab demonstration, summer 2017)
- CAS BI325 (Spring 2016-present) - Principles of Neuroscience (4 credits, 27 lectures undergraduate level)
- CAS BI 581 (Fall 2015) - Seminar in Biology (2 credits, 11 lectures, undergraduate/graduate level, developed by **Alberto Cruz-Martín**)
- CAS BI 598 (Fall 2016-present) - Neural circuits (4 credits, 27 lectures, undergraduate/graduate level, developed by **Alberto Cruz-Martín**)

Outreach and Mentoring

11/2016-present Mentor for Neuroscience Scholars Program (NSP, Society for Neuroscience) mentoring program. NSP is an extensive two-year training program open to underrepresented and diverse neuroscience graduate students and postdoctoral fellows (Sofia Beas, PhD, Penzo lab; Cristina Maria Rios, Morrow/Murphy lab).

- 11/2016 Seminar and recruitment activities for NSF NRT “Understanding the Brain, Neurophotonics”, Universidad de Puerto Rico, Mayagüez and Río Piedras campuses
- 03/2016 Speaker for *Conversations with Scientists*, part of the Yale Ciencia Academy for Career Development - NIH funded initiative to provide graduate students with opportunities for mentoring, peer support and networking; to develop skills important for career advancement; and to contribute to their communities through science outreach
- 2010 Mentor for UCLA’s Undergraduate Research Center for Sciences, Engineering and Mathematics and the Center for Academic and Research Excellence (URC/CARE) program
- 2010 Mentor for UCLA’s Maximizing Access to Research Careers (MARC) program

Academic Service

- 08/2018-present Diversity Recruitment Committee of Boston University (with University Provost Jean Morrison)
- 2015-present Biology Department Seminar Series Committee
- 10/2016 Mentor - Responsible Conduct of Research (RCR) Education workshop on Collaborative Research
- 08/2016-present Neurophotonics Bootcamp Coordinator (NSF Research Training grant (NRT) in Neurophotonics)
- 05/2016-present Laser Safety Subcommittee Member, Boston University
- 2015-2019 Member Addiction Faculty Search Committee, Department of Pharmacology and Experimental Therapeutics & Psychiatry, Boston University

Reviewer

- 2017-2019 National Fellowships Committee for Graduate Women in Science (www.gwis.org)
- 2017 Postdoctoral Fellow applications to the Research Foundation Flanders – FWO (Fonds Wetenschappelijk Onderzoek - Vlaanderen)
- 2015-2016 The Puerto Rico Science Technology and Research Trust’s Science and technology grant program, Subprogram (EPSCoR-style grants program to stimulate competitive research)
- 2015-2016 Louisiana Board of Regents' Research Competitiveness

Reviewer for Scientific Journals

Neuroscience Research, Science, Current Biology, Journal of Comparative Neurology, Journal of Neuroscience, Scientific Reports, JoVE, Frontier

Presentations

Boston University

2019

Kristyn N. Borrelli[§], Emily J. Yao, William W. Yen, Qiu T. Ruan, Julia C. Kelliher[#], Melanie M. Chen, Richard K. Babbs[&], Jacob A. Beierle, Elisha M. Wachman, **Alberto Cruz-Martin**, Camron D. Bryant (2019). Neonatal morphine administration in outbred CFW mice induces behavioral signs of withdrawal and delayed development. 2019 The International Narcotics Research Conference (INRC). New York city, New York, USA.

Leman, D.P., Chen, I.A. [&], Yen, W.W., Clevenger, J.R., Kretsge, L.N. [§], Perkins, L.N. [§], Kilic, K. [&], Liberti III, W.A. [§], **Cruz-Martin A.**, Gardner, T.J., Otchy, T.M., and Davison, I.G. (2019) Imaging during odor-guided behavior with a novel wide-field-of-view miniature fluorescence microscope. *2019 Association for Chemoreception Sciences*. Bonita Springs, Florida, USA.

Ashley L. Comer[§], Tushare Jinadasa[&], Lisa Kretsge[§], Thanh Nguyen³, Jungjoon Lee[#], Elena Newmark[#], Frances Hausmann[#], SaraAnn N. Rosenthal[#], Kevin Lui Kot[#], William Yen, **Alberto Cruz-Martin** (2019). Increased expression of schizophrenia-associated gene C4 in the prefrontal cortex leads to altered social behavior. *2019 Society for Neuroscience Meeting*. Chicago, Illinois, USA.

Ashley L. Comer[§], Tushare Jinadasa[&], Lisa Kretsge[§], Thanh Nguyen[#], Jungjoon Lee[#], Elena Newmark[#], Frances Hausmann[#], SaraAnn N. Rosenthal[#], Kevin Lui Kot[#], William Yen, Alberto Cruz-Martín (2019). Functional hypoconnectivity and altered social behavior with overexpression of schizophrenia-associated gene C4. *2019 Cordon Research Conference: Neuronal Communication: From Receptors to Genes, Circuits and Behavior*. Manchester, New Hampshire, USA

2018

Lisa Kretsge[§], Ashley L Comer[§], William Yen, **Alberto Cruz-Martín** (2018). Examining prefrontal cortical dynamics over development using 2-photon calcium imaging. *NSF Neurophotonics annual meeting*. Alexandria, Virginia, USA

Ashley L Comer[§], Dr. Tushare Jinadasa[&], Thanh Ngyuen[#], Lisa Kretsge[§], Jung Joon Lee[#], William Yen, Frances Hausmann[#], Kevin Liu Kot[#], Elena Newmark[#], Erelle Fuchs[#], **Alberto Cruz-Martín** (2018). Complement component 4 overexpression alters the developmental connectivity of the medial prefrontal cortex. *2018 Cold Spring Harbor meeting: Molecular Mechanisms of Neuronal Connectivity*. Cold Spring Harbor, NY, USA

2017

Minnig M[§], Jinadasa T[&], Fuchs E[#], Wei-Shyu Yen W[#], Newmark E[#], Cruz-Martín A (2017). Interrogation of a Thalamic Circuit Relevant to Psychiatric Disorders. *MD/PhD Annual Retreat*, Boston University School of Medicine, Boston, USA

Comer AL[§], Nguyen T[#], Lee JJ[#], Yen W[#], **Cruz-Martín A** (2017). Elucidating the role of complement proteins in cortical developmental plasticity. *Neurophotonics Symposium*, Boston University, Boston, USA

Kretsge L[§], Comer A[§], Yen W[#], Nguyen T[#], Babbs RK, Kelliher JC[#], Scotellaro JL, Beierle JC, Chen M, Bryant B, **Cruz-Martín A** (2017). Cortical dynamics in a mouse model of Neonatal Abstinence Syndrome. *Neurophotonics Symposium*, Boston University, Boston, USA

Minnig M[§], Jinadasa T[&], Wei-Shyu Yen[#], W, Newmarke E[#], Leman D[#], Price B, Nguyen T[#], **Cruz-Martín A** (2017). Optimizing miniature microscopes to study the role of anterior cingulate cortex in anxiety-like behaviors. *Neurophotonics Symposium*, Boston University, Boston, USA

Comer AL[§], Nguyen T[#], Lee JJ[#], Yen W[#], **Cruz-Martín A** (2017). Complement Component 4 Regulates Synaptic Pruning in Prefrontal Cortex. *UROPS Symposium*, Boston University, Boston, MA

Fuchs E[#], Jinadasa T[&], Minnig M[§], Wei-Shyu Yen W[#], Newmark E[#], **Cruz-Martín A** (2017). Transsynaptic Rabies Mapping of Thalamocingulate Projections Reveals Parallel Feed-Forward Network Diversity. *UROPS Symposium*, Boston University, Boston, MA

undergraduate co-authors, § graduate co-authors, & postdoctoral co-authors

Postdoctoral, Graduate and Undergraduate

Sriram B, Li L, **Cruz-Martín A**, Ghosh A (2018). A Sparse Unreliable Distributed Code Underlies the Limits of Behavioral Discrimination. Society for Neuroscience Meeting, San Diego, CA

Leman DP, Yen WW, Chen IA, Nguyen TPH, Otchy TM, Gardner TJ, **Cruz-Martín A**, Davison IG (2018). An expanded open-source toolbox for widefield calcium imaging in freely behaving animals. Society for Neuroscience Meeting, San Diego, CA

Sriram B, Li L, **Cruz-Martín A**, Ghosh A (2016). Sparse neural coding at the limits of visual performance. Society for Neuroscience Meeting, San Diego, CA

Cruz-Martín A, El-Danaf RN, Osakada F, Sriram B, Dhande O, Nguyen PL, Callaway EM, Ghosh A, Huberman AD (2013). A “labeled line” linking direction selective circuits in retina to superficial layers of primary visual cortex. Society for Neuroscience Meeting, San Diego, CA

Sriram B, **Cruz-Martín A**, Denardo L, Kim EJ, Patel M, Huynh P, Giering E, Reinagel P, Ghosh A (2013). Visually guided behavior in freely moving mice. Society for Neuroscience Meeting, San Diego, CA

Cruz-Martín A, El-Danaf RN, Osakada F, Nguyen P, Callaway EM, Ghosh A, Huberman, AD (2013). A dedicated circuit linking direction selective retinal outputs to visual cortex. Genes, Circuits and Behavior Meeting, Toronto

Kim EJ, Denardo L, **Cruz-Martín A**, Raam T, Ghosh A (2012). Behavioral analysis of mouse visual cortical circuits underlying orientation discrimination using molecular and genetic tools. Society for Neuroscience Meeting, New Orleans, LA

Cruz-Martín A, Crespo M, Portera-Cailliau C (2010). Abnormal turnover of dendritic protrusions in neonatal fragile X mice. Conférences Jacques-Monod, Roscoff (Brittany)

Cruz-Martín A, Crespo M, Portera-Cailliau C (2009). Delayed maturation of dendritic protrusion size and turnover in fragile X mice. Meeting for the Intellectual and Developmental Disabilities Research Center (IDDRC), Los Angeles, CA

Cruz-Martín A, Crespo M, Portera-Cailliau C (2009). Abnormal dynamics of early dendritic protrusions in fragile X mice. Wiring the Brain Meeting, Adare, Co. Limerick

Cruz-Martín A, Schweizer FE (2005). Heterogeneity of synaptic feed-forward inhibition in dual recordings of hippocampal CA3 pyramidal cells. Society for Neuroscience, Washington, DC

Sippy T, **Cruz-Martín A**, Jeromin A, Schweizer FE (2003). Acute changes in short-term plasticity independent of initial release probability at synapses with elevated levels of NCS-1. Society for Neuroscience, New Orleans, LA

Cruz-Martín A, Rojas LV, Mercado JL, McNamee M, Lasalde-Dominicci JA (2000). Tryptophan substitutions in lipid-exposed positions of the M3 transmembrane domains of the torpedo californica nicotinic acetylcholine receptor alter ion channel kinetics. Biophysical Society Meeting, New Orleans, LA