ALEJANDRO PARGA BECERRA, MD PhD

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Career Objective

As a neurophysiologist with extensive medical training and advanced research skills in both in vivo and ex vivo neurophysiological recordings, as well as optochemogenetics, I am an expert in synaptic plasticity within neuronal circuits and the modifications observed in brain disorders. My research integrates electrophysiological tools to explore mechanisms of neuronal networks. I specialize in interpreting neuroanatomical studies and understanding the biophysics underlying neuronal circuits. My objective is to comprehend the function of neuronal ensembles pertinent to cognitive function and to translate this understanding into practical applications that enhance technology for the improment of cognition.

Education

12/2014 Doctor of Philosophy (Ph.D.) Neuroscience
Barrow Neurological Institute - Arizona State University
Dissertation: Cortical auditory functional activation by cortico-striato-thalamo-cortico circuits: An endogenous mechanism of the brain to activate the auditory cortex, relevant to the neuronal basis of auditory hallucinations.
Committee: Co-chair: Janet Neisewander, Neuroscience. Co-chair: Ronald Hammer, Neuroscience & Pharmacology. Amelia Gallitano-Mendel, Psychiatry. Jim McLoone, Psychiatry. Jie Wu, Electrophysiology.

06/2005 Doctor of Medicine (M.D.) Neurophysiology
National University of Colombia – College of Medicine, Bogotá Colombia
Emphasis: Developmental Neurophysiology

Academic Appointments

Scientist, Senior Management
09/2023 - Present Center for Integrative Brain Research, Seattle Children's, Seattle

Research Scientist / Engineer 3
09/2022 - 09/2023 Dr. Nikolai Dembrow, Department of Physiology and Biophysics, University of Washington, Seattle
- Multimodal analysis of primate infragranular pyramidal neurons and their modulation

Senior Fellow
05/2017 – 04/2021 Dr. Christopher B. Ransom, Epilepsy Center of Excellence and Neurology Service, VA Puget Sound Department of Neurology, University of Washington, Seattle
- Regulation of Extra-synaptic GABA-A Receptors in Health and Disease

Postdoctoral Research Associate
01/2015 – 12/2016 Dr. Trent Anderson, Department of Basic Medical Sciences
University of Arizona, College of Medicine, Phoenix

- Neurosteroid action on Cortical Spreading Depression (CSD) through differential Gabaergic signal onto pyramidal neurons
- Optogenetic regulation of CSD using targeted pyramidal inhibition and activation.
- Effects of CSD in intracranial pressure (ICP) as a model of migraine headache.

Research Experience

Research Associate
02/2008 – 11/2014 Dr. Ronald Hammer, Neuroscience and Pharmacology
University of Arizona, College of Medicine, Phoenix,

- Retrograded trans-synaptical tracing of auditory neuronal circuits using pseudorabies virus-152.
- Dopamine-induced auditory cortical activation and attenuation by D2-like receptor-selective antagonist in the caudatoputamen of the rat

04/2013 – 07/2013 Dr. Federico Sanabria, Department of Psychology
Arizona State University, Tempe

- Correlation between dopamine-induced auditory activation and sound perception during sound discrimination task

08/2009 – 12/2009 Dr. Athina Markou, Department of Psychiatry
University of California, San Diego

- Phencyclidine and clozapine effects on the 5-choice serial reaction time task and regional brain zif268 mRNA expression

03/2010 – 06/2010 Dr. Amelia Gallitano-Mendel, Department of Basic Medical Sciences
The University of Arizona, College of Medicine, Phoenix

- Detection 5-HT 2A receptor messenger RNA using *in situ* hybridization histochemistry on brains from EGR3 recombinant mice.

01/2000 – 12/2000 Dr. Jairo Zuluaga. Physiology Department
National University of Colombia

- Motor development and Epilepsy rotation. Neurodevelopment program. Central league against epilepsy.

Bilingual Interviewer, Group Leader
08/2007 – 12/2007 Dr. Mark Roosa, Department of Psychology
Arizona State University, Tempe

- Interviewed Mexican-American families and their children for The Family Project collecting socio-economic data.

Teaching Experience

Teaching Associate
School of Life Sciences, Arizona State University, Tempe

01/2013 - 05/2013. Human Physiology and Anatomy Laboratory (BIO202)

- Taught human anatomy and dissecting techniques on human cadaver preparations
- Held laboratory sessions using a systemic perspective to assist students integrate anatomical and physiological concepts about the human body

- Developed students' learning skills via one-on-one interaction, using hypothesis testing through laboratory activities, and kept online support for the class

08/2008 - 12/2012. Animal Physiology Laboratory (BIO361)

- Implemented surgical procedures and paradigms for animal preparation in laboratory experimentations to expose the physiology of the nervous, circulatory, renal, and respiratory systems
- Provided training to students of the Assistant Teaching Associate Program for the development of their teaching skills. Created and managed online support for this training program.
- Taught physiological concepts for the classification of pathological disorders

06/2012-07/2012. Animal Physiology Lecture (BIO360)

- Developed and taught the Neurophysiology component of the lecture; held study sessions to answer students' questions

06/2010-07/2010. General Biology I (BIO201)

- Taught the scientific method and basic concepts of evolution in the biological sciences

06/2009-07/2009. General Biology II (BIO202)

- Taught fundamentals for scientific writing, proper citation formats, and online databases search used in reports, assignments, and the scientific literature
- Encouraged critical thinking through the analysis of the data obtained in laboratory sessions

Students Training

2018	J.Naizaque	Graduate student	SfN Trainee Professional Development
2015	J. Nichols	Graduate student	Post-Hoc Testing
2013	A. Hoffman	Graduate student	In-situ hybridization histochemistry
2012	R. Bastle	Graduate student	DNA oligonucleotide probe radio-labeling
2011	A. Maple	Graduate student	DNA ribonucleotide probe radio-labeling
2011	J. Huang	Graduate student	ANOVA and regression analysis
2010	M. Lacagnina	Undergraduate student	Stereotaxic intracranial rodent surgery
2009	W. Chu	Undergraduate student	Tissue sectioning with cryostat

Publications and Works in Progress

A. Parga, A. F. Logsdon, W. A. Banks & C. Ransom (2021). Traumatic brain injury broadly affects GABAergic signaling in dentate gyrus granule cells. eNeuro. doi: 10.1523/ENEURO.0055-20.2021

A. Parga & T. Anderson. Targeted optogenetic pyramidal neurons to regulate cortical spreading depression. In preparation.

A. Parga & T. Anderson. Neurosteroids facilitate cortical spreading depression. *Journal of Neurophysiology.* Submitted for publication.

A. Parga, G. Muñoz & R. P. Hammer (2016) Excessive striatal dopamine activates auditory cortex via striato-thalamo-cortical projections in the rat. *Biological Psychiatry* 77(9), 62S. http://doi.org/10.1016/j.biopsych.2015.03.006

A. N. Hoffman, **A. Parga**, P. Paode, L. R. Watterson, E. M. Nikulina, R. P. Hammer, Jr., and C. D. Conrad (2015). Chronic stress-enhanced fear memories are associated with induced amygdala zif268 expression and are resistant to reconsolidation. *Neurobiology of Learning and Memory*, 120, 61-8. http:// doi: 10.1016/j.nlm.2015.02.004.

A. Parga & R. P Hammer (2012). Auditory cortical activation after dopamine infusion in caudal caudatoputamen of the rat. *Biological Psychiatry*, 71(8), 312S. http://doi.org/10.1016/j.biopsych.2012.02.014

Contributions to grants

Title: Multimodal analysis of primate infragranular pyramidal neurons and their modulation
Funding Agency: NINDS
Project number: 1R01MH123620-01
Position: Electrophysiologist
Contribution: Collected electrophysiological recordings and single-cell transcriptomic data from targeted cortical neurons of non-human primates implementing and optimizing patch-seq.

Title: Regulation of extra synaptic GABA-A receptor in health and disease
Funding Agency: VA
Project number: 5I01BX002745
Position: Lead neuro-electrophysiologist
Contribution: Directed an electrophysiology unit for the study of 1. K+ current measurement during evoked or induced GABA-A receptor stimulation and 2. Whole-cell and perforated-patch of tonic GABAergic current measurements; equipment acquisition and implementation of laser uncaging and stimulation for optogenetic neuronal circuit electrophysiological mapping; built collaborations and expanded applications of electrophysiology and microscopy with other labs in the VA and UW.

Title: Mechanisms of neurosteroid regulation of migraine
Funding Agency: NINDS
Project number: 5R01NS087031
Position: Postdoctoral research associate
Contribution: Validated and standardized *ex-/in-vivo* neuronal stimulation protocols and techniques; applied for funding and implemented equipment acquisition of opto/chemogenetics targeted neuronal modulation (laser, polygon, and microscopy optimization); tested electrophysiological effects of focal neurosteroids in cortical spreading depression.

Title: Analysis of instrumental overactivity in animal model of ADHD
Funding Agency: NIMH
Project number: 5R03MH094562
Position: Research associate
Contribution: Directed a collaborative project to study the correlation between dopamine-induced auditory activation and sound perception during sound discrimination task.

Title: Mechanism of 5HT2AR regulation by Egr3
Funding Agency: NIMH
Project number: 5R01MH097803
Position: Research associate

Contribution: Conducted 5-HT2A receptor mRNA expression assessment using *in-situ* hybridization immunohistochemistry

Title: Viral Rainbow: tracing brain circuits with connections order specificity
Funding Agency: NINDS
Project number: 5RC1NS068414
Position: Research associate
Contribution: Carried out retrograded trans-synaptic pseudo-rabies-virus 152 (PRV 152) infection for the mapping of a striatal-thalamic-cortical neuronal circuit.

Title: Negative symptoms of schizophrenia: Animal Models
Funding Agency: NIMH
Project number: 5R01MH062527
Position: Research associate
Contribution: Conducted of 5-choice serial reaction time task and assessment of zif268 mRNA expression after phencyclidine and clozapine treatments in a murine model of schizophrenia.

Title: Neural plasticity and sensorimotor gating in rats
Funding Agency: NIMH
Project number: 5R01MH073930
Position: Research associate
Contribution: Optimized and standardized zif268 *in-situ* hybridization immunohistochemistry for the assessment of neuronal activity in brain regions related to auditory function.

Presentations and Awards

Carleton College – 2023
Department of Neuroscience seminar
Presentation: The Sense of Hearing: How Sounds are Interpreted in our Brains.

Veterans Affairs Miami Health Care – 2022
The Miami Project to Cure Paralysis seminar
Presentation: GABAergic modulation after Severe Traumatic Brain Injury

CODA Biotherapeutics seminar – 2022
Presentation: Impaired Hippocampal GABAergic Modulation in Temporal Lobe Epilepsy: An outcome after Traumatic Brain Injury

Center for Regenerative Therapies Dresden (CRTD) – 2020
Establishment of an Electrophysiology Core Facility in the CRTD
Presentation: Studying the biophysical properties of cellular function and connectivity in regenerated cells

American Epilepsy Society Annual Meeting - 2020
Poster: GABA-B receptor dysfunction in dentate gyrus granule cells after experimental TBI (Controlled cortical impact).

Claremont Graduate University - 2019
School of Social Science Policy and Evaluation seminar
Presentation: The Discovery of ourselves: The scientific exploration of the human brain

48th Annual Meeting of the Society for Neuroscience – 2018
Poster: Modulation of extrasynaptic $GABA_A$ receptor function in dentate gyrus granule cells by $GABA_B$ receptors and severe TBI.

Department of Physiology and Biophysics Seminar, University of Washington – 2017
Presentation: Targeted optogenetic stimulation of cortical pyramidal neurons to regulate cortical spreading depression

46th Annual Meeting of the Society for Neuroscience – 2016
Poster: Neurosteroids selectively disinhibit the cortex and facilitate cortical spreading depression

45th Annual Meeting of the Society for Neuroscience – 2015
Poster: Cortical spreading depression induced by targeted optogenetic activation of cortical pyramidal neurons

70th Annual Scientific Convention of the Society of Biological Psychiatry – 2015
Presentation: Excessive striatal dopamine activates auditory cortex via striato-thalamo-cortical projections in the rat

Arizona State University Graduate College Dissertation Fellowship - 2013
Award: Cortical auditory functional activation by cortico-striato-thalamo-cortico circuits: How excessive dopaminergic transmission in the caudatoputamen activates sound-like cortical patterns.

43rd Annual Meeting of the Society for Neuroscience - 2013
Trans-synaptic retrograde tracing of an auditory cortico-striato-thalamic-cortico circuit with PRV-152

68th Annual Scientific Convention of the Society of Biological Psychiatry – 2013
Presentation: Attenuation of striatal dopamine-induced auditory cortical activation by D1 or D2 receptor-selective antagonist in the rat
Nominated for best poster presentation

4th BNI-ASU Research Symposium - 2012
Poster: Sound-like functional pattern of auditory activation induced by dopamine in caudal caudatoputamen

67th Annual Scientific Convention of the Society of Biological Psychiatry - 2012
Poster: Auditory cortical activation after dopamine infusion in caudal caudatoputamen of the rat

41st Annual Meeting of the Society for Neuroscience - 2011
Poster: Effects of repeated PCP and chronic clozapine treatment on the 5-choice serial reaction time task and regional brain zif268 expression

Medical Experience

Emergency Physician
08/2005 – 05/2006 La Arandia Military Base, National Army of Colombia

Emergency Medical Services

- Provided medical emergency care for privates of anti-narcotics battalions I, II, and III, including helicopter supported evacuations and emergency transfers
- Attended to in/out patients and developed and maintained clinical records for a billeted population of 1500 soldiers (both Colombian and American)
- Physician in charge of the Military Base's Medical Health Center coordinating surgical medical brigades and the emergency personnel, including 16 registered nurses

Hospital Management and Training Activities

- Organized pharmacy budget and ordered pharmacy supplies for La Arandia Military Base's dispensary according to epidemiological data
- Trained nurses in first aid care and resuscitation protocols according to the American Heart Association's (AHA) Advanced Cardiovascular Life Support course (ACLS)

Tropical Diseases Services

- Supervised Leishmaniasis and Malaria treatment for 100+ patients
- Compiled, coded, and reported epidemiologic and demographic data to the Ministry of Health according to morbidity and mortality statistics

Postgraduate Medical Training

12/2012 *Advanced cardiovascular life support provider (ACLS program)*
American Heart Association, Safety On Site Training, Phoenix

Emergency Physician (Clerkship)
07/2004 – 10/2004 Gyneco-Obstetric Services, San Rafael Hospital, Colombia

- Provided medical care in obstetrics emergencies, birth assistance and neonatal adaptations for 25+ obstetric emergency visits per shift

10/2004 – 05/2005 Emergency, Surgery, Internal Medicine and Pediatric Services, Ramon Gonzalez Valencia Hospital, Colombia

- Maintained patients' clinical records. Examined and reported on anamneses and physical examinations
- Interpreted and reported on laboratory assessments to chief medical specialists. Ordered, collected and verified medical orders for chief medical staff
- Assisted appointments of specialized medical cases. In charge of patients' follow up throughout surgical and post-surgical procedures

05/2005 – 08/2005 Psychiatric Services, San Camilo Hospital, Colombia

- Researched and proposed treatment alternatives for medical cases at the emergency department for 10+ psychiatric emergencies per shift
- Documented and reported literature reviews on psychiatric conditions to chief medical specialists

Memberships

Society for Neuroscience (SfN)
Colegio Colombiano de Neurociencia (COLNE)
International Brain Research Organization (IBRO)

Research skills

Patch-Seq, *ex vivo* and *in vivo* electrophysiology recordings of neurons, confocal and multiphoton microscopy, transsynaptic retrograde tracing of neuronal circuits using pseudorabies virus, Intrinsic Optical Signal (IOS) imaging, stereotaxic intracranial surgeries in rodents, fluorogold iontophoretic infusions, *in situ* hybridization histochemistry, immunohistochemistry.

Medical skills

In/out patient care, pre/post operative care, assessment and management of trauma and tropical diseases. Procedures: Cesarean section, labor assistance and neonatal adaptation, thoracic chest tube insertion, upper and lower extremity block, skin closure, surgical debridement, spinal tap

Computational skills

Programing languages: Python, C++
Version controls: GIT
Imaging: ImageJ, NiE, Imaging Workbench, Stereoinvestigator, Neurolucida
Data recording: MIES, Igor Pro, PolyScan2, pClamp, Linlab
Analytics and Statistics: Origin, SPSS, SAS, STATA, Blaise, CDISC

Languages

English – native proficiency
Spanish – native proficiency

References

Dr. Christopher Ransom, M.D., Ph. D.
Assistant Professor of Neurology
Department of Neurology
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Dr. Ron Hammer, Ph.D.
Professor, Co-Director, Clinical Translational Sciences-Phoenix
Department of Basic Medical Sciences
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