

## ALEJANDRO PARGA BECERRA, MD PhD

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### Career Objective

Experienced neurophysiologist with a robust background in trauma medicine and a high level of expertise in clinical and experimental methodologies, including vector interventions and opto/chemogenetics. Leader in orchestrating complex research initiatives aimed to integrate neuroanatomical, electrophysiological, and multiomics approaches to uncover the mechanisms that modulate brain function. Committed to studying neuronal ensembles and applying this knowledge to drive technological advancements for cognitive enhancement.

### 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: Neurophysiology

### Work Experience

#### *Supervisor, Scientist and Senior Management*

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

- Orchestrating the establishment of a neurodevelopmental research laboratory and bridging collaborations in the scientific Seattle area.

#### *Research Scientist / Engineer III*

09/2022 - 09/2023 Dr. Nikolai Dembrow, Department of Physiology and Biophysics, University of Washington, Seattle

- Integrating morphological, functional and transcriptomic approaches of the non-human primate brain for the study of infragranular pyramidal neurons and their modulation

### Academic Appointments

#### *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

- Establishing an electrophysiology core at the VA for the study of trauma effects in the brain.

*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

Nikolai Dembrow<sup>1,2</sup>, Scott Sawchuk<sup>3</sup>, Rachel Dalley<sup>3</sup>, Ximena Opitz-Araya<sup>3</sup>, Mark Hudson<sup>3</sup>, Cristina Radaelli<sup>3</sup>, Lauren Alfiler<sup>3</sup>, Sarah Walling-Bell<sup>3</sup>, Darren Bertagnolli<sup>3</sup>, Nelson Johansen<sup>3</sup>, Jeremy Miller<sup>3</sup>, Kamiliam Nasirova<sup>3</sup>, Victoria Omstead<sup>3</sup>, Scott Owen<sup>3</sup>, **Alejandro Parga-Becerra**<sup>1</sup>, Christine Rimorin<sup>3</sup>, Naz Taskin<sup>3</sup>, Michael Tieu<sup>3</sup>, David Vumbaco<sup>3</sup>, Natalie Weed<sup>3</sup>, Julia Wilson<sup>3</sup>, Brian Lee<sup>3</sup>, Kimberly Smith<sup>3</sup>, Staci Sorensen<sup>3</sup>, William Spain<sup>1,2</sup>, Ed Lein<sup>3</sup>, Steve Perlmutter<sup>1,4</sup>,

Jonathan Ting<sup>1,3,4</sup>, Brian Kalmbach<sup>1,3,\*</sup> (2024). Areal specializations in the morpho-electric and transcriptomic properties of layer 5 extratelencephalic-projecting neurons in the primate neocortex. *Neuron*. Submitted for publication.

**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. Submitted for publication.

**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.org/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<sup>+</sup> 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 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

*48<sup>th</sup> Annual Meeting of the Society for Neuroscience – 2018*

Poster: Modulation of extrasynaptic GABA<sub>A</sub> receptor function in dentate gyrus granule cells by GABA<sub>B</sub> 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

*46<sup>th</sup> Annual Meeting of the Society for Neuroscience – 2016*

Poster: Neurosteroids selectively disinhibit the cortex and facilitate cortical spreading depression

*45<sup>th</sup> Annual Meeting of the Society for Neuroscience – 2015*

Poster: Cortical spreading depression induced by targeted optogenetic activation of cortical pyramidal neurons

*70<sup>th</sup> 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.

*43<sup>rd</sup> Annual Meeting of the Society for Neuroscience - 2013*

Trans-synaptic retrograde tracing of an auditory cortico-striato-thalamic-cortico circuit with PRV-152

*68<sup>th</sup> 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

*4<sup>th</sup> BNI-ASU Research Symposium - 2012*

Poster: Sound-like functional pattern of auditory activation induced by dopamine in caudal caudatoputamen

*67<sup>th</sup> Annual Scientific Convention of the Society of Biological Psychiatry - 2012*

Poster: Auditory cortical activation after dopamine infusion in caudal caudatoputamen of the rat

*41<sup>st</sup> 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 murine models, fluorogold iontophoretic infusions, *in situ* hybridization histochemistry, immunohistochemistry.

## **Medical skills**

In/out patient medical care  
 Pre/post operative care  
 Management of surgical brigades  
 Attending trauma physician  
 Coordinator of Tropical Diseases Department

## **Computational skills**

Programming languages: Python, C++  
 Version controls: GIT, SnakeMake  
 Imaging: ImageJ, NiE, LASX, Imaging Workbench, Stereoinvestigator, Neurolucida  
 Data recording: MIES, Igor Pro, PolyScan2, pClamp, Linlab  
 Analytics and Statistics: Origin, SPSS, SAS, STATA, Blaise, CDIS  
 AI platforms: AIVIA

## **Languages**

English – native proficiency  
 Spanish – native proficiency