BIOGRAPHICAL SKETCH

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NAME: Burgos-Robles, Anthony

eRA COMMONS USER NAME (credential, e.g., agency login): aburgos

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date	FIELD OF STUDY
Pontifical Catholic University (Ponce, PR)	B.S.	05/2003	Chemistry
Ponce School of Medicine (Ponce, PR)	Ph.D.	05/2008	Biomedical Sci
Harvard Medical School (Boston, MA)	Internship	02/2009	Clinical Neurosc
Massachusetts Institute of Tech (Cambridge, MA)	Postdoc	01/2014	Behavioral Neurosci
Massachusetts Institute of Tech (Cambridge, MA)	Postdoc	08/2019	Systems Neurosci

A. Personal Statement

My career path has been dedicated to neuroscience research, particularly focused on evaluating how the brain reads and encodes sensory cues to predict potential threats in the environment, and to elicit behavioral responses associated to threat-induced fear, threat avoidance, and maximization of rewards and benefits. My research work using animal models has established that these crucial functions are encoded and dynamically modulated by functional interactions between regions in the limbic system that include the medial prefrontal cortex, anterior cingulate cortex, and the amygdala. My research findings have produce significant impact and excitement in my field because they also shed light onto how discrete mechanisms for memory encoding in limbic regions are altered after prolonged exposure to psychological stressors, which can be extrapolated to humans for better understanding of psychiatric disorders such as phobia, post-traumatic syndrome, and anxiety. Despite great advances in the field, it is unclear how individual populations of neurons and brain circuits in the limbic system contribute to threat detection and how they contribute to the overall neuropathology of psychiatric disorders. As a principal investigator at UTSA, I developed a research program that tackles these questions. Particularly, our aim is to map and evaluate the functional role of individual cortico-amygdala circuits during healthy states versus stress-induced disease-like states that produce deficits in learning, memory, and behavior. To do so, we integrate *in vivo* approaches such as neurophysiology, neuroanatomy, and neuropharmacology, as well as sophisticated neurogenetic tools such as optogenetics and chemogenetics to turn individual neural circuits 'ON' and 'OFF' using light or designer drugs, respectively, to test neural circuit function.

B. Positions and Honors

Research Positions:

2000 - 2003 MARC U*STAR Undergraduate Student, PUCPR, Ponce, PR
2002 (Summer) RISE Summer Program Student, Rutgers University, Piscataway, NJ
2003 - 2008 Graduate Student, Dept of Physiology & Pharmacology, PSM, Ponce, PR
2005 (Summer) SPINES Summer Program Student, Marine Biological Lab, Woods Hole, MA
2008 - 2009 Clinical Neuroscience Research Fellow, Harvard Med School, Boston, MA
2009 - 2014 Postdoc Fellow, McGovern Institute, MIT, Cambridge, MA
2014 - 2019 Postdoc Research Scientist, Picower Institute, MIT, Cambridge, MA
2019 - Present Assistant Professor, Dept of Biology & Neurosci Institute, UTSA

Teaching Positions:

2005 - 2006 Teaching Assistant, Medical Neuroanatomy (MD Course), PSM, Ponce, PR
2005 - 2006 Teaching Assistant, Medical Neurophysiology (MD Course), PSM, Ponce, PR

2006 - 2007 Teaching Assistant, Synaptic Pharmacology (Graduate Course), PSM, Ponce, PR
2020 (Fall) Instructor, Neuropsychopharmacology (Undergraduate Course), UTSA, TX
2021 (Spring) Instructor, Neurobiology of Learning and Memory (Graduate Course), UTSA, TX

Other Positions:
2002 - 2008 Organizer of Brain Awareness Week Activities to promote neuroscience awareness
2005 - 2006 Vice-President of the Graduate Student Association, PSM, Ponce, PR
2007 - 2009 Fellow of the Latin-American Network for Training and Exchange of Researchers in Neurosci
2014 - 2015 Organizer of the Amygdala Social, SFN Annual Meetings
2017 (Fall) Organizer of fundraiser to contribute to Puerto Rico's hurricane recovery
2017 - Present Peer reviewer for various peer-review journals in neuroscience
2020 (Fall) Graduate Recruitment Committee, Biology Dept, UTSA, TX

Honors & Awards:
2000 Top Chemistry Student Award, PUCPR, Ponce, PR
2003 Cum Laude Award, PUCPR, Ponce, PR
2004 - 2007 NIMH Graduate Research Supplement for Underrepresented Minorities
2005 Travel Award for Symposium on Emotion, Madison, WI
2007 Carl Storm Underrepresented Minority Award, Gordon Research Conference
2008 Distinguished Graduate Student Award, PSM, PR
2008 - 2009 Clinical Research Training Fellowship, Harvard Medical School, Belmont, MA
2014 - 2015 NIMH Research Supplement to Promote Diversity in Health-Related Sciences
2014 - 2016 NARSAD Young Investigator Award, Brain and Behavior Research Foundation
2015 Simons Foundation Autism Research Initiative Travel Award, GRS Conference

C. Mentoring and Training

PhD Students:
2020 - Present Maria Garza (Burgos Lab Member)
2020 (Fall) Morgan Johnston (Research Rotation)
2020 (Fall) Ryan M. Wood (Research Rotation)

Masters Students:
2021 (Spring) Bianca Herrera (Joining Burgos Lab)

Undergraduate Students:
2010 (Summer) Francesca Ramirez, MSRP Student, FIU
2012 (Spring) Marina Afonkina, CO-OP Student, NEU
2014 (Summer) Pablo Pagan, MSRP Student, Sacred Heart U, PR
2015 (Summer) William Ramos-Guasp, MSRP Student, UPR
2016 (Summer) Mary Jane Porzenheim, UROP Student, MIT
2016 (Fall) Kara Presbrey, UROP Student, MIT
2018 (Spring) Marcos Sanchez, Visiting Student, Metropolitan U, PR
2018 (Fall) Lery Ann Morales-Colon, PR-LSAMP Student, PUCPR
2019 - Present Danny Hajali, Volunteer, UTSA
2020 - Present Daniel Arriaga, Independent Studies, UTSA

Other Colleagues:
2006 - 2008 Demetrio Sierra-Mercado, Graduate Student, Quirk Lab, PSM
2007 (Summer) Jose Fuentealba-Evans, Visiting Faculty, Chile, South America
2015 (Spring) Cody Siciliano, Postdoctoral Fellow, Tye Lab, MIT
2015 (Fall) Ada Felix-Ortiz, Graduate Student, Tye Lab, MIT

D. Contributions to Science

1. My thesis work addressed questions on how the brain encodes novel cues (e.g., sounds or lights) to make predictions about potentially aversive or rewarding outcomes, and how appropriate behaviors (e.g., fear vs reward seeking) were guided accordingly. These early studies describe multiple key electrophysiological mechanisms at the single-neuron level within discrete subregions of the medial prefrontal cortex (mPFC) that occur during the encoding of fear-predicting or reward-predicting cues. At that time, my studies elevated the mPFC to a higher podium because functions for cue encoding and subsequent regulation of motivated

behaviors were mainly believed to be roles of the amygdala (another brain region located in the medial temporal lobe). My studies thus laid the fundamental groundwork for many subsequent studies.

a. **Burgos-Robles A***, Vidal-Gonzalez I*, Santini E, Quirk GJ (2007). Consolidation of fear extinction requires NMDA receptor-dependent bursting in the ventromedial prefrontal cortex. *Neuron* 53(6):871-80. **Co-first authors. Cited >507*
b. **Burgos-Robles A***, Vidal-Gonzalez I*, Quirk GJ (2009). Sustained conditioned responses in prelimbic prefrontal neurons are correlated with fear expression and extinction failure. *J Neurosci* 29(26):8474-82. **Co-first authors. Cited >429*
c. Pendyam S, Bravo-Rivera C, **Burgos-Robles A**, Sotres-Bayon F, Quirk GJ, Nair SS (2013). Fear signaling in the prelimbic-amygdala circuit: A computational modeling and recording study. *J Neurophysiol* 110(4):844-61. *Cited >28*

2. Another study resulting from my graduate studies revealed that neural activity in discrete subregions of the mPFC signal distinct aspects of appetitive reward-seeking behavior. Together with the contributions described above, this suggested that the role of the mPFC is to read environmental and sensory cues to more broadly predict either threats or rewards to guide correct behavioral choices while preserving safety.
    a. **Burgos-Robles A**, Bravo-Rivera H, Quirk GJ (2013). Prelimbic and infralimbic neurons signal distinct aspects of appetitive instrumental behavior. *PLoS ONE* 8(2):e57575. *Cited >75*

3. Consistent with the idea that the mPFC might guide correct behavioral choices when facing conflicting motivations (*threats vs reward*), my postdoctoral work revealed that the mPFC indeed performs this function in conjunction with another brain region known as the amygdala in order to guide appropriate behavioral responses. These studies describe essential prefrontal-amygdala interactions during threat-reward conflict, as well as during avoidance of punishment, anxiety, social interaction, and other related behaviors.
    a. **Burgos-Robles A***, Kimchi EY*, Izadmehr EM, Porzenheim MJ, Ramos-Guasp WA, Nieh EH, Felix-Ortiz AC, Namburi P, Leppla CA, Presbrey KN, Anandalingam KK, Pagan-Rivera PA, Anahtar M, Beyeler A, and Tye KM (2017). Amygdala inputs to prefrontal cortex guide behavior amid conflicting cues of reward and punishment. *Nature Neurosci* 20(6):824-835. **Co-first authors. Cited >103*
    b. Felix-Ortiz AC, **Burgos-Robles A**, Bhagat ND, Leppla CA, and Tye KM (2016). Bidirectional modulation of anxiety-related and social behaviors by amygdala projections to the medial prefrontal cortex. *Neurosci* S0306-4522(15)00655-7. *Cited >185*
    c. Diehl MM, Bravo-Rivera C, Rodriguez-Romaguera J, Pagan-Rivera PA, **Burgos-Robles A**, Roman-Ortiz C, and Quirk GJ (2018). Active avoidance requires inhibitory signaling in the rodent prelimbic prefrontal cortex. *eLife* pii: e34657. *Cited >30*
    d. Vander Weele CM, Siciliano CA, Matthews GA, Namburi P, Izadmehr EM, Espinel IC, Nieh EH, Schut EHS, Padilla-Coreano N, **Burgos-Robles A**, Chang CJ, Kimchi EY, Beyeler A, Wichmann R, Wildes CP, and Tye KM (2018). Dopamine enhances signal-to-noise ratio in cortical-brainstem encoding of aversive stimuli. *Nature* 563(7731):397-401. *Cited >56*

4. My work has also shown that prefrontal-amygdala mechanisms are crucial during observational fear learning, which is a powerful brain function that allows individuals to learn about cues that predict threats without directly experiencing the threats themselves, but instead through the observation of other conspecifics undergoing threat punishment.
    a. Allsop SA*, Wichmann R*, Mills F*, **Burgos-Robles A***, Chang CJ, Felix-Ortiz AC, Vienne A, Beyeler A, Izadmehr EM, Glober G, Cum MI, Stergiadou J, Anandalingam KK, Farris K, Namburi P, Leppla CA, Weddington JC, Nieh EH, Smith AC, Ba D, Brown EN, and Tye KM (2018). Corticoamygdala transfer of socially-derived information gates observational learning. *Cell* 173(6):1329-1342.e18. **Co-first authors. Cited >80*
    b. **Burgos-Robles A***, Gothard KM*, Monfils MH*, Morozov A*, and Vicentic A* (2019). Conserved features of anterior cingulate networks support observational learning across species. *Neurosci Biobehav Rev* 107:215-228. **Co-first authors. Cited >6*

5. In addition to the contributions above, some of my studies examined potential targets and treatment strategies for stress and trauma related disorders.
    a. Penetar DM, **Burgos-Robles A**, Trksak GH, MacLean RR, Dunlap S, Lee DYW, Lukas SE (2012). Effects of transcutaneous electric acupoint stimulation on drug use and responses to cue-induced craving: A pilot study. *Chin Med* 7(1):14. *Cited >8*
    b. Meyer RM, **Burgos-Robles A**, Liu E, Correia SS, Goosens KA (2013). A ghrelin-growth hormone axis drives stress-induced vulnerability to enhanced fear. *Mol Psychiatry* 19(12):1284-94. *Cited >108*

c. Gisabella B, Farah S, Peng X, **Burgos-Robles A**, Lim SH, and Goosens KA (2016). Growth hormone biases amygdala network activation after fear learning. *Translational Psychiatry* 6(11):e960. *Cited >11*
d. **Burgos-Robles A** and Goosens KA. Prolonged stress exposure triggers enduring dysregulation of amygdala-prefrontal fear circuit. (*In Revision*)
e. Kimchi EY, **Burgos-Robles A,** Matthews GA, Chakoma T, Patarino M, Weddington JC, Wichmann R, and Tye KM. Cholinergic basal forebrain neurons can drive motivated behavior by serving as a conditioned stimulus. (*In Revision*)

E. Research Support

Ongoing Research Support

Lab Start-Up Funds — Role: P.I. — 09/01/19-08/31/22
Dept of Biology & Neuroscience Institute, University of Texas at San Antonio (UTSA)
Start-up funds were provided to professor Burgos-Robles to support the initiation of his research program.

Completed Research Support

MARC U*STAR Honors Program (NIH-TWD) — Role: Undergrad — 08/01/01-07/31/03
"Role of NMDA receptors during fear learning and extinction"
The goal for this project was to beginning the exploration of whether NMDA receptor activity was required during distinct phases of memory formation associated to fear (e.g., acquisition, consolidation, or expression of fear learning and fear extinction).

Research Supplement for Minorities (NIMH) — Role: Graduate Student — 09/01/04-05/31/07
"Neural mechanisms underlying fear learning and extinction"
The goal for this project was explore neurophysiological activity in medial prefrontal cortical areas during the learning, consolidation, expression, and extinction of fear-inducing associations (e.g., tone-shock pairing).

Clinical Research Training Program (Harvard) — Role: Research Intern — 06/15/08-02/01/09
"Treating comorbid symptoms of anxiety and addiction using transcutaneous electric acupoint stimulation"
The goal for this project was to examine whether repeated transcutaneous electric acupoint stimulation was able to reduce symptoms of anxiety and drug craving.

Research Supplement to Promote Diversity (NIMH) — Role: Postdoc Fellow — 12/01/14-11/30/15
"Dissecting the neural circuits encoding positive and negative valence"
The goal of this project was to distinguish neural circuit mechanisms between the amygdala and prefrontal cortex for assigning emotional valence (either positive or negative) to sensory stimuli that has been paired with either appetitive reward or aversive outcomes (e.g., electric shock).

NARSAD Young Investigator Award (BBRF) — Role: P.I. — 01/15/14-01/14/16
"Amygdala-prefrontal interactions during aversive and rewarding behaviors"
The goal of this project was to distinguish the way amygdala and prefrontal neurons interact during distinct behaviors associated to emotions and conflicting motivations, such as fear, anxiety, appetitive reward seeking, and social reward seeking.