OMB No. 0925-0001 and 0925-0002 (Rev. 03/2020 Approved Through 02/28/2023)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.  
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Panayi, Marios Chris

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

POSITION TITLE: Postdoctoral IRTA Fellow

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  MM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| University of New South Wales (UNSW), Sydney, Australia | BA(Hons) | 03/2010 | Psychology |
| University of New South Wales (UNSW), Sydney, Australia | PHD | 07/2015 | Psychology |
| University of New South Wales (UNSW), Sydney, Australia | Teaching | 12/2015 | Psychology |
| University of Oxford, Oxford, United Kingdom | PostDoc | 02/2020 | Learning and Decision Making |
| National Institute on Drug Abuse Intramural Research Program | Visiting Fellow | Present | Cellular Neurobiology |

**A. Personal Statement**

**Through many experiences in my academic and personal life, I have developed a keen interest in studying the neural and psychological mechanisms of learning, motivation, and behavior. In particular, how do we come to learn about informative cues in our environment, and how do these representations inform our moment-to-moment behavior? Why am I checking the refrigerator? Why am I refreshing my twitter feed? These processes are fundamental to neurotypical and maladpative learning and behavior characteristic of most neuropsychiatric disorders. I focused on these issues in my first independent undergraduate research thesis in the lab of Dr. Simon Killcross at UNSW, Australia I studied how failed feedback from informative cues could be used to model compulsive behaviors in animal models of obsessive-compulsive disorder. This work received the Australian Psychological Society prize and helped me establish a strong background in designing and testing novel behavioral procedures. A desire to understand these processes further led me to study the orbitofrontal cortex (OFC) in the same laboratory, where I learned stereotaxic surgery to perform lesions and micro infusion techniques. My thesis was awarded the The Paxinos Neuroscience Prize and resulted in publications demonstrating greater contribution of the OFC to basic learning phenomena than had previously been thought, and the existence of novel subdivisions within classically defined OFC subregions. During this time, I also collaborated with Dr. Fred Westbrook and Dr. Nathan Holmes to understand how other neural and neurochemical systems contribute to cue-based control of behavior such as the role of benzodiazepines in extinction therapy, oxytocin signaling in the amygdala regulates fear, and nicotine self-administration which resulted in co-authorship on three publications. Throughout my graduate career I also acquired a strong background in statistics and research methods, which started with teaching in undergraduate and postgraduate courses, and led to being hired to develop and teach a new course in statistics and critical thinking.**

**My graduate experience left me with a desire for a finer grained understanding of the relationship between the brain and behavior. This led me to move continent to Europe where I joined the labs of Dr. Mark Walton and Dr. David Bannerman at the University of Oxford to learn how to record real-time dopamine signaling using fast-scan cyclic-voltammetry (FCV) in striatum, to understand how cue learning is disrupted in genetically modified mouse models of aberrant attention in schizophrenia. While some of this work is ongoing, a number of publications from this work have been written up and submitted to journals and I expect they will be published soon. I directly supervised a number of graduate students during my postdoc and continued to teach statistics and research methods. During this time, I also acquired new skills to extend the findings from my graduate work which resulted in three publications. I learned neuroanatomical tracing techniques to provide further evidence of novel subdivisions within OFC and collaborated to develop a novel computational model of OFC function.**

**My productivity has been impacted by the SARS-CoV-2 pandemic. I moved continent to start a second position as a NIDA IRP Visiting Fellow and flew into the US on March 16th, 2020 a day before international travel restrictions. I was then required to quarantine for two weeks. During this time, in person government services were suspended, which prevented me from acquiring a social security number and access to NIDA facilities until early November of 2020. During this time my productivity and access to necessary computing resources was significantly limited. I am aware that many have been significantly impacted by this pandemic, I only raise this to highlight the additional barriers that I experienced because of the unfortunate timing of moving to a new country during the pandemic.**

**I am well suited to fill my role in this project for several reasons. First, I have expertise in animal behavioral testing, including extensive experience developing successful novel behavioral assays. I also have experience with behavioral pharmacology and testing in translational models of neuropsychiatric disorders. I have mastered stereotaxic surgery in rats and mice to lesion, infuse viruses and tracers, implant cannula, and FCV microelectrodes for stable chronic in-vivo recordings. Indeed, there are very few labs that have been able to successfully record FCV signals in freely moving mice. I also have experience and statistical expertise with working with large and complex multivariate data sets that are generated when continuously recording signals from a behaving animal. Finally, I have expertise in OFC function. A key component of my training in the Schoenbaum lab and this proposal is learning in-vivo electrophysiology. Since accessing the laboratory I have already begun pilot testing behavior and learning to assemble and implant microelectrode arrays and microdrives. Critically, all of the research proposed will enhance my training while building on many areas of in which I already have experience. Being awarded a CCB fellowship will provide me with an opportunity build on my strengths and acquire new skills to advance my career in research, teaching and mentoring.**

**B. Positions and Honors**

**Positions and Employment**

**2010 - 2014 Undergraduate course tutor and lecturer, UNSW**

**2014 Teaching and Research Fellow, UNSW**

**2015 Curriculum Development and Postdoctoral Fellow**

**2016 - 2020 Postdoctoral Research Associate in Learning and Decision Making, University of Oxford**

**2020 - present Visiting Fellow, Division of Intramural Research, National Institute of Drug Abuse**

**Other Experience and Professional Membership**

**2009 - 2010 Member, Australian Psychological Society**

**2012 Member, Society for Neuroscience**

**2012 Member, Society for Neuroeconomics**

**2012 Member, Pavlovian Society**

**Honors**

**2008 - 2009 The Faculty of Science Dean’s List, UNSW**

**2009 Graduated Hons. Class 1, and awarded the University Medal in Psychology, UNSW**

**2009 The Australian Psychological Society Prize**

**2010 - 2013 Australian Postgraduate Award**

**2010 - 2013 UNSW Research Excellence Award**

**2012 Postgraduate Research Support Scheme Travel Award, UNSW**

**2012 Postgraduate Research Competition, UNSW**

**2016 The Paxinos Neuroscience Prize, PhD thesis UNSW**

**2017 Vice-Chancellor’s Award for Outstanding Contributions to Student Learning, UNSW**

**2018 Monitoring Molecules in Neuroscience Short Oral Communication Award**

**C. Contributions to Science  
URL to a full list of my published work:** *https://pubmed.ncbi.nlm.nih.gov/?term=Panayi+MC&cauthor\_id=30044220*

**Graduate collaborations:** I collaborated with Dr. Fred Westbrook’s lab where we tested the role of oxytocin signaling, commonly thought of as “the love hormone”, in fear learning. Previous work had suggested that oxytocin infused into the amygdala reduced fear expression, but did not demonstrate whether these effects were specific to oxytocin receptors, differed between subnuclei of the amygdala, or represented reduced fear learning or expression. We found that fear learning was reduced when oxytocin was infused into both the basolateral (BLA) and central (CeA) nuclei of the amygdala before learning. In contrast, fear expression was enhanced by infusions of oxytocin in CeA and reduced by infusions of oxytocin in BLA prior to recall. We also demonstrated that these effects were specific to oxytocin receptor function as they could be replicated using a selective oxytocin receptor agonist, reversed by an oxytocin receptor antagonist, and co-administration of oxytocin and the oxytocin receptor antagonist blocked these effects.

Benzodiazepines, are anxiolytic drugs that are commonly prescribed to treat anxiety disorders and are often combined with behavioral extinction therapy. Extinction learning is sensitive to context, that is, learning that a cue is safe in one context does not generalize to other contexts. We predicted that benzodiazepines, like midazolam, create strong internal drug states that act like a context, and therefore effective extinction of fear learning will depend on when midazolam is given. Midazolam impaired fear extinction when given immediately prior to initial learning, but not when given after some extinction learning had already taken place (i.e. after experiencing at least 5 mins of extinction to a fearful context or conditioned stimulus). This suggests that benzodiazepines might be counterproductive to behavioral extinction therapy if taken from the start of therapy, but not after some extinction has already taken place.

**Graduate career**

**The role of the orbitofrontal cortex in cue outcome learning**

**Distinguishing between anterior and posterior subregions of the lateral orbitofrontal cortex**

**Postdoctoral Career**

Voltammetry

**D. Additional Information: Research Support and/or Scholastic Performance**