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## EDUCATION & RESEARCH EXPERIENCE

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- 2014-present      Purdue University, West Lafayette, Indiana, USA  
Assistant Professor of Neuroscience  
Department of Psychological Sciences; Purdue Institute for Integrative Neuroscience
- 2013                University of Saskatchewan, Saskatoon, Canada  
Research Scientist, Physiology; *Mentor: Dr. John Howland*
- 2009-2012        Ernest Gallo Clinic & Research Center, University of California at San Francisco  
Postdoctoral Fellow, Neurology; *Mentor: Dr. Patricia Janak*
- 2005-2009        Westfälische Wilhelms Universität Münster, Germany (10/2005-04/2009)  
Otto-von-Guericke Universität, Magdeburg, Germany (01/2005-09/2005)  
Postdoctoral Fellow, Neurophysiology; *Mentor: Dr. Hans-Christian Pape*
- 2000-2005        University of Calgary, Canada  
Doctorate, Neuroscience; *Mentor: Dr. Ken Lukowiak*  
Thesis: Consolidation, Reconsolidation, Extinction and Forgetting in *Lymnaea stagnalis*
- 1998-2000        University of British Columbia, Vancouver, Canada  
Laboratory technician, Psychology; *Mentor: Dr. Catharine Rankin*
- 1994-1998        University of British Columbia, Vancouver, Canada  
Bachelor of Science (Behavioural Neuroscience)

## RESEARCH INTERESTS

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My research using animal models focuses on the neurobiological mechanisms underlying memory formation, with an emphasis on neural circuits of emotion. This work is both significant and timely to research on sex differences in Post-Traumatic Stress Disorder and drug addictions. The objectives of my research program are to 1) better understand the circuit mediating discrimination among environmental cues signifying safety, fear or reward, and to 2) identify the neuronal correlates of the behavioral sex differences seen in fear and reward responding in our safety-fear-reward discrimination paradigm. This is being accomplished using a combination of techniques which are in place in my current laboratory at Purdue University: behavior, *in vivo* single unit electrophysiology, and chemogenetics.

## RESEARCH FUNDING

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- NIMH R01 Research Grant (R01MH110425)  
Neural circuitry of safety, fear and reward cue discrimination  
04/01/2018-12/31/2022      Role: PI      Total direct costs: \$1,250,000
- Purdue Institute for Integrative Neuroscience Seed Grant  
A new method for manipulating specific neural pathways during learning  
07/01/2016-06/30/2017      Role: PI      Total costs: \$5,000

## SALARY FELLOWSHIPS

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- Human Frontier Science Program Long-term Postdoctoral Fellowship (International), 2005-2008
- Alexander von Humboldt Postdoctoral Fellowship (Germany), 2005
- Natural Sciences and Engineering Research Council of Canada-Postdoctoral Fellowship, 2004
- Canadian Institutes of Health Research's Canadian Graduate Scholarship-Doctoral Award, 2004
- Natural Sciences & Engineering Research Council of Canada-Postgraduate Scholarship B, 2002-04
- University of Calgary's Faculty of Graduate Studies Award (Canada), 2002
- University of Calgary's Graduate Assistantship (Teaching) (Canada), 2002
- Alberta Heritage Masters Scholarship (Canada), 2001
- University of Calgary's Graduate Research Scholarship (Canada), 2001

## AWARDS & HONORS

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- Nominated for a Prose Award for Excellence in Reference Works by the Association of American Publishers for *Sangha, S. & Foti, D. (2018). Neurobiology of Abnormal Emotion and Motivated Behaviors: Integrating Animal and Human Research. 1<sup>st</sup> edition. Cambridge, Massachusetts: Academic Press.*
- Purdue University Seed for Success Award for Excellence in Research, 2018
- University of Calgary's Hotchkiss Brain Institute 2018 Alumnus of the Year, 2018
- International Travel Grant, Purdue Research Foundation, 2016
- Invited participation in the 5<sup>th</sup> Bonn Humboldt Award Winners' Forum, 'Frontiers in Neuroscience: Multi-scale Analysis of the Nervous System – From Molecules to Circuits', 2015
- Invited participation in the 57<sup>th</sup> Meeting of Nobel Laureates in Lindau, Germany, 2007
- Canadian Institutes of Health Research's Brain Star Award, 2006
- University of Calgary's Chancellor's Graduate Medal - Doctoral Level, 2005
- Finalist, Lindsley Prize for most outstanding dissertation in Behavioral Neuroscience (international competition), 2005
- Canadian Institutes of Health Research's Brain Star Award, 2004
- University of Calgary's Dean's Research Excellence Award, 2004
- Society for Neuroscience Chapters/Eli Lilly Graduate Student Travel Award, 2003
- University of Calgary's Graduate Travel Award, 2003
- University of Calgary's Dean's Research Excellence Award, 2003
- University of Calgary's Faculty of Graduate Studies Award, 2002
- University of Calgary's Graduate Assistantship (Teaching), 2002
- Company of Biologists' Travel Fellowship (for collaboration between Canada & Japan), 2002
- University of Calgary's Dean's Research Excellence Award, 2002
- Alberta Heritage Masters Scholarship (Canada), 2001
- University of Calgary's Graduate Research Scholarship, 2001
- University of Calgary's Dr. Keith Cooper Award, 2001

## PROFESSIONAL & ACADEMIC SERVICES

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<i>Ad hoc reviewer:</i>	Behavioral Neuroscience	Behavioural Brain Research
Biological Psychiatry	BioMed Central Research Notes	European Journal of Neuroscience
Frontiers Behavioral Neuroscience	Journal of Neuroscience	Journal of Comparative Psychology
Learning & Memory	Molecular Psychiatry	Nature Communications
Neurobiology of Learning & Memory	Neuropsychopharmacology	Science Advances
Scientific Reports		

*Frontiers in Behavioral Neuroscience, Review Editor* (2019-2021). Member of the Editorial Board. Responsible for assessing rigor and validity of the research and working collaboratively with authors and editors to improve manuscripts.

*International Behavioral Neuroscience Society:*

*Ethics & Diversity Committee* (2019-2022). Highlighting and encouraging diversity within the society, both in its members and conference locations. Handling reports of incidents violating the IBNS Code of Conduct.

*Education & Training Committee* (2019-2022). Promote participation and achievement of trainees in the behavioral neuroscience field, including selecting travel award winners for the annual conference.

*Pavlovian Society Executive Committee* (2017-2021). Elected member to the executive committee responsible for managing the society, including its annual meeting.

*Greater Indiana Society for Neuroscience Chapter Executive Committee* (2016-2019). Committee organizes yearly chapter meeting representing neuroscience research at Purdue University, Indiana University (Bloomington), Indiana University Purdue University Indianapolis and Indiana University School of Medicine (Indianapolis). Location of meeting rotates among the campuses.

*News and Views writer* (2004-2007), *Journal of Experimental Biology, Neurophysiology/Neuroethology*; Editor: Dr. Kathryn Phillips

## PUBLICATIONS

\*corresponding author

### Research articles

Greiner EM, Müller I, Norris MR, Ng KH, **Sangha S\*** (2019). Sex differences in fear regulation and reward seeking behaviors in a fear-safety-reward discrimination task. *Behavioural Brain Research*, 368: 111903. [Link](#)

Müller I\*, Brinkman AL, Sowinski EM, **Sangha S\*** (2018). Adolescent conditioning affects rate of adult fear, safety and reward learning during discriminative conditioning. *Scientific Reports*, 8:17315. [Link](#)

Ng K, Pollock MW, Urbanczyk PJ, **Sangha S\*** (2018). Altering D1 receptor activity in the basolateral amygdala impairs fear suppression during a safety cue. *Neurobiol Learn Mem*, 147:26. [Link](#)

**Sangha S\*** (2015). Plasticity of fear and safety neurons of the amygdala in response to fear extinction. *Front Behav Neurosci*, 9:354. [Link](#)

**Sangha S\***, Greba Q, Robinson PD, Ballendine SA, Howland JG\* (2014). Heightened fear in response to a safety cue and extinguished fear cue in a rat model of maternal immune activation. *Front Behav Neurosci*, 8:168. [Link](#)

**Sangha S\***, Robinson PD, Davies DA, Greba Q, Howland JG\* (2014). Alterations in reward, fear and safety cue discrimination after inactivation of the prelimbic and infralimbic cortices. *Neuropsychopharm*, 39:2405-2413. [Link](#)

**Sangha S\***, Chadick JZ, Janak PH\* (2013). Safety encoding in the basal amygdala. *J Neurosci*, 33: 3744-3751. [Link](#) ['Featured Article: Systems/Circuits'](#)

**Sangha S\***, Ilenseer J, Sosulina L, Lesting J, Pape H-C (2012). Differential regulation of glutamic acid decarboxylase gene expression after extinction of a recent memory versus intermediate memory. *Learn Mem*, 19:194-200. [Link](#)

Lesting J, Narayanan RT, Seidenbecher T, Kluge C, **Sangha S**, Pape H-C (2011). Patterns of coupled theta activity in amygdala-hippocampal-prefrontal cortical circuits during fear extinction. *PLoS One*, 6:e21714. [Link](#)

**Sangha S**, Narayanan RT, Bergado-Acosta JR, Stork O, Seidenbecher T, Pape H-C (2009). Deficiency of the 65-kDa isoform of glutamic acid decarboxylase impairs extinction of cued but not contextual fear memory. *J Neurosci*, 29:15713-15720. [Link](#)

- Jüngling K, Seidenbecher T, Sosulina L, Lesting J, **Sangha S**, Clark SD, Okamura N, Duangdao DM, Xu Y-L, Reinscheid RK, Pape H-C (2008). Neuropeptide S: reduced expression and facilitated extinction of fear through control of intercalated GABAergic neurons in the amygdala. *Neuron*, 59:298-310. [Link](#)
- Bergado-Acosta JR, **Sangha S**, Narayanan RT, Obata K, Pape H-C, Stork O (2008). Critical role of the 65kD isoform of glutamic acid decarboxylase in consolidation and generalization of Pavlovian fear memory. *Learn Mem*, 15:163-171. [Link](#)
- Narayanan RT, Seidenbecher T, **Sangha S**, Stork O, Pape H-C (2007). Theta re-synchronization during reconsolidation of remote contextual fear memory. *Neuroreport*, 18:1107-11. [Link](#)
- Rose JK#, **Sangha S**#, Rai S#, Norman KR, Rankin CH (2005). Decreased sensory stimulation reduces behavioral responding, retards development and alters neuronal connectivity in *Caenorhabditis elegans*. *J Neurosci*, 25:7159-7168. # contributed equally [Link](#)
- Sangha S**, Scheibenstock A, Martens K, Varshney N, Cooke R, Lukowiak K (2005). Impairing forgetting by preventing new learning and memory. *Behav Neurosci*, 119:787-796. [Link](#)
- Parvez K, Stewart O, **Sangha S**, Lukowiak K (2005). Boosting intermediate-term into long-term memory. *J Exp Biol*, 208:1525-1536. [Link](#)
- Sangha S**, Scheibenstock A, Morrow R, Lukowiak K (2003). Extinction requires new RNA and protein synthesis and the soma of the cell RPeD1 in *Lymnaea stagnalis*. *J Neurosci*, 23:9842-9851. [Link](#)
- Sangha S**, Scheibenstock A, Lukowiak K (2003). Reconsolidation of a long-term memory in *Lymnaea* requires new protein and RNA synthesis and the soma of RPeD1. *J Neurosci*, 23:8034-8040. [Link](#)
- Sangha S**, Morrow R, Smyth K, Cooke R, Lukowiak K (2003). Cooling blocks ITM and LTM formation and preserves memory. *Neurobiol Learn Mem* 80:130-139. [Link](#)
- Sangha S**#, McComb C#, Lukowiak K (2003). Forgetting and the extension of memory in *Lymnaea*. *J Exp Biol* 206:71-77. # contributed equally [Link](#)
- Sangha S**, Scheibenstock A, McComb C, Lukowiak K (2003). Intermediate and long-term memories of associative learning are differentially affected by transcription vs. translation blockers in *Lymnaea*. *J Exp Biol* 206:1605-1613. [Link](#)
- Lukowiak K, Haque Z, Spencer G, Varshay N, **Sangha S**, Syed N (2003). Long-term memory survives nerve injury and the subsequent regeneration process. *Learn Mem* 10:44-54. [Link](#)
- McComb C#, **Sangha S**#, Quadry S, Yue J, Scheibenstock A, Lukowiak K (2002). Context extinction and concurrent context associative learning in *Lymnaea*. *Neurobiol Learn Mem* 78:23-34. # contributed equally. [Link](#)
- Sangha S**#, McComb C#, Scheibenstock A, Johannes C, Lukowiak K (2002). The effects of continuous vs. partial reinforcement schedules on associative learning, memory and extinction in *Lymnaea*. *J Exp Biol* 205:1171-1178. # contributed equally. [Link](#)
- Smyth K, **Sangha S**, Lukowiak K (2002). Gone but not forgotten: The lingering effects of intermediate term memory on the persistence of LTM. *J Exp Biol* 205:131-140. [Link](#)

#### *Edited Book*

- Sangha, S.\***, Foti, D.\* (2018). *Neurobiology of Abnormal Emotion and Motivated Behaviors: Integrating Animal and Human Research*. 1<sup>st</sup> edition. Cambridge, Massachusetts: Academic Press. [Link](#)  
*Nominated for a Prose Award for Excellence in Reference Works by the Association of American Publishers.*

#### *Reviews & Commentaries*

- Sangha S\***, Diehl M, Bergstrom H, Drew M (under review). Know Safety, No Fear. Christianson JP, Fernando ABP, Kazama AM, Jovanovic T, Ostroff LE, **Sangha S** (2012). Inhibition of fear by learned safety signals: minisymposium review. *J Neurosci*, 32:14118-14124. [Link](#)
- Sangha S\*** (2007). Erasing Memories. *J Exp Biol* 210(23): v-a. [Link](#)
- Sangha S\*** (2007). Neurons vie for Recruitment. *J Exp Biol* 210(17): v [Link](#)
- Sangha S\*** (2007). Keeping the Memory Alive. *J Exp Biol* 210(11): vii. [Link](#)
- Sangha S\*** (2007). Unlocking Learning. *J Exp Biol* 210(3): v. [Link](#)
- Sangha S\*** (2006). I Feel Your Pain. *J Exp Biol* 209(21): iv. [Link](#)

- Sangha S\*** (2006). Hopping for Wheaties. *J Exp Biol* 209(15): vi. [Link](#)
- Sangha S\*** (2006). First and only love. *J Exp Biol* 209(9): v-a. [Link](#)
- Sangha S\*** (2006). Less studying, better memory? *J Exp Biol* 209(3): vii. [Link](#)
- Lukowiak K, Martens K, Orr M, Parvez K, Rosenegger D, **Sangha S** (2006). Modulation of aerial respiratory behaviour in a pond snail. *Respir Physiol Neurobiol*, 154: 61-72. [Link](#)
- Sangha S\*** (2005). Moving without dopamine. *J Exp Biol* 208 (21), v. [Link](#)
- Sangha S\*** (2005). Pass the remote please. *J Exp Biol* 208(15), v. [Link](#)
- Sangha S\*** (2005). The synapse that lost the battle. *J Exp Biol* 208(8), vi. [Link](#)
- Sangha S\*** (2005). Competing memories. *J Exp Biol* 208(3), vi. [Link](#)
- Sangha S**, Varshney N, Fras M, Smyth K, Rosenegger D, Parvez K, Sadamoto H, Lukowiak K (2004). Memory, reconsolidation and extinction in *Lymnaea* require the soma of RPeD1. *Adv Exp Med Biol*, 551:311-8. [Link](#)
- Lukowiak K, **Sangha S**, Scheibenstock A, Parvez K, McComb C, Rosenegger D, Varshney N, Sadamoto H (2003). Molluskan model systems: In search for the engram. *J Physiol Paris*, 97:69-76. [Link](#)
- Lukowiak K, **Sangha S**, McComb C, Varshney N, Rosenegger D, Sadamoto H, Scheibenstock A (2003). Associative learning and memory in *Lymnaea stagnalis*: how well do they remember? *J Exp Biol* 206: 2097-2103. [Link](#)

## INVITED LECTURES AT INTERNATIONAL, NATIONAL AND REGIONAL CONFERENCES

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- Mini-symposium: Brain circuits for the selection and scaling of defensive behavior. *Annual Meeting of the Society for Neuroscience*. Chicago, IL, 2019.
- Corticolimbic circuits in the flexible switching between reward seeking and fear behaviors in response to safety cues. *Annual Meeting of the Pavlovian Society*. Vancouver, Canada, 2019.
- Neural circuits of regulating fear by a safety cue in a safety-fear-reward learning paradigm. *Gordon Research Conference: Amygdala function in emotion, cognition and disease*. Stonehill College, MA, 2019
- Making the right choice: Decision making under conflict. *Annual Meeting of the International Behavioral Neuroscience Society*. Cairns, Australia, 2019
- Suppressing conditioned fear in the presence of a safety cue. *Annual Meeting of the International Behavioral Neuroscience Society*. Boca Raton, FL, 2018
- Effect of safety cues on fear and reward seeking behaviors and its neuronal correlates. *Annual Meeting of the Canadian Association of Neuroscience*. Vancouver, Canada, 2018
- Increased reward seeking and lack of conditioned inhibition of fear and fear extinction in female rats. *Organization for the Study of Sex Differences*. Atlanta, GA, 2018
- Neural circuits of inhibiting conditioned fear by a safety cue in a fear-safety-reward cue discrimination task. *Winter Conference on the Neurobiology of Learning & Memory*. Park City, UT, 2018.
- Neural circuits of inhibiting conditioned fear by a safety cue in a fear-safety-reward cue discrimination task. *Annual Meeting of the Pavlovian Society*. Philadelphia, PA, 2017.
- Neural circuitry for suppressing conditioned fear in the presence of a safety cue. *International Conference on Brain Plasticity linking Molecules, Cells & Behavior*. Magdeburg, Germany, 2017.
- Role of the prefrontal cortex in discriminating among fear, safety and extinguished fear cues. *Federation of the European Neuroscience Society*, Copenhagen, Denmark, 2016.
- Amygdalocortical circuitry contributes to discriminative reward, fear and safety learning. *International Behavioral Neuroscience Society*, Victoria, Canada, 2015.
- Discriminating among reward, fear and safety cues. *Indianapolis Society for Neuroscience*, 2014.
- Neurons in the amygdala are responsive to safety cues. *Society for Neuroscience*, New Orleans, LA, 2012.
- The role of GAD65 in extinguishing fear. *Annual Meeting of the Pavlovian Society*, Baltimore, MD, 2010.

- GAD65-mediated GABAergic transmission is important for extinction of cued fear. *Gordon Research Conference: Amygdala in health and disease*, Colby College, MA, 2009.
- Memory formation in a snail is dependent upon one specific cell. *7<sup>th</sup> Annual Meeting of the International Behavioural and Neural Genetics Society*, Sitges, Spain, 2005.
- Well-rehearsed memories are more resistant to disruption. *10<sup>th</sup> Anniversary Meeting of Workshop of Invertebrate Neuroscience*, Honolulu, HI, 2004.
- Memory stabilization after repeated memory reactivation. *West Coast Nerve Net*, Santa Clara, CA, 2004.