**SUSAN SANGHA, PhD**

Department of Psychiatry, Indiana University School of Medicine
Stark Neuroscience Research Institute
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## EDUCATION & RESEARCH EXPERIENCE

| | |
|---|---|
| 2022- | Indiana University School of Medicine, Indianapolis, Indiana, USA<br>Associate Professor of Psychiatry (with tenure)<br>Department of Psychiatry; Stark Neuroscience Research Institute |
| 2021-2022 | Purdue University, West Lafayette, Indiana, USA<br>Associate Professor of Neuroscience & Behavior (with tenure)<br>Department of Psychological Sciences; Purdue Institute for Integrative Neuroscience |
| 2014-2021 | Purdue University, West Lafayette, Indiana, USA<br>Assistant Professor of Neuroscience & Behavior<br>Department of Psychological Sciences; Purdue Institute for Integrative Neuroscience |
| 2013 | University of Saskatchewan, Saskatoon, Canada<br>Research Scientist, Physiology; *Mentor: Dr. John Howland* |
| 2009-2012 | Ernest Gallo Clinic & Research Center, University of California at San Francisco<br>Postdoctoral Fellow, Neuroscience; *Mentor: Dr. Patricia Janak* |
| 2005-2009 | Westfälische Wilhelms Universität Münster, Germany (10/2005-04/2009)<br>Otto-von-Guericke Universität, Magdeburg, Germany (01/2005-09/2005)<br>Postdoctoral Fellow, Neurophysiology; *Mentor: Dr. Hans-Christian Pape* |
| 2000-2005 | University of Calgary, Canada<br>Doctorate, Neuroscience; *Mentor: Dr. Ken Lukowiak*<br>Thesis: Consolidation, Reconsolidation, Extinction and Forgetting in *Lymnaea stagnalis* |
| 1998-2000 | University of British Columbia, Vancouver, Canada<br>Laboratory technician, Psychology; *Mentor: Dr. Catharine Rankin* |
| 1994-1998 | University of British Columbia, Vancouver, Canada<br>Bachelor of Science (Behavioural Neuroscience) |

## RESEARCH INTERESTS

My research employs animal models to investigate the neurobiological mechanisms underlying memory formation and expression, with a focus on the neural circuits of emotional regulation. This work addresses critical questions related to sex differences in stress-related disorders and substance use. I aim to dissect the neural circuits involved in cue discrimination for safety, fear, and reward, and how safety cues can effectively regulate fear behavior, by integrating in vivo single-unit electrophysiology and calcium imaging with circuit manipulation techniques, including chemogenetics and optogenetics, during awake behavior.

## RESEARCH SUPPORT

- NIMH R01 Research Grant (R01MH110425)
  Sangha, Susan
  Neural circuitry of safety, fear and reward cue discrimination
  04/01/2018-12/31/2028 **Role: PI**

- Indiana University School of Medicine, Department of Psychiatry Pilot Grant
  Sangha, Susan
  Microbiota changes in response to alcohol and stress and their associations with poor behavioral and neuronal outcomes
  07/01/2024-06/30/2025 **Role: PI**

- Indiana University School of Medicine, Stark Neuroscience Research Institute Pre-Clinical Neuroimaging Pilot Grant
  Sangha, Susan
  Structural and functional connectivity changes by alcohol and stress
  07/01/2024-06/30/2025 **Role: PI**

- NIAAA K99 Pathway to Independence Award (K99AA028265)
  Timme, Nicholas
  Identify how alcohol-evoked changes in neural firing affect systems level computations during decision-making
  3/8/2021-2/28/2026 Role: Co-Mentor

- Feodor Lynen Return Fellowship, Alexander von Humboldt Foundation
  Müller, Iris
  Fear and safety processing in the brain – activation of brain regions and specific neuronal subpopulations
  09/01/2019-08/31/2020 Role: Co-Mentor

- Bilsland Dissertation Fellowship, Purdue University
  Ng, Ka
  Neuronal correlates of safety-cue elicited fear suppression in the prefrontal cortex
  08/12/2019-05/17/2020 Role: Mentor

- Purdue Doctoral Fellowship, Purdue University
  Escobedo, Abraham
  08/14/2017-05/10/2019 Role: Mentor

- Feodor Lynen Research Fellowship, Alexander von Humboldt Foundation
  Müller, Iris
  The impact of stress on different neuronal subpopulations in the basal amygdala
  05/01/2017-04/30/2019 Role: Mentor

- Purdue Research Foundation Research Grant Award, Purdue University
  Sangha, Susan (PI)
  Neuronal encoding of fear, safety, and reward cue discrimination in the prefrontal cortex
  01/01/2018-12/31/2018 **Role: PI**

- 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**

## AWARDS & HONORS

- Fellow, International Behavioral Neuroscience Society, 2023
- Pavlovian Research Award, Pavlovian Society, 2022
- Distinguished Speaker, Women in Learning at Annual Meeting of Pavlovian Society, 2022
- Purdue University Seed for Success Award for Excellence in Research, 2018
- University of Calgary's Hotchkiss Brain Institute 2018 Alumnus of the Year, 2018
- Canadian Institutes of Health Research's Brain Star Award, 2004, 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

## PROFESSIONAL & ACADEMIC SERVICES

- *Ad hoc reviewer:*

| | |
|---|---|
| Behavioral Neuroscience | Behavioural Brain Research |
| Biological Psychiatry | BioMed Central Research Notes |

eLife
European Journal of Neuroscience
Journal of Comparative Psychology
Learning & Memory
Nature Communications
Neuron
Psychoneuroendocrinology
Scientific Reports
eNeuro
Frontiers Behavioral Neuroscience
Journal of Neuroscience
Molecular Psychiatry
Neurobiology of Learning & Memory
Neuropsychopharmacology
Science Advances
Trends in Cognitive Science

- *Grant reviewer:*
  NIH Study Section Biobehavioral Regulation, Learning, and Ethology (BRLE) (Standing Member 07/2023-06/2027; 10/2022)
  Indiana Traumatic Spinal Cord & Brain Injury Research Grant Program (02/2023, 01/2016)
  NIH Study Section Behavioral Neuroscience Fellowship (03/2022, 10/2021,10/2020, 06/2020)
  Natural Sciences and Engineering Research Council of Canada (2022; 2024)
  Austrian Science Foundation (2020)
  NIH Study Section Neurobiology of Learning & Memory (LAM) (10/2019)
  Human Frontiers Science Program, Career Development Award (2015)
- *Associate Editor/Editorial Board Member*:
  Journal of Experimental Psychology: Animal Learning and Cognition (2025-)
  Neurobiology of Learning & Memory (2023-)
  Frontiers Behavioral Neuroscience: Learning and Memory (2019-2022)
  Frontiers Behavioral Neuroscience: Emotion Regulation and Processing (2019-2022)
  Scientific Reports (2019-2021)
- *Indiana University School of Medicine:*
  Chair, SNRI Trainee Professional Development Committee (2022-)
  Chair, SNRI Seminar Committee (2022-)
  SNRI Executive Committee (2022-)
  SNRI Professional Development & Wellness Committee (2022-)
  SNRI Teaching Advisory Committee (2023-)
  Psychiatry Research Strategic Plan Implementation Committee (2024-)
  Institutional Animal Care and Use Committee (2025-)
- *Pavlovian Society* Executive Committee (2017-2021, 2022-2025), President (2023-2024).
- *International Behavioral Neuroscience Society* Ethics and Education Committees (2019-2022)
- *Greater Indiana Society for Neuroscience Chapter* Executive Committee (2016-2019).
- *Purdue University,* Purdue Faculty Association, Co-Chair (2014-2015).
- *News and Views writer* (2004-2007), Journal of Experimental Biology, Neurophysiology/ Neuroethology; Editor: Dr. Kathryn Phillips

## PUBLICATIONS *corresponding author h-index 26

- ***JOURNAL ARTICLES***

Fitzgerald JM, Webb EK, Davis K, Bennett M, Benjamin T, Pegau B, **Sangha S** (2025). PTSD symptoms moderate predictors of psychophysiological arousal during fear inhibition: Evidence from a fear, reward, and neutral discrimination task. Journal of Affective Disorders, in press. Link

**Sangha S***, Fitzgerald JM (2024). Translational approaches to the neurobiological study of conditional discrimination and inhibition: Implications for psychiatric disease. Behavioral Neuroscience,138: 244-259. Link

Krueger JN, Patel NN, Shim K, Ng K, **Sangha S*** (2024). Conditioned inhibition of fear and reward in male and female rats. Neurobiology of Learning and Memory, 208: 107881. Link

Ng K, Pollock M, Escobedo A, Bachman B, Miyazaki N, Bartlett EL, **Sangha S*** (2024). Suppressing fear in the presence of a safety cue requires infralimbic cortical signaling to central amygdala. Neuropsychopharmacology,49: 359-367. Link

Fitzgerald J*, Webb EK, **Sangha S** (2023). Psychological and physiological correlates of stimulus discrimination in adults. Psychophysiology,60: e14327. Link

Ng KH, **Sangha S*** (2023). Encoding of conditioned inhibitors of fear in the infralimbic cortex. Cereb Cortex, 33: 5658-5670. Link

Hackleman A, Ibrahim M, Shim K, **Sangha S*** (2023). Interaction of stress and alcohol on discriminating fear from safety and reward in male and female rats. Psychopharmacology, 240: 609-621. Link

**Sangha S*** (2021). Elevated dopamine in the amygdala disrupts infant's approach to mother: Implications for development of neurotypical social behaviors and networks. Neuron, 109(24): 3900-3902. Link

Meyer HC*, **Sangha S**, Radley JJ, LaLumiere RT, and Baratta MV (2021). Environmental Certainty Influences the Neural Systems Regulating Responses to Threat and Stress. Neurosci Biobeh Rev, 131: 1037-1055. Link

Müller I*, Adams DD, **Sangha S**, Chester JA (2021). Juvenile stress facilitates safety learning in male and female high alcohol preferring mice. Behavioural Brain Research, 400: 113006. Link

Krueger JN*, **Sangha S*** (2021). On the basis of sex: Differences in safety discrimination vs. conditioned inhibition. Behavioural Brain Research, 400: 113024. Link

Woon E, Seibert T, Urbanczyk P, Ng KH, **Sangha S*** (2020). Differential effects of prior stress on conditioned inhibition of fear and fear extinction. Behavioural Brain Research, 381: 112414. Link

**Sangha S*,** Diehl M, Bergstrom H, Drew M (2020). Know Safety, No Fear. Neurosci Biobeh Rev, 108: 218-230. Link

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'

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***, 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

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

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**, 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

**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

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

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. 1st edition. Cambridge, Massachusetts: Academic Press. Link *Nominated for a Prose Award for Excellence in Reference Works by the Association of American Publishers.*

- ***COMMENTARIES***

**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
**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

## INVITED TALKS: EDUCATIONAL INSTITUTIONS & *CONFERENCES* *(5 year history)*

2025
- *Leibniz Institute for Neurobiology Learning & Memory Meeting.* Magdeburg, Germany. (Held every 5 years)
- *Annual Meeting of the Pavlovian Society.* Sydney, Australia. *Past President Lecture
- *Australian Appetitive Motivation Symposium (AAMS).* Sydney, Australia. *Keynote
- *Gordon Research Conference: Amygdala Function in Emotion, Cognition & Disease.* Barcelona, Spain.
- *Research Society on Alcohol Annual Meeting.* New Orleans, LA.
- *Canadian Neuroscience Annual Meeting.* Toronto, Canada. *Plenary Session
- *Psychology of Associative Learning & Memory (PALM).* Virtual.

2024
- Indiana University. Psychological & Brain Science Seminar Series. Bloomington, IN.

2023
- University of Colorado, Boulder. Neuroscience Seminar Series. Boulder, CO.
- Southern Methodist University. Biological Sciences Seminar Series. Dallas, TX.
- Leibniz-Institut für Neurobiologie Magdeburg, Germany.
- *International Conference on Learning & Memory.* Huntington Beach, CA.
- *Big 10 Neuroscience Meeting.* Indianapolis, IN
- *Gordon Research Conference: Amygdala Function in Emotion, Cognition & Disease.* Barcelona, Spain.

2022
- University of Cincinnati. Neuroscience Seminar Series. Cincinnati, OH.
- University of Texas, San Antonio. Neuroscience Seminar Series. San Antonio, TX.
- *Women in Learning Annual Luncheon.* Distinguished Speaker. Milwaukee WI.
- *Annual Meeting of the Pavlovian Society.* Women in Learning Keynote Speaker. Milwaukee WI.

2021
- University of Evansville, Department of Psychology. “Crick Lecture Series”. Evansville IN.
- *Annual Meeting of the International Behavioral Neuroscience Society*. Puerto Vallarta, Mexico.