

# TAYLER D. SHEAHAN, PH.D.

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## EDUCATION & TRAINING

### University of Pittsburgh School of Medicine, Pittsburgh, PA (01/2018-present)

Postdoctoral Research Associate | Advisor: Sarah E. Ross, Ph.D.

Research Focus: Understanding spinal neuropeptide signaling in itch and pain

### Washington University in St. Louis, St. Louis, MO (08/2012-12/2017)

Ph.D., Neurosciences | Advisor: Robert W. Gereau IV, Ph.D.

Dissertation: Bridging the translational gap between rodent and human pain research

### Marquette University, Milwaukee, WI (08/2008-05/2012)

B.S., Physiological Sciences, Minor: German, *summa cum laude* | Advisor: Edward M. Blumenthal, Ph.D.

Research Focus: Organization of extracellular matrices in *Drosophila melanogaster*

## GRANTS & FELLOWSHIPS

NIH K99/R00 Pathway to Independence Award (NINDS, K99NS126569)	2022-Present
NIH National Research Service Award Postdoctoral Fellowship (NINDS, F32NS110155)	2018-2022
NIH Postdoctoral Training Grant (NINDS, T32 NS086749)	2018
Marquette University Honors Program Undergraduate Research Grant	2011- 2012
DAAD-RISE Research Fellowship, Max Delbrück Center for Molecular Medicine (German Academic Exchange Service - Research Internships in Science & Engineering)	2011
Marquette University Summer Undergraduate Research Fellowship	2010

## ACADEMIC & PROFESSIONAL AWARDS

### University of Pittsburgh School of Medicine

Travel Award, International Association for the Study of Pain (IASP) World Congress, 2018, 2022

Trainee Travel Award, US Association for the Study of Pain Annual Scientific Conference, 2022

NIH Loan Repayment Program Award in Clinical Research (NINDS), 2019-2021, 2021-present

Trainee Professional Development Award, Society for Neuroscience, 2020

Panel Travel Fellow Awardee, Winter Conference on Brain Research, 2020

Hermann Handwerker Prize, World Congress on Itch, 2019

Travel Grant, International Forum for the Study of Itch World Congress, 2019

Best Basic Science Early Career Poster, American Pain Society Scientific Meeting, 2019

### Washington University in St. Louis

Fine Science Tools Travel Fellowship, 2017

Outstanding Abstract, Department of Anesthesiology Academic Evening, 2017

Young Investigator Travel Award, American Pain Society 2014, 2015, 2017

### Marquette University

Biological Sciences Academic Achievement Award, 2012

Klinger College of Arts and Sciences Gold Medal Award, 2012

Catherine Welsch Smith Research Award, 2011

Barry Goldwater Scholarship Honorable Mention, 2011

**PUBLICATIONS**

Warwick C, Salsovic J, Hachisuka J, Smith KM, **Sheahan TD**, Chen H, Ibinson J, Koerber HR, Ross SE (2022). Cell type-specific calcium imaging of central sensitization in mouse dorsal horn. *Nature Communications* 13, 5199. doi: 10.1038/s41467-022-32608-2.

Warwick C, Cassidy C, Hachisuka J, Wright MC, Baumbauer KM, Adelman PC, Lee KH, Smith KM, **Sheahan TD**, Ross SE, Koerber HR (2021). *Mrgprd*<sup>Cre</sup> lineage neurons mediate optogenetic allodynia through an emergent polysynaptic circuit. *Pain* 162 (7) 2120-2131 doi: 10.1097/j.pain.0000000000002227.

**Sheahan TD**, Warwick CA, Fanien FG, Ross SE (2020). The neurokinin-1 receptor is expressed with gastrin-releasing peptide receptor in spinal interneurons and modulates itch. *Journal of Neuroscience*: 40(46):8816–8830. doi:10.1523/JNEUROSCI.1832-20.2020.

**Sheahan TD**, Hachisuka J, Ross SE (2018). Small RNAs, but Sizable Itch: TRPA1 Activation by an Extracellular MicroRNA. *Neuron*: 99(3):421-422. doi:10.1016/j.neuron.2018.07.040.

Iadarola M, McMahon SB, Ross SE, **Sheahan TD**, Verhaagen J. Emerging Techniques in Basic Science and Translation. In: Gold MS, Pogatzki-Zahn EM, Wallace MS, eds. *Pain 2018: Refresher Courses: 17<sup>th</sup> World Congress on Pain*. Washington, DC: IASP Press; 2018:1-14.

Snyder LM, Chiang MC, Loeza-Alcocer E, Omori Y, Hachisuka J, **Sheahan TD**, Gale JR, Adelman PC, Sypek EI, Fulton SA, Friedman RL, Wright MC, Duque MG, Lee YS, Hu Z, Huang H, Cai X, Meerschaert KA, Nagarajan V, Hirai T, Scherrer G, Kaplan DH, Porreca F, Davis BM, Gold MS, Koerber HR, Ross SE (2018). Kappa opioid receptor distribution and function in primary afferents. *Neuron* 99 (6): 1274-1288. doi:10.1016/j.neuron.2018.08.044.

Shepherd AJ, Copits BA, Mickle AD, Karlsson P, Kadunganattil S, Haroutounian S, Tadinada SM, de Kloet AD, Valtcheva MV, McIlvried LA, **Sheahan TD**, Jain S, Ray PR, Usachev YM, Dussor G, Krause EG, Price TJ, Gereau RW, IV, Mohapatra DP (2018). Angiotensin II triggers peripheral macrophage-to-sensory neuron redox to elicit pain. *Journal of Neuroscience* 38(32): 7032-7057. doi:10.1523/JNEUROSCI.3542-17.2018.

**Sheahan TD**, Valtcheva MV, Pullen MY, McIlvried LA, Baranger DAA, Gereau RW, IV (2018). Metabotropic glutamate receptor 2/3 (mGluR2/3) activation suppresses TRPV1 sensitization in mouse, but not human sensory neurons. *eNeuro*. doi:10.1523/ENEURO.0412-17.2018.

**Sheahan TD**, Siuda ER, Bruchas MR, Shepherd AJ, Mohapatra DP, Gereau RW, IV, Golden JP (2017). Inflammation and nerve injury minimally affect mouse voluntary behaviors proposed as indicators of pain. *Neurobiology of Pain* 2:1-12. doi:10.1016/j.ynpai.2017.09.001.

Valtcheva MV, Copits BA, Davidson S, **Sheahan TD**, Pullen MY, McCall JG, Dikranian K, Gereau RW, IV (2016). Surgical extraction of human dorsal root ganglia from organ donors and preparation of primary sensory neuron cultures. *Nature Protocols* 11(10): 1877-1888. doi:10.1038/nprot.2016. PMID: 27606776.

**Sheahan TD**, Copits BA, Golden JP, Gereau RW, IV (2015). Voluntary Exercise Training: Analysis of Mice in Uninjured, Inflammatory, and Nerve-Injured Pain States. *PLoS ONE* 10(7): e0133191. doi:10.1371/journal.pone.0133191. PMCID: PMC4510282.

**MANUSCRIPTS IN PREPARATION**

Madasu MK, Thang L V, Chilukuri P, Palanisamy S, Arackal JS, **Sheahan TD**, Foshage AM, Houghten RA, McLaughlin JP, McCall JG, Al-Hasani R (2020) Peripheral kappa opioid receptor activation drives cold hypersensitivity in mice. bioRxiv:2020.10.04.325118.

Hammarsten CC, Bord A, Shelton ME, Walicki MC, **Sheahan TD**, Golden JP, Gereau RW, IV, McCall JG. Unguided behavioral classification using persistent homology.

Valtcheva MV, Golden JP, **Sheahan TD**, Pullen MY, Vogt SK, Jain S, Davidson S, Gereau RW, IV. Neurotrophic factors selectively modulate pruritogen responses in mouse, but not human, sensory neurons.

**Sheahan TD**, Korthauer LE, Blumenthal EM. The *Drosophila* drop-dead gene is required for eggshell integrity.

## ORAL PRESENTATIONS & SEMINARS

- “Putting the pieces together: Assembling itch spinal neuron networks” (selected symposium abstract). *US Association for the Study of Pain Annual Scientific Conference*, May 2022.
- “Unraveling the spinal coding of itch” (selected abstract). *US Association for the Study of Pain Annual Scientific Conference*, data blitz presentation, May 2022.
- “Probing the cellular basis of kappa opioid receptor inhibition of itch and chemical pain” (selected abstract). *Kappa Therapeutics Conference*, April 2021.
- “The neurokinin-1 receptor is expressed with gastrin-releasing peptide receptor in spinal interneurons and modulates itch” (invited speaker). *Pain Research Forum Seminar Series*, September 2020.
- “Itching for relief: Dissecting the role of neurokinin-1 receptor spinal neurons in itch” (invited speaker). *Winter Conference on Brain Research*, Big Sky, Montana, USA, January 2020.
- “NK1R antagonists for the treatment of chronic itch: Where’s the action?” (selected abstract). *World Congress on Itch*, Sydney, Australia, November 2019.
- “Itching for relief: Dissecting the role of neurokinin-1 receptor spinal neurons in itch” (selected abstract). *North American Pain School*, Montebello, QC, Canada, June 2019.
- “Using human tissue to validate preclinical rodent findings: mGluR2/3 suppress sensory neuron sensitization in mouse and human” (selected abstract). *Department of Anesthesiology Academic Evening*, Washington University in St. Louis School of Medicine, USA, April 2017.
- “Bridging the translational gap between rodent and human pain research” (invited speaker). *Pittsburgh Center for Pain Research*, University of Pittsburgh, USA, March 2017.

## POSTER PRESENTATIONS

- Sheahan TD**, Manalo AP, Perry VJ, Fanien FG, Warwick CA, Smith KM, Ross SE. Identification of itch spinal neuron networks and their inhibition by kappa opioid receptor signaling. (1) *US Association for the Study of Pain Annual Scientific Conference*, 2022; (2) *University of Pittsburgh Postdoctoral Data & Dine Symposium*, 2022; (3) *University of Pittsburgh Annual Safar Symposium*, 2022.
- Sheahan TD**, Manalo AP, Fanien FG, Ross SE. Probing the cellular basis of kappa opioid receptor inhibition of itch. *World Congress on Itch*, 2021.
- Sheahan TD**, Manalo AP, Fanien FG, Ross SE. Probing the cellular basis of kappa opioid receptor inhibition of pain. *NIH Pain Consortium Symposium*, 2021: Invited junior investigator presentation.
- Sheahan TD**, Warwick CA, Fanien FG, Ross SE. The neurokinin-1 receptor is expressed with gastrin-releasing peptide receptor in spinal interneurons and modulates itch. (1) *US Association for the Study of Pain Meeting*, 2020; (2) *Society for Neuroscience Global Connectome*, 2021.
- Sheahan TD**, Chiang MC, Chestang JA, Ross SE. Anatomical organization and functional contributions of NK1R spinal neurons in pain and itch. (1) *Spring Pain*, 2019; *Journal of Pain*, (2) *American Pain Society*, 2019; (3) *University of Pittsburgh Postdoctoral Data & Dine Symposium*, 2019.
- Sheahan TD**, Davidson S, Golden JP, Valtcheva MV, Copits BA, Pullen MY, Baranger DAA, McIlvried LA, Ghetti A, Schmidt RE, Ray PR, Price TJ, Gereau RW, IV. mGluR2/3 suppress TRPV1 sensitization in mouse, but not human sensory neurons. *International Association for the Study of Pain World Congress*, 2018.
- Sheahan TD**, Davidson S, Golden JP, Valtcheva MV, Copits BA, Pullen MY, Baranger DAA, McIlvried LA, Ghetti A, Schmidt RE, Ray PR, Price TJ, Gereau RW, IV. mGluR2/3 differentially modulate TRPV1 sensitization in mouse and human sensory neurons. *Journal of Pain*, *American Pain Society*, 2017.
- Sheahan TD**, Siuda ER, Shepherd AJ, Mohapatra DP, Gereau RW, IV, Golden JG. Voluntary behaviors as readouts for persistent pain in mice. *Society for Neuroscience*, 2016.
- Sheahan TD**, Davidson S, Golden JP, Valtcheva MV, Copits BA, Pullen MY, Ghetti A, Schmidt RE, Ray PR, McIlvried LA, Price TJ, Gereau RW, IV. mGluR2/3 suppress sensory neuron sensitization in mouse and human. *Washington University in St. Louis Neuroscience Retreat*, 2016.

**Sheahan TD**, Siuda ER, Webb JM, Gereau RW IV, Golden JP. Non-reflexive measures of persistent pain in mice. (1) *Society for Neuroscience*, 2015; (2) *Washington University in St. Louis Graduate Student Research Symposium*, 2016.

**Sheahan TD**, Webb JM, Gereau RW, IV, Golden JP. Non-reflexive measures of persistent pain in mice. (1) *Journal of Pain, American Pain Society*, 2015; (2) *Washington University in St. Louis Anesthesiology Academic Evening*, 2015; (3) *Washington University in St. Louis Neuroscience Retreat*, 2015.

**Sheahan TD**, Copits BA, Golden JP, Gereau RW, IV. The effects of voluntary exercise on inflammatory and neuropathic pain. *Society for Neuroscience*, 2014.

**Sheahan TD**, O'Brien DE, Golden JP, Gereau RW, IV. The effects of voluntary wheel running on pain. *Journal of Pain, American Pain Society*, 2014.

**Sheahan TD**, Korthauer LE, Blumenthal EM. Female sterility and compromised eggshell integrity of drop-dead mutants in *Drosophila melanogaster*. (1) *Drosophila Research Conference* 2011; (2) *Marquette University Summer Research Symposium*, 2010.

## PROFESSIONAL DEVELOPMENT & ACADEMIC SERVICE

Moderator, US Association for the Study of Pain Annual Scientific Meeting "Spinal Coding of Somatosensation Symposium"	2022
Panelist, University of Pittsburgh Mentoring and Advising Summit, "Career Development Plans: A Purposeful Approach to Postdoctoral Training"	2022
Secretary, IASP Itch Special Interest Group	2021-Present
Selection Committee, IASP PRF Correspondents Program	2021
Training Representative, Pittsburgh Center for Pain Research	2020, 2021
Panelist, US ASP Meeting, "Training Grant Applications"	2020
Guest, NINDS Building Up the Nerve Podcast "Plan Before You Build" (Season 2, Episode 2)	2020
NINDS Training and Diversity Discussion Panel	2020
North American Pain School (NAPS)	2019
Correspondent, Pain Research Forum Science Communication Training Program	2018
Ph.D. Candidate Representative, WUSTL Neuroscience Program Steering Committee	2013-2015

## TEACHING & OUTREACH

Guest Lecturer, Center for Neuroscience at the University of Pittsburgh (CNUP) Summer Undergraduate Program	2022
Host, "The Pain Beat" Podcast, IASP Pain Research Forum "The Coding of Sensory Information: Population Coding or Labeled Lines?" (Episode 5) "How is Pain Measured if it is Subjective?" (Episode 9) "Pain Research During the Pandemic and Beyond" (Episode 10) "Nobel Prize: A Conversation with David Julius and Michael Caterina" (Episode 13) "Nobel Prize: A Conversation with Ardem Patapoutian and Bertrand Coste" (Episode 14)	2021-Present
Freelance Science Communicator, IASP Pain Research Forum	2019-Present
Guest Lecturer, Neuroscience Undergraduate Proseminar, Pitt	*S2020, F2021
Course Master, Molecular Biology at the Cutting Edge, WUSTL	S2017
Certification in STEM teaching, Washington University Center for the Integration of Research, Teaching, and Learning (WU-CIRTL) Program	2017
Lecturer, Molecular Biology at the Cutting Edge, WUSTL	S2016, 2017
Organizer, Neuroanatomy Outreach at St. Louis University High School	S2016, 2017
Presenter, Neuroanatomy Outreach at St. Louis University High School	S2014-2017
Peer Mentor, BP-ENDURE St. Louis Neuroscience Pipeline	2016
Teaching Assistant, Neurophysiology Lab, WUSTL	F2013

Presenter, St. Louis Science Center Neuroscience Outreach

2013

\*For guest lectures, and outreach, S: spring semester; F: fall semester

**PEER REVIEW SERVICE**

*Ad hoc:* eNeuro, Itch, Journal of Pain | *With mentors:* Nature Neuroscience, Neuron, Pain, Journal of Neuroscience, Journal of Neurophysiology, Neuroscience