

# Nathaniel J. Himmel, PhD

Human Frontier Science Program Postdoctoral Fellow, University of Lausanne

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## EDUCATION & RESEARCH EXPERIENCE

- **Postdoctoral Fellow**, University of Lausanne, Lausanne, Switzerland 2022 –  
Human Frontier Science Program Fellow  
Center for Integrative Genomics, PI: Richard Benton, PhD FRS
- PhD Neuroscience**, Georgia State University, Atlanta, GA, USA 2015 – 2021  
Ruth L. Kirschstein NRSA Fellow; Honeycutt Fellow; Brains & Behavior Fellow  
Neuroscience Institute, PI: Daniel Cox, PhD
- **Research Technician**, Emory University, Atlanta, GA, USA 2013 – 2015  
Department of Medicine, PI: Mitsi Blount, PhD
- BS Biology**, University of Florida, Gainesville, FL, USA 2011 – 2013
- AA Biological Sciences**, Santa Fe College, Gainesville, FL, USA 2008 – 2011

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## PUBLICATIONS

\* authors contributed equally; co-corresponding authors; § undergraduate mentees

18. **Himmel NJ**, Moi D, and **Benton R**. Remote homolog detection places insect chemoreceptors in a cryptic protein superfamily spanning the tree of life. *Current Biology*. 2023.
17. **Benton R**\* and **Himmel NJ**\*. Structural screens identify candidate human homologs of insect chemoreceptors and cryptic *Drosophila* gustatory receptor-like proteins. *eLife*. 2023.
16. **Himmel NJ**, Sakurai A, Letcher JM, Patel AA, Bhattacharjee S, Benson MN<sup>§</sup>, Gray TR<sup>§</sup>, Cymbalyuk GS, and Cox DN. Chloride-dependent mechanisms of multimodal sensory discrimination and nociceptive sensitization in *Drosophila*. *eLife*. 2023.
15. **Himmel NJ** and Benton R. Sweet sensors support stressed cell survival. *PLoS Biology*. 2022.
14. **Himmel NJ**\*, Sakurai A\*, Donaldson KJ\*, and Cox DN. Protocols for measuring cold-evoked neural activity and cold tolerance in *Drosophila* larvae following fictive cold acclimation. *STAR Protocols*. 2022.
13. Patel AA, Sakurai A, **Himmel NJ**, and Cox DN. Modality specific roles for metabotropic GABAergic signaling and calcium induced calcium release mechanisms in regulating cold nociception. *Frontiers in Molecular Neuroscience*. 2022.
12. **Himmel NJ**, Letcher JM, Sakurai A, Benson MN<sup>§</sup>, Gray TR<sup>§</sup>, Donaldson KJ, and Cox DN. Identification of a neural basis for cold acclimation in *Drosophila* larvae. *iScience*. 2021.
11. **Himmel NJ**, Rogers RT, Redd SK, Wang Y<sup>§</sup>, and Blount MA. Purinergic signaling is enhanced in the absence of UT-A1 and UT-A3. *Physiological Reports*. 2021.

10. **Himmel NJ\***, Letcher JM\*, and Cox DN. Dissecting the molecular and neural circuit bases of behavior as an introduction to discovery-driven research: a report on a Course-Based Undergraduate Research Experience. *Journal of Undergraduate Neuroscience Education*. 2020.
9. **Himmel NJ** and Cox DN. Transient Receptor Potential Channels: Current Perspectives on Evolution, Structure, Function, and Nomenclature. *Proceedings of the Royal Society B*. 2020.
8. **Himmel NJ**, Gray TR<sup>§</sup>, and Cox DN. Phylogenetics identifies two eumetazoan TRPM clades and an eighth TRP family, TRP Soromelastatin (TRPS). *Molecular Biology and Evolution*. 2020.
7. **Himmel NJ**, Letcher JM, Sakurai A, Gray TR<sup>§</sup>, Benson MN<sup>§</sup>, and Cox DN. *Drosophila* menthol sensitivity and the Precambrian origins of TRP-dependent chemosensation. *Philosophical Transactions of the Royal Society B*. 2019.
6. Lopez-Bellido R, **Himmel NJ**, Gutstein HB, Cox DN, and Galko MJ. An assay for chemical nociception in *Drosophila* larvae. *Philosophical Transactions of the Royal Society B*. 2019.
5. **Himmel NJ**, Rodriguez DA<sup>§</sup>, Wang Y<sup>§</sup>, Sun MA<sup>§</sup>, and Blount MA. Chronic lithium treatment induces novel patterns of pendrin localization and expression. *American Journal of Physiology – Renal Physiology*. 2018.
4. **Himmel NJ** and Cox DN. Sensing the Cold: TRP channels in thermal nociception. *Channels*. 2017.
3. **Himmel NJ\***, Patel AA\*, and Cox DN. Invertebrate Nociception. Originally printed in *The Oxford Research Encyclopedia of Neuroscience*, 2017. Reprinted in *The Oxford Research Encyclopedia of Sensory Systems*, 2022.
2. Turner HN\*, Armengol K\*, Patel AA, **Himmel NJ**, Sullivan L, Iyer SC, Battacharya S, Iyer EPR, Landry C, Galko MJ, and Cox DN. The TRP channels Pkd2, NompC, and Trpm mediate unique aversive behaviors to noxious cold in *Drosophila*. *Current Biology*. 2016.
1. Sim JH, **Himmel NJ**, Redd SK, Pulous FE, Rogers RT, Black LN, Hong SM, von Bergen TN, and Blount MA. Absence of PKC-alpha attenuates lithium-induced nephrogenic diabetes insipidus. *PLoS One*. 2014.

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## FUNDING and AWARDS

### Grants & Funding:

<b>Human Frontier Science Program Long-Term Fellowship (LT-0003/2022-L)</b> <i>International Human Frontier Science Program Organization</i> “Evolutionary, expression, and functional characterization of ancient putative chemosensors”	2022–2025
<b>Ruth L. Kirschstein National Research Service Award (F31NS117087)</b> <i>National Institute of Neurological Disease and Stroke</i> “Functional roles of chloride homeostasis and chloride ion channels in thermosensory nociception”	2020–2022
<b>Kenneth W. and Georganne F. Honeycutt Fellowship</b> <i>Georgia State University, Neuroscience Institute</i>	2017–2020
<b>Brains &amp; Behavior Fellowship</b> <i>Georgia State University, Brains &amp; Behavior Program</i> Honorary Fellow, 2020-2021	2017–2020

### Other Awards:

<b>Writing Across the Curriculum Pedagogy Award, Georgia State University</b>	2021
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<b>Neuroscience Institute Outstanding Doctoral Scholar</b> , <i>Georgia State University</i>	2020
<b>Neuroscience Institute Outstanding Graduate Student Mentor</b> , <i>Georgia State University</i>	2019
<b>Meritorious Research Award</b> , <i>American Physiological Society</i>	2016
<b>Meritorious Research Award</b> , <i>American Physiological Society</i>	2015

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## TEACHING EXPERIENCE

### Course design/prep:

**Course-Based Undergraduate Research Experience (PERS2002)**  
 Co-designers: Daniel N. Cox & Jamin M. Letcher

### Teaching assistantships:

<b>Biostatistics (BSc2)</b>	2023
<b>Advanced Molecular, Cellular and Developmental Biology (BSc3)</b>	2023
<b>Course-Based Undergraduate Research Experience (PERS2002)</b>	2017
<b>Neuroscience Laboratory (NEUR3010/4000)</b>	2016 & 2018

### Other teaching:

**Writing Advisor - Writing Across the Curriculum Program** 2018–2021  
 GSU, Center for Excellence in Teaching and Learning

### Guest lectures:

GSU's Neuroscience School: <i>Presenting Data in Different Forms</i>	2019
GSU's Neuroscience School: <i>Neurological Diseases</i>	2016
Atlanta Brain Bee Prep Course: <i>Senses, Perception, and Movement</i>	2015
Emory University SUPERR Program: <i>Techniques in Renal Physiology</i>	2015

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## MENTORING, SERVICE, and OUTREACH

### Research trainees (date mentored; current affiliation):

Leana Keel (2024; Masters student, University of Lausanne); Maggie N. Benson (2018-2021; MD/PhD candidate, University of Kansas Medical Center); Thomas R. Gray (2017-2020; PhD candidate, Brandeis University); Grace L. Swaim (2014-2015; PhD candidate, Yale University); Matthew R. Borchart (2015; physician); John H. Ward (2014; physician); Michael A. Sun (2014-2015; Project Manager and Analyst, Galaxy Venture Capital); Daniel A. Rodriguez (2014-2015; Equities Trader, Citadel Securities); Yirong Wang (2014-2015; Assistant Faculty Associate, University of Wisconsin—Madison); Nikki A. Mehran (2013-2015; physician)

### Participation in organized research mentorship:

University of Lausanne, First-step Research Project	2024
GSU, Initiative for Maximizing Student Development (IMSD)	2017–2020
Emory, Summer Undergrad Program in Emory Renal Research (SUPERR)	2015
Emory/American Physiological Society, Frontiers in Physiology	2014
Emory, Summer Undergraduate Research Experience (SURE)	2013–2015

## Peer review & editorial experience:

Preprint Editorial Team Leader (Physio. & Neuro.), *Proceedings of the Royal Society B* 2019–2023

*Ad hoc* peer review: *The Biological Bulletin*; *Current Opinion in Insect Science*; *eLife*; *Frontiers in Ecology and Evolution*; *Genes, Brain and Behavior*; and *Journal of Economic Entomology*

*Ad hoc* grant review: Agence Nationale de la Recherche (France)

## Media coverage:

Weiner S. “Do insects enjoy sex?” *Gizmodo*. June 2017. Web: <https://gizmodo.com/doinsects-enjoy-sex-1796376553>.

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## PRESENTATIONS, POSTERS, and ABSTRACTS

§undergraduate co-author; presenter

### Invited seminars & symposia:

5. Invited speaker, Georgia State University, Neuroscience Institute, Data Analysis Club. July 2022. *Virtual*.
4. Invited speaker, North Carolina State University, College of Veterinary Medicine, Fungal Systems Biology Laboratory. November 2021. *Raleigh, NC, USA*.
3. Invited speaker, Monthly Maggot Meeting. July 2021. *Virtual*.
2. Invited participant, Theo Murphy International Scientific Meeting on the evolution of mechanisms and behaviour important for pain, hosted by The Royal Society. February 2019. *Chicheley, Buckinghamshire, UK*.
1. Invited panelist, NIDDK/KUH Researcher Panel, Summer Student Symposium. July 2015. *Atlanta, GA, USA*.

### Conference talks:

3. **Himmel NJ**, Moi D, Benton R. The enigmatic origins of insect Gustatory and Odorant receptors: a homologous protein superfamily spanning eukaryotes, archaea, and bacteria. June 2023. *Symposium on the emergence of order across biological scales, University of Lausanne, Lausanne, Switzerland*.
2. **Himmel NJ**, Letcher JM, Sakurai A, Gray TR<sup>§</sup>, Benson MN<sup>§</sup>, Cox DN. Menthol elicits *Trpm-* and *TrpA1-* dependent rolling in *Drosophila* larvae, suggesting Precambrian origins for TRP-dependent menthol sensing. October 2019. *Neurobiology of Drosophila, Cold Spring Harbor, NY, USA*.
1. **Himmel NJ**, Rodriguez DA<sup>§</sup>, Blount MA. Chronic lithium treatment induces  $\beta$ -intercalated cell expression in the renal inner medulla. March 2015. *Experimental Biology, Boston, MA, USA*.

### Posters (only first-authored) & other published abstracts:

27. **Himmel NJ**, Moi D, and Benton R. The mysterious origins of insect Odorant receptors; a case study for remote homolog detection in the protein folding age. *22<sup>nd</sup> Annual Human Frontier Science Program Awardees Meeting, Cape Town, South Africa*.

26. **Himmel NJ**, Moi D, and Benton R. The enigmatic origins of *Drosophila* Gustatory and Odorant receptors. June 2023. *Annual G enepode Retreat, Leysin, Switzerland*.
25. **Himmel NJ**, Moi D, and Benton R. The enigmatic origins of *Drosophila* Gustatory and Odorant receptors. June 2023. *Annual Swiss Drosophila Meeting, Fribourg, Switzerland*.
24. **Himmel NJ** and Benton R. Ancient putative chemosensors in the zoosporic fungus *Spizellomyces punctatus*. June 2022. *Annual G enepode Retreat, les Diablerets, Switzerland*.
23. **Himmel NJ** and Benton R. Ancient putative chemosensors in the zoosporic fungus *Spizellomyces punctatus*. June 2022. *Symposium on interactions in biology, University of Lausanne, Lausanne, Switzerland*.
22. **Himmel NJ**, Sakurai A, Letcher JM, Patel AA, Benson MN<sup>§</sup>, Bhattacharjee S, Gray TR<sup>§</sup>, Cymbalyuk GS, and Cox DN. Chloride-dependent mechanisms of multimodal sensory discrimination: roles for *subdued*, *koozie*, and excitatory chloride physiology in *Drosophila* cold nociception. October 2021. *Neurobiology of Drosophila Meeting, Cold Spring Harbor Lab, virtual*.
21. **Himmel NJ**, Letcher JM, Sakurai A, Benson MN<sup>§</sup>, Gray TR<sup>§</sup>, Donaldson KJ, and Cox DN. How The Fly Youth Chill. March 2021. *Annual GSU Brains & Behavior Retreat, virtual*.
20. **Himmel NJ**, Letcher JM, Sakurai A, Benson MN<sup>§</sup>, Gray TR<sup>§</sup>, Donaldson KJ, and Cox DN. How The Fly Youth Chill: The evolution of cold nociception in drosophilid larvae and identification of a neural basis for cold acclimation. March 2021. *Animal Behavior Conference, hosted by Indiana University—Bloomington, virtual*.
19. **Himmel NJ**, Sakurai A, Letcher JM, Benson MA, Gray TR, and Cox DN. Excitatory chloride physiology discriminately encodes noxious cold in a multimodal sensory neuron. January 2021. *Annual meeting of the Society for Neuroscience, virtual*.
18. **Maksymchuk N**, Sakurai A, Patel AA, **Himmel NJ**, Cox DN, Cymbalyuk G. Mechanisms of cold temperatures rate coding by *Drosophila* CIII neurons. October 2019. *Annual meeting of the Society for Neuroscience, San Diego, CA, USA*. [Abstract online](#).
17. **Letcher JM**, **Himmel NJ**, Sakurai A, Holgiun-Lopez M, Cox DN. TrpA1 mediates cold nociception in *Drosophila melanogaster* larvae. October 2019. *Neurobiology of Drosophila Meeting, Cold Spring Harbor Lab, Cold Spring Harbor, NY, USA*.
16. **Maksymchuk N**, Sakurai A, Patel AA, **Himmel NJ**, Cox DN, Cymbalyuk G. Role of TRP channels in temperature rate coding by *Drosophila* noxious cold sensitive neurons. *Conference abstract in BMC Neuroscience*, 20:56, July 2019. doi: [10.1186/s12868-019-0538-0](https://doi.org/10.1186/s12868-019-0538-0)
15. **Himmel NJ**, Letcher JM, Gray TR<sup>§</sup>, Benson MN<sup>§</sup>, Cox DN. TRP-dependent chemical sensing: the Precambrian hypothesis. May 2019. *Annual GSU Brains & Behavior Retreat, Atlanta, GA, USA*.
14. **Himmel NJ**, Letcher JM, Gray TR<sup>§</sup>, Benson MN<sup>§</sup>, Cox DN. Menthol elicits a *Trpm-* and *TrpA1*-dependent nocifensive response in *Drosophila melanogaster* larvae. February 2019. *Theo Murphy International Scientific Meeting on the evolution of mechanisms and behaviour important for pain, hosted by The Royal Society, Chicheley, Buckinghamshire, UK*.
13. Patel AA, **Himmel NJ**, **Cox DN**. Calcium induced calcium release mechanisms in cold nociception. February 2019. *Theo Murphy International Scientific Meeting on the evolution of mechanisms and behaviour important for pain, hosted by The Royal Society, Chicheley, Buckinghamshire, UK*.

12. Patel AA, **Himmel NJ**, Yang JJ, Cox DN. Cellular and behavioral requirements for calcium release mechanisms in cold nociception. October 2018. *Annual meeting of the Society for Neuroscience, San Diego, CA, USA*. [Abstract online](#).
11. Maksymchuk N, Patel AA, **Himmel NJ**, Cox DN, Cymbalyuk G. Modeling of TRP channel mediated noxious cold sensation in *Drosophila* sensory neurons. *Conference abstract in BMC Neuroscience*, 19(Suppl 2):64, July 2018. doi: [10.1186/s12868-018-0452-x](https://doi.org/10.1186/s12868-018-0452-x)
10. **Himmel NJ**, Letcher JM, Gray TR<sup>§</sup>, Cox DN. The evolution of cold nociception in drosophilid larvae. May 2018. *Annual GSU Brains & Behavior Retreat, Atlanta, GA, USA*.
9. **Himmel NJ**, Gray TR<sup>§</sup>, Cox DN. Anoctamins are required for cold nociception in *Drosophila*. April 2018. *Annual Georgia Collegiate Neuroscience Symposium, Athens, GA, USA*.
8. **Himmel NJ**, Gray TR<sup>§</sup>, Cox DN. Calcium-activated chloride channels are required for distinguishing between noxious and innocuous stimuli in multimodal sensory neurons. April 2018. *Annual meeting of the Genetics Society of America, Philadelphia, PA, USA*. [Abstract online](#).
7. Maksymchuk N, Patel AA, **Himmel NJ**, Cox DN, Cymbalyuk G. Modeling cellular noxious cold sensation in *Drosophila* sensory neurons. October 2017 *Annual meeting of the Society for Neuroscience, Washington DC, USA*. [Abstract online](#).
6. Kronk TA, **Himmel NJ**, Mehran NA<sup>§</sup>, Blount MA. Lithium administration can attenuate the progression of polycystic kidney disease. *Conference abstract in The FASEB Journal*, 31(Suppl 1):1032.4, April 2017. doi: [10.1096/fasebj.31.1\\_supplement.1032.4](https://doi.org/10.1096/fasebj.31.1_supplement.1032.4)
5. Patel AA, Moon D<sup>§</sup>, **Himmel NJ**, Cox DN. Cellular and molecular dissection of noxious cold nociception in *Drosophila*. March 2017. *58<sup>th</sup> Annual Drosophila Research Conference, San Diego, CA, USA*. [Abstract](#).
4. Patel AA, Turner HN, Armengol K, **Himmel NJ**, Galko MJ, Cox DN. Cellular and molecular dissection of noxious cold nociception in *Drosophila*. July 2016. *The Allied Genetics Conference, Orlando, FL, USA*. [Abstract online](#).
3. **Himmel NJ**, Rodriguez DA<sup>§</sup>, Wang Y<sup>§</sup>, Sun MA<sup>§</sup>, Blount MA. Chronic lithium treatment induces novel patterns of pendrin localization and expression in the kidney. *Conference abstract in The FASEB Journal*, 30(Suppl1):968.14, April 2016. doi: [10.1096/fasebj.30.1\\_supplement.968.14](https://doi.org/10.1096/fasebj.30.1_supplement.968.14)
2. **Himmel NJ**, Rogers RT, Redd SK, Blount MA. Purinergic signaling is enhanced in the absence of UT-A1 and UT-A3. October 2014. *Emory Department of Medicine Research Day, Atlanta, GA, USA*.
1. Rogers RT, **Himmel NJ**, Redd SK, Blount MA. Purinergic signaling is enhanced in the absence of UT-A1 and UT-A3. *Conference abstract in The FASEB Journal*, 38(Suppl 1): 969.17, April 2014. doi: [10.1096/fasebj.28.1\\_supplement.1137.10](https://doi.org/10.1096/fasebj.28.1_supplement.1137.10)

#### Institutional oral presentations:

6. Chasing cryptic protein homologues through the twilight zone of molecular evolution. March 2023. *Center for Integrative Genomics Seminar, Lausanne, Switzerland*.
5. How The Fly Youth Chill: The protective role of cold nociception in *Drosophila* larvae. June 2021. *Neuroscience Institute Breakfast and Lecture Series, Atlanta, GA, USA*.
4. Insects and vertebrates are the odd ones out: unexpected findings in the evolution of TRP channels. September 2019. *Neuroscience Institute Breakfast and Lecture Series, Atlanta, GA, USA*.

3. Multimodality in *Drosophila melanogaster* sensory neurons. February 2018. *Neurogenomics Forum, Atlanta, GA, USA.*
2. Calcium-activated chloride channels play a role in the function of multimodal sensory neurons. August 2017. *Neuroscience Institute Breakfast and Lecture Series, Atlanta, GA, USA.*
1. Chronic lithium treatment induces renal  $\beta$ -intercalated cell expression in the inner medulla. October 2014. *Emory Transport Signaling Workers Union Seminar, Atlanta, GA, USA.*