

# JOHANNES BURGE

September 10, 2024

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## Academic Positions

Associate Professor of Psychology	University of Pennsylvania	2021-present
Assistant Professor of Psychology	University of Pennsylvania	2014-2021
Post-doctoral Fellow	University of Texas at Austin	2009-2014
Post-doctoral Researcher	University of California, Berkeley	2008-2009

## Education

PhD, Vision Science	University of California, Berkeley	2008
BA: Psychology	Stanford University	2000
Minor: Mathematics		

## Funding ( \* secured; † pending )

I-LINK+ Collaboration Grant †	“Understanding the impact of interocular blur differences on visual processing”	2024-2025
PI: Victor Rodriguez-Lopez	IO-CSIC Total Direct Costs: €24,000 Total Indirect Costs: €0	
Co-PI: <b>Johannes Burge</b>	UPenn (Total Direct Costs to be shared as needed amongst PIs)	
Co-PI: T Rowan Candy	Indiana University (Funding for travel, lodging, meetings, and research stays)	
NIH-R01, EY028571 *	“Estimating and discriminating motion and depth in natural scenes”	2018-2024
PI: <b>Johannes Burge</b>	UPenn: Total Direct Costs: \$1,250,000 Total Indirect Costs: \$762,500	
UPenn VRC Seed Grant *	“Complex cells revisited: Cellular and synaptic population recordings and normative modeling with etiological visual input”	2021-2023
Co-PI: <b>Johannes Burge</b>	UPenn: Total Direct Costs: \$20,000 Total Indirect Costs: \$0	
Co-PI: Benjamin Scholl		
I-LINK+ Collaboration Grant *	“Understanding depth misperceptions in ophthalmic corrections”	2019-2021
PI: Carlos Dorronsoro	IO-CSIC Total Direct Costs: €24,000 Total Indirect Costs: €0	
Co-PI: <b>Johannes Burge</b>	UPenn (Total Direct Costs to be shared as needed amongst PIs)	
Co-PI: Lawrence Cormack	UT Austin (Funding for travel, lodging, meetings, and research stays)	
NIH-R01, EY011747 *	“Detection and estimation of local properties in natural scenes”	2016-2020
PI: Wilson S. Geisler	UT Austin: Direct Costs: \$760,000 Indirect Costs: \$429,400	
Co-Investigator: <b>Johannes Burge</b>	UPenn: Direct Costs: \$240,000 Indirect Costs: \$146,400	
	Total Direct Costs: \$1,000,000 Total Indirect Costs: \$575,800	
Oculus Research Grant *	“Optimal & human focus error estimation from individual images”	2017-2018
PI: <b>Johannes Burge</b>	UPenn: Total Direct Costs: \$25,000; Total Indirect Costs: \$0	

## Awards

NSF CAREER Award	University of Pennsylvania (declined; overlap w. NIH-R01, EY028571)	2018
NIH Training Grant Recipient	University of Texas at Austin	2012-2014
Best Paper Award	SPIE, Digital Photography VIII; Canon USA, Inc.	2012
Postdoctoral Travel Award	Computational and Systems Neuroscience	2012
William C. Ezell Fellowship	American Optometric Foundation (AOF)	2006
NIH Institutional Training Grant	University of California, Berkeley	2002-2004

## Trainee Awards

Victor Rodriguez-Lopez	MIT EmTech Innovators Under 35 Europe	2023
Callista Dyer	UPenn: Phi Beta Kappa	2023
	UPenn: Morris Viteles Excellence in Undergraduate Research Award	2023
Benjamin Chin	UPenn: Dean’s Scholar Award	2018

## U.S. Patents

- Burge J**, Rodriguez-Lopez V, Dorronsoro C. “Anti-Pulfrich monovision ophthalmic correction”. U.S. Patent Application No. 17/425,144. International Application No.: PCT/US2020/016232. International Classes: A61F2/16; A61F2/14; G02C7/02. Filing date: January 31, 2020. Publication date: March 24, 2022.
- Burge J**, Geisler WS. “Focus error estimation in images”. U.S. Patent Application No. 13/965,758. Reference No.: 5934 US. File No.: 93331-001910US-882167. Filing date: August 13, 2013. Publication date: December 12, 2013.

## Research Articles

### Submitted

1. Ni L, **Burge J** (submitted). "Feature-specific divisive normalization improves natural image encoding for depth perception". Preprint posted at *bioRxiv*, 611536, 1-42. doi: <https://doi.org/10.1101/2024.09.05.611536>
2. White DN, **Burge J** (submitted). "How distinct sources of nuisance variability in natural images and scenes limit human stereopsis". Preprint posted at *bioRxiv*, 582383, 1-52. doi: <https://doi.org/10.1101/2024.02.27.582383>
3. Barnett MA, Chin BM, Aguirre GK, **Burge J**, Brainard DH (submitted). "Temporal dynamics of color processing measured using a continuous tracking task". Preprint posted at: *bioRxiv*, 582975, 1-40. doi: <https://doi.org/10.1101/2024.03.01.582975>
4. Rodriguez-Lopez V, Chin BM, **Burge J** (revision under review). "The effect of overall light-level on the reverse Pulfrich effect". *Journal of Vision*. Preprint posted at: *bioRxiv*, 559782, 1-17. doi: <https://www.biorxiv.org/content/10.1101/2023.09.27.559782>
5. Dyer C, **Burge J** (submitted). "Eccentricity strongly decreases visual processing delays". Preprint posted at: *bioRxiv*, 559991, 1-18. doi: <https://www.biorxiv.org/content/10.1101/2023.09.30.559991>
6. **Burge J**, Burge T (submitted). "Perspective in vision: Method and explanation in perceptual psychology". (Preprint not publicly available)
7. **Burge J**, Burge T (submitted). "Representation, frameworks, and perspective on shape". (Preprint not publicly available)

### Published and In Press ( \* peer-reviewed journal publication; † peer-reviewed conference publication )

1. **Burge J**, Bonnen K. (provisionally accepted). "Continuous Psychophysics: Past, Present, Future". *Trends in Cognitive Sciences*.
2. Herrera-Esposito D, **Burge J** (in press). "Optimal local motion-in-depth estimation with natural stimuli". *Journal of Neuroscience*. Preprint posted at: *bioRxiv*, 585059, 1-30. doi: <https://doi.org/10.1101/2024.03.14.585059>
3. **Burge J**, Cormack LK (2024). "Continuous psychophysics shows millisecond-scale visual processing delays are faithfully preserved in movement dynamics". *Journal of Vision*. 24(5):4, 1-23. doi: 23, <https://doi.org/10.1167/jov.24.5.4> \*
4. Herrera-Esposito D, **Burge J** (2023). "Image-computable Bayesian model for 3D motion estimation with natural stimuli explains human biases." In *Shared Visual Representations in Human and Machine Intelligence 2022 Conference Workshop @ NeurIPS*. New Orleans, LA. <https://openreview.net/pdf?id=6Keolx2G0o> †
5. **Burge J**, Burge T (2023). "Shape, perspective, and what is and is not perceived". *Psychological Review*. 130(4), 1125-1136. doi: <https://doi.org/10.1037/rev0000363> \*  
Published as a Theoretical Note in criticism of:  
Morales J, Bax A, Firestone C (2020). "Sustained representation of perspectival shape". *Proceedings of the National Academy of Sciences*. 117(26), 14873-14882.
6. Chin BM, **Burge J** (2022). "Perceptual consequences of interocular differences in the duration of temporal integration". *Journal of Vision*. 22(12):12, 1-17. doi: <https://doi.org/10.1167/jov.22.12.12> \*
7. Oluk C, Bonnen K, **Burge J**, Cormack LK, Geisler WS (2022). "Stereo slant discrimination of planar 3D surfaces: Frontoparallel versus planar matching". *Journal of Vision*. 22(5):6, 1-26. <https://doi.org/10.1167/jov.22.5.6> \*
8. Singh V, **Burge J**, Brainard DH (2022). "Equivalent noise characterization of human lightness constancy". *Journal of Vision*. 25(5):2, 1-27. doi: <https://doi.org/10.1167/jov.22.5.2> \*

9. **Burge J** (2021). Introduction to Tillyer Award Lecture: 2020 Awardee—Wilson S. Geisler. *Optica Fall Vision Meeting*. Seattle, WA. November, 18, 2021
10. Rodriguez-Lopez V, Dorronsoro C, **Burge J** (2020). "Contact lenses, the reverse Pulfrich effect, and anti-Pulfrich monovision corrections". *Nature Scientific Reports*. 10:16086, doi: <https://doi.org/10.1038/s41598-020-71395-y> \*
11. **Burge J** (2020). "Image-computable ideal observers for tasks with natural images". *Annual Review of Vision Science*. 6: 491-517. doi: <https://doi.org/10.1146/annurev-vision-030320-041134> \*
12. Chin BM, **Burge J** (2020). "Predicting the partition of behavioral variability in speed perception with naturalistic stimuli". *Journal of Neuroscience*. 40 (4), 864-879. doi: <https://doi.org/10.1523/jneurosci.1904-19.2019> \*
13. Kim S, **Burge J** (2020). "Natural scene statistics predict how humans pool information across space in surface tilt estimation". *PLoS Computational Biology*. 16 (6), e1007947. doi: <https://doi.org/10.1371/journal.pcbi.1007947> \*
14. Basgoze ZA, White DN, **Burge J**, Cooper EA (2020). "Natural statistics of depth edges modulate perceptual stability". *Journal of Vision*. 20(8): 10, 1-21. doi: <https://doi.org/10.1167/jov.20.8.10> \*
15. **Burge J**, Rodriguez-Lopez V, Dorronsoro C (2019). "Monovision and the misperception of motion". *Current Biology*, 29(15), 2586-2592. doi: <https://doi.org/10.1016/j.cub.2019.06.070> \*  
 Dispatch: Read JCA (2019). "Visual perception: Monovision can bias the apparent depth of moving objects" *Current Biology*, 29 (15), R738-R761.  
 Faculty of 1000 (F1000Prime) entry by Pascal Mamassian: <https://f1000.com/prime/736286496>
16. Iyer AV, **Burge J** (2019). "The statistics of how natural images drive the responses of neurons". *Journal of Vision*. 19(13): 4, 1-25. doi: <https://doi.org/10.1167/19.13.4> \*
17. Kim S, **Burge J** (2018). "The lawful imprecision of human surface tilt estimation in natural scenes". *eLife*. 7:31448. doi: <https://doi.org/10.7554/eLife.31448> \*
18. Iyer AV, **Burge J** (2018). "Depth variation and stereo processing tasks in natural scenes". *Journal of Vision*, 18(6): 4, 1-22. doi: <https://doi.org/10.1167/18.6.4> \*
19. Singh V, Cottaris NP, Heasley BS, Brainard DH, **Burge J** (2018). "Computational luminance constancy from naturalistic images". *Journal of Vision*. 18(13): 19, 1-17. doi: <https://doi.org/10.1167/18.13.19> \*
20. **Burge J**, Jaini P (2017). "Accuracy maximization analysis for sensory-perceptual tasks: Computational improvements, filter robustness, and coding advantages for scaled additive noise". *PLoS Computational Biology*. 13(2):e1005281. doi: <https://doi.org/10.1371/journal.pcbi.1005281> \*
21. Jaini P, **Burge J** (2017). "Linking normative models of natural tasks and descriptive models of neural response". *Journal of Vision*. 17(12): 16, 1-26. doi: <https://doi.org/10.1167/17.12.16> \*
22. **Burge J** (2017). "Accurate image-based estimates of focus error in the human eye and in a smartphone camera". *Information Display*. 33(1), 18-23. doi: <https://doi.org/10.1002/j.2637-496X.2017.tb00964.x>
23. **Burge J**, McCann BC, Geisler WS (2016). "Estimating 3D tilt from local image cues in natural scenes". *Journal of Vision*. 16(13): 2, 1–25. doi: <https://doi.org/10.1167/16.13.2> \*
24. **Burge J**, Geisler WS (2015). "Optimal speed estimation in natural image movies predicts human performance". *Nature Communications*. 6:7900, 1-11. doi: <https://doi.org/10.1038/ncomms8900> \*
25. Sebastian S†, **Burge J**†, Geisler WS (2015). "Defocus blur discrimination in natural images with natural optics". *Journal of Vision*, 5(15):16, 1-17. doi: <https://doi.org/10.1167/15.5.16> †Joint first-authorship \*

26. Bonnen K, **Burge J**, Yates J, Pillow JW, Cormack LK (2015). "Continuous psychophysics: Target-tracking to measure visual sensitivity". *Journal of Vision*, 15:3(14), 1-16. doi: <https://doi.org/10.1167/15.3.14>
27. **Burge J**, Geisler WS (2014). "Optimal disparity estimation in natural stereo-images" *Journal of Vision*. 14:2(1), 1-18. doi: <https://doi.org/10.1167/14.2.1> \*
28. Scholl B, **Burge J**, Priebe NJ (2013). "Binocular integration and disparity selectivity in mouse primary visual cortex". *Journal of Neurophysiology*, 109, 3013-3024. doi: <https://doi.org/10.1152/jn.01021.2012> \*
29. **Burge J**, Geisler WS (2012). "Optimal defocus estimates from individual images for autofocusing a digital camera". In: *Proceedings of the SPIE 8299, Digital Photography VIII*, January: Burlingame, CA. (Best Paper Award)
30. **Burge J**, Geisler WS (2011). "Optimal defocus estimation in individual natural images". *Proceedings of the National Academy of Sciences*, 108 (40): 16849-16854. doi: <https://doi.org/10.1073/pnas.1108491108> \*
31. Cooper EA, **Burge J**, Banks MS (2011). "The vertical horopter is not adaptable but it may be adaptable". *Journal of Vision*, 11(3) 20: 1-19. doi: <https://doi.org/10.1167/11.3.20> \*
32. **Burge J**, Fowlkes CC, Banks MS (2010). "Natural scene statistics predict how the figure-ground cue of convexity affects human depth perception". *Journal of Neuroscience*, 30(21): 7269-7280. doi: <https://doi.org/10.1523/JNEUROSCI.5551-09.2010> \*
33. **Burge J**, Girshick AR, Banks MS (2010). "Visual-haptic adaptation is determined by relative reliability". *Journal of Neuroscience*, 30(22): 7714-7721. doi: <https://doi.org/10.1523/JNEUROSCI.6427-09.2010> \*  
Faculty of 1000 (F1000Prime) entry by Dora Angelaki: <https://f1000.com/prime/7043956>
34. **Burge J**, Ernst MO, Banks MS (2008). "The statistical determinants of adaptation rate in human reaching". *Journal of Vision*, 8(4) 20: 1-19. doi: <https://doi.org/10.1167/8.4.20> \*
35. **Burge J**, Peterson MA, & Palmer SE (2005). "Ordinal configural cues combine with metric disparity in depth perception." *Journal of Vision*, 5(6), 534-542. doi: <https://doi.org/10.1167/5.6.5> \*
36. Gepshtein S, **Burge J**, Ernst MO, & Banks MS (2005). "The combination of vision and touch depends on spatial proximity." *Journal of Vision*, 5(11), 1013-1023. doi: <https://doi.org/10.1167/5.11.7> \*
37. Cowings PS, Kellar MA, Folen RA, Toscano WB, **Burge J** (2001). "Autogenic feedback training exercise and pilot performance: enhanced functioning under search-and-rescue flying conditions". *The International Journal of Aviation Psychology*, 11(3), 303-315. doi: [https://doi.org/10.1207/S15327108IJAP1103\\_04](https://doi.org/10.1207/S15327108IJAP1103_04) \*

**Book Chapters & Miscellaneous Publications ( \* indicates peer-reviewed publication )**

38. LoPrete AJ, **Burge J** (in press). "3D perception, temporal processing, and the Pulfrich Effect". In *Oxford Compendium of Visual Illusions* (2<sup>nd</sup> Edition, Ed. Arthur Shapiro). Oxford, UK. (Preprint not publicly available)
39. Introduction for 2020 Tillyer Award Recipient Wilson S. Geisler. Optical Society of America. Fall Vision Meeting. November 18, 2021.
40. Green JD, **Burge J**, Stansberry JA, Meinke B (2016). "Cameras a Million Miles Apart: Stereoscopic Imaging Potential with Hubble and James Webb Space Telescopes". *arXiv:1610.0748*
41. Geisler WS, **Burge J**, Michel MM, D'Antona AD (2014). Characterizing the effects of stimulus and neural variability on perceptual performance. In: Gazzinga & Mangun (Eds.). *The Cognitive Neurosciences*, 5th Edition, 363-374. Cambridge: MIT Press. \*
42. **Burge J** & Geisler WS (2014). Optimal focus error estimation performance in individual images of a popular smart phone. Technical Document, University of Texas at Austin.
43. **Burge J**, Geisler WS (2013). Simulation of mouse vision appearing in a news feature by Monya Baker. "Through the eyes of a mouse", *Nature*, 502, 156-158.

44. Banks MS, **Burge J**, & Held R (2011). "The statistical relationship between depth, visual cues, and human perception". In: Sensory Cue Integration. Ed: Landy, M. Oxford University Press. \*
45. **Burge J**, Geisler WS (2011). "Optimal image-based defocus estimates from individual natural images". Proceedings of the Optical Society of America: Imaging Systems and Applications, July: Toronto, Canada. <https://doi.org/10.1364/ISA.2011.IMC2>

### In Preparation

1. Dyer C, Rodriguez-Lopez V, **Burge J** (in prep). "Monovision-induced misperceptions of motion in general and presbyopic patient populations".
2. Dyer C, **Burge J** (in prep). "The spatio-temporal latency function in human vision".
3. **Burge J**, Geisler WS (in prep). "The Spectral Ideal Observer".
4. **Burge J** (in prep). "A new principle for complex-cell design optimizes signal-to-noise for latent variable encoding in natural scenes".
5. LoPrete AJ, **Burge J** (in prep). "The full-width at half-maximum of the gamma function".
6. Herrera DE, **Burge J** (in prep). "Statistical moments of the general projected normal distribution".
7. Herrera DE, **Burge J** (in prep). "Accuracy Maximization Analysis with feature-specific divisive normalization".
8. Chin BM, **Burge J** (in prep). "Perceptual signatures of the temporal dynamics of color processing".

### Professional & University Service

Official Advisor	Computational Neuroscience Minor, University of Pennsylvania	2015-present
Member	Chair Selection Executive Committee	2022-2023
	Undergraduate Education Executive Committee	2022-2023
	Graduate Executive and Admissions Committee	2021-2022
	Chair Advisory Committee	2020-2021
Editorial Board	Journal of Vision	2024-present
	Neurons, Behavior, Data analysis, and Theory (NBDT)	2018-present
	Scientific Reports	2016-present
Feature Editor	Journal of Vision Special Issue: Continuous Psychophysics	2023-2024
Guest Editor	eLife	2019
Organizer	Vision Sciences Society Symposium (w. Kate Bonnen): "Continuous Psychophysics"	2023
	Vision Seminar, U Penn (Chair)	2019-present
	MindCORE Education Committee, U Penn	2019-2021
	Interdisciplinary Mind-Brain Colloquium Series, U Penn (Chair)	2017-2018
	Interdisciplinary Mind-Brain Colloquium Series, U Penn	2016-2017
	CoSyNe Workshop: "Joint Encoding/Decoding in Specific Sensory-Perceptual Tasks"	2017
	CoSyNe Program Committee Member	2015, 2016
Department of Psychology Colloquium Series	2015-16	
Lecturer	NYU Grad Seminar in Motion and Depth Perception: Guest Lecturer	2022, November
	NYU Grad Seminar in Motion and Depth Perception: Guest Lecturer	2022, October
	Comp. Neuroscience Summer Course at Cold Spring Harbor	2022, July
	Comp. Neuroscience Summer Course at Cold Spring Harbor (canceled; COVID-19)	2021, July
	Comp. Neuroscience Summer Course at Cold Spring Harbor (canceled; COVID-19)	2020, July
Summer Workshop on Natural scene statistics, Ludwig Maximilian Universität	2011, July	

Reviewer Advances in Neural and Information Processing Systems, Cerebral Cortex, Cognition, Current Biology, eLife, Frontiers in Computer Science, Frontiers in Perception Science, Frontiers in Neuroscience, Frontiers in Psychology, IEEE-Transactions on Image Processing, IEEE-Pattern Analysis and Machine Intelligence, Investigative Ophthalmology and Visual Science, Journal of Computational Neuroscience, Journal of Neuroscience, Journal of Neurophysiology, Journal of Vision, Nature Neuroscience, Neural Computation, Neuron, PLoS Computational Biology, PLoS One, Proceedings of the National Academy of Sciences, Royal Society Open Science, Scientific Reports, Scientific Advances, Transactions on Haptics, Vision Research

Panelist Meet the Professors, Vision Sciences Society Meeting, St. Petersburg, FL 2023, 2024  
 MindCore Grant Writing Workshop (U Penn) 2018  
 Interdisciplinary Mind-Brain (iMB) Job Interview Workshop (U Penn) 2017

### Talks

2024, October	School of Optometry, Indiana University, Bloomington	Bloomington, IN
2024, March	Dept of Computer Science, Brown University	Providence, RI
2024, February	Annual Interdisciplinary Conference	Jackson, WY
2023, October	Diversity Equity Engagement at Penn in STEM (UPenn)	Philadelphia
2023, June	Undergraduate Summer School Research Presentation (UPenn)	Philadelphia, PA
2023, May	Continuous Psychophysics: Past, Present, Future	St. Petersburg, FL
2023, May	Magic Leap, Inc.	(virtual) Plantation, FL
2023, April	Institute of Optics, Rochester University	(virtual) Rochester, NY
2023, March	Center for Vision Research, York University	Toronto, CA
2022, February	Ann. Interdisciplinary Conference: 3D Vision: Modeling & Psychophysics	Jackson, WY
2022, November	Dept. of Psychology & Neuroscience, New York University	New York, NY
2022, November	University of Wisconsin-Madison, Dept. of Neuroscience	Madison, WI
2022, October	Dept. of Psychology & Neuroscience, New York University	New York, NY
2022, August	Center for Machine Perception, Czech Technical Univ. in Prague	Prague, Czech Republic
2022, July	Cold Spring Harbor Computational Neuroscience Summer Course	Cold Spring Harbor, NY
2022, June	Undergraduate Summer School Research Presentation (UPenn)	Philadelphia, PA
2022, May	Vision Journal Club, New York University	New York, NY
2022, February	University of Wisconsin-Madison	(canceled; COVID-19) Madison, WI
2021, December	L.V. Prasad Eye Institute, Optometry & Vision Science	(virtual) Hyderabad, India
2021, November	Introduction for Tillyer Award—Recipient: Bill Geisler	(virtual) Seattle, WA
2021, October	Optica Fall Vision Meeting	(virtual) Seattle, WA
2021, July	Computational Neuroscience Summer Course (canceled; COVID-19)	Cold Spring Harbor, NY
2021, April	Center for Perceptual Systems, Univ. of Texas at Austin	(virtual) Austin, TX
2021, February	Stanford University	(virtual) Stanford, CA
2020, July	Computational Neuroscience Summer Course (canceled; COVID-19)	Cold Spring Harbor, NY
2020, April	York University	(canceled; COVID-19) Toronto, Canada
2020, January	British Machine Vision Association: Keynote Lecture <i>"3D worlds from 2D images in humans and machines."</i>	London, England
2019, November	University of Minnesota	Minneapolis, MN
2019, October	Department of Psychology Retreat (UPenn)	Philadelphia, PA
2019, October	Theory Interest Group (UPenn)	Philadelphia, PA
2019, July	Princeton University	Princeton, NJ
2019, May	Vision Sciences Society	St. Petersburg, FL
2019, May	Massachusetts Institute of Technology	Boston, MA
2019, April	Theory Interest Group (UPenn)	Philadelphia, PA
2019, March	Institute of Optics, Spanish National Research Council	Madrid, Spain
2019, February	Annual Interdisciplinary Conference	Jackson Hole, WY
2018, September	Fall Vision Meeting, Optical Society of America	Reno, NV
2018, April	King's Court English House (UPenn)	Philadelphia, PA
2018, March	University of Ulm	Ulm, Germany
2017, May	University of Nevada at Reno	Reno, NV
2017, April	Rochester Institute of Technology	Rochester, NY

2017, March	State University of New York: College of Optometry	New York, NY
2017, February	Cosyne Workshop "Joint Encoding and Decoding in Specific Sensory-Perceptual Tasks"	Salt Lake City, UT
2017, January	Annual Interdisciplinary Conference	Breckenridge, CO
2016, October	PRISM 6 "Perceptual representation of illumination, shape, and materials"	Geissen, Germany
2016, September	Rank Prize Lectures "Seeing the World from More than One Perspective"	Grasmere, England
2016, May	Vision Sciences Society: Symposium "Artifice versus realism as an experimental methodology"	St. Petersburg, FL
2016, April	Princeton University	Princeton, NJ
2015, August	Stanford University Workshop	Stanford, CA
2015, June	Systems & Integrative Vision Training Grants Retreat (UPenn)	Philadelphia, PA
2015, May	Vision Sciences Society	St. Petersburg, FL
2014, November	Rutgers University	New Brunswick, NJ
2014, May	Vision Sciences Society	St. Petersburg, FL
2014, February	Annual Interdisciplinary Conference	Jackson Hole, WY
2013, May	Vision Sciences Society	Naples, FL
2013, January	University of Pennsylvania	Philadelphia, PA
2012, June	"Perception, Representation, & Objectivity: Themes from Tyler Burge"	St. Petersburg, Russia
2012, February	Computational and Systems Neurosciences	Salt Lake City, UT
2012, January	IS&T/SPIE Conference on Electronic Imaging	Burlingame, CA
2012, January	Stanford University	Stanford, CA
2011, July	Optical Society of America, Imaging Systems	Toronto, Canada
2011, May	Vision Sciences Society	Naples, FL
2011, February	Ohio State University	Columbus, OH
2010, September	Redwood Center for Theoretical Neuroscience	Berkeley, CA
2010, May	Vision Sciences Society	Naples, FL
2010, March	Italian Institute of Technology	Genoa, Italy
2010, March	Computational and Systems Neurosciences	Salt Lake City, UT
2008, May	Vision Sciences Society	Naples, FL
2007, August	European Conference on Visual Perception	Arezzo, Italy
2005, August	European Conference on Visual Perception	La Coruna, Spain
2005, July	MPI for Biological Cybernetics	Tubingen, Germany

## Teaching

2023, Fall	Psych 600: Pro-seminar in Perception	University of Pennsylvania
2023, Fall	Psych : Introduction to Perception	University of Pennsylvania
2022, Fall	Psych : Introduction to Perception	University of Pennsylvania
2022, Fall	BE 899: Independent Study in Computational Methods	University of Pennsylvania
2022, Summer	Summer Course; Computational Neuroscience: Vision	Cold Spring Harbor Univ.
2022, Spring	Psych 311: Classic & Modern Research in Perception Science	University of Pennsylvania
2021, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2021, Fall	Psych 600: Pro-seminar in Perception	University of Pennsylvania
2020, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2020, Spring	Psych 600: Pro-seminar in Perception	University of Pennsylvania
2019, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2018, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2017, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2016, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2016, Fall	Psych 600: Pro-seminar in Perception	University of Pennsylvania
2016, Spring	Psych 511: Fundamentals of Vision	University of Pennsylvania
2015, Fall	Psych 111: Introduction to Perception	University of Pennsylvania
2015, Spring	Psych 111: Introduction to Perception	University of Pennsylvania
2011, July	Summer Workshop: Natural scene statistics	Ludwig Maximilian Universität
2003	Perception & Psychophysics	UC, Berkeley
2003	Perception & Psychophysics	UC, Berkeley



## Mentoring

<i>Research Scientists:</i>	Takahiro Doi, Ph.D.	(2017-2021)
<i>Post-doctoral Fellows:</i>	Daniel Herrera, Ph.D.	(2022-present)
	Vijay Singh, Ph.D.	(2016-2019; jointly advised with David Brainard)
	Seha Kim, Ph.D.	(2015-2020)
	Arvind Iyer, Ph.D.	(2015-2018)
<i>PhD students:</i>	David White	Neuroscience (2016-present)
	Long Ni	Psychology (2020-present)
	Anthony LoPrete	Bioengineering (2021-present)
<i>Graduated PhD students:</i>	Benjamin Chin	Psychology (2015-2022)
<i>Rotation students:</i>	Lingqi Zhang	Psychology (2018)
	David White	Neuroscience (2016)
	Benjamin Chin	Psychology (2015)
<i>Undergrad researchers:</i>	Callista Dyer	Psychology (2022-present)
	Heather Schneps	Psychology (2020-2021)
<i>Visiting students:</i>	Victor Rodriguez-Lopez	Spanish National Research Council-CSIC, Optics M.S. student, Primary Advisor: Carlos Dorronsoro (2018-2022).
	Priyank Jaini	University of Waterloo, Computer Science Ph.D. student, Primary Advisor: Pascal Poupard (2015-2017).
<i>Exam Committees:</i>	Simon Bohn	Neuroscience, 2021-present, Qualifying Committee Advisor: Nicole Rust
	Emily Meyer	Neuroscience, 2023-present, Qualifying Committee Advisor: Michael Arcaro
	Lingqi Zhang	Psychology, 2019-2023, Qualifying & Thesis Committee (Chair) Advisors: David Brainard & Alan Stocker
	Kara McGaughey	Neuroscience, 2019-present, Qualifying Committee Advisor: Josh Gold
	Ron Ditullio	Neuroscience, 2019-2022, Thesis Committee (Chair) Advisors: Yale Cohen & Vijay Balasubramanian
	Michael Barnett,	Psychology, 2018-2022, Qualifying & Thesis Committee (Chair) Advisors: David Brainard & Geoff Aguirre
	Kyra Schapiro	Neuroscience, 2018-2022, Thesis Committee Advisors: Josh Gold
	Ann Sizemore,	Bioengineering, 2018, Qualifying Committee Advisor: Danielle Basset
	Jennifer Stiso,	Neuroscience, 2018, Qualifying Committee Advisors: Danielle Bassett & Timothy Lucas
	Colin Xu,	Psychology, 2016, 699 Exam Committee Advisor: Rob DeRubeis
	Yunshu Fan,	Neuroscience, 2015-2019, Qualifying & Thesis Committees Advisors: Long Ding & Josh Gold
	Andrew Jaegle,	Neuroscience, 2015-2018, Qualifying & Thesis Committees Advisors: Diego Contreras & Kostas Daniilidis
	Alex Burka,	Bioengineering, 2015-2018, Qualifying & Thesis Committees Advisor: Katherine Kuchenbecker
	Manuel Spitschan,	Psychology, 2014-2016, Thesis Committee Advisors: David Brainard & Geoff Aguirre

## Media

Monovision contact lenses raise risk for traffic accidents	Medscape, May 22, 2020
The illusion of safety	Scientific American, Aug. 9, 2019
Instead of bifocals, some try monovision... but depth perception can suffer	Philadelphia Inquirer, Jul. 30, 2019
When a fix for one vision problem causes another	Penn Today, Jul. 25, 2019
Imaging the solar system in 3-D with Hubble & Webb	America Space, Nov. 15, 2016



Space telescope duo will showcase the solar system in 3D	New Scientist, Oct. 31, 2016
Predicting how humans estimate speed	NeuroscienceNews.com, Sept. 4, 2015
Autofocus and the importance of 'defocusing'	The Guardian Observer, Jan. 14, 2015
Giving cameras the best autofocus possible, autofocus from the human eye	Scientific American, Nov. 4, 2011
Psychologists decipher brain's clever autofocus software	Wired Magazine, Oct. 10, 2011
Deciphering the brain's autofocus mechanism	Science Magazine, Oct. 7, 2011
Researchers develop optimal algorithm for determining focus error in eyes and cameras	Fast Company, Sept 26, 2011

### Conference Talks & Abstracts

Rodriguez-Lopez V, Dyer CM, **Burge J**. (2024). "Prevalence of the reverse Pulfrich effect in general and presbyopic populations". 10th Iberian Conference on Perception. Miraflores de la Sierra, Spain.

**Burge J**, Geisler WS (2024). "The Spectral Ideal Observer: Focus Error and Pupil Size Estimation". Vision Sciences Society, St. Petersburg, FL

Dyer CM, **Burge J** (2024). "The human temporal delay function". Vision Sciences Society, St. Petersburg, FL

Herrera DE, **Burge J** (2024). "Analytic model of response statistics in noisy neural populations with divisive normalization". Vision Sciences Society, St. Petersburg, FL

White DN, **Burge J** (2024). "Partitioning the effects of distinct natural-scene properties on visual performance". Vision Sciences Society, St. Petersburg, FL

Dyer CM, **Burge J** (2024). "Monovision-induced misperception of motion in general and presbyopic populations". Scheie Eye Institute & UPenn Vision Science Symposium, Philadelphia, PA

Herrera-Esposito D, **Burge J** (2024). "Analytic model of response statistics in noisy neural populations with divisive normalization". CoSyNe. Lisbon, Portugal.

**Burge J** (2024). "The Spectral Ideal Observer and Its Applications". Annual Interdisciplinary Conference, Jackson, WY (TALK)

**Burge J**, Bonnen K (2023). "Continuous psychophysics: Past, Present, and Future". Vision Sciences Society, St. Petersburg, FL (TALK)

Dyer C, **Burge J** (2023). "Retinal eccentricity strongly modulates how interocular delays are impacted by image differences". Vision Sciences Society, St. Petersburg, FL (TALK)

Herrera D, **Burge J** (2023). "Natural-image-computable Bayesian model for 3D motion estimation". Vision Sciences Society, St. Petersburg, FL

Chin B, **Burge J** (2023). "Interocular binding of chromatic signals across time". Vision Sciences Society, St. Petersburg, FL (TALK)

**Burge J** (2023). "Perceptual consequences of variation in temporal processing dynamics". Annual Interdisciplinary Conference, Jackson, WY (TALK)

Herrera D, **Burge J** (2023). "Image-computable Bayesian model for 3D motion estimation with natural stimuli explains human biases". In *SVRHM 2022 Conference Workshop @ NeurIPS*. New Orleans, LA

Barnett MA, Chin BM, Aguirre GK, **Burge J**, Brainard DH (2022). "Temporal dynamics of color processing measured using a continuous tracking task". 26<sup>th</sup> Symposium of the International Colour Vision Society, Crete, GR

Barnett MA, Chin BM, Aguirre GK, Brainard DH, **Burge J** (2022). "Temporal dynamics of color processing measured using a continuous tracking task". Vision Sciences Society, St. Petersburg, FL

Ni L, **Burge J** (2022). "Encoding fidelity of binocular receptive fields with internal noise in the presence of external variability from natural scenes". Vision Sciences Society, St. Petersburg, FL

Chin BM, **Burge J** (2022). "Interocular differences in temporal integration drive anomalous Pulfrich percepts". Vision Sciences Society, St. Petersburg, FL

Rodriguez-Lopez V, Dorronsoro C, **Burge J** (2022). "The impact of light level on the Classic and Reverse Pulfrich Effects". Vision Sciences Society, St. Petersburg, FL

Barnett M, Chin BM, Aguirre GK, Brainard DH, **Burge J** (2022). "Temporal dynamics of color processing measured using a continuous tracking task". Vision Sciences Society, St. Petersburg, FL

Chin BM, **Burge J** (2021). "Perceptual consequences of interocular differences in temporal processing". Optica Fall Vision Meeting, Seattle, WA (virtual, COVID-19)

**Burge J**, Cormack LK (2021). "Target tracking shows millisecond-scale visual delays are faithfully preserved in the movement of the hand". Optica Fall Vision Meeting, Seattle, WA (virtual, COVID-19)

Doi T, **Burge J** (2020). "Suboptimal visual averaging reveals compulsory nonlinear mechanisms in human vision". Vision Sciences Society, St. Petersburg, FL (virtual, COVID-19)

Kim S, **Burge J** (2020). "Pooling model of tilt estimation based on surface tilt statistics in natural scenes". Vision Sciences Society, St. Petersburg, FL (virtual, COVID-19)

Rodriguez-Lopez V, Serrano-Pedraza I, **Burge J**, Dorronsoro C (2020). "Measuring the Reverse Pulfrich effect in the general population". Vision Sciences Society, St. Petersburg, FL (virtual, COVID-19)

Singh, V, **Burge J**, Brainard D (2020). "Equivalent noise characterization of human lightness constancy". Vision Sciences Society, St. Petersburg, FL (virtual, COVID-19)

**Burge J**, Cormack LK (2020, accepted but withdrawn: COVID-19). "3D target tracking rapidly reveals millisecond-scale interocular differences in temporal processing". Vision Sciences Society, St. Petersburg, FL

Chin BM, **Burge J** (2020, accepted but withdrawn: COVID-19). "Towards an understanding of the spatial frequency binding problem". Vision Sciences Society, St. Petersburg, FL

White DN, **Burge J** (2020, accepted but withdrawn: COVID-19). "Natural scene statistics and depth estimation errors in half-occluded zones in natural scenes". Vision Sciences Society, St. Petersburg, FL

Rodriguez-Lopez V, **Burge J**, Dorronsoro C (2020). "The Reverse Pulfrich effect with contact lenses". The Association for Research in Vision and Ophthalmology, Fort Lauderdale, FL

Doi T, **Burge J** (2020). "Suboptimal evidence integration informs adaptive, nonlinear mechanisms in spatial vision". CoSyNe, Denver, CO

Green JD, Meinke B, Stansberry J, **Burge J** (2020). "Depth Vision: Stereoscopic potential with the Hubble and James Webb Space Telescopes". American Astronomical Society Meeting, 426.01, #235. Honolulu, HI

**Burge J**, Rodriguez-Lopez V, Dorronsoro C (2019). "Monovision and the misperception of motion". Vision Sciences Society, St. Petersburg, FL (TALK)

Rodriguez-Lopez V, **Burge J**, Dorronsoro C (2019). "The reverse Pulfrich effect: Misperception of motion in depth". 8<sup>th</sup> Iberian Conference on Visual Perception, El Escorial, Spain (TALK)

Doi T, **Burge J** (2019). "Local variability causes adaptive spatial integration". Vision Sciences Society, St. Petersburg, FL (TALK)

Kim S, **Burge J** (2019). "Optimal spatial integration: How to pool local estimates into a global percept". Vision Sciences Society, St. Petersburg, FL

Chin BM, **Burge J** (2019). "Human sensitivity to task-relevant features in speed discrimination". Vision Sciences Society, St. Petersburg, FL

White D, **Burge J** (2019). "Depth estimates in half-occluded zones in natural scenes". Vision Sciences Society, St. Petersburg, FL

Basgoze Z, White DN, **Burge J**, Cooper EA (2019). "Effects of context on the visual stability of depth edges in natural scenes". Vision Sciences Society, St. Petersburg, FL

**Burge J** (2019). "The Reverse Pulfrich effect". Annual Interdisciplinary Conference, Jackson Hole, WY (TALK)

**Burge J** (2018). "Inferring the shape of the decision variable distributions from psychometric functions". Vision Sciences Society, St. Petersburg, FL

Kim S, **Burge J** (2018). "Spatial pooling of local Bayes-optimal estimates predicts human 3D tilt estimation in natural scenes". Vision Sciences Society, St. Petersburg, FL

Chin B, **Burge J** (2018). "A model grounded in natural scene statistics predicts human performance with both natural and artificial stimuli". Vision Sciences Society, St. Petersburg, FL

Iyer A, **Burge J** (2018). "Optimal binocular disparity estimation in the presence of natural depth variation". Vision Sciences Society, St. Petersburg, FL

Doi T, **Burge J** (2018). "Adaptive spatial re-weighting in stereoscopic depth perception revealed by disparity reverse correlation". Vision Sciences Society, St. Petersburg, FL

White D, **Burge J** (2018). "Human binocular disparity estimation with natural stereo-images". Vision Sciences Society, St. Petersburg, FL

Oluk C, Bonnen K, **Burge J**, Cormack LK, Geisler WS (2018). "Stereo slant estimation of planar surfaces: Standard cross-correlation vs. planar-correlation". Vision Sciences Society, St. Petersburg, FL

Kim S, **Burge J** (2018). "Global estimation of signed 3D surface tilt from natural images". ModVis: Computational and Mathematical Models in Vision, St. Petersburg, FL (TALK)

Meinke B, Green J, **Burge J**, Stansbury JA, May B (2018). "Solar System Stereoscopia with Hubble and James Webb Space Telescopes". XXXth General Assembly of the International Astronomical Union. Vienna, Austria

Singh V, Heasly B, Cottaris N, Brainard DH, **Burge J** (2017). "A supervised approach to understanding color constancy". Society for Neuroscience, Washington D.C.

Singh V, Heasly B, Cottaris N, Brainard DH, **Burge J** (2017). "A supervised approach to understanding color constancy". Cognitive Computational Neuroscience, New York, NY

Green JD, Stansbury JA, **Burge J**, Meinke B (2017). "Potential and Challenges for Stereo 3D Imaging with the Hubble and James Webb Space Telescopes". 49th Annual Division for Planetary Sciences Meeting, Provo, UT

Chin B, **Burge J** (2017). "Predicting human performance in a natural task with strongly constrained models of noise". Vision Sciences Society, St. Petersburg, FL (TALK)

Kim S, **Burge J** (2017). "Human surface tilt estimation in natural and artificial 3D scenes". Vision Sciences Society, St. Petersburg, FL (TALK)

- Iyer AV, **Burge J** (2017). "Predicting natural depth variation and its effect on binocular disparity estimation". Vision Sciences Society, St. Petersburg, FL
- Burge J**, Jaini P (2017). "Linking Normative Models of Natural Tasks and Descriptive Models of Neural Response". Vision Sciences Society, St. Petersburg, FL
- Burge J**, Jaini P (2017). "Linking Normative Models and Methods for Neural Systems Identification". Cosyne, Salt Lake City, UT
- Burge J** (2017). "Depth variation, binocular contrast differences, and disparity estimation in natural scenes". Annual Interdisciplinary Conference, Breckenridge, CO (INVITED TALK).
- Burge J** (2016). "Predicting human performance in fundamental visual tasks with natural stimuli". Vision Sciences Society Symposium: "Artifice versus realism as an experimental methodology". St. Petersburg, FL (INVITED TALK)
- Burge J** (2016). "Local cues for half-occlusion detection in stereo-images of natural scenes". Vision Sciences Society, St. Petersburg, FL
- Geisler WS, **Burge J** (2016). "Local Estimation of Global Surface Orientation from Texture and Disparity". Vision Sciences Society, St. Petersburg, FL.
- Kim S, **Burge J** (2016). "Human tilt estimation in local patches of natural stereo images". Vision Sciences Society, St. Petersburg, FL
- Chin B, **Burge J** (2016). "External vs. internal determinants of human speed discrimination with natural image movies". Vision Sciences Society, St. Petersburg, FL
- Burge J**, Jaini P (2016). "Accuracy Maximization Analysis for Sensory-Perceptual Tasks: Computational Improvements, Priors, and Coding Advantages for Multiplicative Noise". NETI Workshop, Austin, TX
- Burge J** (2016). "Optimal motion-in-depth estimation from natural stereo image movies". COSYNE, Salt Lake City, UT
- Iyer AV, **Burge J** (2016). "Weber's Law in disparity discrimination is predicted by the statistics of natural stereo-images." CoSyNe, Salt Lake City, UT
- Burge J**, Geisler WS (2015). "Optimal speed estimation in natural image movies predicts human performance". Vision Sciences Society, St. Petersburg, FL (TALK)
- Burge J**, Geisler WS (2014). "3D surface tilt estimation in natural scenes from image cue gradients". Vision Sciences Society, St. Petersburg, FL (TALK)
- Bonnen K, **Burge J**, Yates JL, Pillow JW, Cormack LK (2014). "A general behavioral tracking paradigm for estimating visual sensitivity using dynamic internal models". CoSyNe, Salt Lake City, UT
- Burge J**, Geisler WS (2014). "3D surface tilt estimation in natural scenes from image cue gradients". CoSyNe, Salt Lake City, UT
- Burge J**, Geisler WS (2014). "Using natural image movies to determine optimal processing for speed estimation". Annual Interdisciplinary Conference, Jackson Hole, WY
- Burge J**, Geisler WS (2013). "Optimal retinal speed estimation in natural image movies". Vision Sciences Society, Naples, FL
- Burge J**, Geisler WS (2013). "Optimal speed estimation in natural image movies". CoSyNe, Salt Lake City, UT

- Burge J**, Geisler WS (2012). "Linear and non-linear receptive fields for optimal disparity estimation in natural stereo-images". CoSyNe, Salt Lake City, UT (TALK)
- Burge J**, Geisler WS (2012). "Optimal defocus estimates from individual images for autofocusing a digital camera". IS&T/SPIE Conference on Electronic Imaging: Digital Photography, Burlingame, CA (TALK)
- Sebastian S, **Burge J**, Geisler WS (2011). "Human discrimination of defocus blur in natural images". Society for Neuroscience, Washington, D.C.
- Burge J**, Geisler WS (2011). "Optimal receptive fields for disparity estimation in natural images". Society for Neuroscience, Washington, D.C.
- Burge J**, Geisler WS (2011) "Optimal image-based defocus estimates from individual natural images". Optical Society of America: Imaging Systems and Applications. Toronto, Canada. (TALK)
- Burge J**, Geisler WS (2011) "Optimal disparity estimation in natural stereo-images". Vision Sciences Society, Naples, Florida. (TALK)
- Burge J**, Geisler WS (2010) "Optimal defocus detection and estimation in natural images". Vision Sciences Society, Naples, Florida. (TALK)
- Burge J**, Geisler WS (2010) "Detection and estimation of defocus in natural images". COSYNE, Salt Lake City, Utah (TALK)
- Burge J**, Held R, Banks MS (2008) "Blur and accommodation are metric depth cues." Vision Sciences Society, Sarasota, Florida (TALK)
- Girshick AR, **Burge J**, Banks MS (2008). "Prior expectations in slant perception: has the visual system internalized natural scene geometry". Vision Sciences Society, Sarasota, Florida (TALK)
- Burge J**, Fowlkes, CC, Banks, MS (2007) "Configural cues, disparity, and depth perception: the internalization of natural scene statistics". European Conference on Visual Perception, A Coruna, Spain (TALK)
- Burge J**, Girshick AR, Banks MS (2007) "Visuo-haptic adaptation: the role of relative reliability" Vision Science Society, Sarasota, Florida
- Burge J**, Ernst MO, Banks MS (2006) "Modeling visuo-motor adaptation behavior with a Kalman Filter" Computational workshop: bridging the gap between sensation and perception, Karlsruhe, Germany
- Burge J**, Peterson MA, Palmer SE, & Banks MS (2005) "Configural cues combine with disparity in depth perception", European Conference on Visual Perception (TALK)
- Ernst MO, **Burge J**, Banks MS (2005). "Using a Kalman Filter to predict visuomotor adaptation behavior". European Conference on Visual Perception
- Banks MS, **Burge J**, & Schlerf, JE (2005). "Disparity and texture gradients are combined in a weighted sum and a subtraction" European Conference on Visual Perception
- Ernst MO, **Burge J**, Banks MS (2005). "Resolving visual-tactual incongruity depends on sensory reliability". International Multisensory Research Forum, Dublin, Ireland
- Burge J**, Hillis JM., Landy MS, & Banks MS (2003) "Disparity and texture gradients are combined in two ways." Vision Sciences Society