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Appointments	<b>University of California, Los Angeles</b> Postdoctoral Research Fellow Advisers: Hakwan Lau, Keith Holyoak, Hongjing Lu	Los Angeles, CA 2019 – 2022
	<b>Princeton University</b> Postdoctoral Research Fellow Adviser: Jonathan Cohen	Princeton, NJ 2018 – 2019
Education	<b>Princeton University</b> PhD, MA, Cognitive Psychology and Neuroscience Adviser: Michael Graziano	Princeton, NJ 2012 – 2018
	<b>University of Southern California</b> BA, Neuroscience BM, Music Composition	Los Angeles, CA 2005 – 2010
Awards	F32 Postdoctoral National Research Service Award (NIH) T32 Training Fellowship in Computational Neuroscience (NIH) Charlotte Elizabeth Procter Fellowship (Princeton University) Graduate Student Teaching Award (Princeton University) Graduate Student Fellowship (Princeton University) Graduate Student Research Funding (Princeton University) Discovery Scholar Award (University of Southern California) Undergraduate Research Fellowship (Rose Hills Foundation)	2019 – 2021 2018 – 2019 2017 2017 2017 2016 – 2017 2010 2008 – 2010
Research interests	Metacognition; decision-making; analogy and relational reasoning; visual attention; neuroimaging; computational modeling; artificial intelligence	
Manuscripts in preparation	<b>Webb, T. W.</b> , Holyoak, K. J., & Lu, H. (in preparation). Emergent analogical reasoning in large language models.	
Manuscripts under review	<b>Webb, T. W.</b> , Fu, S., Bihl, T., Holyoak, K. J., & Lu, H. (2022). Zero-shot visual reasoning through probabilistic analogical mapping. <i>In submission</i> , <i>preprint available on arXiv</i> . <a href="https://doi.org/10.48550/arXiv.2209.15087">doi.org/10.48550/arXiv.2209.15087</a> <b>Webb, T. W.</b> , Mondal, S. S., & Cohen, J. D. (2022). Learning to reason over visual objects. <i>In submission</i> . <b>Webb, T. W.</b> , Miyoshi, K., Yan So, T., Rajananda, S., & Lau, H. (2022). Natural statistics support a rational account of confidence biases. <i>Revised and resubmitted at Nature Communications, preprint available on bioRxiv</i> . <a href="https://doi.org/10.1101/2021.09.28.462081">doi.org/10.1101/2021.09.28.462081</a>	

Publications  
h-index = 13

- Webb, T. W.**, Sinha, I., & Cohen, J. D. (2021). Emergent symbols through binding in external memory. In *9th International Conference on Learning Representations (ICLR\*)*. [doi.org/10.48550/arXiv.2012.14601](https://doi.org/10.48550/arXiv.2012.14601)
- Webb, T. W.**, Dulberg, Z., Frankland, S. M., Petrov, A. A., O'Reilly, R. C., & Cohen, J. D. (2020). Learning representations that support extrapolation. In *37th International Conference on Machine Learning (ICML\*)* (pp. 10136-10146). [doi.org/10.48550/arXiv.2007.05059](https://doi.org/10.48550/arXiv.2007.05059)
- \* ICLR and ICML are competitively peer-reviewed, archival conference proceedings, and are considered to be premier venues for publishing work in machine learning and artificial intelligence.
- Wilterson, A. I., Kemper, C. M., Kim, N., **Webb, T. W.**, Reblando, A. M., & Graziano, M. S. A. (2020). Attention control and the attention schema theory of consciousness. *Progress in Neurobiology*, 195, 101844. [doi.org/10.1016/j.pneurobio.2020.101844](https://doi.org/10.1016/j.pneurobio.2020.101844)
- Guterstam, A., Kean, H. H., **Webb, T. W.**, Kean, F. S., & Graziano, M. S. A. (2019). Implicit model of other people's visual attention as an invisible, force-carrying beam projecting from the eyes. *Proceedings of the National Academy of Sciences*, 116(1), 328-333. [doi.org/10.1073/pnas.1816581115](https://doi.org/10.1073/pnas.1816581115)
- Bio, B. J., **Webb, T. W.**, & Graziano, M. S. A. (2018). Projecting one's own spatial bias onto others during a theory-of-mind task. *Proceedings of the National Academy of Sciences*, 115(7), E1684-E1689. [doi.org/10.1073/pnas.1718493115](https://doi.org/10.1073/pnas.1718493115)
- Webb, T. W.**, Igelstrom, K. M., Schurger, A., & Graziano, M. S. A. (2016). Cortical networks involved in visual awareness independent of visual attention. *Proceedings of the National Academy of Sciences*, 113(48), 13923-13928. [doi.org/10.1073/pnas.1611505113](https://doi.org/10.1073/pnas.1611505113)
- Igelstrom, K. M., **Webb, T. W.**, & Graziano, M. S. A. (2016). Functional connectivity between the temporoparietal cortex and cerebellum in autism spectrum disorder. *Cerebral Cortex*, 27(4), 2617-2627. [doi.org/10.1093/cercor/bhw079](https://doi.org/10.1093/cercor/bhw079)
- Igelstrom, K. M., **Webb, T. W.**, Kelly, Y. T., & Graziano, M. S. A. (2016). Topographical organization of attentional, social and memory processes in the human temporoparietal cortex. *Eneuro*, 3(2). [doi.org/10.1523/ENEURO.0060-16.2016](https://doi.org/10.1523/ENEURO.0060-16.2016)
- Webb, T. W.**, Kean, H. H., & Graziano, M. S. A. (2016). Effects of awareness on the control of attention. *Journal of Cognitive Neuroscience*, 28(6), 842-851. [doi.org/10.1162/jocn\\_a\\_00931](https://doi.org/10.1162/jocn_a_00931)
- Igelstrom, K. M., **Webb, T. W.**, & Graziano, M. S. A. (2015). Neural processes in the human temporoparietal cortex separated by localized independent component analysis. *Journal of Neuroscience*, 35(25), 9432-9445. [doi.org/10.1523/JNEUROSCI.0551-15.2015](https://doi.org/10.1523/JNEUROSCI.0551-15.2015)
- Webb, T. W.**, & Graziano, M. S. A. (2015). The attention schema theory: a mechanistic account of subjective awareness. *Frontiers in psychology*, 6,

500. [doi.org/10.3389/fpsyg.2015.00500](https://doi.org/10.3389/fpsyg.2015.00500)

Graziano, M. S. A., & **Webb, T. W.** (2014). A mechanistic theory of consciousness. *International Journal of Machine Consciousness*, 6(02), 163-176. [doi.org/10.1142/S1793843014400174](https://doi.org/10.1142/S1793843014400174)

Kelly, Y. T., **Webb, T. W.**, Meier, J. D., Arcaro, M. J., & Graziano, M. S. A. (2014). Attributing awareness to oneself and to others. *Proceedings of the National Academy of Sciences*, 111(13), 5012-5017. [doi.org/10.1073/pnas.1401201111](https://doi.org/10.1073/pnas.1401201111)

Conference  
proceedings  
(non-archival)

**Webb, T. W.**, Miyoshi, K., Yan So, T., & Lau, H. (2021). A task-optimized neural network model of decision confidence. In *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society*. [pdf](#)

Dulberg, Z., **Webb, T. W.**, & Cohen, J. D. (2021). Modelling the development of counting with memory-augmented neural networks. In *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society*. [doi.org/10.48550/arXiv.2105.10577](https://doi.org/10.48550/arXiv.2105.10577)

Frankland, S. M., **Webb, T. W.**, Petrov, A. A., O'Reilly, R. C., & Cohen, J. D. (2019). Extracting and Utilizing Abstract, Structured Representations for Analogy. In *Proceedings of the 41st Annual Meeting of the Cognitive Science Society*. [pdf](#)

Book chapters

Graziano, M. S. A., & **Webb, T. W.** (2018). Understanding consciousness by building it. In *The Bloomsbury Companion to the Philosophy of Consciousness*, 187. [pdf](#)

Graziano, M. S. A., & **Webb, T. W.** (2016). From sponge to human: The evolution of consciousness. In *Evolution of Nervous Systems: Second Edition* (pp. 547-554). Kaas J. and Krubitzer L., Eds., Elsevier. [pdf](#)

Conference  
presentations

2021. Performance-optimized neural networks as an explanatory framework for decision confidence. Invited talk at *Metacognition in the Age of AI: Challenges and Opportunities* workshop, Neural Information Processing Systems (NeurIPS), Virtual.

2021. Emergent symbols through binding in external memory. Talk presented at the International Conference on Learning Representations (ICLR), Virtual.

2019. Canonical representations for generalization in relational reasoning. Talk presented at the *Understanding interactions amongst cognitive control, learning and representation* symposium, Cognitive Science Society Annual Meeting, Montreal.

2017. A functional role for consciousness in model-based control of attention. Talk presented at the Association for the Scientific Study of Consciousness Annual Meeting, Beijing.

2016. Manipulating visual awareness while controlling attention: effects on cortical networks. Talk presented at the Association for the Scientific Study of Consciousness Annual Meeting, Buenos Aires.

Teaching	<i>Assistant Instructor</i> , Princeton University	
	Life Cycles of Behavior.	2017
	Introduction to Clinical Neuropsychology.	2015 – 2016
	Introduction to Cognitive Neuroscience.	2014 – 2016
	Fundamentals of Neuroscience.	2013 – 2014
Mentorship	• Hope Kean, PhD student at MIT.	
	• Alexandra Reblando, research assistant at Columbia University.	
	• Ishan Sinha, product manager at LinkedIn.	
	• Sivananda Rajananda, masters student at Harvard University.	
	• Zach Dulberg, PhD student at Princeton University.	
	• Shanka Subhra Mondal, PhD student at Princeton University.	
	• Yichen Wang, undergraduate student at UCLA.	
	• Jiayi Sun, undergraduate student at UCLA.	
Outreach	<i>Volunteer Instructor</i> , Princeton Prison Teaching Initiative.	2014 – 2018