

Benjamin Y. Hayden

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University of Minnesota
Department of Neuroscience
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CAREER HISTORY

Associate professor
Department of Neuroscience and
Center for Magnetic Resonance Research
University of Minnesota

Sept 2017 – present
Minneapolis, MN

Associate professor
Assistant professor
Department of Brain and Cognitive Sciences,
Center for Visual Science, Center for the Origins of Cognition
University of Rochester

July 2016–Sept 2017
July 2011–June 2016
Rochester, NY

Post-doctoral fellow (laboratory of Michael Platt)
Duke University

Nov 2005 – June 2011
Durham, NC

Post-doctoral fellow (laboratory of Jack Gallant)
University of California, Berkeley

June 2005 – Oct 2005
Berkeley, CA

Ph.D. (Molecular and Cell Biology, advisor: Jack Gallant)
Thesis title: *Mechanisms of working memory, attention, and decision in visual area V4*
University of California, Berkeley

August 2000 –May 2005
Berkeley, CA

B.A. (Chemistry)
Rice University

August 1996 – May 2000
Houston, TX

PEER-REVIEWED ORIGINAL RESEARCH

(for reprints, please visit <http://www.haydenlab.com/papers>)

- Yoo, S. B. M., Sleezer, B. J., and Hayden, B. Y. (2018). Robust encoding of spatial information in orbitofrontal cortex and striatum. *Journal of Cognitive Neuroscience*. *In press*.
- Azab, H. and Hayden, B. Y. (2018). Correlates of economic choice processes in dorsal and subgenual anterior cingulate cortices. *European Journal of Neuroscience*. *In press*.
- Alonso-Diaz, S., Piantadosi, S. T., **Hayden, B. Y.**, and Cantlon, J. F. (2018). Intrinsic whole number bias in humans. *Journal of Experimental Psychology: Human Perception and Performance*. *In press*.
- Blanchard, T. C., Piantadosi, S., and **Hayden, B. Y.** (2018). Robust mixture modeling reveals category-free selectivity in reward region neuronal ensembles. *Journal of Neurophysiology*. *In press*.
- Azab, H. and **Hayden, B. Y.** (2017). Correlates of decision dynamics in the dorsal anterior cingulate cortex. *PLoS Biology*. *In press*.
- Wang, Z. M. and **Hayden, B. Y.** (2017). Reactivation of associative structure specific neural responses to outcomes during prospective evaluation. *Nature Communications*. 8 article 15821.
- Pirrone, A., Azab, H., **Hayden, B. Y.**, Stafford, T., and Marshall, J. A. (2017). Evidence for the speed-value tradeoff: human and monkey decision-making is magnitude sensitive. *Decision*.

- Sleezer, B. J., Loconte, G., Castagno, M.D., and **Hayden, B.Y.** (2017). Neuronal responses support a role for orbitofrontal cortex in cognitive set reconfiguration. *European Journal of Neuroscience*. 45(7) 940-951.
- Sleezer, B. J., Castagno, M. D., and **Hayden, B. Y.** (2016). Rule encoding in orbitofrontal cortex and striatum guides action selection. *Journal of Neuroscience* 36(44) p 11223-11237.
- Sleezer, B. J. and **Hayden, B. Y.** (2016) Differential contributions of ventral and dorsal striatum to early and late phases of cognitive set reconfiguration. *Journal of Cognitive Neuroscience* 28(12) p 1849-1864.
- Strait, C. E., Sleezer, B. J., Blanchard, T. C., Azab, H., Castagno, M. D., and **Hayden, B. Y.** (2016) Neuronal selectivity for spatial position of offers and choices in five reward areas. *Journal of Neurophysiology* 115(3) p 1098-1111. DOI:10.1152/jn.00325.2015.
- Blanchard, T. C., Strait, C. E., and **Hayden, B. Y.** (2015) Ramping ensemble activity in dorsal anterior cingulate cortex neurons during persistent commitment to a decision. *Journal of Neurophysiology* 114(4) p 2439-2449.
- Heilbronner, S. R. and **Hayden, B. Y.** (2016) The description-experience gap in risky choice in non-human primates. *Psychonomic Bulletin and Review*. 23(2) p 593-600. **Psychonomic Society Award for Best Paper of 2016.**
- Piantadosi, S. T. and **Hayden, B. Y.** (2015). Utility-free heuristic models of two-option choice can mimic predictions of utility-stage models under many conditions. *Frontiers in Decision Neuroscience*. <http://dx.doi.org/10.3389/fnins.2015.00105>
- Strait, C. E., Sleezer, B. J., and **Hayden, B. Y.** (2015). Signatures of value comparison in ventral striatum neurons. *PLoS Biology* (2015). DOI/10.1371/journal.pbio.1002173. Primer by Stott and Redish in same issue.
- Blanchard, T. C. and **Hayden, B. Y.** (2015). Monkeys are more patient in a foraging task than in a standard intertemporal choice task. *PLoS One*. 10(2) e0117057.
- Blanchard, T. C., **Hayden*, B. Y.**, and Bromberg-Martin*, E. S. (*=co-senior authors). (2015). Orbitofrontal cortex uses distinct codes for different choice attributes in decisions motivated by curiosity. *Neuron* 85, 602-614.
- Hughes, K. D., Higham, J. P., Allen, W., Elliot, A. J., and **Hayden, B. Y.** (2015). Extraneous color affects female macaques' gaze preference for photographs of male conspecifics. *Evolution and Human Behavior* 36(1) p 25-31. Media coverage: "The Red Effect in People and Monkeys" by Mary Bates, Wired (October, 2014).
- Blanchard, T. C., Wilke, A., and **Hayden, B. Y.** Hot hand bias in rhesus monkeys. *Journal of Experimental Psychology: Animal Learning and Cognition* (2014) 40(3) 280-286. Media coverage: "That's so random" by Carl Zimmer, New York Times (June, 2014)
- Strait, C. E., Blanchard, T. C., and **Hayden, B. Y.** Reward value comparison via mutual inhibition in ventromedial prefrontal cortex. *Neuron* (2014). 82(1), 1-10. PMID 24881835.
- Blanchard, T. C. and **Hayden, B. Y.** Neurons in dorsal anterior cingulate cortex signal post-decisional variables in a foraging task. *Journal of Neuroscience* (2014). 34(2) 646-655. PMID 24403162.
- Blanchard, T. C., Wolfe, L. S., Vlaev, I., Winston, J. S., and **Hayden, B. Y.** Biases in preferences for sequences of outcomes in monkeys. *Cognition* (2014). Vol 130 (289-299). PMID 24374208.
- Strait, C. E. and **Hayden, B. Y.** Preferences for skewed gambles in rhesus monkeys. *Biology Letters* (2013) Vol. 9(6). PMID 24335772.
- Blanchard, T. C., Pearson, J. M., and **Hayden, B. Y.** Postreward delays and systematic biases in measures of animal temporal discounting. *Proceedings of the National Academy of Sciences* (2013). Vol. 110(38) 15491-15496. PMID 24003113.
- Hayden, B. Y.** and Gallant, J. L. Working memory and decision processes in visual area V4. *Frontiers in Decision Neuroscience* (2013) 7:18. PMCID 3582211.
- David, S. V. and **Hayden, B. Y.** Neurotree: A collaborative, graphical database of the academic genealogy of neuroscience. *PLoS ONE* (2012) Vol 7(10) article 46608. PMCID: 3465338.
- Heilbronner, S. R. **Hayden, B. Y.**, and Platt, M. L. Decision salience signals in posterior cingulate cortex. *Frontiers in Decision Neuroscience* (2011). Volume 5, article 55. PMCID: 3082769.
- Hayden, B. Y.**, Pearson, J.M., and Platt, M.L. Neuronal basis of sequential foraging in a patchy environment. *Nature Neuroscience* (2011). Vol 14 (7) 933-941. PMID 21642973.
- Hayden, B. Y.**, Heilbronner, S. R., Pearson, J. M., and Platt, M.L. Surprise signals in anterior cingulate cortex: neuronal encoding of unsigned reward prediction errors driving adjustments in behavior. *Journal of Neuroscience* (2011). Vol 31(11) 4178-87. PMCID: 3070460.
- Pearson, J. M., **Hayden, B. Y.**, and Platt, M. L. Explicit information reduces discounting behavior in monkeys. *Frontiers in Comparative Psychology* (2010) Vol. 1, article 237. PMCID: 3153841.
- Hayden, B. Y.**, Smith, D. V., and Platt, M. L. Cognitive control signals in posterior cingulate cortex. *Frontiers in Human Neuroscience* (2010) Vol. 4, article 223. PMCID: 3001991.
- Hayden, B. Y.**, Heilbronner, S. R., and Platt, M. L. Ambiguity aversion in rhesus macaques. *Frontiers in Decision Neuroscience* (2010) vol 4 art 166. PMCID: 2948461.

- Smith, D. V., **Hayden, B. Y.**, Truong, T., Song, A., Platt, M. L., and Huettel, S. A. Distinct value signals in anterior and posterior ventromedial prefrontal cortex. *Journal of Neuroscience* (2010) vol 30 p. 2490-2495. PMCID: 2856318.
- Hayden, B. Y.** and Platt, M. L. Neurons in anterior cingulate cortex multiplex information about reward and action. *Journal of Neuroscience* (2010) vol. 30 p. 3339-3346. PMCID: 2847481.
- Pearson, J. M., **Hayden, B. Y.**, Raghavachari, S., and Platt, M. L. Neurons in posterior cingulate cortex signal exploratory decisions in a dynamic multi-option choice task. *Current Biology* (2009) vol. 19 (18), p 1-6. PMID: 19733074.
- Hayden, B. Y.** and Platt, M. L. The mean, the median, and the St. Petersburg Paradox. *Judgment and Decision Making* (2009) vol. 4 (4), p. 256-273. PMID: 24179560.
- Hayden, B. Y.**, Pearson, J. M., and Platt, M. L. Fictive reward signals in anterior cingulate cortex. *Science* (2009) vol. 324 (5929) p. 948-950. PMCID: 3096846. Media coverage: "In that tucked tail, real pangs of regret?" by John Tierney, New York Times, May 2009.
- Hayden, B. Y.**, Smith, D. V., and Platt, M. L. Electrophysiological correlates of default-mode processing in macaque posterior cingulate cortex. *Proceedings of the National Academy of Sciences* (2009) vol. 106 (14) p. 5948-5953. PMCID: 2667004. Faculty of 1000 Biology selectee.
- Hayden, B. Y.** and Platt, M. L. Gambling for Gatorade: risk-sensitive decision making for fluid rewards in humans. *Animal Cognition* (2009) vol. 12(1) p. 201-207. PMCID: 2683409.
- Hayden, B. Y.** and Gallant, J. L. Combined effects of spatial and feature-based attention on responses of V4 neurons. *Vision Research* (2009) vol. 49(10) p. 1182-1187 PMID 18619996.
- Hayden, B. Y.**, Nair, A. C., McCoy, A. N., and Platt, M. L. Posterior cingulate cortex mediates outcome-contingent allocation of behavior. *Neuron* (2008) vol 60(1) p. 19-25. PMCID: 2575690.
- David, S. V., **Hayden, B. Y.**, Mazer, J. A., and Gallant, J. L. Attention to stimulus features shifts spectral tuning of V4 neurons during natural vision. *Neuron* (2008) vol 59(3) p. 509-521. PMCID: 2948549
- Hayden, B. Y.**, Heilbronner, S. R., Nair, A. C., and Platt, M. L. Cognitive influences on risk-seeking by rhesus macaques. *Judgment and Decision Making* (2008) vol. 3(5) p. 389-395. PMCID: 2763334.
- Hayden, B. Y.**, Parikh, P. C., Deaner, R. O., and Platt, M. L. Economic principles motivating social attention in humans. *Proceedings of the Royal Society B* (2007) vol. 274(1619) p. 1751-1756. PMCID: 2493582.
- Hayden, B. Y.** and Platt, M. L. Temporal discounting predicts risk sensitivity in rhesus macaques. *Current Biology* (2007) vol. 17(1) p. 49-53. PMCID: 1868415.
- David, S. V., **Hayden, B. Y.**, and Gallant, J. L. Spectral receptive field properties explain shape selectivity in area V4. *Journal of Neurophysiology* (2006) vol. 96(6) p. 3492:3505. PMID 16987926.
- Hayden, B. Y.** and Gallant, J. L. Timecourse of attentional modulation reveals differences in mechanisms of spatial and feature attention. *Neuron* (2005) vol. 47(5) p. 637-643. PMID 16129394.
- Fu, Y., Djupsund, K., Gao, H., **Hayden, B. Y.**, Shen, K., and Dan, Y. Temporal specificity in the cortical plasticity of visual space representation. *Science* (2002) vol. 296 p. 1999-2003. PMID 12065829.

PREPRINTS

- Azab, H. and **Hayden, B. Y.** Shared roles of dorsal and subgenual cingulate cortices in economic decisions. *bioRxiv* (2016). doi: <http://dx.doi.org/10.1101/074484>

REVIEWS, CHAPTERS, AND PREVIEWS

- Eisenreich, B. and **Hayden, B. Y.** Persistent apes are intelligent apes. *Current Biology*. (2018) 28(4) 160-162. [Preview]
- Hayden, B. Y.** Economic choice: the foraging perspective. *Current Opinion in Behavioral Science* (2018) 24 1-6. [Perspective].
- Hayden, B. Y.** and Cantlon, J. Comparative Cognition. *Current Opinion in Behavioral Science* (2017). 16 iv-vi. [Preview]
- Hayden, B. Y.** and Haggard, P. Neuroscience: decision, insight, and intention. *Current Biology* (2017). 27(15) 750-753. [Preview]
- Eisenreich, B., Akaishi, R., and **Hayden, B. Y.** Control without controllers: towards a distributed neuroscience of executive control. *Journal of Cognitive Neuroscience* (2016). 29(10) 1684-1698. [Review]
- Eisenreich, B. and **Hayden, B. Y.** Choice-induced preference: a challenge for contrast. *Animal Sentience*. (2017) 12(3) [Commentary]
- Hunt, L. and **Hayden, B. Y.** A distributed, hierarchical, and recurrent framework for reward-based choice. *Nature Reviews Neuroscience*. (2017) 18 172-182. [Review]
- Alexander, W. H., Brown, J. W., Collins, A. G. E., **Hayden, B. Y.**, and Vassena, E. (2017). Prefrontal cortex in control: broadening the scope to identify mechanisms. *Journal of Cognitive Neuroscience*. [Preview]

- Ebitz, R. B. and **Hayden, B. Y.** Dorsal anterior cingulate: a Rorschach test for cognitive neuroscience. *Nature Neuroscience* (2016) 19 p 1278-1279. [Preview]
- Akaishi, R. and **Hayden, B. Y.** A spotlight on reward. *Neuron*. (2016) 90(6) 1148-1150. [Preview]
- Heilbronner, S. R. and **Hayden, B. Y.** Dorsal anterior cingulate cortex: a bottom-up view. *Annual Review of Neuroscience* (2016). 39 p 149-170. [Review]
- Kidd, C. and **Hayden, B. Y.** Neuroscience and psychology of curiosity. *Neuron* (2015) 88(3) 449-460. [Perspective]
- Calhoun, A. J. and **Hayden, B. Y.** The Foraging Brain. *Current Opinion in Behavioral Sciences*. (2015) 5 p 24-31 [Review]
- Hayden, B. Y.** Time discounting and time preferences in animals: a critical review. *Psychonomic Bulletin and Review* (2015). Vol 23(1) 39-53. [Review]
- Hayden, B. Y.** and Heilbronner, S. R. All that glitters is not reward signal. *Nature Neuroscience* (2014). Vol. 17, Number 9, pages 1142-1144. PMID 25157509. [Preview]
- Hayden, B. Y.** and Walton, M. E. Neuroscience of foraging. *Frontiers in Decision Neuroscience* (2014). Vol. 8, Number 81. PMID 24795556. [Review]
- Hayden, B. Y.** and Pasternak, T. Linking neural activity to complex decisions. *Visual Neuroscience* (2013). Vol 30, number 5-6, pages 331-342. PMID 24040867. [Review]
- Heilbronner, S. R. and **Hayden, B. Y.** Contextual factors explain risk preferences in rhesus macaques. *Frontiers in Decision Neuroscience* (2013) 7:7 PMCID: 356 1601. [Review]
- McGinty, V. B., **Hayden, B. Y.**, Heilbronner, S. R., Dumont, E. C., Graves, S. M., Mirrione, M. M., du Hoffman, J., Sartor, G. C. España, R. A., Millan, E. Z. Di Feliceantonio, A. G., Marchant, N. J., Napier, T. C., Root, D. H., Borgland, S. L., Treadway, M. T., Floresco, S. B., McGinty, J. F., and Haber, S. N. Emerging, reemerging, and forgotten brain areas of the reward circuit: notes from the 2010 Motivational and Neural Networks Conference. *Behavioral Brain Research* (2011) vol. 225 (1), p 348-357. PMCID: 3445023. [Review]
- Platt, M. L. and **Hayden, B. Y.** Learning: not just the facts, ma'am, but the counterfactuals as well. *PLoS Biology* (2011) vol 9 (6) e1001092. PMCID: 3125155. [Preview]
- Pearson, J. M., Heilbronner, S. R., Barack, D. L., **Hayden, B. Y.**, and Platt, M. L. Posterior cingulate cortex: adapting behavior to a changing world. *Trends in Cognitive Sciences* (2011) vol. 15 (4) p. 143-151. PMCID: 3070780. [Review]
- Pearson, J. M., **Hayden, B. Y.**, and Platt, M. L. A role for posterior cingulate cortex in policy switching and cognitive control. In *Neural Basis of Motivation and Cognitive Control* (2011) Mars, Sallet Rushworth, and Yeung, editors. [Book chapter]
- Platt, M. L., Watson, K. K., **Hayden, B. Y.**, Shepherd, S. V., and Klein, J. T. Neuroeconomics: implications for understanding the neurobiology of addiction. In *Advances in the Neuroscience of Addiction* (2010), Kuhn and Koob, editors. [Book chapter]
- Hayden, B. Y.**, and Platt, M. L. Risky decisions and fictive learning: case studies on the difficulties of integrating evidence from fMRI and electrophysiology in cognitive neuroscience. In *Attention and Performance* (2010), Robbins and Delgado, editors. [Book chapter]
- Hayden, B. Y.** Neuroethology of Vision. In *Primate Neuroethology* (2009), Platt and Ghazanfar, editors. [Book chapter]
- Heilbronner, S. R., **Hayden, B. Y.**, and Platt, M. L. Neuroeconomics of risk sensitive decision making. In *Impulsivity: The Behavioral and Neurological Science of Discounting* (August, 2009); Madden, Bickel, and Critchfield, editors. [Book chapter]
- Hayden, B. Y.** and Platt, M. L. Animal cognition: great apes wait for grapes. *Current Biology* (2008) 17:21: PMID: 17383569. [Preview]
- Hayden, B. Y.** and Platt, M. L. Cingulate cortex. *New Encyclopedia of Neuroscience*, Elsevier (2008). [Invited chapter]
- Hayden, B. Y.** and Platt, M. L. Fool me once, shame on me; fool me twice, blame ACC. *Nature Neuroscience* 2006 9:7 857-859. PMID: 16801914. [Preview]

RECENT ABSTRACTS (2014-present)

- 2016 Akaishi, R. **Hayden, B. Y.** (Nov 2016). Navigation and decision in a virtual foraging task for monkeys. Society for Neuroscience, San Diego, CA.
- Wang, Z. and **Hayden, B. Y.** (Nov 2016). Prospective evaluation involves reactivating neural response patterns associated with outcome monitoring. Society for Neuroscience, San Diego, CA.
- Azab, H. and **Hayden, B. Y.** (Nov 2016). Economic roles of subgenual and dorsal anterior cingulate cortices in decision making. Society for Neuroscience, San Diego, CA.
- Yoo, S., Piantadosi, S., and **Hayden, B. Y.** (Nov 2016). Spatial tuning for both manual and oculomotor movements in dorsal anterior cingulate cortex neurons. Society for Neuroscience, San Diego, CA.

- Loconte, G., Sleezer, B. J., Castagno, M. D. and **Hayden, B. Y.** (Nov 2016). Rule encoding in orbitofrontal cortex and striatum. Society for Neuroscience, San Diego, CA.
- Bromberg-Martin, E., Merel, J., Blanchard, T. and **Hayden, B. Y.** (Nov 2016). Distinct neural processes for appetitive and informational rewards. Society for Neuroscience, San Diego, CA.
- Balasubramani, P. **Hayden, B. Y.** (Nov 2016). Stopping signals in orbitofrontal cortex. Society for Neuroscience, San Diego, CA.
- Blanchard, T. C., Piantadosi, S. T., and **Hayden, B. Y.** (August 2016) *A Bayesian method of testing discrete neuron categories based on response properties*. 39th Annual Meeting of the Japan Neuroscience Society. Yokohama, Japan.
- Azab, H. and **Hayden, B. Y.** (August 2016) *Control without controllers: a distributed model of executive control*. Motivated Cognition and Control Meeting, St. Andrews University, Scotland, UK.
- Wang, M. Z. and **Hayden, B. Y.** (June 2016) *Reactivation as a mechanism of evaluation*. University of Rochester Center for Visual Science Symposium on the Future of Attention. Rochester, NY.
- Azab, H. and **Hayden, B. Y.** (June 2016) *Demand for control increases recruitment in dorsal anterior cingulate cortex*. University of Rochester Center for Visual Science Symposium on the Future of Attention. Rochester, NY.
- Yoo, M. and **Hayden, B. Y.** Tuning for gaze and hand direction in a joystick task in dorsal anterior cingulate cortex. (June 2016). University of Rochester Center for Visual Science Symposium on the Future of Attention. Rochester, NY.
- Wang, M. Z. and **Hayden, B. Y.** (May 2016) *Reactivation as a mechanism of evaluation*. Klingenstein Scholars Meeting, New York City, NY.
- 2015 Wang, Z. M. and **Hayden, B. Y.** (Oct 2015) *Reward simulation in orbitofrontal cortex*. Society for Neuroscience Meeting, Chicago, IL.
- Sleezer, B. J. and **Hayden, B. Y.** (Oct 2015) *Differential contribution of ventral and dorsal striatum to early and late phases of cognitive set reconfiguration*. Society for Neuroscience Meeting, Chicago, IL.
- Castagno, M. D., Sleezer, B. J., and **Hayden, B. Y.** (Oct 2015) *Contributions of the orbitofrontal cortex (OFC) to cognitive flexibility and associative learning during an attentional set-shifting task*. Society for Neuroscience Meeting, Chicago, IL.
- Blanchard, T. C. Piantadosi, S. T., and **Hayden, B. Y.** (Oct 2015) *A Bayesian method of categorizing neurons based on functional properties*. Society for Neuroscience Meeting, Chicago, IL.
- Azab, H. and **Hayden, B. Y.** (Oct 2015) *Demand for control reduces coding sparseness in dorsal anterior cingulate cortex*. Society for Neuroscience Meeting, Chicago, IL.
- Blanchard, T. C., Piantadosi, S. T., and **Hayden, B. Y.** (Sept 2015) *A Bayesian method of categorizing OFC neurons based on functional properties*. Third Quadrennial Meeting on Orbitofrontal Cortex Function, Paris, France.
- Hayden, B. Y.** *Do reward-based choices depend on neuronal simulation of possible rewards?* (May 2015) Klingenstein Scholars Meeting, New York City, NY.
- Bromberg-Martin E. S., Merel J., Blanchard T. C., **Hayden B. Y.** (March 2015) *Distinct neural processes for appetitive and informational rewards*. (2015) COSYNE meeting, Salt Lake City UT.
- Hayden, B. Y.** *Contributions of Neurons in Macaque Subgenual Anterior Cingulate Area 25 to Risky Choice*. (Dec 2014). American College of Neuropsychopharmacology Meeting, Phoenix, AZ.
- 2014 Blanchard, T. C and **Hayden, B. Y.** (Nov 2014) *Coding formats during anticipatory delay reveal regulatory role of anterior cingulate cortex*. Society for Neuroscience Meeting, Washington D.C.
- Thome, A., Blanchard, T. C. and **Hayden, B. Y.** (Nov 2014) *Subgenual cingulate cortex tracks incurred costs but not foregone reward*. Society for Neuroscience Meeting, Washington D.C.
- Strait, C. E., Sleezer, B. J., Blanchard, T. C., and **Hayden, B. Y.** (Nov 2014) *Value comparison through a corticostriatal circuit*. Society for Neuroscience Meeting, Washington D.C.
- Jahn, A., Strait, C. E., Brown, J. W., and **Hayden, B. Y.** (Nov 2014) *Testing computational models of anterior cingulate cortex with monkey single units*. Society for Neuroscience Meeting, Washington D.C.
- Sleezer, B. J., Blanchard, T. C., and **Hayden, B. Y.** (Nov 2014) *Effects of short-term cocaine self-administration on neural signals related to flexible decision making in rostral striatum*. Society for Neuroscience Meeting, Washington D.C.
- Hughes, K. D., Higham, J. P., Allen, W. L., Elliott, A. J., and **Hayden, B. Y.** (Aug 2014) *Female rhesus macaques show a sensory bias in preferences for male color signals*. International Society for Behavioral Ecology 15th meeting, New York, New York.

ACTIVE GRANTS

- *Applying a neuroeconomics paradigm for the assessment of central fatiguability in an aging population.* Role: Co-I (PI: Feng Vankee Lin). NIH R21 AG053193 (2016-2016) [\$144,520 direct costs, BYH: 0.45 months]
- *Neural basis of reward-based choice.* Role: PI. NIH R01 DA037229 (2015-2020) [\$1,095,000 direct costs]
- *Neuronal basis of persistence.* Role: PI. NIH R01 DA038615 (2015-2020) [\$1,135,000 direct costs]
- *Repeated cocaine exposure and striatal contributions to cognitive control.* Role: PI. R01 DA038106 (2014-2019) [\$1,245,000 direct costs]
- *Flexible control of reward-based decisions.* Role: PI. NSF CAREER award BCS 1253576 (2013-2018) [\$464,583]

COMPLETED GRANTS

- *Do reward-based choices depend on neuronal simulation of possible rewards?* Role: PI. Klingenstein-Simons Fellowship (2014-2016) [\$100,000 direct costs]
- *Center for the Origins of Cognition.* Role: PI (with Jessica Cantlon, Co-PI). University of Rochester Pump Primer. [\$8,000 direct costs]
- *Future-oriented decisions in macaques.* Role: PI. Templeton Science of Prospection Award (2015-2016) [\$150,000 direct costs]
- *The Future of Visual Attention.* Role: PI. NSF conference grant (2016) [\$10,000]
- *The Future of Visual Attention.* Role: PI. NIH R13 conference grant EY026284 (2016) [\$25,000]
- *Dissociable roles of caudate and ventral striatum in set-shifting in monkeys.* Role: PI. NARSAD Young Investigator Award, Brain and Behavior Research Foundation (2013-2015) [\$60,000 direct costs]
- *Advanced electrodes for recording activity in striatum and prefrontal cortex.* Role: PI; Co-PI: Tatiana Pasternak (2013-2015). Schmitt Equipment Award. [\$11,000 direct costs]
- *Neural basis of choice.* Role: PI. Sloan Foundation Fellowship (2013-2015) [\$50,000 direct costs]
- *Dopamine and the role of anterior cingulate cortex in executive processes.* Role: PI. NIDA K99/R00 027718-01 (2010-2014) [\$750,000]
- *Neural mechanisms of self-control.* Role: PI. Tourette Syndrome Association Fellowship (2010-2011) [\$30,000]
- *The role of the posterior cingulate cortex in reward-guided decision-making.* Role: PI. NIDA Kirschstein NRSA 023338-01 (2008-2010)
- *Neural mechanisms of reward-based decision-making.* Role: Awardee. Duke Translational Neuroscience Fellowship (2005-2006)

HONORS

- 2016 Best Paper Award in Psychonomic Bulletin and Review for “The description-experience gap in risky choice in non-human primates” from the Psychonomic Society
- Templeton Foundation Fellow in Prospection (August 2014). John Templeton Foundation
- Klingenstein-Simons Fellowship Award in the Neurosciences (May 2014). Klingenstein-Simons Foundation
- Elected as *Associate Member* of the American College of Neuropsychopharmacology (Dec 2013)
- NARSAD Young Investigator Award (Aug 2013) Brain and Behavior Research Foundation
- Poster selected for Data Blitz (Dec 2012). Meeting of the American College of Neuropsychopharmacology (ACNP)
- Sloan Research Fellow (Feb 2012). Sloan Foundation
- Travel Award, American College of Neuropsychopharmacology (Dec 2011). 50th Annual ACNP Conference, Waikoloa Village, Hawaii
- Outstanding poster (April, 2010). Motivational Neuronal Networks Conference, Shell Island, NC COSYNE
- Spotlight poster (March 2010). COSYNE meeting
- Young Investigator Award (Sept, 2009). Society for Neuroeconomics
- Best post-doc talk (March, 2009). Department of Neurobiology Retreat, Duke University Medical School
- Valedictorian (May, 2005). Department of Molecular and Cell Biology, University of California Berkeley

INVITED TALKS

Posterior Cingulate Cortex and Reward. Baylor College of Medicine. Houston, TX. Apr 2018.

Choice and choice processes. Indiana University. Bloomington, IN. Mar 2018.
Towards wireless recording in freely moving macaques. TBS Webinar. Jan, 2018.
Neural basis of reward-based choice. University of Minnesota. Minneapolis, MN. Jan, 2018.
Distributed executive control. Control Processes. Amsterdam, Netherlands. Oct 2017.
Neuroscience of foraging choices. NYU CNS department seminar. New York City, NY. Oct 2017.
Neural basis of choice. Colloquium talk. University of Minnesota. Minneapolis, MN. Sept 2017.
The past and future of neuroeconomics. Klingenstein Fellows meeting. New York City, NY. May 2017
Circuitry for curiosity based decisions. Origins of Cognition Symposium, RIT, Rochester, NY. May 2017
The neuronal foundations of value. Cognition and Decision Seminar. Columbia University, New York City, NY. Apr 2017
Neuroscience of reward-based decisions. Albert Einstein University. New York City, NY. Mar 2017.
Neuroscience of foraging decisions. University of Rochester, department of Ecology. Rochester, NY. Feb 2017.
Neuroscience of foraging decisions. University of Chicago. Chicago, IL. Feb 2017.
Distributed mechanisms of evaluation and comparison. SFN Mini-Symposium (Chair/Speaker). San Diego, CA. Nov 2016
Distributed approaches to economic choice and executive control. Carnegie Mellon University. Pittsburgh, PA. Oct 2016
Positive and negative in cingulate cortex. Persistent Maladaptive Behaviors Meeting. UR. Rochester, NY, Oct 2016
Micro and macro: bridging across levels in neuroeconomics. University of Minnesota. St. Paul, MN. Sept 2016
Imagination is the cure for poor self-control. Templeton Meeting on Prospection. Philadelphia, PA. Aug 2016
Attention as a solution to the selection problem in economic choice. CVS Symposium on the Future of Visual Attention, University of Rochester, Rochester, NY. June 2016
Demand for control reduces coding sparseness in dorsal anterior cingulate cortex. CNS Meeting. NYC, NY. Apr 2016
Distributed computation, economic choice, and control. Cognitive Science Dinner, UR, Rochester, NY. Mar 2016
Circuitry for economic choice. Department of Neurobiology, Duke University, Durham, NC. Feb 2016
Neural basis of economic choice. Department of Psychology, Vanderbilt University, Nashville, TN. Jan 2016
Distributed mechanisms of economic choice. Affective Brain Lab, UCL (on-line talk series), London, UK, Oct 2015
Representation of reward on the orbital surface. Quadrennial Meeting on OFC, INSERM, Paris, France, Sept 2015
Does economic choice involve simulation of possible rewards? Templeton Meeting on Prospection. Phila., PA, Aug 2015
Neuroscience of foraging. Duke-Kunshan University Summer School in Neuroeconomics. Shanghai, China, July 2015
Neuroscience of foraging. NYU-Shanghai Summer School in Neuroeconomics. Shanghai, China, July 2015
Neuroscience of economic choice. Neurobiology and Behavior Colloquium Series, Cornell University, Mar 2015
Representation and reward. Department of Psychological and Brain Sciences, Johns Hopkins University, Feb 2015
Representation and the reward system. Behavior, Genetics, and Neuroscience Series, Yale University, Jan 2015
Spatial selectivity in reward regions. Workshop on Computational Properties of Prefrontal Cortex, Whistler, BC, Oct 2014
Economics for monkeys. Laboratory for Laser Energetics Science and Technology Series, Rochester NY, Oct 2014
Reward representation in orbitofrontal cortex. NIA / NIDA Intramural Program, Baltimore, MD, Sept 2014
Future-oriented decisions in macaques. Templeton Conference on Prospection, Philadelphia, PA, Aug 2014
Information-seeking, curiosity, and reward. Gordon Conference on Neurobiology of Cognition, Newry, Maine, July 2014
Information-seeking, curiosity, and reward. Symposium on Biology of Decision Making, Paris, France, May 2014
Orbitofrontal cortex, Representation and Reward. Mount Sinai Medical School, New York, NY, April 2014
Neural basis of persistence. SFN Minisymposium (presenter and chair), SFN meeting, San Diego, CA, Nov 2013
Neural basis of self-control. EBBS meeting, Munich, Germany, Sept 2013
Eat prey, leave: the neuroscience of foraging. Symposium on Decision Neuroscience, Heinrich Heine Universität, Düsseldorf, Germany, June 2013
Economics vs. Neuroeconomics. University of Illinois, Urbana-Champaign, April, 2013
Neuroscience of foraging [submitted symposium]. COSYNE Workshop (organizer), Salt Lake City, UT, Mar 2013
Reward and decisions. COSYNE Workshop, Salt Lake City, UT, Mar 2013
Decision-making and control. Princeton University, Princeton, NJ, Mar 2013
Why do monkeys like to gamble? TEDxRochester, Rochester, NY, Nov 2012
We don't know what we want. Interactive Strategies 2012, Houston, TX, Oct 2012
Eat, Prey, Leave: Self-control and foraging. Clarkson University, Potsdam, NY, Sept 2012
Elements of reward-based choice. Oxford University, Oxford, UK, Sept 2012
Neural basis of reward-guided decisions. University College London, London, UK, Sept 2012
Process models of decisions involving risk (and time). University of Warwick, Warwick, UK, Sept 2012
Anterior cingulate cortex and oculomotor control. UR Center for Visual Science Symposium, Rochester, NY, Jun 2012
Anterior cingulate cortex and oculomotor control. UR CVS Research Talk Series, Rochester, NY, Apr, 2012
Why do monkeys like to gamble?. University of Rochester Phelps Colloquium Series, Rochester, NY, Feb 2012

Algorithms for value-based choice. University of Zurich, Switzerland, Oct 2011
Neural basis of foraging decisions Brain, Mind, and Society Series, Caltech, Pasadena, CA, Oct 2010
Cingulate cortex, outcomes, and behavioral adjustments. Workshop on Prefrontal Cortex, Whistler, BC, Sept 2010
Cingulate cortex, outcomes, and behavioral adjustments. Neuro2010, Kobe, Japan, September 2010
What do ACC neurons signal? RIKEN seminar, Tokyo, Japan, August 2010
Neural basis of foraging decisions. Yale University, New Haven, CT, June 2010
What information is carried by ACC neurons? Motivation and Cognitive Control, University of Oxford, UK, June 2010
Neural representation of fictive outcomes [submitted symposium]. COSYNE Workshops, Snowbird, UT, March 2010
Monitoring an uncertain world: cingulate cortex. University of Rochester, Rochester, NY, February 2009
Cingulate cortex: learning about rewards. Carnegie Mellon University, Pittsburgh, PA, February 2009
Cingulate cortex: learning about rewards. University of Texas, Austin, TX, February 2009
Cingulate cortex: choice and monitoring. Dartmouth College, Hanover, NH, January 2009
Monitoring an uncertain world: cingulate cortex. University of Pennsylvania, Philadelphia, PA, August 2009
Uncertainty, monitoring, and the cingulate cortex. Yale University Medical School, New Haven, CT, May 2009
Cingulate cortex monitors outcomes of risky decisions. NIMH, Bethesda, MD, October 2008
What causes risk sensitivity among primates? Economics for Apes Conference, MPI, Leipzig, Germany, July 2007
Attention, working memory, and decision in V4. Oxyopia Seminar, UC Berkeley, Berkeley, CA, January 2005

MENTORSHIP

Post-docs supervised:

- Ruyuan Zhang, Neuroscience, University of Minnesota, 2018-present
- Becket Ebitz, Brain and Cognitive Sciences, University of Rochester and University of Minnesota, 2017-present
- Benjamin Eisenreich, Brain and Cognitive Sciences, University of Rochester and University of Minnesota, 2016-present
- Brianna Sleezer, Brain and Cognitive Sciences, University of Rochester, 2016-2017
- Rei Akaishi, Brain and Cognitive Sciences, University of Rochester, 2016-2017
- Pragathi Priyadharsini Balasubramani, Brain and Cognitive Sciences, University of Rochester, 2015-2017
- Alex Thome, Brain and Cognitive Sciences, University of Rochester, 2013-2015

Graduate students supervised:

- Priyanka Mehta (Sproull Fellow), Brain and Cognitive Sciences, University of Rochester, 2016-present
- Seng-Bum (Michael) Yoo, Brain and Cognitive Sciences, University of Rochester, 2015-present
- Habiba Azab, Brain and Cognitive Sciences, University of Rochester, 2014-present
- Shraddha Shah, Brain and Cognitive Sciences, University of Rochester, 2014-2016
- Zhe (Maya) Wang, Brain and Cognitive Sciences, University of Rochester, 2014-present
- Brianna Sleezer, Neuroscience Graduate Program, University of Rochester, 2012-2016
- *CVS Training Fellowship 2013-2014*
- Caleb Strait, Brain and Cognitive Sciences, University of Rochester, 2011-2016
- Tommy Blanchard, Brain and Cognitive Sciences, University of Rochester, 2011-2015

Other graduate student supervision:

- Bethany Stieve, NGP rotation, University of Minnesota, 2018
- Jesse Wang, UR MSTP program, 2015, Summer 2015
- David Mallpress, University of Bristol, Worldwide University Network Scholars Program, Summer 2013
- Andrew Jahn, Indiana University, collaboration with Josh Brown (IU), Summer 2013
- Jordan Silberman, UR CSP department (served as mentor for \$5000 Phelps award project, 2011-2012)

Undergraduates supervised:

- UMN students: Kyle Edmonston, Efemona Famati, Jude Goosens, Hannah Lee, Alex Rich, Afra Suri, Sydney Walsh
- UR students: Lisa Kaggen, Ryan Brown, Jack Billings, Karla Sordano, Ben Landwersiek, Lauren Wolfe, Mariah Meyer, Alberto Sepulveda Rodriguez, Michael Shteyn, Evan Alter, Kara Ng, Krina Patel, An An, Jack Yu, Guiliana Loconte, Julian Nin, Andrew Brodtkin, Shanna Cleveland, Naveen Maliakkal, Sadie Dix, Tara Daly, Emily Tingle, and others.
- CVS Summer Scholars: Linnea Marks (2012), Trisha Patel (2013)
- McNair Scholars: Ariana Mitchell (2014) and Courtney Thomas Jr. (2016)

SERVICE

Intramural service

Co-Organizer, University of Rochester Neuromedicine Symposium on Persistent Maladaptive Behaviors (with Suzanne Haber), 2016-2017

Co-Organizer, CVS symposium 2016, with Jude Mitchell. Topic: The Future of Visual Attention.

Major Advisor, Neuroscience Major: 2016-present

Faculty advisor for BCS 206 (Undergraduate research in cognitive science).

Society for Neuroscience, Rochester Chapter, Council Member (2014-present)

University of Rochester, University Committee for Interdisciplinary Studies (2013-present)

BCS Faculty Search Committee (2012-2014) Systems Neuroscience and Computation/Theory searches

CVS Website Committee (2012-2013)

Neuroscience Graduate Program Admissions Committee (2011-present)

Graduate student thesis committees:

- Roger Feltman (CSP), Jordan Silberman (CSP), Celeste Kidd (BCS), Berkeley Fahrenthold (NGP), Kevin Dieter (BCS), Adam Pallus (Neuroscience)

University of Rochester undergraduate senior project committees (n=7)

Courses taught:

- NSC 203 (Neuroscience Lab) team taught with Kathy Nordeen and Dave Kornack, 2012-present
- NSC 301 (Senior seminar) 2013-present
- BCS 248/548 (Seminar in Neuroeconomics) 2014-present

Coordinator, Duke Center for Neuroeconomic Studies Major Speaker Series (2007-2009)

Coordinator, Duke Center for Neuroeconomic Studies Summer Journal Club (2007-2008)

Co-coordinator, Duke Neuroeconomics Journal Club (2006-2007) with Bethany Weber

Extramural service

Ad-hoc study section member, SCP, NIH (San Francisco, March, 2017)

Co-organizer, Motivated Neural Networks (MNN) 2017 meeting with Stan Floresco (UBC) and Mauricio Delgado (Rutgers University)

Co-director, Neuroeconomics Summer Course (NYU-Shanghai) with Nathaniel Daw (NYU), Hilke Plassman (INSEAD), and Agnieszka Tymula (U Sydney)

Abstract reviewer, COSYNE (2014 and 2015 meeting)

Co-creator, Neurotree website (<http://www.neurotree.org>) with Stephen V. David

NIH Review Panel for CEBRA (R21) awards (2015)

NSF Review Panel for Brain and Cognitive Sciences (2013) and ad hoc reviewer, 2011-present

Reviewing Editor, Frontiers in Decision Neuroscience (2010-present)

Editor, Invited special issue on neuroscience of foraging, Frontiers in Decision Neuroscience (2012-2013)

Ad-hoc reviewer for Science, Nature Neuroscience, Neuron, Cerebral Cortex, J Neurosci, J Neurophys, Plos One, Plos Biology, Cognition, Current Biology, Oxford Press, BBR, PNAS, EBR, and others.

Ad-hoc grant reviewer for Wellcome Trust, EU Grant foundation, Leakey Foundation, and others