

Steven T. Piantadosi

Assistant Professor
University of Rochester
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Interests

Language acquisition and processing, conceptual development, machine learning, information theory

Academic Positions

2014-Present Assistant Professor, Dept. of Brain and Cognitive Sciences, Rochester
Apr-May 2014 Visiting Scientist, Dept. of Brain and Cognitive Sciences, MIT
Jan-Feb 2014 Visiting Scholar, Center for the Study of Language and Information, Stanford
2011-2014 Postdoctoral Researcher, Dept. of Brain and Cognitive Sciences, Rochester
2006-2011 Graduate Student, Dept. of Brain and Cognitive Sciences, MIT

Education

2011 Ph.D. Brain and Cognitive Sciences MIT
2006 BS Mathematics UNC Chapel Hill
2006 BA Linguistics UNC Chapel Hill

Teaching

2016 Information theory in cognitive science and neuroscience (graduate)
2016 Cognition (undergraduate)
2015 Behavioral Methods (graduate)
2015 Cognition (undergraduate)

Awards

2012 Robert J. Glushko Dissertation Prize, Cognitive Science Society
2012 Top 30 under 30 in Science and Innovation, Forbes Magazine
2010 Walle Nauta award for continuing dedication to teaching, MIT
2009 Angus McDonald award for excellence in undergraduate teaching, MIT

Funding

2016 R01: Origins of Logic and Counting Algorithms (co-PI with Jessica Cantlon), NIH
2013 Academic hardware donation program, NVIDIA
2012 Ruth L. Kirschstein National Research Service Awards (NRSA), NIH
2010 SBE Doctoral Dissertation Research Improvement Grants in Linguistics, NSF
2008 Graduate Research Fellowship Award, NSF

Journal Publications¹

- S. T. Piantadosi, "The computational origin of representation and conceptual change", under review.
- S. T. Piantadosi, K. Mahowald, C. Kidd, R. Futrell, E. Gibson, "Lexical prescriptivism reduces communicative efficiency", under review.
- S. T. Piantadosi, H. Palmeri, R. Aslin, "Limits on composition of conceptual operations in 9-month-olds", under review.
- K. Mahowald, I. Dautriche, E. Gibson, S. T. Piantadosi, "Word forms are structured for efficient use", under review.
- E. Gibson, S. T. Piantadosi, J. Jara-Ettinger, R. Levy, "Task effects in cross-cultural research: Computerized experiments can yield misleading results in non-industrialized populations", under review.
- I. Dautriche, K. Mahowald, E. Gibson, A. Christophe, S. T. Piantadosi, "Words cluster phonetically beyond phonotactic regularities", under review.
- E. Gibson, R. Futrell, J. Jara-Ettinger, K. Mahowald, L. Bergen, S. Ratnasigam, M. Gibson, S.T. Piantadosi, B. Conway. "Color naming across languages reflects color use", under review.
- S. E. Koopman, J. F. Cantlon, S.T. Piantadosi, E. L. MacLean, U. S. Anderson, J. M. Baker, K. Banerjee, M. J. Beran, D. Hanus, S. M. Jones, K. E. Jordan, S. Mahamane, A. Nieder, B. M. Perdue, F. Range, J. R. Stevens, M. Tomonaga, D. J. Ujfalussy, J. Vonk. "The evolution of quantitative sensitivity", under review.
- M. Overlan, R. Jacobs, S.T. Piantadosi, "Learning abstract visual concepts via probabilistic program induction in a Language of Thought", under review.
- B. Lake, S.T. Piantadosi, "Learning recursive visual concepts from examples", under review
- T. Blanchard, S.T. Piantadosi, B. Hayden, "Robust mixture modeling reveals category-free selectivity in reward regions", under review.
- J. Register, F. Mollica, S.T. Piantadosi, "Verification of 'most' is flexible and sensitive to context", under review.
- S. T. Piantadosi, J. Cantlon, "True Numerical Cognition in the Wild", Psychological Science, in press.
- S. T. Piantadosi, E. Fedorenko, "Infinitely productive language can arise from chance under communicative pressure", Journal of Language Evolution, in press.
- F. Mollica, S. T. Piantadosi, "How data drives early word learning: A cross-linguistic waiting time analysis", Open Mind, in press.
- S. Ferrigno, J. Jara-Ettinger, S. T. Piantadosi, J. Cantlon, "Universal and uniquely human factors in spontaneous number perception", Nature Communications, in press.
- S. T. Piantadosi, "A rational analysis of the approximate number system", Psychonomic Bulletin and Review, 2016, pp. 1-10.
- S. T. Piantadosi, J. Tenenbaum, N. Goodman, "The logical primitives of thought: Empirical foundations for compositional cognitive models", Psychological Review, 2016.
- S. T. Piantadosi, R. Jacobs, "Four problems solved by the probabilistic Language of Thought", Current Directions in Psychological Science, vol. 25, 2016, pp. 54-59.
- S. T. Piantadosi, C. Kidd, "Extraordinary intelligence and the care of infants", Proceedings of the National Academy of Sciences, vol. 113, no. 25, 2016.

¹ All papers are available on my website. All code and data is available on the website or by request with no restrictions.

- S. T. Piantadosi, C. Kidd, "Endogenous or exogenous? The data don't say (Commentary on Han, Musolino, & Lidz 2016)", *Proceedings of the National Academy of Sciences*, vol. 113, no. 20, 2016.
- S. T. Piantadosi, "Efficient estimation of Weber's W", *Behavior Research Methods*, vol. 48, 2016, pp. 42-52.
- S. T. Piantadosi, R. Aslin, "Compositional reasoning in early childhood", *PLOS ONE*, 2016.
- J. Jara-Ettinger, S. T. Piantadosi, E. Spelke, R. Levy, E. Gibson, "Mastery of the logic of natural numbers is not the result of mastery of counting: Evidence from late counters", *Developmental Science*, 2016.
- R. Futrell, L. Stearns, D. L. Everett, S. T. Piantadosi, E. Gibson, "A Corpus Investigation of Syntactic Embedding in Pirahã", *PLOS ONE*, 2016.
- I. Dautriche, K. Mahowald, E. Gibson, S. T. Piantadosi, "Wordform similarity increases with semantic similarity: an analysis of 100 languages", *Cognitive Science*, 2016.
- E. J. Bigelow, S. T. Piantadosi, "A large dataset of generalization patterns in the number game", *Journal of Open Psychology Data*, vol. 4, 2016.
- S. T. Piantadosi, B. Hayden, "Response: "Commentary: Utility-free heuristic models of two-option choice can mimic predictions of utility-stage models under many conditions"", *Frontiers in Neuroscience*, vol. 9, no. 299, 2015.
- S. T. Piantadosi, "Problems in the philosophy of mathematics: A view from cognitive science", in *Mathematics, Substance and Surmise: Views on the Meaning and Ontology of Mathematics*, E. Davis, P. J. Davis, Eds., Springer, 2015.
- S. T. Piantadosi, B. Hayden, "Utility-free models of binomial choice can replicate predictions of utility models in many conditions", *Frontiers in Neuroscience*, 2015.
- M. Pelz, S. T. Piantadosi, C. Kidd, "The dynamics of idealized attention in complex learning environments", in *The 5th Joint IEEE International Conference on Development and Learning and on Epigenetic Robotics*, 2015.
- J. Jara-Ettinger, E. Gibson, C. Kidd, S. T. Piantadosi, "Native Amazonian Children Forego Egalitarianism When They Learn to Count", *Developmental Science*, 2015.
- E. Gibson, P. Jacobson, P. Graff, K. Mahowald, E. Fedorenko, S. T. Piantadosi, "A pragmatic account of complexity in definite Antecedent-Contained-Deletion relative clauses", *Journal of Semantics*, vol. 32, 2015.
- J. Cantlon, S. T. Piantadosi, S. Ferrigno, K. Hughes, A. Barnard, "The origins of counting algorithms", *Psychological Science*, 2015.
- S. T. Piantadosi, C. Kidd, R. Aslin, "Rich analysis and rational models: Inferring individual behavior from infant looking data", *Developmental Science*, 2014, pp. 1-16.
- S. T. Piantadosi, E. Gibson, "Quantitative Standards for Absolute Linguistic Universals", *Cognitive Science*, vol. 38, no. 4, 2014, pp. 736-756.
- S. T. Piantadosi, J. Jara-Ettinger, E. Gibson, "Children's learning of number words in an indigenous farming-foraging group", *Developmental Science*, vol. 17, no. 4, 2014, pp. 553-563.
- S. T. Piantadosi, "Zipf's word frequency law in natural language: A critical review and future directions", *Psychonomic Bulletin & Review*, vol. 21, 2014, pp. 1112-1130.
- C. Kidd, S. T. Piantadosi, R. N. Aslin, "The Goldilocks Effect in Infant Auditory Attention", *Child Development*, vol. 85, 2014, pp. 1795-1804.
- C. Rieth, S. T. Piantadosi, K. Smith, E. Vul, "Put your money where your mouth is: Incentivizing the Truth by Making Nonreplicability Costly", *European Journal of Personality*, 2013.

- S. T. Piantadosi, H. T. H., E. Gibson, "Information content versus word length in natural language: A reply to Ferrer-i-Cancho and Moscoso del Prado Martin [arXiv:1209.1751]", ArXiv e-prints, 2013.
- E. Gibson, L. Bergen, S. T. Piantadosi, "The rational integration of noise and prior semantic expectation: Evidence for a noisy-channel model of sentence interpretation", *Proceedings of the National Academy of Sciences*, vol. 11, 2013, pp. 8051-8056.
- S. T. Piantadosi, L. Stearns, D. Everett, E. Gibson, "A corpus analysis of Pirahã grammar: An investigation of recursion", Talk presented at the LSA (by E. Gibson)., 2012.
- S. T. Piantadosi, J. Tenenbaum, N. Goodman, "Bootstrapping in a language of thought: a formal model of numerical concept learning", *Cognition*, vol. 123, 2012, pp. 199-217.
- K. Mahowald, E. Fedorenko, S. T. Piantadosi, E. Gibson, "Info/information theory: speakers actively choose shorter words in predictable contexts.", *Cognition*, vol. 126, 2012, pp. 313-318.
- C. Kidd, S. T. Piantadosi, R. Aslin, "The Goldilocks Effect: Human Infants Allocate Attention to Visual Sequences That Are Neither Too Simple Nor Too Complex", *PLoS ONE*, 2012.
- E. Gibson, S. T. Piantadosi, E. Fedorenko, "Quantitative methods in syntax / semantics research: A response to Sprouse & Almeida", *Language and Cognitive Processes*, 2012.
- E. Gibson, S. T. Piantadosi, K. Brink, L. Bergen, E. Lim, R. Saxe, "A noisy-channel account of crosslinguistic word order variation", *Psychological Science*, vol. 24, 2012, pp. 1079-1088.
- E. Fedorenko, S. Piantadosi, E. Gibson, "Processing Relative Clauses in Supportive Contexts", *Cognitive Science*, vol. 36, 2012, pp. 1-27.
- E. Fedorenko, S. T. Piantadosi, E. Gibson, "The interaction of syntactic and lexical information sources in language processing: The case of the noun--verb ambiguity", *Journal of Cognitive Science*, 2012.
- S. T. Piantadosi, H. Tily, E. Gibson, "Word lengths are optimized for efficient communication", *Proceedings of the National Academy of Sciences*, vol. 108, no. 9, 2011, pp. 3526.
- S. T. Piantadosi, H. Tily, E. Gibson, "Reply to Reilly and Kean: Clarifications on word length and information content", *Proceedings of the National Academy of Sciences*, vol. 108, no. 20, 2011, pp. E109.
- S. T. Piantadosi, "Learning and the language of thought.", Ph.D. dissertation, MIT, 2011.
- S. T. Piantadosi, H. Tily, E. Gibson, "The communicative function of ambiguity in language", *Cognition*, vol. 122, 2011, pp. 280--291.
- E. Gibson, S. T. Piantadosi, K. Fedorenko, "Using Mechanical Turk to Obtain and Analyze English Acceptability Judgments", *Language and Linguistics Compass*, vol. 5, no. 8, 2011, pp. 509-524.
- S. T. Piantadosi, J. Crutchfield, "How the Dimension of Space Affects the Products of Pre-Biotic Evolution: The Spatial Population Dynamics of Structural Complexity and The Emergence of Membranes", Santa Fe Institute Working Paper arXiv:1010.5019, 2010.
- S. T. Piantadosi, "Symbolic dynamics on free groups", *Discrete and Continuous Dynamical Systems*, vol. 20, no. 3, 2008, pp. 725-738.

Conference & Proceedings Papers

- Overlan, M. C., Jacobs, R. A., & Piantadosi, S. T. (2016). A hierarchical probabilistic language-of-thought model of human visual concept learning. In *Proceedings of the cognitive science society*.

- Bigelow, E. J. & Piantadosi, S. T. (2016b). Inferring priors in compositional cognitive models. In Proceedings of the cognitive science society.
- Martí, L., Mollica, F., Piantadosi, S. T., & Kidd, C. (2016). What determines human certainty? In Proceedings of the cognitive science society.
- Mollica, F. & Piantadosi, S. T. (2015). Towards semantically rich and recursive word learning models. In Proceedings of the cognitive science society.
- Mollica, F., Piantadosi, S. T., & Tanenhaus, M. K. (2015a). The perceptual foundation of linguistic context. In Proceedings of the cognitive science society.
- Alonso-Diaz, S., Cantlon, J., & Piantadosi, S. T. (2015a). Cognition in reach: continuous statistical inference in optimal motor planning. In Proceedings of the cognitive science society.
- Hemmer, P., Persaud, K., Kidd, C., & Piantadosi, S. T. (2015a). Inferring the Tsimane's use of color categories from recognition memory. In Proceedings of the cognitive science society.
- Pelz, M., Piantadosi, S. T., & Kidd, C. (2015). The dynamics of idealized attention in complex learning environments. In The 5th joint IEEE International Conference on Development and Learning and on Epigenetic Robotics.
- Piantadosi, S. T., Tenenbaum, J., & Goodman, N. (2010c). Beyond boolean logic: exploring representation languages for learning complex concepts. In Proceedings of the cognitive science society.
- Kidd, C., Piantadosi, S. T., & Aslin, R. (2010). The Goldilocks effect: infants' preference for visual stimuli that are neither too predictable nor too surprising. In Proceedings of the cognitive science society.
- Piantadosi, S. T., Tily, H., & Gibson, E. (2009c). The communicative lexicon hypothesis. In Proceedings of the cognitive science society (pp. 2582–2587).
- Tily, H. & Piantadosi, S. T. (2009b). Refer efficiently: use less informative expressions for more predictable meanings. In Proceedings of the workshop on the production of referring expressions: bridging the gap between computational and empirical approaches to reference.
- Piantadosi, S. T., Goodman, N., Ellis, B., & Tenenbaum, J. (2008b). A Bayesian model of the acquisition of compositional semantics. In Proceedings of the cognitive science society.

Invited talks

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| May 2016 | Number learning in the Bolivian Amazon, Math Cognition and Learning Conference |
| Nov 2015 | Statistics over Computations: Inference, Structure, and Human Thought, University of Rochester Biostatistics |
| April 2015 | Language learning as computational inference Rutgers, Newark |
| Dec 2014 | Language learning as computational inference NYU Linguistics |
| Jun 2014 | Language learning as computational inference Max Planck Institute for Psycholinguistics |
| Apr 2014 | Learning to count as algorithmic inference RuCCS Colloquium Series Rutgers University |
| Jan 2014 | Cognitive determinants of word frequency, Stanford University CSLI Workshop on Gradience |
| Dec 2013 | Communicative design in human language, Saarland University Distinguished Lecture Series |

Conference talks

- Mollica, F., & Piantadosi, S.T. (2017). An information-theoretic buffer supports language processing. CUNY
- Hemmer, P., Persaud, K., Kidd, C., & Piantadosi, S. T. (2015b). Inferring the Tsimane's use of color categories from recognition memory. Cognitive Science Society.
- Alonso-Diaz, S., Cantlon, J., & Piantadosi, S. T. (2015b). Cognition in reach: continuous statistical inference in optimal motor planning. Cognitive Science Society.
- Mollica, F., Piantadosi, S. T., & Tanenhaus, M. K. (2015b). The perceptual foundation of linguistic context. Cognitive Science Society.
- Piantadosi, S. T., Jara-Ettinger, J., & Gibson, E. (2015). Number word acquisition in an indigenous amazonian group. Society for Research in Cognitive Development.
- Dautriche, I., Mahowald, K., Gibson, E., Christophe, E., & Piantadosi, S. (2014). Lexical clustering in efficient language design. AMLAP.
- Mahowald, K., Dautriche, I., Gibson, E., Christophe, E., & Piantadosi, S. (2014). Efficient phonological clustering in the mental lexicon. Ninth International Conference on the Mental Lexicon. Niagara-on-the-Lake, Ontario.
- Piantadosi, S., Goodman, N., & Tenenbaum, J. (2013). Modeling the acquisition of quantifier semantics: a case study in function word learnability. Workshop on the Acquisition of Quantification, UMass Amherst.
- Piantadosi, S., Stearns, L., Everett, D., & Gibson, E. (2012a). A corpus analysis of Pirahã grammar: an investigation of recursion. Linguistic Society of America (presented by E. Gibson).
- Mahowald, K., Fedorenko, E., Piantadosi, S., & Gibson, E. (2012a). Info/information theory: speakers actively choose shorter words in predictable contexts. CUNY Sentence Processing Conference.
- Piantadosi, S., Tenenbaum, J., & Goodman, N. (2012a). Discovering function word meanings through Bayesian concept learning. UAI.
- Piantadosi, S., Kidd, C., & Aslin, D. (2012). Rich modeling and data analysis for infant experimentation. International Society on Infant Studies.
- Kidd, C., Piantadosi, S., & Aslin, R. (2012a). Infants allocate attention to avoid overly simple and overly surprising word sequences. International Society on Infant Studies.
- Gibson, E., Piantadosi, S., Ichinco, D., & E., F. (2011). Evaluating structural overlap across constructions: inter-subject analysis of co-variation. Linguistic Society of America.
- Piantadosi, S., Tenenbaum, J., & Goodman, N. (2010a). Beyond boolean logic: a learning theory for complex compositional concepts. MathPsych.
- Piantadosi, S., Tenenbaum, J., & Goodman, N. (2010b). Beyond boolean logic: a learning theory for complex compositional concepts. Cognitive Science Society.
- Tily, H. & Piantadosi, S. (2009a). Refer efficiently: use less informative expressions for more predictable meanings. Cognitive Science Society workshop on the Production of Referring Expressions.
- Piantadosi, S., Tily, H., & Gibson, E. (2009a). The communicative lexicon hypothesis. CUNY Conference on Human Sentence Processing.

- Piantadosi, S., Tily, H., & Gibson, E. (2009b). The communicative lexicon hypothesis. Cognitive Science Society.
- Piantadosi, S., Goodman, N., & Tenenbaum, J. (2009). A formal model of number bootstrapping. Recursion.
- Piantadosi, S., Goodman, N., & Tenenbaum, J. (2008). Uniform information density in discourse: a cross-corpus analysis of syntactic and lexical predictability. CUNY Conference on Human Sentence Processing.
- Piantadosi, S. (2006a). Symbolic dynamics and free groups. UNC-Chapel Hill Department of Mathematics Seminar Talk.
- Piantadosi, S. (2005a). Symbolic dynamics and the free group. UNC-G Regional Undergraduate Mathematics Conference.
- Piantadosi, S. (2005b). When space matters: an algebraic perspective on spatial population dynamics. Santa Fe Institute.

Conference posters

- Ballard, I., Miller, E., Piantadosi, S.T., Goodman, N., McClure, S. (2017) Beyond reward prediction errors: human striatum updates rule values during learning. Cosyne.
- Blanchard, T. C., Piantadosi, S. T., & Hayden, B. Y. (2016c). A Bayesian method of testing discrete neuron categories based on response properties. Japan Neuroscience Society.
- Blanchard, T. C., Piantadosi, S. T., & Hayden, B. Y. (2016a). A Bayesian method of categorizing ofc neurons based on functional properties. Orbitofrontal Cortex and Cognition in the City of Lights (OFC2015).
- Blanchard, T. C., Piantadosi, S. T., & Hayden, B. Y. (2016b). A Bayesian method of categorizing OFC neurons based on functional properties. Society for Neuroscience.
- Conway, B. R., Jara-Ettinger, J., Mahowald, K., Piantadosi, S., Bergen, L., Futrell, R., & Gibson, E. (2016). Color language reflects usefulness of color. Vision Sciences Society.
- Ferrigno, S., Jara-Ettinger, J., Piantadosi, S. T., & Cantlon, J. (2015). A universal number bias in monkeys, children, and innumerate adults. Cognitive Development Society.
- Mahowald, K., Piantadosi, S., Alper, M., & Gibson, E. (2015). Lexical items are privileged slots for meaning. CUNY Sentence Processing Conference.
- Mollica, F., Piantadosi, S., & Tanenhaus, M. (2015c). Establishing context in sentence processing: perceptual cues define linguistic context. CUNY Sentence Processing Conference.
- Futrell, R., Mahowald, K., Piantadosi, S., & Gibson, E. (2014). Efficient communication forward and backward. CUNY.
- Gibson, E., Jacobson, P., Graff, P., Mahowald, K., Fedorenko, E., & Piantadosi, S. (2014). Pragmatic influences on the processing of and relative clauses. CUNY.
- Mahowald, K., S.T., P., & Gibson, E. (2012). Lexical clustering in efficient language design. CUNY.
- Piantadosi, S., Goodman, N., Ellis, B., & Tenenbaum, J. (2008a). A Bayesian model of the acquisition of compositional semantics. Cognitive Science Society.
- Fedorenko, E., Cherkasskiy, L., Piantadosi, S., & Saxe, R. (2008). Prosody influences the listener's online representation of the speaker's thoughts. CUNY.
- Fedorenko, E., Cherkasskiy, L., Piantadosi, S., Scholz, J., & Saxe, R. (2008). Prosody influences the listener's online representation of the speaker's thoughts. The Annual Meeting of the Cognitive Neuroscience Society.

Aizawa, H., Plitt, J., Piantadosi, S.T., & Bochner, B. (2002). Human eosinophils, basophils, and hmc-1 cells express both short and long splice variants of siglec-8. 58th meeting of the American Academy of Asthma, Allergy and Immunology.

Reviewing

Behavior Research Methods, Child Development, Cognition, Cognitive Science, Cognitive Science Society Conference, CUNY Sentence Processing Conference, Developmental Psychology, Developmental Science, Entropy, Infancy, Journal of Experimental Psychology, Journal of Memory and Language, Language Acquisition: A Journal of Developmental Linguistics, Laboratory Phonology, Language and Cognition, Language and Speech, Language Learning and Development, Memory and Cognition, National Science Foundation, Philosophical Psychology, Proceedings of the Royal Society, PLOS ONE, PLOS Computational Biology, Proceedings of the National Academy of Sciences, Reading and Writing, Royal Society Open Access, Scientometrics, Topics in Cognitive Science, Trends in Cognitive Science