website: www.mit.edu/~hopekean
email1: hopekean@mit.edu
email2: hkean@alumni.princeton.edu

Hope H. Kean

phone: +1(240)-743-9983
46-4127G, 43 Vassar St.,
Cambridge, MA 02139

EDUCATION

Massachusetts Institute of Technology, Department of Brain & Cognitive Sciences, Postdoc	present
Massachusetts Institute of Technology, Department of Brain & Cognitive Sciences, PhD	2025
Princeton University A.B. in Neuroscience with Honors and Certificate in Cognitive Science	2018

PAPERS

Kean, H., Fung, A., Chen, J., Ohams, C., Rule, J., Tenenbaum, J., Piantadosi, S., & Fedorenko, E. (about to be preprinted, see version in thesis). A human brain network specialized for abstract formal reasoning.

Kean, H., Wolna, A., Swords, S., Jhingan, N., Shewmon, A., Richardson, M., Fedorenko, E. (about to be preprinted, see version in thesis). Functional specificity is a core principle of human brain organization, as revealed by highly anatomically atypical brains.

Kean, H. (2025). The Neural Architecture of Human Reasoning: Higher-order Cognitive Specialization for Formal Thought and in Atypical Brains. (Doctoral dissertation, MIT).

Kean, H., Fung, A., Jaggers, P., Chen, J., Rule, J., Benn, Y., Tenenbaum, J., Piantadosi, S., Varley, R., & Fedorenko, E. (under revision). Evidence from Formal Logical Reasoning Reveals that the Language of Thought is not Natural Language.

Kean, H., Fung, A., Pramod, RT., Chomik-Morales, J., Kanwisher, N., & Fedorenko, E. (2025). Intuitive physical reasoning is not mediated by linguistic nor exclusively domain-general abstract representations. Neuropsychologia.

deVarda, A., D'Elia, F., **Kean, H.,** Lampinen, A., and Fedorenko, E. (under revision) The cost of thinking is similar between large reasoning models and humans**.**

Shain*, C., **Kean*, H.,** Casto, C., Lipkin, B., Affourtit, J., Siegelman, M., Mollica, F., Fedorenko, E. (2024) Distributed Sensitivity to Syntax and Semantics throughout the Language Network. Journal of Cognitive Neuroscience.

Regev, T., Lipkin B., Boebinger D., Paunov A., **Kean, H**., Norman-Haignere S.V., and Fedorenko, E.(2024) Preserved functional organization of human auditory cortex in individuals missing one temporal lobe from birth. iScience,

Li, J., **Kean, H.**, Fedorenko, E. and Saygin, Z. (2022). Intact reading ability despite lacking a canonical visual word form area in an individual born without the left superior temporal lobe. Cognitive Neuropsychology

Tuckute, G., Paunov, A., **Kean, H.,** Small, H., Mineroff, Z., Blank, I.A., Fedorenko, E. (2022): Frontal language areas do not emerge in the absence of temporal language areas: A case study of an individual born without a left temporal lobe, Neuropsychologia

Hu, J, Small, H., **Kean, H.,** Takahashi, A., Zekelman, L., Kleinman, D., Ryan, E., Nieto-Castañón, A., Ferreira, V., and Fedorenko, E. (2022). Precision fMRI reveals that the language-selective network supports both phrase-structure building and lexical access during language production. Cerebral Cortex

Chen, X., Affourtit, J., Ryskin, R., Regev, T., Norman-Haignere, S., Jouravlev, O., Malik-Moraleda, S., **Kean, H.,** Varley, R., and Fedorenko, E. (2022). The human language system does not support music processing. Cerebral Cortex

Lipkin, B., Tuckute, G., Affourtit, J., Small, H., Mineroff, Z., **Kean, H.,** Jouravlev, O., Rakocevic, L., Pritchett, B., Siegelman, M., Hoeflin, C., Pongos, A., Blank, I., Kline, M., Ivanova, A., Shannon, S., Sathe, A., Hoffman, M., Nieto-Castañón, A., and Fedorenko, E. (2022). LanA (Language Atlas): A probabilistic atlas for the language network based on fMRI data from >800 individuals. Nature Scientific Data

Ivanova, A., Srikant, S., Sueoka, Y., **Kean, H.,** Dhamala, R., O'Reilly, U., Bers, M., and Fedorenko, E. (2020) Comprehension of computer code relies primarily on domain-general executive brain regions. eLife

Mollica, F., Siegelman, M., Diachek, E., Piantadosi, S., Futrell, R., Mineroff, Z., **Kean, H.,** Qian, P., and Fedorenko, E. (2020) Composition is the core driver of the language-selective network. Neurobiology of Language.

Guterstam*, A., **Kean*, H.,** Webb, T., Kean, F., and Graziano, G. (2018) Implicit model of other people's visual attention as an invisible, force-carrying beam projecting from the eyes. PNAS.

Webb, T., **Kean, H.,** and Graziano, M. (2016) Effects of awareness on the control of attention. Journal of Cognitive Neuroscience.

IN PREP

Kean, H., Diachek, E., Blank, I., and Fedorenko, E. (in prep) Logic, Simple Arithmetic, and Language Co-Lateralize in the Human Brain.

Kean, H., Fung, A., Chen, J., Rule, J., Tenenbaum, J., Piantadosi, S., & Fedorenko, E. (in prep). Distributed Neural Mechanisms of Inductive Inference.

Kean*, H., deVarda*, A., Piantadosi, S., & Fedorenko, E. (in prep). Why Language Representations are an Impoverished Format for Thought.

PRESENTATIONS

1. Kean, H. (2025) The Neural Architecture of Logical Reasoning. University of Trento CIMeC Colloquium.
2. Kean, H. (2025) Keynote Speaker. On the Neural Ontology of Thought and Human Reasoning. Boston College 52nd annual Insight Conference.
3. Kean, H., Fung, A., Rule, J., Piantadosi, S., Tenenbaum, J., and Fedorenko, E. (2025) Deduction and Induction Dissociate in the Human Brain. MIT Brain & Cognitive Sciences Graduate Research Poster Session.
4. Kean, H. (2024) Domain-general Reasoning in the Human Brain. Steve Piantadosi's *CoLaLa* Lab Meeting. UC Berkeley
5. Kean, H. (2024) Reasoning Systems in the Human Brain. MIT Quest for Intelligence Visiting Committee.
6. Kean, H., Fung*, A., Jaggers*, P., Rule, J., Benn, Y., Tenenbaum, J., Piantadosi S., Varley R., Fedorenko, E. (2024) The Language of Thought is not Language: Evidence from Formal Induction. SNL
7. Kean*, H., Wolna*, A., Swords, S., Jhingan, N., Shewmon, A., Richardson, M., Fedorenko, E. (2024) Functional specificity is a core principle of human brain organization, as revealed by highly anatomically atypical brains. SNL
8. Kean, H., Fung, A., Rule, J., Piantadosi, S., Tenenbaum, J., and Fedorenko, E. (2024) Deduction and Induction Dissociate in the Human Brain. Cognitive Computational Neuroscience Conference.
9. Kean, H. (2024) Inductive Inference and Reasoning in the Human Brain, 51st Annual Summer Insight Boston College Philosophy Conference.
10. Kean, H. (2023) Domain-general Reasoning in the Human Brain, Cognitive Department Lunch Series MIT BCS Cog Lunch
11. Kean, H. (2023) Program Induction and Reasoning in the Human Brain. Emerging Scholar in Psychological Science, Princeton Neuroscience Institute.
12. Kean, H. (2023) Guest Lecture for 9.85 Infant Cognition: Language Development and the Human Brain
13. Kean, H. (2022) The Interesting Brains Project: Preserved Cognition after Massive Lesions to Cortex. Inauguration of the MIT Museum, Cambridge Science Festival. https://www.youtube.com/watch?v=3NGX6taF_rw&ab_channel=ddlk66
14. Kean, H. (2022) Guest Lecture for 9.85 Infant Cognition: Language Development and the Human Brain
15. Regev T, Jhingan N, Kim HS, Kean H, Casto C, and Fedorenko E. (2022) Neural Representation of Prosody. Society for the Neurobiology of Language
16. Kean, H. (2021) Temporal Receptive Windows, Cognitive Department Lunch Series (MIT BCS Cog Lunch)
17. Ivanova, A. A., Siegelman, M., Cheung, C., Pongos, A. L. A., Kean, H. H., & Fedorenko, E. (2020) The effect of task on sentence processing in the language and multiple demand brain networks. Society for the Neurobiology of Language.
18. Hu, J., Small, H., Kean, H. H., Takahashi, A., Zekelman, L., Kleinman, D., Ryan, E., Ferreira, V., & Fedorenko, E. (2020). Distributed and overlapping neural mechanisms for lexical access and syntactic encoding during language production. Society for the Neurobiology of Language
19. Gallée J, Kean HH, Fedorenko E (2020) Robust Neural Adaptation to Syntactic Structure. Cognitive Neuroscience Society.
20. Kean, H. (2019) Probabilistic Program Generation: Intuitive Physical Theory of Balance, Brains, Minds, & Machines (CBMM)
21. Kean HH, Ellis CT, Webb TW, Graziano MSA (2017) Implicit biases about invisible forces that project from the eyes. Princeton Neuroscience Institute Research Symposium
22. Liao VTY, Webb TW, Kean HH, Graziano MSA (2017) Effects of Awareness on the Control of Attention: An Auditory Behavioral Paradigm. Princeton Neuroscience Institute Research Symposium.
23. Kean, H. (2016) TARP γ-8, γ-2, Cornichon, Auxiliary Binding Proteins in AMPA Receptor Trafficking, Seoul National University
24. Webb TW, Kean HH, and Graziano MSA (2015) Awareness alters the control of attention. Poster presented at the Society for Neuroscience Annual Meeting, Chicago.
25. Kean HH, Ogilvie K, Lussier M, Roche K (2014) Binding of MAGUK family proteins to Neuroligin -1 and -2. NINDS Summer Research Symposium.
26. Kean HH, Ogilvie K, Lussier M, Roche K (2014) Binding of MAGUK family proteins to Neuroligin -1 and -2. NINDS Award Ceremony and Winning Presentation Meeting.

OTHER RESEARCH EXPERIENCE

Technical Associate & Lab Manager, *EvLab, Brain & Cognitive Sciences, MIT*	2018 – 2020
Research Assistant, *Princeton Neuroscience Institute, Cognitive Science Fellowship*	2014 – 2018
Research Student, *Semmelweis University Medical School*	Summer 2016
Paideia Institute, *Intern & Project Lead – NeuroLatin Initiative*	2016
Research Fellow, *Seoul National University Medical School Neuroscience Department*	Summer 2015
Cancer Hospital Volunteer, *Seoul National University Hospital*	Summer 2015
Neurosurgery Intern, *Bethesda Surgery Center*	2014
Research Intern, *National Institute of Neurological Disorders and Stroke NINDS/NIH*	Summer 2013

TEACHING & MENTORSHIP EXPERIENCE

Research Mentor, *Undergraduate and Post-bac Research Mentor* 2020-2025
Graduate Resident Tutor, *MIT Simmons Hall – advised students (approx. 30 per year)* 2021-2025
Teaching Assistant (& Guest Lecture), *Infant Cognition 9.85* 2023
Teaching Assistant (& Guest Lecture), *Infant Cognition 9.85* 2022
Peer-to-Peer Tutor, *Aristotle Circle* 2011-2014

MOST RELEVANT COURSEWORK

Diverse Intelligences Summer Institute DISI Summer School 2022
Center for Brain, Minds, & Machines CBMM Summer School 2019
9.590 Lab in Psycholinguistics, with Prof. Ted Gibson, *Brain and Cognitive Sciences, MIT* 2019
9.660 Computational Cognitive Science, with Prof. Josh Tenenbaum, *Brain and Cognitive Sciences, MIT* 2019
Mathematical Tools for Neuroscience, with Prof. Jonathan Pillow *Princeton Neuroscience Institute* 2016
Memory & Cognition, with Prof. Ken Norman**,** *Princeton Neuroscience Institute* 2015

HONORS, AWARDS, & FELLOWSHIPS

Fellowship, K. Lisa Yang Integrative Computational Neuroscience Center 2024
Fellowship, Friends of the McGovern Institute Student Fellow 2022
MIT Presidential Fellowship 2020
Princeton Cognitive Science Fellowship 2018
Streicker International Research Fellowship – fully funded summer research internship at Seoul National 2015
Outstanding Work – Princeton Theatre Class of 2018 2015
James Madison Program Fellowship – fully funded research on Spoken Latin in Rome with the Paideia Institute 2015
National Merit Finalist and Scholarship Recipient 2014
Bausch & Lomb Honorary Science Award 2013
St. Michael's Book Award for Academic Achievement and Social Conscience 2013

SKILLS

Natural Languages: Spanish (proficient), Korean (reading/writing), Latin (proficient)
Programming Languages: Matlab, Python, Java, JavaScript, R/RStudio, HTML/CSS

ACTIVITIES

Peer Mentor / Student Officer, ***EvLab, Brain & Cognitive Sciences, MIT***
Computational Psychiatry & Reinforcement Learning Reading Groups, ***Princeton Neuroscience Institute***
Director/Conference Organizer, ***Conversations on Love – campus-wide interdisciplinary series***
Actor/Volunteer, ***Windows Shakespeare Project, Trenton at-risk low income youth***
Graduate Philosophy of Science Discussion Group, ***Princeton Neuroscience Institute***
Inspiring Women in Philosophy Initiative, ***Scala Foundation***
Actor, ***Mental Health Initiative - Student Monologues***
Peer Representative, ***Honor Committee at Princeton University***
Captain/Lawyer, ***Princeton Mock Trial***
Cognitive Lunch Organizer, ***Brain & Cognitive Sciences Department at MIT***
Organizer, ***MIT Metaphysics Reading Group***
Organizer, ***CAMINO Women's Art Society***
Art Collaboration with Isabel Englebert, ***selected for Armory Show 2024***

MEDIA

The New York Times: The Curious Hole in my Head
Psychology Today: How the Brain Processes Different Components of Language
MIT News: Studies of unusual brains reveal critical insights into brain organization, function
WIRED: She was missing a chunk of her brain. It didn't matter
Psychology Today: The temporal lobe and language development
Devil in the Stack: Searching for the Soul of the New Machine
Science Rehashed Podcast: Cracking the code: the neural basis of computer code comprehension
MIT News: To the brain, reading computer code is not the same as reading language
The New York Art Fair: Times Square Art Exhibit "Presence of the Absence"