

# Tyler Zarus Knowlton

(last updated July 22, 2024)

## Current Address

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## Contact Information

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## Research Interests

**Broad:** psycholinguistics; semantics; language acquisition; the language-thought relationship  
*Specific:* quantification; natural logic; lexical decomposition; syntactic bootstrapping; linguistic universals and learnability; object-files and ensembles; the meaning-cognition interface

## Employment

Postdoctoral Research Fellow 2021-24  
Mind Center for Outreach, Research, and Education ([MindCORE](#))  
**University of Pennsylvania**, Philadelphia, PA

## Education and Training

Ph.D. in Linguistics 2016-21  
*Thesis:* [The psycho-logic of universal quantifiers](#)  
*Advisors:* [Jeffrey Lidz](#) and [Paul Pietroski](#)  
**University of Maryland**, College Park, MD

Lab Manager, [Vision and Cognition Lab](#) 2015-16  
Department of Psychological & Brain Sciences  
**Johns Hopkins University**, Baltimore, MD

B.A. in Cognitive Science (with honors) 2011-15  
Minors in Linguistics, Philosophy, and Psychology  
**Johns Hopkins University**, Baltimore, MD

## Grants, Fellowships, and Awards

[NSF Doctoral Dissertation Improvement Grant](#), “Doctoral Dissertation Research:  
The mental representation and acquisition of the universal quantifiers” 2020  
(NSF #BCS-2017525) (with [Jeffrey Lidz](#))

[Graduate Student Service Award](#) 2020  
University of Maryland, College of Arts and Humanities

[Howard Lasnik Award for Distinguished Teaching by a Graduate Student](#) 2020  
University of Maryland, Linguistics Department

[Jerrold J. Katz Young Scholar Award](#) 2019  
CUNY Conference on Human Sentence Processing

Jacob K. Goldhaber Travel Grant University of Maryland	2018
Fellow, NSF-NRT Training Program, “NRT-DESE: Flexibility in Language Processes and Technology: Human- and Global-Scale” (NRT #1449815)	2017
Phi Beta Kappa Johns Hopkins University	2015
Provost’s Undergraduate Research Award Johns Hopkins University	2014

## Publications

### Books

Lidz, J. & **Knowlton, T.** (under contract) *A course in first language acquisition*. Oxford University Press.

### Refereed Journal Articles

**Knowlton, T.**, Trueswell, J., & Papafragou, A. (under review) *Non-conservative quantifiers are unlearnable*. Language.

Perkins, L., **Knowlton, T.**, Williams, A., & Lidz, J. (2024) *Thematic content, not number matching, drives syntactic bootstrapping*. Language Learning and Development.

Odic, D., **Knowlton, T.**, Wellwood, A., Pietroski, P., Lidz, J., & Halberda, J. (2024) *Observers efficiently extract the min and max element in perceptual magnitudes sets: evidence for a bipartite format*. Psychological Science.

**Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2023) *Individuals versus ensembles and “each” versus “every”: linguistic framing affects performance in a change detection task*. Glossa Psycholinguistics.

**Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2023) *Psycholinguistic evidence for restricted quantification*. Natural Language Semantics.

**Knowlton, T.**, Trueswell, J., & Papafragou, A. (2023) *Keeping quantifier meaning in mind: connecting semantics, cognition, and pragmatics*. Cognitive Psychology.

**Knowlton, T.**, Pietroski, P., Halberda, J., & Lidz, J. (2022) *The mental representation of universal quantifiers*. Linguistics and Philosophy.

**Knowlton, T.**, Hunter, T., Odic, D., Wellwood, A., Halberda, J., Pietroski, P., & Lidz, J. (2021) *Linguistic meanings as cognitive instructions*. Annals of the New York Academy of Sciences.

## Refereed Conference Proceedings (mentees underlined)

- Huang, S.-Z., **Knowlton, T.**, & Schwarz, F. (2024) *Cross-linguistic comparisons on distributive universal quantification: “each” vs. “every” vs. “mei”*. Proceedings of the Linguistic Society of America.
- Knowlton, T.** & Schwarz, F. (2024) *“Every” provides an implicit comparison class when “each” does not*. Proceedings of the 47th Annual Penn Linguistics Conference.
- Ongchoco, J., **Knowlton, T.**, & Papafragou, A. (2023) *Language shifts the representation of sounds in time: from auditory individuals to auditory ensembles*. Proceedings of the Annual Meeting of the Cognitive Science Society.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *New evidence for the unlearnability of non-conservative quantifiers*. Proceedings of the 23rd Amsterdam Colloquium.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *A mentalistic semantics explains “each” and “every” quantifier use*. Proceedings of the Annual Meeting of the Cognitive Science Society.
- Knowlton, T.** & Gomes, V. (2022) *Linguistic and non-linguistic cues to acquiring the strong distributivity of “each”*. Proceedings of the Linguistic Society of America.
- Knowlton, T.** & Lidz, J. (2021) *Genericity signals the difference between “each” and “every” in child-directed speech*. Proceedings of the 45th annual Boston University Conference on Language Development.
- Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2021) *Determiners are “conservative” because their meanings are not relations: evidence from verification*. Proceedings of Semantics and Linguistic Theory 30.

## Volumes Edited

- Knowlton, T.**, Schwarz, F., & Papafragou, A. (Eds.) (2023) *Proceedings of the second Experiments in Linguistic Meaning (ELM 2)*. Linguistic Society of America.

## Presentations

### Invited Talks

- Knowlton, T.** (2024) *Learnability and linguistic meanings: the case of conservativity*. Cognitive Development Center Seminar Series, Central European University.
- Knowlton, T.** (2023) *Universal quantifiers: logically equivalent, psychologically distinct*. Linguistics & Cognitive Science Colloquium, University of Delaware.
- Knowlton, T.** (2023) *Universal quantifiers, objects, and ensembles: a case study in psychosemantics*. 19th Workshop on Syntax, Semantics and Phonology, Nantes Université.

- Knowlton, T.** (2023) *The poverty of the stimulus in the animal kingdom (humans included)*. 19th Workshop on Syntax, Semantics and Phonology (pre-workshop course), Nantes Université.
- Knowlton, T.** (2023) *Different determiners invite different ways of restricting and representing the domain*. The New York Philosophy of Language Workshop, New York University.
- Knowlton, T.** (2023) *What conservativity tells us about Universal Grammar*. Linguistics Colloquium, University of Maryland.
- Knowlton, T.** (2022) *Non-conservative quantifiers are unlearnable (and what that means for semantic theory)*. The Psycholinguistics Workshop, University of Massachusetts Amherst.
- Knowlton, T.** (2022) *Every universal is first-orderizable, but only “each” is first-ordered*. Cognitive Semantics and Quantities Workshop, University of Amsterdam.
- Knowlton, T.** (2021) *The psycho-logic of “each” and “every”*. LingLangLunch, Brown University.
- Knowlton, T.** (2021) *The psycho-logic of universal quantifiers*. Linguistics Colloquium, University of Southern California.
- Knowlton, T.** (2019) *The psychological treatment of (universal) quantification*. Integrated Language Sciences and Technology Seminar, University of Pennsylvania.
- Knowlton, T.** (2018) *Are natural language quantifiers first- or second-order?* McDonnell Network Focused Workshop on “The Development of Set and Quantifier Representations”, Johns Hopkins University.

## Conference Talks

- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2024) *Conservativity, learnability, and grammatical architecture*. Workshop on Explaining Semantic Universals, The 9th Conference of the Scandinavian Association for Language and Cognition, Norwegian University of Science and Technology.
- Knowlton, T.** & Schwarz, F. (2023) *“Every” provides an implicit comparison class when “each” does not*. The 47th annual Penn Linguistics Conference (PLC), University of Pennsylvania.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2023) *Non-conservative quantifiers are unlearnable*. Linguistic Society of America (LSA) Annual Meeting, Denver, CO.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *New evidence for the unlearnability of non-conservative quantifiers*. Workshop on Biases in Language and Cognition, 23rd Amsterdam Colloquium (AC), Amsterdam, Netherlands.
- Gomes, V., **Knowlton, T.**, Papafragou, A., & Trueswell, J. (2022) *Differentiating universal quantifiers by differentiating their domains*. Boston University Conference on Language Development (BUCLD) 47, Boston University.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *A mentalistic semantics explains “each” and “every” quantifier use*. 44th Annual Meeting of the Cognitive Science Society (CogSci), Toronto, Canada.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2022) *Universal quantification without language? Ten-month-old infants represent the exhaustivity of a relation in visually presented events*. Symposium on The Language of Thought, 3rd Joint Conference of the Society for Philosophy and Psychology and the European Society of Philosophy and Psychology (SPP/ESPP), Milan, Italy.

- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2022) *On the origins of universal quantification: 10-month-old infants represent the exhaustivity of multi-agent intentional actions*. XXIII International Congress of Infant Studies (ICIS) Biennial Congress, Ottawa, Canada.
- Knowlton, T.** & Gomes, V. (2022) *Linguistic and non-linguistic cues to acquiring the strong distributivity of “each”*. Linguistic Society of America (LSA) Annual Meeting, Washington, DC.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2021) *Evaluating “each”- (but not “every”-) sentences encourages encoding individual properties*. 34th CUNY Conference on Human Sentence Processing, University of Pennsylvania.
- Knowlton, T.** & Lidz, J. (2021) *Bootstrapping universal quantifiers: the role of genericity*. Linguistic Society of America (LSA) Annual Meeting, San Francisco, CA.
- Knowlton, T.** & Lidz, J. (2020) *Genericity signals the difference between “each” and “every” in child-directed speech*. Boston University Conference on Language Development (BUCLD) 45, Boston University.
- Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2020) *Memory for cardinality supports a non-relational account of conservativity*. Experiments in Linguistic Meaning (ELM) 1, University of Pennsylvania.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2020) *An investigation of the origins of logical quantification: infants’ (and adults’) representations of exhaustivity in collective or individual complex actions*. Symposium on Learning ‘hard words’, XXII International Congress of Infant Studies (ICIS) Biennial Congress, Glasgow, Scotland.
- Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2020) *Conservative meanings with only one set: evidence from verification*. 33rd CUNY Conference on Human Sentence Processing, University of Massachusetts Amherst.
- Knowlton, T.**, Pietroski, P., Halberda, J., & Lidz, J. (2019) *The mental representation of universal quantifiers: evidence from verification*. 32nd CUNY Conference on Human Sentence Processing, University of Colorado Boulder.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2018) *Acquiring the universal quantifiers: every part together or each part on its own?* Boston University Conference on Language Development (BUCLD) 43, Boston University.

#### Conference Posters / Lightning Talks (mentees underlined)

- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2024) *(Im)possible determiners and their learnability*. Boston University Conference on Language Development (BUCLD) 49, Boston University.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2024) *The strength of a universal*. 46th Annual Meeting of the Cognitive Science Society (CogSci), Rotterdam, Netherlands.
- Huang, S.-Z., **Knowlton, T.**, & Schwarz, F. (2024) *Cross-linguistic comparisons on distributive universal quantification: “each”/“every” vs. “mei”*. Linguistic Society of America (LSA) Annual Meeting, New York, NY.
- Ongchoco, J., **Knowlton, T.**, & Papafragou, A. (2023) *Language Shifts the Representation of Sounds in Time: From Auditory Individuals to Auditory Ensembles*. 45th Annual Meeting of the Cognitive Science Society (CogSci), Sydney, Australia.

- Knowlton, T.** & Schwarz, F. (2023) *“Every” provides an implicit comparison class when “each” does not*. 36th Annual Conference on Human Sentence Processing (HSP), University of Pittsburgh.
- Cesana-Arlotti, N., Icard, T., **Knowlton, T.**, Lidz, J., Pietroski, P., & Halberda, J. (2023) *The slower they swim, the faster they fly! Can preverbal infants learn antitonic functions?* Budapest CEU Conference on Cognitive Development (BCCCD) 23, Budapest, Hungary.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *Non-conservative quantifiers are unlearnable*. Boston University Conference on Language Development (BUCLD) 47, Boston University.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *A psycho-semantic explanation of “each” and “every” quantifier use*. Experiments in Linguistic Meaning (ELM) 2, University of Pennsylvania.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2022) *Universal quantification without language? Ten-month-old infants represent the universality of visually presented properties*. Experiments in Linguistic Meaning (ELM) 2, University of Pennsylvania.
- Knowlton, T.**, Trueswell, J., & Papafragou, A. (2022) *Psycho-semantic representations explain “each” and “every” quantifier use*. 35th Annual Conference on Human Sentence Processing (HSP), University of California, Santa Cruz.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2021) *An investigation of the origins of logical quantification: infants’ (and adults’) representations of exhaustivity in collective or individual complex actions*. Society for Philosophy and Psychology (SPP) 47th Annual Meeting, Princeton University.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2021) *Representing the exhaustivity of collective and individual actions: an investigation of universal quantification in adults and infants*. 12th Dubrovnik Conference on Cognitive Science, Virtual.
- Knowlton, T.**, Pietroski, P., Williams, A., Halberda, J., & Lidz, J. (2020) *Determiners are ‘conservative’ because their meanings are not relations: evidence from verification*. Semantics and Linguistic Theory (SALT) 30, Cornell University.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2020) *An investigation of the origin of logical quantification: infants’ and adults’ representations of collective and distributive actions in complex visual scenes*. 42nd Annual Meeting of the Cognitive Science Society, Virtual.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., & Halberda, J. (2020) *Who’s chasing whom? Adults’ and infants’ engagement of quantificational concepts (“each” and “all”) when representing visual chasing events*. Vision Sciences Society (VSS) 20th Annual Meeting, Virtual.
- Cesana-Arlotti, N., **Knowlton, T.**, Lidz, J., Pietroski, P., & Halberda, J. (2019) *Concepts of universal quantification (“each” and “all”) may support infant and adult understanding of collective and distributive actions*. Cognitive Development Society (CDS) 2019 Biennial Meeting, Louisville, KY.
- Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2019) *A novel memory task reveals early understanding of quantifier meanings*. Society for Research in Child Development (SRCD) 2019 Biennial Meeting, Baltimore, MD.
- Knowlton, T.**, Pietroski, P., Halberda, J., & Lidz, J. (2019) *Representational format and universal quantifiers*. Linguistic Society of America (LSA) Annual Meeting, New York, NY.
- Perkins, L., **Knowlton, T.**, Williams, A., & Lidz, J. (2018) *Matching number vs. linking roles: using 3-participant scene percepts to understand infants’ bootstrapping*. Boston University

Conference on Language Development (BUCLD) 43, Boston, MA.

**Knowlton, T.**, Perkins, L., Williams, A., & Lidz, J. (2018) *Getting a grip on infants' event representations: participant number in TAKE and PICK-UP*. XXI International Congress of Infant Studies (ICIS) Biennial Congress, Philadelphia, PA.

**Knowlton, T.**, Wong, A., Halberda, J., Pietroski, P., & Lidz, J. (2018) *Different determiners, different algorithms: two majority quantifiers in Cantonese bias distinct verification strategies*. 31st CUNY Conference on Human Sentence Processing, University of California, Davis.

**Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2017) *Sentences, centers, and sets: set selection and the meanings of more and most*. Cognitive Development Society (CDS) Biennial Meeting, Portland, OR.

**Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2017) *Distinguishing first- from second-order specifications of each, every, and all*. Mid-Atlantic Colloquium of Studies in Meaning (MACSIM) 7, Georgetown University.

**Knowlton, T.**, Halberda, J., Pietroski, P., & Lidz, J. (2017) *Set selection and storage reflect differences in quantifier meanings*. McDonnell Network Plenary Workshop on "The Ontogenetic Origins of Combinatorial Thought", University of California, San Diego.

Perkins, L., **Knowlton, T.**, Hirzel, M., Dudley, R., Williams, A., & Lidz, J. (2017) *Linguistic and conceptual structure in verb learning*. McDonnell Network Plenary Workshop on "The Ontogenetic Origins of Combinatorial Thought", University of California, San Diego.

## Teaching and Mentorship

### Teaching Experience

#### *University of Pennsylvania*

Instructor of Record: [Language, Cognition, and Culture](#) (LING1720) Spring 2024  
Designed and taught undergraduate seminar

Coordinator: Cognition, Language, And Perception Seminar (CLAPS) Fall 2022  
Lead ~15 person graduate seminar

#### *University of Maryland*

Instructor of Record: [Language and Thought](#) (LING449T) Spring 2020  
Designed and taught undergraduate seminar

TA: Grammar and Meaning (LING410; Instructor: Valentine Hacquard) Fall 2019  
Responsible for grading, office hours, reviewing p-sets in class, once teaching ~25 student lecture

TA: Child Language Acquisition (LING444; Instructor: Jeffrey Lidz) Spring 2019  
Responsible for grading, office hours, helping write exams, once teaching ~20 student lecture

TA: Language and Mind (LING240; Instructor: Tonia Bleam) Fall 2018  
Responsible for grading, office hours, review sessions, twice teaching ~50 student lecture

TA: Introductory Linguistics (LING200; Instructor: Tonia Bleam) Spring 2018  
Responsible for weekly discussion section of ~30 students, grading, office hours

## Mentorship Experience

### *University of Pennsylvania*

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|---|---------|
| Cognitive science independent study co-mentor   | 2022-23 |
| – Supervised 2 undergraduate thesis projects  |         |
| – Mentee J. Ongchoco won the 2023 Robert J. Glushko Outstanding Undergraduate Award in Cognitive Science and a Phi Beta Kappa Senior Thesis Award |         |
| MindCORE <a href="#">Step-Ahead Mentorship Program</a>  | 2021-22 |
| – Supervised 1 undergraduate student  |         |

### *University of Maryland*

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| Undergraduate mentor, <a href="#">Project on Children's Language Learning</a>  | 2018-21 |
| – Supervised 7 undergraduate research assistants   |         |
| High school summer intern mentor, <a href="#">Project on Children's Language Learning</a>  | 2019    |
| – Mentee S. Chervenak won “Best Paper in Behavioral Sciences” from the Washington Academy of Science for his presentation at the Blair Magnet School STEM Fair |         |

### *Johns Hopkins University*

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| Undergraduate mentor, <a href="#">Vision and Cognition Lab</a> | 2015-16 |
| – Supervised 5 undergraduate research assistants               |         |

## Academic Activities

### Service

#### *University of Pennsylvania*

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|---|---------|
| Organizing committee, <a href="#">ELM 3</a> (Experiments in Linguistic Meaning)   | 2023-24 |
| Admissions committee, <a href="#">DivE In</a> (Diversity and Equity Initiative) 3 <sup>rd</sup> & 4 <sup>th</sup> Annual Mentorship Weekend | 2023-24 |
| Proceedings co-editor, <a href="#">ELM</a> (Experiments in Linguistic Meaning)  | 2022-24 |
| Volunteer, <a href="#">The 9<sup>th</sup> MACSIM</a> (Mid-Atlantic Colloquium of Studies in Meaning)  | 2023    |
| Student mentor, <a href="#">DivE In</a> (Diversity and Equity Initiative) 2 <sup>nd</sup> Annual Mentorship Weekend                         | 2022    |
| Host, <a href="#">Behind the CV: Stories from Faculty</a>   | 2022    |
| MindCORE <a href="#">Outreach Committee</a>   | 2021    |
| Organizing committee, <a href="#">ELM 2</a> (Experiments in Linguistic Meaning)   | 2021-22 |

#### *University of Maryland*

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| Linguistics Colloquium Committee  | 2019-21 |
| Organizing committee, <a href="#">Mayfest 2020: Hindsight</a> (postponed due to COVID-19) | 2019-20 |



Co-organizer, Developmental Science Workshop entitled <i>Endless Possibilities: The Development of Possibility and Necessity in Cognition, Language, and Society</i>	2018-19
Chair, Language Science Outreach Committee	2018-19
Planning committee, Winter Storm 10 (graduate student skills workshop)	2017-18
Co-chair, Linguistics Graduate Student Association	2017-18
Career fair coordinator, Language Science Outreach Committee	2016-18
Planning committee, Winter Storm 9 (graduate student skills workshop)	2016-17
Organizing committee, SALT 27 (Semantics And Linguistic Theory)	2016-17

## Ad Hoc Reviewing

### *Manuscripts*

Cognitive Science  
Discourse Processes  
First Language  
Journal of Memory and Language (×3)  
Journal of Semantics (×2)  
Language Learning and Development (×3)  
Natural Language Semantics  
PLOS One

### *Proposals*

National Science Foundation Doctoral Dissertation Research Improvement Grant

### *Conference Abstracts/Papers*

Annual Conference on Human Sentence Processing  
Annual Meeting of the Cognitive Science Society  
Budapest CEU Conference on Cognitive Development  
European Summer School in Logic, Language and Information  
Experiments in Linguistic Meaning  
Penn Linguistics Conference  
Procedural and Computational Models of Semantic and Pragmatic Processes  
Sinn und Bedeutung

## Professional Memberships

Society for Human Sentence Processing  
Cognitive Science Society  
Society for Research in Child Development  
International Congress of Infant Studies  
Cognitive Development Society  
Linguistic Society of America