

Erik P Hoel, PhD
Curriculum Vitae
Postdoctoral researcher

NeuroTechnology Center
Department of Biological Sciences
Columbia University
New York, NY, 10027, USA

hoelerik@gmail.com
www.erikphoel.com
@erikphoel

University education

- | | |
|---------------------------------|---|
| PhD, 2010 (Sept.) – 2016 (Jan.) | University of Wisconsin-Madison, WI
Advisor: Giulio Tononi, M.D., PhD.
Thesis: “Brain organization and information integration” |
| B.A. 2006 (Sept.) – 2010 (May) | Hampshire College, MA
Advisor: Jane Couperus, PhD.
Theses: “A Graph-Theoretic Approach to the Neural Correlates of Consciousness” and “Closing the Explanatory Gap in Philosophy of Mind” |
-
-

Published papers

a. Peer-reviewed journal articles

1. Klein, B. & **Hoel, E.** Causal Emergence in Complex Networks. In prep.
2. Wenzel, M, Shuting, H., Smith, E., **Hoel, E.**, House, P., Yuste, R. Cortical micro-substrates of drug-induced loss of consciousness. In prep.
3. **Hoel, E.**, Wenzel, M., & Yuste, R. The complexity of neural activity at different levels of consciousness. In prep.
4. Albantakis, L., Marshall, W., **Hoel, E.**, & Tononi, G. What causes what? An irreducible account of actual causation. Available on *arXiv*. Under review.
5. **Hoel, E.** (2017) When the map is better than the territory. *Entropy*, 19(5), 188. Selected for the issue cover.
6. **Hoel, E.** (2017) Agent above, atom below. Foundational Questions Institute prizewinner. Included in *Wandering Toward a Goal*, selected to be part of Springer’s *Frontiers Collection*.
7. **Hoel, E.**, Albantakis, L., Marshall, W., & Tononi, G. (2016) Can the macro beat the micro? Integrated information across spatiotemporal scales. *Neuroscience of Consciousness*, no.1.
8. **Hoel, E.**, Albantakis, L., Cirelli, C., & Tononi, G. (2016) Synaptic refinement during development and its effect on slow-wave activity: a computational study. *Journal of neurophysiology* 115.4: 2199-2213.
9. **Hoel, E.**, Albantakis, L., & Tononi, G. (2013) Quantifying causal emergence shows that macro can beat micro. *Proceedings of the National Academy of Sciences* 110.49: 19790-19795 (2013).

b. Peer-reviewed conference publications

1. Aubert-Kato, N., Witkowski, O., **Hoel, E.**, Bredeche, N. (2016) Towards Detecting the Emergence of Agency in Evolved Artificial Chemistries. Carlos Gershenson, Tom Froese, Jesus

M. Siqueiros, Wendy Aguilar, Eduardo J. Izquierdo and Hiroki Sayama (eds.), *Artificial Life XV: Late-Breaking Proceedings of the Fifteenth International Conference on the Synthesis and Simulation of Living Systems*, 20–21.

Poster presentations

1. Klein, B & Hoel, E. *Causal Emergence in Complex Networks*. (2018) The International Conference on Complex Networks.
 2. Aubert-Kato, N., Witkowski, O., Hoel, E., & Bredeche, N. (2016) *Decision Making in Messy Chemistries: Case Study with an Invasion-based Reaction Diffusion Scenario*. Proceedings of the International Conference on Unconventional Computation and Natural Computation.
 3. Hoel, E., Albantakis, L., & Tononi, G. (2015) *The spatial and temporal scale of conscious experience*, presented at the Association for the Scientific Study of Consciousness.
 4. Hoel, E., Albantakis, L., & Tononi, G. (2014) *Synaptic refinement and brain organization*. Presented at the Neuroscience Research Symposium of the Neuroscience Training Program.
 5. Albantakis, L., Hoel, E., Oizumi, M., Koch, C., & Tononi, G. (2014) *Intrinsic causation and consciousness*. Presented at The Association for the Scientific Study of Consciousness.
 6. Hoel, E., Albantakis, L., & Tononi, G. (2012) *The 'neural code' from the intrinsic perspective: Quantifying causal power at different spatiotemporal scales*. Present at Frontiers in Computational Neuroscience Conference.
 7. Hoel, E., Hogan, M., Couperus, J. W. (2010) *The network properties of conscious experience: relative blindsight, 'small worlds,' and functional connectivity*. Presented at The Association for the Scientific Study of Consciousness.
 8. Couperus, J. W., Hoel, E., Alperin, B. (2009) *Perceptual load modifies processing of distractor stimuli both in the presence and absence of target stimuli*. Presented at the Annual Meeting of the Cognitive Neuroscience Society.
-

Other publications

a. Essays and articles

1. "Intellectuals defend the value of being intellectuals" in *Scientific American* (2017).
2. "Fiction in the Age of Screens." *The New Atlantis* (2016).
3. "Why Do We Sleep?" *Big Questions Online* (2016).
4. "How to Mathematically Measure Consciousness." *The Daily Beast* (2016).
5. "City on Fire by Garth Risk Hallberg proves how Culturally Dominant Television Has Become." *The Atlantic* (2015).
6. "Why Free-Range Kids Are Healthier." *The Daily Beast* (2014).
7. "Science as a Subject of Art." *SciArt Magazine* (2013).
8. "A Review of Incomplete Nature: How Mind Emerged from Matter." The Neuroethics Blog of Emory University (2012).
9. "Framing and Responsibility in Consciousness Studies." The Neuroethics Blog of Emory University (2012).

b. Short stories

1. "E Pluribus Unum." *The Center for Fiction Emerging Writers collection* (2017).
2. "Higher Education." *Arts & Letters* (2017).
3. "Ars Memoritiva." Winner of the *Writer's Digest* Literary Fiction Award; anthologized in the 77th Annual Writer's Digest Writing Contest Collection (2012)

4. “The Substance I am Made of.” Anthologized in *American Fiction: Vol 12* (2012).
5. “Big Cats.” A winner in the Emerging Writer Awards; published in *Our Stories* (2010).
6. “All the Anne Franks.” *Strange Horizons* (2009).

Research talks

1. “The Hierarchical Causal Structure of Biological Life” at the Beyond Center at Arizona State University (2017, **Invited**, upcoming)
2. “Quantifying emergence and reduction” at the Network Science Institute (2017, **Invited**).
3. “Some Things Can’t be Reduced: Agents and their Causal Structure” at the London School of Economics (2017, **Invited**).
4. “Literature and the Hard Problem of Consciousness” presented at the Institute for Advanced Study (2016, **Invited**).
5. “Brain Organization and Integrated Information” for the public defense portion of the PhD for the Neuroscience Training Program at the University of Wisconsin-Madison (2016).
6. “Causal Emergence and Neural Ensembles” at the NeuroTechnology Center at Columbia University (2015, **Invited**).
7. “Measuring Causal Emergence” at the Center for Theoretical Neuroscience at Columbia University (2015, **Invited**).
8. “How the Macro Beats the Micro” presented at the workshop on The Integrated Information Theory of Consciousness: Foundational Issues at New York University (2015, **Invited**).
9. “Brain organization and the spatiotemporal scale of brain activity” for the Neuroscience Training Program seminar series at the University of Wisconsin-Madison (2015).
10. “The Limits of Reductionism” at Hampshire College’s 40th anniversary celebration (2013, **Invited**).
11. “Graph Theory and the Neural Correlates of Consciousness” in the Division III Presentation Series at Hampshire College (2010).
12. “Electrophysiological Evidence of Pattern Completion and Separation in the CA1 Region of the Macaque Hippocampus” at the Summer Undergraduate Research Program at New York University (2008).

Research positions

2016 (Apr.) – ongoing	COLUMBIA UNIVERSITY, New York, NY Advisor: Rafael Yuste <i>Postdoctoral researcher: Causal structure of the cortex</i>
2016 (May) – 2017 (May)	INSTITUTE FOR ADVANCED STUDY, Princeton, NJ Advisor: Piet Hut, Head of The Program of Interdisciplinary Studies <i>Visiting scholar: Measures of the level and content of consciousness</i>
2016 (Sept.) – ongoing	YHouse Inc, Hoboken, NJ <i>Co-founder: Chair of Development and outreach</i>
2010 (Sept.) – 2016 (Jan.)	UNIVERSITY OF WISCONSIN-MADISON, Madison, WI. Advisor: Giulio Tononi <i>Graduate student: Developing Integrated Information Theory (IIT)</i>

- 2008 (Sept.) – 2010 (May) HAMPSHIRE COLLEGE, Amherst, MA
 Advisor: Jane Couperus, Dean of the School of Cognitive Science
EEG lab manager: Neuroimaging research of attention
- 2008 (summer) NEW YORK UNIVERSITY, New York, NY
 Advisor: Wendy Suzuki, Professor of Neural Science
NSF research internship: Electrophysiology in primates
-

Honors/Awards/Grants

a. Honors and prizes

Forbes 30 under 30 in Science Finalist (decision on winners pending); Foundational Questions Institute prize winner; NYC Emerging Writers Fellow; First place winner of the Writer's Digest Annual short story competition; Neuroscience Training Program Merit Scholarship; Honorable mention in the Writers of the Future Award; Hampshire College Faculty Choice Scholarship; Emerging writer award from *Our Stories*.

b. Awarded grants (contributed to or PI)

DARPA – Breaking the Code: engineering neural controllers and behavior in the hydra (~\$7,500,000); Templeton World Charity Foundation – Grant ID: TWCF 0067/AB41 (~\$2,500,000); Culture, Brain, and Development Grant: brain structure in ADHD; School of Cognitive Science Grant; Culture, Brain, and Development Research Assistantship Grant; School of Natural Science Grant; SURP at the Center for Neural Science at NYU, NSF-REU; Culture, Brain, and Development grant: neuronal development; Coppinger Grant to study human evolution.

Teaching and public outreach

a. Teaching/Assistantships

- 2014 – 2015 (summers) PEOPLE Program, Madison, WI
Taught neuroscience to low-income minority high school students
- 2009 HAMPSHIRE COLLEGE Amherst, MA
TA: "Minds, Brains, Machines."
- 2009 HAMPSHIRE COLLEGE, Amherst, MA
TA: "Gene Cloning."
- 2008 HAMPSHIRE COLLEGE, Amherst, MA
TA: "Brain Mechanisms."

b. Organizations

I co-founded YHouse, Inc, a registered nonprofit organization based in New York City devoted to scientific outreach, innovative and transdisciplinary research, intellectual partnership, and public discourse tackling questions on awareness, consciousness, and the future of intelligence. We host ongoing programs of public lecture series, events, weekly meetups, and conversations about scientific and philosophical approaches to consciousness, often in partnership with other organizations.

c. *Public talks and events*

1. “The Threat of Artificial Intelligence.” A live debate onstage with Simon Dedeo at the Caveat Center in Brooklyn (upcoming).
2. “How We Experience.” I will be leading a conversation with Zia Haider Rahman and Mark de Silva about consciousness and literature (upcoming).
3. Appearing on Story Collider’s live event at the Caveat Center and accompanying podcast in an episode about the theme of consciousness (upcoming).
4. “An Evening with the 2017 Emerging Writers.” I and the other fellows read short pieces (2017).
5. “Emergence, Free Will, and Causal Responsibility,” delivered at the Consciousness Club of YHouse, Inc (2017).
6. “The Mind-Body Problem: The More Theories the Better?” speaking with John Horgan, on the current state of the field of consciousness research, at the Consciousness Club (2017).
7. “The Origins of Awareness,” as a panel member of the series *Chasing Consciousness: from cells to societies, neuroscience to machine awareness*. I co-organized the series and it was co-hosted at the Rubin Museum of Art in partnership with YHouse, Inc (2016).
8. “The Hard Problem of Consciousness or the Hard Problem of Matter?” as part of the *Chasing Consciousness: from cells to societies, neuroscience to machine awareness* series at the Rubin Museum of Art, in partnership with YHouse, Inc (2016).

References

Rafael Yuste, M.D., PhD
 PI of the NeuroTechnology Center
 Department of Biological Sciences
 Columbia University
 906 NWC Building
 550 West 120th St
 New York, NY 10027
 rmy5@columbia.edu
 (212) 854-2354

Piet Hut, PhD
 Head of the Program in Interdisciplinary Studies
 Professor, Program of Interdisciplinary Studies
 Institute for Advanced Study
 1 Einstein Drive
 Princeton, NJ 08540
 piet@ias.edu
 (609) 734-8075

Giulio Tononi, M.D., PhD
 Distinguished Chair in Consciousness Research
 Center for Sleep and Consciousness
 University of Wisconsin
 6001 Research Park Blvd
 Madison, WI 53719
 gtononi@wisc.edu
 (608) 263-6063