
ERAN AGMON, Ph.D.

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PROFESSIONAL APPOINTMENTS

University of Connecticut Health Center, Farmington, CT *2022–present*
Assistant Professor of Molecular Biology and Biophysics,
Center for Cell Analysis and Modeling,
Biomedical Engineering Department

Stanford University, Stanford, CA *2017–2022*
Postdoctoral Research Fellow, Department of Bioengineering
Funding: NIH F32 Fellowship

Columbia University, New York City, NY *2016–2017*
Postdoctoral Research Scientist, Department of Biological Sciences

EDUCATION AND TRAINING

Indiana University, Bloomington, IN *2016*
Joint Ph.D., Informatics and Computing, and Cognitive Science
Funding: NSF Integrative Graduate Education and Research Traineeship (IGERT) Fellowship

Portland State University, Portland, OR *2011*
M.Sc. in Systems Science

University of California, San Diego, San Diego, CA *2009*
B.S., Cognitive Science (minor in Biology)

RESEARCH EXPERIENCE

Stanford University Stanford, CA
Integrative, multi-scale modeling software for computational biology *2019–2022*
Adviser: Markus W. Covert
• Led the development of Vivarium – a software tool that can make any mechanistic model into a module that can be wired together in multi-scale hybrid simulations.

Allen Discovery Center for Systems Modeling of Infection Stanford, CA
Whole-cell model of Escherichia coli *2017–2022*
Adviser: Markus W. Covert
• Worked with computational scientists, software engineers, and experimentalists to build the most comprehensive computational model of *E. coli* in the world.

Columbia University New York City, NY
Molecular model of membranes, lipid homeostasis, and cell death *2016–2017*
Adviser: Brent R. Stockwell
• Developed a coarse-grained molecular model of lipid membrane composition associated with a type of cell death called ferroptosis.

Indiana University

Bloomington, IN

Dissertation research: Spatial model of metabolism/membrane interactions in a protocell

2013–2016

Committee: Randall D. Beer (chair), Colin Allen, Peter M. Todd, James A. Glazier

- Developed a spatial model of a protocell that emerges from the co-construction of metabolism and membrane.
- Applied a perturbational analysis to quantify the simulation's robustness, plasticity, fragility, and viability.

Indiana University

Bloomington, IN

Computational model of action-switching agents

2011–2013

Advisor: Randall D. Beer

- Built a computational model to investigate the dynamics of embedded agents that can autonomously switch between actions, and applied a genetic algorithm for parameter search.

PUBLICATIONS

Published:

1. Shaikh, B., Smith, L. P., Vasilescu, D., Marupilla, G., Wilson, M., Agmon, E., [...] and Karr, J. R. (2022). BioSimulators: a central registry of simulation engines and services for recommending specific tools. *Nucleic Acids Research*: <https://doi.org/10.1093/nar/gkac331>
2. **Agmon, E.**, Spangler, R.K., Skalnik, C.J., Poole, W., Morrison, J.H., Peirce, S.M., and Covert, M.W. (2022). Vivarium: an interface and engine for integrative multi-scale modeling in computational biology. *Bioinformatics*, 38(7), 1972-1979.
3. Covert, M.W., Gillies, T.E., Kudo, T., and **Agmon, E.** (2021). A forecast for large-scale, predictive biology: lessons from meteorology. *Cell Systems*, 12: 6.
4. **Agmon, E.**, and Spangler, R.K. (2020). A multi-scale approach to modeling *E. coli* chemotaxis. *Entropy*, 22: 1101.
5. Macklin, D.N., Ruggero, N.A., Carrera, J., Choi, H., Horst, T.A., Mason, J.C., Sun, G., **Agmon, E.**, DeFelice, M.M., Maayan, I., Lane, K., Spangler, R.K., Gillies, T.E., Paull, M.L., Akhter, S., Bray, S.R., Weaver, D.S., Keseler, I.M., Karp, P.D., Morrison, J.H., and Covert, M.W. (2020). Simultaneous cross-evaluation of heterogeneous *E. coli* datasets via mechanistic simulation. *Science*, 369, eaav3751.
6. Talman, L., **Agmon, E.**, Peirce, S.M., and Covert, M.W. (2019). Multiscale models of infection. *Current Opinion in Biomedical Engineering*, 11, 102-108.
7. **Agmon, E.**, Solon, J., Bassereau, P., and Stockwell, B.R. (2018). Modeling the effects of lipid peroxidation during ferroptosis on membrane properties. *Scientific Reports*, 8(1): 5155.
8. **Agmon, E.** and Stockwell, B.R. (2017). Lipid homeostasis and regulated cell death. *Current Opinion in Chemical Biology*. 39: 83-89.
9. **Agmon, E.**, Gates, A.J., and Beer, R.D. (2016). The structure of ontogenies in a model protocell. *Artificial Life* 22 (4): 499-517.
10. Taylor, T., Bedau, M. A., Channon, A., et al. (2016). Open-Ended Evolution: Perspectives from the OEE1 Workshop in York. *Artificial Life* 22 (3): 408-423.
11. **Agmon, E.**, Gates, A.J., Churavy, V. and Beer, R.D. (2016). Exploring the space of viable configurations in a model of metabolism-boundary co-construction. *Artificial Life*, 22 (2): 153-171.
12. **Agmon, E.**, & Beer, R. D. (2014). The evolution and analysis of action switching in embodied agents. *Adaptive Behavior*, 22(1), 3-20.
13. **Agmon, E.** (2014). Action Switching in Brain-Body-Environment Systems. In *Guided Self-Organization: Inception* (pp. 295-318). Springer Berlin Heidelberg.

In review:

1. Skalnik, C.J., **Agmon, E.**, Spangler, R.K., Talman, L., Morrison, J.H., Peirce, S.M., and Covert, M.W. (in review). Whole-Colony Modeling of *Escherichia coli*. *bioRxiv*.

In preparation:

1. Hickey, J.W., **Agmon, E.**, Horowitz, N., Lamore, M., Sunwoo, J., Covert, M.W., and Nolan, G.P. (in preparation). Integrating Multiplexed Imaging and Multiscale Modeling Identifies Tumor Phenotype Transformation as a Critical Component of Therapeutic T Cell Efficacy.
2. Hickey J.W., Horowitz, N., Caraccio, C., Tan, Y., Clave, X.R., Zhu, B., Vasquez, G., Barlow, G., **Agmon, E.**, Goltsev, Y., Sunwoo, J., Covert, M.W., and Nolan, G.P (in preparation). Therapeutic T Cells Can Drive Tumor Tissue Restructuring Critical for Mounting a Coordinated Immune Response.

Selected conference proceedings:

1. Covert, M.W., and **Agmon, E.** (2019). Building whole-cell computational models to predict cellular phenotypes and accelerate discovery. *Proceedings of the Solvay Conference in Chemistry*.
2. **Agmon, E.**, Glazier, J.A, and Beer, R.D. (2017). Structural Coupling of a Potts Model Cell. *Proceedings of the 14th European Conference on Artificial Life 2017*, (pp. 13-20). MIT Press.
3. Virgo, N., **Agmon, E.**, and Fernando, C. (2017). Lineage selection leads to evolvability at large population sizes. *Proceedings of the Fourteenth European Conference on Artificial Life*, (pp. 420-427). MIT Press.
4. **Agmon, E.**, Gates, A.J., and Beer, R.D. (2015). Ontogeny and adaptivity in a model protocell. In P. Andrews, L. Caves, R. Doursat, S. Hickinbotham, F. Polack, S. Stepney, T. Taylor & J. Timmis (Eds.), *Proceedings of the European Conference on Artificial Life 2015* (pp. 216-223). MIT Press. [**Winner of Best Paper Award**]
5. **Agmon, E.**, Gates, A.J., Churavy, V. and Beer, R.D. (2014). Quantifying robustness in a spatial model of metabolism-boundary co-construction. In H. Sayama, J. Rieffel, S. Risi, R. Doursat & H. Lipson (Eds.), *Artificial Life 14: Proceedings of The Fourteenth International Conference on the Synthesis and Simulation of Living Systems* (pp. 514-521). MIT Press.

RESEARCH GRANTS

NIH P41 <i>Center for Reproducible Biomedical Modeling.</i>	2022-present
DARPA ASKEM <i>Building a Causal Inference Engine for Multi-Scale Simulations.</i>	2022-present
NIH F32 Postdoctoral Fellowship <i>Adding an environment and motility in a whole-cell model of Escherichia coli</i>	2020-2022
NSF IGERT Fellowship. <i>Brain-Body-Environment Systems in Behavior and Cognition.</i>	2011–2015

AWARDS AND HONORS

Outstanding Dissertation Award, <i>Indiana University Cognitive Science.</i>	2017
Best Paper Award, <i>European Conference on Artificial Life.</i>	2015
1st Place Poster, <i>NSF IGERT Research Showcase.</i>	2015
Outstanding Teaching Award, <i>Indiana University Cognitive Science.</i>	2014
1st Place Poster, <i>NSF IGERT Research Showcase.</i>	2014
Supplemental Research Fellowship, <i>Cognitive Science Program.</i>	2014
2nd Place Poster, <i>NSF IGERT Research Showcase</i>	2013

OTHER AFFILIATIONS

NASA Ames Research Center <i>Research Affiliate, Center for the Emergence of Life</i>	Moffett Field, CA 2021
• Collaborated on machine learning approaches to modeling RNA synthesis and selection at the origin of life.	
Institute for Advanced Study <i>Visiting Scholar, Program in Interdisciplinary Studies</i>	Princeton, NJ 2016–2017
• Co-founded YHouse, a research institute focused on artificial intelligence and the science of awareness.	

- Worked with an interdisciplinary group of scientists to model molecular evolution at the origins of life.

TEACHING AND MENTORSHIP

Stanford University Bioengineering <i>Research Mentor</i>	2019–2022
<ul style="list-style-type: none">• Mentored eight BS and PhD students in whole-cell modeling of <i>E. coli</i>.• Organized meetings to teach systems biology concepts, review code, and establish collaborative practices.	
SSRP-Amgen Scholars Program <i>Research Mentor</i>	2021
<ul style="list-style-type: none">• This program provides training to undergraduate students who, by reason of their background would bring diversity to graduate study in the biomedical and biological sciences.	
Build-A-Cell Chemical Reaction Network modeling tutorials <i>Co-instructor</i>	2020
Stanford International Genetically Engineered Machine (iGEM) competition <i>Mentor</i>	2019
Course: Autonomous Robotics <i>Associate Instructor, Indiana University</i>	2014, 2016
Course: Brains & Minds, Robots & Computers <i>Associate Instructor, Indiana University</i>	2013

PRESENTATIONS

1. **Akamatsu M. & Agmon E.** “Modular multiscale simulations of endocytic actin networks using Vivarium.” *Find Your Inner Modeler V*, 2022.
2. **Agmon E.** “Vivarium: an interface and engine for integrative multi-scale modeling.” *COMBINE 2021*.
3. **Agmon E.** “Vivarium: an interface and engine for multi-scale modeling in computational biology.” *Build-A-Cell workshop*. NIST, Gaithersburg, MD, 2020.
4. **Agmon E.** “A multi-scale platform for whole-cells and colonies.” *Basement seminar*. Stanford Bioengineering Department, 2020.
5. **Agmon E.** “Structural coupling of a Potts model cell.” *14th European Conference on Artificial Life*. Lyon, France, 2017.
6. **Agmon E.** “Computational models of heterogeneous lipid membranes.” *Frontiers in Computing Systems*. Columbia University, NY, 2017.
7. **Agmon E.** “Simulations of Ferroptosis.” *p53 Multi-Group meeting*. Columbia University, NY, 2017.
8. **Agmon E.** “The biological foundations of enactivism.” *Workshop on the Biological Foundations of Enactivism, at Artificial Life 16*. Cancun, Mexico, 2016.
9. **Agmon E.** “Whole-cell models and perturbation-based analysis.” *Department of Biological Sciences*. Columbia University, NY, 2016.
10. **Agmon E.** “The dynamics of protocell ontogenies.” *ENSO online seminar*. 2016.
11. **Agmon E.** “Ontogeny and adaptivity in a model protocell.” *Evolutionary Systems Biology Lab*. Albert Einstein College of Medicine, NY, 2016.
12. **Agmon E.** “Action switching in embodied, dynamical agents.” *Workshop on self-organization in brain-body-environment system*. University of Cincinnati, OH, 2015.
13. **Agmon E.** “Ontogeny and adaptivity in a model protocell.” *ECAL 15*. York, UK, 2015.
14. **Agmon E.** “The physiology and metabolic closure of organisms.” *Workshop on the causal factors of robustness and plasticity in living systems*. Bloomington, IN, 2014.

15. **Agmon E.** “Biological individuation, ontogeny and adaptation.” *Cognitive Science Program*. Bloomington, IN, 2015.
16. **Agmon E.** “Quantifying robustness in a spatial model of metabolism-boundary co-construction.” *Artificial Life 14*. New York City, NY, 2014.
17. **Agmon E.** “Action switching in embodied, dynamical agents.” *4th Annual Midwest Cognitive Science Conference*. Dayton, OH, 2014.
18. **Agmon E.** “Action switching in brain-body-environment systems.” *Department of Informatics*. University of Zaragoza, Spain, 2013.
19. **Agmon E.** “A dynamical account of probabilistic inference.” *Guided Self-Organization 5*. Sydney, Australia, 2012.

SELECTED WORKSHOPS AND SEMINARS

Build-A-Cell. <i>Stanford University.</i>	2022
Find Your Inner Modeler. <i>University of Illinois, Chicago.</i>	2022
COMBINE (virtual).	2021
Build-A-Cell. <i>California Institute of Technology.</i>	2022
Build-A-Cell (virtual). <i>Hosted by NIST.</i>	2020
Build-A-Cell. <i>NASA Ames, Mountain View, CA.</i>	2020
qBio. <i>San Francisco, CA.</i>	2019
Agency in the Physical Sciences, at Artificial Life 17. <i>Lyon, France.</i>	2017
Frontiers in Computing Systems. <i>Columbia University.</i>	2017
Expanding Views on the Emergence of the Biosphere: 5th ELSI International Symposium. <i>Tokyo Institute of Technology, Tokyo, Japan.</i>	2017
The Biological Foundations of Enactivism, at Artificial Life 16. <i>Cancun, Mexico.</i>	2016
Re-conceptualizing the Origins of Life. <i>Carnegie Institution for Science, Washington D.C.</i>	2015
Self-organization in brain-body-environment systems. <i>University of Cincinnati.</i>	2015
Towards an Integrative Approach to the Study of Awareness. <i>Kobe University.</i>	2015
Causal Factors of Robustness and Plasticity in Living Systems. <i>Indiana University.</i>	2014
New England Complex Systems Institute. <i>Massachusetts Institute of Technology.</i>	2010

PROFESSIONAL SERVICE

Reviewer. <i>Bioinformatics.</i>	2022
Reviewer. <i>International Workshop on Bio-Design Automation (IWBD).</i>	2022
Member. <i>Engineering Biology Research Consortium (EBRC).</i>	2022-present
Member. <i>Biomedical Engineering Society (BMES).</i>	2021-present
Reviewer. <i>IEEE International Conference on Bioinformatics & Biomedicine (BIBM).</i>	2019
Program committee. <i>International Conference on Complex Systems (ICCS).</i>	2018
Associate Editor. <i>Journal of Adaptive Behavior.</i>	2016-present
Program committee. <i>Conference on Complex Systems.</i>	2017
Organizer. <i>Workshop on Agency in the Physical Sciences, at the ECAL 17</i>	2017
Organizer. <i>The Biological Foundations of Enactivism, at Artificial Life 16</i>	2016
Program committee. <i>Conference on Artificial Life.</i>	2016–2020
Program committee. <i>Artificial Life 15: The Fifteenth International Conference on the Synthesis and Simulation of Living Systems.</i>	2016

Reviewer. *Artificial Life Journal* 2015–present
Organizer. *E-cog: weekly meeting on Embodied, Embedded, and Enactive approaches in Cog Sci* 2013–2015
Organizer. *Workshop on the Causal Factors of Robustness and Plasticity in Living Systems.* 2014