

Experience

Google DeepMind *Research Scientist*, Oct 2018-
Neuroscience-inspired artificial intelligence

Kernel *Chief Strategy Officer*, Jan 2017-August 2018
Technologies for interfacing with the human brain and accelerating human neuroscience.

MIT Media Lab *Research Scientist and “Director of Scientific Architecting”*, Synthetic Neurobiology Group, 2014-2017. *Research affiliate*, 2017-
Advisor: Ed Boyden
Methods for scalable and comprehensive brain circuit mapping and analysis.

BioBright LLC *Co-founder*, 2012- (currently passive role)
“Smart Lab” startup funded by investments, DARPA, and industry contracts.

Education

Harvard University *Ph.D., Biophysics, 2014*
Thesis: *Designing scalable biological interfaces*
Advisor: George Church
Research on bio-nanotechnology, synthetic biology and neuro-technology.

Yale University *B.S., Physics, 2009*
Advisor: Michel Devoret
Research on quantum information theory and superconducting quantum circuits.

Key Publications (* indicates equal contribution) [H-Index: 12, Citations: >1550]**Physical principles for scalable neural recording**

Adam H. Marblestone*, Brad Zamft*, Yael Maguire, Mikhail Shapiro, Josh Glaser, Ted Cybulski, Dario Amodè, P. Benjamin Stranges, Reza Kalhor, David Dalrymple, Dongjin Seo, Elad Alon, Michel M. Maharbiz, Jose M. Carmena, Jan M. Rabaey, Ed Boyden**, George Church**, Konrad Kording**
Frontiers in Computational Neuroscience (2013). Featured in *Nature Physics*.

Towards an integration of deep learning and neuroscience

Adam H. Marblestone, Greg Wayne and Konrad Kording. *Frontiers in Computational Neuroscience* (2016).

Feasibility of 3D Reconstruction of Neural Circuits using Expansion Microscopy and Barcode-Guided Agglomeration

Yoon, Dai, Wohlwend, Marblestone*, Boyden*. *Frontiers in Computational Neuroscience* (2017)

Multiplexed neural recording along a single optical fiber via optical reflectometry

Sam Rodrigues*, Adam H. Marblestone*, Max Mankin, Lowell Wood and Ed Boyden. *Journal of Biomedical Optics*. (2016)

3-D Nanofabrication by Volumetric Deposition and Controlled Shrinkage of Patterned Scaffolds

Oran*, Rodrigues*, Gao, Asano, Scott, Chen, Tillberg, Marblestone** and Boyden**. *Science*. 14 Dec 2018: Vol. 362, Issue 6420, pp. 1281-1285
DOI: 10.1126/science.aau5119 [co-last author] See also: perspective by Long and Williams. Featured by major news outlets internationally and on MIT homepage.

The atoms of neural computation

Gary Marcus, Adam H. Marblestone and Tom Dean. *Science*. (2014)

Steven Pinker’s Twitter endorsement: “groundbreaking new ideas” <https://twitter.com/sapinker/status/529018176684572672>

+ **Frequently asked question for: The atoms of neural computation** Gary Marcus, Adam H. Marblestone and Tom Dean. *ArXiv*. (2014).

+ **How thalamic relays might orchestrate deep training and symbolic computation in the brain** Ken Hayworth and Adam Marblestone. *bioRxiv*. (2018)

Measuring cation-dependent DNA polymerase fidelity landscapes by deep sequencing

Brad Zamft*, Adam H. Marblestone*, Konrad Kording, Daniel Schmidt, Daniel Alarcon, Keith Tyo, Ed Boyden and George Church.
PLoS ONE (2012) 7(8): p. e43876. Featured in *Nature*, *Wired* & elsewhere.

Exponential quantum enhancement for distributed addition with local nonlinearity

Adam H. Marblestone and Michel Devoret. *Quantum Information Processing*. Volume 9 #1 47-59 (2009)

Other Publications (* indicates equal contribution)**Malthusian reinforcement learning**

Joel Z. Leibo, Julien Perolat, Edward Hughes, Steven Wheelwright, Adam H. Marblestone, Edgar Duéñez-Guzmán, Peter Sunehag, Iain Dunning, Thore Graepel.
ArXiv. 1812.07019 (2019)

Statistical analysis of molecular signal recording

Joshua Glaser, Bradley Zamft*, Adam H. Marblestone*, Jeffrey Moffitt, Keith Tyo, Edward Boyden, George Church and Konrad Kording.
PLoS Computational Biology (2013)

Rosetta brains: a strategy for molecularly annotated connectomics

Adam H. Marblestone, Evan R. Daugharthy, Reza Kalhor, Ian D. Peikon, Justus M. Kebschull, Seth L. Shipman, Yuriy Mishchenko, Je Hyuk Lee, Konrad P. Kording, Edward S. Boyden, Anthony M. Zador and George M. Church. *ArXiv*. (2014)

Nanoscale imaging of RNA with expansion microscopy

Fei Chen*, Asmamaw T. Wassie*, Allison J. Cote, Anubhav Sinha, Shahar Alon, Shoh Asano, Evan R. Daugharthy, Jae-Byum Chang, Adam Marblestone, George M. Church, Arjun Raj, Edward S. Boyden. *Nature Methods*. (2016)

A theoretical analysis of single molecule protein sequencing via weak binding spectra

Samuel G. Rodrigues, Adam Marblestone, Edward Boyden. *BioRxiv and in review*. (2018)

Conneconomics: the economics of large-scale, dense, high-resolution neural connectomics

Adam H. Marblestone, Evan R Daugharthy, Reza Kalhor, Ian Peikon, Justus Kebschull, Seth L Shipman, Yuriy Mishchenko, David A Dalrymple, Bradley M Zamft, Konrad P Kording, Edward S Boyden, Anthony M Zador, George M Church. *BioRxiv*. (2013)

Rapid prototyping of three-dimensional DNA-origami shapes with caDNANO

Shawn Douglas, Adam H. Marblestone, Surat Teerapittayanon, Alejandro Vazquez, George Church and William Shih. *Nucleic Acids Research*. 37:5001–6 (2009) Open-source software at: <http://www.cadnano.org>

Multiplexed in-vivo his-tagging of enzyme pathways for in-vitro single-pot multi-enzyme catalysis

Harris H. Wang*, Po-Yi Huang*, George Xu, Wilhelm Haas, Adam H. Marblestone, et al. *ACS Synth. Biol.*, 2012, 1 (2), pp. 43–52

Gene assembly from chip-synthesized oligonucleotides

Nikolai Eroshenko*, Sriram Kosuri*, Adam H. Marblestone, Nicholas Conway and George M. Church. *Curr. Protoc. Chem. Biol* (2012)

Molecular threading: mechanical extraction, stretching and placement of DNA molecules at a liquid-air interface

Andrew Payne*, Michael Andregg*, Kent Kemmish, Mark Hamalainen, Wolfgang Lehrach, C. Bowell, A. Bleloch, N. Klejwa, K. Schatz, H. Stark, Adam H. Marblestone, George Church**, Chris Own** and William Andregg. *PLoS ONE* 8(7): e69058.

Highly multiplexed three-dimensional subcellular transcriptome sequencing in situ

Jay Lee*, Evan Daugharthy*, Jonathan Scheiman, Reza Kalhor, Joyce Yang, Thomas Ferrante, Richard Terry, Sauveur Jeanty, Chao Li, Ryoji Amamoto, Derek Peters, Brian Turczyk, Adam H. Marblestone, Samuel Inverso, Amy Bernard, Prashant Mali, Xavier Rios, John Aach and George M. Church. *Science*. (2014)

Designing scalable biological interfaces

Adam H. Marblestone. PhD Thesis. Biophysics. Harvard University. (2014)

Spatial information in large-scale neural recordings

Ted Cybulski*, Josh Glaser*, Adam H. Marblestone, Brad Zamft, Ed Boyden, George Church and Konrad Kording. *Frontiers in Computational Neuroscience*. (2014)

Rosetta brain

George Church, Adam H. Marblestone and Reza Kalhor. *The Future of the Brain: Essays from the World's Leading Neuroscientists*. (2014)

Designing tools for assumption-proof brain mapping

Adam H. Marblestone and Ed Boyden. *Neuron*. (2014)

How to study the brain

Gary Marcus, Adam H. Marblestone and Jeremy Freeman. *The Chronicle of Higher Education*. (2014)

Grand challenges for global brain sciences

Joshua T. Vogelstein, Katrin Amunts, Andreas Andreou, Dora Angelaki, Giorgio Ascoli, Cori Bargmann, Randal Burns, Corrado Cali, Frances Chance, Miyoung Chun, George Church, ..., Adam H. Marblestone, David Markowitz, Justin McArthur, Brett Mensh, Michael Milham, Partha Mitra, Pedja Neskovic, Miguel Nicolelis, Richard O'Brien, Aude Oliva, Gergo Orban, Hanchuan Peng, Alyssa Picchini-Schaffer, Marina Picciotto, Jean-Baptiste Poline, Mu-ming Poo, Alex Pouget, Sri Raghavachari, Jane Roskams, Terry Sejnowski, Fritz Sommer, Nelson Spruston, Larry Swanson, Arthur Toga, R. Jacob Vogelstein, Rafael Yuste, Anthony Zador, Richard Haganir, Michael Miller. *ArXiv*. (2016)

DNA binding strength increases the processivity and activity of a Y-Family DNA polymerase

Wu J, De Paz A, Zamft BM, Marblestone AH, Boyden ES, Kording KP, Tyo KE. *Scientific reports*. 2017 Jul 6;7(1):4756.

An optical observatory of molecular complexity in the normal and diseased brain

Mermelstein, Abnet, Rodrigues, Marblestone, Boyden. *Whitepaper draft conveyed to Argonne National Lab and Lawrence Berkeley National Lab*.

Understand the cogs to understand cognition

Marblestone, Wayne and Kording. Commentary on: Building Machines That Learn and Think Like People by Lake et al. *Behavioral and Brain Sciences*. (2017)

In-situ technologies enable a pan-omic human cell atlas

Shahar Alon, Edward S. Boyden, Fei Chen, George M. Church, Evan R. Daugharthy, Samuel Inverso, Adam Marblestone, Sam Rodrigues, Chao-Ting Wu
Whitepaper circulated at Chan-Zuckerberg Initiative Human Cell Atlas meeting (Feb 2017) https://www.readcoor.com/s/CZI_final-lbza.pdf

Ethical guidelines for neurotechnologies and machine intelligence.

Rafael Yuste, Sara Goering, ..., Marblestone, et al. *Nature*. (2017)

High-resolution mapping of DNA polymerase fidelity using nucleotide imbalances and next-generation sequencing

Alexandra M. de Paz, Thaddeus R. Cybulski, Adam H. Marblestone, Bradley M. Zamft, George M. Church, Edward S. Boyden, Konrad P. Kording, Keith E. J. Tyo. *Nucleic Acids Research*. (2018) DOI: 10.1093/nar/gky296

Signal-to-pump back-action and self-oscillation in a double-pump Josephson parametric amplifier

Archana Kamal, Adam H. Marblestone and Michel Devoret. *Physical Review B*. 79:184301 (2009)

In-preparation papers

Expansion sequencing

S. Alon*, F. Chen*, E. R. Daugharthy*, A. Payne, P. W. Tillberg, A. T. Wassie, ..., Adam H. Marblestone**, G. M. Church**, E. S. Boyden**.
In preparation. [Co-last author]

Awards and honors

Technology Review 35 Innovators Under the Age of 35
Fannie and John Hertz Foundation Fellowship
James Mills Peirce Fellowship at Harvard
Barry M. Goldwater Scholarship
Stanford Graduate Fellowship (declined)
Fulbright Scholarship (declined)

Other Experience

Protocol Labs Volunteer Consultant (Summer 2018) Software tools for accelerating science
OccamzRazor Advisory board member (2015-2018) Knowledge capture and sharing platform for scientists
Expil Consultant on scientific knowledge graphs (2014) Online participatory math education. Funded by VCs.
Beagle Co-steering (with Juan Batiz-Benet) a project to develop a social annotation tool for the scientific literature (2014-)
Fannie and John Hertz Foundation Fellowship Interviewer (2015-) Identifying next-generation science/engineering leaders
Open Philanthropy Project Scientific Advisor (2013-2016) Advising on biological tools & techniques, AI, nanotechnology, science policy, & more
Brain Preservation Foundation Scientific Advisor (2015-2018)
Shannon Labs Informal advising (Summer 2018)
MIT Media Lab Advisory group member on the "Future of Science+Art/Design/Engineering" (2016-) [\$10,000 award]
Peer Reviewer for: *PLoS Computational Biology, JoVE, Nature Communications, MIT Press*
Early unpaid consulting for what became the company **Neuralink** (July-Nov 2016)
Co-creator: **Neurotechnology Architecting Network**, featured in White House BRAIN Initiative 9/30/2014 announcement, <http://neuroarchitecting.org/>
"Technology and infrastructure" working group participant: **Genome Project Write** (GP-Write)
Volunteer executive advisor: **Institute for Transformational Biotechnology (IXBio)** (2018-)
"Molecular Additive Manufacturing", Cambridge University UK, Led workshop (2016)
Kavli Futures Symposium, "Towards a Taxonomy of Cortical Computations", Co-organized with Gary Marcus, Funded \$60k by Kavli Foundation (2015)
Cosyne Workshop, "Tools and Approaches for Ground-Truth Neuroscience", Co-organized with Annabelle Singer (2015)
New York Stem Cell Foundation Workshop, "Immuno-engineering", Co-initiated workshop (2015)
Rapporteur: **BrainX.io** global brain research coordination meeting (2016)
Participant: NTC Neuro-Ethics Workshop (2017), Kavli Futures Symposium: Neurotechnology (2017), Deep Learning in the Brain workshop at UPenn (2018)

Selected Talks/Lectures

Tianjin University (Tianjin, China): 5 lectures for undergraduates on *design principles for DNA self-assembly* (2012) [with M. Dai]
Harvard Medical School *nm2cm: bridging top-down and bottom-up nanotechnology* (2012) [initiated and organized meeting]
TEDx Beacon Street (Boston, USA): *Billion-year-old information technologies* (2012)
COSYNE Beyond Optogenetics Workshop (Snowbird, USA): *Molecular ticker-tapes* (2013)
Bar-Ilan University (Ramat Gan, Israel): *Molecular information storage technologies* (2013)
Stanford University (Palo Alto, USA): *Guest lecturer in the course Computational Models of the Neocortex* (2013)
Harvard Medical School *Physics of brain activity mapping* (2013) [initiated and co-organized meeting]
Rehabilitation Institute of Chicago (Chicago, USA): *An architecture for neural recording via optical time-domain reflectometry* (2013)
Vannevar Group (Palo Alto, USA): *Collaboratively surveying neuro-technological possibility space* (2013)
MIT Media Lab (Cambridge MA, USA): *Networked biology* (2014)
MIT Center for Bits and Atoms workshop on Bits <=> Biology (Cambridge MA, USA): *Digital encoding for scalable brain mapping* (2014)
University of Waterloo Theoretical Neuroscience Summer School (Waterloo ON, CA): *Semantic pointer operations on word similarity spaces* (2014)
Northeastern University Center for Complex Network Research (Boston MA, USA): *Towards a complete activity map for the smallest brain* (2014)
White House OSTP/NPI Photonics Industry Neurotechnology Group (Washington DC, USA): *Photonics needs for scalable neural interfacing* (2014)
Radcliffe Institute Workshop on Programmable Molecular Robots (Cambridge MA, USA): *Bigger nanorobots* (2014)
MIT Biophysics Program Student Seminar Series (Cambridge MA, USA): *The physics of whole-brain mapping* (2014)
Society for Neuroscience 2014 (Washington DC, USA): *Fiber optic reflectometry as a next-generation electrode* (2014)
MSRI workshop on Breaking the Neural Code (Berkeley, USA): *Rosetta brain* (2014)
Stanford University (Palo Alto, USA): *Guest lecturer in the course Computational Models of the Neocortex* (2015)
Harvard Effective Altruism (Cambridge, USA): *Effective altruism, technological convergence and scientific roadmap* (2015)
Digital Garage Conference: Hacking the Human Body (San Francisco, USA): *Mapping the brain in search of the architecture of the mind* (2015)
MIT Media Lab (Cambridge, USA): *Guest lecture in the course New Destinations in Artificial Intelligence* (2015)
MSRI workshop on the Theory of Neural Computation (Berkeley, USA): *Rosetta brain maps and what they might teach us* (2015)
Brandeis Computational Neuroscience Journal Club (Waltham, USA): *Towards technologies and frameworks for scalable brain mapping* (2016)
Panelist for MIT Center for Brains Minds and Machines (Cambridge, USA) *Debate on AI and neuroscience, moderated by Max Tegmark* (2016)
Future of Humanity Institute at Oxford (Oxford, UK): *A roadmap for connecting neuroscience and machine learning* (2016)
Stanford University (Palo Alto, USA): *Guest lecturer in the course Computational Models of the Neocortex* (2016)
Wyss Institute (Boston, USA): *IARPA MICRONS site visit talk on ExM validation of FISSEQ-BOINC connectomics* (2016)
SciFoo (Mountain View, USA): *Participant in panel discussion on artificial intelligence, co-led session on scientific tools* (2016)
Sanger Institute (Hinxton, UK): *Talks on FISSEQ-BOINC connectomics, and on BioBright smart lab* (2016)
IARPA MICRONS Technical Exchange Meeting (Bethesda, USA): *Validating FISSEQ-BOINC connectomics* (2017)
US Army Neural-Inspired AI Army Science Planning Strategy Meeting (Aberdeen, USA): *Towards an integration of deep learning and neuroscience* (2016)
Columbia Workshop on Brain Circuits, Memory and Computation (NY, USA): *Towards neural substrates of variable binding and deep learning* (2017)
Cosyne Workshop - Electrons, fluorophores, and nucleotides: bridging the gaps in high-throughput connectomics (Snowbird, USA):
Towards a "best of all worlds" connectomics: integrating expansion microscopy tracing, in-situ barcoding and machine learning (2017)
Connectomics Berlin (Berlin, Germany): *Combining expansion microscopy and in-situ barcoding for connectomics* (2017)
Stanford University (Palo Alto, USA): *Guest lecturer in the course Computational Models of the Neocortex* (2017)
Quantifying Structure in Large Neural Datasets (New York, USA): *Rosetta brain neuroanatomy* (2017)
Advancing Neuroscience with the National Labs (Chicago, USA): *Scalable optical connectomics* (2017)
Machine Learning meets Biology (Geneva, Switzerland): *Towards an integration of deep learning and neuroscience* (2017)
Blue Brain Project (Geneva, Switzerland): *Scalable optical connectomics* (2017)
YConf (San Francisco, USA): *Could new kinds of circuit maps reveal the brain's computational architecture?* (2017)

Effective Altruism Global (Boston, USA): *Accelerating neuroscience progress* (2017)
Fannie and John Hertz Foundation Summer Workshop (San Diego, USA): *Kernel* (2017)
Fannie and John Hertz Foundation East Coast Retreat (Cape Cod, USA): *Towards an integration of deep learning and neuroscience* (2017)
Neuromodulation of Neural Microcircuits (Lausanne, Switzerland): *Molecularly annotated connectomics* (2017)
Harvard Effective Altruism Club (Cambridge, USA): *Nanotechnology and neuroscience* (2017)
MIT Effective Altruism Club (Cambridge, USA): *Accelerating neuroscience progress* (2017)
Harvard Effective Altruism Club (Cambridge, USA): *The Turing Test #3 (podcast): Adam Marblestone* (2017)
IEEE Sensing the Brain workshop (Glasgow, Scotland): *Physical limits, hybrid modalities and whole-brain neural recording* (2017)
University of Montreal (Montreal, Canada): *Towards an integration of deep learning and neuroscience* (2017)
University of Indiana (Bloomington, USA): *Towards an integration of deep learning and neuroscience* (2018)
US National Institutes of Health (Bethesda, USA): *Towards an integration of deep learning and neuroscience* (2018)
Google DeepMind (London, UK): *Towards an integration of deep learning and neuroscience* (2018)
Institute of Neuroinformatics (Zurich, Switzerland): *Towards an integration of deep learning and neuroscience* (2018)
Emerging Technologies Conference (Cambridge, MA): *Scalable neurotechnology* (2018)

Patents

In-situ nucleic acid sequencing of expanded biological samples

Inventors: Edward Stuart Boyden, Fei Chen, Shahar Alon, George Church, Paul Warren Tillberg, Adam Marblestone, Evan Daugharthy.

<https://www.google.com/patents/US20160304952>

Issued August 28th 2018 (Assigned to MIT)

System and method for simultaneously detecting phase modulated optical signals

Inventors: Changhui Yang, Adam Marblestone, Jamu Alford, Daniel Sobek, and Christian Wentz

<https://patents.google.com/patent/US10016137B1/>

US 10,016,137 B1 Issued July 10th 2018 (Assigned to Kernel)

Nanofabrication by shrinking of patterned gels

Inventors: Rodriques, Marblestone, Chen, Tillberg, Boyden.

<https://patents.google.com/patent/US20170081489A1> (Assigned to MIT)

Multiplexed Signal Amplified FISH via Splinted Ligation Amplification and Sequencing

Inventors: Chen, Alon, Wassie, Sinha, Marblestone, Boyden.

<https://patents.google.com/patent/US20180216161A1> (Assigned to MIT)

Ligation-based assembly of nucleic acid molecules guided by self-assembled DNA nanostructures

Inventors: Zhang, David Y; Marblestone, Adam H; Yin, Peng. *US provisional patent filed.*

Methods and apparatus for multiplexed neural interfacing via optical micro-fibers

Inventors: Marblestone, Amodei, Church, Boyden, Wood. *US provisional patent filed.*

Single molecule protein identification by spectral sequencing

Inventors: Rodriques, Marblestone, Boyden. *US provisional patent filed.*

U.S. Provisional Patent Application Serial No. 62/666,926 [neural interfacing technologies]

U.S. Provisional Patent Application Serial No. 62/666,963 [neural interfacing technologies]

U.S. Provisional Patent Application No. 62/640,416 [neural interfacing technologies]

U.S. Patent Application: 62/657,634 [neural interfacing technologies]

U.S. Patent Application No. 15/853,538 [neural interfacing technologies]

U.S. Provisional Patent Application Serial No. 62/722,152 [neural interfacing technologies]

U.S. Provisional Patent Application Serial No. 62/719,509 [neural interfacing technologies]

Posters

In situ mapping of RNA at subcellular resolution using expansion sequencing (ExSeq) in intact brain tissue

Daniel Goodwin, Shahar Alon, Fei Chen, Asmamaw Wassie, Andrew Payne, Anubhav Sinha, Yosuke Bando, Atsushi Kajita, Karl Marrett, Evan Daugharthy, Ho-Jun Suk, Ru Wang, Paul Tillberg, Paul Reginato, Nikita Pak, Adam Marblestone, George Church, Edward S Boyden. *Society for Neuroscience* (2018).

Multiplexed, targeted in situ sequencing of RNA in intact brain processed with expansion microscopy

A. Sinha, A. Wassie, S. Alon, D. Goodwin, A. Marblestone, F. Chen, G. Church, E.S. Boyden. *Society for Neuroscience* (2018)

Next-generation expansion microscopy with lipid labels for morphological analysis of neurons.

J. Kang, E. Karagiannis, J-B. Chang, G. Huynh, Adam H. Marblestone and E. Boyden. *Society for Neuroscience* (2016)

3D Reconstruction of Neural Circuits using Expansion Microscopy

Y.-G. Yoon, P. Dai, J. Wohlwend, J.-B. Chang, A. Marblestone* and E. S. Boyden*. *Society for Neuroscience* (2016)

ExFISH: Nanoscale imaging of RNA with expansion microscopy

A. Wassie, F. Chen, A. Cote, A. Sinha, S. Alon, S. Asano, E. Daugharthy, J.-B. Chang, A. Marblestone, G. Church, A. Raj, E. S. Boyden. *Society for Neuroscience* (2016)

Expansion microscopy of lipids for scalable morphological analysis of neurons and neural circuits

E. Karagiannis, Adam H. Marblestone, E. Boyden. *Society for Neuroscience* (2015)

Expansion Sequencing (ExSEQ): comprehensive in-situ transcriptome characterization throughout intact brain circuits

S. Alon, F. Chen, E. Daugharthy, P. Tillberg, Adam H. Marblestone, A. Wassie, G. Church, E. Boyden. *Society for Neuroscience* (2015)

Vascular Interfaces for Brain Imaging and Stimulation

Bob Desimone, Edward Boyden, Elazer Edelman, Ken Shepard, Colin Derdeyn, Eric Leuthardt, Bruce Fischl, Jon Polimeni, George Church, Adam H. Marblestone. 2nd Annual BRAIN Initiative Investigators Meeting, Bethesda, MD. (2015)

Physical Principles for Whole-Brain Activity Mapping

Adam H. Marblestone, Bradley Zamft, Yael Maguire, Mikhail Shapiro, Joshua Glaser, Ben Stranges, Reza Kalhor, DJ Seo, Elad Alon, Michel Maharbiz, Jose Carmena, George Church, Konrad Kording and Ed Boyden. *Society for Neuroscience* (2014)

DIY physiological sensors: towards the Arduino of physiology Charles Fracchia (MIT), Adam H. Marblestone and Stephen Heisig (IBM)

GET: Genomes, Environments & Traits (2013)

Controllable release of gold nanoparticles from a switchable DNA box Sun*, Schaus*, Wu*, Marblestone, Wang, Perkons, Shih and Yin

10th Annual Conference, Foundations of Nanoscience: Self-Assembled Architectures and Devices (2013)

Continuous in-vivo multiplex genome engineering Kevin Esvelt*, Adam H. Marblestone* and George Church. *Wyss Institute Annual Retreat* (2012)

Acknowledgements in published works

Lillicrap and Kording, "Can neural computation be compressed enough for us to understand it?" (2019)

Drexler, "Reframing super-intelligence" (2019)

Drexler, "Molecular Imprinting: The missing piece in the puzzle of abiogenesis?" *ArXiv* (2018)

Landsdell and Kording, "Towards learning to learn" (2018)

Rolnick et al. "Morphological Error Detection in 3D Segmentations" *ArXiv* (2017)

Payne, "Towards sequencing by synthesis in-situ" (2017)

Legenstein, Papadimitriou, Vempala, Maass "Assembly pointers for variable binding in networks of spiking neurons" *NIPS CoCo Workshop* (2016)

Kalhor, Reza, Prashant Mali, and George M. Church. "Rapidly evolving homing CRISPR barcodes." *Nature Methods* (2016)

Jonas, Eric and Kording, Konrad. "Can a neuroscientist fix a microprocessor?" <http://biorxiv.org/content/early/2016/05/26/055624>

Chen, Fei, Paul W. Tillberg, and Edward S. Boyden. "Expansion microscopy" *Science* 347.6221 (2015): 543-548.

Chen, Ho-Lin, David Doty, and Shinnosuke Seki. "Program Size and Temperature in Self-Assembly." *Algorithmica* 72.3 (2015): 884-899.

Seo, Dongjin, et al. "Neural dust: An ultrasonic, low power solution for chronic brain-machine interfaces." *arXiv preprint arXiv:1307.2196* (2013).

Douglas, Shawn, Ido Bachelet and George Church. "A logic-gated nanorobot for targeted transport of molecular payloads." *Science* 335.6070 (2012)

Press coverage

Mentioned and cited in "Team invents method to shrink objects to the nanoscale" | MIT News (Dec 2018); highlighted by many news sites, CNN homepage
Quoted in Quanta Magazine, Sept 2018

Mentioned in EmTech MIT: How AI and biomedical innovations are transforming health care, ZDNet, Sept 2018

Interviewed on Brain Inspired neuroscience podcast, Sept 2018

"Kernel neuroscience company seems to be making radical progress...", futuretimeline.net, July 2018

Technology Review 35 Innovators Under 35 – Adam Marblestone, June 2018

Hertz Fellow Adam Marblestone Named to MIT Technology Review's 2018 Innovators Under 35 List, June 2018

Profiled in Hertz Foundation "Faces of the Foundation", Feb 2018

Mentioned in On Intelligence, Phys.org, April 2017

Mentioned in Import AI, Feb 2017

Mentioned in "Building better brains", Neurotech Business Report, 2017

Mentioned in "Elon Musk backs brain-computer interface venture", International Business Times, March 2017

Mentioned in "Silicon valley's race to develop a brain-computer interface", Technology Review, March 2017

Mentioned in "Kernel is trying to hack the human brain – but neuroscience has a long way to go", The Verge, Feb 2017

Quoted in "Kernel Acquires KRS to Build Next-Generation Neural Interfaces" (2017)

Cited in "Recording the brain with light", Hertz Foundation Newsletter (2016)

Cited in "Seeing RNA at the nanoscale", Science Bulletin, 2016

Interviewed for the O'Reilly report "Artificial Intelligence: Teaching Machines to Think Like People" by Jack Clark (2016)

Mentioned in "The smart lab blends the best of humans and automation", Glenn Martin, O'Reilly Radar, July 2016

Quoted in "Government seeks high-fidelity brain computer interface", Adam Piore, Technology Review, Feb 2016

Mentioned in "Wyss Institute will lead IARPA funded brain mapping consortium", Eurekalert, Jan 2016

Cited in "Brain-machine interfaces as a challenge to the 'moment of singularity'", Philip Kennedy, H+ Magazine, Dec 2015

Mentioned in "Face it, your brain is a computer", Gary Marcus, New York Times Sunday Review, June 2015

Mentioned in "Fifteen MIT scientists receive NIH BRAIN Initiative grants", MIT News, Sept 2014

Cited in "Brain Teaser", Mark Buchanan, Nature Physics, September 2013

Cited in "The world according to Itskov: Futurists convene at GF2045 (Part 2)", Stuart Mason Dambrot, Phys.org, Aug 2013

Cited in "Physical principles for scalable neural recording", John Hewitt, Medical Xpress, July 2013

Cited in "Neuroscience: Solving the brain", Alison Abbott, Nature, July 2013

Cited in "The science behind Obama's brain project", Jean-François Gariépy, BrainFacts.org, April 2013

Other Educational Experiences

Center for Theoretical Neuroscience Summer School, *large-scale spiking neural network models*, University of Waterloo, 2014
NSF I-CORPs, *completed program as entrepreneurial co-lead for BioBright*, http://www.nsf.gov/awardsearch/showAward?AWD_ID=1522517, 2015
Stanford University Mathematics Camp, *algebraic topology*, Stanford University, 2004

Teaching

MIT Instructor for “Revolutionary Ventures” graduate course (MIT Course Numbers: 9.455 ~ 15.128 ~ 20.454 ~ MAS.883) at MIT in Fall 2015
Instructor for “Cognitive Integration” seminar (MAS.S63) at MIT Media Lab in Spring 2016
Co-created **C. elegans optogenetics demo lab** for the 2014 “Neurotechnology In Action” graduate course, based on cheap off-the-shelf hardware
Individual students supervised: J. Wohlwend, S. Rezhikov, D. Barabasi (Notre Dame), G. Khimulya (Harvard). Mentor for MIT PRIMES.
Harvard *Co-mentored Harvard's biomolecular engineering and synthetic biology team*: 3rd overall (2011) and best wiki (2012) in BIOMOD
Individual students supervised: N. Donoghue (Brown), A. Payne (Toronto), J. Lovelock (Toronto), W. Chen, J. Pritt, E. Wu
Teaching Fellow: **Bio-Inspired Molecular Engineering** (2011), **Biomolecular Engineering and Synthetic Biology** (2011, 2013)
Co-developed course structure and materials. *Certificate of Distinction in Teaching*.
Yale *Peer Tutor*: Intensive Introductory Physics

Skills

Programming: TensorFlow, Python; Earlier: C, Java, Actionscript, Mathematica
Experimental: electronics design and production, microcontrollers, basic bench optics, micro-fluidic device fabrication; mechanical rapid prototyping (laser cutter, 3D printer, CNC micro-mill); nano-scale imaging (AFM, TEM, SEM, TIRF); molecular biology, Gibson cloning, MAGE, liquid handling robot; bacterial and mammalian cell culture; DNA nanostructures; Illumina sequencing
Selected coursework (at Amherst College, Yale, Harvard and MIT): quantum mechanics I & II, statistical physics, mesoscopic physics, quantum theory of solids, physics of information technology, general relativity, classical mechanics, principles of neuro-science, principles of neuro-engineering, mathematical methods of physics, how to make (almost) anything, biological instrumentation and measurement, advanced computational biology, algorithms, data structures and programming techniques, experimental strategies in cellular biology, biochemistry, organic chemistry, vector calculus and linear algebra, real analysis, groups rings & fields, intro to Lie groups, theory of statistics, neuro-technology ventures

Research Funding

IARPA MICRONS D16PC00008	PI: George Church	2016-2020
Cortical architecture and algorithms for machine listening The goal of this project is to develop cortically inspired algorithms using brain mapping. We will demonstrate novel scalable connectomic technologies based on in-situ DNA barcode readout, similar to those described in our Rosetta Brain whitepaper (http://arxiv.org/abs/1404.5103). Role: Co-investigator, PI for MIT, co-authored proposal . https://wyss.harvard.edu/wyss-institute-will-lead-iarpa-funded-brain-mapping-consortium/ Preliminary results on expansion sequencing of barcodes featured at: https://spectrum.ieee.org/biomedical/imaging/ai-designers-find-inspiration-in-rat-brains	Funding: >\$21,000,000 across several institutions	
DARPA HR0011-16-9-0004	PI: Charles Fracchia	2016-2017
BioBright: A platform for real-time tracking of biological experiments Role: Led proposal conception, writing, budgeting and contract negotiation Preliminary results featured at: https://biobright.com/darpa-press-release.html	Funding: \$698,000	
NIH 1R24MH106075-01	PI: Robert Desimone	2014-2017
Vascular interfaces for brain imaging and stimulation The goal of the study is to initiate a collaborative effort to design a human-applicable vascular neural interface for multiplexed neural recording and stimulation, and to carry out preliminary pilot theoretical and experimental projects to validate the basic parameters of the resulting concepts. Role: Collaborator, co-authored proposal, organized proposal team http://news.mit.edu/2014/fifteen-mit-scientists-receive-nih-brain-initiative-grants-0930	Funding: ~\$1,500,000	
MIT McGovern Institute Neurotechnology (MINT) program	PI: Michael Mermelstein	2015
3D tessellation imaging (3DTI) for large-volume, super-resolution, multi-color microscopy Role: Co-authored proposal	Funding: \$100,000	
Open Philanthropy Project		2016-2019
Gift to support Synthetic Neurobiology Group research Role: Co-authored proposal http://www.openphilanthropy.org/focus/scientific-research/miscellaneous/massachusetts-institute-technology-synthetic-neurobiology-group	Funding: \$2,970,000 plus additional follow-on funding	
NIH R01-MH103910-02 (Transformative Research Award)	PI: Kording, Church, Boyden, Tyo	2013-2017
Recording neural activity into DNA Role: Co-authored proposal, generated preliminary data http://news.feinberg.northwestern.edu/2013/12/kording_neurons/	Funding: >\$9,000,000 across the three institutions	
MetaKnowledge Network	PI: Marblestone, Boyden	10/2014-08/2015
Beagle: A tool to empower individuals and teams to organize and share scientific insights Role: Co-PI, authored proposal, oversaw project http://www.knowledgelab.org/news/detail/1.4-million-in-grants-awarded-to-metaknowledge-projects	Funding: ~\$110,000	
NIH R01	PI: Kasthuri, Cai, Boyden	2016-
An Accessible Toolbox for Comprehensive Analysis of Neural Tissue Architecture Role: Co-authored proposal http://grantome.com/grant/NIH/R01-MH110932-01	Funding: >\$1,500,000 across three institutions	