

Date Prepared: February 2023

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Place of Birth: Brooklyn, NY

Education

1990	Bachelor's in Science with Honors in Neural Science	Neuroscience (Ford F. Ebner, Ph.D., thesis advisor)	Brown University
1999	Doctor of Medicine		Emory University School of Medicine
1999	Doctor of Philosophy	Neuroscience (Donald R. Humphrey, Ph.D., dissertation advisor)	Emory University Grad. School of A&S

Postdoctoral Training

1999 – 2000	Intern	Internal Medicine	Emory University Affiliated Hospitals Residency Training Program
2000 – 2003	Resident	Neurology	Massachusetts General Hospital/Brigham & Women's Hospital/Harvard Medical School
2003 – 2004	Chief Resident	Neurology	Massachusetts General Hospital/Brigham & Women's Hospital/Harvard Medical School
2003 – 2004	Fellow	Stroke/Neurocritical Care	Massachusetts General Hospital/Brigham & Women's Hospital/Harvard Medical School

Faculty Academic Appointments

2004 – 2009	Instructor of Neurology	Neurology	Harvard Medical School
2004 – 2008	Investigator in Neuroscience	Neuroscience	Brown University
2008 – 2013	Associate Professor	Engineering	Brown University
2010 – 2012	Visiting Associate Professor	Neurology	Harvard Medical School
2013 – Present	Senior Lecturer	Neurology	Harvard Medical School
2013 – 2015	Associate Professor (tenured)	Engineering	Brown University
2015 – 2022	Professor	Engineering	Brown University
2022 – present	L. Herbert Ballou University Professor of Engineering	Engineering	Brown University
2022 - present	Professor	Brain Science	Brown University

Appointments at Hospitals/Affiliated Institutions

Past:

09/00 – 06/03	Resident	Neurology	Massachusetts General Hospital/Brigham & Women's Hospital/Harvard Medical School
07/02 – 06/03	Chief Resident	Neurology	Massachusetts General Hospital/Brigham &

07/03 – 07/04	Graduate Assistant	Neurology	Women’s Hospital/Harvard Medical School Massachusetts General Hospital/Brigham & Women’s Hospital/Harvard Medical School
07/03 – 05/12	Associate Neurologist	Stroke and Neurocritical Care Services	Brigham and Women’s Hospital
07/04 – 10/10	Assistant in Neurology	Neurocritical Care and Stroke Services	Massachusetts General Hospital
11/10 – 12/12	Associate Neurologist	Division of Neurocritical Care and Emergency Neurology, and Stroke Service, Department of Neurology	Massachusetts General Hospital
2012 – 2014	Neurologist	Stroke and Neurocritical Care Services	Brigham and Women’s Hospital
<i>Current:</i>			
07/04 – Present	Consulting Staff	Neurology	Spaulding Rehabilitation Hospital
02/06 – Present	Physician	Center for Neurorestoration and Neurotechnology	Dept. of Veterans Affairs Medical Center, Rehabilitation R&D Service, Providence, RI
2007 – Present	Appointed at ~20 additional hospitals in Massachusetts, New Hampshire, Maine, and New York, solely for the provision of TeleStroke Services on behalf of Massachusetts General Hospital		
01/13 – Present	Neurologist	Division of Neurocritical Care and Acute Stroke Service, Massachusetts General Hospital, Department of Neurology	

Other Professional Positions

2007	Scientific Advisory Panel	Stryker Development, LLC; GE Healthcare	
2008	Consultant	CardioFocus, Inc.	
2017	Scientific Advisory Board	Synchron Med, Inc.	

Major Administrative Leadership Positions*Local*

1992 – 1998	Founder and Coordinator, Electronic Transcript Database	Emory University
1994 – 1998	Developer and Controller, EUSM LearnLink (Intranet for Medical Education)	Emory University
2009 – Present	Director, Center for Neurotechnology and Neurorecovery (former Neurotechnology Trials Unit)	Massachusetts General Hospital
2012 – 2014	Associate Director, VA RR&D Center for Neurorestoration and Neurotechnology	Dept. of Veterans Affairs, Providence RI
2014 – Present	Director, VA RR&D Center for Neurorestoration and Neurotechnology	Dept. of Veterans Affairs, Providence RI
2017 – 2020	Program Director, MGH-Spaulding Neurorecovery Fellowship	Massachusetts General Hospital

Committee Service*Local*

1992	LCME Accreditation Subcommittee on Student Analysis, Member; Report Editor	Emory University
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1992	Year-1 Curriculum Revision Committee and Subcommittee On Evaluation, Member	Emory University
1999	LCME Accreditation Library/Computer & Information Resource Committee, Member	Emory University
1999	Teaching and Education Strategic Plan: Informatics/Technology and Student Subcommittees, Member	Emory University
2002 – 2003	Neuro Clinical Performance Management Comm., Member	Massachusetts General Hospital
2002 – 2004	Clinical Pathway Development Team Neurology “Safe Transitions in Anticoagulation Therapy”	Massachusetts General Hospital
2002 – 2006	Optimum Care Committee, Member	Massachusetts General Hospital
2005	15 th Reunion Gift Committee, Class of 1990	Brown University
2007	Ad hoc reviewer, Institutional Review Board	Spaulding Rehabilitation Hospital
2009	Neurology Finance Committee	Massachusetts General Hospital
2010 – 2011	Biomedical Engineering Faculty Search Subcommittee	Brown University
2011, 2015	Faculty Liaison to Clinical Policy & Records Committee, and Medical Policy Committee, re: Determination of Death by Brain Criteria in Adults	Massachusetts General Hospital
2011	Member, Psychiatry Chief of Service Search Committee	Providence VA Medical Center and Brown University
2012	Computational Neuroscience Search Committee, Department of Neuroscience	Brown University
2011 – Present	Member, Executive Committee	Carney Institute for Brain Science (former Brown Institute for Brain Science), Brown University
2012 – 2015	Research Committee, Dept. of Neurology	Massachusetts General Hospital
2012 – Present	Spaulding-Harvard Traumatic Brain Injury Model Systems Scientific Advisory Board	Spaulding – Harvard Medical School
2014 – 2015	Chair, Neuroengineering Faculty Search Committee	Brown University
2017 – 2019	Chair, Neurotechnology Faculty Search Committee	Massachusetts General Hospital
2017 – present	Member, Executive Committee, NINDS T32 Postdoctoral Training Program in Recovery and Restoration of CNS Health and Function	Massachusetts General Hospital and Brown University
2019 - 2020	30th Reunion Participant Committee, Class of 1990	Brown University
2019 – present	Chair, Promotion and Tenure Committee, Biomedical Engineering/School of Engineering Faculty Member	
2020	Faculty Liaison to Clinical Policy & Records Committee, and Medical Policy Committee, re: Determination of Death	Massachusetts General Hospital

	by Brain Criteria in Adults; and, MGH Guideline for Apnea Testing and Blood Pressure for Death Determination Using Brain Criteria in the Adult Patient on ECMO Support	
2020 – present	Neurology Research Space Committee	Massachusetts General Hospital
2021 – present	Target of Opportunity Recruitment Committee, School of Engineering	Brown University
2022 – 2027	Steering Committee Council, Neurotech Harbor	Johns Hopkins and Howard Universities
<i>National</i>		
1995	5 th Reunion Gift Committee, Class of 1990	Brown University
2006	Task Group 10, Invited Member, “Smart Prosthetics” 2007	Keck Futures Initiative, National Academy of Sciences
2008 – 2009	Organizing Committee, Indo-US Frontiers of Science Frontiers of Science	National Academy of Sciences
2007 – 2010	Course Director, Brain-Computer Interfaces: Frontiers in Neurology and Neurosciences	American Academy of Neurology Annual Meeting
2009 – 2012	Point of Care Center in Emerging Neurotechnology Member, Advisory Board	University of Cincinnati and National Institute on Bioengineering and Biomedical Imaging
2011	Scientific Vision Workshop on Plasticity	Eunice Kennedy Shriver National Institute on Child Health & Human Development
2011	Member, Recovery and Rehabilitation Subcommittee, Stroke Progress Review Group	National Institute of Neurological Diseases and Stroke, NIH
2014	Translational Working Group on Brain-Computer Interfaces (Workshop, invited group leader)	Div. Neurologic & Physical Medicine Devices U.S. Food & Drug Administration
2014	Workshop: Ethical Issues in Neuroscience Research (invited participant)	Office of the Director, NIH
2014	Workshop: Addressing Paralysis Through Spinal Stimulation Technologies (invited participant; panelist)	National Institute of Biomedical Imaging and Bioengineering, NIH
2014	Brain-Computer Interface (BCI) Devices for Patients with Paralysis and Amputation (invited moderator)	Office of Device Evaluation, U.S. Food & Drug Administration
2014 – Present	Member, Scientific Program Advisory Committee	American Neurological Association
2014	Workshop: Ethical Issues in Neuroscience (invited participant)	Office of the Director, NIH
2015	Member, Industry Partnerships to Facilitate Early Access to Neuromodulation and Recording Devices for Human Clinical Studies	NIH Brain Initiative Workshop
2016	Internal Reviewer, R25 Applications	MGH

2016	Reviewer, Clinical Transitional Research Grant	RI Center for Translational Science/Brown
2021 – present	OpenMind Scientific Steering Group	OpenMind (Brown, UCSF, Mayo Clinic, Oxford)
2022	Brain-Machine Interfaces for Disorders of Consciousness Committee	Neurocritical Care Society, Coma Survival Working Group

International

2011-2013	Steering/Program Committee, 5 th International Brain-Computer Interface Meeting	
2013	Exploratory Committee, International Brain-Computer Interface Society	
2014 - 2015	Executive Committee and Conference General Chair, International Clinical Brain-Machine Interface Conference, Tokyo, Japan	
2016 - 2017	International Program Committee, 7th Graz Brain-Computer Interface Conference, Graz, Austria	

Professional Societies

1993 – Present	Society for Neuroscience, Member	
2001 – Present	American Academy of Neurology, Member (elected Fellow, 2012)	
2008 – 2009	Member, Work Group on Spinal Cord/Nerve Repair/Neurorehabilitation, AAN	
2001 – Present	Massachusetts Medical Society, Member	
2003 – Present	Neurocritical Care Society, Member	
2003 – 2014	American Stroke Association/American Heart Association, Member	
2014 – Present	American Neurological Association, Fellow	
2015 – 2018	Founding and Executive Board Member, Brain Computer Interface Society	

Grant Review Activities

2006	Netherlands Organization for Scientific Research Ad hoc grant reviewer	
2007	CIMIT Ad hoc grant reviewer	
2008	Point of Care Center for Emerging Neurotechnology (POCENT) Member	NIH/NIBIB
2009	Challenge Grant Review (ZRG1 BBBP-J (58)) Stage I Reviewer	NIH
2009 – Present	Merit Review Study Section, Rehabilitation R&D Service Reviewer	Dept. Veterans Affairs
2009 – Present	Career Development Panel Study Section, Rehabilitation R&D Service, Reviewer	Dept. Veterans Affairs
2009	K99/R00 Grant Review Study Section (ZNS1 SRB-M (73)) Reviewer	NIH/NINDS
2010	Pre-Doctoral Associated Health Rehabilitation Research Fellowship Reviewer	Dept. Veterans Affairs
2012	R01 Grant Review Study Section (ZDC SRB Y 59)	NIH/NIDCD

	Reviewer	
2014	P41 Grant Review Study Section/Site Visit (ZEB1 OSR-C (M2))	NIH/NIBIB
	Reviewer	
2016	Bioengineering of Neuroscience, Vision and Low Vision Technologies (BNVT) Study Section, Reviewer	NIH
2017, 2019	Loan Repayment Program (LRP) applications	NIH/NICHD
	Reviewer	
2017	NIH BRAIN Initiative, Reviewer	NIH/NINDS
2018	Recording and Modulation in the Human CNS (ZNS1 SRB E (10)), Reviewer	NIH
2018	Next Generation BRAIN Devices & Translational Device Proposals	NIH/NINDS
	Reviewer	
2019	NIH Early Independence Award (DP5)	NIH
	Reviewer	
2019	NIDCD CDRC Early Investigators Award	NIDCD/CDRC
	Reviewer	
2019	AHA Collaborative Sciences Award Letter of Intent (CSI-LOI)	AHA
	Reviewer	
2020	NIH Early Independence Award (DP5) ZRG1 PSE-H 70	NIH
	Reviewer	
2020	NIH Research Education Program (R25) ZNS1 SRB-X 14	NINDS
	Reviewer	

Editorial Activities

Ad hoc Reviewer:

Archives of Internal Medicine, Epilepsy and Behavior, Journal of the American Medical Association, Journal of Neural Engineering, Journal of Neuroscience Methods, Journal of Rehabilitation Research and Development, Lancet, Neurobiology of Disease, New England Journal of Medicine, Neuron, Neurology, Neurorehabilitation and Neural Repair, Scholarpedia, others.

Other Editorial Roles:

2009	Review Editor	Frontiers in Neuroprosthetics
2013	Manuscript Editor	Proceedings of the National Academy of Sciences (US)
2020	Associate Editor	Frontiers in Neuroprosthetics

Honors and Prizes

1990 – 1992	Robert W. Woodruff Fellow in Medicine	Emory University School of Medicine
1998 – 1999	Robert W. Woodruff Fellow in Medicine	Emory University School of Medicine
1992	American Federation for Clinical Research Award	American Federation for Clinical Research
1994	Excellence in Teaching Award	Emory University, Graduate Division of Biological and Biomedical Sciences
1998	Omicron Delta Kappa	Emory University
1999	Dean's Award	Emory University School of Medicine
2002	Outstanding Teaching Resident Award	Emory University School of Medicine
2002	Partners in Excellence Award (Awarded to Neurology Chief Residents)	Massachusetts General Hospital/Brigham & Women's Hospital, Harvard Medical School
2003	American Academy of Neurology Annual Meeting Resident Scholarship	American Academy of Neurology
2005	Dean's Teaching Excellence Award	Warren Alpert Medical School of Brown U.
2006	Partners in Excellence Award (Awarded to MGH Telestroke Team)	Massachusetts General Hospital/Brigham & Women's Hospital/Harvard Medical School
2007	Dean's Teaching Excellence Award	Warren Alpert Medical School of Brown U.
2007	Fellow, 19th Annual Kavli Frontiers of Sciences Symposium, National Academy of Sciences	Symposium, National Academy of Sciences
2008	Dean's Teaching Excellence Award	Warren Alpert Medical School of Brown U.

2008	Clinical Scientist Development Award	Doris Duke Charitable Foundation
2009	Dean's Teaching Excellence Award	Warren Alpert Medical School of Brown U.
2010	Frontiers in Clinical Neuroscience Plenary Lecturer	American Academy of Neurology
2010	Exemplary Teaching Recognition	Warren Alpert Medical School of Brown U.
2011	Exemplary Teaching Recognition	Warren Alpert Medical School of Brown U.
2012	Exemplary Teaching Recognition	Warren Alpert Medical School of Brown U.
2012	Fellow of the American Academy of Neurology (FAAN)	American Academy of Neurology
2013	Joseph B. Martin Research Prize in Basic Research	Massachusetts General Hospital
	Top prize awarded annually for basic science research	
2013	Herbert Pardes Award for Excellence in Clinical Research	Clinical Research Forum
	Top prize awarded annually for clinical research	
2013	Exemplary Teaching Recognition	Warren Alpert Medical School of Brown U.
2013	Israel Brain Technologies International B.R.A.I.N. Prize (\$1 million, to BrainGate team, awarded by President Shimon Peres)	Moshe Mirilashvili Memorial Fund
2014	Fellow of the American Neurological Association (FANA)	American Neurological Association
2014	Distinguished Medical Achievement Award	Emory University School of Medicine
2014	Derek Denny-Brown Young Neurological Scholar Award	American Neurological Association
2015	Spirit of Lou Gehrig Award (to six Brown faculty)	ALS Association, Rhode Island Chapter
2016	Elected Alumni Member	Alpha Omega Alpha
2018	Annual BCI Award, 1st Place: Restoring Functional Reach-to-Grasp in a Person with Chronic Tetraplegia using Implanted Functional Electrical Stimulation and Intracortical Brain-Computer Interfaces (Awarded to Ajiboye, <i>et al.</i>)	
2019	Annual BCI Award, 1st Place: Decoding speech from intracortical multielectrode arrays in dorsal motor cortex (Awarded to Stavisky, <i>et al.</i>)	
2020	Annual BCI Award, 1st Place: A High-Performance Handwriting BCI (Awarded to Willett, <i>et al.</i>)	
2021	CERF Medical Engineering Prize, "BrainGate+Soft Robotics" (with Conor Walsh and Sabrina Pagononi)	
2022	Paul B. Magnuson Award	U.S. Department of Veterans Affairs
2022	Xandra Breakefield Research Mentor of the Year	Massachusetts General Hospital, Dept. of Neurology

Report of Funded and Unfunded Projects

Funding Information

Past Funding

1990 – 1999	Trainee	Medical Scientist Training Program, Emory University School of Medicine
1994	Trainee	Emory Center for Neurological Sciences (Lucille P. Markey Charitable Trust)
1994	PI	Southern Medical Association, Research Project Grant Stability and Plasticity of the Arm-Hand Representations in Primate Primary Cortex The major goal of the study was to understand changes in the somatotopic representation of the macaque arm and hand during learning of a novel motor task
2003	Scholarship Recipient	American Academy of Neurology, Resident Scholarship, AAN Annual Meeting
2005 – 2009	PI	Cyberkinetics Neurotechnology Systems, Inc. Feasibility Study of the BrainGate Neural Interface System for Patients Unable to Use Their Hands This is a pilot clinical trial of an intracortically-based brain-computer interface for people with spinal cord injury, brainstem stroke, or muscular dystrophy.
2006 – 2009	PI	Cyberkinetics Neurotechnology Systems, Inc. Feasibility of the BrainGate Neural Interface System in Persons with Motor Neuron Disease This is a pilot clinical trial of an intracortically-based brain-computer interface for people with ALS or other motor neuron diseases.
2006 – 2008	PI	Rehabilitation R&D Service, Dept. Veterans Affairs

Associate Investigator Award

- 2007 – 2009 PI NIH/NIDCD
R21 DC009317
Utility of the P300 Brain-Computer Interface for Patients in Acute Care Environments
The major goal of this project is to test the feasibility of a non-invasive brain-computer interface to improve the communication of patients acutely hospitalized with paralysis and an inability to speak.
- 2008 – 2011 PI Rehabilitation R&D Service, Dept. Veterans Affairs
B6310N
VA Career Development Transition Award
This is a Career Development Transition Award (CDTA) focusing on the development of intracortical neural interface systems (NISs) for the restoration of communication, mobility, and independence for veterans and others with severe paralysis or limb loss.
- 2008 – 2011 Subcontract PI NICHD/NCMRR
N01HD53403
Controller Development for Upper Limb Movement
This is a subcontract for maintenance of the clinical trial of an implanted neural interface system. The overall project goal is to design a cortical controller for implanted functional electrical stimulation devices.
- 2009 – 2012 Subcontract PI NICHD
1RC1HD063931
Cortical Control of an Assistive Robot Arm – Challenge Grant
The goal of this grant is to demonstrate the intracortically-based neural control of an assistive robot arm to assist people with tetraplegia.
- 2008 – 2013 PI Doris Duke Charitable Foundation
Clinical Scientist Development Award
Neural Interfaces for Restoration of Function After Paralysis
This Clinical Scientist Development Award is for further development and leadership in the development of neurally-controlled assistive devices for people with stroke or spinal cord injury.
- 2009 – 2013 Co-Investigator NSF/EFRI
EFRI-BioSA
Integration of Dynamic Sensing and Actuating of Neural Microcircuits
The goal of this project is to study complex nonlinear dynamics of brain microcircuits and their function by developing and fusing a new biosensing (recording) and actuation (neurostimulation) techniques.
- 2010 – 2014 Subcontract Co-PI DARPA
REPAIR
The goal of this contract is to harness and expand optogenetic technologies for the understanding of sensorimotor integration and cortical plasticity.
- 2011 – 2014 Subcontract PI NICHD/NCMRR
N01HD53403
Controller Development for Upper Limb Movement
This is a subcontract for direction of the clinical trial of an implanted neural interface system. The overall project goal is to design a cortical controller for implanted functional electrical stimulation devices.
- 2011 – 2015 PI Stanford University
BrainGate: Stanford Clinical Trial Site
This is a contract between Stanford and MGH for collaborative clinical research activities associated with the BrainGate2 pilot clinical trial.
- 2015 PI National Science

Meeting grant: International Conference on Clinical Brain - Machine Interfaces

- 2009 – 2017 PI NIDCD
R01DC009899
Restoring Communication with an Intracortical Neural Interface System
The major goal of this project is to develop an intracortically-based communication system for people with locked-in syndrome.
- 2011 – 2017 Subcontract PI Rehabilitation R&D Service/Department of Veterans Affairs,
Simeral, PI A-6779-I
Direct Intracortical Control of a Multijoint Prosthetic Arm
This is a subcontract to MGH for clinical activities and research activities for BrainGate2 participants engaged in research associated with this project.
- 2008 – 2017 PI MGH Deane Institute
Restoration of Motor Function After Stroke
The goal of this grant is to provide post-doctoral support to further develop intracortically-based neuroprosthetics for people with brainstem stroke.
- 2012 – 2017 Co-Investigator NINDS
R01NS079533
Multi-Scale Cortical Dynamics in Human Epilepsy
The goal of this project is to understand, at the mesoscale level of ensembles of individual neurons, the evolution of seizures in people with medically intractable epilepsy.
- 2014 – 2017 Subcontract PI NICHD/NCMRR
Kirsch, PI R01HD077220
Intracortical control of FES-restored arm and hand function in people with SCI
This is a subcontract to MGH for maintenance and coordination of the BrainGate2 clinical trial as it relates to evaluating an implanted functional electrical stimulation system under direct brain control.
- 2008 – 2018 PI Rehabilitation R&D Service, Department of Veterans Affairs
VA Merit Review Award B6453R
This Merit Review Award supports two participants in a pilot clinical trial toward the testing and further development of a neural interface system for people with ALS. (Includes subcontract to MGH).
- 2017 – 2018 Co-I Defense Advanced Research Projects Agency
Nurmikko, PI (NESD Initiative)
Cortical Intranet for Therapies of Sensory Deficits
- 2014 – 2018 Co-Investigator Rehabilitation R&D Service, Department of Veterans Affairs
Truccolo, PI Multi-Scale Cortical Dynamics and Seizure Prediction in Human Focal Epilepsy
Merit Review (1I01RX000668)
The goal of this project is to develop models for the detection and prediction of seizure in people with medically intractable epilepsy.
- 2016 – 2019 Subcontract PI NINDS
Cash, PI U01 (RFA-NS-16-008)
Understanding the Neural Basis of Volitional State through Continuous Recordings in Humans
The overarching goal of this research is to utilize platforms which allow for continuous acquisition of high-fidelity neural ensemble activity in humans synchronized with behavioral data and contextual information to allow discovery of the neural basis for changes in intent.
- 2015 – 2021 Subcontract PI NIDCD
Henderson, PI R01DC014034
Advanced Neural Decoders for Communication Interfaces R01
This subcontract to MGH supports the clinical research and regulatory oversight of the project, focused on developing next-generation neural decoders to help people with locked-in syndrome.

- 2019 – 2021 Co-Investigator NINDS/NIH
Schachter, PI 1R21NS110982
A study of Neuroimmune Mechanisms of Poststroke Fatigue using Integrated PET/MRI
This project will use PET/MRI to test the hypothesis that brain inflammation and associated changes in brain connectivity underlie post-stroke fatigue in people with chronic stroke.
- 2019 – 2021 Subcontract PI CDMRP-SCIRP
Ajiboye, PI SC180308
Restoring Multi-Dimensional Coordinated Reaching and Dexterous Grasping to Persons with Chronic Tetraplegia Through Functional Electrical Stimulation
The primary objective of the proposed work is to implement a combined FES+iBCI neuroprosthesis (comprised of an advanced implanted FES nerve-cuff electrode system and an implanted iBCI) to restore both coordinated reaching and dexterous grasping movements to people with chronic tetraplegia.

Current Funding

- 2019 – 2025 PI NIDCD
U01DC017844
Intuitive, complete neural control of tablet computers for communication
The goal of this proposal is to further translate knowledge about interpreting brain signals related to movement, and to further develop an intracortical brain-computer interface (iBCI) that could restore rapid and intuitive use of communication apps on tablet computers by people with paralysis.
- 2015 – 2022 Contact PI and Co-PI NINDS UH2/UH3
Hochberg and Nurmikko UH2NS095548
High-Bandwidth Wireless Interfaces for Continuous Human Intracortical Recording
This project will complete the regulatory testing and conduct the early clinical testing of a new, fully implanted neural interface system that can record from up to 100 neurons and transmit that neural activity to a nearby receiver. An important goal of the system is to allow people with neurologic injury to control cursors on a computer screen simply by thinking about the movement of their own hands.
- 2019 – 2022 PI American Heart Association
19CSLOI34780000
Intracortical control of soft robotics for restoration of hand function after stroke
The goal of the research is to develop and test intracortical control of a new soft robot glove system in collaboration with Prof. Conor Walsh.
- 2017 – 2023 PI Rehabilitation R&D Service, Department of Veterans Affairs
A2295-R
BrainGate: Robust Neural Decoding for Veterans with ALS
In this research, we will develop improved, stable neural decoders toward an iBCI that provides Veterans with ALS with intuitive, robust, at-home control of computers and other assistive communication technologies.
- 2019 – 2024 Co-I NIH Director's New Innovator Award
Edlow, PI DP2HD101400
A Connectome-Based Clinical Trial Platform to Promote Early Recovery of Consciousness after Traumatic Coma
The goal of this project is to create a new paradigm for individualized brain connectome mapping to guide targeted therapy aimed at promoting recovery of consciousness in the ICU
- 2018 – 2023 PI Rehabilitation R&D Service/Department of Veterans Affairs
N2864-C
Center for Neurorestoration and Neurotechnology
The goal of this Center is to promote and facilitate interdisciplinary research in neurotechnology and translational neuroscience in service of our nation's Veterans.
- 2018 – 2022 Co-I Rehabilitation R&D Service/Department of Veterans Affairs

- | | | | |
|----------------|---|---|--|
| | Simeral, PI | A2827-R | Deployment of a Mobile Broadband BCI
To update the hardware and software of a mobile battery powered BCI signal processing system, deploy it to the homes of several individuals with tetraplegia and assess its utility, usability and effectiveness for extended independent communication and digital access without technical oversight. |
| 2018 – 2022 | Co-I
Borton, PI | DARPA
HR001118S0041/D19AC00015 | Intelligent Spine Interface
The research proposes to build an Intelligent Spine Interface (ISI) capable of reading and writing simultaneously to, and from, the human spinal cord both above, and below, the site of spinal cord injury. |
| 2018 – 2021 | Co-PI
Cash, Co-PI | Cerebral Palsy Alliance Research Foundation (CPARF) | CPARF is supporting planning for the development of technologies and clinical trials of neurotechnologies for the restoration of communication. |
| 2020 – 2025 | Subcontract PI
Henderson, PI | NIDCD, NIH
R01DC014034 | Engaging new cognitive and motor signals to improve communication prostheses.
This is a subcontract to MGH for maintenance and coordination of the BrainGate2 Clinical trial as it relates to the Stanford-based research on BrainGate-based communication interfaces. |
| 2020 – 2022 | PI | ALS Association
20-MALS-553 | Enabling independent home use of an intracortical brain-computer interface for control of multiple communication devices
This project will advance the core user and caregiver software for the BrainGate technology so that people with ALS and other forms of tetraplegia would be able to control multiple, full-function communication and environmental control technologies in their own homes, without the aid of a team of researchers. |
| 2021 – 2023 | Co-I
Angle, PI (Cash, MPI) | NIMH, NIH
1R44MH125700 | Development and Evaluation of Novel High-Density Intracortical Microelectrode Arrays for Clinical Applications
The goal of this project is the initial, acute testing of a new brain-computer interface technology |
| 2021 – 2021 | Subcontract PI
Henderson, and Shnoy PI | NINDS, NIH
U01NS123101 | Cortical basis of complex motor sequences in humans for neural interface.
Advance the capabilities of iBCIs for restoration of lost function and our understanding of the detailed neural mechanisms of complex movements, such as handwriting, in motor cortex. |
| 2019 – present | PI | MassGeneral Neuroscience / McCance Brain Health | Neurorecovery: the MGH-CNTR/ MGH-IHP/ Spaulding Collaborative
The goal of the SPARC-supported Neurorecovery Collaborative is to transform the field of Neurorecovery by establishing a neuroscience-informed learning health care system for patients with acute neurologic injury. |
| 2017 – present | PI | MGH institutional funding | Stroke Motor Rehabilitation and Recovery Study (“SMaHRT Study”)
Longitudinal study to understand the natural history of upper extremity motor recovery after ischemic stroke. |
| 2017 – present | Subcontract PI
Kimberley, PI | MicroTransponder Inc. | Vagus Nerve Stimulation Study (VNS study)
This subcontract from IHP to MGH supports the investigational therapy that combines VNS system with physical therapy for stroke rehabilitation. |

2018 – present Consultant to Massachusetts General Hospital Translational Research Center
 Consultation for the TRC supports Clinical Research Support Agreements between the hospital and entities seeking MGH
 faculty insights to guide preclinical research and clinical trial planning. Current entities include Synchron Med, and Neuralink.

Report of Local Teaching and Training

Teaching of Students in Courses:

2005 – 2013	Neurobiology	Lecturer	
First year medical students, Brown University			10 ('05), 2 ('06), 4 ('07-'13) hour lectures
2008 – 2010	Clinical Approach to the Human Brain		One-hour lecture
Undergraduate students, Massachusetts Institute of Technology			
2009 – present	Neuroengineering	Lecturer and Course Director	Taught or co-taught 16 one-hour lectures, (sabbatical 2014 and 2020, 2-3 lectures)
Undergraduate and Graduate Students, Brown University			
2009	Bench-to-Bedside		One-hour lecture
Graduate students and Psychiatry residents, Brown Institute for Brain Sciences and Department of Neuroscience			
2009	Careers in Medicine	Panelist	One-hour panel
Medical and MD/PhD students, Brown University			
2009, 2010	Neurotechnology	Lecturer	One-hour lecture
First-year Engineering students, Brown University			
2011	Integrative Mind-Brain	Lecturer	One-hour lecture
Second year medical students, Harvard Medical School			
2012, 2013	Integrative Mind-Brain	Lecturer	One-hour lecture
Third year medical students, Harvard Medical School			
2012 – 2013	Biomedical Engineering	Honors Director	Symposium
Coordinated the evaluation and symposium for 10 students pursuing the Sc.B. with Honors in Biomedical Engineering			
2013, 14, 16, 17	Engineering	Lecturer	One-hour lecture: ENGN 0020, Introduction to Engineering
First year undergraduate students, Brown University			
April 2018	Neuroethics lecture on BCI		Lecture
HMS Master's Program in Bioethics, Boston, MA			
2017, 18, 19, 20	Engineering	Lecturer	One-hour lecture: ENGN 0030, Introduction to Engineering
First year undergraduate students, Brown University			
March 2020	Neuroethics lecture on BCI		Lecture
HMS Master's Program in Bioethics, Boston, MA			
March 2022	Neuroethics lecture on BCI		Lecture
HMS Master's Program in Bioethics, Boston, MA			

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs):

2006	Brain-Computer Interfaces		
Neurology Residents, Stroke Fellows		MGH/BWH	One-hour lecture
2007, 2009	Locked-In Syndrome		

Stroke and Neurocritical Care Fellows	MGH/BWH	One-hour lecture
2017 – present	Program Director, MGH-Spaulding Neurorecovery Fellowship	Massachusetts General Hospital
Clinical Supervisory and Training Responsibilities:		
2004 – 2006	Neurology Consult Attending SRH	One half-day per week
2004 – Present	Acute Stroke Attending MGH	20-24 evenings per year
2006 – 2010	Neurology Stroke/ICU Consult Service Attending MGH	Four weeks per year
2004 – 2011	Neuroscience Intensive Care Unit Attending Neurologist BWH	One weekend per month
2010 – 2011	Neuroscience Intensive Care Unit Attending Neurologist MGH	Four weeks per year
2011 – Present	Neuroscience Intensive Care Unit Attending Neurologist and Neurotrauma Consultant MGH	Six weeks/year and one weekend/month

Laboratory and Other Research Supervisory and Training Responsibilities:

2006 – Present	Guide multidisciplinary research effort of residents, post-doctoral students and junior faculty at Harvard Medical School and Brown University	Daily interaction
2007 – Present	Direct weekly BrainGate meeting, videoconference between MGH, Brown, Case Western Reserve University, PVAMC, and Stanford University; guide multiple post-doctoral and graduate students	Weekly interaction
2007	Guide summer undergraduate student in P300 Research	Weekly mentorship for 3 months
2008 – Present	Supervision of undergraduate honors thesis students in Neuroscience, Biomedical Engineering, Computer Science	Weekly mentorship
2009 – Present	Supervision of graduate students in Biomedical Engineering, Neuroscience, and Electrical and Computer Engineering	Weekly mentorship

Formally Supervised Trainees:**Recent Position*****Residents, Clinical Fellows, and Postdoctoral Fellows:***

2007 – 2009	John Mislow, M.D., Ph.D.	Neurosurgery Resident, BWH/HMS
Residency research co-mentor		
2007 – 2012	Terrance Kummer, M.D., Ph.D.	Instructor in Neurology,
Residency mentor		Washington University School of Medicine
2008 – Present	John Simeral, Ph.D.	Assistant Professor (Research),
Senior postdoctoral and research faculty mentor		Brown University
2009 – 2011	Nivideta Jerath, M.D.	Neuromuscular Fellow,
Residency mentor		University of Iowa
2009 – 2017	Wasim Malik, Ph.D.	Instructor in Anesthesiology,
Postdoctoral/junior faculty research advisor		MGH/HMS

(with Emery Brown, M.D., Ph.D.)

2010 – 2018	Beata Jarosiewicz, Ph.D. Postdoctoral/junior faculty research advisor (with John Donoghue, Ph.D.)	Scientist, Neuralink, CA
2010 – 2011	Jie Liu, Ph.D. Postdoctoral research advisor	Research Engineer, Rehabilitation Institute of Chicago
2010 – 2011	Nicholas Masse, Ph.D. Postdoctoral Co-Advisor	Postdoctoral research fellow, University of Chicago
2010 – 2013	Janos Perge, Ph.D. Postdoctoral research advisor	Health Data Scientist, Aetna
2013 – 2015	Brian Edlow, M.D. Career/Transition to Faculty Mentor	Associate Professor of Neurology, Harvard Med. School NeuroICU Attending, MGH
2012 – 2014	Tomislav Milekovic Postdoctoral research advisor (with John Donoghue, Ph.D.)	Ambizione Fellow, Ecole Polytechnique Federale de Lausanne, Geneva, Switzerland
2015 – 2017	Vamsi Chavakula, M.D., Ph.D. Postdoctoral research advisor	Chief Resident in Neurosurgery, BWH/HMS
2014 – 2016	Damien Lesenfants, Ph.D. Postdoctoral research advisor	Post-Doc, Katholiek Universitetit Leuven, Belgium
2014 – Present	David Lin, M.D. Career/Transition to Faculty Mentor	Neurocritical Care Physician, Instructor in Neurology, MGH/HMS VA CDA-1, Providence VAMC
2015 – 2018	Marco Vilela, Ph.D. Postdoctoral research advisor	Post-Doc, School of Engineering, Brown University
2017 – 2020	Kevin Huang, M.D. Postdoctoral research advisor	Resident in Neurosurgery, BWH/HMS
2014 – Present	Daniel Rubin, M.D., Ph.D. Career/Transition to Faculty Mentor	Neurocritical Care Physician, Instructor in Neurology, MGH/HMS
2016 – 2020	David Chung, M.D., Ph.D. Career mentor, K08 advisory committee chair	Instructor in Neurology, MGH; Neurointensivist, Boston Medical Center
2018 – Present	Daniel Thengone, Ph.D. Research advisor, mentor	F32 Fellow, Postdoc MGH, Brown University
2019 – Present	Amanda Duffy, Ph.D. Postdoctoral Research Advisor	Postdoctoral Fellow, CNTR/MGH/HMS
2019 – 2020	Aristotle Filippidis, MD, PhD Postdoctoral research advisor	Chief Resident in Neurosurgery, BIDMC/BMC, Harvard Medical School
2020 – Present	Michael Young, M.D., MPhil Career/Transition to Faculty Mentor	Instructor in Neurology, Harvard Medical School Assistant in Neurology, MGH

Graduate Students and Medical Students

2007 – 2008	Nicholas Taylor, B.S.	U. Penn. School of Medicine, 21 st Century
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Completed M.S. project in neurotechnology device development		Scholar
2008 – 2009	Ammar Shaikhouni, Sc.B. Ph.D. Thesis Committee Member and reader	Neurosurgery Resident, Ohio State University
2010 – 2012	Sunmee Park, B.S., Ph.D., Thesis committee member	Engineering, Brown University
2009 – 2013	Brandon King, B.S. Thesis committee member	Neuroscience, Brown University
2010 – 2013	Jessica Feldman, Sc.B. M.D./Ph.D. research co-advisor	Medical Student, Brown University
2009 – 2014	Mark Homer, M.S. Ph.D. Dissertation Advisor Thesis: Novel algorithms for better decoding neural signals	Postdoctoral Fellow, Clinical Informatics Harvard Medical School
2011 – 2012	David Borton, B.S. Thesis committee member	Assistant Professor of Engineering, Brown University
2012 – 2014	Fabien Wagner, B.S. Ph.D. Thesis committee member, Neuroscience	Post-Doctoral Research Associate, Brown University
2012 – 2014	Erin Hoops, B.S. Lab Rotation Advisor	Neuroscience Graduate Training, Brown University
2013 – 2018	David Brandman, M.D. Ph.D. Thesis Advisor, Neuroscience	Assistant Professor of Neurosurgery University of California, Davis
2014 – 2016	Jose Albites Sanabria, B.S. Master's Thesis Advisor	Biomedical Engineering, Peru
2016– Present	Nicole Provenza, B.S. PhD Thesis Committee Member	Biomedical Engineering, Brown University
2016 – 2020	David Xing, B.S. Mentor, PhD thesis committee member	Postdoctoral Researcher, Northwestern University
2016 – 2019	Evan Matteson, B.S. Mentor, Preliminary thesis committee member	Biomedical Engineering, Brown University
2016 – Present	Radu Darie, B.S. Mentor, PhD thesis committee member	Biomedical Engineering, Brown University
2016 – 2020	Marc Powell, B.S. Mentor, PhD thesis committee member	Postdoctoral Researcher, University of Pittsburgh
2017 – Present	Kaitlin Wilcoxon, B.S. PhD Thesis Advisor	Neuroscience, Brown University
2017 – Present	Jacob Gusman, B.S. PhD Thesis Advisor	Biomedical Engineering, Brown University
2018	Sarah Syrop, B.S. Reader, Masters' Thesis	Biomedical Engineering, Brown University

2018 – Present PhD Thesis Advisor	Aliceson Nicole Dusang, B.S.	Electrical and Computer Engineering, Brown University
2018 – Present Thesis committee	Peter Lauro, B.S.	MD/PhD student, Neuroscience, Brown University
2018 – Present PhD Thesis Advisor	Ewina Pun, B.S.	Biomedical Engineering, Brown University
2019 – 2021 Master’s Thesis Advisor	Sarah Cavanagh, B.S.	Biomedical Engineering, Brown University
2021 – Present Master’s thesis committee member	Derek Wacks, B.S.	Biomedical Engineering, Brown University
2021 – 2022 Master’s thesis committee member	Lola Olabode, B.S.	Biomedical Engineering, Brown University

Undergraduate Students

2008 Summer undergraduate student in P300 research	Stephen Van Wert	Graduate Student, Pennsylvania State University, PA
2008 – 2009 Mentor, undergraduate honors thesis in Neuroscience, “Stability of continuous multi-electrode recordings in motor cortex during control of a neural interface system”	Jacob Donoghue	HST Student, Harvard Medical School
2009 – 2010 Mentor, undergraduate honors thesis in Biomedical Engineering	Tanya Lewis	Health and Medicine Editor, Scientific American
2010 Reader, honors thesis in Biomedical Engineering	Phillip Grice	Graduate Student, Biomedical Engineering, Penn State University
2010 – 2012 Mentor, undergraduate honors thesis in Biomedical Engineering	Kathryn Tringale	Resident, Radiation Oncology Memorial Sloan-Kettering
2011 – 2012 Independent Study Advisor (co-mentored with John Simeral, Ph.D.)	Anish Sarma	Graduate Student, California Institute of Technology
2011 – 2012 Independent Study Advisor (co-mentored with Beata Jarosiewicz, Ph.D.)	William Schweitzer	
2012 – 2014 Special Concentration Advisor (Neuroengineering)	Ignacio Peres Poseulo	
2013 – 2015 Undergraduate Research Advisor, Neuroengineering	Lev Levitchskiy	Research Assistant, Broad Institute, Boston
2013 – 2017 Undergraduate Research Co-Advisor, Computer Science (co-mentored with Erik Sudderth, Ph.D.)	Daniel Milstein	Master’s Student, Brown University
2013 – 2014 Undergraduate Honors Research Co-Advisor, Bioelectrical Engineering	James Besancon	Master’s Student, Brown University
2013 – 2014 Undergraduate Honors Research Advisor (co-mentored with Beata Jarosiewicz, Ph.D.)	Camille Spencer Salmon	Clinical Research Coordinator, MGH, Neurology

2013 – 2014	Mark St. Louis	
Undergraduate Research Advisor, Neuroscience		
2012 – 2014	Evan Matteson	Grad Student, Biomedical Engineer, Brown University
Undergraduate Honors Research (co-mentored with John Simeral, Ph.D.)		
2016	Miranda Olson	Undergrad Student, Biomedical Engineering, Brown University
Undergraduate Research Advisor		
2016	John Eager	Undergrad Student, Brown University
Undergraduate Research Advisor		
2016 – 2017	Mark Hays	Undergrad Student, Brown University
Undergraduate Research Advisor		
2016 – 2018	Benjamin Shanahan	Undergrad Student, Brown University
Undergraduate Research Advisor		
2016 – 2017	Naryan Murthy	Undergrad Student, Brown University
Undergraduate Research Advisor		
2017 – 2018	Lauren Ostrowski	Undergrad Student, Brown University
Honors Thesis Supervisor		
2020 – Present	Connor Johnson	Neuroscience, Brown University
Undergraduate Research Advisor		
2020 – Present	Zoe Beckman	Neuroscience, Brown University
Undergraduate Research Advisor		
High School Students		
Summer 2018	Oliver Rosand	Summer Student, Brown University and MGH
Summer 2018	Christopher Schiff	Summer Student, Brown University
Summer 2019	Abhinav Tripathi	Summer Student, Brown University and MGH

Clinical Neurotechnology Research Assistants (CNRA) – daily interaction, career mentorship

2008 – 2010	Katherine Centrella Newell	Attending, Emergency Medicine, North Carolina
2010 – 2011	Etsub Berhanu	Examiner, US Patent and Trademark Office
2010 – 2012	Erin Gallivan Oakley	Resident, Emergency Medicine, Boston University
2012 – 2015	Brittany Sorice	Speech and language pathologist
2015 – 2018	Brian Franco	Clinical Field Engineer, NeuroPace, NJ
2016 – Present	Jessica Kelemen	Senior CNRA, MGH Neurology
2017 – 2020	Alison Cloutier	Engineer, Biotech startup

2019 – 2020	Julie DiCarlo	CNRA, MGH Neurology/Neurorecovery
2020 – Present	Anastasia Kapitonava	CNRA, MGH Neurology
2022 – Present	Claire Nicolas	CNRA, MGH Neurology

Formal Teaching of Peers:

2005 Ischemic & Hemorrhagic Update	Antiplatelet Therapy in Secondary Prevention of Stroke Harvard Medical School, Boston	Single Presentation
2006 Impact of Technology on Stroke Rehabilitation	Brain-Computer Interfaces in Neurorehabilitation Harvard Medical School, New York	Single Presentation
2007 Ischemic & Hemorrhagic Update	Vertebrobasilar Disease: Medical management and Indications for Intervention Harvard Medical School, Boston	Single Presentation
2013 Harvard Neuroradiology Postgraduate Course	BrainGate: Toward Restoring Communication, Mobility, and Independence	Single Presentation

Local Invited Presentations:

2004 PM&R, Spaulding Rehabilitation Hospital	Brain-Computer Interfaces: From Bench to Bedside	Lecture
2004 Boston, MA	Brain-Computer Interfaces: Turning Thought into Action	Seminar Cyberkinetics, Inc. (no compensation)
2004 Boston, MA	Mind to Movements: Turning Thought into Action	Seminar Cyberkinetics Inc. (no compensation)
2005 CIMIT/Dartmouth College/Harvard Medical School	Advanced Technologies in the Neurosciences	Seminar
2005 Brown University	Restoring Function: Blending Human and Machine	Lecture
2005 Department of Neurosurgery, Children's Hospital/BWH	Chronic Intracortical Recordings	Grand Rounds
2005 PM&R, Spaulding Rehabilitation Hospital	Brain-Computer Interface in Neurorehabilitation	Lecture
2006 Department of Neuroscience, Brown University	Progress in Intracortical Brain-Computer Interfaces	Lecture
2006 Department of Neurosurgery, MGH	Intracortically-based Brain-Computer Interfaces	Grand Rounds
2006 OT/PT/SLP, Massachusetts General Hospital	Neurotechnology: Restoring Communication and Mobility	Seminar
2006 Boston Society of Neurology and Psychiatry	NeuroRobotics	Lecture

2007	Brain-Computer Interfaces in Neurorehabilitation PM&R, Spaulding Rehabilitation Hospital	Grand Rounds
2007	Brain-Computer Interfaces Departments of Neurology, BIDMC/BWH/CH	Grand Rounds
2007	Brain-Computer Interfaces Telestroke Service	Grand Rounds
2007	Neurotechnology Center for Engineering and Medicine, MGH	Lecture
2008	Brain-Body Interfaces CIMIT	Lecture
2008, 2009, 2011	EEG and Intracortical Brain-Computer Interfaces Stroke Service, MGH	Lecture
2009	Creating an IDE Trial at MGH MGH Clinical Research Council	Lecture
2009	Intracortical Brain-Computer Interfaces Leonard Morse Hospital	Grand Rounds
Sept 2010	Connected Health Symposium Partners HealthCare Center for Connected Health	Invited Panelist
Jan 2011	Ethics in Implanted Neural Interfaces Brown University Bearcore	Invited Faculty Lecture
Dec 2011	BrainGate Research Leonard Florence Center for Assisted Living, Chelsea, MA	Invited Presentation
Apr 2012	BrainGate2: Neurologists Listening to Neurons MGH Case Management Education Committee	Invited Presentation
2012	BrainGate: Collaborative Research in Neurorestoration General Executive Committee, The General Hospital Corporation	Invited Presentation
Nov 2012	Intracortical Neural Interfaces MGH Departments of Neurology, Neurosurgery, and Psychiatry	Combined Neuroscience Grand Rounds
March 2014	Machine-Brain Interface 1005 th Meeting of the Boston Society for Neurology and Psychiatry	Invited Presentation
2014	Intracortically-based Communication Devices Board of Trustees, The Boston Home	Invited Presentation
May 2015	BrainGate Research at MGH MGH Office for Research Career Development, Research Fellows Celebration	Keynote Presentation
Oct 2015	Neurologists Listening to Neurons MGH Department of Psychiatry, Russell Museum, Boston	Lecture, MGH HUBweek
Oct 2015	Connected Health Symposium Partners HealthCare Center for Connected Health	Invited Panelist

Nov 2015	Neural interfaces for restoring communication and mobility American Physical Therapy Association of Massachusetts Fall Conference	Invited Presentation
Dec 2015	Ethics of Brain-Computer Interfaces Harvard Medical School, Center for BioEthics, Boston	Invited Presentation
Jan 2016	Neuroprosthetics and Learning MGH, Alzheimer's Disease Research Center, Boston	Lecture
Jan 2016	Human Performance Enhancement American Academy of Arts and Sciences, Somerville, MA	Panel, Dinner Lecture
Aug 2016	BrainGate Research Study Summer Learning Series, MGH, Stroke Research Center, Boston, MA	Lecture
May 2017	BCI: Neurologists Listening to Neurons Research Technical Lunch, Partners ERIS, Boston, MA	Lecturer
May 2017	Update on BrainGate Research to Secretary Shulkin Providence VA Medical Center, RI	Presentation
June 2017	Brain-Computer Interfaces SRH Neurorehabilitation Course, Waltham, MA	Presenter
Oct 2017	Update on BrainGate Research Study Fall Learning Series, MGH, Stroke Research Center, Boston, MA	Lecture
March 2018	Harnessing Neuroscience for the Restoration of Communication and Mobility Wellesley College Patterson Symposium, Wellesley, MA	Key Speaker
June 2018	Brain-Computer Interfaces SRH Neurorehabilitation Course, Waltham, MA	Presenter
June 2018	Forum: Subarachnoid Hemorrhage MGH Cerebrovascular Future Care Symposium, Assembly Row, Somerville, MA	Panelist
Aug 2018	Update on BrainGate Research Study Summer Learning Series, MGH, Stroke Research Center, Boston, MA	Lecture
Oct 2018	Brain Injury Services in Massachusetts /A Life Worth Living MAB Community Services Annual Meeting, Boston University, Boston, MA	Panelist
May 2019	BrainGate: Understanding and harnessing neuronal ensemble activity for the restoration of communication and mobility Harvard SBB series, Faculty Seminar	Presenter
May 2019	Boston University Neurosurgery Grant Rounds BU, Boston, MA	Presenter
May 2019	Brain-Computer Interfaces SRH SCI Collaborative Work Group	Presenter
June 2019	Brain-Computer Interfaces SRH Neurorehabilitation Course, Waltham, MA	Presenter

Oct 2019 MGH, Boston	MGH Neurology Research Retreat/ Circuits Panel	Panelist
Nov 2019 BCI: VISN1 SCI Symposium, Boston VA Medical Center	Brain-Computer Interfaces	Presenter
Dec 2019 B2B NSGP seminar, Brown University, Providence RI	TBI, Spinal Cord Injury, and Intracortical Neurotechnologies for Restoring Function and Understanding the Brain	Event host/Presenter
March 2020 CNTR/IHP/SRH, Assembly Row, Somerville, MA	Neurorecovery Collaborative Retreat	Event host
June 2020 T32 Symposium and Mislow lecture, Brown University, Partners/MGH, virtual event	Neuroscience of Consciousness and Recovery from Coma	Event host
Dec 2020 Paralysis Center/ Spaulding, Cambridge, MA	BrainGate Clinical Trials	Presenter
January 2021 HMS Master's Program in Bioethics, Boston, MA	Neuroethics lecture on BCI	Lecturer
June 2021 The Practical Neurological Toolkit: High Yield Updates for the Office and the Ward, Boston (virtual)	Glow on the Horizon: Therapeutic Innovations to Come	Presenter
June 2021 Everything ALS, Boston (virtual)	BrainGate: Toward the Restoration of Communication and Mobility for People with ALS	Presenter
March 2022 Brown University Carrie Tower Society, NY, NY	BrainGate	Presenter
March 2022 Marine Biologic Lab, Woods Hole	Listening to Neurons: Restoring Communication and Mobility.	Herman T. Epstein Endowed Memorial Lecturer

Report of Regional, National and International Invited Teaching and Presentations

Regional

2005 Northeastern Rehabilitation Center, Salem, NH	The BrainGate Clinical Trial	Plenary Talk
2005 Rehabilitation R&D Service, Providence VA Medical Center	Cortical Control of Limb Prosthesis:	Bench to Bedside Lecturer
March 2005 Dartmouth-Hitchcock Medical Center, Hanover, NH	Chronic Intracortical Recordings in Humans: Frontiers In Clinical Neuroscience and Neurorehabilitation	Grand Rounds
2006 Department of Neurology, University of Massachusetts Medical School	Frontiers in Intracortical Recordings	Grand Rounds
2006	Neurotechnology Futures Workshop	Policy Discussion

Potomac Institute for Policy Studies, Charlestown, MA

2006	Restoring Function after Stroke Northeast Cerebrovascular Consortium, Boston, MA	Lecture
Jan 2007	Brain-Computer Interfaces and Restorative Neurotechnologies: Emerging Tools to Help Our Patients Association of Neuroscience Nurses (Boston Chapter)	Seminar
March 2007	Brain-Computer Interfaces and Restorative Neurotechnology CIMIT	Lecture
2009	Toward Restoring Communication and Mobility with Intracortical Neurotechnologies IEEE Engineering in Biology in Medicine (Boston Chapter)	Lecture
2009	Neurologists Listening to Neurons Department of Neurology, Boston University School of Medicine	Grand Rounds
Nov 2012	Brain-Machine Interfaces 33rd Annual Braintree Neurorehabilitation Conference, Cambridge, MA	Keynote Lecture
Oct 2014	Update: Intracortical Brain-Computer Interfaces Departments of Neurosurgery and Neurology, Boston University School of Medicine	Grand Rounds
Oct 2015	Turning Thought into Action: Brown, BrainGate, and the Restoration of Mobility and Independence Brown University, Providence, RI	Lecture
Jan 2016	Brain Science and Neurotechnology Brown University, Providence, RI	Lecture
Nov 2016	Neurotechnology Update: mindBEAGLE and BrainGate Spaulding Stroke Research Symposium, Charlestown, MA	Presenter
Apr 2017	Sensitive Periods in Brain Development: Therapeutic Opportunities for Enhancing Brain Health across the Lifespan Mind-Brain Health Symposium, MGH, Boston, MA	Presenter
Aug 2017	BrainGate: Toward Restoring Communication and Mobility Functional Neurosurgery Meeting, Providence, RI	Presenter
Sept 2017	BCI: Toward Restoring Communication and Mobility MDG Forum: Brain and Spine Injury, Weston, MA	Presenter
Oct 2017	Neurologists Listening to Neurons: BrainGate Research toward the Restoration of Communication and Mobility" Burke Medical Research Institute, NY	Presenter
June 2018	Translational Neuroscience and Neuroengineering Workshop Salve Regina University, Newport, RI	Presenter
July 2018	BrainGate: Restoring Communication and Mobility Advancement Lunch and Talk - Ivy Plus Conference, Brown University, Providence, RI	Lecture
Oct 2018	BrainGate: Toward Restoring Communication and Mobility Seminar, Ryan Institute for Neuroscience, RI University, Providence, RI	Lecturer

May 2019	Spaulding New England Regional SCI Model Systems Knowledge in Motion (KIM) Lecture SRH, Charlestown, MA	Lecturer
Nov 2019	BrainGate: Clinical trials of intracortical BCIs for restoration of communication and mobility MIT Neurotech 2019 Symposium, Cambridge, MA	Guest speaker
Jan 2020	Brain-Computer Interfaces Neurosciences Grand Rounds. Cedar-Sinai Medical Center, Los Angeles, CA	Presenter
Apr 2022	BrainGate: Intracortical Brain-Computer Interfaces for the Restoration of Communication and Mobility University of Louisville, Dept. of Neurosurgery, KY	Grand Rounds Presenter
May 2022	BrainGate: Toward the Restoration of Communication and Mobility VA ORD Virtual Research Week Symposium, Providence, RI	Magnuson Speaker
Jun 2022	BrainGate: Intracortical BCIs towards the Restoration of Communication and Mobility University of California, Davis	Speaker
<i>National</i>		
2005	Intracortical Recordings: Frontiers in Neuroscience and Functional Neurosurgery Research in Neuroscience for Neurosurgeons, Woods Hole, MA	Lecture RUNN/Duke University
2006	Frontiers in Intracortical Recordings Albany Medical College	Grand Rounds
2006	Workshop on Brain-Computer Interfaces for Speech Synth. National Institute of Deafness and Communicative Disorders, Bethesda, MD	Lecture
2006	Brain-Machine Interface American Society of Stereotactic and Functional Neurosurgery, Boston, MA	Plenary Lecture
2006	Neural Interface Workshop National Institute of Neurological Diseases and Stroke, Bethesda, MD	Special Presentation
2006	Restorative Neurology Department of Biomedical Engineering, Johns Hopkins University	Grand Rounds
2006	Applied Neural Computing IEEE Engineering in Medicine and Biology Annual Conference	Lecture
2007	Brain-Computer Interfaces for ALS ALS Association Annual Meeting, California	Lecture
2007	Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience American Academy of Neurology, Boston, MA	Lecture
2007	Implanting Change: The Ethics of Neural Prosthetics	Plenary Lecture

Pennsylvania State University

2007	Neurologists Listening to Neurons Departments of Neurology and Neurosurgery, University of Pennsylvania	Grand Rounds
2007	Neural Interfaces for Restoration of Communication and Mobility Kavli Frontiers of Science, National Academy of Science, California	Lecture
2007	Neurologists Listing to Neurons: Brain-Computer Interfaces in Neurorehabilitation Dept. of Neurology, UCLA David Geffen School of Medicine	Grand Rounds
2007	Intracortical Recordings: Frontiers in Neuroscience and Functional Neurosurgery Research in Neuroscience for Neurosurgeons, Woods Hole, MA	Lecture RUNN/Duke University
2008	Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience American Academy of Neurology, Chicago, IL	Lecture
2008	Brain-Computer Interfaces for Restoring Function After Stroke International Stroke Conference/American Stroke Association/American Heart Association	Special Lecture
2008	Inaugural Soffia Wathne Memorial Lecture Mt. Sinai School of Medicine, New York, NY	Special Lecture
2008	Brain-Comp. Interfaces and Restorative Neurotechnology Society for Laparoendoscopic Surgery, Chicago, IL	Keynote Speaker
2008	Brain-Computer Interfaces in Neurorehabilitation 29th Annual Braintree Neurorehabilitation Conference, Cambridge, MA	Lecture
2008	Intracortical Recordings: Frontiers in Neuroscience and Functional Neurosurgery Research in Neuroscience for Neurosurgeons, Woods Hole, MA	Lecture RUNN/Duke University
2009	Neurologists Listening to Neurons PM&R, Columbia/Cornell School of Medicine	Grand Rounds
2009	Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience American Academy of Neurology, Seattle, WA	Lecture
2009	Brain-Computer Interfaces Singularity University, NASA Ames Research Center, Palo Alto, CA	Lecture
2009	Research in Restorative Neurotechnology Rocky Mountain Brown Club	Lecture
2009	Neurologists Listening to Neurons Neurology, University of Pittsburgh Medical Center, Pittsburgh, PA	Grand Rounds
2009	Clinical Trials of an Intracortical Neural Interface System Biomedical Engineering Society, Pittsburgh, PA	Special Lecture

2009	Intracortically-based Brain-Computer Interfaces and Restorative Neurotechnologies 15th Annual Brain Injury Symposium, Miami, FL	Keynote Lecture
2009	Intracortical Recordings: Frontiers in Neuroscience and Functional Neurosurgery Research in Neuroscience for Neurosurgeons, Woods Hole, MA	Lecture RUNN/Duke University
2009	Neurologists Listening to Neurons Neurology, Northwestern University Medical School, Chicago, IL	Grand Rounds
2010	Brain-Computer Interfaces Yeshiva University, New York, NY	Invited Lecture
2010	Intracortically-based Brain-Computer Interfaces and Restorative Neurotechnologies Boston-Area Brain Machine Interface Group, Boston University	Invited Lecture
2010	Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience American Academy of Neurology, Toronto, Ontario, Canada	Lecture
2010	American Society of Stereotactic and Functional Neurosurgery, Biannual Meeting New York Marriott Downtown, New York, NY	Invited Lecture
2010	BrainGate Update 4th International Brain-Computer Interface Conference, Asilomar, CA	Oral Presentation
2010	Intracortically-Based Brain-Computer Interfaces Transforming Technologies Conference Rancho Los Amigos National Rehabilitation Hospital, Downey, CA	Invited Lecture
2010	BrainGate2 Update New York Academy of Sciences "Building Better Brains" Aspen Brain Forum, Given Institute, Aspen, CO	Invited Lecture
2010	Intracortical Recordings: Frontiers in Neuroscience and Functional Neurosurgery Research in Neuroscience for Neurosurgeons, Woods Hole, MA	Lecture RUNN/Duke University
2010	Neurologists Listening to Neurons SUNY Downstate Medical Center, Brooklyn, NY	Grand Rounds
2010	Neurotechnology Panel Discussion Partners Connected Health Symposium, Boston, MA	Invited Panelist
2010	BrainGate Research Study Rhode Island Neurological Society	Invited Lecture
2011	Neurologists Listening to Neurons Emory University School of Medicine, Atlanta, GA	Grand Rounds
2011	Intracortical Brain-Computer Interfaces American Association for the Advancement of Science, and The Dana Foundation, "Neurotechnology and the Military", hosted by House Armed Services Committee, Emerging Threats and Capabilities Subcommittee, Rayburn House Office Building, Washington, DC	Invited Lecture and Panelist

2011	IEEE Engineering in Medicine and Biology Conference Annual IEEE EMBC, Boston, MA	Invited Lectures (4)
2011	Intracortical Recordings: Frontiers in Neuroscience and Functional Neurosurgery Research in Neuroscience for Neurosurgeons, Woods Hole, MA	Lecture RUNN/Duke University
Oct 2011	Update on BrainGate Pilot Clinical Trials Congress of Neurological Surgeons, Washington, DC	Special Lecturer
Nov 2011	Restoring Communication and Mobility Association for Research in Nervous and Mental Diseases, 91st Annual Meeting, Rockefeller University, NY	Invited Speaker
June 2012	Update on BrainGate Pilot Clinical Trials American Association for Stereotactic and Functional Neurosurgery, San Francisco, CA	Invited Presenter
June 2012	Clinical Imperatives in BCIs Neural Interfaces Conference, Salt Lake City, UT	Invited Speaker and Panelist
June 2012	Intracortically-based Neural Interfaces Department of Neurosurgery, University of Texas - Southwestern, Houston, TX	Grand Rounds Presenter
Nov 2012	BrainGate Pilot Clinical Trials Miami Project to Cure Paralysis, University of Miami, FL	Gail F. Beach Memorial Lecture Series
Nov 2012	Intracortically-based Restorative Neurotechnologies 26th Annual Roland D. Pinkham, M.D., Basic Science Lectureship Swedish Hospital Medical Center, Seattle, WA	Invited Speaker and Panelist
Dec 2012	Neurologists Listening to Neurons Yale School of Medicine, New Haven, CT	Grand Rounds Presenter
Feb 2013	BrainGate FutureMed, Singularity University, California	Keynote Speaker
Feb 2013	Progress and Lessons Being Learned: BrainGate Pilot Trials 1st International Conference on Brain-Neural Machine Interfaces, Houston, TX	Invited Speaker
Feb 2013	Intracortical Neural Interfaces for Restoring Function American Society of Experimental Neurotherapeutics, Washington, DC	Invited Speaker and Panelist
April 2013	Brain Computer Interfaces and Neurotechnology Lawrence Technological University, Detroit, MI	Cisler Lecturer
April 2013	Intracortical Neural Interfaces for Restoring Function Michigan State University/Spectrum Health, Grand Rapids, MI	Grand Rounds
May 2013	Intracortical Neural Interfaces for Restoring Function Inova Fairfax Hospital, Fairfax, VA	Visiting Professor and Grand Rounds
June 2013	Implantable BCI Panel, 5th International BCI Meeting Asilomar, Pacific Grove, CA	Invited Speaker
Oct 2013	Presidential Symposium	Invited Lecture

American Neurological Association Annual Meeting, New Orleans, CA

Dec 2013	BrainGate and Neurotechnologies Annual Retreat, UCSF/Berkeley Center for Neural Engineering and Prosthesis	Keynote Lecture
Feb 2014	The Next Big Thing in Stroke Plenary Session International Stroke Conference, San Diego, CA	Invited Speaker
July 2014	BrainGate Research International Surgical Conference	Special Lecture
Sept 2014	Listening to Neurons International Maternal Fetal Surgical Society	Keynote Lecture
March 2015	Restoring Communication and Mobility University of Alabama, Birmingham	Keynote Lecture
June 2015	Neurologists Listening to Neurons University of Virginia School of Medicine	Grand Rounds
Oct 2015	Prosthesis and Brain Interface 13th Neurocritical Care Society Meeting, Scottsdale, AZ	Invited Speaker
Feb 2016	Neuroethics Workgroup NIH BRAIN Multi-Council Working Group, Bethesda, MD	Panelist
Sep 2016	Session: Agency and Brain Stimulation NTC Kavli Futures Symposium, Columbia University, New York, NY	Invited Panelist
Oct 2016	The Neuroscience of Consciousness and Coma ANA Pre-Meeting Symposium, Baltimore, MD	Chair
Nov 2016	Intracortical Neural Interfaces for the Restoration of Communication and Mobility 10 th International Workshop on Electrocorticography, San Diego, CA	Presenter
Nov 2016	Intracortical BCI Pilot Clinical Trials - Progress, Promise, Challenges, and Opportunities ASNR Annual Meeting, San Diego, CA	Invited Speaker
Nov 2016	Session: Brain Machine Interface for Neural Prosthetics and Recovery of Function ASNR Annual Meeting, San Diego, CA	Session Director
Dec 2016	Neurologists Listening to Neurons SUNY Downstate, New York, NY	Grand Rounds Presenter
Jan 2017	Intracortical Brain Computer Interfaces AAN 2017 Breakthroughs in Neurology Conference	Presenter
April 2017	Panel: Frontiers in Brain Machine Interfaces; Advances in Science, Medicine and Technology ASIA 2017 Annual Scientific Meeting, Albuquerque, NM	Invited Panelist
May 2017	Intracortical BCIs: Neurologists Listening to Neurons UCLA, Los Angeles, CA	Grand Rounds Presenter

May 2017	Veterans Health Research: Showcase of Advancements (BCI) FOVA Executive Committee, Washington DC	Presenter
May 2017	Strategic Partnership Spotlight: PVAMC - Brown University Brain Trust: Pathways to InnoVAtion, Boston, MA	Presenter
May 2017	High Bandwidth Wireless Interfaces in Quadriplegia DBS Think Tank, Atlanta, GA	Presenter
Nov 2017	Neuroscience 2017 Press Conference: Protheses/Robotics Society for Neuroscience, Washington DC	Moderator
Dec 2017	Intracortical Brain-Computer Interfaces American Association for the Advancement of Science, and The Dana Foundation, "Neurotechnology and the Military", Rayburn House Office Building, Washington, DC	Invited Lecture and Panelist
March 2018	BrainGate: Toward Restoring Communication and Mobility Center for Neuroengineering (CNE), University of Minnesota, Minneapolis, MN	Lecture
March 2018	Intracortical Neural Interfaces for the Restoration of Communication and Mobility Neurosciences in Intensive Care International Symposium, Arlington, VA	Presenter
May 2018	Technical issues in implanted BCIs Restorative neuro-technologies: thinking big and little, Advancing Innovations in Assistive Technology Summit, San Francisco, CA Cerebral Palsy Research Alliance Foundation	Presenter
July 2018	Thought-to-Speech, Step 2 meeting Cerebral Palsy Research Alliance Foundation and Massachusetts General Hospital, Boston, MA	Meeting Chair
Oct 2018	BrainGate pilot clinical trials: Harnessing motor cortical signals for the control of communication devices by people with ALS 2018 Annual NEALS Meeting, Clearwater, FL	Abstract Presenter
Oct 2018	BCIs for Communication and Mobility 2018 AANEM Annual Meeting, Washington DC	Presenter
Nov 2018	BrainGate pilot clinical trial: progress and challenges toward restoring communication and mobility 2018 IEEE Brain Initiative, San Diego, CA	Presenter
Nov 2018	Thought-to-Speech, Step 3a-3b meeting Cerebral Palsy Research Alliance Foundation and Massachusetts General Hospital Chicago, IL	Meeting Chair
April 2019	Intracortical Brain-Computer Interfaces for Communication and Mobility Rutgers-Princeton Neuroscience Institute	Distinguished Speaker
April 2019	Intracortical Brain-Computer Interfaces for Communication and Mobility 2019 MDA Clinical & Scientific Conference, Orlando, FL	Presenter
June 2019	BrainGate: Toward Restoring Communication and Mobility for People with ALS	Presenter

Northeast ALS (NEALS) Consortium webinar

Oct 2019	Brain Computer Interfaces in Neurological Disease ANA Pre-meeting Symposium, St. Louis, MO	Presenter
Oct 2019	BrainGate: Clinical Trials in Intracortical Brain-Computer Interfaces for the Restoration of Communication and Mobility Research Update in Neuroscience for Neurosurgeons course, Wood Hole, MA	Presenter/ RUNN
Oct 2019	2019 Andrew S. Rachlin UNC Neuroscience Symposium UNC Chapel Hill/NCSU	Keynote speaker
Aug 2020	Investigator perspectives on ethical challenges re: COVID-induced protocol changes for human subjects research NIH BRAIN Neuroethics Working Group meeting, Virtual event	Panelist
Oct 2020	Seminar: COVID-19: Veterans, Rehabilitation, and RR&D Virtual event, hosted by VA RR&D Center for Limb Loss and MoBility (CLiMB), Seattle, WA	Presenter
Apr 2021	Intracortical Control of Neuroprosthetics Brain Computer Interfaces (BCIs) Through the Lifespan ASNR 2021 (virtual)	Presenter
June 2021	Broadband Wireless Intracortical BCI Enables Independent Use at Home 7th Annual Virtual BRAIN Initiative Investigators Meeting, (virtual)	Presenter
Feb 2022	Decoding Brain Signal to Treat Disorders of Mood, Motor and Communication American Association for Advancement of Science, (virtual)	Presenter
March 2022	Progress in Brain-Computer Interfaces Muscular Dystrophy Association Annual Meeting	Panel Co-Chair
Apr 2022	What's Happening in the World of Brain-Computer Interfaces? Association of Health Care Journalists Conference, Austin, TX	Panelist
Sept 2022	Brain-Machine and Related Neuro Interface Technologies: Scientific, Technical, Ethical, and Regulatory Issues National Academies of Science, Engineering and Medicine	Panelist
Oct 2022	New Biomarkers, Neurotech & Beyond Annual ALS Research Symposium	Presenter
Oct 2022	Brain-Computer Interfaces Annual ALS Research Symposium	Moderator
Nov 2022	BrainGate: Clinical Trials in Intracortical Brain-Computer Interfaces for the Restoration of Communication and Mobility Research Update in Neuroscience for Neurosurgeons course, Wood Hole, MA	Presenter/ RUNN
Nov 2022	Update on the BrainGate Clinical Trials: Toward the Restoration of Communication and Mobility NEALS Science Symposium	Presenter

Nov 2022	Press Conference Neuroscience 2022: Neurotechnology Society for Neuroscience	Moderator
Dec 2022	BrainGate Neuronal Interface System 7th Annual Neuroplastics Surgery Symposium, Miami, FL	Presenter
Dec 2022	Update on the BrainGate Brain-Computer Interface Clinical Trials 33rd International Symposium on Amyotrophic Lateral Sclerosis/Motor Neuron Disease (Virtual)	Plenary Speaker
<i>International</i>		
2004	Neuronal Recordings as Input to Robotic Devices University Medical Center, Utrecht, Netherlands	Lecture
2005	Clinical Studies in Neuromotor Prosthesis 3rd International Brain-Computer Interface Meeting, Rensselaer, NY	Lecture
2005	Clinical Trials and Frontiers in Intracortical BCIs and Human Neuromotor Prosthesis Society for Psychophysiological Research, Lisbon, Portugal	Lecture
2006	Intracortical Recordings and Plasticity Winter Conference on Neural Plasticity, Barbados	Lecture
2006	Chronic Intracortical Recordings for Restoring Neurological Function Japanese Neurosurgical Society, Kyoto, Japan	Plenary Presentation
2006	Intracortically-based Brain-Computer Interfaces: First Experience with a Person with ALS Motor Neuron Disease Association, Yokohama, Japan	Lecture
2007	Intracortical BCIs and Restorative Neurotechnology 2nd International BCI2000 Workshop, Beijing, China	Lecture
2007	BrainGate Pilot Clinical Trial Update International Neuromodulation Society and North American Neuromodulation Society, Acapulco, Mexico	Lecture INS/NANS
2008	Brain Control of Prosthetic Devices for Humans With Tetraplegia Institut Guttmann Annual Spinal Cord Injury Symposium, Institut Guttmann, Barcelona, Spain	Presentation
2010	Intracortical BCIs for Stroke Rehabilitation Chinese University of Hong Kong, Hong Kong, China	Invited Lecture
2010	Frontiers in Clinical Neuroscience American Academy of Neurology Annual Meeting, Toronto, Ontario, Canada	Plenary Lecture
2012	Intracortically-based Brain Computer Interfaces BML-Osaka, Japan Neurosurgery Society, Osaka, Japan	Invited Lecture
2013	Plenary Lecture, International Conference on Control, Automation and Systems ICCAS Annual Meeting, Gwangju, Korea	(could not attend)

2013	Opening, Centre for Translational Systems Neuroscience and Institute for Neuroscience Annual Lecture University of Newcastle, Newcastle-Upon-Tyne, UK	Inaugural Lecture
2013	International Center for Scientific Debate Barcelona, Spain	Lecture
2014	Federation of European Neuroscience Societies Controlling Neurons, Circuits, and Behavior Copenhagen, Denmark	Invited Lecture
2015	Lessons Being Learned in the BrainGate Pilot Clinical Trials and, Roadmaps for BMI research Tokyo, Japan	Keynote Lecture
2016	Neuroprosthetics Workshop University of Valencia Valencia, Spain	Invited Lecture
2016	Brain-machine interface systems for motor rehabilitation International Conference on Neurorehabilitation Segovia, Spain	Invited Speaker
2017	BrainGate: Listening to Neurons, Restoring Communication and Mobility/Center for Information and Neural Network Osaka, Japan	Invited Speaker
2017	BrainGate: Progress Toward Restoring Communication and Mobility 28 th Annual International Symposium on ALS/MND Boston, MA	Invited Speaker
2019	Workshop: Human implantable Brain-Machine-Interfaces IEEE EMBS Conference On Neural Engineering (NER'19) San Francisco, CA	Presenter
2019	BrainGate Clinical Trials: Toward the Restoration of Communication and Mobility IEEE EMBS Conference On Neural Engineering (NER'19) San Francisco, CA	Presenter
2019	Cerebral Palsy Research Briefing Sydney, Australia	Keynote Speaker
2019	Presenting on BCI for people with paralysis and other neurological disorders Westmead Hospital, Adult and Children's Westmead, Australia	Invited Speaker
2019	Progress in BMI / Plenary Session2 Fifth Annual Selected Topics in Neuroplastic and Reconstructive Surgery: An International Symposium on Cranioplasty and Implantable Neurotechnology Sydney, Australia	Invited Speaker
2019	BrainGate Neural Interface System	Invited Speaker

	International Neuromodulation Society (INS)14th World Congress Boston, MA, US	
2019	Intracortical Brain-Computer Interfaces: Toward Restoring Communication and Mobility AACPDM 73rd Annual and IAACD 2nd Tri-Annual Meeting, Anaheim, US	Presidential Guest Lecturer
2019	Assistive Technology Innovations for Communication and Mobility in Cerebral Palsy: McEwan, Karlsson, Hochberg AACPDM 73rd Annual and IAACD 2nd Tri-Annual Meeting, Anaheim, US	Presenter
2020	Clinical BMI 6 th CiNet Conference: BMI- Medical Engineering based on Neuroscience Osaka, Japan	Invited Speaker
2020	Update on the BrainGate trial/ Brain Computer Interfaces (BCI): Updates from the Cutting Edge 2 nd SyNC Symposium and National Disability Technology Network Sydney, Australia (virtually)	Invited Speaker
2021	Brain Computer Interface for Paralysis Annual British Neuropsychiatry Association meeting (virtually)	Invited Speaker
2021	BrainGate: Intracortical BCI Trials Toward the Restoration of Communication and Mobility Nature Conference on Technologies for Neuroengineering (virtually)	Invited Speaker
2021	BrainGate: Brain-Computer Interfaces Toward the Restoration of Communication and Mobility Hotchkiss Brain Institute Research Day 2021 (virtually)	Keynote Speaker
2021	BrainGate: Brain-Computer Interfaces Toward the Restoration of Communication and Mobility ARC Training Centre in Cognitive Computing for Medical Technologies, Seminar Series (virtually)	Invited Speaker
2022	BrainGate: Intracranial Brain-Computer Interfaces Toward the Restoration of Communication and Mobility Hong Kong Student Association of Neuroscience (virtually)	Keynote Speaker

Report of Clinical Activities and Innovations

Current Licensure and Certification:

2003	Massachusetts Board of Registration in Medicine
2005	Diplomate in Neurology, American Board of Psychiatry and Neurology
2007	New Hampshire Board of Medicine
2008	Diplomate in Vascular Neurology #491, American Board of Psychiatry and Neurology
2008	Maine Board of Licensure in Medicine
2011	Diplomate in Neurocritical Care, United Council of Neurologic Subspecialties
2015	Renewal, Diplomate in Neurology and Vascular Neurology, American Board of Psychiatry and Neurology
2020	New York State Education Department (Medicine) #304904

Practice Activities (all affiliated with Harvard Medical School):

Neurocritical Care	Attending	NeuroICU, MGH	Six weeks per year
Neurocritical Care	Attending	NeuroICU, MGH	One weekend per month
Acute Stroke	Consultation	ED and Interventional Suite, MGH	Two evenings per month

Report of Technological and Other Scientific Innovations

BrainGate2 Neural Interface System

Investigational Device Exemption, BrainGate2 Neural Interface System
FDA IDE G090003

Sponsor-Investigator, Study Director, and Principal Investigator for academically directed, federally and philanthropically funded pilot clinical trial of BrainGate Neural Interface System. Trial is the clinical core resource for multiple research pursuits at MGH, Brown University, Case Western Reserve University, Stanford University, and the Department of Veterans Affairs, all directed toward developing improved assistive technologies for people with paralysis or limb loss.

United States Patent, issued October 22, 2019

Methods for Prediction and Early Detection of Neurological Events
Truccolo, W.T., **Hochberg L.R.**, Donoghue, J.P., and Cash, S.S.
US 10,448,877

United States Patent, Patent Pending

Methods and System for Commanding Electronic Devices from Discrete Neural Gestures
Hochberg L.R., Simeral, J., Hosman, T., Vargas-Irwin, C., Thengone, D., Singer-Clark, T., Gross, R., and Kapitonava, A.

United States Patent, Patent Pending

Brain Computer Interface (BCI) System that can be Implemented on Multiple Devices
Hochberg L.R., Simeral, J., Hosman, T., Thengone, D., Singer-Clark, T., Gross, R., and Kapitonava, A.

Report of Education of Patients and Service to the Community Activities

2006	Speaker	Brain Injury Association of New Hampshire
2006	Keynote Lecturer	Spastic Paraplegia Foundation
2007	Speaker	No Barriers Festival
	“Restorative Neurotechnology for Persons with Paralysis”	
2008	Honorary Benefit Gala Committee	The Boston Home
2010	Keynote Lecturer	Steve Saling ALS Residence Grand Opening
2010 – 2011	Research featured at “The Brain” exhibit	American Museum of Natural History, NYC
2011	Research featured at RoboLab exhibit	Ars Electronica Center, Linz, Austria
2012	Honorary Benefit Gala Committee	The Boston Home
2012 – Present	Member, Board of Trustees	The Boston Home
	Established in 1881, The Boston Home, in Dorchester, Massachusetts, is a not-for-profit specialized care residence for 96 adults with advanced multiple sclerosis and other neurological diseases.	
2013 – Present	Founder and Board Member	Speak Your Mind Foundation
	A spin-off of my laboratory, SYMFound (www.speakyourmind.org) is a not-for-profit foundation developing and providing low-cost, personalized assistive technologies for people with motor and speech disabilities.	

Educational Material for Patients and the Lay Community

2006 – Present Interviewed/quoted by:

60 Minutes/CBS News (International), CNN (International), CBS-TV (National), CBS4-TV (Boston), WCVB/ABC-TV (Boston), WFXT/Fox-TV (Boston), WHDH/NBC-TV (Boston), BBC (radio), Canadian Broadcasting Company (radio), News Network (Internet), Washington Post, Providence Journal, Providence Business Journal, Reuters, San Jose Mercury News, The Telegraph (UK), The Australian, Liberation/Paris, Science Magazine, Lancet, Technology Review, Wired Magazine, Applied Neurology, Neurocritical Care Newsletter, Quest (Muscular Dystrophy Association newsletter), Alzheimer’s Research Forum, Boston Globe, Men’s Health, National Public Radio, ABC News (National), Brown Daily Herald, Harvard Medicine, Science News and Views, Minnesota Public Radio, Daily Planet (Canada), NPR Science Friday with Ira Flato, NPR All Things Considered with Robert Siegel, Wall Street Journal, PBS News Hour with Margaret Warner, NOVA Science Now with David Pogue, New York Times, Michael Chorost, Business Insider, Wired UK, Voice of America – Russia, Bloomberg, Engadget, Neurology Today, HealthDay, SiriusXM/Doctor Radio and others.

Other Recognition

1999 Who’s Who Among Students in American Universities and Colleges
2010 Who’s Who in America

Report of Scholarship

Publications:

Peer-Reviewed Publications in print or other media

Research investigations

1. Burrow M, Dugger J, Humphrey DR, Reed DJ, and **Hochberg LR**. Cortical control of a robot using a time-delay neural network. In: Proceedings of the Fifth International Conference on Rehabilitation Robotics; 1997.
2. **Hochberg LR**, Sims JR, Davis BT. West Nile encephalitis in Massachusetts. *N Engl J Med*. 2002; 346(13):1030-1.
3. Kubler A, Mushahwar VK, **Hochberg LR**, Donoghue JP. BCI Meeting 2005-workshop on clinical issues and applications. In: IEEE Trans Neural Syst Rehabil Eng; June 2005; New York; 2006. p. 131-4.
4. **Hochberg LR**, Serruya MD, Friehs GM, Mukand JA, Saleh M, Caplan AH, Branner A, Chen D, Penn RD, Donoghue JP. Neuronal ensemble control of prosthetic devices by a human with tetraplegia. *Nature*. 2006; 442(7099):164-71.
5. **Hochberg LR**, Donoghue JP. Sensors for brain-computer interfaces. *IEEE Eng Med Biol Mag*. 2006; 25(5):32-8.
6. Aaron RK, Herr HM, Ciombor DM, **Hochberg LR**, Donoghue JP, Briant CL, Morgan JR, Ehrlich MG. Horizons in prosthesis development for the restoration of limb function. *J Am Acad Orthop Surg*. 2006; 14(10):S198-204.
7. Donoghue JP, **Hochberg LR**, Nurmikko AV, Black MJ, Simeral JD, and Friehs G. Neuromotor Prosthesis Development. *RI Medicine and Health*. 2007; 90(1):12-15.
8. Donoghue JP, Black M, Nurmikko A, and **Hochberg LR**. Assistive technology and robotic control using MI ensemble-based neural interface systems in humans with tetraplegia. *Journal of Physiology*. 2007; March 15; 569(3) p. 603-11. PMC2151381.
9. Kim S-P, Simeral JD, **Hochberg LR**, Donoghue JP, Friehs GM, and Black MJ. Multi-state decoding of point-and-click control signals from motor cortical activity in a human with tetraplegia. *IEEE Engineering in Medicine and Biology International Conference on Neural Engineering*. 2007; 486-489.
10. Truccolo W, Friehs GM, Donoghue JP, **Hochberg LR**. Primary motor cortex tuning to intended movement kinematics in humans with tetraplegia. *Journal of Neuroscience*, 2008; 28(5):1163-1178.
11. Kim S-P, Simeral JD, **Hochberg LR**, Donoghue JP, and Black MJ. Neural control of computer cursor velocity by decoding motor cortical spiking activity in humans with tetraplegia. *J. Neural Eng*. 2008; 5: 455-476. PMC2911243.
12. Jha RM, **Hochberg LR**, Hakimelahi R, Hirsch JA, González RG, and Yoo AJ. Hyperacute stent placement in acute cervical internal carotid artery occlusions: the potential role of magnetic resonance imaging. *J. NeuroIntervent. Surg*. 2009; 1: 171-174.
13. Truccolo W, Hochberg LR, and Donoghue JP. Collective Dynamics in Human and Monkey Sensorimotor Cortex: Predicting Single Neuron Spikes from Intra and Inter-Areal Ensemble Spiking Histories. *Nature Neuroscience* 2010 Jan; 13(1):105-11. PMC2820252.
14. Nurmikko AV, Donoghue JP, **Hochberg LR**, Patterson, WR, Song Y-K, Bull CW, Borton DA, Laiwalla F, Park S, Ming Y, Aceros J. Listening to Brain Microcircuits for Interfacing With External World—Progress in Wireless Implantable Microelectronic Neuroengineering Devices. *Proc IEEE*. 2010; 98(3); 375-388.
15. Keller CJ, Truccolo W, Gale JT, Eskandar E, Thesen T, Carlson C, Devinsky O, Kuzniecky R, Doyle WK, Madsen JR, Schomer DL, Mehta AD, Brown EN, **Hochberg LR**, Ulbert I, Halgren E, and Cash SS. Heterogeneous neuronal firing patterns during interictal epileptiform discharges in the human cortex. *Brain* 2010; 133: 1668-1681.
16. Ajiboye A, **Hochberg LR**, Donoghue JP, and Kirsch RF. Application of system identification methods for decoding imagined single-joint movements in an individual with high tetraplegia. *Conf Proc IEEE Eng Med Biol Soc*. 2010; 1:2678-81.
17. Malik WQ, Truccolo W, Brown EN, and **Hochberg LR**. Efficient Decoding with Steady-State Kalman Filter in Neural Interface Systems. *IEEE Trans. Neural Syst. Rehab. Engin*. 2011; 19(1):25-34. (PMC3044609).
18. Kim S-P, Simeral JD, **Hochberg LR**, Donoghue JP, Friehs GM, and Black MJ. Point-and-click cursor control with an intracortical neural interface system in humans with tetraplegia. *IEEE Trans. Neural Syst. Rehab. Engin*. 2011. 19(2):193-203
19. Simeral JD, Kim S-P, Black MJ, Donoghue JP, **Hochberg LR**. Neural control of cursor trajectory and click by a human with tetraplegia 1000 days after implant of an intracortical microelectrode array. *J. Neural Engin*. 2011; 8(2) 02027.
20. Truccolo W, Donoghue JA, **Hochberg LR**, Eskandar E, Madsen J, Anderson WS, Brown EN, Halgren E, and Cash SS. Single neuron dynamics in human focal epilepsy. *Nature Neuroscience* 2011; 14(5): 635-41.
21. Chadwick EK, Blana D, Simeral JD, Lambrecht J, Kim S-P, Cornwell AS, Taylor DM, **Hochberg LR**, Donoghue JP, and Kirsch RF. Continuous neuronal ensemble control of simulated arm reaching by a human with tetraplegia. *J. Neural Engin*. 2011 8(3): 034003.
22. Peyrache A, Dehghani N, Eskandar EN, Madsen JR, Anderson WS, Donoghue JA, **Hochberg LR**, Halgren E, Cash SS, Destexhe A. Spatio-temporal dynamics of neocortical excitation and inhibition during human sleep. *Proc Nat Acad Sci USA* 2012; 109(5):1731-6.
23. **Hochberg LR**, Bacher D, Jarosiewicz B, Masse NY, Simeral JD, Vogel J, Haddadin S, Liu J, Cash SS, van de Smagt P, and Donoghue JP. Reach and grasp by people with tetraplegia using a neurally controlled robotic arm. *Nature* 2012; 485: 372-375.
24. Ajiboye AB, Simeral JD, Donoghue JP, **Hochberg LR**, and Kirsch RF. Prediction of Imagined Single-Joint Movements in a Person with High Level Tetraplegia. *IEEE Transactions in Biomed. Engin*. 2012; Oct 59(10):2755-65.

25. Lewis LD, Weiner VS, Mukamel EA, Donoghue JA, Eskandar EN, Madsen JR, Anderson WS, **Hochberg LR**, Cash SS, Brown EN, and Purdon PL. Rapid fragmentation of neuronal networks at the onset of propofol-induced unconsciousness. *Proc Natl Acad Sci USA*. 2012 Nov 5.
26. Kramer MA, Truccolo W, Eden UT, Lepage KQ, **Hochberg LR**, Eskandar EN, Madsen JR, Lee JW, Maheshwari A, Halgren E, Chu CJ, and Cash SS. Human seizures self-terminate across spatial scales via a critical transition. *Proc Natl Acad Sci USA*. 2012 Dec 18;109(51):21116-21.
27. Shaikhouni A, Donoghue JP, and **Hochberg LR**. Somatosensory Responses in a Human Motor Cortex. *J Neurophysiol*. 2013 Apr;109(8):2192-204.
28. Chan AM, Dykstra AR, Jayaram V, Leonard MK, Travis KE, Gygi B, Baker JM, Eskandar E, **Hochberg LR**, Halgren E, and Cash SS. Speech-Specific Tuning of Neurons in Human Superior Temporal Gyrus. *Cereb Cortex*. 2013 May 16.
29. Perge JA, Homer ML, Malik WQ, Cash S, Eskandar E, Friehs G, Donoghue JP, and **Hochberg LR**. Intra-day signal instabilities affect decoding performance in an intracortical neural interface system. *J Neural Eng*. 2013 Jun;10(3):036004.
30. Edlow BL, Giacino JT, Hirschberg RE, Gerrard J, Wu O, **Hochberg LR**. Unexpected Recovery of Function After Severe Traumatic Brain Injury: The Limits of Early Neuroimaging-Based Outcome Prediction. *Neurocrit Care*. 2013; 19: 364-375.
31. Jarosiewicz B, Masse NY, Bacher D, Cash SS, Eskandar E, Friehs G, Donoghue JP, **Hochberg LR**. Advantages of closed-loop calibration in intracortical brain-computer interfaces for people with tetraplegia. *J Neural Eng*. 2013 Aug; 10(4):046012.
32. Homer M, Perge J, Black M, Harrison M, Cash S, **Hochberg LR**. Adaptive Offset Correction for Intracortical Brain Computer Interfaces. *IEEE Trans Neural Syst Rehabil Eng*. 2014 Mar;22(2):239-48.
33. Perge JA, Zhang S, Malik WQ, Homer ML, Cash S, Friehs G, Eskandar EN, Donoghue JP, **Hochberg LR**. Reliability of directional information in unsorted spikes and local field potentials recorded in human motor cortex. *J Neural Eng*. 2014 Jun 12; 11(4):046007.
34. Truccolo W, Ahmed OJ, Harrison MT, Eskandar EN, Cosgrove GR, Madsen JR, Blum AS, Potter NS, **Hochberg LR**, Cash SS. Neuronal ensemble synchrony during human focal seizures. *J. Neurosci* 2014 July 23;34(30)9927-44.
35. Masse NY, Jarosiewicz B, Simeral JD, Bacher D, Stavisky SF, Cash SS, Oakley EM, Berhanu E, Eskandar E, Friehs G, **Hochberg LR**, Donoghue JP. Non-causal spike filtering improves decoding of movement intention for intracortical BCIs. *J. Neurosci. Meth*. 2014 Oct 30; 236:58-67.
36. Malik WQ, **Hochberg LR**, Donoghue JP, and Brown EN. Modulation Depth Estimation and Variable Selection in State-Space Models for Neural Interfaces. *IEEE Trans. Biomed. Eng*. 2015 Feb;62(2):570-81.
37. Bacher D, Jarosiewicz B, Masse N, Stavisky S, Simeral J, Newell K, Oakley E, Cash SS, Friehs G, **Hochberg LR**. Neural point-and-click communication by a person with incomplete locked-in syndrome. *Neurorehab. Neural Repair* 10 Nov. 2014. (Pub. online).
38. Vogel J, Haddadin S, Jarosiewicz B, Simeral JD, Bacher D, **Hochberg LR**, Donoghue JP, van der Smagt P. An assistive decision-and-control architecture for force-sensitive hand-arm systems driven by human-machine interfaces. *Int. Jour. Robotics Research*. May 2015 vol. 34 no. 6 763-780.
39. Pandarinath C, Gilja V, Blabe CH, Nuyujukian P, Sarma AA, Sorice BL, Eskandar EN, **Hochberg LR**, Henderson JM, Shenoy KV. Neural population dynamics in human motor cortex during movements in people with ALS. *eLife*. 2015 Jun 23;4:e07436. doi: 10.7554/eLife.07436. PubMed PMID: 26099302; PMC4475900.
40. Wagner FB, Eskandar EN, Cosgrove GR, Madsen JR, Blum AS, Potter NS, **Hochberg LR**, Cash SS, Truccolo W. Microscale spatiotemporal dynamics during neocortical propagation of human focal seizures. *Neuroimage*. 2015 Aug 14; 122:114-130. doi: 10.1016/j.neuroimage.2015.08.019. PMID: 26279211.
41. Gilja V, Pandarinath C, Blabe CH, Nuyujukian P, Simeral JD, Sarma AA, Sorice BL, Perge JA, Jarosiewicz B, **Hochberg LR**, Shenoy KV, Henderson JM. Clinical translation of a high-performance neural prosthesis. *Nat Med*. 2015 Oct;21(10):1142-5. doi: 10.1038/nm.3953. Epub 2015 Sep 28. PPMID: 26413781.
42. Jarosiewicz B, Sarma AA, Bacher D, Masse NY, Simeral JD, Sorice B, Oakley EM, Blabe C, Pandarinath C, Gilja V, Cash SS, Eskandar EN, Friehs G, Henderson JM, Shenoy KV, Donoghue JP, **Hochberg LR**. Virtual typing by people with tetraplegia using a self-calibrating intracortical brain-computer interface. *Sci Transl Med*. 2015 Nov 11;7(313):313ra179. doi: 10.1126/scitranslmed.aac7328. PMID: 26560357.
43. Bowsher K, Civillico EF, Coburn J, Collinger J, Contreras-Vidal JL, Denison T, Donoghue J, French J, Getzoff N, **Hochberg LR**, Hoffmann M, Judy J, Kleitman N, Knaack G, Krauthamer V, Ludwig K, Moynahan M, Pancrazio JJ, Peckham PH, Pena C, Pinto V, Ryan T, Saha D, Scharen H, Shermer S, Skodacek K, Takmakov P, Tyler D, Vasudevan S, Wachrathit K, Weber D, Welle CG, Ye M. Brain-computer interface devices for patients with paralysis and amputation: a meeting report. *J Neural Eng*. 2016 Apr; 13(2):023001. doi: 10.1088/1741-2560/13/2/023001. Epub 2016 Feb 29
44. Willett F, Pandarinath C, Jarosiewicz B, Murphy B, Memberg WD, Blade C, Saab J, Walter B, Sweet J, Miller J, Henderson JM, Shenoy KV, Simeral JD, **Hochberg LR**, Kirsch RF, Ajiboye AB. Feedback control policies employed by people using intracortical brain-computer interfaces. *Journal of Neural Engineering*, 2017;14(1):016001. doi:10.1088/1741-2560/14/1/016001
45. Aghagholzadeh M, **Hochberg LR**, Cash SS, Truccolo W (2016) Predicting seizures from local field potentials recorded via intracortical microelectrode arrays. *Int IEEE EMBS Conf Neural Engineering*, 6353-6356, 2016

46. Pandarinath C, Nuyujukian P, Blabe CH, Sorice BL, Saab J, Willett F, **Hochberg LR**, Shenoy KV, Henderson JM. High performance communication by people with paralysis using an intracortical brain-computer interface; 2017 Feb 21;6. pii: e18554. doi: 10.7554/eLife.18554.
47. Willett F, Murphy B, Memberg W, Blabe C, Pandarinath C, Walter B, Sweet J, Miller J, Henderson J, Shenoy K, **Hochberg LR**, Kirsch R, Ajiboye A. Signal-independent noise in intracortical brain-computer interfaces causes movement time properties inconsistent with Fitts law, *J Neural Eng*, JNE-101543.R1, Published online 2017 Feb 8. doi: 10.1088/1741-2552/aa5990
48. Ajiboye AB, Willett FR, Young DR, Memberg WD, Murphy BA, Miller JP, Walter BL, Sweet JA, Hoyen HA, Keith MW, Peckham PH, Simeral JD, Donoghue JP, **Hochberg LR**, Kirsch RF. Restoration of reaching and grasping movements through brain-controlled muscle stimulation in a person with tetraplegia: a proof-of-concept demonstration. *Lancet*. 2017 Mar 28. pii: S0140-6736(17)30601-3. doi: 10.1016/S0140-6736(17)30601-3
49. Jarosiewicz B, Sarma AA, Saab J, Franco B, and **Hochberg LR**. Retrospectively supervised click decoder calibration for self-calibrating point-and-click brain-computer interfaces. *J. Physiol (Paris)* 2016 Nov;110(4 Pt A):382-391. doi: 10.1016/j.jphysparis.2017.03.001
50. Brandman DM, Cash SS, and **Hochberg LR**, Review: Human Intracortical recording and neural decoding for brain-computer interfaces TNSRE-2017-00018, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, March 2017
51. Edlow BL, Chatelle C, Spencer CA, Chu CJ, Bodien YG, O'Connor KL, Hirschberg RE, **Hochberg LR**, Giacino JT, Rosenthal ES, Wu O. Early detection of consciousness in patients with acute severe traumatic brain injury. *Brain*, Volume 140, Issue 9, September 2017
52. Even-Chen N, Stavisky SD, Pandarinath C, Nuyujukian P, Blabe CH, **Hochberg LR**, Henderson JM, Shenoy KV. Feasibility of Automatic Error Detect-and-Undo System in Human Intracortical Brain-Computer Interfaces. *IEEE Trans Biomed Eng*. 2018 Aug;65(8):1771-1784. doi: 10.1109/TBME.2017.2776204. Epub 2017 Nov 21.
53. Milstein DJ, Pacheco JL, **Hochberg LR**, Simeral JD, Jarosiewicz B, Sudderth EB, Multiscale semi-Markov dynamics for intracortical brain-computer interfaces. 31st Conference on Neural Information Processing Systems (NIPS). 2017 Dec.
54. Willett F, et al. A Comparison of Intention Estimation Methods for Decoder Calibration in Intracortical Brain-Computer Interfaces. *IEEE TBME*, 2017 Dec 14. doi: 10.1109/TBME.2017.2783358
55. Birbaumer N, **Hochberg LR**. A useful communication in brain-computer interfaces. *Neurology*. 2018 Jul 17;91(3):109-110. doi: 10.1212/WNL.0000000000005804. Epub 2018 Jun 27.
56. Brandman DM, Hosman T, Saab J, Burkhart M, Shanahan B, Ciancibello J, Sarma AA, Milstein DJ, Vargas-Irwin C, Franco B, Kelemen JN, Blabe CH, Murphy BA, Young DR, Willett FR, Pandarinath C, Stavisky SD, Kirsch RF, Walter BL, Ajiboye AB, Cash SS, Eskandar EN, Miller JP, Sweet JA, Shenoy KV, Henderson JM, Jarosiewicz B, Harrison MT, Simeral JD, **Hochberg LR**, Rapid calibration of an intracortical brain computer interface for people with tetraplegia, *J. Neural Eng*. 2018 Jan 24
57. Milekovic T*, Sarma AA*, Bacher D, Simeral JD, Saab J, Pandarinath C, Sorice BL, Blabe C, Oakley EM, Tringale KR, Eskandar E, Cash SS, Henderson JM, Shenoy KV, Donoghue JP, **Hochberg LR**. Stable long-term BCI-enabled communication in ALS and locked-in syndrome using LFP signals. *J. Neurophysiol*. 2018 Apr 25;120(1).
58. Young D, Willett F, Memberg WD, Murphy B, Walter B, Sweet J, Miller J, **Hochberg LR**, Kirsch RF, Ajiboye AB. Signal processing methods for reducing artifacts in microelectrode brain recordings caused by functional electrical stimulation. *J Neural Eng*. 2018 Apr;15(2)
59. Chatelle C, Spencer CA, Cash SS, **Hochberg LR**, Edlow BL. Feasibility of an EEG-based brain-computer interface in the intensive care unit. *Clin Neurophysiol*. 2018 Aug;129(8):1519-1525. doi: 10.1016/j.clinph.2018.04.747. Epub 2018 May 9.
60. Pandarinath C, O'Shea DJ, Collins J, Jozefowicz R, Stavisky SD, Kao JC, Trautmann EM, Kaufman MT, Ryu SI, **Hochberg LR**, Henderson JM, Shenoy KV, Abbott LF, Sussillo D. Inferring single-trial neural population dynamics using sequential auto-encoders. *Nature Methods*. Sept 2018
61. Ramirez-Zamora A, Giordano JJ, Gunduz A, Brown P, Sanchez JC, Foote KD, Almeida L, Starr PA, Bronte-Stewart HM, Hu W, McIntyre C, Goodman W, Kumsa D, Grill WM, Walker HC, Johnson MD, Vitek JL, Greene D, Rizzuto DS, Song D, Berger TW, Hampson RE, Deadwyler SA, **Hochberg LR**, Schiff ND, Stypulkowski P, Worrell G, Tiruvadi V, Mayberg HS, Jimenez-Shahed J, Nanda P, Sheth SA, Gross RE, Lempka SF, Li L, Deeb W, Okun MS, Evolving applications, technological challenges and future opportunities in neuromodulation: Proceedings of the Fifth Annual Deep Brain Stimulation Think Tank, *Front Neurosci*. 2018 Jan 24;11:734. doi: 10.3389/fnins.2017.00734.
62. Brandman DM, Burkhart MC, Kelemen J, Franco B, Harrison MT, **Hochberg LR**. Robust Closed-Loop Control of a Cursor in a Person with Tetraplegia using Gaussian Process Regression. *Neural Computation*. 2018 Nov;30(11):2986-3008
63. Stavisky SD, Rezaii P, Willett FR, Hochberg LR, Shenoy KV, Henderson JM. Decoding Speech from Intracortical Multielectrode Arrays in Dorsal "Arm/Hand Areas" of Human Motor Cortex. *Conf Proc IEEE Eng Med Biol Soc*. 2018;2018:93-97. doi:10.1109/EMBC.2018.8512199
64. Vargas-Irwin C, Feldman J, King B, Simeral JD, Sorice BL, Oakley E, Cash S, Eskandar EN, Friehs GM, **Hochberg LR**, Donoghue JP Watch, Imagine, Attempt: Motor cortex single unit activity reveals context-dependent movement encoding in humans with tetraplegia, *Frontiers in Human Neuroscience*, 2018 Nov 15;12. doi.org/10.3389/fnhum.2018.00450

65. Nuyujukian P, Albites Sanabria J, Saab J, Pandarinath C, Jarosiewicz B, Blabe CH, Franco B, Mernoff ST, Eskandar EN, Simeral JD, **Hochberg LR**, Shenoy KV, Henderson JM. Cortical control of a tablet computer by people with paralysis, *PLoS ONE*. 2018 Nov 21; 13(11).
66. Young D, Willett F, Memberg WD, Murphy B, Rezaii P, Walter B, Sweet J, Miller J, Shenoy KV, **Hochberg LR**, Kirsch RF, Ajiboye AB. Closed-loop cortical control of virtual reach and posture using Cartesian and joint velocity commands. *J Neural Eng*. 2019 Apr;16(2):026011. doi: 10.1088/1741-2552/aaf606.
67. Hosman T, Vilela M, Milstein D, Kelemen JN, Brandman DM, **Hochberg LR**, Simeral JD. BCI decoder performance comparison of an LSTM recurrent neural network and a Kalman filter in retrospective simulation, 2019 9th International IEEE/EMBS Conference on Neural Engineering (NER), San Francisco, CA, USA. 2019 Mar. pp. 1066-1071.
68. Stavisky SD, Kao JC, Nuyujukian P, et al. Publisher Correction: Brain-machine interface cursor position only weakly affects monkey and human motor cortical activity in the absence of arm movements. *Sci Rep*. 2019;9(1):5528. Published 2019 Mar 28.
69. Milekovic T, Bacher D, Sarma AA, Simeral JD, Saab J, Pandarinath C, Yvert B, Sorice BL, Blabe C, Oakley EM, Tringale KR, Eskandar E, Cash SS, Shenoy KV*, Jaimie M. Henderson*, **Hochberg LR**, Donoghue JP Volitional control of single-electrode high gamma local field potentials by people with paralysis, *Journal of Neurophysiology*. 2019 Apr 11; 121(4): 1428-1450.
70. Willett FR, Young DR, Murphy BA, et al. Principled BCI Decoder Design and Parameter Selection Using a Feedback Control Model. *Sci Rep*. 2019;9(1):8881. Published 2019 Jun 20.
71. Park YS, Cosgrove R, Madsen JR, et al. Early Detection of Human Epileptic Seizures Based on Intracortical Microelectrode Array Signals [published online ahead of print, 2019 Jun 6]. *IEEE Trans Biomed Eng*. 2019;10.1109/TBME.2019.2921448.
72. Proix T, Aghagolzadeh M, Madsen JR, Cosgrove R, Eskandar E, **Hochberg LR**, Cash SS, Truccolo W. Intracortical neural activity distal to seizure-onset-areas predicts human focal seizures. *PLoS One*. 2019;14(7):e0211847. Published 2019 Jul 22. doi:10.1371/journal.pone.0211847
73. Stavisky SD, Willett FR, Wilson GH, Murphy BA, Rezaii P, Avansino DT, Memberg WD, Miller JP, Kirsch RF, **Hochberg LR**, Ajiboye AB. Neural ensemble dynamics in dorsal motor cortex during speech in people with paralysis. *Elife*. 2019 Dec 10;8:e46015.
74. Lin DJ, Cloutier AM, Erler KS, et al. Corticospinal Tract Injury Estimated From Acute Stroke Imaging Predicts Upper Extremity Motor Recovery After Stroke. *Stroke*. 2019 Dec;50(12):3569-3577. doi: 10.1161/STROKEAHA.119.
75. Rastogi A, Vargas-Irwin CE, Willett FR, Abreu J, Crowder DC, Murphy BA, Memberg WD, Miller JP, Sweet JA, Walter BL, Cash SS, Rezaii PG, Franco B, Saab J, Stavisky SD, Shenoy KV, Henderson JM, **Hochberg LR**, Kirsch RF, Ajiboye AB Neural Representation of Observed, Imagined, and Attempted Grasping Force in Motor Cortex of Individuals with Chronic Tetraplegia. *Sci Rep*. 2020 Jan 29;10(1):1429. doi: 10.1038/s41598-020-58097-1.PMID: 31996696
76. Stavisky SD, Willett FR, Avansino DT, **Hochberg LR**, Shenoy KV, Henderson JM Speech-related dorsal motor cortex activity does not interfere with iBCI cursor control. *J Neural Eng*. 2020 Feb 5;17(1):016049. doi: 10.1088/1741-2552/ab5b72.PMID: 32023225
77. Vilela M, Hochberg LR. Applications of brain-computer interfaces to the control of robotic and prosthetic arms. *Handb Clin Neurol*. 2020;168:87-99. doi: 10.1016/B978-0-444-63934-9.00008-1.PMID: 32164870
78. Burkhart MC, Brandman DM, Franco B, **Hochberg LR**, Harrison MT. The Discriminative Kalman Filter for Bayesian Filtering with Nonlinear and Nongaussian Observation Models. *Neural Comput*. 2020 May;32(5):969-1017. doi: 10.1162/neco_a_01275. Epub 2020 Mar 18.PMID: 32187000
79. Willett FR, Deo DR, Avansino DT, Rezaii P, **Hochberg LR**, Henderson JM, Shenoy KV. Hand Knob Area of Premotor Cortex Represents the Whole Body in a Compositional Way. *Cell*. 2020 Apr 16;181(2):396-409.e26. doi: 10.1016/j.cell.2020.02.043. Epub 2020 Mar 26.PMID: 32220308
80. Even-Chen N, Muratore DG, Stavisky SD. **Hochberg LR**, Henderson JM, Murmann B, Shenoy KV. Power-saving design opportunities for wireless intracortical brain-computer interfaces. *Nat Biomed Eng* (2020). <https://doi.org/10.1038/s41551-020-0595-9>
81. Eichenlaub JB*, Jarosiewicz B*, Saab J, Franco B, Kelemen J, Halgren E, **Hochberg LR**, Cash SS. Replay of learned neural firing sequences during rest in human motor cortex. *Cell Reports*. 2020 May 5;31:107581.
82. Fischer D, Threlkeld ZD, Bodien YG, Kirsch JE, Huang SY, Schaefer PW, Rapalino O, **Hochberg LR**, Rosen BR, Edlow BL. Intact brain network function in an unresponsive patient with COVID-19. *Annals of Neurology*. 2020; 2020; doi: 10.1002/ana.25838. PMID: 327361474
83. Edlow BL, Barra ME, Zhou DW, Foulkes AS, Snider SB, Threlkeld ZD, Chakravarty S, Kirsch JE, Chan ST, Meisler SL, Bleck TP, Fins JJ, Giacino JT, **Hochberg LR**, Solt K, Brown EN, Bodien YG. Personalized connectome mapping to guide targeted therapy and promote recovery of consciousness in the intensive care unit. *Neurocritical Care*. 2020; doi: 10.1007/s12028-020-01062-7. PMID: 327361474
84. Wilson GH, Stavisky SD, Willett FR, Avansino DT, Kelemen JN, **Hochberg LR**, Henderson JM, Druckmann S, Shenoy KV. Decoding spoken English phonemes from intracortical electrode arrays in dorsal precentral gyrus. *J Neural Eng*. 2020 Nov 25;17(6):066007. doi: 10.1088/1741-2552/abbfef
85. Rastogi A, Willett FR, Abreu J, Crowder DC, Murphy BA, Memberg WD, Vargas-Irwin CE, Miller JP, Sweet JA, Walter BL, Rezaii PG, Stavisky SD, **Hochberg LR**, Shenoy KV, Henderson JM, Kirsch RF, Ajiboye AB. The neural representation of force across grasp types in motor cortex of humans with tetraplegia. *eNeuro eN-NWR-0231-20R2*, Oct 2020, accepted

86. Oxley TJ, Yoo PE, Rind GS, Ronayne SM, Lee CMS, Bird C, Hampshire V, Sharma RP, Morokoff A, Williams DL, MacIsaac C, Howard ME, Irving L, Vrljic I, Williams C, John SE, Weissenborn F, Dzenko M, Balabanski AH, Friedenber D, Burkitt AN, Wong YT, Drummond KJ, Desmond P, Weber D, Denison T, **Hochberg LR**, Mathers S, O'Brien TJ, May CN, Mocco J, Grayden DB, Campbell BCV, Mitchell P, Opie NL. Motor neuroprosthesis implanted with neurointerventional surgery improves capacity for activities of daily living tasks in severe paralysis: first in-human experience. *J Neurointerv Surg*. 2020 Oct 28. doi: 10.1136/neurintsurg-2020-016862. Epub ahead of print. PMID: 33115813.
87. Kline DK, Lin DJ, Cloutier AM, Sloane K, Parlman K, Ranford J, Picard-Fraser M, Fox AB, **Hochberg LR**, Kimberley TJ, Arm Motor Recovery After Ischemic Stroke: A Focus on Clinically Distinct Trajectory Groups, *J Neurol Phys Ther*. 2021 Apr 1;45(2):70-78. doi: 10.1097/NPT.0000000000000350.PMID: 33707402
88. Hosman T, Hynes JB, Saab J, Wilcoxon KG, Buchbinder BR, Schmansky N, Cash SS, Eskandar EN, Simeral JD, Franco B, Kelemen JN, Vargas-Irwin C, **Hochberg LR**, Auditory cues reveal intended movement information in middle frontal gyrus neuronal ensemble activity of a person with tetraplegia. *Sci Rep* 2021 **11**, 98. doi.org:10.1038/s41598-020-77616-8.
89. Rastogi A, Willett FR, Abreu J, Crowder DC, Murphy BA, Memberg WD, Vargas-Irwin CE, Miller JP, Sweet J, Walter BL, Rezaii PG, Stavisky SD, **Hochberg LR**, Shenoy KV, Henderson JM, Kirsch RF, Ajiboye AB. The Neural Representation of Force across Grasp Types in Motor Cortex of Humans with Tetraplegia. *eNeuro*. 2021 Feb 19;8(1):ENEURO.0231-20.2020. doi: 10.1523/ENEURO.0231-20.2020.
90. Kline DK, Lin DJ, Cloutier A, Sloane K, Parlman K, Ranford J, Picard-Fraser M, Fox AB, **Hochberg LR**, Kimberley TJ. J Arm Motor Recovery After Ischemic Stroke: A Focus on Clinically Distinct Trajectory Groups. *Neurol Phys Ther*. 2021 Apr 1;45(2):70-78. doi: 10.1097/NPT.0000000000000350.PMID: 33707402
91. Young MJ, Lin DJ, **Hochberg LR**. Brain-Computer Interfaces in Neurorecovery and Neurorehabilitation. *Semin Neurol*. 2021 Apr;41(2):206-216. doi: 10.1055/s-0041-1725137. Epub 2021 Mar 19.PMID: 33742433
92. Simeral JD, Hosman T, Saab J, Flesher SN, Vilela M, Franco B, Kelemen JN, Brandman DM, Ciancibello JG, Rezaii PG, Eskandar EN, Rosler DM, Shenoy KV, Henderson JM, Nurmikko AV, **Hochberg LR**. Home Use of a Percutaneous Wireless Intracortical Brain-Computer Interface by Individuals With Tetraplegia. *IEEE Trans Biomed Eng*. 2021 Jul;68(7):2313-2325. doi: 10.1109/TBME.2021.3069119. Epub 2021 Jun 17.PMID: 33784612
93. Deo DR, Rezaii P, **Hochberg LR**, Okamura A, Shenoy KV, Henderson JM. Effects of Peripheral Haptic Feedback on Intracortical Brain-Computer Interface Control and Associated Sensory Responses in Motor Cortex. *IEEE Trans Haptics*. 2021 Apr 12;PP. doi: 10.1109/TOH.2021.3072615. Online ahead of print. PMID: 33844633
94. Lin DJ, Erler KS, Snider SB, Bonkhoff AK, DiCarlo JA, Lam N, Ranford J, Parlman K, Cohen A, Freeburn J, Finklestein SP, Schwamm LH, **Hochberg LR**, Cramer SC. Cognitive Demands Influence Upper Extremity Motor Performance During Recovery From Acute Stroke. *Neurology*. 2021 May 25;96(21):e2576-e2586. doi: 10.1212/WNL.0000000000011992. Epub 2021 Apr 15.PMID: 33858997
95. Dawson J, Liu CY, Francisco GE, Cramer SC, Wolf SL, Dixit A, Alexander J, Ali R, Brown BL, Feng W, DeMark L, **Hochberg LR**, Kautz SA, Majid A, O'Dell MW, Pierce D, Prudente CN, Redgrave J, Turner DL, Engineer ND, Kimberley TJ. Vagus nerve stimulation paired with rehabilitation for upper limb motor function after ischaemic stroke (VNS-REHAB): a randomised, blinded, pivotal, device trial. *Lancet*. 2021 Apr 24;397(10284):1545-1553. doi: 10.1016/S0140-6736(21)00475-X.PMID: 33894832
96. Yang JC, Harid NM, Nascimento FA, Kokkinos V, Shaughnessy A, Lam AD, Westover MB, Leslie-Mazwi TM, **Hochberg LR**, Rosenthal ES, Cole AJ, Richardson RM, Cash SS. Responsive neurostimulation for focal motor status epilepticus. *Ann Clin Transl Neurol*. 2021 Jun;8(6):1353-1361. doi: 10.1002/acn3.51318. Epub 2021 May 6.PMID: 33955717
97. Willett FR, Avansino DT, **Hochberg LR**, Henderson JM, Shenoy KV. High-performance brain-to-text communication via handwriting. *Nature*. 2021 May;593(7858):249-254. doi: 10.1038/s41586-021-03506-2. Epub 2021 May 12.PMID: 33981047
98. **Hochberg LR**, Cash SS. Freedom of Speech. *N Engl J Med*. 2021 Jul 15;385(3):278-279. doi: 10.1056/NEJMe2106392. PMID: 34260841
99. Young MJ, Bodien YG, Giacino JT, Fins JJ, Truog RD, **Hochberg LR**, Edlow BL. The neuroethics of disorders of consciousness: a brief history of evolving ideas. *Brain*. 2021 Aug 4:awab290. doi: 10.1093/brain/awab290. Online ahead of print. PMID: 34347037
100. Goldberg MA, **Hochberg LR**, Carpenter D, Walz JM. Development of a Manually Operated Communication System (MOCS) for patients in intensive care units. *Augment Altern Commun*. 2021 Dec;37(4):261-273. doi: 10.1080/07434618.2021.2016958.
101. Paulk AC, Kfir Y, Khanna AR, Mustroph ML, Trautmann EM, Soper DJ, Stavisky SD, Welkenhuysen M, Dutta B, Shenoy KV, **Hochberg LR**, Richardson RM, Williams ZM, Cash SS. Large-scale neural recordings with single neuron resolution using Neuropixels probes in human cortex. *Nat Neurosci*. 2022 Feb;25(2):252-263. doi: 10.1038/s41593-021-00997-0.
102. Erler KS, Wu R, DiCarlo JA, Petrilli MF, Gochyev P, **Hochberg LR**, Kautz SA, Schwamm LH, Cramer SC, Finklestein SP, Lin DJ. Association of Modified Rankin Scale With Recovery Phenotypes in Patients With Upper Extremity Weakness After Stroke. *Neurology*. 2022 Mar 11:10.1212/WNL.00000000000200154.

Research publications without named authorship

1. Smith WS, Sung G, Starkman S, Saver JL, Kidwell CS, Gobin YP, Lutsep HL, Nesbit GM, Grobelny T, Rymer MM, Silverman IE, Higashida RT, Budzik RF, Marks MP; MERCI Trial Investigators*. Safety and efficacy of mechanical embolectomy in acute ischemic

- stroke: results of the MERCI trial. *Stroke*. 2005 Jul; 36(7):1432-8 (*member of the investigative team cited in the appendix of the manuscript).
2. Schachter SC, Gutttag J, Schiff SJ, Schomer DL, Summit Contributors*. *Advances in the Application of Technology to Epilepsy: The CIMIT/NIO Epilepsy Innovation Summit*. *Epilepsy and Behavior*. 2009. 16:3-46. (member of the contributors cited in the appendix of the manuscript).
 3. Shi ZS, Loh Y, Walker G, Duckwiler GR; MERCI and Multi-MERCI Investigators. Clinical outcomes in middle cerebral artery trunk occlusions versus secondary division occlusions after mechanical thrombectomy: pooled analysis of the Mechanical Embolus Removal in Cerebral Ischemia (MERCI) and Multi MERCI trials. *Stroke*. 2010 May;41(5):953-60. Epub 2010 Apr 8. (member of the investigative team cited in the appendix of the manuscript).
 4. Shi ZS, Loh Y, Walker G, Duckwiler GR; MERCI and Multi MERCI Investigators. Endovascular thrombectomy for acute ischemic stroke in failed intravenous tissue plasminogen activator versus non-intravenous tissue plasminogen activator patients: revascularization and outcomes stratified by the site of arterial occlusions. *Stroke*. 2010 Jun; 41(6):1185-92. (member of the investigative team cited in the appendix of the manuscript).
 5. Johnston SC, Easton JD, Farrant M, Barsan W, Conwit RA, Elm JJ, Kim AS, Lindblad AS, Palesch YY; Clopidogrel and Aspirin in Acute Ischemic Stroke and High-Risk TIA. Clinical Research Collaboration, Neurological Emergencies Treatment Trials Network, and the POINT Investigators. *N Engl J Med*. 2018 Jul 19;379(3):215-225. doi: 10.1056/NEJMoa1800410. Epub 2018 May 16 (member of the POINT investigators team cited in the appendix of the manuscript)

Non-peer reviewed scientific or medical publications/materials in print or other media

Proceedings of meetings or other non-peer reviewed research publications

1. Humphrey DR and **Hochberg LR**. Intracortical recording of brain activity for control of limb prostheses. In: *Proceedings of the Rehabilitation Engineering Society of North America; Vancouver, Canada: RESNA; 1995. p. 650-658.*

Reviews, chapters, monographs and editorials

1. **Hochberg LR**. Acute Stroke. In: *Decision Making in Medicine: An algorithmic approach*. Mushlin S., editor. St. Louis (MO): Mosby; 2009.
2. Donoghue JP and **Hochberg LR**. Designing a Neural Interface System to Restore Mobility. In: *Textbook of Neuromodulation*. Krames E, Pechkam PH, and Rezaei AR, editors. Blackwell; 2009.
3. **Hochberg LR**. Reconnecting Brain to Muscle. *Journal Watch Neurology*: 11(2); 2009.
4. Chae J and **Hochberg LR**. Electrical Stimulation Approaches to Stroke Recovery. In: *Brain Repair After Stroke*. Nudo RJ and Cramer SC, Cambridge University Press 2010.
5. **Hochberg LR**. A Step Toward Sensing Prosthetic Limbs. *Journal Watch Neurology*: 11(11); 2009.
6. **Hochberg LR**. Turning thoughts into action. *N Engl J Med*. 2008; 359(11): 1175-7.
7. **Hochberg LR** and Taylor DM. Intuitive prosthetic limb control (Invited Comment). *Lancet*. 2007; 369(9959) 345-46.
8. **Hochberg LR** and Schwamm LH. Stroke, Seizure, and Encephalopathy. In: *Critical Care Handbook of the Massachusetts General Hospital*. Philadelphia (PA): Lippincott, Williams, and Wilkins; 2005.
9. **Hochberg LR** and Anderson KD. BCI Users and Their Needs. In: *Brain-Computer Interfaces: Principles and Practice*. Wolpaw JR, Wolpaw EW, eds. Oxford University Press; 2012.
10. **Hochberg LR** and Cochrane TI. Implanted Neural Interfaces: Ethics in Research and Treatment. In: *Neuroethics in Practice*. Farah M, Chatterjee A, eds. Oxford University Press: 2012.
11. Jarosiewicz B and **Hochberg LR**. (in press) Intracranial brain-computer interfaces for communication and control. In Slezer M, Clarke S, Cohen L, Duncan P, Gage F, eds. *Textbook of Neural Repair and Rehabilitation, 2nd Edition (Vol. 2)*, Cambridge University Press.
12. Homer ML, Nurmikko AV, Donoghue JP, **Hochberg LR**. Sensors and decoding for intracortical brain computer interfaces. *Annu Rev Biomed Eng*. 2013 Jul 11; 15:383-405.
13. **Hochberg LR**, Cudkowicz ME. Locked in, but not out? *Neurology*. 2014 May 27;82(21):1852-3.
14. Jarosiewicz B and **Hochberg LR**. Brain-computer interfaces for stroke rehabilitation. *Neurobiology of Disease Workshop Syllabus, Society for Neuroscience Annual Meeting 2014* (adapted from [11]).
15. Cash SS, **Hochberg LR**. The emergence of single neurons in clinical neurology. *Neuron*. 2015 Apr 8; 86(1):79-91.
16. Vilela M, **Hochberg LR**, Applications of brain-computer interfaces to the control of robotic and prosthetic arms. In: Ramsey NF, and Millán JDR, (eds). *Brain-Computer Interfaces*. San Diego: Elsevier BV, 2020: p 87-100.

Professional Educational Materials or Reports, in print or other media

1. **Hochberg LR**, Wolpaw JR, Donoghue JP, and Ling GSF. Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Hochberg, LR, ed. 2007.
2. **Hochberg LR**, Wolpaw JR, Pascual-Leone A, and Ling GSF. Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Hochberg, LR, ed. 2008.
3. **Hochberg LR**, Schalk G, Donoghue JP, Pascual-Leone A, and Ling GSF. Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Hochberg, LR, ed. 2009.
4. **Hochberg LR**, Wolpaw JR, Donoghue JP, Pascual-Leone A, and Ling GSF. Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Hochberg, LR, ed. 2010.
5. **Hochberg LR**. Intracortical Neural Interfaces. In: Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Ganguly K, ed. 2012.
6. **Hochberg LR**. Intracortical Neural Interfaces. In: Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Ganguly K, ed. 2014.
7. **Hochberg LR**. Intracortical Neural Interfaces. In: Brain-Computer Interfaces: Frontiers in Neurology and Neuroscience. American Academy of Neurology Annual Meeting, Ganguly K, ed. 2015.

Electronic, interactive case studies in vascular neurology

1. Feske SK and **Hochberg LR**. A 65-year-old man Presents to the emergency room complaining of arm weakness and inability to speak. Philadelphia, PA: MedCases, Inc.;2004.<http://www.cemedicus.com/ce-bin/owa/eact?a=3779>.
2. Buonanno FS and **Hochberg LR**. Secondary stroke prevention in a young woman with patent foramen ovale. Philadelphia, PA: MedCases, Inc.;2004.<http://www.cemedicus.com/ce-bin/owa/eact?a=3778>.
3. Furie KL and **Hochberg LR**. Secondary stroke prevention in a woman with atrial fibrillation and stroke with hemorrhagic conversion. Philadelphia, PA: MedCases, Inc.;2005.<http://www.cemedicus.com/ce-bin/owa/eact?a=3545>.
4. Furie KL and **Hochberg LR**. A 50 year-old right-handed man Presents with left face and arm weakness. Philadelphia, PA: MedCases, Inc.; 2005.<http://www.cemedicus.com/ce-bin/owa/eact?a=3780>.

Thesis

1. **Hochberg LR**. Behavioral effects of supragranular lesions in the rat posteromedial barrel subfield [undergraduate thesis]. Providence, RI: Brown University; 1990.
2. **Hochberg LR**. Primary motor cortex: Functional reorganization with acquisition of subtly changing motor tasks, and suitability of multi-site, multi-unit recordings for control of a prosthetic device [Ph.D. dissertation]. Atlanta, GA: Emory University; 1998.