

David A. Bjånes, PhD

Senior Postdoctoral Scholar
California Institute of Technology
Department of Biology and Biological Engineering
Tianqiao and Chrissy Chen Institute for Neuroscience

www.davidbjanes.com
dbjanes@caltech.edu
+1.717.606.7601

Education

- UNIVERSITY OF WASHINGTON** 2014-18
Ph.D. Electrical and Computer Engineering, Neural Computation and Engineering
Principal Investigators: **Dr. Chet Moritz, Dr. Josh Smith**

Dissertation: Sensory Stimulation of the Sensorimotor Cortex: Characterization of Stimulation Parameters for Modulating Intensity of Evoked Perception
- UNIVERSITY OF PITTSBURGH** 2012-14
M.S. Electrical and Computer Engineering
Principal Investigators: **Dr. Doug Weber, Dr. Rob Gaunt**

Thesis: Heuristic Spike Sorting Tuner for the Determination of an Optimal Parameter Set for a Generic Spike Sorting Algorithm
- CORNELL UNIVERSITY** 2008-12
B.S. Electrical and Computer Engineering

Current Position

BRAIN-MACHINE-INTERFACES IN HUMAN PARTICIPANTS since 2019
Senior Postdoctoral Scholar, California Institute of Technology
Principal Investigator: **Dr. Richard Andersen**

- Scientific goals focus on motor control of dexterous robotic hand, restoration of somatosensation via electrical stimulation, and decoding speech from posterior parietal cortex in tetraplegic human patients
- Human clinical trial director responsibilities: scientific aims, experimental design and publications, regulatory documentation (FDA & IRBs), implant planning and cortical locations, direct supervisor of students/post-docs
- Planned and directed two implant surgeries with placement of 12 chronic Utah arrays (6 each)
- Supervised eight Ph.D. students and postdoctoral scholars, resulting in two co-authored papers
- Achieved 3 finger, real-time, bi-directional control of the hand, with somatosensory feedback for individual digits
- First quantification of evoked somatosensory percepts from multi-electrode stimulation patterns in humans
- First demonstration of single neuron modulation of internal speech (incl. words from multiple languages)
- First highly accurate, real-time decoder of internal spoken words (91% online), requiring only 96s of training data
- Quantified performance and physical degradation of 980 electrodes implanted over 5+ years in humans
- First report of stability of somatosensory representation in S1 over 9+ years of stimulation evoked percepts
- First in human chronic implant in pre-frontal cortex for investigating cognitive control processes (working memory, inhibition, selective attention, mood regulation, etc)

This work has resulted in ten publications thus far (four in review). Additionally, six in preparation. Funded by two NIH U01s (I contributed aims, text and figures), an NSF, CPS: TTP award and two postdoctoral fellowships.

Publications

17. **D. Bjånes** et al. Quantifying physical degradation alongside recording and stimulation performance of 980 intracortical microelectrodes chronically implanted in three humans for 956-2130 days, *Acta Biomaterialia*. 2025
16. S. Wandelt, **D. Bjånes** et al. Representation of internal speech by single neurons in human supramarginal gyrus *Nature: Human Behavior*, 2024
15. **D. Bjånes** et al. Charge density of multi-channel intra-cortical micro-stimulation modulates intensity and naturalness of evoked somatosensations, 2024 (in review)

14. **D. Bjånes** et al. Multi-channel intra-cortical micro-stimulation yields quick reaction times and evokes natural somatosensations in a human participant, 2023 (in review)
13. J. Lim, ... **D. Bjånes** et al. Embedded systems bi-directional brain-computer interface enables real-time walking exoskeleton control with bilateral leg sensory feedback, 2025 (in review)
12. L. Bashford, ... **D. Bjånes** et al. Neural subspaces of imagined movements remain stable over several years in humans, *Journal of Neural Engineering*, 2024
11. E. Graczyk, ... **D. Bjånes** et al. Clinical applications and future translation of somatosensory neuroprostheses, *Journal of Neuroscience* 2024
10. I. Rosenthal, ... **D. Bjånes** et al. Visual context affects the perceived timing of tactile sensations elicited through intra-cortical microstimulation, 2024 (in review)
9. S. Wandelt, ... **D. Bjånes** et al. Decoding grasp and speech signals from the cortical grasp circuit in a tetraplegic human, *Neuron*, 2022
8. R.A.A. Andersen, ... **D. Bjånes** et al. Exploring cognition with brain machine interfaces, *Annual Review of Psychology*, 2022. Vol 73.
7. **D. Bjånes** et al. Design of intra-cortical micro-stimulation patterns to control the location, intensity, and quality of evoked sensations in human and animal models, *Somatosensory Feedback for Neuroprosthetics*, Elsevier, 2021
6. **D. Bjånes** et al. Artificial sensory feedback to the brain: somatosensory feedback for neural devices and BCI, *Handbook for Neuroengineering*, Springer, 2021
5. **D. Bjånes** et al. Heuristic spike sorting tuner (HSST), a framework to determine optimal parameter selection for a generic spike sorting algorithm, *bioRxiv*, 2020
4. **D. Bjånes** et al. A robust encoding scheme for delivering artificial sensory information via direct brain stimulation, *IEEE Transactions on Neural Systems & Rehabilitation Engineering*, 2019
3. N. Goshi, ... **D. Bjånes** et al. Glassy carbon mems for novel origami-styled 3d integrated intracortical and epicortical neural probes, *Journal of Micromechanics and Microengineering*, 2018
2. **D. Bjånes** et al. Automated Center-out Rodent Behavioral Trainer (ACRoBaT), an automated device for training rats to perform a modified center out task, *Behavioral Brain Research*, 2017

PATENTS

1. **D. Bjånes** et al. "System and method for delivering sensory feedback to the cortex via electrical stimulation"
Pending US Patent Application 17/090,685 filed 11/5/2020. UW Reference: 48425.02US2

SELECT CONFERENCE PROCEEDINGS

- D. Bjånes** et al. Long-term stability over 2,800 days of stimulation and recording through SIROF arrays in a human participant, *International Brain-Computer Interface Meeting*, 2025
- L. Bashford, **D. Bjånes** et al. Neural Dynamics of Cognitive Tasks in Human Prefrontal and Parietal Cortex, *BCI Society Conference*, 2025
- D. Bjånes** et al. Quantifying physical degradation alongside recording and stimulation performance of 980 intracortical microelectrodes chronically implanted in three humans, *IEEE NERS*, 2023
- D. Bjånes** et al. Multi-channel intra-cortical micro-stimulation yields quick reaction times and evokes natural somatosensations in a human participant, *Brain Stimulation Conference*, 2023
- D. Bjånes** et al. Optimizing parameter selection of spike sorting algorithms using the heuristic spike sorting tuner, *Neuromodulation Conference*, 2014

Research Experience

INTRA-CORTICAL MICRO-STIMULATION (ICMS) FOR SENSORY PERCEPTS

2014-18

University of Washington: Dept. of Electrical Engineering and Rehabilitation Science

Principal Investigators: **Dr. Chet Moritz & Dr. Adrienne Fairhall**

- Characterized effects of ICMS in the sensorimotor cortex as a feedback mechanism for neural control of a motor task in a rodent model
- Determined charge-per-pulse as key parameter for modulation of target neural population
- Designed 3D printed hardware, an embedded system client platform and server for data collection
- Collaborated with a multi-disciplinary team of institutions and researchers
- Mentored nine students (high school, undergrad and graduate), designing projects and giving technical feedback

This work resulted in three publications, two textbook chapters, one patent pending. It was funded by two fellowships (NSF ERC Graduate Student Award, UW NEI Fellowship).

PROPRIOCEPTIVE SIGNALS IN PERIPHERAL NERVE AND SPINAL CORD ACTIVITY

2012-14

University of Pittsburgh: Dept. of Electrical Engineering and Bioengineering

Principal Investigators: **Dr. Doug Weber & Dr. Rob Gaunt**

- Recorded ventral and dorsal root activity from postural perturbations in feline model for modeling proprioception
- Designed a novel ML algorithm to identify separate single unit neural activity (either cortical and/or peripheral)
- Leveraged knowledge of biological systems to build complex data signal processes

This work resulted in one publication and was funded by NSF, DARPA and NIH grants.

THERAPEUTIC ROBOTICS: HUMAN PERCEPTION OF HAPTIC ASSISTANCE

2011-12

University of California Irvine: Depts. of Biomedical Engineering & Physical Medicine and Rehabilitation

Principal Investigator: **Dr. David Reinkensmeyer**

- Researched the therapeutic benefits of motor limb rehabilitation in haptic upper-limb powered exoskeletons and studied optimal learning strategies within these environments.
- Discovered enhanced sensitivity in human subjects when learning in viscous haptic environments
- Designed a vibrotactile pressure sensor for 24-hour home monitoring of hand activity for stroke patients
- Wrote an IRB for regulatory approval of human subject experiments

CONTROL THEORY IN BIPEDAL LOCOMOTION

2011

Cornell University: Dept. of Mechanical Engineering

Principal Investigator: **Dr. Andy Ruina**

- Designed a high current prototype motor controller driven by new type of transistor (GANFet)
- Modelled efficient robotic biped locomotion and control theory for steering the autonomous Ranger robot

NEURAL AND BIOELECTRIC INTERFACES

2011

Cornell University: Dept. of Electrical Engineering

Principal Investigator: **Dr. Al Molnar**

- Designed a novel spike detection method utilizing a custom Multi-Teager Energy Operator
- Achieved high accuracy of determining spike occurrences at low SNR (<1) in publicly available datasets

ACTIVE PROSTHETIC: LOWER LIMB, KNEE & ANKLE

2010

Massachusetts Institute of Technology: Media Lab

Principal Investigator: **Dr. Hugh Herr**

- Designed two printed circuit boards for two high current motor controllers for lower-limb active prosthetic devices
- Designed a wearable, 8 channel, low-cost EMG sensing platform for real time monitoring (commercially unavailable at the time)

Research Grants

Sensory motor transformations in human cortex

since 2021

Principal Investigator: **Dr. Richard Andersen**

California Institute of Technology, Pasadena

NIH Brain Initiative U01

Role: Co-author. I contributed to the development of the aims and provided both text and figures to the funded proposal.

Director of a human clinical trial, responsible for scientific aims, experimental design, data collection, mentorship of graduate students, regulatory documentation and interfacing with clinical partners.

A bi-directional BCI for restoration of walking and lower extremity sensation after spinal cord injury

2017 - 2022

Principal Investigators: **Payam Heydari, Zoran Nenadic**

California Institute of Technology, Pasadena

NSF, CPS: TTP Option: Frontier: Collaborative Research

Role: Experimenter. Collected stimulation data from ECoG participants and guided protocols for restoration of sensation via electrical stimulation patterns

Dexterous BMIs for tetraplegic humans utilizing somatosensory cortex stimulation

2016 - 2021

Principal Investigator: **Dr. Richard Andersen**

California Institute of Technology, Pasadena

NIH Brain Initiative U01

Role: Experimenter. Responsible for experimental design, data collection, and mentorship of graduate students

Fellowships & Awards

Tianqiao and Chrissy Chen Institute: Postdoctoral Fellow

since 2025

Award: \$160,000

Brain Computer Interface Society: Young Talent Travel Award

2025

Craig H. Neilsen Foundation: Spinal Cord Injury Research Translational Spectrum Postdoctoral Fellow

2021 - 2023

Award: \$150,000

Washington Research Foundation: UW Institute for Neuro-Engineering Innovation Fellow

2016 - 2018

Award: \$60,000

National Science Foundation ERC: Center for NeuroTechnology Graduate Student Award

2015 - 2017

Award: \$60,000

National Science Foundation ERC: Center for NeuroTechnology Hackathon, 1st place

2014

Cornell Electrical and Computer Engineering: Master's and Senior Design Competition, 3rd place

2012

Presentations

TALKS

Brain Computer Interface Society, Workshop Chair & Research Session Talk, *Banff, Canada*

2025

ETH Zürich, *Zürich, Switzerland* **(Invited)**

2025

Society for Brain Mapping and Therapeutics, Section Chair, *Los Angeles, USA*

2025

The Brain and the Chip, *Elche, Spain* **(Invited)**

2024

Society for Neuroscience, Mini-symposium, *Chicago, USA*

2024

University of Texas Southwestern Medical Center, *Dallas, USA* **(Invited)**

2024

CYPSY27, *Arizona, USA*

2024

Society for Neuroscience, Nano-symposium, *Washington DC, USA*

2023

NIH BRAIN Initiative - ROH Young Investigators Meeting, *MIT, USA*

2023

Miguel Hernández University, <i>Elche, Spain</i> (Invited)	2023
Chen Institute for Neuroscience Annual Conference, <i>Los Angeles, USA</i>	2023
Brain Stimulation, <i>Lisbon, Portugal</i>	2023
Society for Neuroscience, Nano-symposium, <i>San Diego, USA</i>	2022
University of Oslo, <i>Oslo, Norway</i> (Invited)	2022
NIH Brain Investigators Meeting, <i>Virtual</i>	2020
IEEE: Engineering in Medicine and Biology Society, <i>Virtual</i>	2020
Neural Computation and Engineering Connection, <i>Seattle, USA</i>	2016

POSTERS

Brain Computer Interface Society, <i>Banff, Canada</i>	2025
BRIDGE Stimulation Workshop, <i>Pittsburgh, USA</i>	2025
NIH Brain Initiative, <i>Washington, DC, USA</i>	2023
Brain Computer Interface Society, <i>Brussels, Belgium</i>	2023
International IEEE EMBS Conference on Neural Engineering, <i>Bethesda, USA</i>	2023
Society for Neuroscience, <i>San Diego, USA</i>	2022
Human Single Unit Conference, <i>Los Angeles, USA</i>	2022
Chen Institute for Neuroscience Annual Conference, <i>Los Angeles, USA</i>	2019
Society for Neuroscience, <i>Chicago, USA</i>	2017
NeuroFutures Conference, <i>Seattle, USA</i>	2017
Neural Computation and Engineering Connection, <i>Seattle, USA</i>	2016
NeuroFutures Conference, <i>Seattle, USA</i>	2016
Society for Neuroscience, <i>San Diego, USA</i>	2016
Neural Interfaces Conference, <i>Dallas, USA</i>	2014
Society for Neuroscience, <i>Washington DC, USA</i>	2014

Mentoring Experience

CALIFORNIA INSTITUTE OF TECHNOLOGY

Brandon Ruszala, Ph.D. <i>currently a postdoctoral scholar at Caltech</i>	since 2024
Sean Darcy (as a Ph.D. student) <i>currently a graduate student at Caltech</i>	since 2024
Bingchuan Liu, Ph.D. <i>currently a postdoctoral scholar at Caltech</i>	since 2023
Mac Thurston (as a M.D., Ph.D. student) <i>currently a graduate student at Caltech</i>	since 2023
Austin Brotman (as a rotation Ph.D. student) <i>currently a joint graduate student at Caltech & Cedars-Sinai Medical Center</i>	2023
Brenna L. Outten (as a rotation Ph.D. student) <i>currently a graduate student at Caltech</i>	2023
Sarah Wandelt, Ph.D. (as a Ph.D. student) <i>currently a neural engineer at The Feinstein Institute</i>	2021 - 2023
Clothilde Vauvelle, M.S. (as a Master's student) <i>currently at Sartorius Stedim Biotech</i>	2019

UNIVERSITY OF WASHINGTON

Richie Yun, Ph.D. (as a rotation Ph.D. student) <i>currently a computational neuroscientist at Sonera Magnetics, Inc</i>	2018
Jasmeet Khera (as an undergraduate student) <i>currently at UW</i>	2018
Ryan Kelly (as an undergraduate student) <i>currently at Fred Hutchinson Cancer Center</i>	2017 - 2018
Su-Yee Lee (as a rotation Ph.D. student) <i>currently a graduate student at UW</i>	2017
Amanda An Nguyen (as a high-school student in the UW: Young Scholars Program) <i>currently a master's student at the University of Tokyo</i>	2016
Thien Nguyen (as a high-school student in the UW: Young Scholars Program) <i>currently an undergraduate in computer science at UW</i>	2016
Anna Pendleton (as an undergraduate student) <i>currently a software engineer at Google</i>	2016
Oliver Stanley, Ph.D (as a rotation Ph.D. student) <i>currently a postdoctoral scholar at Johns Hopkins: Applied Physics Lab</i>	2015
Nile River, Ph.D. (as a rotation Ph.D. student) <i>currently at Microsoft Research Center</i>	2014

Teaching Experience

Guest Lecturer, California Institute of Technology Course: CNS 256, Brain-Machine Interfaces Responsibilities: Develop an introduction to stimulation for creating sensory percepts for bi-directional brain-machine-interfaces for graduate students.	2024
Guest Lecturer, University of Southern California, Keck Course: Biomedical Research Senior Seminar Responsibilities: Introduction to collaborative research between clinicians and university researchers for 4 th year medical students.	2024
Guest Lecturer, University of Washington Course: An Introduction to Neural Engineering, for Upward Bound Responsibilities: Develop an introduction to brain-machine-interfaces for high-school students. Lectured in person and recorded video for publication of an open-access course, a resource for high school teachers nationwide.	2017

Service and Outreach

Reviewer <i>npj Flexible Electronics</i>	2025
Editorial Board Member <i>Frontiers in Neuroscience - Neuroprosthetics</i>	since 2023
Reviewer <i>Nature: Biomedical Engineering</i>	2023, 2023
Reviewer <i>Brain Stimulation</i>	2021
Reviewer <i>IEEE Transactions on Neural Systems & Rehabilitation Engineering</i>	2019, 2023, 2024
Student Industry Liaison at University of Washington, Center for NeuroTechnology Facilitated student roundtables with industry representatives about career opportunities and trajectories. Served on the student council for the NSF Engineering Research Center at UW.	2017-2018

Student Equipment Manager at University of Washington, Center for NeuroTechnology 2015-2017
Facilitated access and training of onsite research equipment such as 3D printers, laser etchers, microcontrollers, VR headsets, EMG systems and more.

Technical Expert, Hackathon Volunteer at UW, Center for NeuroTechnology 2016, 2017
Consulted as technical expert for hackathon participants, providing assistance with programming, VR headsets, 3D printing, data collection systems, and cloud resources

Media

Australian Broadcasting Corporation's NewsRadio	2024
3AW Studio 1, Sydney Australia	2024
Knowable Magazine	2023
PBS - Searching: Our Quest for Meaning in the Age of Science feat. Alan Lighman	2023
Mercury News	2022

Associations

IEEE Member

Society for Neuroscience Member

BCI Society Member

Languages

English

Norwegian

References

Richard Andersen, Ph.D. richard.andersen@vis.caltech.edu
California Institute of Technology
James G. Boswell Professor of Neuroscience
Leadership Chair and Director, Tianqiao and Chrissy Chen Brain-Machine Interface Center
Dept. of Biology and Biological Engineering

Chet Moritz, Ph.D. ctmoritz@uw.edu
University of Washington
CJ & Elizabeth Hwang Endowed Professor
Depts. of Rehabilitation Medicine and Physiology & Biophysics
Dept. of Electrical & Computer Engineering

Doug Weber, Ph.D. dougweber@cmu.edu
Carnegie Mellon University
Akhtar and Bhutta Professor
Dept. of Mechanical Engineering
Neuroscience Institute

David A. Bjånes, Ph.D.

rag53@pitt.edu

Robert Gaunt, Ph.D.

University of Pittsburgh

Associate Professor in Physical Medicine and Rehabilitation

Engineering Director at Rehab Neural Engineering Labs

David Reinkensmayer, Ph.D.

University of California Irvine

Professor in Mechanical and Aerospace Engineering

Dept. of Anatomy and Neurobiology

Dept. of Biomedical Engineering

Dept. of Physical Medicine and Rehabilitation

dreinken@uci.edu