Hammad F. Khan

Weldon School of Biomedical Engineering,

Purdue University

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GitHub: https://github.com/HammadFKhan/

RESEARCH INTEREST

Neuroengineering, calcium imaging, electrophysiology, bio-integrated devices, motor cortical circuits

PhD in Biomedical Engineering, *Purdue University* Expected May 2026

BS in Electrical Engineering, *Montana State University* Graduated May 2020

RESEARCH EXPERIENCE

Graduate Research Assistant, *Purdue University* August 2020 – Present
Research Advisors: Dr. Krishna Jayant (Primary) and Dr. Tamara L. Kinzer-Ursem (Coadvised)
Focusing on developing scalable bioelectronic interfaces for multimodel mapping of neural activity. Studying mechanisms underlying volitional movement under healthy and diseased cortical circuits in mice.

Undergraduate Research Assistant, *Montana State University* June 2018 – June 2020
Research Advisor: Dr. Anja Kunze
Focused on developing scalable and biocompatible cell assays to investigate cytosolic calcium signaling during cortical neurite maturation in vitro.

PUBLICATIONS & PATENTS

1) Krishna Jayant, Om T. Kolhe, Daniel L. Gonzales, **Hammad F. Khan**
2D and 3D neural electrodes and methods thereof. *US Patent # 63/542,491. 2024*

2) **Hammad F. Khan***, Om Kolhe*, Meiseim Habibimatin, Krishna Jayant
Traveling waves gate reliable volitional movement. ***In prep, *Equal Contribution***

3) Daniel L. Gonzales, **Hammad F. Khan**, Hayagreev Keri, Saumitra Yadav, Lyle Muller, Scott Pluta, Krishna Jayant
A translaminar space time code supports touch-evoked traveling waves. ***In review***

4) **Hammad F. Khan,** Sayan Dutta, Alicia N. Scott, Shulan Xiao, Saumitra Yadav, Xiaoling Chen, Tamara L. Kinzer-Ursen, Jean-Christophe Rochet, Krishna Jayant.
Site-specific seeding of Lewy pathology induces distinct pre-motor cellular and dendritic vulnerabilities in the cortex. ***In review***

5) C. L. Beck, **H. F. Khan**, A Kunze
Biomechanical modulation of calcium event rates in soft matter neuro patterns. *Proceedings of the 25th International Conference on Miniaturized Systems for Chemistry and Life Science 2022.*

6) **H. F. Khan,** C. L. Beck, A. Kunze,
Multi-curvature micropatterns unveil distinct calcium and mitochondrial dynamics in neuronal networks. *Lab on a Chip 2021*.

7) Anja Kunze, Connor L. Beck, **Hammad F. Khan**
Multi-curvature soft matter patterns and methods for lab-on-chip pharmaceutical testing and neurobiology studies. *US Patent #63/143.701, 2021*.

RESEARCH GRANTS

NSF Graduate Research Fellowship (GRFP) July 2022 – July 2027
Project title: *Large-scale mapping of somato-dendritic dynamics during memory formation and replay*

NIH T32DC016853 July 2021 – July 2023
Project title: *Mapping intracellular rate code in CA1 neurons under auditory spatial cues*

NIH P20GM103474 January 2019 – January 2020
Project title: *Using Agarose Hydrogel to Mimic Organize Neural Network Response and Mechanical Stimulus In Vitro*

PRESENTATIONS

- SfN Barrels Confence (Poster), *Baltimore, MD* November 2023
  Hammad F. Khan*, Om Kolhe*, Meisem Habibimatin, Krishna Jayant
  Traveling waves gate reliable volitional motor movement

- SfN Conference (Poster), *San Diego, CA* November 2022
  Hammad F. Khan, Sayan Dutta, Saumitra Yadav, Xiaoling Chen, Tamara L. Kinzer-Ursem, Jean-Christophe Rochet, Krishna Jayant
  Prodromal phase alpha synucleinopathy-induced motor circuit dysfunction in vivo

- SfN Conference (Poster), *San Diego, CA* November 2022
  Daniel L. Gonzales, **Hammad F. Khan**, Hayagreev V. S. Keri, Saumitra Yadav, Scott R. Pluta, Krishna Jayant
  Mapping the cellular and sub-cellular circuit motifs underlying sensory-driven traveling waves from the cortical surface

- SfN Conference (Poster), *San Diego, CA* November 2022
  Nico Masala**,** Gergely Tarcsay, **Hammad F. Khan**, Daniel L. Gonzales Laura A. Ewell, Krishna Jayant

- *Chronic dual optical-voltage recordings from hippocampus of awake head-fixed mice*

- CSHL Neuronal Circuits Conference (Poster), *Cold Spring Harbor. NY* March 2022
  Hammad F. Khan, Sayan Dutta, Saumitra Yadav, Xiaoling Chen, Tamara L. Kinzer-Ursem, Jean-Christophe Rochet, Krishna Jayant
  Examining the coupling between beta oscillations and functional cortical ensembles in an alpha-synuclein mouse model of dementia

- CSHL Neuronal Circuits Conference (Poster), *Cold Spring Harbor. NY* March 2022
  Daniel L. Gonzales, **Hammad F. Khan**, Scott R. Pluta, Krishna Jayant
  Transparent, flexible electrodes for mapping sensory-driven activity from the cortical surface in awake animals

- Annual NCUR Conference (Invited Talk), *Montana State University, MT* March 2020
  Hammad Khan, Connor Beck, Anja Kunze.
  Agarose Microchannels to Study Curvature Effects in Neuronal Calcium Signaling.

- Annual BMES Conference (Invited Talk), *Philadelphia, PA* Oct. 2019
  Hammad Khan, Connor Beck, Anja Kunze.
  Soft-gel Microchannels to Study Curvature Effects in Neuronal Calcium Signaling.

- Annual BMES Conference (Poster), *Philadelphia, PA* Oct. 2019
  Jeneane Jaber, **Hammad Khan**, Anja Kunze.
  Quantifying Magnetic Nanoparticle Movement Under Micromagnetic Field Patterns.

- NSF NNCI Convocation (Invited Talk), *Cornell University, NY* Aug. 2019
  Hammad Khan, Connor Beck, Anja Kunze.
  Agarose microchannels to study curvature effects in neuronal calcium signaling.

- NIH INBRE Convocation (Poster), *Montana State University, MT* Aug. 2019
  Hammad Khan, Connor Beck, Anja Kunze.

Agarose microchannels to study curvature effects in neuronal calcium signaling.

- Undergraduate Scholars Research Celebration (Poster), *Montana State University, MT* — May 2019
  Hammad Khan, Anja Kunze.
  Fine-tuning Agarose Concentrations towards Soft-gel based Neuro-microfluidics.

- IEEE Neuroengineering Conference (Poster), *San Francisco, CA* — March 2019
  Derek Judge, **Hammad Khan,** Anja Kunze.
  Neural network growth under heterogeneous magnetic gradient patterns.

AWARDS

Society of Neuroscience Professional Development Award	October 2022
Stephan Ash Fellowship	August 2020
Undergraduate Scholar Program Travel Award	March, Oct. 2019
Extended abstract for annual (BMES) conference	July 2019
National Institute of Health INBRE Fellowship	May 2019
IM Flash Scholarship	March 2019
Warren Edward and Phyllis Sullivan Howe Scholarship	2016 – 2019
Frank L. Eckard Scholarship Endowment	2018 – 2019

LEADERSHIP EXPERIENCE

Purdue BME GSA
- Treasurer — July 2021 – Present
- First Year representative — August 2020-July 2021

Sophomore Surge Program
- Mentor — Aug. 2017 – June 2020

Mentored incoming students on academic resources, registrations, and classes. Researched high impact practices for seminar classroom.

Biomedical Engineering Journal Club
- Member — May 2018 – May 2019

Presented on a diverse set of biomedical and neuroengineering topics. Reviewed and discussed new developments within respective fields.

Residence Hall Association (RHA)
- Senator — Aug. 2016 – May 2017

Participated in advocating for community needs within our residence halls. Coordinated with other student organizations for monetary budgets and activities.

Montana State University, University Comm. Sept. 2018 – Dec. 2019
- Peer Facilitator; US 101

Helped facilitate discussions in a freshman seminar classroom.

Montana State University, Department of Mathematics Sept. 2017 – Dec. 2017
- Co-instructor; M121

Lectured three times a week in introductory algebra for non-traditional students.
Graded quizzes and compiled homework packets.