Allison Hess-Dunning, Ph.D.

CONTACT INFORMATION

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RESEARCH INTERESTS

MEMS; bioMEMS; Neural Interfaces; Microfabrication; Additive Manufacturing; Responsive Materials; Biosensors; Electrochemical Sensing; Materials for Electrochemical Sensing; Materials Integration

EDUCATION

PhD **Case Western Reserve University** Cleveland, Ohio
Electrical Engineering May 2011
Dissertation: Integration of Process-Incompatible Materials for Microfabricated Polymer-Based Neural Interfaces

MS **Case Western Reserve University** Cleveland, Ohio
Electrical Engineering May 2008
Thesis: Design and Fabrication of Polynorbornene- and Liquid Crystal Polymer-Based Electrode Arrays for Biomedical Applications

BS **University of Pittsburgh** Cleveland, Ohio
Engineering Physics May 2005
Summa cum laude

CURRENT POSITIONS

Biomedical Engineer/Research Investigator June 2011 – present
Louis Stokes Cleveland Cleveland, Ohio
Department of Veterans Affairs Medical Center

Adjunct Assistant Professor July 2020 – present
Dept. Biomedical Engineering Cleveland, Ohio
Case Western Reserve University

Adjunct Assistant Professor August 2021 – present
Dept. Electrical, Computer, and Systems Engineering Cleveland, Ohio
Case Western Reserve University

AWARDS AND HONORS

2020	Steven Garverick Innovation Incentive Program Award – APT Center
2015	Career Development Award – Level 2 – Rehabilitation R&D, Department of Veterans Affairs
2013	Career Development Award – Level 1 – Rehabilitation R&D, Department of Veterans Affairs
2012	Postdoctoral Diversity Travel Award – Neural Interface Conference 2012
2010	Materials Research Society Fall 2010 Meeting – Best Poster Award

2008 AVS 55th International Symposium & Exhibition, BioMEMS Topical Conference – Young Investigator Award (1 of 2 awards given, only graduate student recipient)

2005 Case Prime Fellowship

PEER-REVIEWED PUBLICATIONS

[22] Amani Hamedani H, Stegall T, Yang Y, Menon A, Bhalotia A, Karathanasis E, Capadona JR, **Hess-Dunning A**. Flexible Multifunctional Titania Nanotube Array Platform for Biological Interfacing. MRS Bulletin. [in press]

[21] Kim Y, Druschel LN, Mueller N, Sarno D, Gisser K, **Hess-Dunning A**, Capadona JR. In vivo validation of a mechanically adaptive microfluidic intracortical device as a platform for sustained local drug delivery. Front Biomater Sci. 2, 1279367 (2023).

[20] Kim Y, Mueller NN, Schwartzman WE, Sarno D, Wynder R, Hoeferlin GF, Gisser K, Capadona JR, **Hess-Dunning A**. Fabrication Methods and Chronic In Vivo Validation of Mechanically Adaptive Microfluidic Intracortical Devices. Micromachines. 14, 1015 (2023).

[19] Koppaka S, **Hess-Dunning A**, Tyler DJ. Biomechanical characterization of isolated epineurial and perineurial membranes of rabbit sciatic nerve. J Biomech. 136, 111058 (2022). PMID: 35349870

[18] Sui Y, **Hess-Dunning A**, Radwan AN, Sankaran RM, Zorman CA. Engineering the surface morphology of inkjet printed Ag by controlling solvent evaporation during plasma conversion of AgNO3 inks. J Mater Chem C. 10, 5257–5265 (2022).

[17] Koppaka S, **Hess-Dunning A**, Tyler DJ. Directed stimulation with interfascicular interfaces for peripheral nerve stimulation. J Neural Eng. 18, 066006 (2021).

[16] Szabo E, **Hess-Dunning A**. Irreversible, self-aligned microfluidic packaging for chronic implant applications. J Micromechanics Microengineering. 31, 095011 (2021).

[15] Sui Y, **Hess-Dunning A**, Sankaran RM, Zorman CA. Inkjet-Printed Hydrogen Peroxide Sensor with Sensitivity Enhanced by Plasma Activated Inorganic Metal Salt Inks. J Microelectromechanical Syst. 29 (2020)..

[14] Monney B, **Hess-Dunning AE**, Gloth P, Capadona JR, Weder C. Mechanically adaptive implants fabricated with poly(2-hydroxyethyl methacrylate)-based negative photoresists. J Mater Chem B. **8**, 6357–6365 (2020). PMID: **32555874**

[13] Sui Y, **Hess-Dunning A**, Wei P, Pentzer E, Sankaran RM, Zorman CA. Electrically Conductive, Reduced Graphene Oxide Structures Fabricated by Inkjet Printing and Low Temperature Plasma Reduction. Adv Mater Technol. **4**, 1900834 (2019).

[12] **Hess-Dunning A**, Tyler DJ. A Mechanically-Adaptive Polymer Nanocomposite-Based Intracortical Probe and Package for Chronic Neural Recording. Micromachines. 9, 583 (2018). PMID: 30413034

[11] Kim Y, Meade SM, Chen K, Feng H, Rayyan J, **Hess-Dunning A**, Ereifej ES. Nano-Architectural Approaches for Improved Intracortical Interface Technologies. Front Neurosci. 12, 456 (2018). PMID: 30065623

[10] French J, Bardot D, Graczyk E, **Hess-Dunning A**, Lujan JL, Moynahan M, Tan W, Triolo R, Zbrzeski A. The need for understanding and engaging the patient as consumer of products developed by neural engineering. J Neural Eng. 15, 040201 (2018). PMID: 29781806

[9] **Hess-Dunning A**, Smith RL, Zorman CA. Development of polynorbornene as a structural material for microfluidics and flexible BioMEMS. *Journal of Applied Polymer Science*, 2014; 11:056015.

[8] Nguyen JK, Park DL, Skousen JL, **Hess-Dunning AE**, Tyler DJ, Rowan SJ, Weder C, Capadona JR. Mechanically-compliant intracortical implants reduce the neuroinflammatory response. J Neural Eng. **11**, 056014 (2014). PMID: **25125443**

[7] **Hess-Dunning AE**, Tyler DJ, Harris JP, et al. Microscale Characterization of a Mechanically Adaptive Polymer Nanocomposite With Cotton-Derived Cellulose Nanocrystals for Implantable BioMEMS. J Microelectromechanical Syst. 23, 774–784 (2014).

[6] **Hess AE**, Potter K, Tyler DJ, Zorman CA, Capadona JR, Environmentally-controlled Microtensile Testing of Mechanically-Adaptive Polymer Nanocomposites for Ex Vivo Characterization. Journal of Visualized Experimen*ts*, e50078 (2013). PMID: 23995288

[5] **Hess AE,** Sabens DM, Martin HB, Zorman CA. Diamond-on-Polymer Microelectrode Arrays Fabricated Using a Chemical Release Transfer Process. J Microelectromechanical Syst. 20, 867–875 (2011).

[4] Barnes A, **Hess A**, Zorman C, et al. Development of a Packaging System for Clinical Evaluation of a Nanocomposite-Based Neural Electrode Array Fabricated from a Chemoresponsive Polymer Substrate. Surf Mt Technol Int Exhib. (2010.).

[3] Harris JP, **Hess AE***, Rowan SJ, Weder C, Zorman CA, Tyler DJ, Capadona JR. In vivo deployment of mechanically adaptive nanocomposites for intracortical

microelectrodes. J Neural Eng. 8, 46010 (2011). PMID: 21654037. [*co-first author]

[2] **Hess AE**, Capadona JR, Shanmuganathan K, Hsu L, Rowan SJ, Weder C, Tyler DJ, Zorman CA. Development of a stimuli-responsive polymer nanocomposite toward biologically optimized, MEMS-based neural probes. J Micromechanics Microengineering. 21, 54009 (2011).

[1] **Hess AE,** Sabens DM, Martin HB, Zorman CA. Polycrystalline Diamond-on-Polymer Electrode Arrays Fabricated Using a Polymer-Based Transfer Process. Electrochem Solid-State Lett. 13, J129 (2010).

REFEREED BOOK CHAPTERS

[1] **Hess-Dunning A**, Zorman CA. Electrical interfaces for recording, stimulation, and sensing. In: Bhunia S, Majerus S, Sawan M, eds. *Implantable Biomedical Microsystems*. William Andrew Publishing; 2015:13-38. doi:10.1016/B978-0-323-26208-8.00002-9

CONFERENCE PROCEEDINGS PAPERS

[10] Kim Y, Mueller N, Schwartzman W, Aluri V, Herried A, Capadona JF, **Hess-Dunning A**. Hybrid Fabrication Method for Microfluidic Channels within a Polymer Nanocomposite for Neural Interfacing Applications. In: Transducers 2021: 21st International Conference on Solid-State Sensors, Actuators, and Microsystems. IEEE; 2021: 900-903.

[9] Jorfi M, Potter KA, Nguyen JK, **Hess-Dunning AE**, Foster EJ, Capadona JR, Weder C. Mechanically adaptive materials for intracortical implants. In: *2015 7th International IEEE/EMBS Conference on Neural Engineering (NER)*. IEEE; 2015:601-602. doi:10.1109/NER.2015.7146694

[8] **Hess-Dunning AE**, Tyler DJ, Zorman CA. Stretchable thin-film metal structures on a stimuli-responsive polymer nanocomposite for mechanically-dynamic microsystems. In: *2013 Transducers & Eurosensors XXVII: The 17th International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS & EUROSENSORS XXVII)*. IEEE; 2013:2229-2232. doi:10.1109/Transducers.2013.6627247

[7] **Hess AE**, Shanmuganathan K, Capadona JR, Hsu L, Rowan S, Weder C, Tyler DJ, Zorman CA. Mechanical behavior of microstructures from a chemo-responsive polymer nanocomposite based on cotton cellulose nanofibers. In: *2011 IEEE 24th International Conference on Micro Electro Mechanical Systems*. IEEE; 2011:453-456. doi:10.1109/MEMSYS.2011.5734459

[6] **Hess AE**, Zorman CA. Fabrication and Characterization of MEMS-Based Structures from a Bio-Inspired, Chemo-Responsive Polymer Nanocomposite. *MRS Proc*. 2011;1299:mrsf10-1299-s04-07. doi:10.1557/opl.2011.56

[5] **Hess A**, Sabens D, Martin H, Zorman C. Polycrystalline Diamond-On-Polymer Microelectrode Arrays for Mechanically-Flexible Neural Interfacing. In: *Technical Digest – 2010 Solid State Sensors, Actuators and Microsystems Workshop (Hilton Head 2010).* 2010:142-145.

[4] **Hess A**, Dunning J, Harris J, Capadona JR, Shanmuganathan K, Rowan SJ, Wedera C, Tyler DJ, Zorman CA. A bio-inspired, chemo-responsive polymer nanocomposite for mechanically dynamic microsystems. In: *TRANSDUCERS 2009 - 2009 International Solid-State Sensors, Actuators and Microsystems Conference*. IEEE; 2009:224-227. doi:10.1109/SENSOR.2009.5285522

[3] **Hess AE**, Dunning JL, Tyler DJ, Zorman CA. A Polynorbornene-Based Microelectrode Array for Neural Interfacing. In: *TRANSDUCERS 2007 - 2007 International Solid-State Sensors, Actuators and Microsystems Conference*. IEEE; 2007:1235-1238. doi:10.1109/SENSOR.2007.4300360

[2] **Hess AE**, Dunning J, Tyler D, Zorman CA. Development of a Microfabricated Flat Interface Nerve Electrode Based on Liquid Crystal Polymer and Polynorbornene Multilayered Structures. In: *2007 3rd International IEEE/EMBS Conference on Neural Engineering*. IEEE; 2007:32-35. doi:10.1109/CNE.2007.369604

[1] **Hess A**, Parro R, Du J, Dunning J, Scardelletti M, Zorman CA. PECVD Silicon Carbide as a Thin Film Packaging Material for Microfabricated Neural Electrodes. *MRS Proc*. 2007;1009:1009-U04-03. doi:10.1557/PROC-1009-U04-03

ABSTRACTS OF CONFERENCE PRESENTATIONS

[37] Mueller, NN, Kim, Y, Ocoko, MYM, Dernelle, P, Hermoso, AC, Chirra, D, Li, K, Gisser, K, Lugo, I, Capadona, JR, **Hess-Dunning, A**. (2023). Mechanically-adaptive, resveratrol-eluting neural probes record single unit action potentials in vivo. Podium presentation at: Biomaterials Day Conference, Society for Biomaterials; November 10-11, 2023.

[36] Ocoko, MYM, Duncan, J, Wang, H, Capadona, J, Amani Hamedani, H, **Hess-Dunning, A**. (2023). Development of Patterning and Transfer Processes for Integrating Annealed Titanium Nanotube Array Microsegments onto Polymer Substrates. Poster presented at: Biomaterials Day Conference, Society for Biomaterials; November 10-11, 2023.

[34] Li, K, Mueller, N, Kim, Y, Capadona, J, **Hess-Dunning, A**. (2023). Fabrication Process Development Toward Coupling Mechanically-Adaptive Intracortical Electrodes with Microfluidic Channels. Poster presented at: 2023 Biomedical Engineering Society (BMES) Annual Meeting; October 11-14, 2023; Seattle, WA.

[33] Espinoza, FP, Duncan, J, Wang, H, Brubach, J, Capadona, J, Amani Hamedani, H, **Hess-Dunning, A.** (2023). Developing a Method to Characterize and Characterize Drug-Release Profiles Under Biologically-Relevant Conditions. Poster presented at: 2023 Biomedical Engineering Society (BMES) Annual Meeting; October 11-14, 2023; Seattle, WA.

[32] Mueller NN, Kim Y, Ocoko M, Dernelle P, Hermoso A, Chirra D, Capadona JR, Hess-Dunning A. Mechanically-Adaptive, Resveratrol-Eluting Neural Probes Improve Single-Unit Recording Performance. Platform presentation at: Biomedical Engineering Society (BMES) 2023 Annual Meeting; October 11-14, 2023; Seattle, WA.

[31] **Hess-Dunning, A.** Integration of Multi-Functional Nanostructured Microelectrodes onto a Mechanically-Adaptive Polymer Nanocomposite for Neural Interfacing Applications. Poster presented at: 2023 American Spinal Cord Association (ASIA) Scientific Meeting; April 17-19, 2023; Atlanta, GA.

[30] Mueller NN, Kim Y, Ocoko M, Chirra D, Dernelle P, Hermoso A, Capadona JR, **Hess-Dunning A**. Mechanically-Adaptive, Resveratrol-Loaded Intracortical Microelectrodes for Neural Interfacing. Poster presented at: Society for Biomaterials 2023 Annual Meeting and Exposition; April 19-22, 2023; San Diego, CA.

[29] Amani Hamedani H, Wang H, Stegall T, Sacco D, Menon A, Yang Y, Capadona JR, **Hess-Dunning A**. Integration of Multi-Functional Nanostructured Microelectrodes onto a Mechanically-Adaptive Polymer Nanocomposite for Neural Interfacing Applications. Poster presented at: ASIA 2023 - American Spinal Injury Association; April 17-19, 2023; Atlanta, GA.

[28] Mueller N, Ocoko M, Chirra D, Dernelle P, Hermoso AC, Capadona JR, **Hess-Dunning A**. The Effect of Laser Processing on Drug-Loaded Polymers for Microfabricated Neural Interfaces. Poster presented at: AVS 68th International Symposium & Exhibition; November 6-11, 2022; Pittsburgh, PA.

[27] Sacco D, Wang H, Stegall T, Menon A, Yang Y, Capadona JR, Amani Hamedani H, **Hess-Dunning A**. Titania Nanotube Array Electrochemical Characterization and Integration Into a Mechanically-Adaptive Neural Interface. Poster presented at: AVS 68th International Symposium & Exhibition; November 6-11, 2022; Pittsburgh, PA.

[26] Mueller N, Kale I, Dernelle P, Patwa S, Hermoso AC, Valencia D, Kim Y, Capadona JR, **Hess-Dunning A**. Resveratrol-Loaded Polymer-Based Nanocomposite Probes for Neural Interfacing. Poster Presented at: Joint Symposium – Society for Biomaterials and Japanese Society for Biomaterials; January 8-10, 2022 [online]

[25] Stegall TJ, Yang Y, Naruka D, Capadona JR, **Hess-Dunning A**, Amani Hamedani H. Flexible Multifunctional Titania Nanotube Array Platform for Biological Interfacing. Oral Presentation Presented at: 2021 MRS Fall Meeting & Exhibit; December 6, 2021 [online].

[24] Mueller N, Kim Y, Capadona J, **Hess-Dunning A**. Resveratrol-Loaded Photolithography-Defined Nanocomposite Intracortical Microelectrodes. Poster Presented at: Biomedical Engineering Society Annual Meeting 2021; October 6-9, 2021; Orlando, FL.

[23] Kim Y, Mueller N, Schwartzman W, Aluri V, Herried A, **Hess-Dunning A**, Capadona JR. Resveratrol Delivery Methods to Improve Intracortical Implant Performance and Neuroinflammation. Oral Presentation at: Biomedical Engineering Societry Annual Meeting 2021; October 6-9, 2021; Orlando, FL.

[22] Szabo E, Greenwood L, Hess-Dunning A. A Low-Temperature Packaging Process for Mechanically-Adaptive Neural Interfaces for Microfluidic-Aided Drug Delivery. Oral Presentation at: AVS 66th International Symposium and Exhibition; October 20-25, 2019; Columbus, OH.

[21] Koerwer H, **Hess-Dunning A**. Micro Contact Printing of Reduced Graphene Oxide on Microelectrodes. Poster Presented at: Intersections, Case Western Reserve University; August 3, 2018; Cleveland, OH.

[20] **Hess-Dunning A**, Lerchbacker J, Szabo E, Maguire G, Divakar G. Microfluidic-Aided Diffusion-Based Transport through a Mechanically-Adaptive Neural Probe for Drug Delivery Applications. Poster Presented at: Neural Interfaces Conference 2018; June 26-27, 2018; Minneapolis, MN.

[19] **Hess-Dunning A**, Lerchbacker J. Integration of Microfluidic Channels for Hybrid Drug-Delivery Mechanism in Mechanically-Adaptive Neural Probes. Presented at: 2017 Materials Research Society Spring Meeting; April 19, 2017; Phoenix, AZ.

[18] **Hess-Dunning, AE**. Multi-functional Bio-inspired Neural Microsystems Toward Locally-Responsive Brain Interfaces. Presented at: AVS Ohio Chapter Annual Meeting 2015; October 10, 2015; Cleveland, OH.

[17] Zorman CA, **Hess-Dunning AE**. Fabrication of polymer-based neural interfaces from process-incompatible materials. Presented at: AVS Ohio Chapter Annual Meeting 2015; October 10, 2015; Cleveland, OH.

[16] **Hess-Dunning AE**, Zorman CA, Tyler DJ. Intracortical Probes for Neural Recording Based on a Stimuli-Responsive Polymer Nanocomposite Substrate with Switchable Stiffness. Poster presented at: Neural Interfaces Conference 2012; June 18-20, 2012; Salt Lake City, UT. Abstract #E-27.

[15] Brill N, **Hess A**, Miller L, Ethier C, Tyler DJ. Selective Activation of Upper Extremty Muscles Using High Density Nerve Cuff Electrodes in Nonhuman Primates. Poster presented at: Neural Interfaces Conference 2012; June 18-20, 2012; Salt Lake City, UT. Abstract #I-1.

[14] Koppaka S, Hess AE, Marasco P, Tyler D. Force Required to Insert Probes into Epineurial and Perineurial Membranes. Presented at: Biomedical Engineering Society Conference; October 14, 2011; Hartford, Connecticut. Abstract #Fri-2-5-F.

[13] Martin HB, Sabens DM, **Hess AE**, Zorman CA. Diamond-on-polymer Microelectrode Arrays as Flexible Electrochemical Sensors. Presented at: *Fall 2010 Meeting of the Materials Research Society*; November 29-December 3, 2010; Boston, MA. Abstract #A8-4.

[12] **Hess AE**, Shanmuganathan K, Harris J, Capadona JR, Hsu L, Rowan SJ, Weder C, Tyler DJ, Zorman CA. Fabrication of Mechanically-Dynamic, Chemo-Responsive Polymer Nanocomposite Microdevices for Neural Interfacing. Poster presented at: *Biomaterials Day*; November 6, 2010; Cleveland, OH.

[11] Sabens DM, **Hess AE**, Zorman CA, Martin HB. Electrochemistry on a flexible diamond-on-polymer electrode array. Presented at: at *21st European Conference on Diamond, Diamond-Like Materials, Carbon Nanotubes, and Nitrides*; September 5-9, 2010; Budapest, Hungary.

[10] Martin HB, Halpern JM, Sabens DM, **Hess AE**, Zorman CA, Chiel HJ. Mechanically-flexible Diamond Electrodes for Implantable Neural Devices. Presented at: *2010 European MRS Spring Meeting*; June 7-9, 2010; Strasbourg, France. Invited Talk.

[9] Martin HB, Halpern JM, Sabens DM, **Hess AE**, Zorman CA. Mechanically-flexible diamond electrodes for implantable sensors. Presented at: *2009 Annual Meeting of the American Institute of Chemical Engineering*; November 8-12, 2009; Nashville, TN. Abstract #154b

[8] Harris JP, Capadona JR, Shanmuganathan, Hess A, Dunning J, Rowan SJ, Zorman, Weder C, Tyler DJ. Pliant polymer microprobes for intracortical electrodes. Poster presented at Biomedical Engineering Society (BMES) Annual Meeting; October 7-10, 2009; Pittsburgh, PA. Poster #PS 10A-162.

[7] Sabens DM, **Hess AE**, Zorman CA, Martin HB. Mechanically-flexible Electrode Arrays based on Selectively-grown Diamond Thin Film Patterns and Temperature-Sensitive Polymer Substrates. Presented at: *20th European Conference on Diamond*, (Diamond 2009); October 6-10, 2009. Athens, Greece. Abstract #O81.

[6] Sabens DM, **Hess AE**, Zorman CA, Martin HB. Mechanically flexible Electrode Arrays based on Selectively Grown Diamond Thin Film Patterns and Temperature

Sensitive Polymer Substrates. Presented at: *New Diamond and NanoCarbons Conference 2009*; June 7-11, 2009. Traverse City, MI.

[5] Harris JP, Capadona JR, Shanmuganathan K, **Hess A,** Dunning J, Rowan SJ, Zorman C, Weder C, Tyler DJ. Cortical Tissue Response to a Mechanically-Dynamic Polymer Nanocomposite. Presented at: *37th Annual Meeting of the Society for Neuroscience*; November 15-19, 2008; Washington, DC.

[4] Hess A, Dunning J, Harris J, Capadona JR, Shanmuganathan K, Rowan S, Weder C, Tyler D, Zorman CA. Microfabrication of MEMS-based Neural Probes from a Bio-inspired, Mechanically Dynamic Polymer Nanocomposite. Presented at AVS 55th International Symposium; October 19-24, 2008; Boston, MA.

[3] Capadona J, Shanmuganathan K, Harris J, **Hess A**, Dunning J, Zorman C, Tyler D, Rowan S, Weder C. Bio-inspired Mechanically-dynamic Polymer Nanocomposites for Intercortical Microelectrode Substrates. Presented at: *214th Meeting of the Electrochemical Society*; October 12-17, 2008; Honolulu, HI.

[2] **Hess A**, Dunning J, Tyler D, Zorman CA. Development of Microfabricated Peripheral Nerve Electrodes Made from Liquid Crystal Polymer and Polynorbornene. Poster presented at: *38th Annual Neural Interfaces Conference*; June 16-18, 2008; Cleveland, OH.

[1] **Hess A**, Dunning J, Tyler D, Zorman CA. A Polynorbornene-based Microelectrode Array for Neural Interfacing. Poster presented at: Neural Engineering and Rehabilitation Lectures; June 8, 2007; Cleveland, OH.

INVITED TALKS AND OTHER PRESENTATIONS

[14] **Hess-Dunning A.** Soft Materials for Hard Problems: Materials and Microdevice Approaches for Enhancing Neural Interface Integration. Presented at AVS Ohio 2023 Symposium; August 1, 2023; Dayton, OH.

[13] **Hess-Dunning A**. Mechanically-Softening Intracortical Implants for Sensing and Drug Delivery. Presented at Fall 2019 ACS National Meeting; August 25-29, 2019; San Diego, CA.

[12] **Hess-Dunning A**. Bio-inspired Systems Toward Locally-Responsive Brain Interfaces. Presented at the Neural Engineering Center Seminar, Case Western Reserve University; September 25, 2015; Cleveland, OH.

[11] Zorman C, **Hess A**. Development of New Materials and Processes for Mechanically-flexible, Microfabricated Neural Electrode Arrays for Long-Term Implant

Applications. Presented at Department of Chemical Engineering Seminar, University of Louisville; October 15, 2010; Louisville, KY. Invited.

[10] **Hess A**, Sabens D, Martin H, Zorman CA. Microfabrication of Flexible Diamond Microelectrode Arrays on Polymer Substrates. Presented at Research ShowCASE 2010, Case Western Reserve University; April 15, 2010; Cleveland, OH.

[9] Harris J, Capadona J, **Hess A**, Dunning J, Shanmuganathan K, Koppaka S, Rowan A, Weder C, Zorman C, Tyler D. Tissue response to mechanically dynamic intracortical microelectrodes. Presented at Research Day and 40th Anniversary Celebration, Department of Biomedical Engineering, Case Western Reserve University; October 22, 2009; Cleveland, OH.

[7] **Hess A**, Dunning J, Harris J, Capadona J, Tyler D, Zorman CA. Fabrication and Evaluation of Mechanically Dynamic Microsystems from a Bio-inspired Polymer Nanocomposite. Poster presented at Research ShowCASE 2009, Case Western Reserve University; April 16 2009; Cleveland, OH.

[5] Harris J, Capadona JR, Shanmuganathan K, Rowan SJ, Weder C, **Hess A**, Dunning J, Zorman CA, Tyler DJ. Cortical Response to Polyvinyl Acetate- Tunicate Whisker Polymer Nanocomposite (PVAc-TW). Presented at Research ShowCASE 2008, Case Western Reserve University; April 16-17, 2008; Cleveland, OH.

[4] **Hess A**, Dunning J, Tyler DJ, Polasek K, Brill N, Zorman CA. Development of Microfabricated, Mechanically Flexible, Peripheral Nerve Electrode Arrays. Presented at Research ShowCASE 2008, Case Western Reserve University; April 16-17, 2008; Cleveland, OH.

[3] **Hess A**, Dunning J, Tyler D, Zorman CA. A Polynorbornene-based Microelectrode Array for Neural Interfacing. Neural Engineer and Rehabilitation Lectures; June 8, 2007; Cleveland, OH.

[2] **Hess A**, Dunning J, Tyler D, Zorman CA. Development of FINE Electrode Structures Based on Micromachined Polymer Substrates. Presented at Research ShowCASE 2007, Case Western Reserve University; April 11-12, 2007; Cleveland, OH.

[1] Keesara V, **Hess A**, Zorman CA. Process Development and Evaluation of Polynorbornene as a Structural Material in Multilayered Flexible Devices. Presented at Research ShowCASE 2006, Case Western Reserve University; April 5-6, 2006; Cleveland, OH.

PATENTS

Tyler D, Xu Y, **Hess-Dunning A**, Zorman C. Interconnect devices, systems, and methods for bridging electronic devices.
Patent Application Number: 14/619,560
Filing Date: February 11, 2015

Issue Date: November 8, 2016
Patent Number: US 9,486,619 B2
Patent Assignee: Case Western Reserve University

GRANTS AWARDED

Department of Veterans Affairs Merit Review Award (Hess-Dunning)
Department of Veterans Affairs Rehabilitation R&D Grant #I01RX003950
"Microelectrodes for Co-Localized Tunable Drug Delivery and Neural Recording"
Role: Principal Investigator (11/2022-10/2026) $1,198,962 DC

The goal of this project is to utilize anti-inflammatory loaded metal oxide nanotube structures embedded within a mechanically-softening intracortical probe for sustained drug release to mitigate the inflammatory response to the implant and sustain long-term neural recording functionality.

Department of Veterans Affairs Office of Research and Development Summer Research Program Pilot (Capadona/Hess-Dunning)
"Biomedical Science and Engineering Summer Research Program at L. Stokes Cleveland VA"
Role: Co-Principal Investigator (5/2022-9/2024) $290,229 DC

This program endeavors to provide a 10-week summer research experience to undergraduate students who are Veterans or from underrepresented or underprivileged populations. Students are paired with mentors and become completely integrated into the mentor's lab throughout the duration of the program. Additionally, didactic training in responsible conduct of research and communicating research is provided through a weekly class. Weekly lab tours allow the students to see a variety of different types of pre-clinical and clinical lab spaces. Each summer, the program ends with a poster symposium that allows each student to present their research to the local research community.

Steven Garverick Innovation Incentive Program Award (Hess-Dunning/Amani Hamendani)
"Flexible Neural Electrodes Based on Porous Nanotube Arrays for Simultaneous In Vivo Neural Recording and Drug Delivery"
Role: Principal Investigator (12/2020-11-2022) $50,000 DC

The major goal of this project is to develop a mechanically flexible neural probe with titania nanotube microelectrodes for neural recording and drug delivery applications. The developments from this seed funding are being used to motivate translation from benchtop and pilot studies to pre-clinical studies.

Department of Veterans Affairs Merit Review Award (Hess-Dunning/Capadona)
Department of Veterans Affairs Rehabilitation R&D Grant #I01RX003083
"Hybrid Drug-Eluting Microfluidic Neural Probe for Chronic Drug Infusion"
Role: Principal Investigator (4/2019-9/2023) $1,094,478 DC

The purpose of this project is to improve neural recording signals by preventing reactive oxygen species accumulation by locally delivering resveratrol through a novel microfluidic-enabled neural drug delivery system.

Career Development Award II
Department of Veterans Affairs Rehabilitation R&D Grant #IK2RX001841
"Flexible Multi-Sensory Mode Neural Devices for Neurochemical Control"
Role: Principal Investigator (8/2015 – 7/2019) $816,641 DC

The purpose of this project was to develop electrochemical sensors and a novel microfluidic-enabled neural drug delivery system for equipping mechanically-softening neural probes with additional modalities of interacting with tissue locally.

Career Development Award I
Department of Veterans Affairs Rehabilitation R&D Grant #IK1RX000959
"Nanobiosensing Neural Probes for Traumatic Brain Injury Applications"
Role: Principal Investigator (7/2013 – 6/2015) $135,274 DC

The purpose of this project was to develop mechanically-adaptive neural probes with electrochemical sensors that can detect markers of neuroinflammation *in vivo*.

Research Initiative Program FY 2012 (Hess)
"Mechanically-Flexible Micro-Optrode Platform for Optical Neural Stimulation"
Role: Principal Investigator (10/2011 – 9/2012) $7,500 DC

The purpose of this project was to evaluate novel materials as candidates for microfabricated waveguides for optogenetics applications.

SERVICE

- Advisor, National Science Foundation BIO (November 2023)
- Associate Editor, Frontiers in Bioengineering and Biotechnology (October 2023 – present)
- Panelist, Women in Tech Event, Case Western Reserve University (April 2023)
- Research & Development Committee, Member, Louis Stokes Cleveland VA Medical Center (January 2023 – present)
- Panelist, National Science Foundation Graduate Research Fellowship Program (January 2023)
- Program Director, APT Wen Ko & DEI Center Summer Internship Program (Fall 2018 – present)
- Selection Committee, Wen Ko APT Center Summer Internship Program (February 2018)
- Panelist, National Science Foundation (February 2017)

- Reviewer, Technical Program Committee, IEEE Sensors 2016-present
- Scientific Reviewer: *Small, Advanced Engineering Materials, Advanced Functional Materials, Advanced Biosystems*, *Frontiers in Neuroscience*, *Journal of Applied Polymer Science*, *Journal of Micromechanics and Microengineering*, *Journal of Neural Engineering*, *Microsystems & Nanoengineering*, *Nanotechnology, IEEE Sensors*, *IEEE Sensors Letters, International Journal of Mechanical Science*, *Journal of Physics D*, *IEEE Journal of Emerging and Selected Topics in Circuits and Systems*, *Nanotechnology, MDPI Sensors, MDPI Micromachines, MDPI Electronics, MDPI Materials, MDPI Biomedical Materials.*

PROFESSIONAL MEMBERSHIPS AND AFFILIATIONS

- Materials Research Society (MRS)
- American Vacuum Society (AVS)
- Institute of Electronic and Electrical Engineers (IEEE) (Engineering in Medicine and Biology Society, Women in Engineering Society)
- American Association for the Advancement of Science (AAAS)
- Women in Neural Engineering Forum

TEACHING

Teaching Experience:

ECSE 322/415: Integrated Circuits and Electronic Devices (Fall 2021, Fall 2022)
ECSE 434: Microsystems Technologies (Spring 2022)
ECSE 422: Solid State Electronics II (Spring 2023)
Wen Ko APT Summer Internship Program Class (2020, 2021) [online], (2022, 2023)[Face to face]