

NICHOLAS S. WITHAM
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EDUCATION

University of Utah, Ph.D. Biomedical Engineering
BioInnovate Track • GPA 3.90
Salt Lake City, UT
August 2018-August 2023 (expected)

University of Utah, MSc. Biomedical Engineering
BioInnovate Track • GPA 3.81
Salt Lake City, UT
August 2018-May 2021

University of North Carolina, BS in Biomedical Engineering
Honors and Distinction • GPA 3.64
Chapel Hill, NC
August 2014-August 2018

RESEARCH EXPERIENCE

Neuromuscular Rehabilitation Engineering Lab (NCSU)
Research Intern/Scientific Programmer
Raleigh, NC
May 2017-August 2017

- Composing Matlab code to visualize High Density EMG, temperature, pressure, and moisture signals in real time on 3D anatomical models
- Assisting with experiments involving both amputees and able-bodied persons

Sports Oncology Lab and Applied Physiology Lab (UNC)
Research Intern/Scientific Programmer
Chapel Hill, NC
August 2016-August 2018

- Researching alternate methods of indirect calorimetry and VO₂ measurement in patients with compromised health, primarily utilizing pulse oximetry
- Fulfilling normal intern tasks such as revising papers for publication

The Helping Hands Project, LLC (UNC)
Innovation Chair
Chapel Hill, NC
October 2016-August 2018

- Researching, designing, and making open-source 3D printed prosthetic hands
- Networking with professionals related to prosthetics and 3D printing
- Directing a R&D team that improved the organization and its pediatric prostheses

UNC/NC State Biomedical Engineering Honors Thesis
Independent Researcher of Artificial Muscles
Chapel Hill, NC
March 2017-April 2018

- Designing and conducting experiments aimed at increasing the contraction potential and reducing the temperature of Twisted Coiled Polymer (mfTCP) Muscles
- Designing and making scientific equipment for coiling and twisting tensioned fibers

Microsystems Laboratory (University of Utah)
Lead Researcher of Twisted Coiled Polymer Muscles
Salt Lake City, UT
August 2018-Present

- Designing and conducting experiments to manufacture Twisted Coiled Polymer Actuators (TCPAs) optimized for rehabilitative and biomedical applications
- Designing and fabricating scientific equipment to determine textile parameters

R&D – Bionics – Ankles (Össur Prosthetics)
Intern
Reykjavik, Iceland
May 2021-August 2021

- Researching Multiple Degree of Freedom (MDOF) Prosthetic Ankles for design input
- Analyzing biomechanics and movement data in context of prosthetic ankle design
- Designing/selecting components (e.g., variable stiffness springs) for MDOF ankle

ENTREPRENEURSHIP

Gaia Technologies, LLC
CEO & Co-Founder

Salt Lake City, UT
August 2018-Present

- Pitching to financiers, grant agencies, and seed funding review panels
- Directing the R&D of assistive device components
 - Myoplexer™ prosthetic distance sensor array
 - Flexible Generically Sized Socket
- Directing department heads to accomplish business milestones

Heimdall Health, LLC
Co-Founder

Salt Lake City, UT
July 2019-2022

- Design and prototyping of the Mapping Otoscope™ to quantify ear infections
- Managing the engineering team to accomplish milestones
- Compile FDA mandated documentation and healthcare reimbursement research

USobek
Co-Founder & Lead Project Manager

Salt Lake City, UT
August 2019-2020

- Customer discovery research, branding, and marketing strategy
- Talent recruitment and strategic networking
- Strategizing business model generation, employee recruitment, and formation

PUBLICATIONS

1. N. S. Witham, L. Pan, M. Liu, and H. Huang. "The Cardinal Method of High Density Biosensor Display (Abstract)." BMES (Biomedical Engineering Society) 2017 Annual Meeting, Phoenix, AZ, USA. Library of Annual Meeting Abstracts. 2017.
2. N. S. Witham. "Functional Actuation of Twisted Coiled Polymer (TCP) Muscles in Organic Temperature Ranges (UG Thesis)." Carolina Digital Repository (CDR) Honors Thesis Collection, University North Carolina at Chapel Hill, NC, USA. 2018
3. N. S. Witham. "Functional Actuation of Twisted Coiled Polymer (TCP) Muscles in Organic Temperature Ranges (Abstract)." Celebration of Undergraduate Research, University North Carolina at Chapel Hill, NC, USA. 2018.
4. K. Barth, S. Qiao, S. Devore, C. Wang, C.H. Chiang, N. Witham, E.A. Voinas, M. Wong, B. Ferrentino, O. Devinsky, W. Doyle, F. Solzbacher, D. Friedman, B. Pesaran, J. Viventi. "A Thin, Flexible 320-Channel ECoG Array with a Hybrid Macro/Micro-Electrode Design for Epilepsy Monitoring (Abstract)." AEC (American Epilepsy Society) 2019, Baltimore, MD, USA. 2019.
5. C. Chiang¹, C. Wang, K. Barth, S. Rahimpour, M. Trumpis, S. Duraivel, I. Rachinskiy, A. Dubey, K. Wingel, M. Wong, N. S. Witham, T. Odell, V. Woods, B. Bent, W. Doyle, D. Friedman, E. Bihler, C. F. Reiche, D. G. Southwell, M. M. Haglund, A. H. Friedman, S. P. Lad, S. Devore, O. Devinsky, F. Solzbacher, B. Pesaran, G. Cogan, and J. Viventi. "Flexible, high-resolution thin-film electrodes for human and animal neural research." JNE (Journal of Neural Engineering). 2021.
6. N. S. Witham, J. Mersch, G. Gerlach, and F. Solzbacher. "Computer Vision to Improve Artificial Muscle Manufacturing (Abstract)." UBEC (Utah Biomedical Engineering Conference), Salt Lake City, Utah, USA. 2022
7. J. Mersch, N. S. Witham, M. Koenigsdorff, F. Solzbacher, and G. Gerlach. "Continuous and highly efficient production of twisted monofilaments for twisted coiled polymer actuators (Conf. Paper)." ACTUATOR Conference, Mannheim, Germany. 2022.
8. N. S. Witham, C. Reiche, T. Odell, F. Mogharrabi, J. Viventi, K. Barth, C. Wang, C. Chiang, B. Pesaran, S. Devore, D. Friedman, and F. Solzbacher. "Flexural Bending to Approximate Cortical Forces Exerted by Electrocorticography (ECoG) Arrays." JNE (Journal of Neural Engineering). 2022.
9. J. Mersch, N. S. Witham, F. Solzbacher, and G. Gerlach. "Continuous Textile Manufacturing Method for Twisted Coiled Polymer Artificial Muscles **(in prep.)**." Textile Research Journal. 2023.
10. N. S. Witham, J. Mersch, S. Lin, G. Gerlach, and F. Solzbacher. "Manipulating Mechanical and Thermomotive Characteristics of Plied Yarns for Artificial Muscle Applications **(in prep.)**." Advanced Materials. 2023.

PRESENTATIONS

1. N. S. Witham, L. Pan, M. Liu, and H. Huang. "The Cardinal Method of High Density Biosensor Display." BMES (Biomedical Engineering Society) 2017 Annual Meeting, Phoenix, AZ, USA. 2017.
2. N. S. Witham. "HHP (Helping Hands Project) Prosthetic Device Compilation." Joint Department of Biomedical Engineering Junior Design Lecture, University North Carolina at Chapel Hill, NC, USA. 2018.
3. N. S. Witham and K. P. Donnelly. "Functional Actuation of Twisted Coiled Polymer (TCP) Muscles in Organic Temperature Ranges." UNC & NC State Joint Department of Biomedical Engineering Honors Thesis Defense, University North Carolina at Chapel Hill, NC, USA. 2018.
4. J. T. Alvarez, C. Clinard, E. Jia, J. Raynor, A. Romero, D. Selezneva, and N. S. Witham*. "Wearable Biosensor Array for Actuation of Upper-Limb Prosthetic Device." UNC & NC State Joint Department of Biomedical Engineering Senior Design Symposium, University North Carolina at Chapel Hill, NC, USA. 2018.
5. N. S. Witham and K. P. Donnelly. "Functional Actuation of Twisted Coiled Polymer (TCP) Muscles in Organic Temperature Ranges (Presentation)." Celebration of Undergraduate Research, University North Carolina at Chapel Hill, NC, USA. 2018.
6. N. S. Witham, F. Mogharrabi, D. Anderson, R. Shorti, J. Huang, and T. LeSueur. "Myoplexer." Bench to Bedside 2019, Salt Lake City, UT, USA.
7. N. S. Witham, S. V. Mastrangelo, T. Marrouche, A. Kachel, and B. McRae. "Heimdall Health - the Mapping Otoscope." Bench to Bedside 2019, Salt Lake City, UT, USA. 2019.
8. N. S. Witham, S. V. Mastrangelo, T. Marrouche, A. Kachel, and B. McRae. "Heimdall Health - the Mapping Otoscope." NUS Medical Grand Challenge 2019, Singapore. 2019.
9. K. Barth, S. Qiao, S. Devore, C. Wang, C.H. Chiang, N. Witham, E.A. Voinas, M. Wong, B. Ferrentino, O. Devinsky, W. Doyle, F. Solzbacher, D. Friedman, B. Pesaran, J. Viventi. "A Thin, Flexible 320-Channel ECoG Array with a Hybrid Macro/Micro Electrode Design for Epilepsy Monitoring (Poster)." AEC (American Epilepsy Society) 2019, Baltimore, MD, USA. 2019.
10. N. S. Witham and F. Solzbacher. "Biomimetic Textile Muscles (Lecture)." Research Training Group Digital Workshop, Dresden Technical University, Germany. 2020.
11. N. S. Witham and F. Solzbacher. "Experience UAC day (Electrical and Computer Engineering Department Recruitment Lecture)" Utah Asia Campus, Songdo, Korea. 2020.
12. N. S. Witham, J. Mersch, G. Gerlach, and F. Solzbacher. "Computer Vision to Improve Artificial Muscle Manufacturing (Conf. Presentation)." UBEC (Utah Biomedical Engineering Conference), Salt Lake City, Utah, USA. 2022
13. J. Mersch, N. S. Witham, M. Koenigsdorff, F. Solzbacher, and G. Gerlach. "Continuous and highly efficient production of twisted monofilaments for twisted coiled polymer actuators (Conf. Presentation)." ACTUATOR Conference, Mannheim, Germany. 2022.
14. N. S. Witham. "Gaia Myoplexer Pitch (Conf. Presentation)." Wearable Technologies Conference, San Francisco, California, USA. 2022.
15. N. S. Witham. "Gaia Myoplexer Pitch (Conf. Presentation)." Wearable Technologies Conference, San Francisco, California, USA. 2022.
16. N. S. Witham. "Novel Sensors for Upper Limb Prosthetic Control (Conf. Presentation)." NINDS T32 Fellowship Annual Meeting, Ann Arbor, Michigan, USA. 2022.

PATENTS

Granted

1. 62/829,955: Pneumatic otoscope that utilizes a novel monocular 3D computer vision system (trigonometry and laser diffraction) to quantify ear infections
2. 62/830,837: The Myoplexer is a flexible high-density distance sensor array that is used to quantify forearm muscle state (force, length, and velocity) to determine hand gesture for use in prosthetic control and augmented reality

Under Review

Pending

1. 62/899,855: Twisted Coiled Polymer Actuator that is internally heated with a thermoelectric transducer, application specific, robust response range, energy efficient, and can be mass produced via continuous textile manufacturing
2. 62/940,189: On-demand sperm testing, transport, and temporary storage method

Disclosures

1. Power Efficient and Easily Manufactured Mandrel Formed Twisted Coiled Polymer Muscles [TVC University of Utah]
2. Wire Bundle Thermal transducer (Thermoelectric) [TVC University of Utah]
3. Cathemeral Energy Capture Utilizing Concentric Syndiotactic Textile (CST) Actuators
4. Low-Force, Quasistatic Universal Materials Testing Machine [TVC University of Utah]
5. Non-Orthogonal Axis Joint [Össur Prosthetics]
6. Textile Artificial Muscle Manufacturing Method [PIVOT University of Utah]

SERVICE

The Helping Hands Project, LLC (UNC)

Chapel_Hill, NC

Innovation Chair

Oct 2016-Aug 2018

- Researching, designing, and making open-source 3D printed prosthetic hands
- Networking with professionals related to prosthetics and 3D printing
- Directing a R&D team that improved the organization and its pediatric prostheses

Feelin' DNA, LLC (UNC)

Chapel_Hill, NC

Founding Member/Design Chair

Feb 2017-Jan 2018

- Structuring the organization and advising on the design and production processes used to make 3D printed scientific diagrams for visually impaired children

University of Utah Graduate Student Advisory Committee

Salt Lake City, UT

Outreach & Service Committee Co-chair

Sep 2018-Present

- Organizing a STEM education event at UofU focused on introducing children and parents to rehabilitation engineering, while fostering a limb difference community

University of Utah Rehabilitation Engineering Youth Education Day

Salt Lake City, UT

Event Organizer

Aug 2018-Jun 2019

- Planning the STEM education event for children and families with limb differences

Limb Difference Night

Salt Lake City, UT

Event Organizer

Aug 2019-Nov 2019

- Planning and funding the outreach event aimed at increasing awareness and understanding between limb difference community groups and able-bodied people

HONORS AND AWARDS

- 07/10: Eagle Scout (Constructed 7 octagon picnic tables for outdoor classroom)
- 01/15-07/18: Dean's List UNC-CH (GPA > 3.50 with no grade below C)
- 08/18: Graduated from UNC-CH & NCSU
- *Honors* (GPA > 3.30, two semester honors thesis research project, public research presentation, and thesis defense)
 - *Distinction* (GPA > 3.50)
 - *Carolina Research Scholar* (2 research intensive courses, an interdisciplinary course, and public research presentation)
- 04/19: Bench to Bedside medical device competition
- *Grand Prize* for my Mapping Otoscope project
 - *Best in Medicine* for my Myoplexer project
- 01/20: Opportunity Quest University of Utah Top 10
- *University business model competition*
- 03/20: Utah Entrepreneur Challenge Top 20 (Cancelled COVID-19)
- *Largest statewide business model competition in Utah*
- 08/20: NINDS T32 Predoctoral Fellow
- 09/20: Bench to Bedside medical device competition
- *Legacy Runner-up for Gaia Technologies' Myoplexer project*
- 03/21: Utah Entrepreneur Challenge
- *Top 8*
 - *Intellectual Property (Jones Waldo)*
 - *Prototype (Espiritu Designs)*

GRANTS, FELLOWSHIPS, & SCHOLARSHIPS

REU NSF Grant #1361549 Recipient	2017
UNC Office of Undergraduate Research Travel Grant	2017
Sarah Steele Danhoff Undergraduate Research Award	2017
GetSeeded University of Utah Seed Grant	March 2019
The NSF Innovation Corps (I-CORPS) at University of Utah	2019-2020
GetSeeded University of Utah Seed Grant	October 2019
Opportunity Quest University of Utah Top 10	2020
Utah Entrepreneur Challenge Top 20 (Cancelled COVID19)	2020
Bench to Bedside 2020: Nominated (Cancelled COVID19)	2020
The NSF Innovation Corps (I-CORPS) at UC Berkeley	June 2020
Predoctoral Fellow, NINDS T32 Translational Neuroscience Training Grant T32NS115723	August 2020
Utah Entrepreneur Challenge	March 2021

POFESSIONAL MEMBERSHIPS

Biomedical Engineering Society	2017
Order of the Engineer	2018