

Caitlin Knowles

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Education	Doctoral Degree, Fiber & Polymer Science – GPA 4.00/4.00 2019 – Present (grad. 05/2023) NEXT Research Group – Wilson College of Textiles – North Carolina State University Raleigh, NC Dissertation Title: <i>Digital Strategies to Inform e-Textile Design and Manufacturing</i> Provost Doctoral Fellowship, Senior Design Teaching Assistant
	Bachelor's Degree, Materials Engineering Co-op Program – GPA 3.82/4.00 2014 – 2019 McGill University Montréal, Québec, Canada Heather Munroe-Blum Leadership Award: ~ \$23,000/year W.H. Howard Scholarship, J. G. Metrakos Scholarship, J.H Ambrose Scholarship, J.D. Hall Prize
Work Experience	NEXT Research Group (NCSU) Raleigh, North Carolina, USA 09/2019 – Present <i>Graduate Student Researcher</i> Advisor: Dr. Jesse Jur <ul style="list-style-type: none">Developing strategies to improve the e-textile design and manufacturing process using emerging technologies such as 3D garment simulation and virtual reality<ul style="list-style-type: none">E-textile component and product fabrication, testing, modeling, and simulationKnit fabric mechanical and electrical performance prediction using tensile testing, image analysis, finite element analysis, and statistical methodsFull-garment and component modeling of compressive garments for prediction of electrical performance and to inform the sizing/fit and material selection processDevelopment of an educational virtual reality platform using real-time cloth simulation to communicate the inherent tangibility of textiles
	Korea Institute of Industrial Technology (KITECH) Seoul, South Korea 09/2018 – 12/2018 <i>Smart Textiles Intern</i> <ul style="list-style-type: none">Immersion in the design and development process of smart textile elements and productsDevelopment of an electromechanical resistance model for a conductive, strain sensing yarn2-week apparel workshop including pattern making/sizing, garment construction, fabric sourcing
	HydroMET Group (McGill) Montréal, Québec, Canada 01/2018 – 04/2018 <i>Undergraduate Researcher</i> <ul style="list-style-type: none">Development of a TiO₂-nZVI composite film fabrication method via electrophoretic depositionExperimental design, sample production & characterization, data collection & analysis
	Nonwovens Innovation & Research Institute (NIRI) Ltd. Leeds, UK 01/2017 – 07/2017 <i>Technical Project Coordinator</i> <ul style="list-style-type: none">Manufactured technical textiles using nonwoven technologies such as wetlaying, carding, airlaying, hydroentanglement, chemical bonding, binder impregnation, coating and calendaringDesigned a novel method of manufacturing wetlaid-hydroentangled water-dispersible wipesExtensive textile testing including FTIR, SEM, air permeability, flushability, thermal resistance, porometry, and image analysis
	Engineering Undergraduate Society of McGill Montréal, Québec, Canada 05/2016 – 04/2018 <i>Sustainability in Engineering at McGill (SEAM) VP Webmaster</i> <ul style="list-style-type: none">Analyzed various McGill groups' needs to determine the most environmentally friendly and cost-effective waste reduction optionsWorked with McGill Administration and other SEAM VPs to publicize, plan, and run eventsConceptualized, planned, and executed a website concept using WordPress
	3D Printing Design Team Montréal, Québec, Canada 12/2015 – 01/2017 <i>Member</i> <ul style="list-style-type: none">Attended weekly workshops, developing knowledge of 3D printing and various CADing softwareAssisted set-up and operation of a Prusa i3 3D printer, analyzed malfunctions, participated in calibration process and online CADing challenges

Publications

C.G. Knowles, B. Ju, M. Noon, J.S. Jur, "Flexible Interconnect Simulation and Electromechanical Analysis for E-Textile Applications" (*forthcoming*)

Z.B. Rosenberg, **C. G. Knowles**, B. Ju, A. Mills, J.S. Jur., "Method of Robotic Handling of Fabric to Enable Automated Manufacturing of Textile Products" (*forthcoming*)

C. Knowles, A. Mills, J. S. Jur. "Virtual Hands-on Learning – The development of a virtual product inspection portal for engineering design education". 2022 ASEE Annual Conference, Design in Engineering Education Division. May 2022. (*accepted*)

C. Knowles, B. Sennik, B. Ju, A. Mills, J. S. Jur., "e-Textile Garment Simulation to Improve ECG Data Quality" ISMICT 2022, Special Session: E-textiles Technologies for Health and Medical Applications". May 2022. (*accepted*)

C.G. Knowles*, Z.B. Rosenberg*, A. Mills, J.S. Jur., "Design Strategies for E-Textiles," in Smart Clothes and Wearable Technology (2nd Edition), Woodhead Publishing (*accepted*)

B.M. Li, B. Ju, Y. Zhou, **C.G. Knowles**, Z.B. Rosenberg, T.J. Flewellin, F. Kose, J.S. Jur, "Airbrushed PVDF-TrFE Fibrous Sensors for E-Textiles," ACS Appl. Electron. Mater., vol. 3, no. 12, pp. 5307–5326, Dec. 2021, doi: 10.1021/acsaelm.1c00802.

B. Ju, I. Kim, B.M. Li, **C.G. Knowles**, A. Mills, L. Grace, J.S. Jur, "Inkjet Printed Textile Force Sensitive Resistors for Wearable and Healthcare Devices," Advanced Healthcare Materials, vol. 10, no. 20, p. 2100893, 2021, doi: 10.1002/adhm.202100893.

Grants/Awards

C. G. Knowles, A. Mills, J.S. Jur, *DELTA Exploratory Grant 2021-2022*. "Extended Reality for a Virtual Textile Experience". 2021.

A. Mills, **C.G. Knowles**. "e-Textile Product Inspection and Analysis". Advanced Functional Fabrics of America (AFFOA). 2021.

C. Knowles, ASEE/EngineeringCAS Student Video Contest: "Adapting to the Virtual World". 2nd Place (\$1500). 2021.

C. G. Knowles, ASU+GSV 2020 Summit Creator Contest "Virtual Reality in Education". Top 5 (\$1000). 2020

A. Mills, **C.G. Knowles**, J.S. Jur, *DELTA Online and Distance Education Grant 2020-2021*. "Development of an Online Distance Education Course on e-Textile Design Inspection"

Conferences

IFAI (Industrial Fabrics Association International) Expo 2021. Nashville TN. 2021 11/1-3

C.G. Knowles, A. Mills, J. S. Jur, 2020 Virtual MRS Spring/Fall Meeting & Exhibit. 2020 Nov 27-Dec 4

Skills

Software: Adobe Premiere Pro, Illustrator, Photoshop, Lightroom, CLO 3D, ANSYS, Unity, Arduino, OriginPro, Minitab, Matlab, AutoCAD, SolidWorks, JMP

Lab Skills: Tensile Testing, Scanning Electron Microscopy, X-Ray Diffraction, X-Ray. Photoelectron Spectroscopy, FTIR, Raman, TGA, Electrochemical Processing, Abrasion, Moisture Management, Image Analysis

Prototyping: Laser Cutting, Screen-printing, Heat Press, 3D Printing, Sewing