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## Andrew Closson

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### Educational Preparation

THAYER SCHOOL OF ENGINEERING at Dartmouth College, Hanover, New Hampshire, USA

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Ph.D. Candidate in Engineering Sciences with a focus in Biomedical Engineering

Advisor: John X.J. Zhang

PhD Innovation Fellow: Fully funded program that fosters both technical and entrepreneurial expertise.

Research Project: Flexible piezoelectric and conductive nanofibers enabled sensors: applications in wearable biomedical monitoring and implantable cardiac energy harvesting.

UNIVERSITY OF MAINE, Orono, Maine, USA

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B.S. Bioengineering, Minor in Nanotechnology

GPA: 3.802/4.00

December 2016

Summa Cum Laude

Honors College Graduate with High Honors

Rising Star Student Athlete/Scholar Athlete

Undergraduate Capstone Project: Improved Methods for Drug Uptake in *C. elegans*.

- Researched and discussed theoretical approaches to drug solubility, delivery and analysis in the nematode *C. elegans*.

Undergraduate Honors Thesis: The role of citrate ion concentration and pH on gold nanoparticle growth kinetics.

- Investigated the role of citrate's counter ion and pH on gold nanoparticle growth kinetics with the aid of an analytical disc centrifuge.

### Graduate Level Courses

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ENGS 092 Fourier Transforms & Complex Var.

ENGS 133 Material Characterization

ENGS 093 Statistical Methods in Engineering

ENGM 188 Law for Tech. & Entrepreneurship

ENGS 130 Mechanical Behavior of Materials

ENGM 187 Tech Innovation & Entrepreneurship

ENGS 159 Molecular Sensors & Nanodevices

ENGM 180: Corporate Finance

ENGS 199 Biomechanics

ENGG 197: PhD Professional Workshops

ENGS 135 Thin Film & Microfabrication

### Professional Employment History

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*PhD Candidate/PhD Innovation Fellow*

Dartmouth College, NH

Fall 2017- current

- Mentored multiple undergraduate students including for a Senior Honor's Thesis.
- Developed multiple research projects:
  - Electrospinning nanofibers for energy harvesting on leadless pacemakers.
  - Inkjet printing of conductive polymer electrodes on electrospun piezoelectric nanofibers for highly scalable fabrication of patternable flexible pressure sensors.
  - Wearable piezoelectric detection of pulse wave velocity.
  - 2D constraints on electroactive polymers (EAPs) creating 3D actuation for soft robotics.

*Residential Fellow*

Dartmouth College, NH

Fall 2019 - current

- Live-in graduate student mentoring undergraduates.
- Ran social media pages for housing community.

*Teaching Assistant ENGS 22: Systems Engineering*  
Winter 2018/Summer 2019

Dartmouth College, NH

- Received citation from teaching Professor, “for exceptional work in the lab and helping students during the project phase of the course.”
- As the head TA I managed 6 other undergraduate TA’s for grading and office hour purposes.
- Held office hours, graded homework/tests, developed questions, and held review lectures.

*Research Associate, IDEXX Laboratories, Inc.*

Westbrook, ME

Spring-Summer 2017

- Lead an investigation into the feasibility of a continuous flow process for conjugating antibodies to gold nanoparticles.
- Aided in the process characterization of new reagents for assay development.
- Analyzed particles using DLS, Zetapotential, UV-vis spectrometry, analytical disc centrifugation, and Multisizer for various groups within the R&D department.

*Research Assistant for the University of Maine in Conjunction with IDEXX Laboratories*

Orono, ME

Fall-Winter 2016/17

- Lead a small group of undergraduate students developing an instrument for analyzing antibody conjugated colloids utilizing Surface Enhanced Raman Spectroscopy for a group at IDEXX.

*R&D Co-op, IDEXX Laboratories, Inc.*

Westbrook, ME

Summer 2016

- Independently worked as the primary contact with a consultant aiding in the modeling of flow and mixing for various small-scale reactors and projecting these into larger scales.
- Optimized manufacturing processes to improve synthetic chemistry and ensure scale-up robustness of a colloidal system.
- Presented posters of research at symposiums to members of the R&D department.

Fall 2015

- Aided in the scale up of a colloidal system from experimental scale to an intermediate scale.
- Investigated the aqueous synthesis of a nanocrystalline colloid. UV-vis spectroscopy, analytical disc centrifugation, dynamic light scattering and high-performance liquid chromatography were used to characterize the kinetics and mechanisms of the nucleation and growth of the system.

*Undergraduate Research Assistant, University of Maine*

Orono, ME

Summer 2015

- Synthesized and analyzed iron nanoparticles with varying procedures.
- Developed procedures for creating useful samples of dried nanocellulose.
- Aided in the repair and assembly of an Infrared Microscope.

*Summer Undergraduate Research Program Member, University of Montana*

Missoula, MT

Summer 2014

- Gained expertise in cell culture, uptake of nanomaterials, fluorescence cytometry and confocal imaging.
- Investigated in the field of nanotoxicology (uptake of nanoparticles in human lung epithelial cells) and presented the research to professors and doctoral students.

## **Publications and Talks**

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- [1] A. Tadimety, **A. Closson**, et al., Crit. Rev. Clin. Lab. Sci., pp. 1–23, Feb. 2018.
  - [2] N. Hao, **et al.**, Mater. Res. Lett., pp. 1–7, Sep. 2017.
  - [3] Z. Xu, **et al.**, ACS Appl Mater Interfaces, pp 33516–33522, Oct 2018.
  - [4] L Dong, **et al.**, Adv. Mater. Tech., 2019, 4, 1800148.
  - [5] N. Hao, **et al.**, J Colloid Interface Sci., pp. 87–94, Mar. 2019.

- [6] N. Hao, Y. Nie, Z. Xu, **A. B. Closson**, T. Usherwood, and J. X. J. Zhang, "Microfluidic continuous flow synthesis of functional hollow spherical silica with hierarchical sponge-like large porous shell," *Chem. Eng. J.*, vol. 366, pp. 433–438, Jun. 2019.
- [7] L. Dong, **A. B. Closson** et al., "In vivo cardiac power generation enabled by an integrated helical piezoelectric pacemaker lead," *Nano Energy*, p. 104085, 2019.
- [8] Dong, L., **Closson, A. B.**, Jin, C., Trase, I., Chen, Z., Zhang, J. X. J., *Vibration-Energy-Harvesting System: Transduction Mechanisms, Frequency Tuning Techniques, and Biomechanical Applications*. *Adv. Mater. Technol.* 2019, 1900177.
- [9] Lin Dong, **Andrew B. Closson**, Meagan Oglesby, Danny Escobedo, Xiaomin Han, Yuan Nie, Shicheng Huang, Marc Feldman, Zi Chen and X.J. Zhang 2019 " In vivo cardiac power generation enabled by an integrated helical piezoelectric pacemaker lead", *Nano Energy*, 66, 104085, DOI: 10.1016/j.nanoen.2019.104085
- [10] L. Dong, **A. B. Closson**, C. Jin, Y. Nie, A. Cabe, D. Escobedo, S. Huang, I. Trase, Z. Xu, Z. Chen, M. Feldman, and J. X.J. Zhang, "Cardiac Energy Harvesting: Multifunctional Pacemaker Lead for Cardiac Energy Harvesting and Pressure Sensing" *Advanced Healthcare Materials*, 2020, 9, 2000053. <https://doi.org/10.1002/adhm.202000053> (featured on cover)
- [11] Lin Dong#, Congran Jin#, **Andrew B. Closson**, Ian Trase, Haley R. Richards, Zi Chen and John X.J. Zhang 2020 "Cardiac energy harvesting and sensing based on piezoelectric and triboelectric designs", *Nano Energy*, 76, 105076. Presentation: Engineering in Medicine Seminar, *Energy Harvesting: The Human Body*, October 2018
- [12] **A. Closson**, H. Richards, L. Dong, Z. Xu, and J. X. J. Zhang, "Method for Inkjet-printing PEDOT:PSS polymer electrodes on piezoelectric PVDF-TrFE fibers," in *IEEE FLEPS (virtual)*, 2020.

Presentation: Engineering in Medicine Seminar, *Energy Harvesting: The Human Body*, October 2018

Presentation: Talk at Analog Devices, *Materials for Harvesting, Sensing and Actuation*, March 2018

Poster: Dartmouth CBRAD

Presentation: A. Closson, et al., "Method for Inkjet-printing PEDOT: PSS polymer electrodes on piezoelectric PVDF-TrFE fibers", *IEEE FLEPS 2020*, August 16-19, Manchester UK, 2020 (Virtual Conference).

\*2nd Place Best Student Paper

Presentation: A. Closson, et. al, "PVDF-TrFE/PDMS Composite with Inkjet Printed PEDOT:PSS Electrodes for Flexible Sensing", *MRS 2020*, Phoenix, (Virtual Conference).

## Other Information

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President (previously First Year PhD Rep.) of Thayer Graduate Student Council

First Year PhD Representative of Thayer Council

Lean Six Sigma Green Belt Certification, March 2017

Treasurer of University of Maine's Chapter of Tau Beta Pi Engineering Honors Society

Men's University of Maine Division I Cross Country, Track and Field

Membership In:

- Tau Beta Pi Engineering Honors Society
- Biomedical Engineering Society (BMES)
- MRS

