Matthew Courtney

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Skills Summary

- **Research:** 3 years of experience working in Mechanical/Biomedical Engineering research labs with a publication as the first author in Analytical Chemistry.
- **Biomedical Devices:** 3 years of experience in biomedical device design and fabrication through CAD software, micromachining, photolithography, laser ablation, and chemical vapor deposition.
- **Experimental Setup:** 3 years of experience preparing microfluidic experiments with biochemical solutions, syringe pumps, pressure systems, high-speed cameras, and fluorescence microscopy.
- **Software:** Proficient in MATLAB, JavaScript, SolidWorks, MS Excel and COMSOL.
- **Communication/Leadership:** Supervision of 2 co-op students. 3 years of experience translating medical needs into biomedical devices with high-quality reports.

Education

PhD, **Mechanical and Mechatronics Engineering** Sept 2017 – Aug 2021 (expected)
University of Waterloo, Waterloo, ON

Project 1: A free-flow electrophoresis device for enhanced protein analysis
- Designed the device using COMSOL and SolidWorks, then built it in the machine shop.
- Prepared the lab setup, which included pumps, a high voltage source, and a microscope.
- Developing an optical system to characterize proteins through UV-absorbance.

Project 2: A droplet-based microfluidic device with an integrated microwave sensor
- Fabricated the device using spin coating, photolithography, and thin film deposition.
- Working towards developing an automated high-throughput system.

BASc, **Nanotechnology Engineering** Sept 2012 – Apr 2017
University of Waterloo, Waterloo, ON

Specialty 1: Microelectromechanical systems (MEMS) and point-of-care devices
- Designed a MEMS device using COMSOL, then fabricated and tested it in a clean room.
- Developed and tested a PCB for a piezoelectric transducer which was then used for gas sensing.
- Researched several optical- and electrical-based sensors for point-of-care medical devices.

Specialty 2: Materials synthesis and characterization
- Worked in state-of-the-art facilities to synthesize different nanomaterials, polymers, and hydrogels.
- Characterized materials using SEM, X-ray diffraction, tensile testing, impact testing, and UV-Vis.
- Fourth-year design project consisted of developing and testing transition contact lenses.

Publications

M. Courtney, X. Chen, S. Chan, T. Mohamed, P. P. N. Rao, C. L. Ren, "A Droplet Microfluidic System with On-demand Trapping and Releasing of Droplet for Drug Screening Applications", Analytical Chemistry, vol. 89, no. 1, pp. 910-915, 2017

M. Courtney and C. L. Ren, "Counter-Flow Gradient Electrophoresis for Focusing and Elution", Electrophoresis, Accepted November 2018

Relevant Work Experience

Biomedical Engineering Intern Jan 2016 – Aug 2016
Sunnybrook Research Institute, Toronto, ON

- Designed a high-frequency ultrasound transducer array for photoacoustic tomography (PAT).
- Developed process for building transducers through micromachining and thin film deposition.
- Developed process for connecting 256-element array through wire-bonding and soldering.
- Tested and characterized transducers using oscilloscope and network analyzer.

Microfluidics Research Assistant Jan 2014 – Apr 2015
University of Waterloo, Waterloo, ON

- Collaborated with the School of Pharmacy to develop a lab-on-a-chip drug screening platform.
- Designed microfluidic channels to trap and release droplets on-demand using MATLAB simulations.
- Fabricated microfluidic devices using photolithography.
- Monitored protein aggregation within nanolitre droplets using fluorescence microscopy.

Additional Work Experience

Content Developer Apr 2013 – Aug 2013
Maplesoft, Waterloo, ON

- Developed education software for university students using Maple software.

Hockey and Lacrosse Referee Sept 2009 – Apr 2015
Orangeville, ON

- Refereed competitive hockey and lacrosse.