

DEPARTMENT OF MECHANICAL ENGINEERING
COLLEGE OF ENGINEERING AND APPLIED SCIENCE

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: 03/01/2018

PROJECT TITLE: Metal 3D Printing from a Room-Temperature Liquid

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Project Description

Background

When you think of 3D printing processes, what do you visualize? Usually a plastic being melted out of a nozzle, or a laser heating a bed of powder. However, we are pushing the boundaries of what 3D printing can be, by researching a new process where solid metal can be directly deposited out of a liquid by applying electricity.

This process, electrochemical additive manufacturing (ECAM), is an emerging process that combines 3D printing and manufacturing at various scales ranging from macro to micro to nano scales. At the small scales, this manufacturing process is a promising candidate for the fabrication of micro and nano parts of complex three-dimensional geometries. However, many obstacles still remain in being able to create any given three-dimensional part using this process. Remaining work lies in creating strategies to work around these obstacles and research how to create the desired shape using the ECAM process.

The student will learn to create three-dimensional ECAM parts at the micro level. The student will investigate process inputs including:

- Tool path planning and algorithms
- Tool rotation/kinematics
- Electrical process parameters
- Chemical process parameters

Learning opportunities for students

As this research is multidisciplinary in nature, it offers tremendous opportunity for undergraduate students to be exposed to interdisciplinary research. The project will also introduce students to the various aspects of academic research starting from literature review to report preparation. The simulation system development and experimentation involved will provide

hands- on experience in research. Students will learn about 3D Printing, stepper motor control, electrochemistry, and design and planning of an emerging 3D printing technology. The undergraduate student will also be encouraged to present the work at either a conference and/or prepare a paper for journal publication.