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**Funding Source:** College of Engineering Undergraduate Research Option

## **Fabrication of equipment to conduct LCORR research**

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Liquid core optical ring resonators (LCORRs) allow label-free detection of biological chemical molecules, along with low sample consumption and a low detection limit. The LCORR is a glass capillary that is heated and pulled to a diameter of about 100  $\mu\text{m}$  and a wall thickness of a few microns. The LCORR being hollow naturally provides a fluidic channel to deliver the sample to the sensor. The cross section forms a ring resonator that supports whispering gallery modes (WGMs), which interact with the sample inside the capillary. Three devices are essential to conducting LCORR research. These devices are an LCORR puller, a taper puller, and a syringe pump. The LCORR puller and taper puller cannot be purchased, so must be made out of necessity. Syringe pumps can be purchased but are very expensive, so cheaper versions were made. Also the pulling of LCORRs was modeled in MatLab using a simplified steady-state equation solved by the forward derivative method. For the LCORR puller a setup was made that consists of two computer controlled CO<sub>2</sub> lasers, two computer controlled slides driven by stepper motors, and a program with a user interface created in LabVIEW to control the setup. For the taper puller a setup was made that consists of two computer controlled slides driven by stepper motors, a manual torch, and a program with a user interface created in LabVIEW to control the setup. For each syringe pump (total of 3) a setup was made that consists of one slide driven by a stepper motor, an LCD screen, LED indicators, and a PIC microcontroller to run these components.

