

# Automated System Design for Microfluidic Drop Creation

Brandeis University



## Project Background

Microfluidic devices utilize micron-scale fluid channels to take advantage of the low Reynolds number regime present in low volumes of fluids. Devices can be patterned to perform a number of laboratory functions and experiments.

While some experiments require large numbers of drops or high-throughput devices, others require only a few controlled drops to conserve valuable reagents. The latter experiments use drop-on-demand microfluidic devices to make drops of precise volumes in small quantities

## Project Statement

The Fraden Group at Brandeis University has prototyped a manual drop-on-demand system. The Brandeis SCOPE team was tasked with automating the process, as well as designing a smaller, lighter, and more modular system.

The system designed by the Brandeis SCOPE team integrates pressure control hardware with a Labview user interface to automatically create drops on demand.

## Microfluidics

The microfluidic device creates individual drops of expensive reagents to use for experimentation. The movement of fluids inside the device is driven by pressure to create these drops.

## Pressure System

Each pressure module packages all pneumatic components in a standalone system. The modules allow for expansion of the system and easy maintenance.

## Software

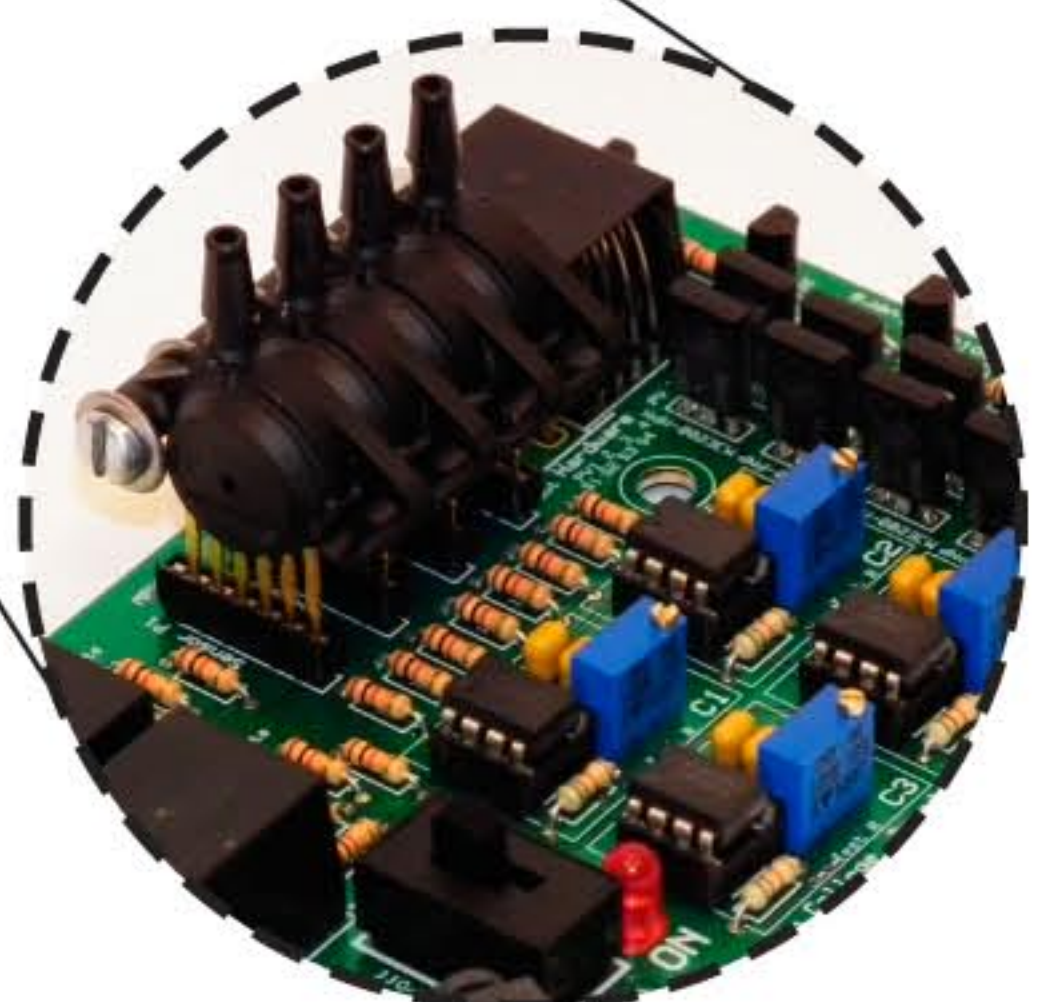
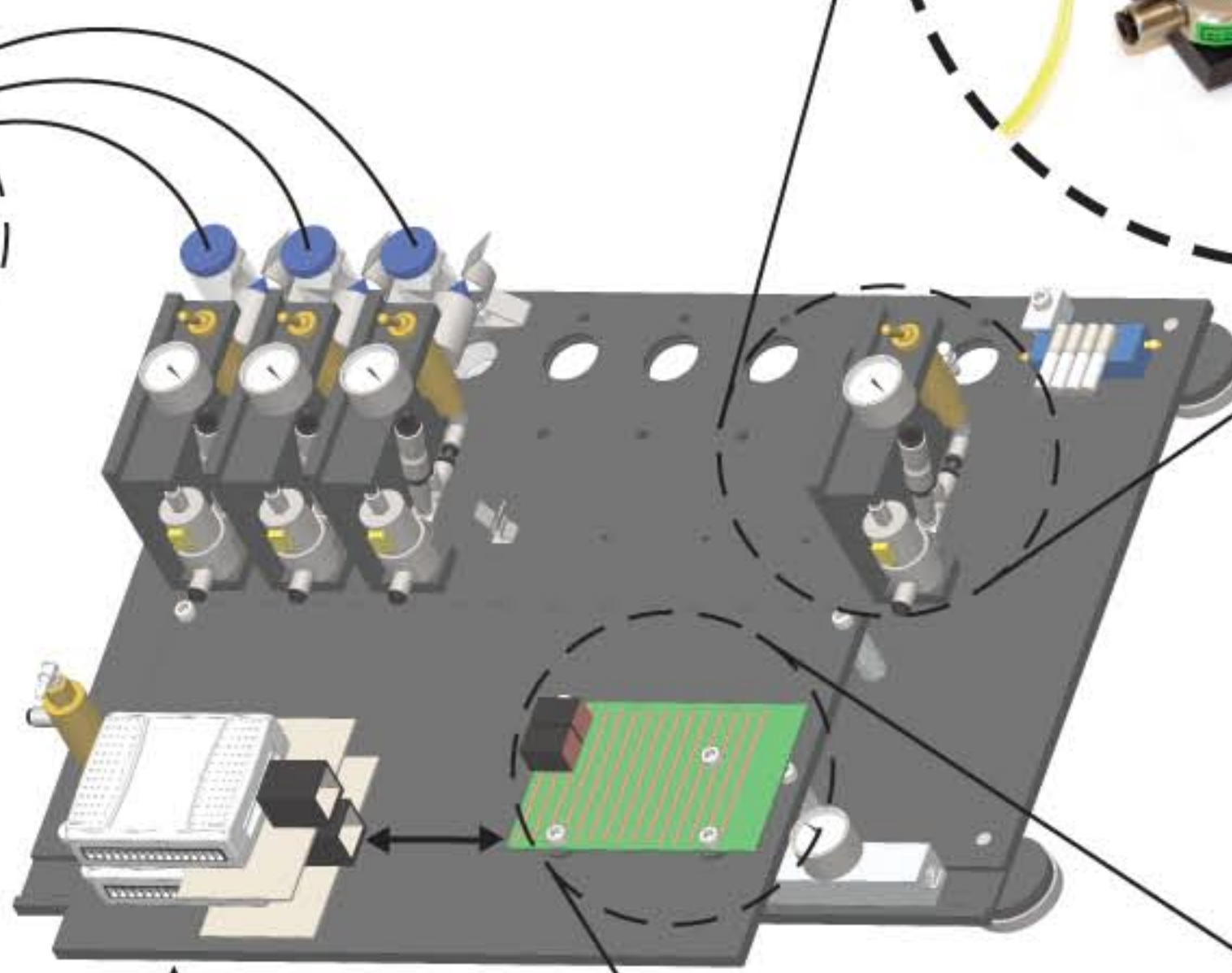
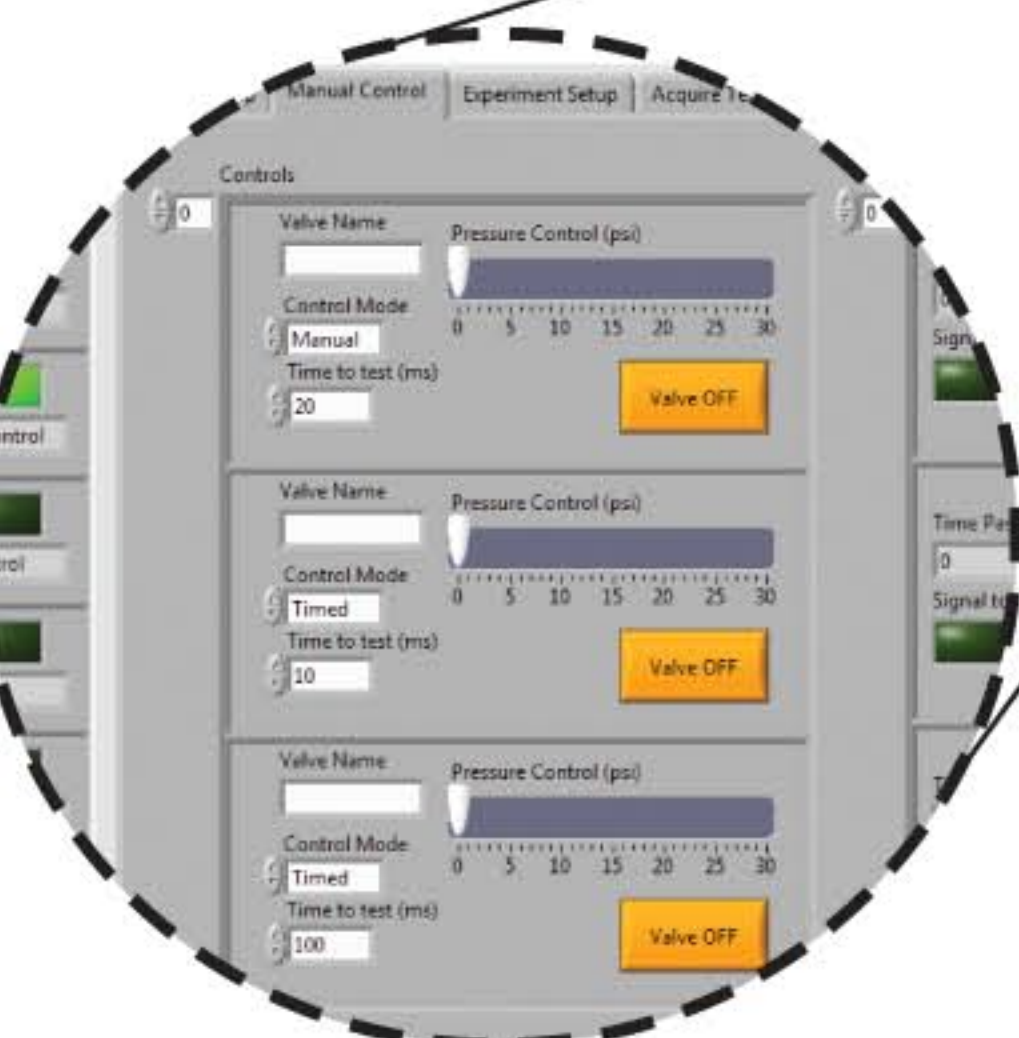
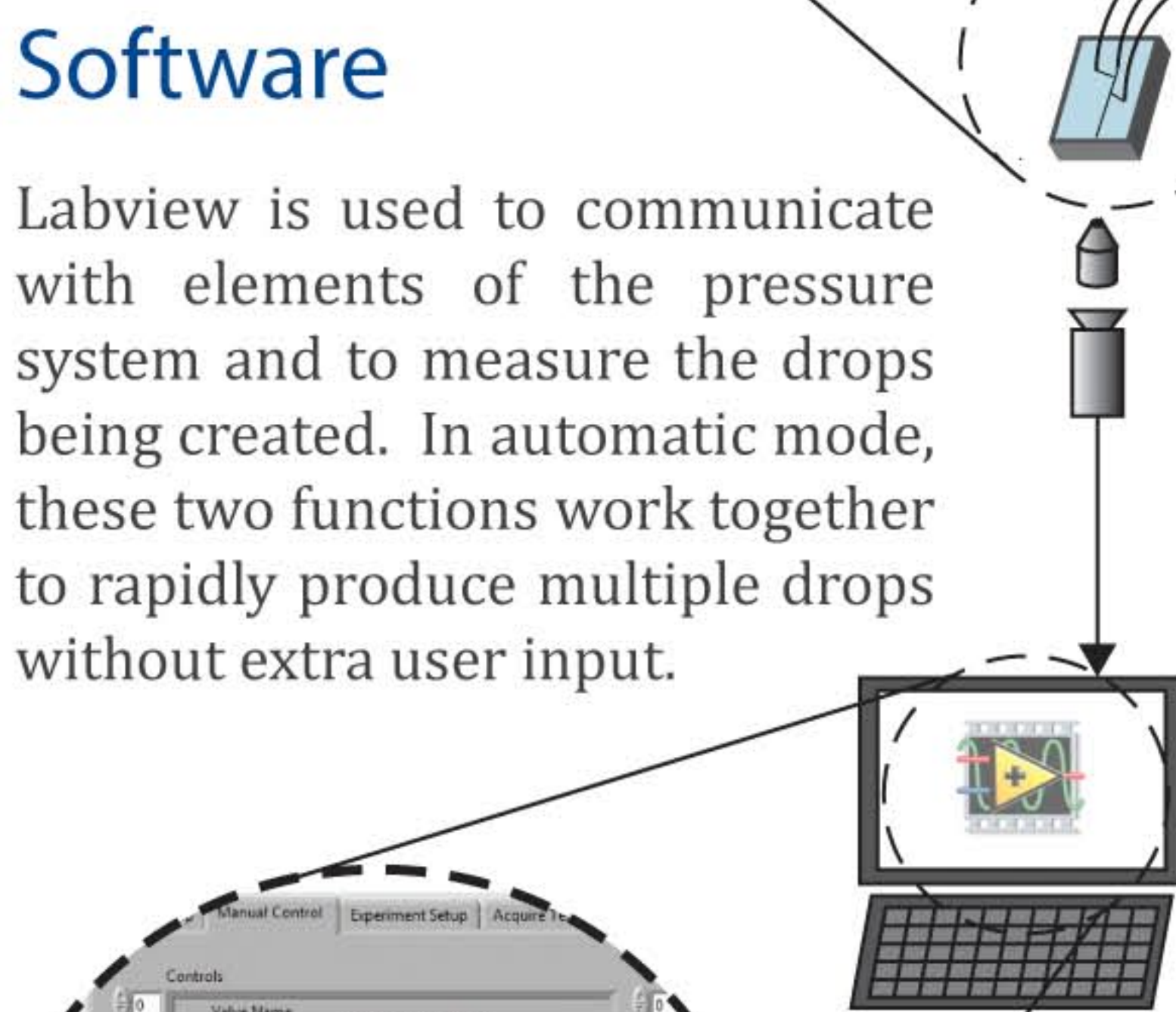
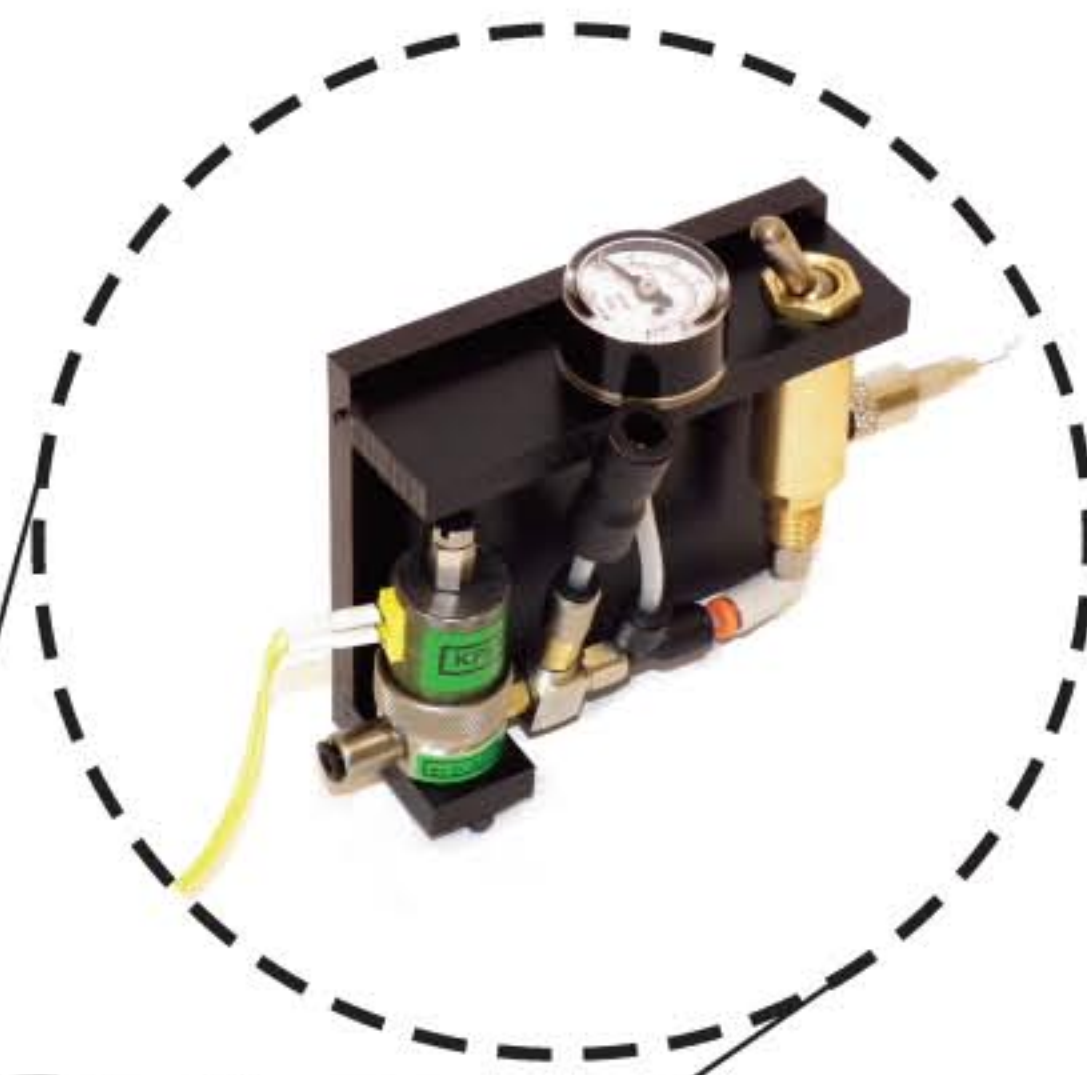
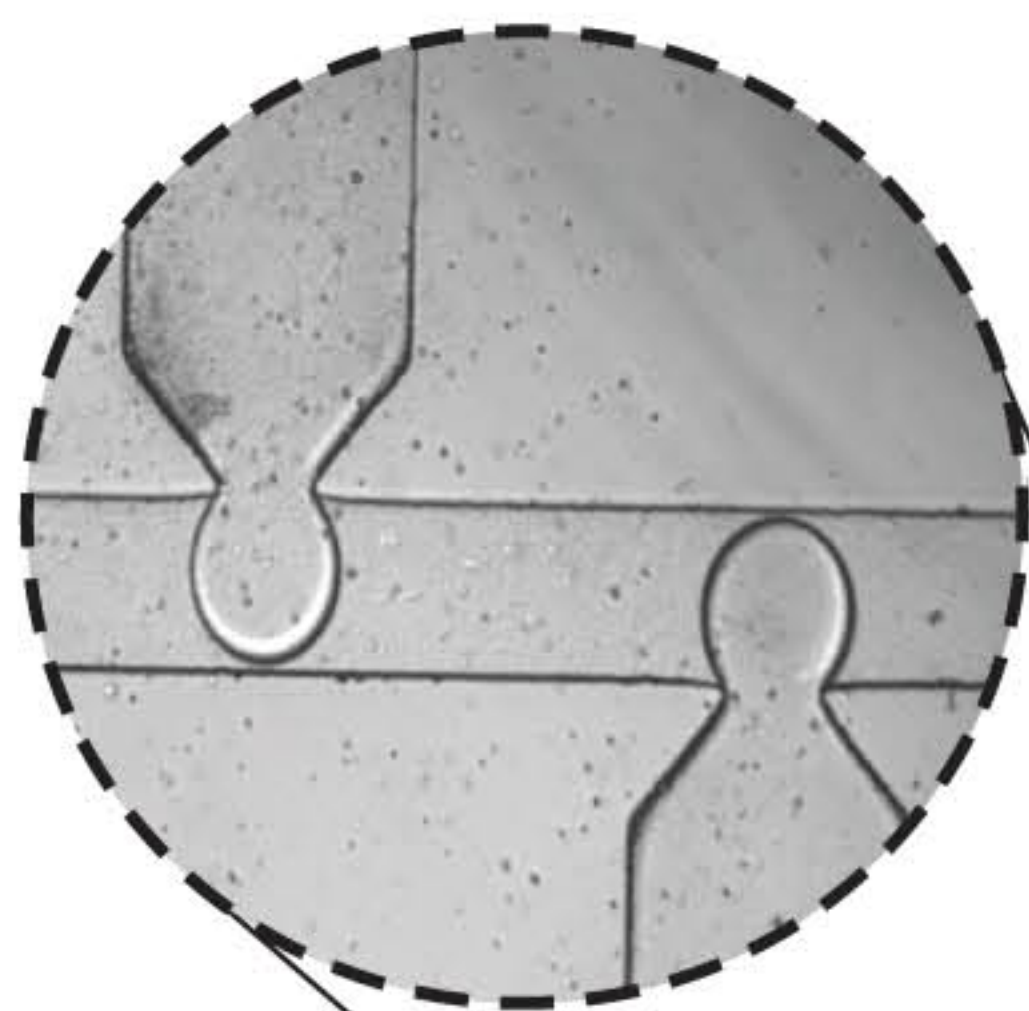
Labview is used to communicate with elements of the pressure system and to measure the drops being created. In automatic mode, these two functions work together to rapidly produce multiple drops without extra user input.

## Platform

The component platform locates all pneumatic and electronic components in a compact, modular fashion. The platform can hold up to 8 individual pressure modules and the associated vials.

## Electronics

A custom printed circuit board (PCB) neatly integrates sensors, controllers, and drivers for each pressure line and communicates with the computer via NI Data Acquisition (DAQ) devices.



**Sponsor Liaisons:** Rafael Cabanas, Dr. Seth Fraden, and Dr. Dongshin Kim



Olin College



**Acknowledgments:** Rebecca Christianson, Scott Harris, Wego Wang, and Chris Lee

Torie Hamilton  
Project Manager

Jeff Hart  
Budget Officer

Ben Smith  
Safety & Ethics Lead

Lillian Tseng  
Communications Officer

Camille Girabawe  
Microfluidics Consultant

Brian Storey  
Advisor