

# 2<sup>nd</sup> Biomedical Engineering Conference and Expo

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## Hand-operated, USB-powered microfluidic DNA analysis system incorporating HDA and on-chip sequence specific detection

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The development of lab-on-a-chip devices is important in solving current medical and healthcare problems, such as the need for fast pathogen detection (i.e. ebola epidemic, HIV, water borne diseases typhoid, cholera, dysentery) and the need for personalized medicine (i.e. cancer genomics, drug susceptibility). A novel microfluidic DNA analysis device was developed, incorporating helicase dependent amplification (HDA) and sequence specific DNA probe detection. These are incorporated into a glass/polymer platform that is hand operated and powered by a laptop computer. Thermal modeling sets operation at less than 3 Watts and fabrication consistency testing ensures samples volumes of  $17.2 \pm 0.9 \mu\text{L}$ . The heating element and optical components are powered via 3 USB ports. The heating element consists of a thin film heater and thermistor controlled in a feedback loop with Matlab and Arduino interfacing. Using fuzzy rule set in the Mamdani fuzzy inference mechanism, the temperature of the PCR chamber has been controlled by varying the heater voltage. On chip amplification has been verified using a commercial LightScanner32 device. Current development includes incorporating sequence specific DNA probes for on-chip detection with a USB powered spectrometer, as well as further constancy testing and calibration.

### Biography

Collin Tranter is a Doctoral candidate at Louisiana Tech University, pursuing a PhD in micro/nanosystems engineering. While obtaining a Bachelor's degree in Nanosystems Engineering, he began working with Dr. Niel Crews on developing DNA analysis systems utilizing real-time spatial melting analysis. His graduate research has continued, involving collaborative work on zero-gravity flight missions Louisiana Tech University, Grambling State University, and University of Louisiana at Lafayette. He has also been an instructor for freshman engineering courses at Louisiana Tech University and an instructor at Louisiana GEAR UP camps.

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### Notes: