Summer Positions Available
BioRad – QuantaLife Business Unit
Pleasanton, CA

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Project: Next Generation Droplet Transport

Introduction: The QX100 product from Bio-Rad utilizes microfluidics to separate and transport nanoliter volume droplets for fluorescent detection.

Description: This project will involve: (1) theoretical analysis of the physical forces that can be imparted on a droplet through electrical, mechanical, thermal or other external sources, (2) designing unique fluidic devices to combine, separate, and sort droplets, (3) prototyping designs for proof-of-concept experiments, (4) designing hardware and analysis tools to analyze experimental results.

Desired Skills:
- Major in engineering or science
- Knowledge of basic CAD tools such as SolidWorks
- Experience with laboratory instrumentation and automation of fluidic systems
- Programming experience using either Matlab or Python
- Ability to work independently

Project: Droplet Generation Physics

Introduction: The QX100 product from Bio-Rad is a digital PCR instrument that utilizes microfluidics to divide aqueous DNA samples into nanoliter-scale droplets. The foundation of this technology is the ability to quickly produce droplets of precise volumes from any DNA sample.

Description: The objective of this position is to explore droplet generation dynamics in micro-channels focusing on the effects of sample rheology on the droplet generation process. Research tasks will include: design of experimental plans, data analysis, exploring droplet generation dynamics in a variety of microfluidic geometries, and exploring the use of external forces to controllably induce droplet generation.

Required Skills:
- Demonstrated ability to perform experiments with microfluidics (syringe pumps, fluidic interconnects)
- Academic background in basic fluid dynamics, with micro-fluidics a bonus
- Basic ability to program in Python or Matlab

Project: Droplet Generation Image Analysis

Introduction: The QX100 product from Bio-Rad is a digital PCR instrument that utilizes microfluidics to divide aqueous DNA samples into nanoliter-scale droplets. The foundation of this technology is the ability to quickly produce droplets of precise volumes from any DNA sample.

Description: The objective of this position is to develop image analysis algorithms and software to analyze droplet dynamics during the generation process. The project will focus on providing new capabilities to our current image analysis package including: dynamic edge analysis, user interface, as well as shape and velocity analysis.

Required Skills:
- Demonstrated ability to do image processing, preferably in Python or Matlab
- Familiarity with static or video image analysis algorithms
- Academic background in basic fluid dynamics, with microfluidics a bonus

Project: Automated Image and Video Analysis of Microfluidic Systems

Introduction: The QX100 product from Bio-Rad utilizes microfluidic circuits designed to separate and transport nanoliter volume droplets for fluorescent detection. To evaluate performance, we collect high speed video of the droplets as they pass through various fluidic components, and then make measurements of droplet location and shape from these videos.

Description: This project will involve the development of software to automatically analyze diagnostic videos and extract quantitative measurements. The focus of the project will be the development of software modules which perform the following analyses: detection of the presence of droplets within an image, shape and size analysis, and shape categorization to automatically identify anomalous features.

Desired Skills:
- Computer scientist or multidisciplinary engineer with solid software coding skills (Python, LabView, MatLab)
- Familiarity with static or video image analysis algorithms
- Experience with laboratory instrumentation, microfluidic systems, and high speed video imaging
- Ability to work independently, yet integrate seamlessly into a strong team of highly experienced scientists and engineers.

Project: Measurement, modeling, and simulation of fluidic components and circuits

Introduction: The QX100 product from Bio-Rad utilizes microfluidic circuits designed to separate and transport nanoliter volume droplets for fluorescent detection. These fluidic circuits are governed by basic physical principals, and can be characterized in terms of fluidic resistance, capacitance, and inertance.

Description: This project will involve: (1) making measurements of the fluidic properties of prototype fluidic components and circuits, (2) using these measurements to calibrate computational models of such circuits, (3) using the resulting models to drive design of next-generation fluidic circuits, and (4) prototyping and optimizing these revised circuits.

Desired Skills:
- The ideal candidate will be an electrical engineer, fluidics engineer, or multidisciplinary engineer
- Solid skills developing and using software (Excel, Python, MatLab, Comsol) for numerical modeling and simulation
- Experience with laboratory instrumentation and automation of microfluidic systems
- Ability to work independently, yet integrate seamlessly into a strong team of highly experienced scientists and engineers.