

Selective Cell Picking with Optical Fiber Probe

Projects available: 1 or 2 positions (2 sub-projects under the same major project called “Multifunctional Fiber for Cancer Theranostics”)

Project Description: We intend to develop an “all-fiber” selective cell picking probe capable of rapidly analysing cells and/or micro-particles, with diameters in the range 2–15 μm and then selectively picking desired cells. The motivation here is to create a *Lab-in-a-fiber* probe to pick cells of interest from tissue sample or group of cells. The cell selection is done based on fluorescence tagging and analysing the emitted light before picking up the cell. The tagging can be used to identify cancerous cells and this project aims to build a preliminary cell picking platform before it is used in vivo in tissue samples to pick cancerous cells.

Schematic diagram of the cell picking setup with motorized 3D stage and microfluidic pump

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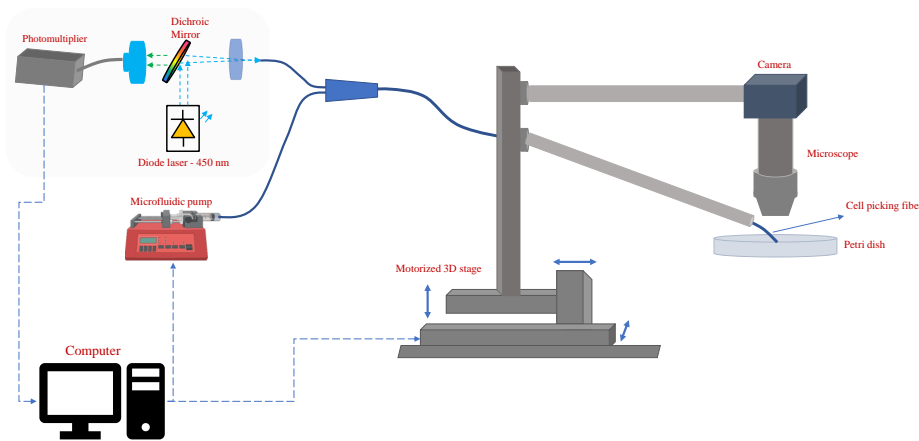


Figure 1: Conceptual diagram showing the methodology to create Lab-in-a-fiber probe for automated selective cell picking.

Methods & goals: An optical microstructured fiber is used for excitation and detection. When the fluorescence signal exceeds a predetermined threshold, the particle is considered to be of interest and to be sufficiently near the fiber-tip to be captured. A suction mechanism is then activated, which brings the particle into the hole in the microstructured fiber. Several aspects deserve a closer look to make the technique useful. This will be a truly cross-disciplinary project enabling us to pick cells in vivo to determine whether the cells are cancerous.

Work nature: Interface development, optical setup development, optical component fabrication and design, and data collection and analysis. **Requirements:** Ability to work independently on difficult problems, interest in Bio-Physics and Photonics, basic knowledge of Python programming, writing reports and presenting results in a clear and easy manner.

Projects offered: We are offering two subprojects that are interlinked and students will have to work on either sub-projects depending on the requirement. Although the thesis for the two sub-projects can be written distinctly the main results can be shared in the final thesis submission.

Sub-project 1: Investigation of microstructured fibers for selective cell picking

Sub-project 2: Instrumentation development for selective cell picking with optical fiber probe