IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	**Microfluidic devices for probing adhesive properties of cells**	
Project Number	**IMURA1055**	
Monash Main Supervisor (Name, Email Id, Phone)	Tuncay Alan, tuncay.alan@monash.edu	*Full name, Email*
Monash Co-supervisor(s) (Name, Email Id, Phone)		
Monash Head of Dept/Centre (Name,Email)	Michael Yu Wang, Michael.Y.Wang@monash.edu	*Full name, email*
Monash Department:	Mechanical and Aerospace Engineering	
Monash ADRT (Name,Email)	Timothy Scott, Eng-ADGR@monash.edu>	*Full name, email*
IITB Main Supervisor (Name, Email Id, Phone)	Debjani Paul, debjani.paul@iitb.ac.in,	*Full name, Email*
IITB Co-supervisor(s) (Name, Email Id, Phone)	NA	*Full name, Email*
IITB Head of Dept (Name, Email, Phone)	P. V. Balaji, head.bio@iitb.ac.in	*Full name, email*
IITB Department:	Biosciences and Bioengineering	

Research Clusters:

Highlight which of the Academy's CLUSTERS this project will address?
*(Please nominate JUST **one.** For more information, see www.iXXXXX.org)*

1	*Material Science/Engineering (including Nano, Metallurgy)*
2	*Energy, Green Chem, Chemistry, Catalysis, Reaction Eng*
3	*Math, CFD, Modelling, Manufacturing*
4	***CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control***
5	*Earth Sciences and Civil Engineering (Geo, Water, Climate)*
6	*Bio, Stem Cells, Bio Chem, Pharma, Food*
7	*Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng*
8	*HSS*

The research problem

Define the problem

The adhesive property of cells has emerged as a promising biophysical marker. For example, in malaria and sickle cell disease, the red blood cells (RBC) tend to become stickier. Similarly, it has been shown that metastatic cancer cells are heterogeneous in terms of their adhesion properties. Further, the metastatic potential of cancer cells can be correlated to their adhesive property (Beri et al, Cancer Research, 2020). In this project, we propose to develop prototypes of both flow-based microfluidic devices and surface acoustic wave (SAW)-based devices to probe the adhesive properties of different cells in a systematic manner so that these devices can be used as a tool for biologists.

Project aims

Define the aims of the project

1. Development and characterization of a SAW-based device to study the adhesiveness of cells.
2. Fabrication and characterization of flow-based microfluidic devices.
3. Characterization of the adhesion properties of healthy and malaria-infected red blood cells.
4. Characterization of adhesion properties of different cell lines with different surface coatings.
5. Develop integrated prototypes of these devices.

Expected outcomes

Highlight the expected outcomes of the project

1. The student will improve upon the design of a SAW-based device for measuring cell adhesion.
2. The student will develop a flow-based microfluidic device for measuring cell adhesion.

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

This project fits in the area of 'CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control'.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

1. Demonstrated engineering aptitude, with good problem-solving and numeric skills.
2. Good laboratory skills acquired during a research project.
3. The student must be willing to pick up both engineering and biology concepts and laboratory skills required for the project.
4. Students from both engineering and biology backgrounds are welcome to apply as long as they demonstrate the right aptitude.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Dr. Swati Patankar (IIT Bombay), Dr. Shamik Sen (IIT Bombay)

Select up to **(4)** keywords from the Academy's approved keyword list **(available at www.iitbmonash.org)** relating to this project to make it easier for the students to apply.

Microfluidics, surface acoustic wave devices, cell adhesion, diagnostics