**Project Title:** Development of scaffolds for in vitro culture of immune cells

**Project Number:** IMURA0904

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**Research Clusters:**

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

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<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Advanced computational engineering, simulation and manufacture</td>
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<tr>
<td>2</td>
<td>Infrastructure Engineering</td>
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<td>3</td>
<td>Clean Energy</td>
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<td>Water</td>
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<td>5</td>
<td>Nanotechnology</td>
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<td>6</td>
<td>Biotechnology and Stem Cell Research</td>
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<tr>
<td>7</td>
<td>Humanities and social sciences</td>
</tr>
<tr>
<td>8</td>
<td>Design</td>
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**The research problem**

Define the problem

Adoptive cell therapy, which involves extraction, manipulation, and administration of ex vivo generated autologous T cells to patients, requires laborious and expensive laboratory procedures which makes their use in clinics difficult. With an objective to improve the ex vivo expansion of large amount of specific T cells, we propose the use of three-dimensional (3D) scaffolds to present a microenvironment resembling the natural environment of secondary lymphoid organs. Here, we propose to develop relevant scaffold system to study the activation, proliferation, and differentiation of T cells when cultured on these 3D scaffolds to show an increase in cell proliferation compared to standard suspension systems.
Project aims
Define the aims of the project

(1) Development and optimization of scaffolds
(2) Optimization of culture of immune cells on scaffolds
(3) Development of this system as a platform for in vitro expansion of immune cells

Expected outcomes
Highlight the expected outcomes of the project including likelihood of patents

- A highly trained PhD student with broad expertise in materials science and engineering and cell biology
- High impact publications
- Commercially exploitable IP

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.

Biotechnology and stem cell research: the project concerns the development of biotechnological devices (scaffolds) for the culture of cells of the immune system, including those derived from stem cells sources.

Capabilities and Degrees Required
List the ideal set of capabilities that a student should have for this project. 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.

The student should have a background in either materials chemistry or a bioscience related subject (preferably with expertise in cell and molecular biology).

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.

N/A

Select up to (4) keywords from the Academy’s approved keyword list (available at http://www.iitbmonash.org/becoming-a-research-supervisor/) relating to this project to make it easier for the students to apply.

- BioScience
- Bio Medical Engineering
- Materials Chemistry/Science
- Bio Chemistry