CIRMM

MATSUNAGA LAB.

[Design of Living Tissue]

Center for International Research on MicroNano Mechatronics

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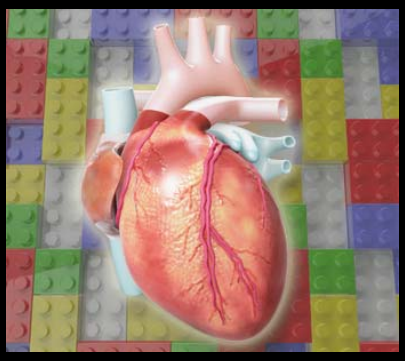
MEMS Tissue Engineering

Shape Brings Function

In the field of medicine and cell biology, there is an increasing demand for *in vitro* models that capture the function of living tissues. To capture the *in vivo* function in engineered tissues, there is a need to create bio-structures that mimic the hierarchical architecture and complexity of living tissues. Therefore, controlling cell microenvironment in a highly controllable, reproducible and scalable manner is necessary. microenvironment in a manner that is precisely controlled, reproducible and scalable.

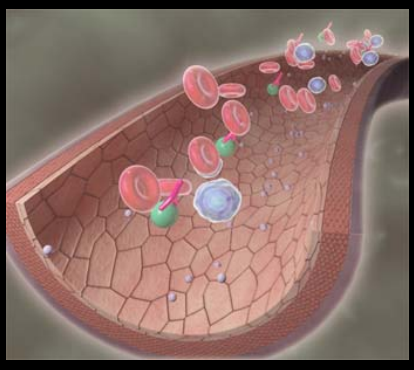
By exploiting innovative approaches including microfabrication techniques (MEMS) and material science, we focus on development of three-dimensional engineered tissues for regenerative medicine and fundamental cell biology.

Bottom-up Tissue Engineering



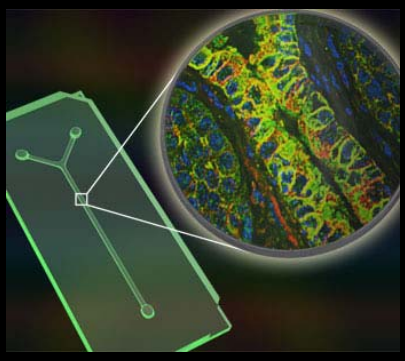
Using microfabrication techniques (microfluidics, micromolding, etc.), we focus on fabricating microtissue units with specific microarchitectural features, and use these units to engineer macroscopic tissues from the bottom-up.

Vascular Tissue Engineering



A major challenge in tissue engineering is the lack of proper vascularization of the fabricated tissues. We focus on formation of microvasculatures in engineered three-dimensional tissues that allows transport fluids inside, mimicking chemical and mechanical environment of the tissues.

3D Tissue Chip



In vitro tissue model has been expected to use as major alternatives to *in vivo* animal testing. We focus on creating 'tissue chip' that researchers can use to predict the performance of a candidate drug, vaccine or biologic agent quickly and inexpensively.