2. Bioengineering/Bioprinting/Organoids Boot Camp

Outline:

- UCI-CIRM SRL will offer training in 3D tissue and organ manufacturing technologies to equip the next generation of scientists and engineers to contribute to this growing biomanufacturing discipline.
- Course will provide instruction of the principles of tissue engineering as well as their relevance to development, stem cell technology, and a variety of biological disciplines.
- Two optional graduate elective classes are available to UCI students, providing enhanced biomanufacturing content (CBE 249: Stem Cells & Tissue Engineering; Soft Hybrid Biomaterials).

This five-day "bootcamp" will be offered twice per year, providing participants with a foundational understanding of the key concepts and techniques in 3D bioprinting.

The first day of the bootcamp will focus on introducing participants to 3D bioprinting. They will explore different bioprinting technologies, including inkjet, extrusion, laser-assisted, and stereolithography. Additionally, participants will be introduced to various biomaterials used in bioprinting, such as hydrogels, bioinks, and scaffolds. Through hands-on activities, participants will have the opportunity to gain practical experience with these technologies and biomaterials.

On day 2, participants will delve into computer-aided design (CAD) for 3D bioprinting, including creating digital models of tissues and organs using specific software packages (see **Figure**).

The final three days will cover applications of bioprinting and bioreactor systems with hands-on demos. Participants will gain an understanding of the role of bioreactor systems in tissue engineering and the crucial factors that influence tissue growth and maturation, such as perfusion systems, mechanical stimulation, and environmental considerations. Participants will discuss the current advancements, challenges, and potential future applications of 3D bioprinting. Group discussions will allow participants to explore potential applications and ethical considerations in this field.

Throughout the bootcamp, a combination of lectures, interactive discussions, hands-on activities, and group work will facilitate learning and engagement. Participants will be encouraged to actively participate, ask questions, and collaborate with their peers. Supplementary resources, including research papers and articles, will allow participants to explore further the topics covered during the bootcamp.

UCI mascot (Peter the Anteater) generated during student training course on 3D bioprinter

Assessment will be based on active participation in discussions, completion of hands-on activities, and a final project where participants will design and present a basic 3D bioprinting concept. By the end, participants will have a solid understanding of 3D bioprinting, including the various technologies, biomaterials, CAD design, tissue engineering principles, and the role of bioreactor systems. With this knowledge and skill set, participants will be well-equipped to embark on basic 3D bioprinting projects and pursue further advancements in this field**.**

Faculty: Drs. Quinton Smith, Herdeline Ardoña, Momoko Watanabe, Medha Pathak, and Tayloria Adams.

Expected class size: 10-15 students/course

Services and resources available to students:

- Students will receive a notebook with extensive and detailed protocols, best practices and a list of vendors for bioprinting instruments and reagents.
- While in the course, students will have access to reagents, materials and equipment needed to successfully conduct 3D bioprinting exercises and consider approaches for the development of tissue organoids.