UNIVERSITY OF SOUTHERN CALIFORNIA

Department of Medicine

3 Paid Multidisciplinary Undergrad Internships:

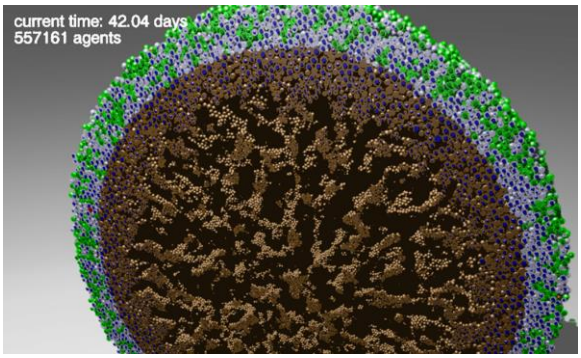
Biologist, Computational Modeler, and Computer Scientist team up to help make 3-D cancer simulators useful and intuitive.

USC Center for Applied Molecular Medicine (CAMM),
Consortium for Integrative Computational Oncology (CICO)
Macklin Math Cancer Lab (http://MathCancer.org**)**

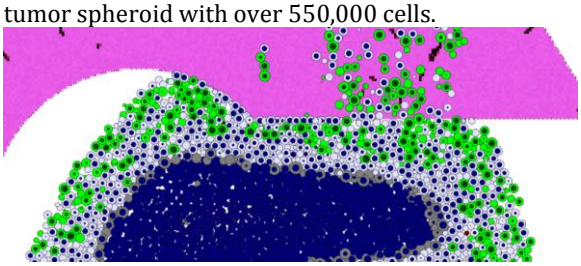
Project overview: The Macklin lab has developed a detailed 3-D computer model of individual cancer cells growing in digital tissues with realistic biomechanics. The model can be calibrated to individual patients or to experiments, and can simulate systems of 500,000 or more cells in complex 3-D tissues. However, for this simulator to be useful to clinicians and biologists, it has to be user-friendly. Usability should be driven by real-world tests by biologists and clinicians.

In this project, a multidisciplinary team of a biologist (biology or pre-med), a computational modeler (mathematics or engineering), and a programmer (computer science or engineering) will jointly develop a graphical user interface (GUI) by tackling a series of clinically-inspired use cases, spanning breast cancer, stem cell biology, and chemotherapy in realistic tissues. This GUI will allow a modeler, biologist, clinician, or computer scientist to design a 3-D tissue, import digital cell lines, apply plug-ins to govern cell behavior, and write out a standardized XML file to configure and run the 3-D simulator. The software will also import, view, and recombine simulation data.

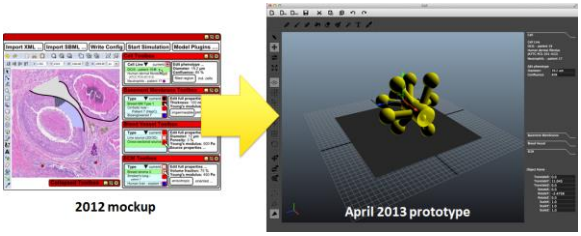
About CAMM, CICO, and Macklin Lab: CAMM is a cross-disciplinary cancer research center that brings together physical scientists, mathematicians, biologists, and clinicians for day-to-day collaboration. CICO aims to develop clinically-oriented computational tools to fight cancer. The Macklin Lab is developing state-of-the-art multiscale cancer simulators to predict cancer progression and therapy response *in individual patients.* We aim to accelerate discovery, challenge and refine cancer biology orthodoxy, and put powerful computational tools in the hands of cancer doctors to improve lives.



Cutaway: Simulating growth of a 1.7 mm *in vitro* tumor spheroid with over 550,000 cells.



Cross-section:3-D invasive breast cancer simulation.



The evolving simulation configuration tool.

Positions: We seek three talented undergraduate interns to work as a cohesive, multidisciplinary team:

Programmer: A computer science, engineering or related major will extend our configuration software (C++, Qt, OpenGL) to improve usability and to enable model "plug-ins". Usability theory, ontology, and 3-D graphics are all desirable skills.

Modeler: A math or engineering major will work with the biologist to develop mathematical models, and will work with the programmer to implement them in as "plug-ins". Experience in computational biology and/or PDEs preferred.

Biologist: A biology or pre-med major will work with the modeler to develop biology "plug-ins", and will guide the programmer in usability testing. Experience in cancer biology, pathology, or imaging preferred.

Interns will receive a **$2000 stipend** (Summer 2013 – Spring 2014) and possibly **independent research credits** in biomedical engineering. Interns will participate in CAMM activities. Exceptional interns may **co-author journal publications**.

To apply: Send an email with subject "URAP application 2013" to Paul.Macklin@usc.edu including:

(1) a cover letter including your choice of position (biologist, modeler, programmer), how it fits your long-term goals, and how your experience makes you the best fit for the preferred position;
(2) a brief résumé, indicating relevant courses and grades; and
(3) (optional) a letter of recommendation from a faculty member supporting your experience and/or work ethic.
(4) (optional) code samples, class projects to further highlight your skills.

Ideal candidate is a junior at time of application with 3.5+ GPA. Communication and writing skills are essential. We seek creative individuals with a passion for combining strengths from many fields to understand cancer, and who want to make a difference in improving clinical care. Send all submissions by **11:59 pm, May 15, 2012.** Interviews to be held May 13-17.