

# Virtual Heart Surgery



## Alison Marsden

Associate Professor, Pediatrics - Cardiology, Cardiology, Bioengineering Institute for Computational and Mathematical Engineering  
Associate Professor, Mechanical Engineering

## CURRENT RESEARCH

### Computer simulation as a predictive tool to test surgical methods for babies with heart defects

For babies with congenital heart defects mortality rates are high, surgeries are risky, and families are fraught with stress and anxiety throughout each grueling stage. Dr. Alison Marsden and her team at Stanford University are collaborating with clinicians to create new tools for these babies through virtual surgery that will allow surgeons and clinicians to test surgical methods before trying them on patients, thus reducing patient risk and fostering innovation. Her research is uniquely interdisciplinary, combining traditional tools from engineering with cutting edge problems in cardiovascular medicine. Dr. Marsden and her team are actively seeking to translate tools from fields of engineering and mathematics, including optimization, uncertainty quantification and high performance computing, to the clinical world. They are coming up with new treatment strategies for children with life threatening heart defects. Due to ethical and technical considerations, testing new surgical methods in patients or animals is challenging and computer simulations can provide a risk-free approach to testing "out of the box" new ideas. Dr. Marsden's initiatives are being well-received by private and public funding agencies. The NSF, NIH, Leducq Foundation, and Burroughs Wellcome Fund are funding her research in cardiovascular simulations and Google has provided funding for the research related to the uses of non-invasive data for the prediction of heart failure.

Dr. Marsden's lab develops computer simulation codes for cardiovascular disease and devices. Starting from medical image data such as CT scans, they construct 3D patient specific models of the vasculature. They then simulate blood flow in these models using...

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## AFFILIATION

 Stanford University

## EDUCATION

- B.S.E. in Mechanical Engineering 1998 ,Princeton University
- M.S.E. in Mechanical Engineering 2000 ,Stanford University
- Ph.D. in Mechanical Engineering 2005 ,Stanford University

## AWARDS

- Career Award at the Scientific Interface from the Burroughs Wellcome Fund, 2007
- 2012 NSF CAREER award winner, 2012
- UCSD Panhellenic Society Outstanding Professor Award, 2013
- UCSD Graduate Student Association Faculty Mentor Award, 2014

## RESEARCH AREAS

Life Science, Cardiovascular, Cardiovascular, Pediatric

## FUNDING REQUEST

Dr. Marsden is running several projects in various stages of clinical translation. The lab has a solid team of postdocs, graduate researchers and clinical collaborators. Funding would help pay for researcher salaries, office essentials such as computers, and servers. It will also help fund research coordinators at the hospital who maintain patient relationships.