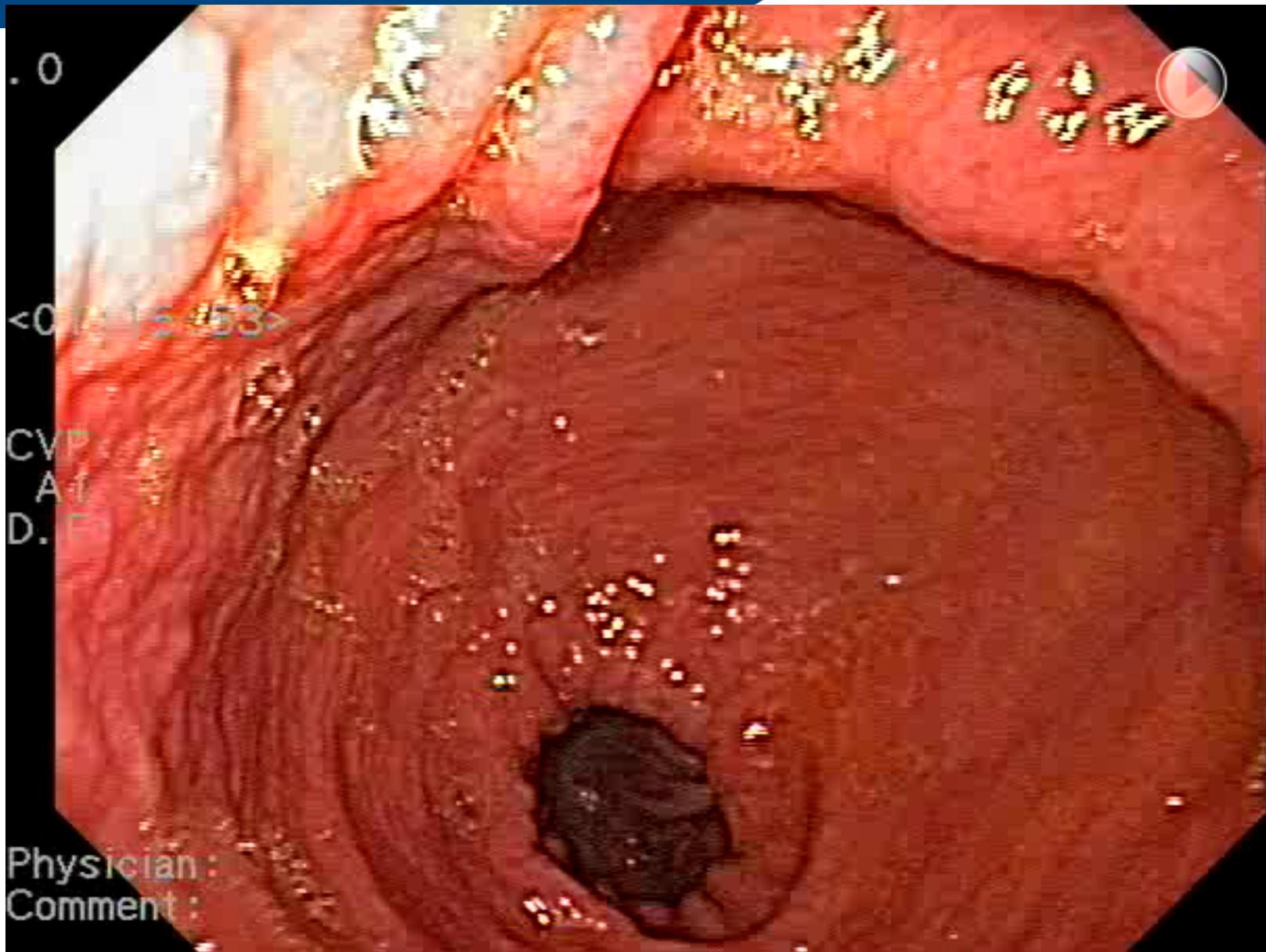
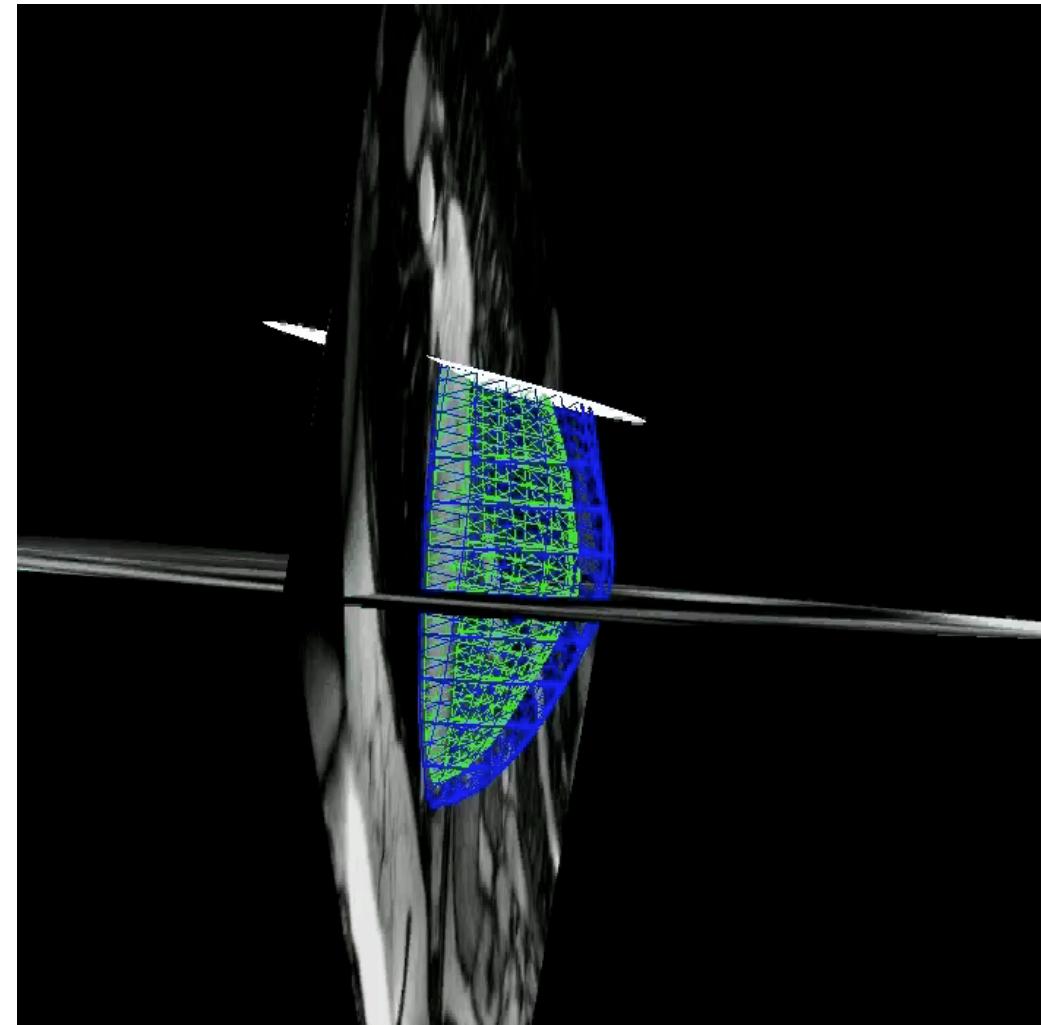
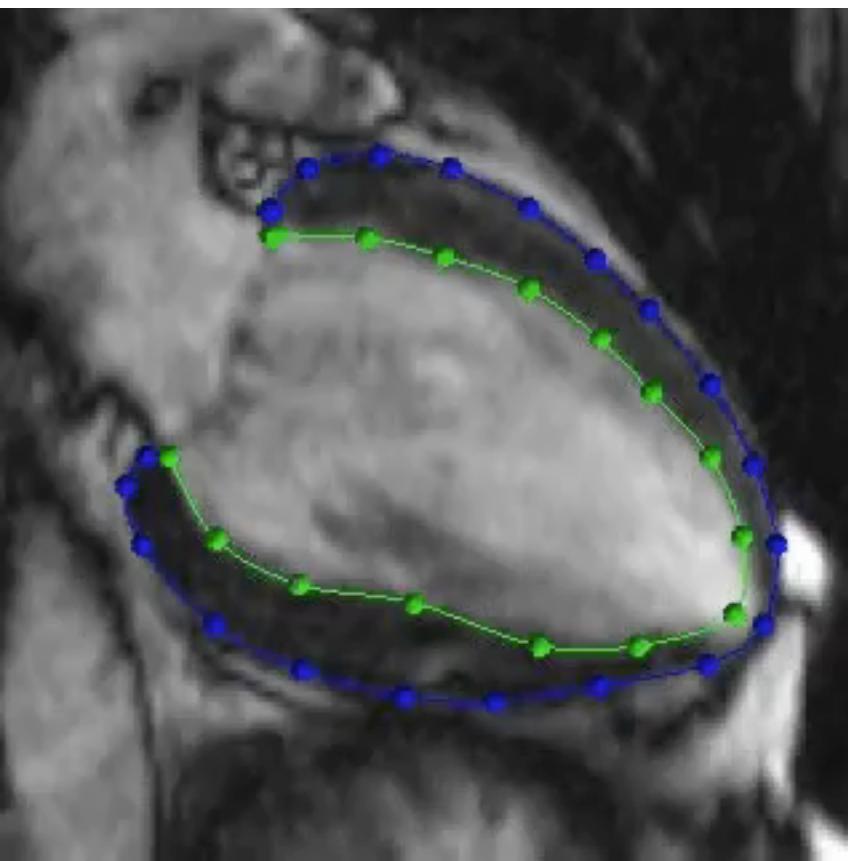


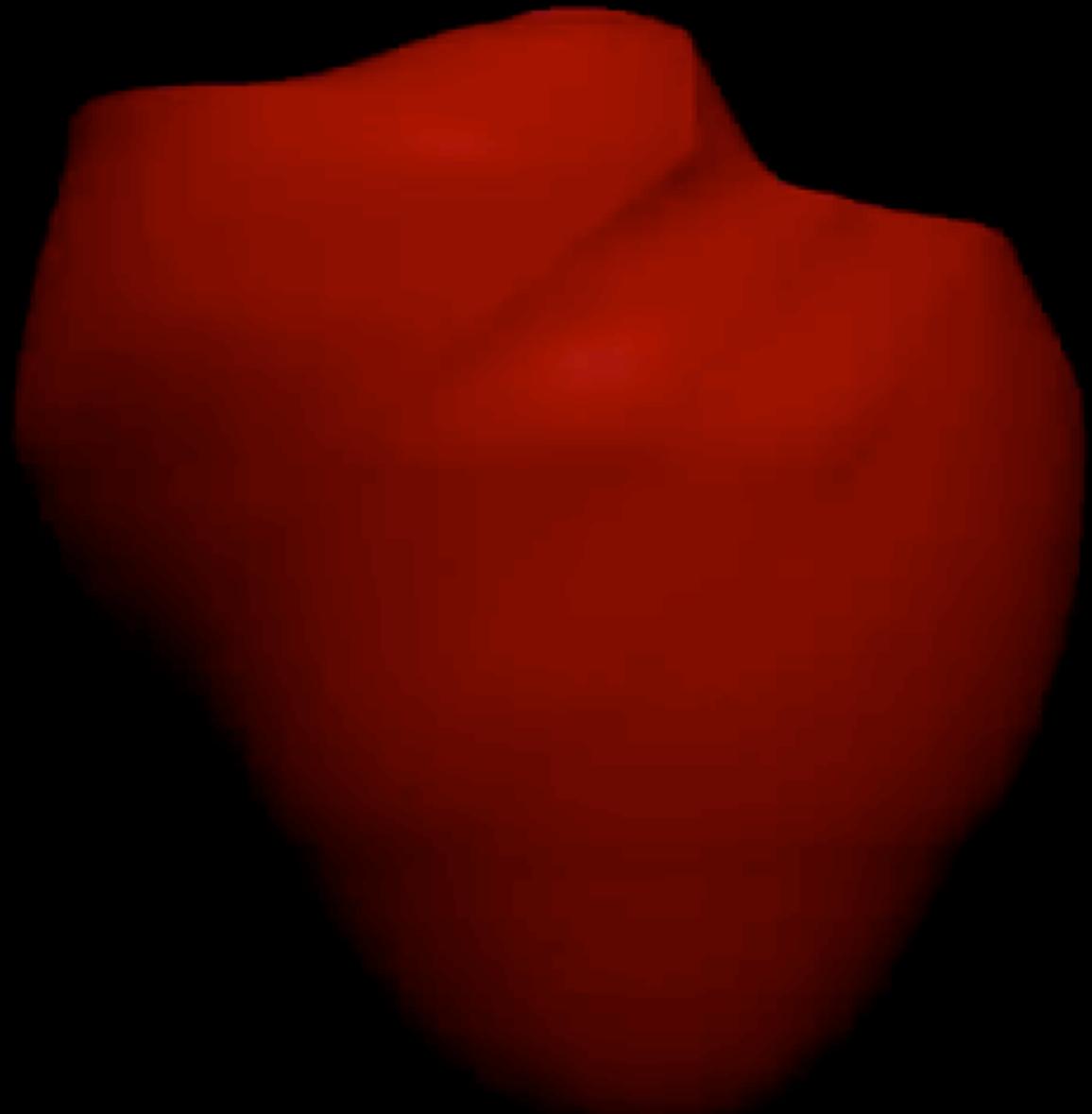
# **Managing model complexity using CellML and the Physiome Model Repository**

David Nickerson ([about.me/david.nickerson](http://about.me/david.nickerson)),  
Tommy Yu, Poul Nielsen, Peter Hunter  
Auckland Bioengineering Institute  
University of Auckland  
New Zealand

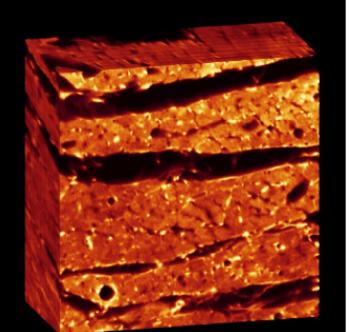
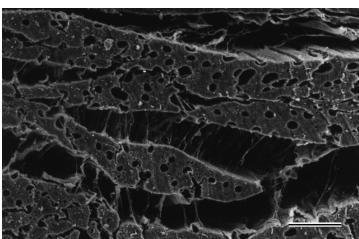
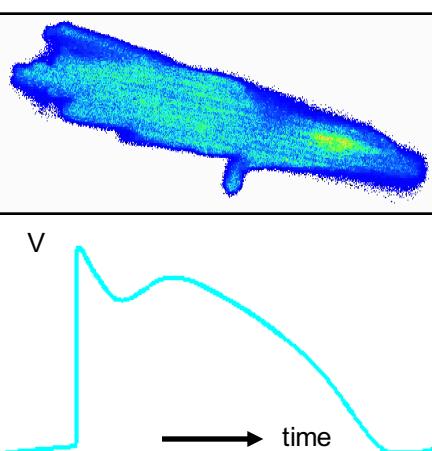
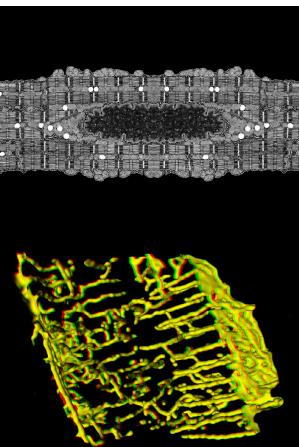
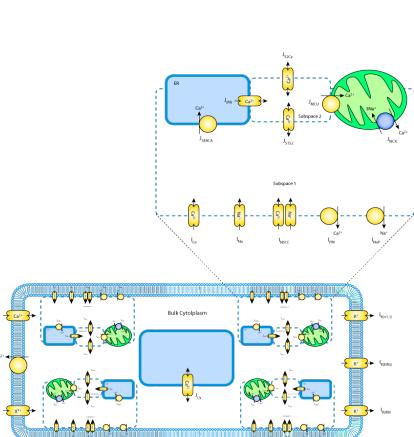
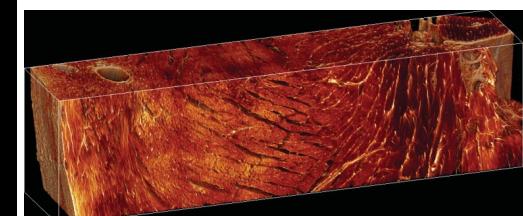
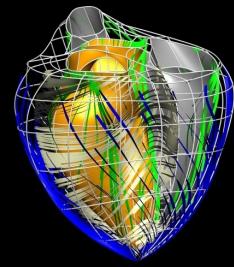
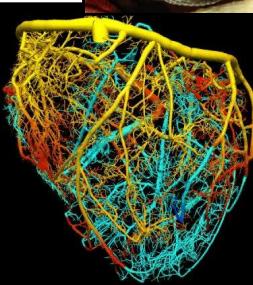
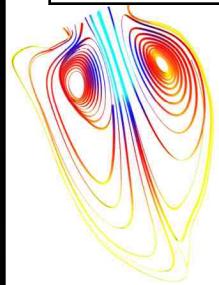
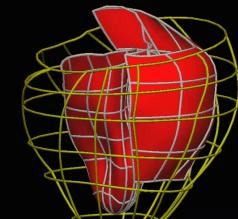
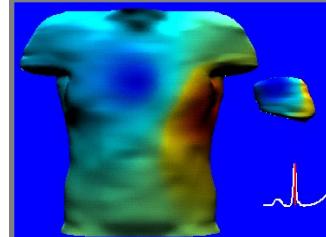
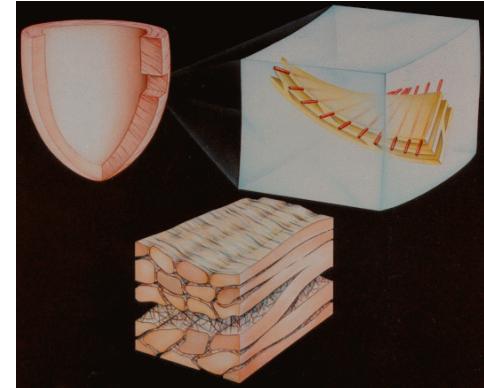
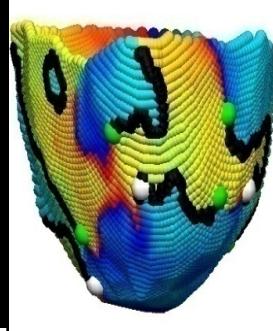
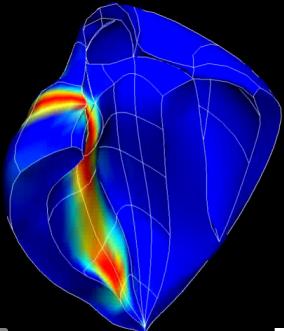
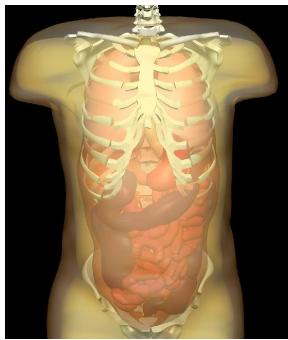


Physician:  
Comment:

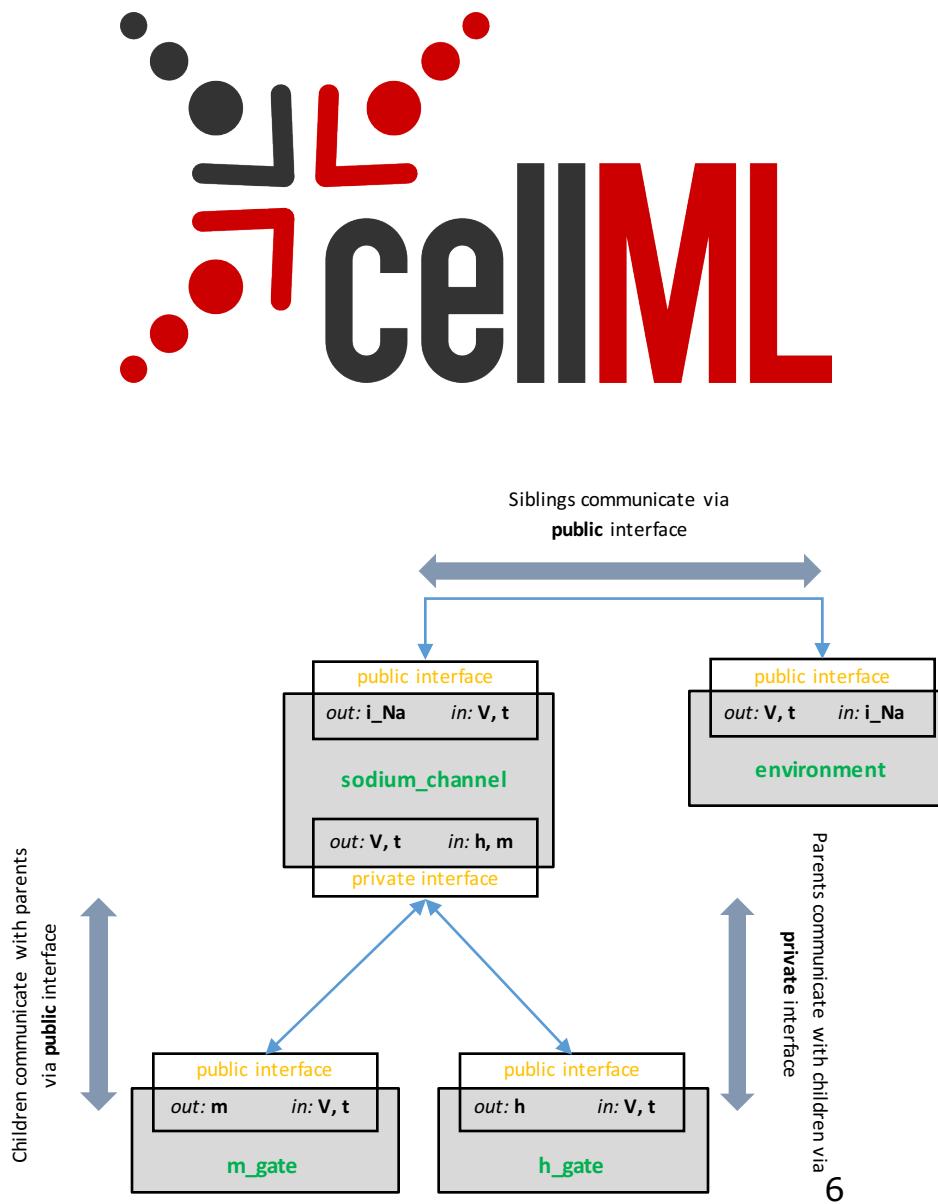
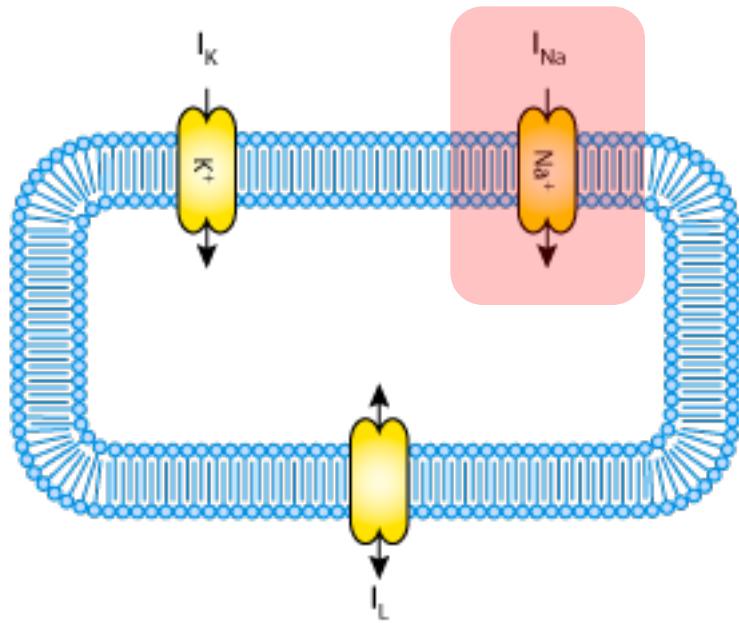
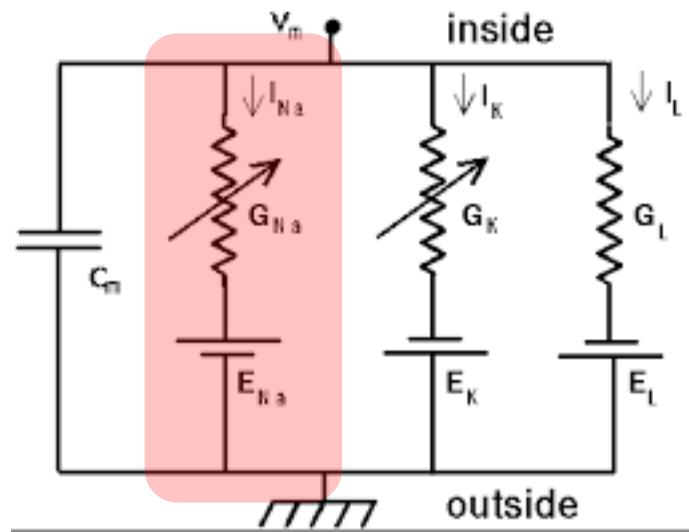


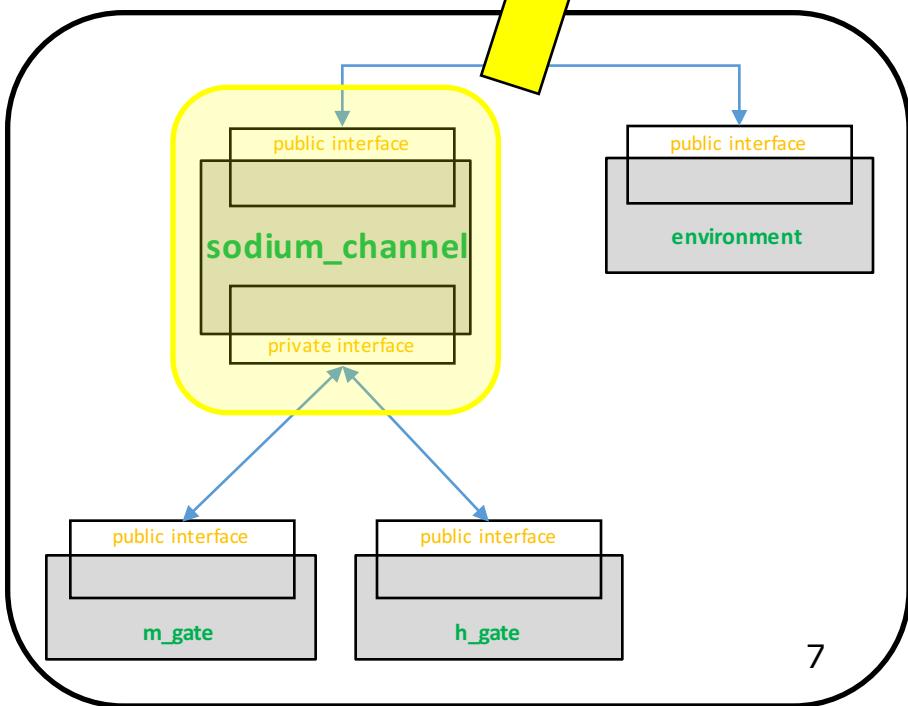
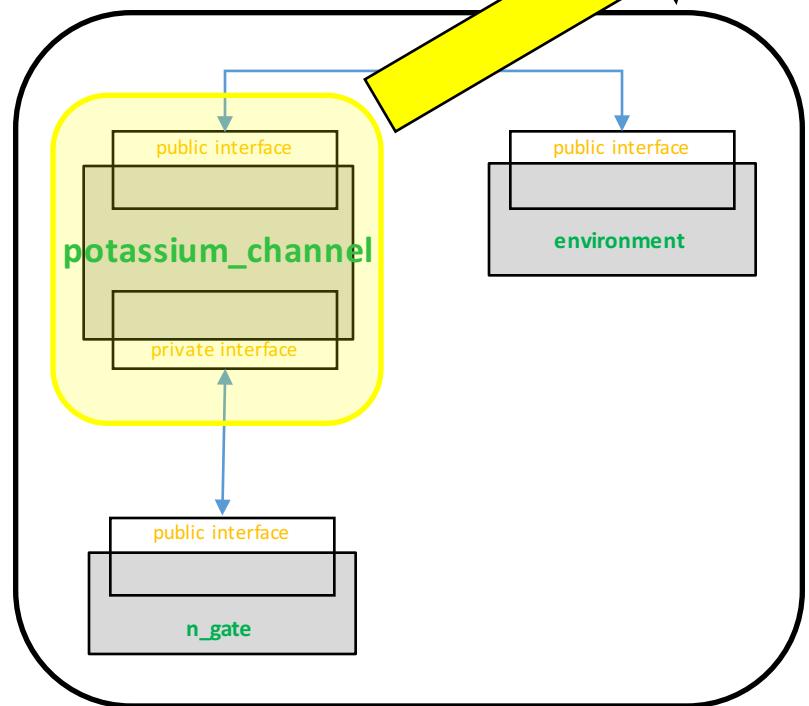
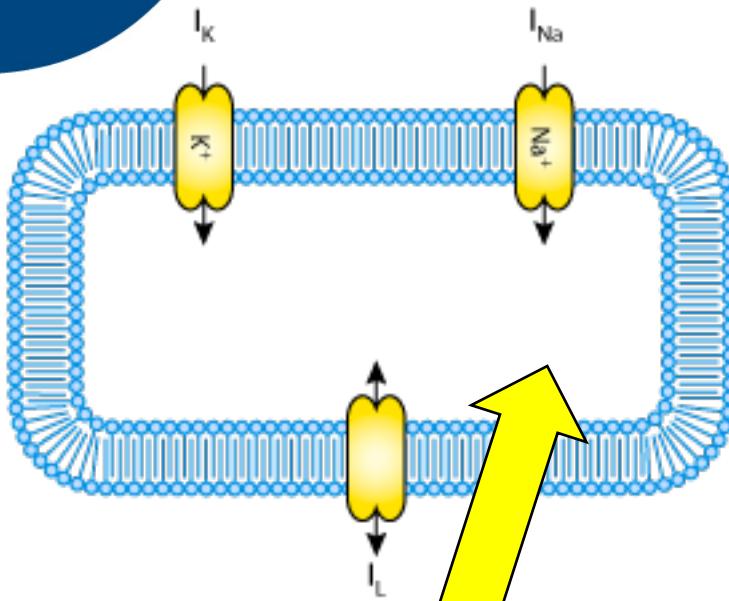
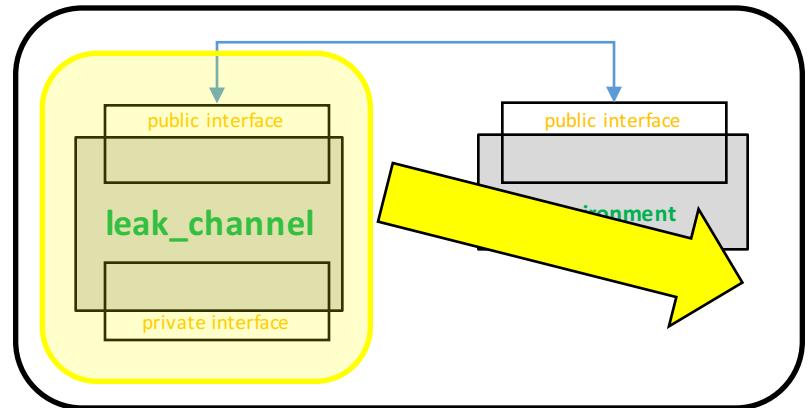


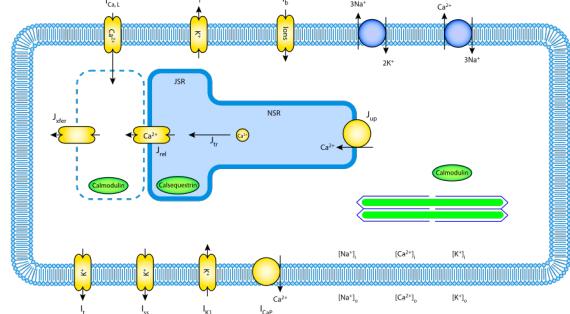
# Models are complex!



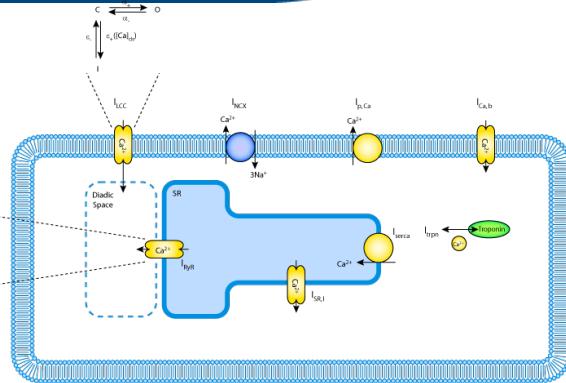
Trabeculum:  
[https://youtu.be/\\_VHZyPEpxsc](https://youtu.be/_VHZyPEpxsc)



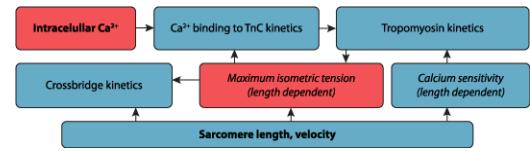




Pandit *et al.*  
cardiac action potential

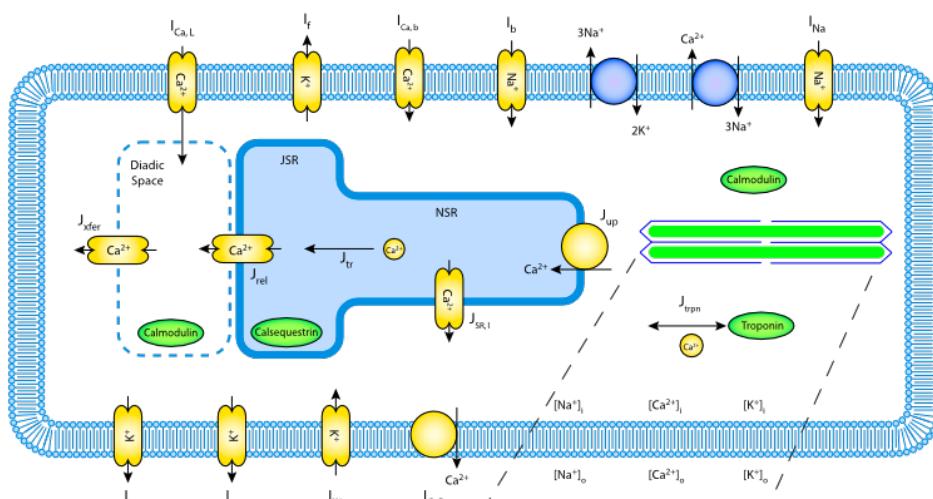


Hinch *et al.*  
Ca-induced Ca release



Niederer *et al.*  
myofilament mechanics

=

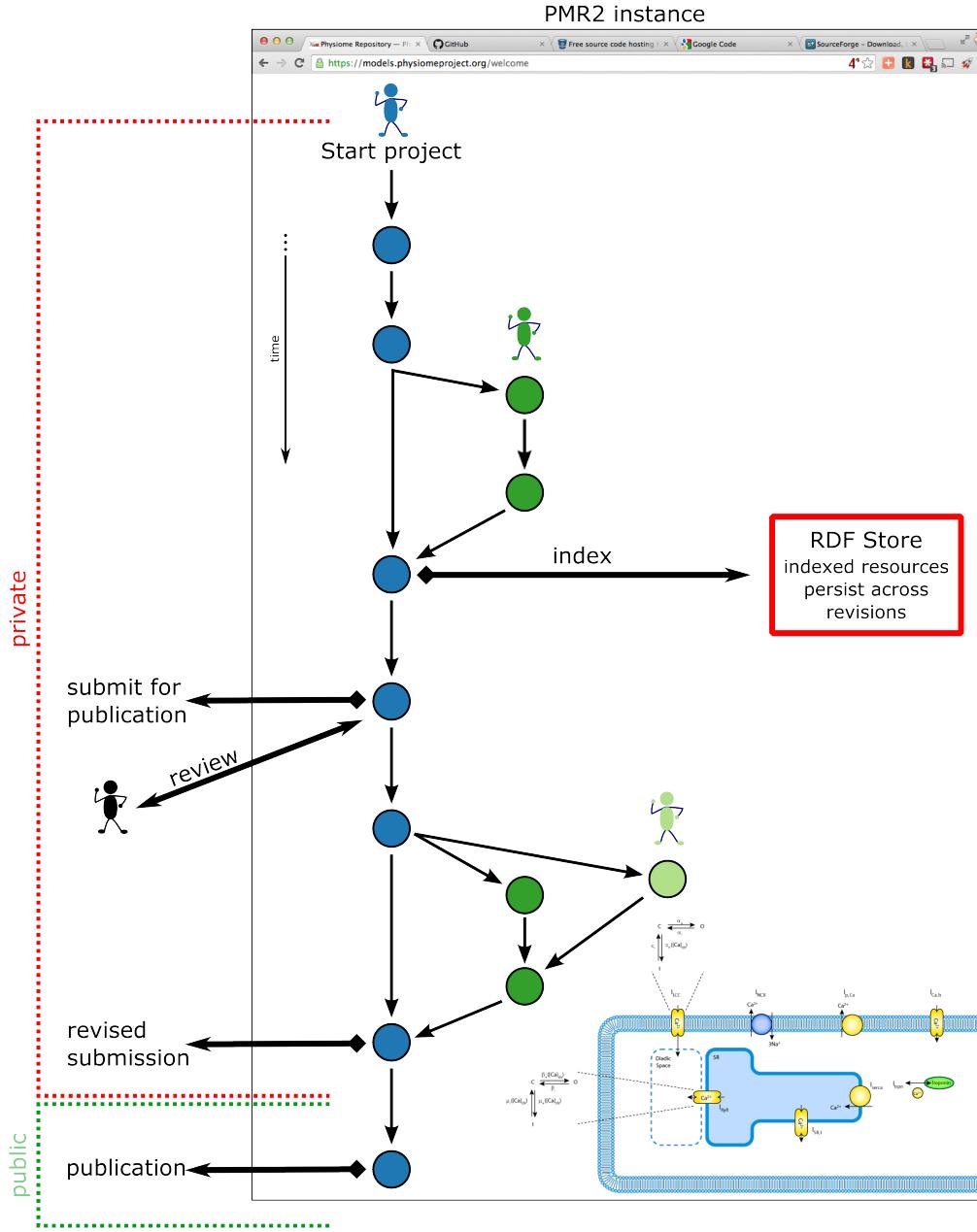


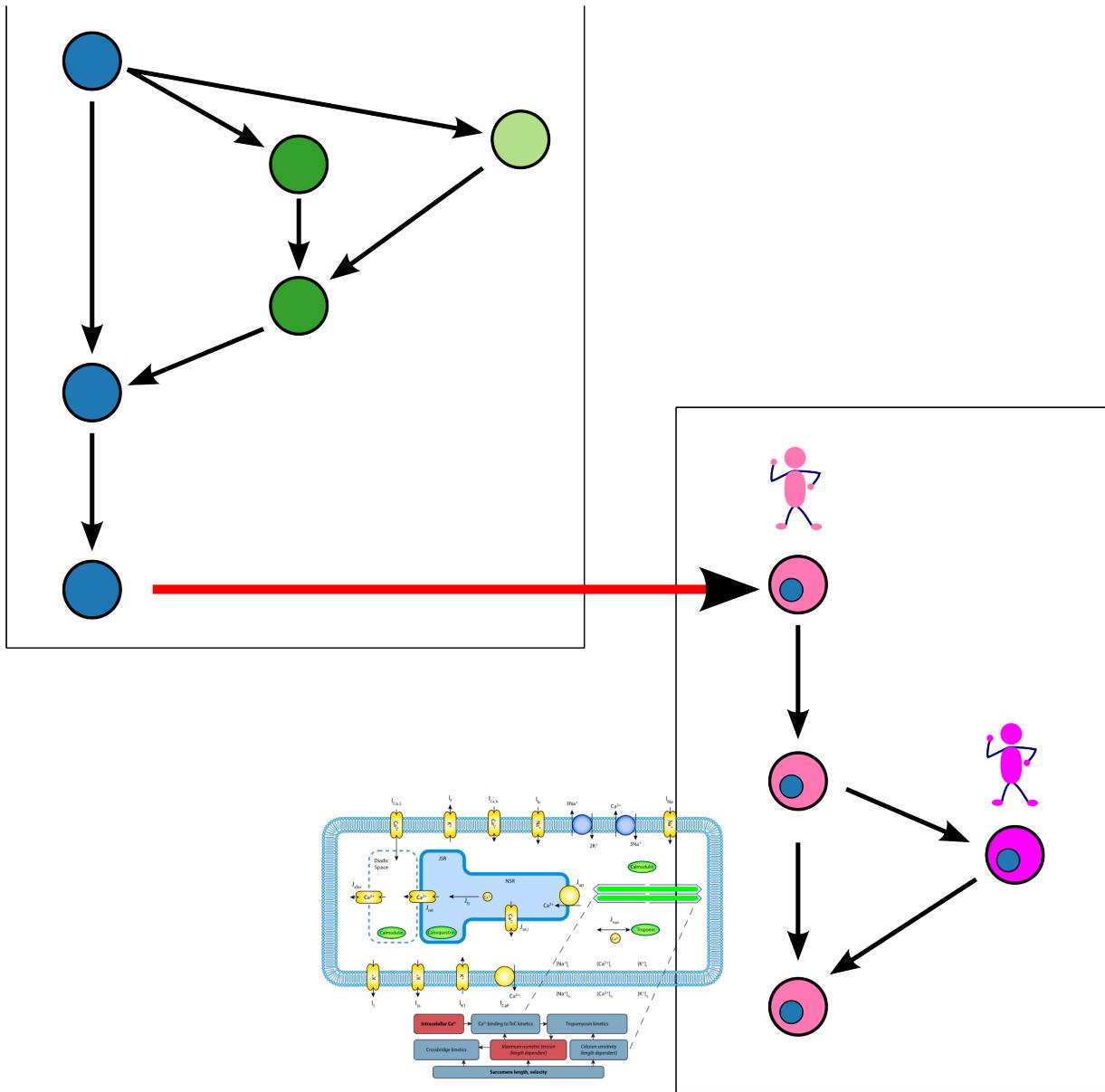
Terkildsen *et al.*  
coupled e-c + Ca

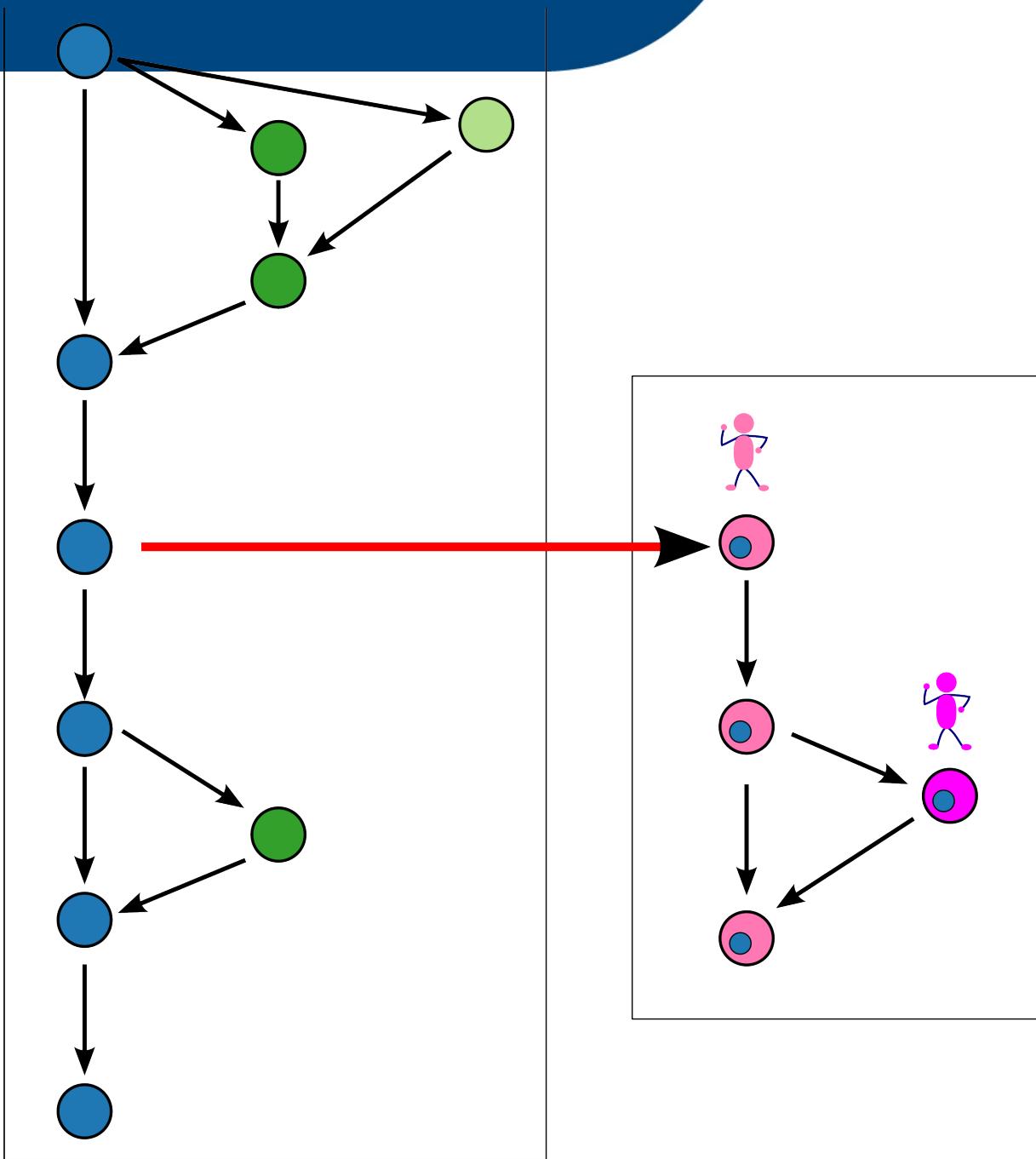
# **Managing modularity and reuse**

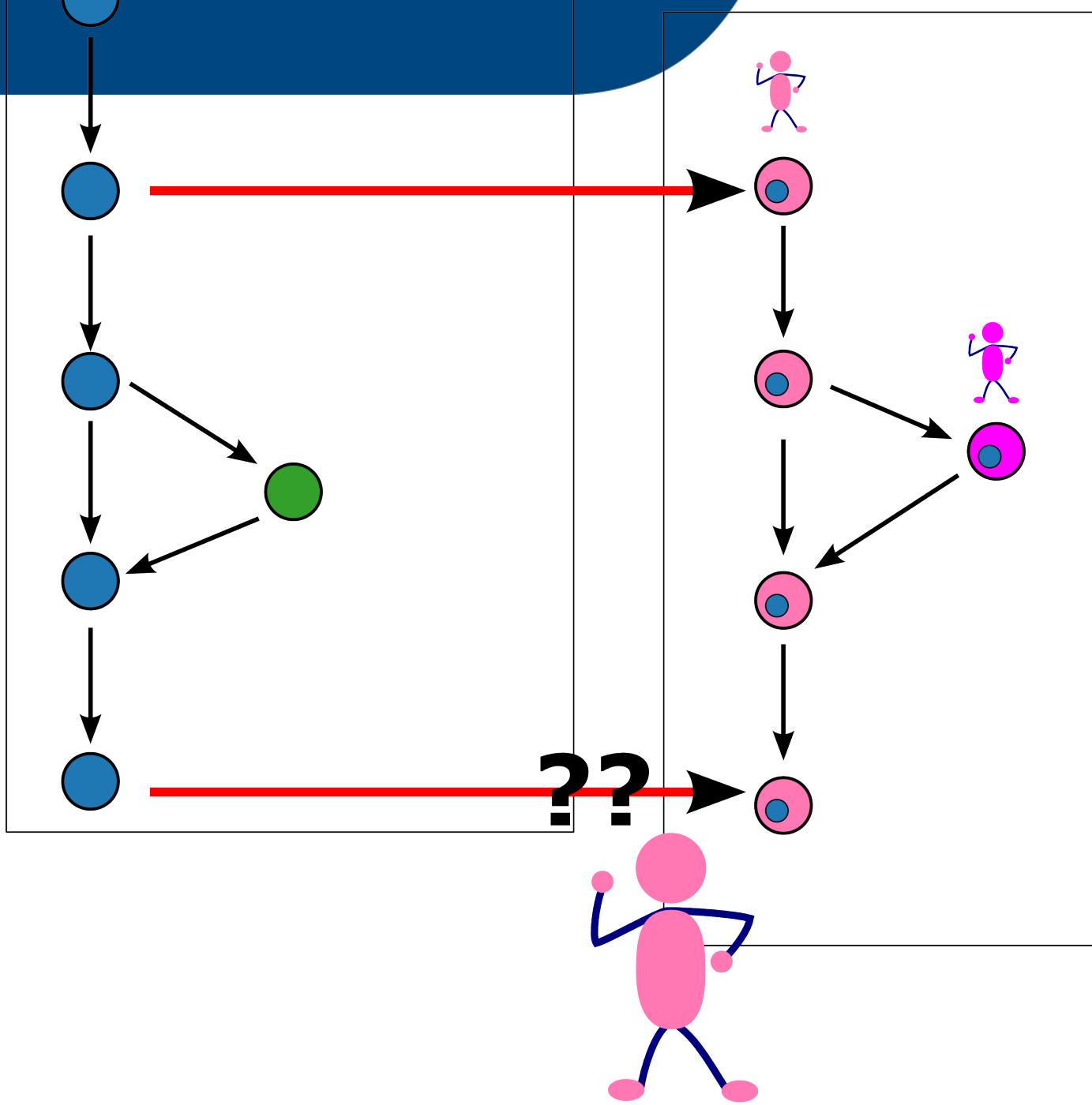
- How do you keep track of your modules?
- What happens if someone changes one of the modules you rely on?
- How do you share your hierarchical model?
- How do you make your hierarchical model available to others for further application and re-use?

**<https://models.physiomeproject.org>**



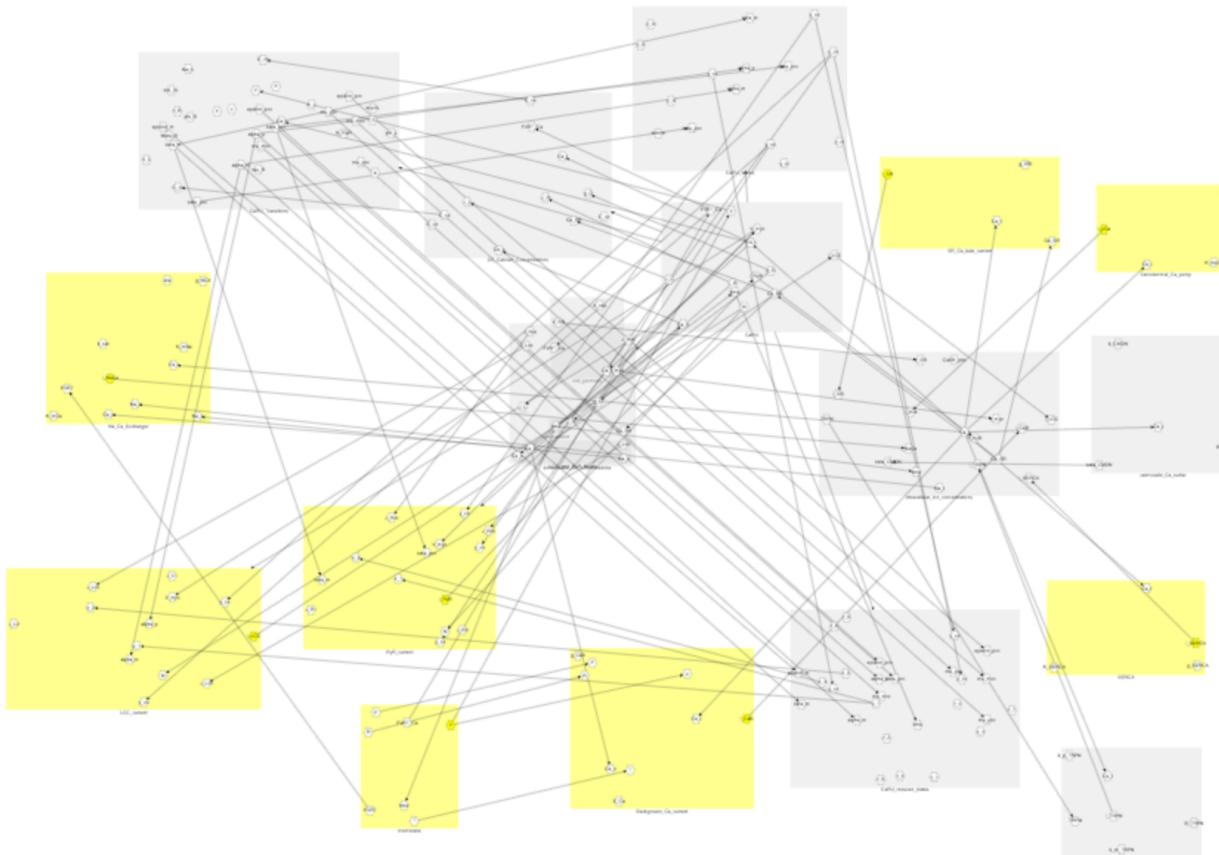






# BiVeS Model Diff Viewer

Showing changes to Hinch, Greenstein, Tanskanen, Xu, Winslow, 2004 @ 87ed469acd6f / hinch\_greenstein\_tanskanen\_xu\_winslow\_2004.cellml made by Hinch, Greenstein, Tanskanen, Xu, Winslow, 2004 @ 914b7b3784eb / hinch\_greenstein\_tanskanen\_xu\_winslow\_2004.cellml.



## CellML Differences

### Component Na\_Ca\_Exchanger

Variable: I\_NaCa

- Attribute id was inserted: [Na\\_Ca\\_Exchanger\\_I\\_NaCa](#)

### Component Background\_Ca\_current

Variable: I\_CaB

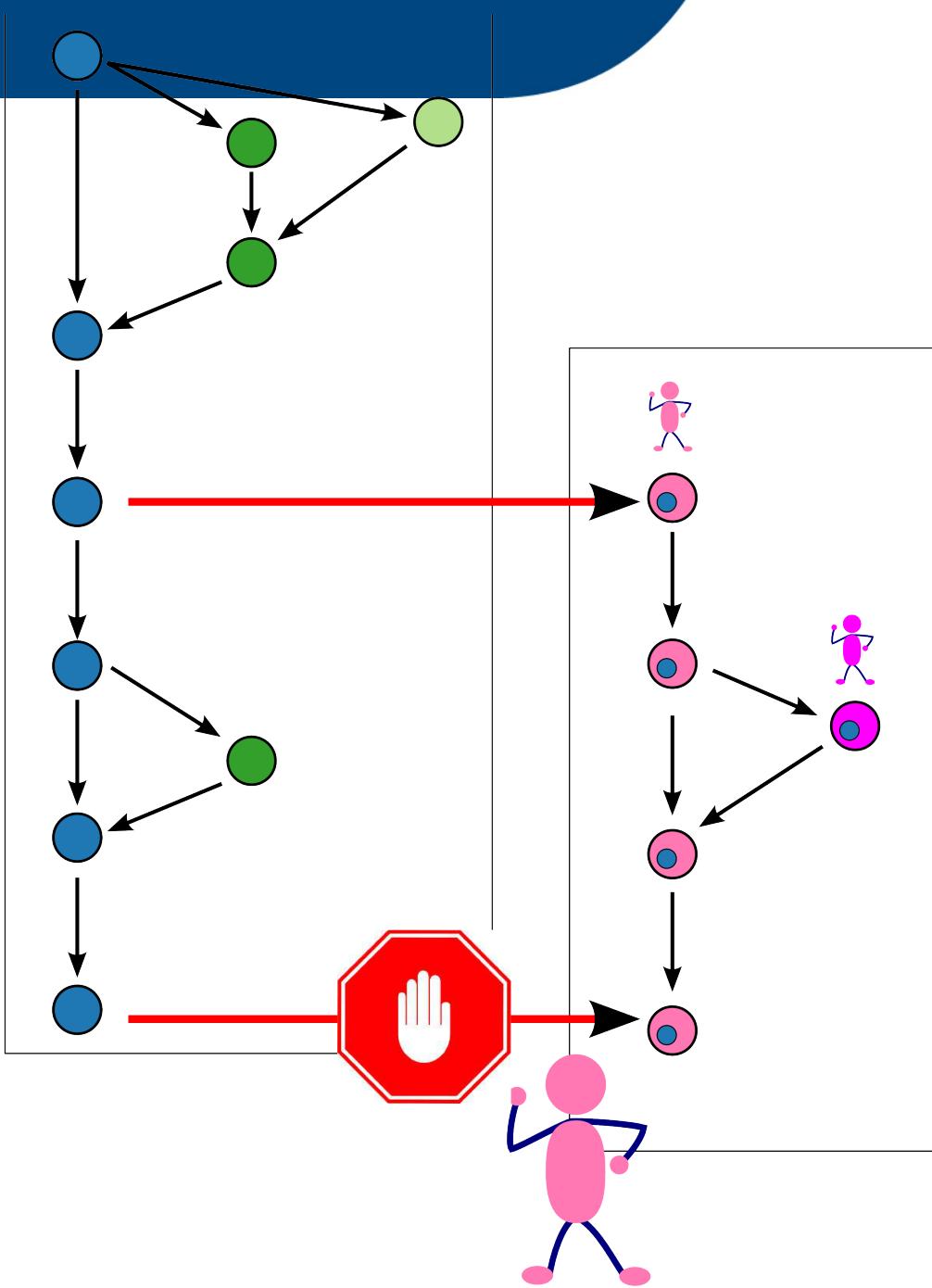
- Attribute id was inserted: [Background\\_Ca\\_current\\_I\\_CaB](#)

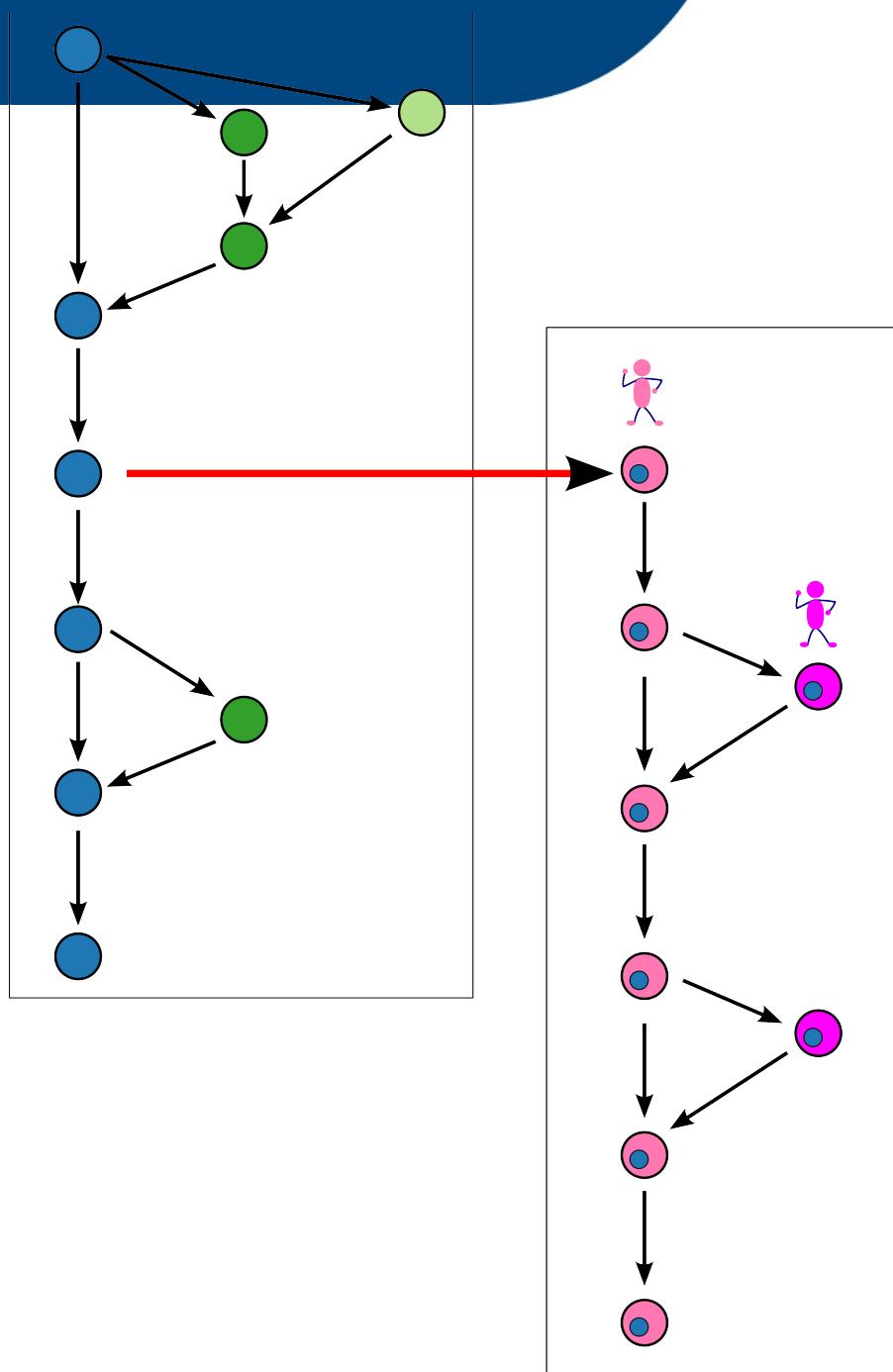
### Component SR\_Ca\_leak\_current

Variable: I\_SR

- Attribute id was inserted: [SR\\_Ca\\_leak\\_current\\_I\\_SR](#)

### Component LCC\_current



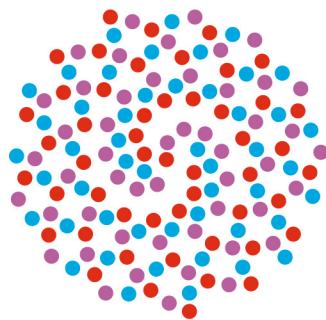


# Acknowledgements



The Virtual Physiological  
Rat Project

[www.virtualrat.org](http://www.virtualrat.org)



MAURICE WILKINS CENTRE  
FOR MOLECULAR BIODISCOVERY



AUCKLAND  
BIOENGINEERING INSTITUTE

THE UNIVERSITY OF AUCKLAND  
NEW ZEALAND

Te Whare Wānanga o Tāmaki Makaurau