# Call for theses in Biology and Electronics for MSc students in MathEng

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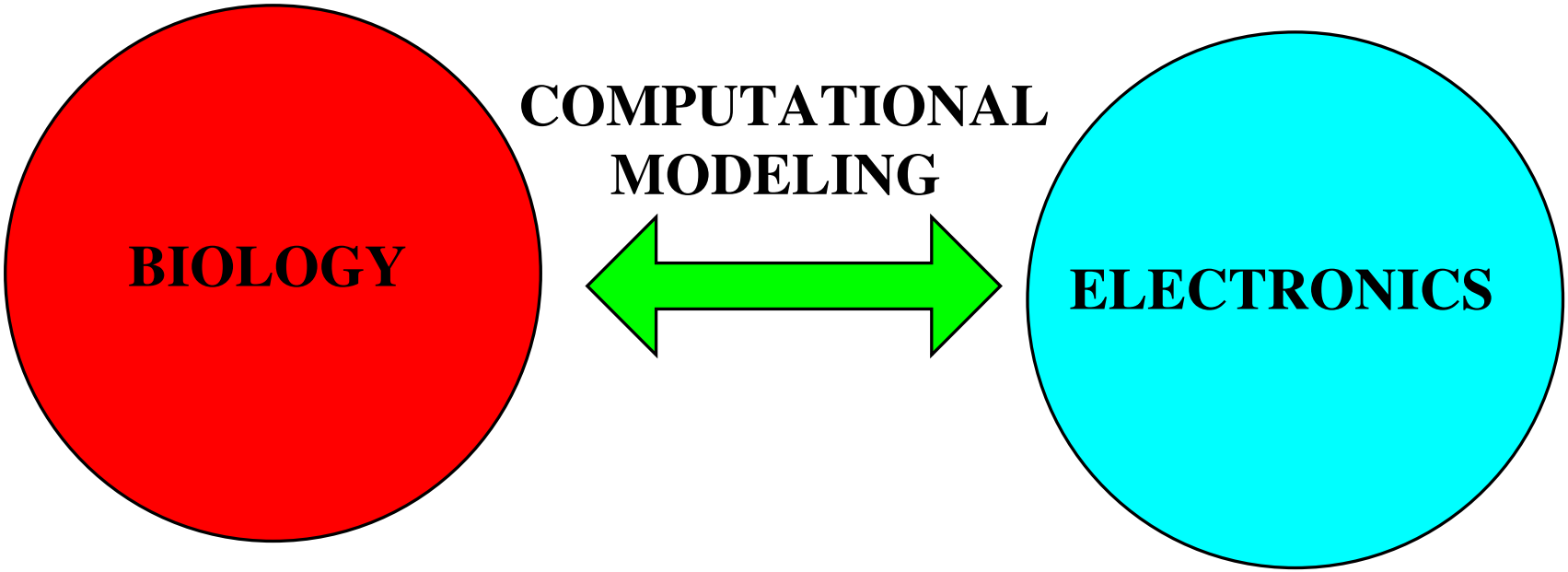
# Applications: A Multiphysics Framework




**cellular structure/functions**

**blood microcirculation in the eye2brain system**

**ionic channels**

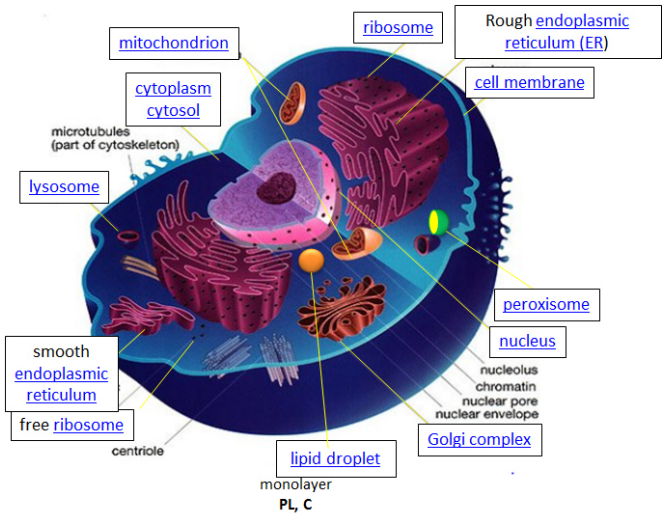
**phase change memories**

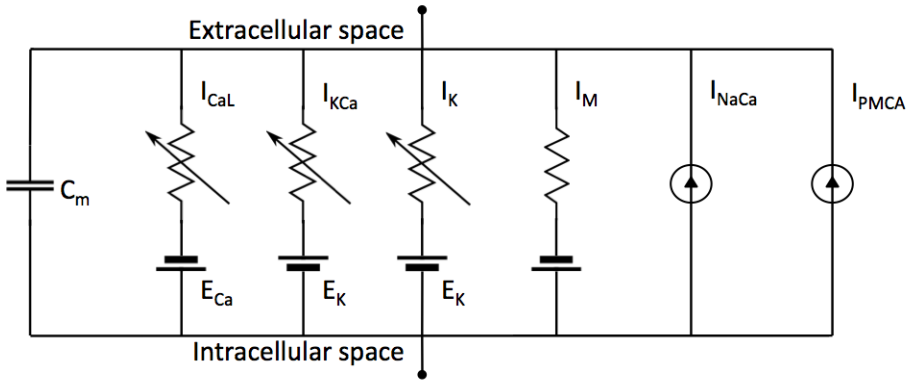
**charge transport**

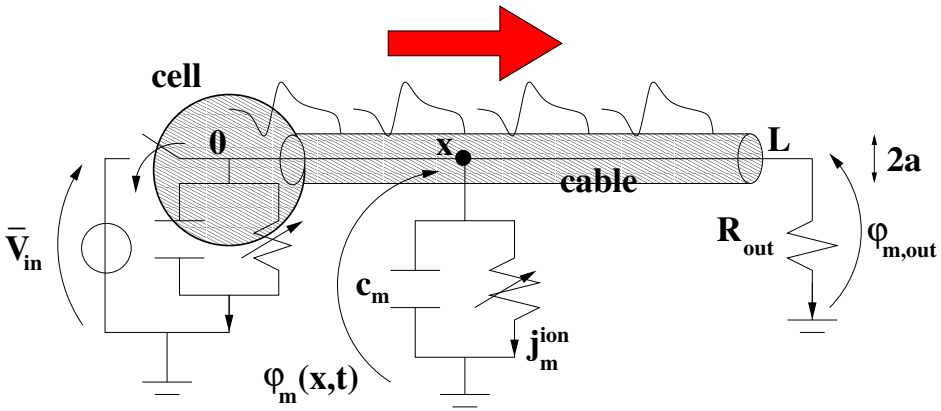
**heat transport/dissipation**

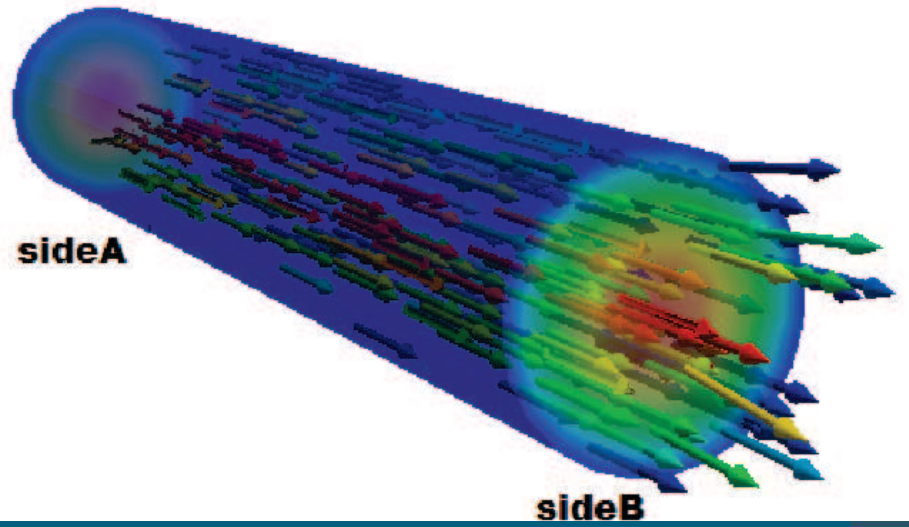
# Computational Modeling: A Multiscale Framework

We consider a natural multiscale hierarchy of models:
0D - 1D - 2D - 3D Coupling



# Methodological Facilities

Presently available:

- FEMOS-MP (3D Finite Element Method Oriented Simulator for MultiPhysics)
- C++ solver: electrical, electrochemical, fluid and mechanical blocks
- Families of robust and accurate finite elements on simplices
- Efficient direct/iterative solvers for linear algebra
- Matlab solvers (mainly for 0D/1D problems)

To be developed:

- Algorithms for fluid-structure interaction
- Multidomain formulations (for ex.: the three-field method)
- Mixed-hybridized finite elements for stress/flux conservation

# Courses and Opportunities

- **COMPUTATIONAL MODELING IN ELECTRONICS AND BIOMATHEMATICS (CMEB)** 096659 (8CFUs. Riccardo Sacco, Aurelio G. Mauri).

- USA (Indianapolis) - France (Strasbourg): internship (max. 6 months) at IRMA (Institut de Recherche Mathématique Avancée), advisors: Prof. Giovanna Guidoboni, Prof. Christophe Prud'homme. Salary: 510 euros/per month.
  Research project: **Eye2Brain. A multiscale computational paradigm for ocular biomarkers in neurodegenerative disorders** (Principal Investigator: Giovanna Guidoboni).

- PoliMi-Micron Semiconductor Italia. Advisors: Dr. Aurelio G. Mauri, Prof. Riccardo Sacco, Prof. Maurizio Verri.
  Research project: **Modeling and simulation of electro-thermo-mechanical behavior in semiconductors**.