

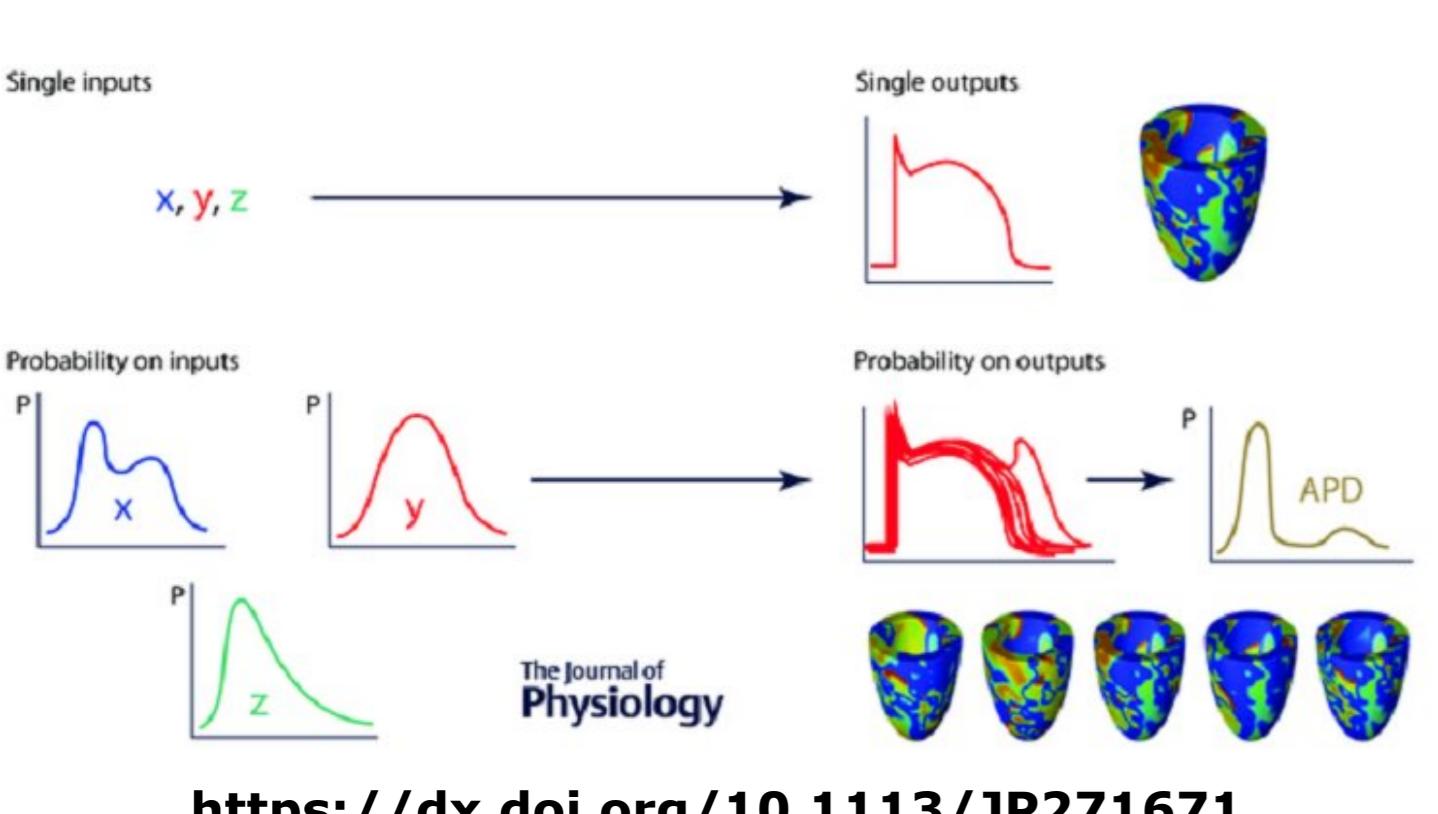
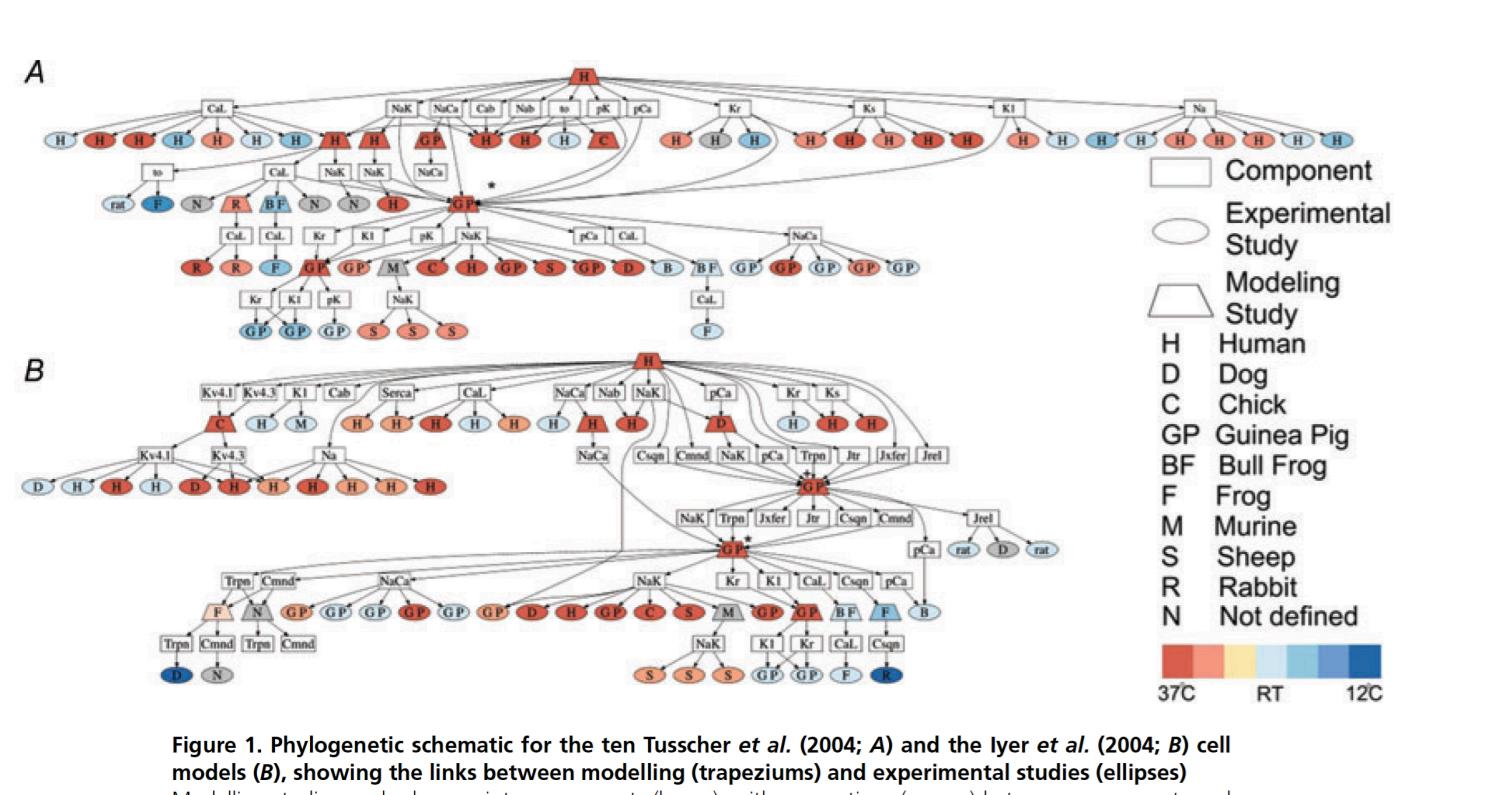
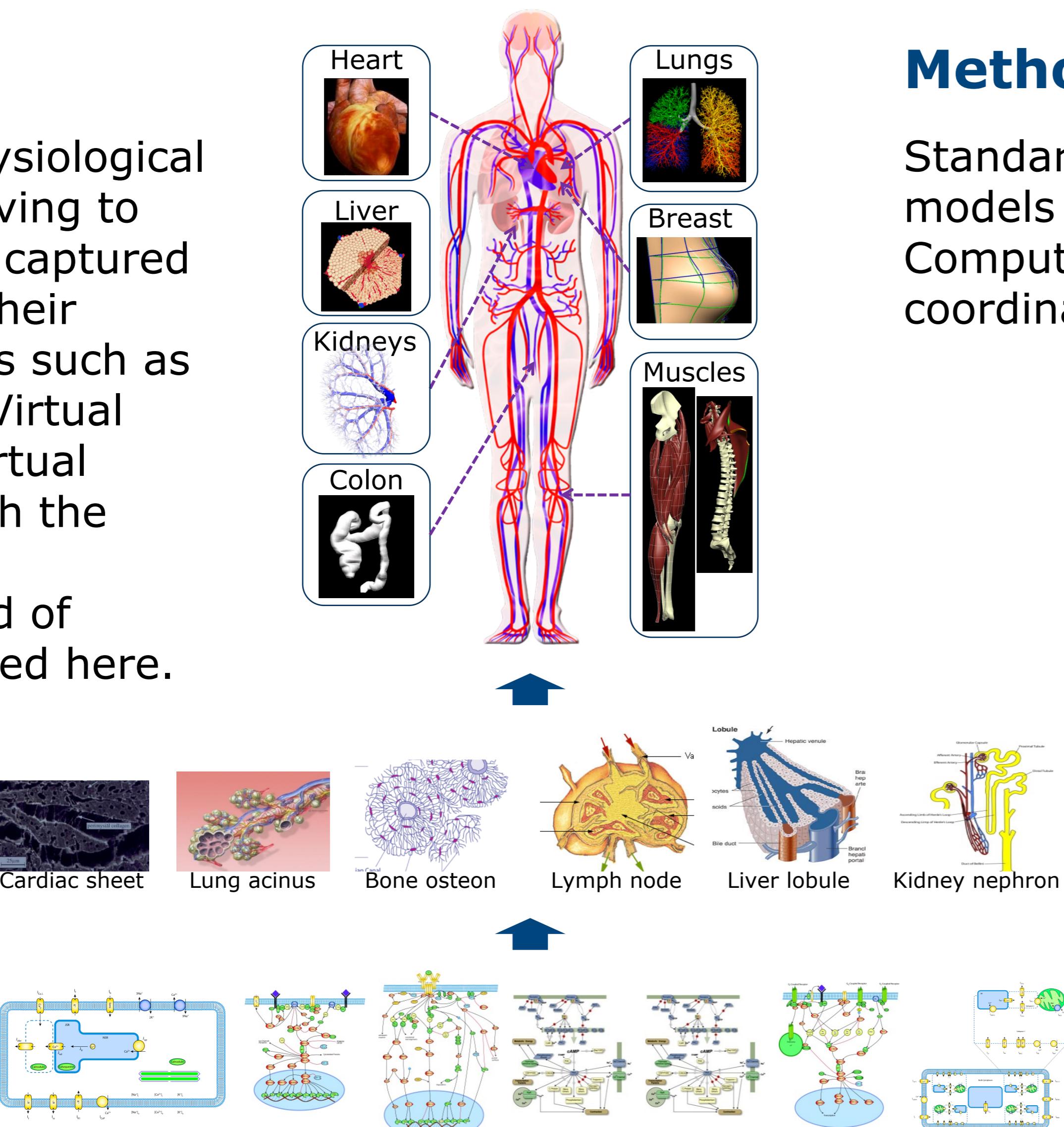
# Discoverable, Reproducible, and Reusable Biosimulation Models

David Nickerson <<http://about.me/david.nickerson>> & Peter Hunter, Auckland Bioengineering Institute, University of Auckland, New Zealand

## Background

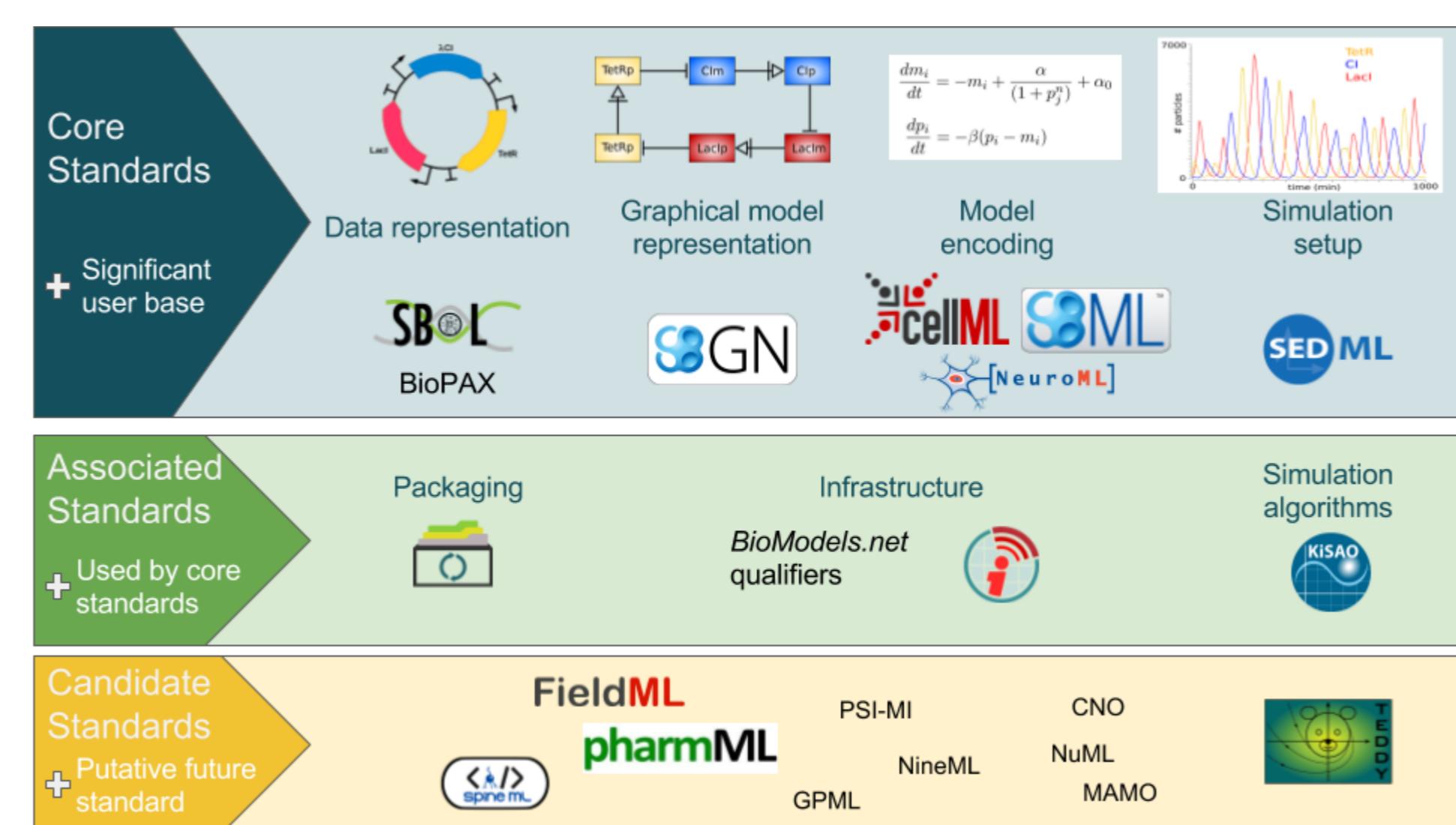
Computational models of physiological systems are continually evolving to improve the biological detail captured in the models and enhance their predictive capabilities. Efforts such as the IUPS Physiome Project, Virtual Physiological Human, and Virtual Physiological Rat help to push the boundaries of computational physiology to enable the kind of multiscale modelling illustrated here.

As biosimulation models increase in size and complexity, it becomes impossible to reuse a given model from the primary publication of the model in traditional scientific literature alone.



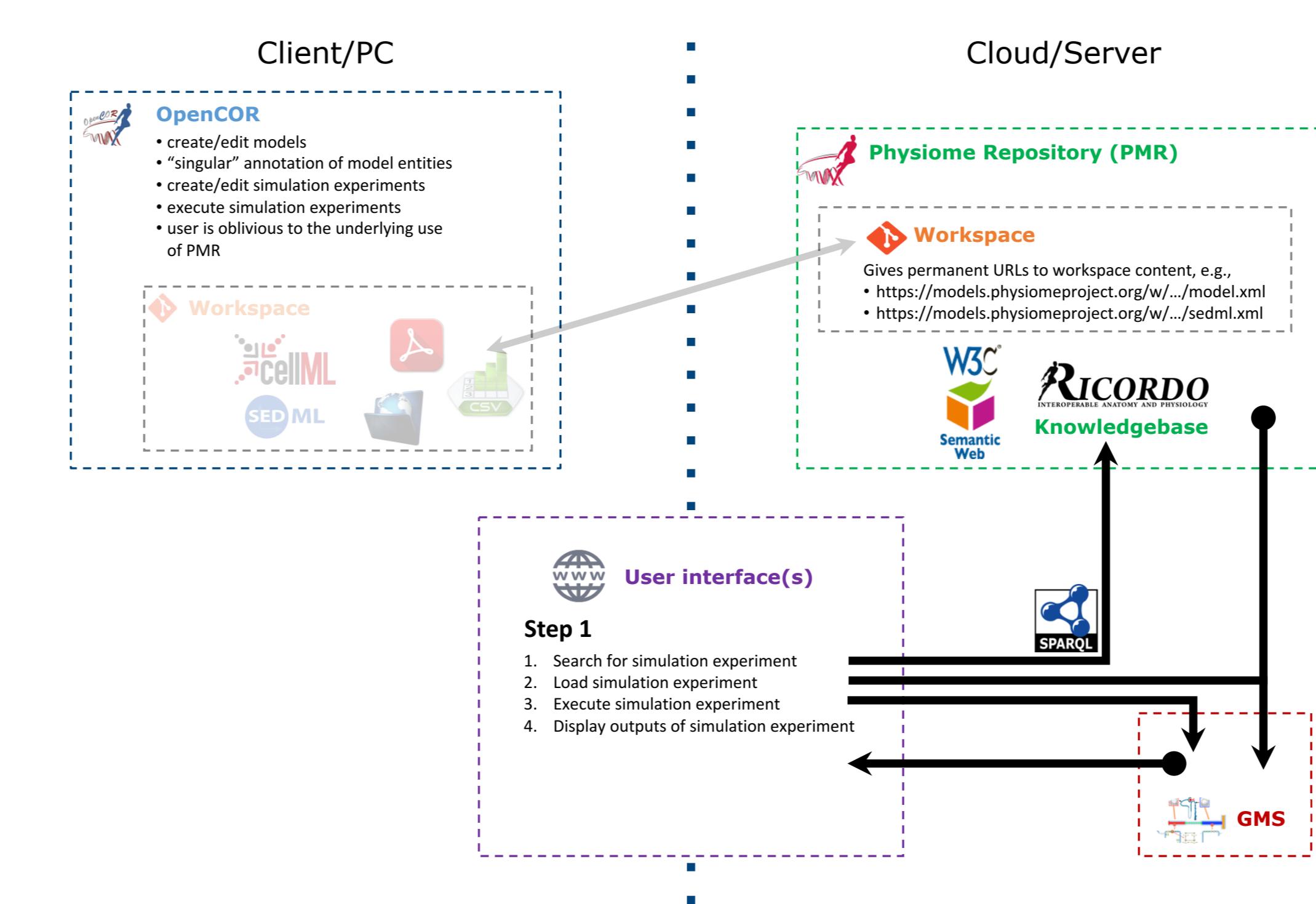
## Methods

Standards are being developed to address the need to enable biosimulation models to be shared in a reproducible and reusable manner. The Computational Modelling in Biology Network (COMBINE) is an effort to coordinate the development of such standards.



**combine** <http://co.mbine.org/>

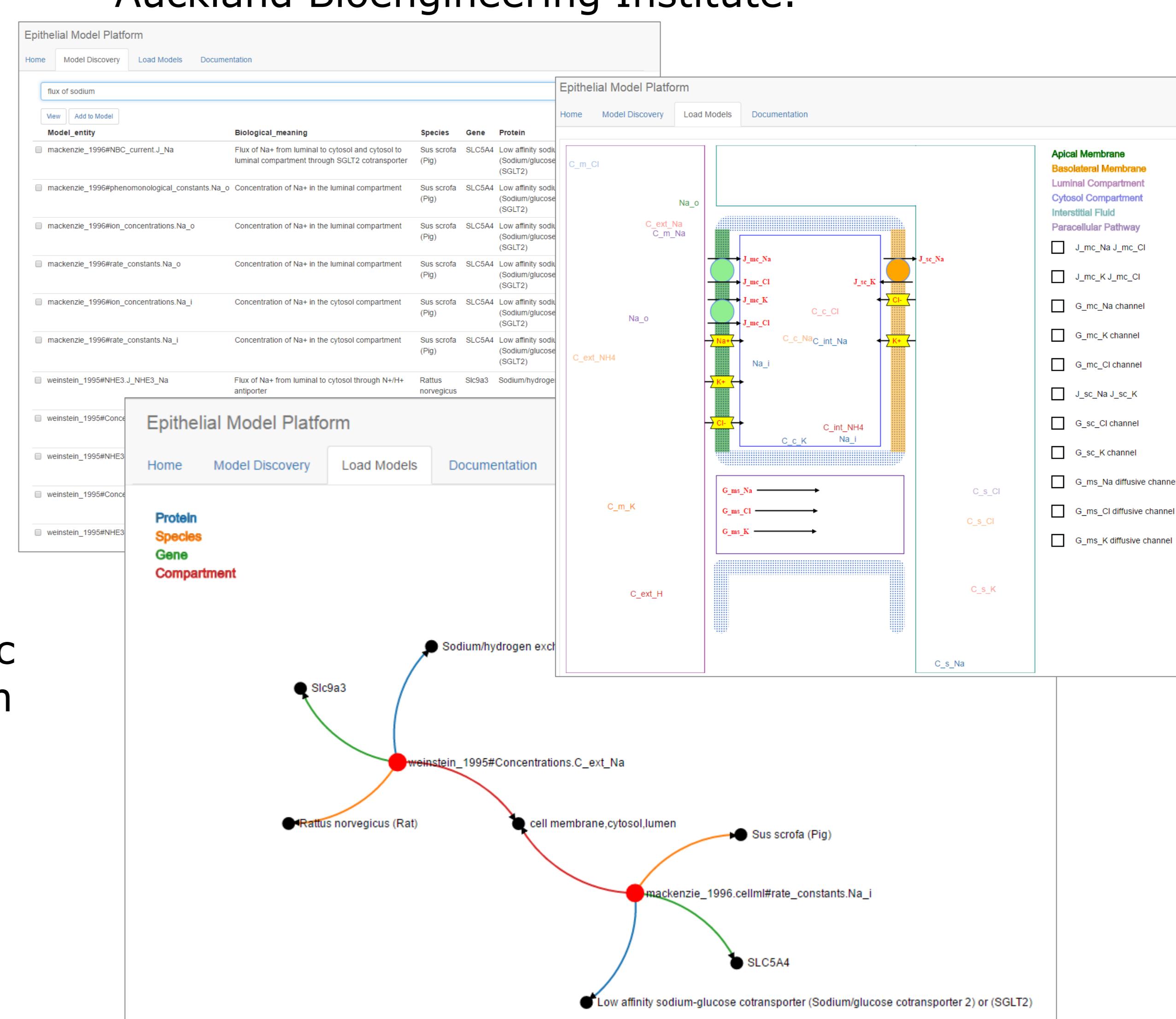
The adoption of such standards to encode biosimulation models allows scientists to leverage existing domain specific tools to explore and interact with the models and simulation experiments, as illustrated below.



Enhancing the encoded biosimulation models with computable descriptions of their provenance, construction, instantiation, etc, information further improves their discoverability and understandability. Repositories such as the PMR (<https://models.physiomeproject.org/>) are then able to provide discovery and comprehension services using this knowledge.

## Results

We are beginning to build tools which make use of these semantic-web based discovery and comprehension services. The example below illustrates a model discovery and assembly tool that is being developed by Dewan Sarwar at the Auckland Bioengineering Institute.



The example above demonstrates the points of biological similarity for two entities from different CellML models.

As tools such as these evolve, we hope to demonstrate the added value to scientists putting in the extra work to make their models available as described here. To this end, the IUPS is launching a new "journal" to be called *Physiome*, which will provide a mechanism to publish curated and annotated models and track their reuse by the scientific community.

## Acknowledgements

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