

Cell Behavior Model Definition Language (CBMDL): A Cell Behavior Ontology (CBO) based, modeling-method independent, multi-cellular model representation and exchange language.

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Abstract

Systems Biology Markup Language (SBML) has been instrumental in allowing investigators to share, validate, and reuse molecular-reaction network models; and to create easy-to-use software tools for their creation and evaluation. Along with CellML, which covers a similar domain, SBML, and its associated technologies, has become the *de facto* standard for the specification of biochemical reaction networks in implementation-independent fashion. In contrast, multi-cell modeling of the dynamic organization of many cells into tissues still employ ad-hoc proprietary formats with conflicting vocabularies closely linked to non-generic software and mathematical implementations.

We propose the extensible Cell Behavior Model Description Language (CBMDL) in concert with the Cell Behavior Ontology (CBO) to allow researchers to create consistent, uniform, and rigorous descriptions of multi-cell biological processes and phenomena; and to use these descriptions to generate multi-cell computational models independent of their specific mathematical or software implementations. CBMDL models can be validated by a variety of simulation methods, shared and reused, and composed with other models in CBMDL and existing modeling languages in other domains, including SBML and MathML.

We present use-cases illustrating our design approach, CBMDLs current elements and capabilities, and preliminary translators and interfaces for existing multi-cellular simulation environments. We believe CBMDL can serve as a unifying exchange language and also advance the acceptance of multi-cellular simulation environments.