

The Systems Biology Ontology

lenov@ebi.ac.uk

courtot@ebi.ac.uk

SBO

<http://www.ebi.ac.uk/sbo/>

creators Joe User (juser@eden.com), Anne Other (aother@eden.com)

creation date 01 January 0000

last modification 31 May 2005

Constituent	Data Type	Identifier	Qualifier	Meaning
model	http://www.pubmed.gov/ http://www.ncbi.nlm.nih.gov/Taxonomy/ http://www.geneontology.org/ http://www.geneontology.org/ http://www.genome.jp/kegg/pathway/ http://www.genome.jp/kegg/pathway/	0000000 9606 GO:0007204 GO:0051279 hsa04020 hsa04070	IsVersionOf IsVersionOf IsPartOf IsPartOf	<i>Homo sapiens</i> <i>positive regulation of cytosolic [Ca²⁺]</i> <i>regulation of release of sequestered Ca²⁺ into cytop</i> <i>Calcium signaling pathway - H sapiens</i> <i>Phosphatidylinositol signaling system - H sapiens</i>
compartment ER	http://www.geneontology.org/	GO:0005790		<i>smooth endoplasmic reticulum</i>
reactant Ca _{in}	http://www.ebi.ac.uk/chebi/	CHEBI:29108		<i>calcium(2+)</i>
cytoplasm	http://www.geneontology.org/	GO:0005737		<i>cytoplasm</i>
reactant Ca _{out}	http://www.ebi.ac.uk/chebi/	CHEBI:29108		<i>calcium(2+)</i>
reactant IP3	http://www.ebi.ac.uk/chebi/	CHEBI:16595		<i>1D-myo-inositol 1,4,5-tris(dihydrogen phosphate)</i>
reactant PIP2	http://www.ebi.ac.uk/chebi/	CHEBI:18348		<i>1-phosphatidyl-1D-myo-inositol 4,5-bisphosphate</i>
reactant IP3R	http://www.uniprot.org/ http://www.uniprot.org/ http://www.uniprot.org/	Q14643 Q14571 Q14573	HasVersion HasVersion HasVersion	<i>Inositol 1,4,5-trisphosphate receptor type 1</i> <i>Inositol 1,4,5-trisphosphate receptor type 2</i> <i>Inositol 1,4,5-trisphosphate receptor type 3</i>
reactant PLC _{act}	http://www.uniprot.org/	Q9NQ66	IsVersionOf	<i>PIP2 phosphodiesterase β1</i>
reactant PLC _{tot}	http://www.uniprot.org/	Q9NQ66		<i>PIP2 phosphodiesterase β1</i>
reactant IP3 _{ase}	http://www.uniprot.org/	Q14642		<i>Type I inositol-1,4,5-trisphosphate 5-phosphatase</i>
reactant G _q	http://www.uniprot.org/	Q6NT27		<i>Guanine nucleotide binding protein Gq</i>
reaction Ca _{release}	http://www.geneontology.org/ http://www.geneontology.org/	GO:0005220 GO:0008095	IsVersionOf	<i>IP3-sensitive calcium-release channel activity</i> <i>IP3 receptor activity</i>
reaction IP3 _{production}	http://www.geneontology.org/ http://www.ebi.ac.uk/intenz/	GO:0004435 3.1.4.11	IsVersionOf IsVersionOf	<i>phosphoinositide phospholipase C activity</i> <i>phosphoinositide phospholipase C</i>
reaction IP3 _{degradation}	http://www.ebi.ac.uk/intenz/	3.1.3.56	IsVersionOf	<i>inositol-polyphosphate 5-phosphatase</i>
reaction PLC _{activation}	http://www.geneontology.org/	GO:0007200		<i>G-protein signaling coupled to IP3 2nd messenger</i>

creators Joe User (juser@eden.com), Anne Other (aother@eden.com)
 creation date 01 January 0000
 last modification 31 May 2005

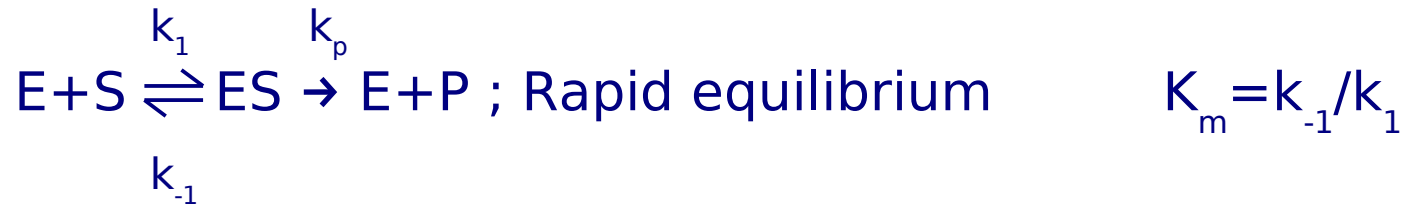
What is common?

Constituent	Data Type	Identifier	Qualifier	Meaning
model	http://www.ncbi.nlm.nih.gov/Taxonomy/	0000000		
	http://www.geneontology.org/	9606		<i>Homo sapiens</i>
	http://www.geneontology.org/	GO:0007204	IsVersionOf	<i>positive regulation of cytosolic [Ca²⁺]</i>
	http://www.geneontology.org/	GO:0051279	IsVersionOf	<i>regulation of release of sequestered Ca²⁺ into cytop</i>
	http://www.genome.jp/kegg/pathway/	hsa04020	IsPartOf	<i>Calcium signaling pathway - H sapiens</i>
	http://www.genome.jp/kegg/pathway/	hsa04070	IsPartOf	<i>Phosphatidylinositol signaling system - H sapiens</i>
compartment ER	http://www.geneontology.org/	GO:0005790		<i>smooth endoplasmic reticulum</i>
reactant Ca _{in}	http://www.ebi.ac.uk/chebi/	CHEBI:29108		<i>calcium(2+)</i>
cytoplasm	http://www.geneontology.org/	GO:0005737		<i>cytoplasm</i>
reactant Ca _{out}	http://www.ebi.ac.uk/chebi/	CHEBI:29108		<i>calcium(2+)</i>
reactant IP3	http://www.ebi.ac.uk/chebi/	CHEBI:16595		<i>1D-myo-inositol 1,4,5-tris(dihydrogen phosphate)</i>
reactant PIP2	http://www.ebi.ac.uk/chebi/	CHEBI:18348		<i>1-phosphatidyl-1D-myo-inositol 4,5-bisphosphate</i>
reactant IP3R	http://www.uniprot.org/	Q14643	HasVersion	<i>Inositol 1,4,5-trisphosphate receptor type 1</i>
	http://www.uniprot.org/	Q14571	HasVersion	<i>Inositol 1,4,5-trisphosphate receptor type 2</i>
	http://www.uniprot.org/	Q14573	HasVersion	<i>Inositol 1,4,5-trisphosphate receptor type 3</i>
reactant PLC _{act}	http://www.uniprot.org/	Q9NQ66	IsVersionOf	<i>PIP2 phosphodiesterase β1</i>
reactant PLC _{tot}	http://www.uniprot.org/	Q9NQ66		<i>PIP2 phosphodiesterase β1</i>
reactant IP3 _{ase}	http://www.uniprot.org/	Q14642		<i>Type I inositol-1,4,5-trisphosphate 5-phosphatase</i>
reactant G _q	http://www.uniprot.org/	Q6NT27		<i>Guanine nucleotide binding protein Gq</i>
reaction Ca _{release}	http://www.geneontology.org/	GO:0005220		<i>IP3-sensitive calcium-release channel activity</i>
	http://www.geneontology.org/	GO:0008095	IsVersionOf	<i>IP3 receptor activity</i>
reaction IP3 _{production}	http://www.geneontology.org/	GO:0004435	IsVersionOf	<i>phosphoinositide phospholipase C activity</i>
	http://www.ebi.ac.uk/intenz/	3.1.4.11	IsVersionOf	<i>phosphoinositide phospholipase C</i>
reaction IP3 _{degradation}	http://www.ebi.ac.uk/intenz/	3.1.3.56	IsVersionOf	<i>inositol-polyphosphate 5-phosphatase</i>
reaction PLC _{activation}	http://www.geneontology.org/	GO:0007200		<i>G-protein signaling coupled to IP3 2nd messenger</i>

- Controlled Vocabularies: “An indexed dictionary”.
- Ontology: A set of elements of knowledge linked with sense-bearing relationships.
- Each term is associated to a perennial identifier. Once created a term is never destroyed. It can be merged with other, or made obsolete, but it still exists.
- An ontology is an evolving structure: It can cope with an increase or refinement of knowledge. No need to reconstruct everything as with the taxonomies.
- An ontology is a Direct Acyclic Graph, and not a hierarchy. A term can possess more than one parent.
- Ontologies are stored in standard machine-readable formats. They can be subjected to automatic treatments.



- Henri-Michaelis-Menten:



- Van Slyke-Cullen:



- Briggs-Haldane:



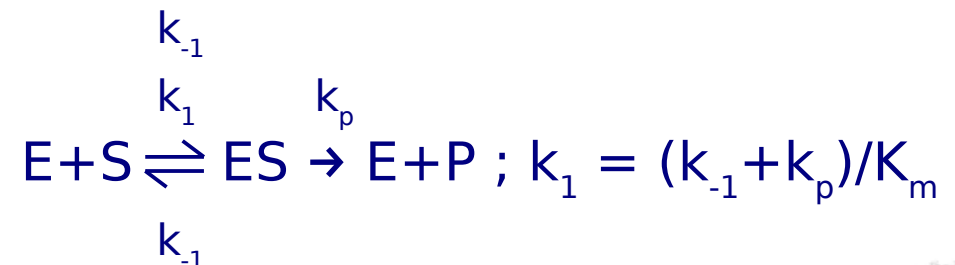
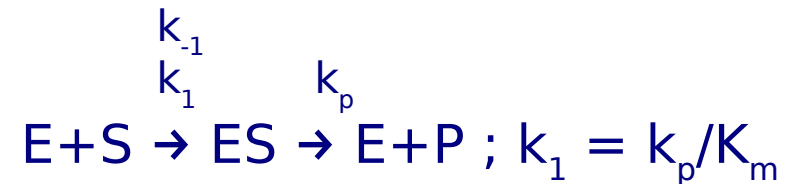
```

<reaction>
  <listOfReactants>
    <speciesReference species="S" />
  </listOfReactants>
  <listOfProducts>
    <speciesReference species="P" />
  </listOfProducts>
  <listOfModifiers>
    <speciesReference species="E" />
  </listOfModifiers>
  <kineticLaw>
    <listOfParameters>
      <parameter id="Km" />
      <parameter id="kp" />
    </listOfParameters>
    <math xmlns="http://www.w3.org/1998/Math/MathML">
      <apply>
        <divide/><apply>
          <times/><ci>E</ci>
          <ci>kp</ci>
          <ci>S</ci>
        </apply>
      </apply>
      <apply>
        <plus/><ci>Km</ci>
        <ci>S</ci>
      </apply>
    </math>
  </kineticLaw>
</reaction>

```



Import in a discrete simulator



- A taxonomy of the roles of reaction participants, including the following terms: “substrate”, “catalyst” etc.
- A CV for parameter roles in quantitative models. This CV includes terms like “Michaelis constant”, “forward unimolecular rate constant” etc.
- A classification of rate laws. This CV is a taxonomy of kinetic rate equations. Examples of terms in this CV are “mass action kinetics”, “Henri-Michaelis-Menten equation” etc. Each term contains a precise mathematical expression stored as a MathML lambda function. The variables refer to the CVs described above.
- A list of modelling framework to precise how to interpret the rate-law. E.g. “continuous modelling”, “discrete modelling” etc.
- A list of event type, such as “catalysis” or “addition of a chemical group”



- Reacting entity type? => link with BioPAX and SBGN
- Experimental evidence?
- ...



id	SBO:\d{7}	minOccurs=1	maxOccurs=1
name	unicode string	minOccurs=1	maxOccurs=1
def	unicode string	minOccurs=0	maxOccurs=1
is_a	SBO:\d{7}	minOccurs=0	minOccurs=n
part_of	SBO:\d{7}	minOccurs=0	maxOccurs=n
synonyms	unicode string	minOccurs=0	minOccurs=n
mathml	MathML lambda function	minOccurs=0	maxOccurs=1
comment	unicode string	minOccurs=0	maxOccurs=1



id: SBO:0000031

name: Briggs-Haldane equation

def: "Rate-law presented in "G.E. Briggs and J.B.S. Haldane (1925) A note on the kinetics of enzyme action, Biochem. J., 19: 339-339". It is a general rate equation that does not require the restriction of equilibrium of Henri-Michaelis-Menten or irreversible reactions of Van Slyke, but instead make the hypothesis that the complex enzyme-substrate is in quasi-steady-state. Although of the same form than the Henri-Michaelis-Menten equation, it is semantically different since K_m now represents a pseudo-equilibrium constant, and is equal to the ratio between the rate of consumption of the complex (sum of dissociation of substrate and generation of product) and the association rate of the enzyme and the substrate.

is_a: SBO:0000011 ; kinetics of unireactant enzymes

MathML: $\langle \text{math xmlns="http://www.w3.org/1998/Math/MathML"} \rangle$

$\langle \text{semantics definitionURL="http://biomodels.net/SBO/#SBO:0000062"} \rangle$

$\langle \text{lambda} \rangle$

$\langle \text{bvar} \rangle \langle \text{ci definitionURL="http://www.biomodels.net/SBO/#SBO:0000015"} \rangle S \langle \text{ci} \rangle \langle \text{bvar} \rangle$

$\langle \text{bvar} \rangle \langle \text{ci definitionURL="http://www.biomodels.net/SBO/#SBO:0000014"} \rangle E \langle \text{ci} \rangle \langle \text{bvar} \rangle$

$\langle \text{bvar} \rangle \langle \text{ci definitionURL="http://www.biomodels.net/SBO/#SBO:0000025"} \rangle k_p \langle \text{ci} \rangle \langle \text{bvar} \rangle$

$\langle \text{bvar} \rangle \langle \text{ci definitionURL="http://www.biomodels.net/SBO/#SBO:0000008"} \rangle K_m \langle \text{ci} \rangle \langle \text{bvar} \rangle$

$\langle \text{apply} \rangle$

$\langle \text{divide} \rangle$

$\langle \text{apply} \rangle$

$\langle \text{times} \rangle \langle \text{ci} \rangle E \langle \text{ci} \rangle \langle \text{ci} \rangle k_p \langle \text{ci} \rangle \langle \text{ci} \rangle S \langle \text{ci} \rangle$

$\langle \text{apply} \rangle$

$\langle \text{apply} \rangle$

$\langle \text{plus} \rangle \langle \text{ci} \rangle K_m \langle \text{ci} \rangle \langle \text{ci} \rangle S \langle \text{ci} \rangle$

$\langle \text{apply} \rangle$

$\langle \text{apply} \rangle$

$\langle \text{lambda} \rangle$

$\langle \text{semantics} \rangle$

$\langle \text{math} \rangle$



- syntax: `<elementX sboTerm="SBO:ddddddd" >`
- present in:
 - model
 - initialAssignment (new element of L2V2)
 - rule
 - constraint (new element of L2V2)
 - reaction
 - speciesReference and modifierSpeciesReference
 - kineticLaw
 - parameter



```
<reaction>
  <listOfReactants>
    <speciesReference species="S" />
  </listOfReactants>
  <listOfProducts>
    <speciesReference species="P" />
  </listOfProducts>
  <listOfModifiers>
    <speciesReference species="E" />
  </listOfModifiers>
  <kineticLaw sboTerm="SBO:0000031">
    <listOfParameters>
      <parameter id="Km" />
      <parameter id="kp" />
    </listOfParameters>
    <math xmlns="http://www.w3.org/1998/Math/MathML">
      <apply>
        <divide/><apply>
          <times/><ci>E</ci>
            <ci>kp</ci>
            <ci>S</ci>
        </apply>
      <apply>
        <plus/><ci>Km</ci>
          <ci>S</ci>
      </apply>
    </math>
  </kineticLaw>
</reaction>
```



```

<reaction sboTerm="SBO:0000062">
  <listOfReactants>
    <speciesReference species="S" sboTerm="SBO:0000015"/>
  </listOfReactants>
  <listOfProducts>
    <speciesReference species="P" sboTerm="SBO:0000011"/>
  </listOfProducts>
  <listOfModifiers>
    <speciesReference species="E" sboTerm="SBO:0000014"/>
  </listOfModifiers>
  <kineticLaw sboTerm="SBO:0000031">
    <listOfParameters>
      <parameter id="Km" sboTerm="SBO:0000008"/>
      <parameter id="kp" sboTerm="SBO:0000025"/>
    </listOfParameters>
    <math xmlns="http://www.w3.org/1998/Math/MathML">
      <apply>
        <divide/><apply>
          <times/><ci>E</ci>
            <ci>kp</ci>
            <ci>S</ci>
        </apply>
      <apply>
        <plus/><ci>Km</ci>
          <ci>S</ci>
        </apply>
      </apply>
    </math>
  </kineticLaw>
</reaction>

```



```

<reaction sboTerm="SBO:0000062">
  <listOfReactants>
    <speciesReference species="A" sboTerm="SBO:0000015"/>
  </listOfReactants>
  <listOfProducts>
    <speciesReference species="B" sboTerm="SBO:0000011"/>
  </listOfProducts>
  <listOfModifiers>
    <speciesReference species="C" sboTerm="SBO:0000014"/>
  </listOfModifiers>
  <kineticLaw sboTerm="SBO:0000031">
    <listOfParameters>
      <parameter id="U" sboTerm="SBO:0000008"/>
      <parameter id="V" sboTerm="SBO:0000025"/>
    </listOfParameters>
  </kineticLaw>
</reaction>

```

continuous simulator

$$v = [C] \times V \times \frac{[A]}{(U + [A])}$$

discrete simulator

$$v1 = \frac{(k_{-1} + V)}{U} * [A] * [C]$$

$$v2 = k_{-1} * [D]$$

$$v3 = V * [D]$$



- Dynamic update of the ontology
- Authentication mechanism
- Concurrent access
- Add/Obsoleting terms
- Add/delete relationships



MODIFY SBO:0000031

Briggs-Haldane equation

Definition

Rate-law presented in "G.E. Briggs and J.B.S. Haldane (1925) A note on the kinetics of enzyme action, Biochem. J., 19: 339-339". It is a general rate equation that does not require the restriction of equilibrium of Henri-Michaelis-Menten or irreversible reactions of Van Slyke, but instead make the hypothesis that the complex enzyme-substrate is in quasi-steady-state. Although of the same form than the Henri-Michaelis-Menten equation, it is semantically different since Km now represents a pseudo-equilibrium constant, and is equal to the ratio between the rate of consumption of the complex (sum of

MathML

```
<math xmlns="http://www.w3.org/1998/Math/MathML">
<semantics definitionURL="http://biomodels.net/SBO/#SBO:0000062">
  <lambda>
    <bvar><ci>
      definitionURL="http://biomodels.net/SBO/#SBO:0000025">kcat</ci></bvar>
    <bvar><ci>
      definitionURL="http://biomodels.net/SBO/#SBO:0000014">Et</ci></bvar>
    <bvar><ci>
```

Comment

Parent(s)

SBO:0000028 kinetics of unireactant enzymes (is a)

Done

- OBO Flat File, version 1.2
 - http://www.geneontology.org/GO.format.obo-1_2.shtml
- SBO-XML
 - http://www.ebi.ac.uk/sbo/docs/sboxml_schema.xsd
- Ontology Web Language (OWL)
 - <http://www.w3.org/2004/OWL/>



- OBO: Open Biomedical Ontologies
- Standard format used by Gene Ontology
- Tab delimited flat file
- Easily human readable
- Can be loaded into DAGEdit
- Encoding + MathML issues



[Term]

id: SBO:0000031

name: Briggs-Haldane equation

def: "Rate-law presented in \"G.E. Briggs and J.B.S. Haldane (1925) A note on the kinetics of enzyme action\", Biochem. J., 19: 339-339\".... the enzyme and the substrate.\n\n<math xmlns=\"http://www.w3.org/1998/Math/MathML\">\n<semantics definitionURL=\"http://biomodels.net/SBO/#SBO:0000062\">\n <lambda>\n <bvar><ci>\n definitionURL=\"http://biomodels.net/SBO/#SBO:0000025\">kcat</ci></bvar>\n <bvar><ci definitionURL=\"http://biomodels.net/SBO/#SBO:0000014\">Et</ci></bvar>\n <bvar><ci>\n definitionURL=\"http://biomodels.net/SBO/#SBO:0000015\">S</ci></bvar>\n <bvar><ci definitionURL=\"http://biomodels.net/SBO/#SBO:0000027\">Km</ci></bvar>\n <apply>\n <divide/>\n <apply>\n <times/>\n <ci>kcat</ci>\n <ci>Et</ci>\n <ci>S</ci>\n </apply>\n <plus/>\n <ci>Km</ci>\n <ci>S</ci>\n </apply>\n </lambda>\n</semantics>\n</math>" []

is_a: SBO:0000028 ! kinetics of unireactant enzymes



- [-] Systems Biology Ontology
 - [+] [P] event
 - [-] [P] mathematical expression
 - [i] obsolete mathematical expression
 - [-] [i] rate law
 - [+] [i] Hill equation
 - [+] [i] mass action kinetics
 - [-] [i] non-interacting reactant enzyme kinetics
 - [i] kinetics of non-interacting bireactant
 - [i] kinetics of non-interacting trireactant
 - [-] [i] kinetics of unireactant enzymes
 - [i] Briggs-Haldane equation
 - [+] [i] Henri-Michaelis Menten equation
 - [i] normalised kinetics of unireactant
 - [i] Van Slyke-Cullen equation
 - [+] [P] modelling framework
 - [+] [P] participant role
 - [+] [P] quantitative parameter
 - [+] Types
 - [+] Obsolete

Find terms

NOT has with

that

Advanced All Selected Children Obsoletes

ID **SBO:0000031**

Namespace

Term name

Text	Dbxrefs	Edit
Rate-law presented in "G.E. Briggs and J.B.S. Haldane (1925) A note on the kinetics of enzyme action, Biochem. J., 19: 339-339". It is a general rate equation that does not require the restriction of equilibrium of Henri-Michaelis-Menten or irreversible reactions of Van Slyke, but instead make the hypothesis that the complex enzyme-substrate is in quasi-steady-state. Although of the same form than the Henri-Michaelis-Menten equation, it is semantically different since Km now represents a pseudo-equilibrium constant, and is equal to the ratio between the rate of consumption of the complex (sum of dissociation of substrate and generation of product) and the association rate of the enzyme and the substrate.		

Synonyms

Select a synonym from the list to edit it, or press add to create a new synonym

- ### DAG Viewer
- [-] Systems Biology Ontology
 - [-] [P] mathematical expression
 - [-] [i] rate law
 - [-] [i] non-interacting reactant enzyme kinetics
 - [-] [i] kinetics of unireactant enzymes
 - [i] Briggs-Haldane equation

[Main](#)
[Criteria](#)
[Ontologies](#)
[Browse](#)
[Project](#)
[CVS](#)
[Subscribe](#)
[Contact](#)

OBO Ontologies

These are the ontologies currently lodged within OBO. Click on the column heading to sort the table and click on the ontology name for further information on the ontology.

A subset of the OBO ontologies have the tag **candidate OBO Foundry ontology** (abbreviated to **Foundry**). This designates the ontology as a candidate for the **OBO Foundry** project, a new paradigm for biomedical ontology development driven by a set of principles specifying best developmental practices. Please see the **OBO Foundry website** for more information.

Files tagged as **OBO CVS** are maintained in the OBO SourceForge CVS repository and are updated daily (where applicable).

Show only OBO Foundry ontologies

Domain	Prefix	Files	Format	Foundry	OBO CVS
Animal natural history and life history	ADW	protege source	Protege	no	no
Arabidopsis development	TAIR	arabidopsis development.obo	OBO	no	yes
Arabidopsis gross anatomy	TAIR	po anatomy.obo	OBO	no	yes
Biological imaging methods	FBbi	image.obo	OBO	no	yes
Biological process	GO	gene ontology.obo	OBO	yes	yes

■ ■ ■

Sequence types and features	SO	so.obo	OBO	yes	yes
Systems Biology	SBO	sbo.obo	OBO	no	no
UniProt taxonomy	[none]	Organism identification code list	plain text	no	no
Zebrafish anatomy and development	ZDB	zebrafish anatomy.obo	OBO	no	yes



- Easy to parse
- No encoding issue
- “Traditional” exchange format
- Human readable



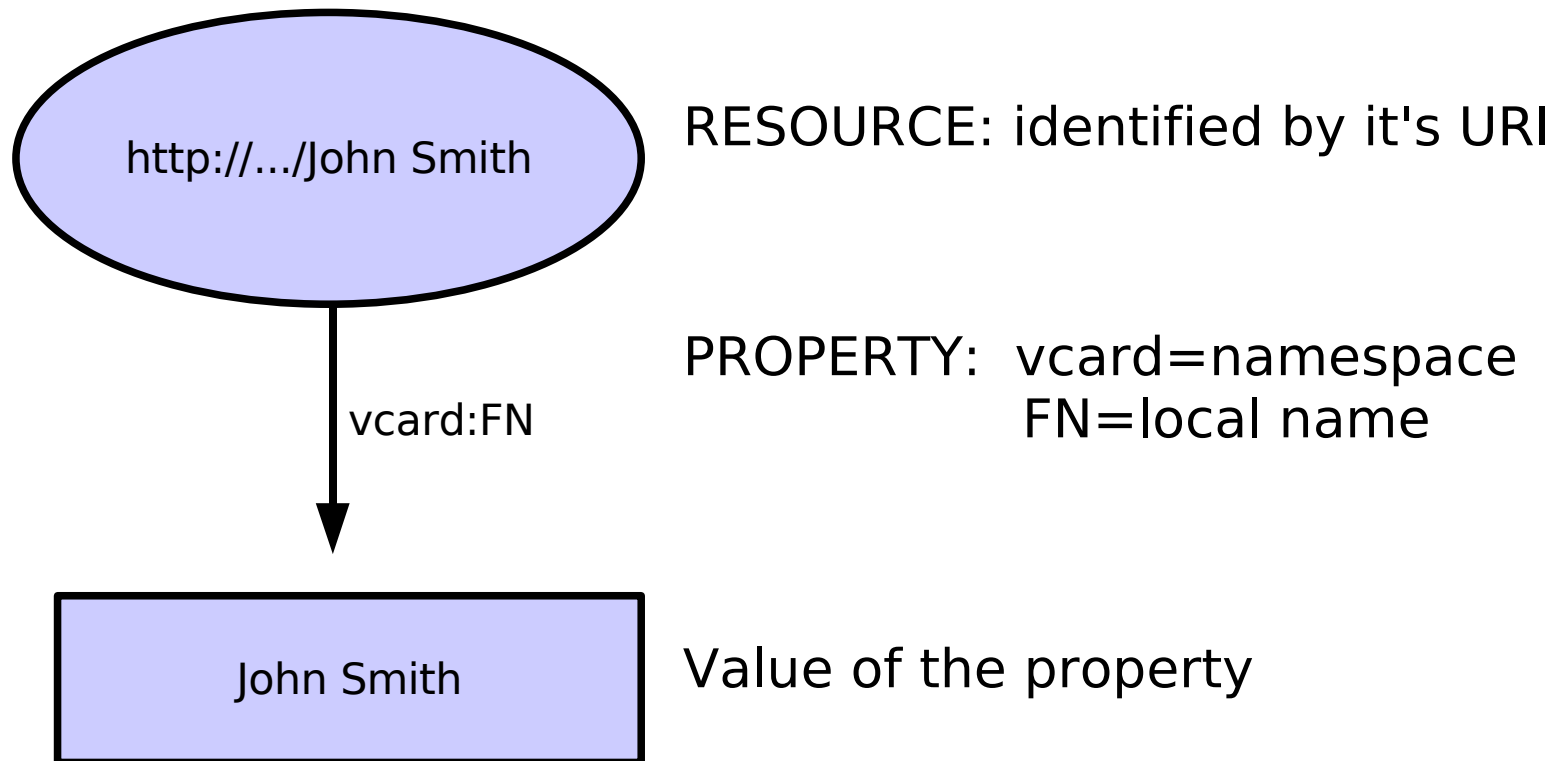
- First approach: OBO-XML
- Problems:
 - didn't match our requirements
 - no MathML support
 - no schema
- Development of SBO-XML
 - based on OBO-XML
 - design of our own XML schema
 - design of our own MathML subset schema (cf SBML)
 - Castor API
 - Includes validation



```
<Term>
  <id>SBO:0000031</id>
  <name>Briggs-Haldane equation</name>
  <namespace>Systems Biology Ontology</namespace>
  <def>
    <defstr>Rate-law presented ....</defstr>
  </def>
  <math xmlns="http://www.w3.org/1998/Math/MathML">
    <semantics definitionURL="http://biomodels.net/SBO/#SBO:0000062">
      <lambda>
        <bvar>
          <ci definitionURL="http://biomodels.net/SBO/#SBO:0000025">kcat</ci>
        </bvar>
        ...
      <apply>
        ...
      </apply>
    </lambda>
  </semantics>
</math>
  <is_a>SBO:0000028</is_a>
</Term>
```



- Vocabulary extension of RDF



- More complex description of classes, properties



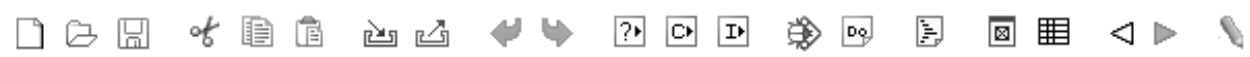
- Jena API
- is_a -> **subClassOf**
- part_of -> general transitive property part of and restriction on this property

```
<rdfs:subClassOf>  
  
  <owl:Restriction>  
  
    <owl:someValuesFrom rdf:resource="#SBO_0000000"/>  
  
    <owl:onProperty>  
  
      <owl:TransitiveProperty rdf:about="#part_of"/>  
  
    </owl:onProperty>  
  
  </owl:Restriction>  
  
</rdfs:subClassOf>
```



```
<owl:Class rdf:ID="SBO_0000031">
  <rdfs:subClassOf>
    <owl:Class rdf:about="#SBO_0000028"/>
  </rdfs:subClassOf>
  <rdfs:label rdf:parseType="Literal">
    <math xmlns="http://www.w3.org/1998/Math/MathML">
      ...
    </math>
  </rdfs:label>
  <rdfs:comment>Rate-law presented in "G.E. Briggs ...
  </rdfs:comment>
  <rdfs:label>Briggs-Haldane equation</rdfs:label>
</owl:Class>
```





OWLClasses Properties Forms Individuals Metadata

SUBCLASS RELATIONSHIP

For Project: SBO_OWL

Asserted Hierarchy

- owl:Thing
 - SBO_0000000
 - SBO_0000002
 - SBO_0000003
 - SBO_0000004
 - SBO_0000064
 - SBO_0000001
 - SBO_0000012
 - SBO_0000150
 - SBO_0000028
 - SBO_0000029
 - SBO_0000030
 - SBO_0000031
 - SBO_0000199
 - SBO_0000151
 - SBO_0000152
 - SBO_0000192
 - SBO_0000005
 - SBO_0000231

CLASS EDITOR

For Class: SBO_0000031 (instance of owl:Class)

Name SameAs DifferentFrom

SBO_0000031

rdfs:comment
 Rate-law presented in "G.E. Briggs and J.B.S. Haldane (1925) A note on the kinetics of enzyme action, Biochem. J., 19: 339-339". It is a general rate equation that does not require the restriction of equilibrium of Henri-Michaelis-Menten or irreversible reactions of Van Slyke, but instead make the

Annotations

Property	Value	Lang
rdfs:comment	Rate-law presented in "C...	
rdfs:label	<math xmlns="http://w...	
rdfs:label	Briggs-Haldane equation	

Asserted Inferred

Asserted Conditions

- SBO_0000028 — NECESSARY & SUFFICIENT
- SBO_0000028 — NECESSARY
- ∃ part_of SBO_0000000 [from SBO_0000064] — INHERITED

Properties

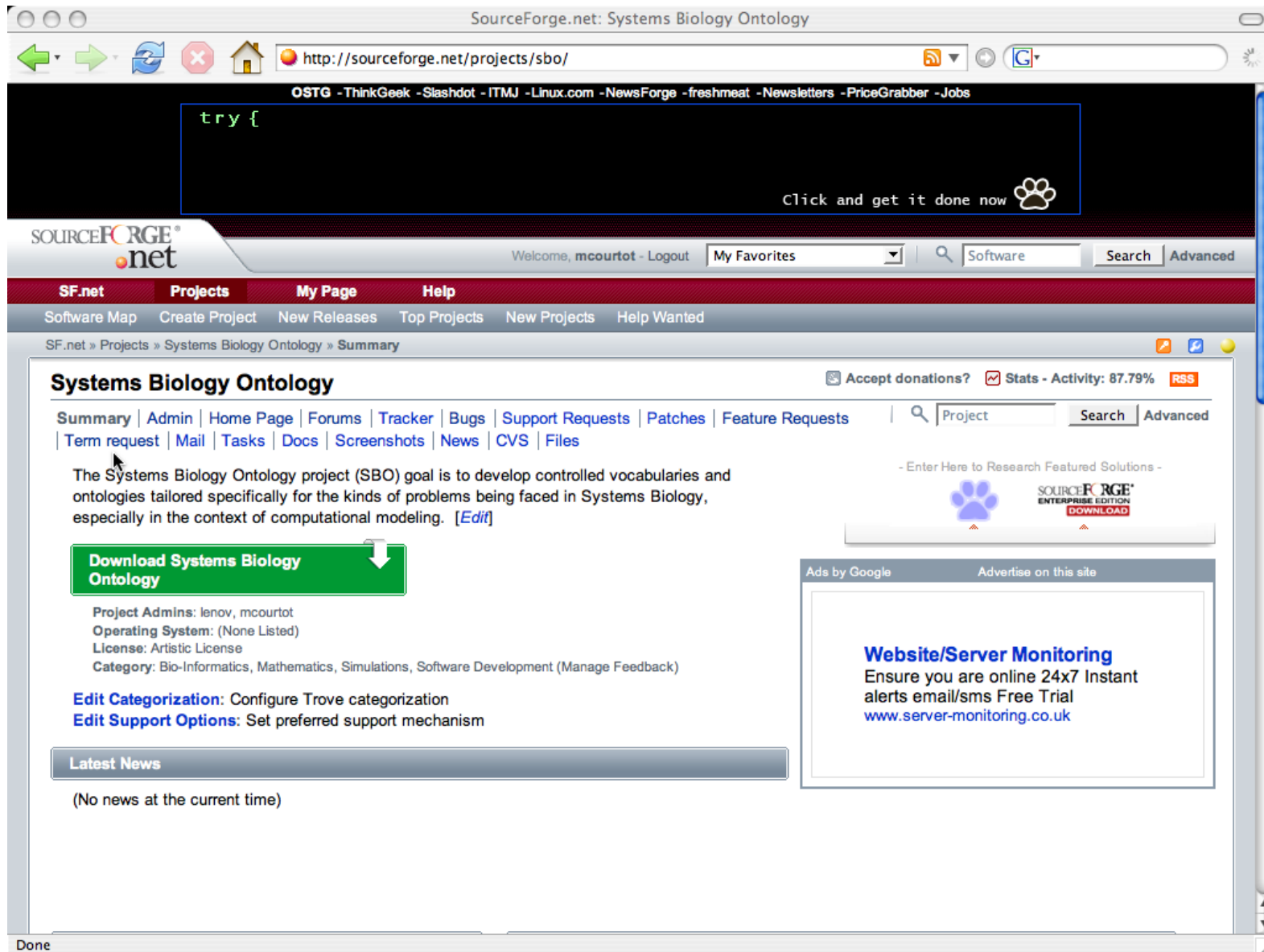
- part_of
 - SBO_0000000 [from SBO_0000064]

Disjoints

-

- Next step
- Build on Apache Axis and Castor
- Axis: communication
- Castor: data-binding + validation





The screenshot shows a web browser window displaying the SourceForge project page for Systems Biology Ontology. The browser's address bar shows the URL `http://sourceforge.net/projects/sbo/`. The page features a dark header with a code editor snippet containing `try {` and a button that says "Click and get it done now" with a paw print icon. Below the header is the SourceForge logo and a navigation bar with links for "SF.net", "Projects", "My Page", and "Help". The main content area is titled "Systems Biology Ontology" and includes a search bar, a list of navigation links (Summary, Admin, Home Page, Forums, Tracker, Bugs, Support Requests, Patches, Feature Requests, Term request, Mail, Tasks, Docs, Screenshots, News, CVS, Files), and a description of the project's goal. A prominent green button labeled "Download Systems Biology Ontology" is visible. To the right, there is an advertisement for "Website/Server Monitoring" with the text "Ensure you are online 24x7 Instant alerts email/sms Free Trial www.server-monitoring.co.uk". The browser's status bar at the bottom shows "Done".


<http://sourceforge.net/projects/sbo/>



SourceForge.net: term request

http://sourceforge.net/tracker/?group_id=174625&atid=871591

```
try { installTomcat(); integrateAxis(); addSecurity(); throwInMessaging();
}
catch
```

Click and get it done now 

WELCOME, mcourtot - Logout My Favorites Software Search Advanced

SF.net Projects My Page Help

Software Map Create Project New Releases Top Projects New Projects Help Wanted

SF.net » Projects » Systems Biology Ontology » Tracker » term request » Browse Tracker Items

Systems Biology Ontology

Accept donations? Stats - Activity: 87.79% [RSS](#)

[Summary](#) | [Admin](#) | [Home Page](#) | [Forums](#) | [Tracker](#) | [Bugs](#) | [Support Requests](#) | [Patches](#) | [Feature Requests](#) | [Term request](#) | [Mail](#) | [Tasks](#) | [Docs](#) | [Screenshots](#) | [News](#) | [CVS](#) | [Files](#)

[Submit New](#) | [Browse](#) | [Reporting](#) | [Admin](#)

Assignee: (?) Status: (?) Category: (?) Group: (?)

Show only: Submitter username (show mine): Summary keyword:

Sort By: (?)

List of suggested SBO term creations or modification.

Request ID	Summary	Open Date	Priority	Status	Assigned To	Submitted By
<input type="checkbox"/> 1557038	protonation	2006-09-12 13:57	5	Closed	lenov	lenov
<input type="checkbox"/> 1557035	cleavage as a child of conversion	2006-09-12 13:55	5	Closed	lenov	lenov
<input type="checkbox"/> 1557033	group addition and removal	2006-09-12 13:53	5	Closed	lenov	lenov
<input type="checkbox"/> 1542119	Add ionisation	* 2006-08-17 20:13	5	Closed	lenov	lenov
<input type="checkbox"/> 1542118	Add acid-base reaction	* 2006-08-17 20:12	5	Closed	lenov	lenov

[Check All](#) - [Clear All](#)

Admin: If you wish to apply changes to all items selected above, use these controls to change their properties and click once on "Mass Update".

Category: (?) Group: (?)

http://sourceforge.net/mail/?group_id=174625



- Andrew Finney, Michael Hucka
- SBO concepts and structure
- Chen Li, Nicolas Rodriguez
- SBO browser/Editor
- SBML, OBO and OWL communities
- National Institute of General Medical Sciences



