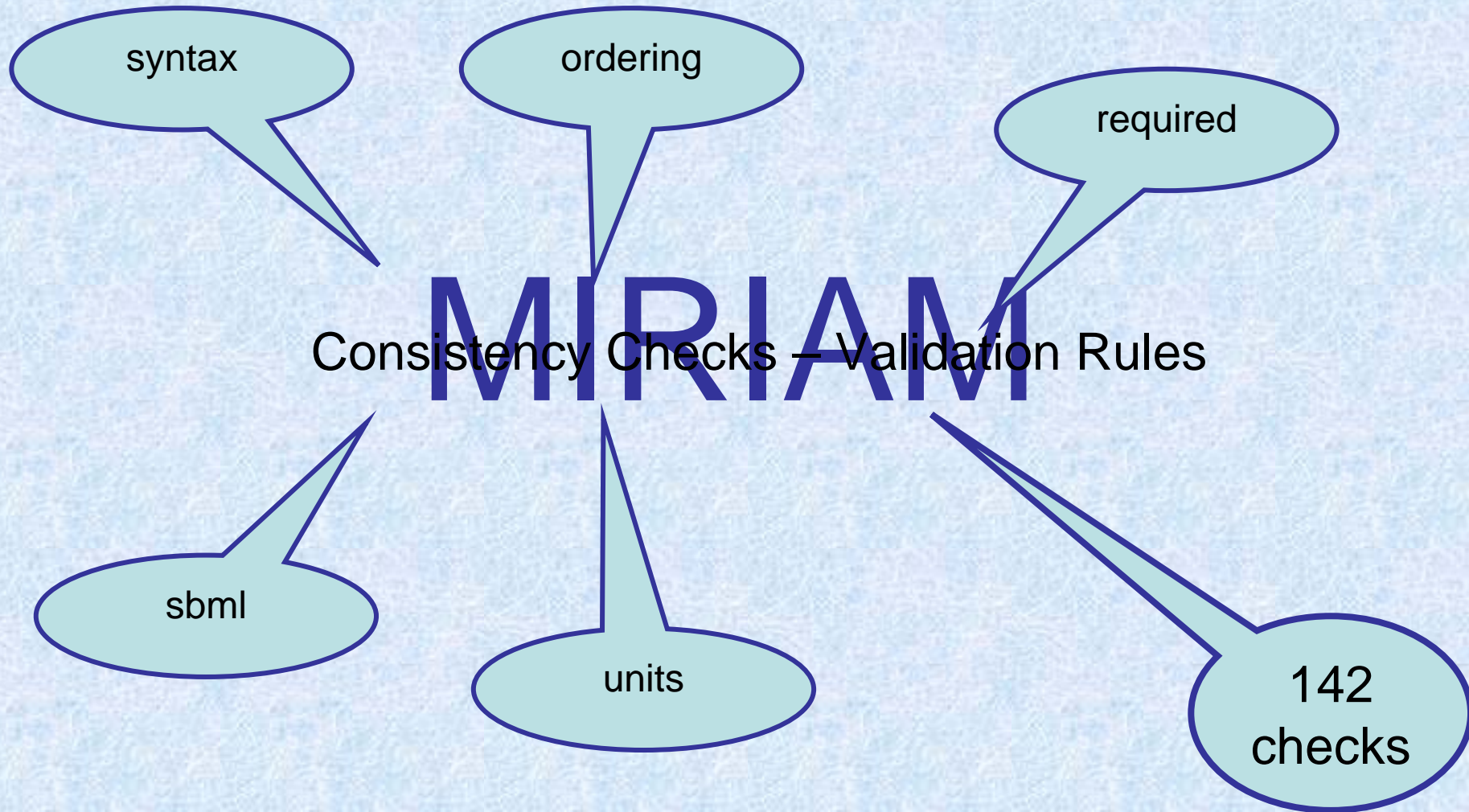


# libSBML interface to SBO and MIRIAM

Sarah Keating

The model must comply with the encoding standard.

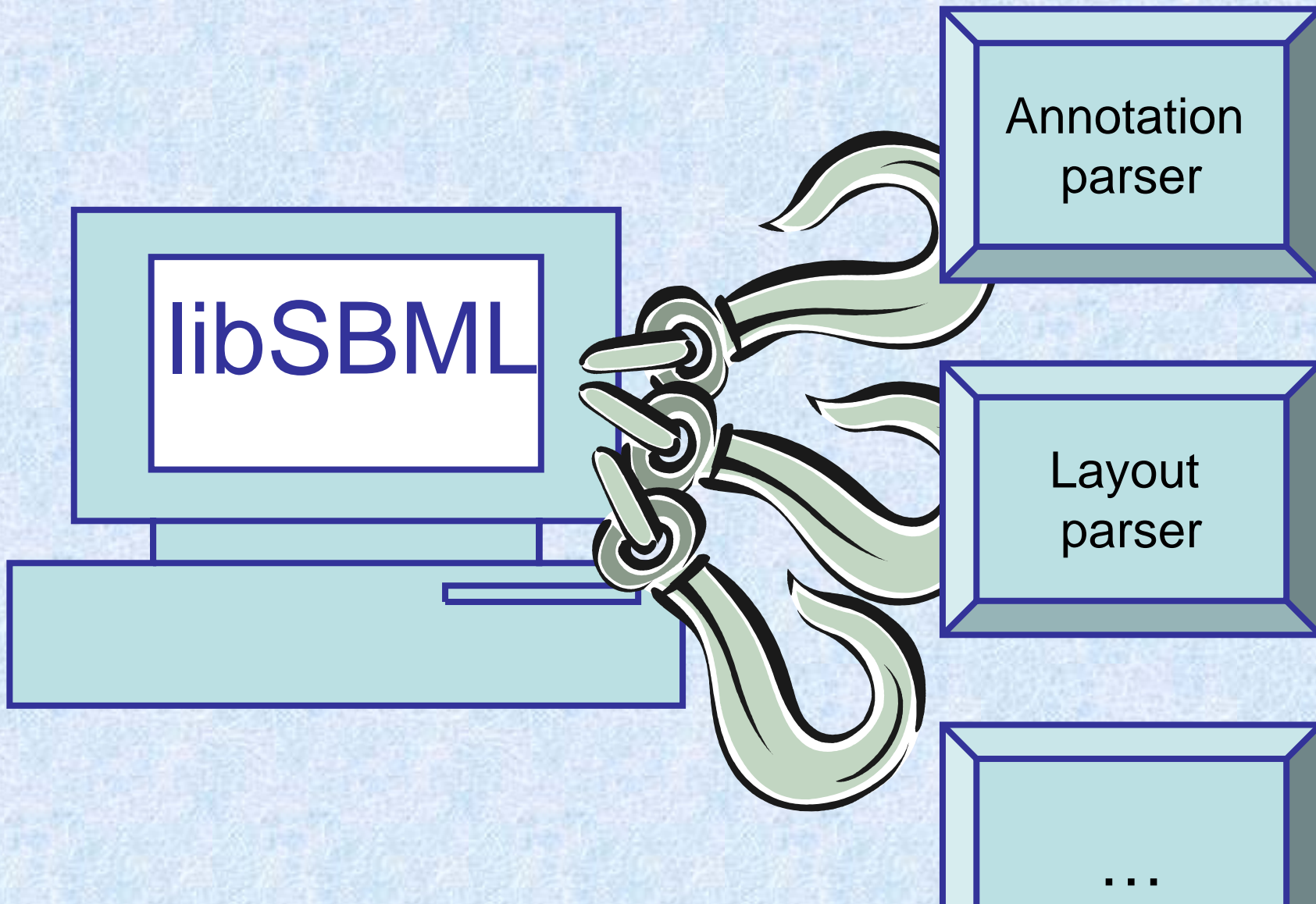


# External resource annotation

## Object model for annotations

CVTerm  
term.add  
term.add  
Species.

```
<species id="calcium_calmodulin" metaid="cacam">
  <annotation>
    <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
      xmlns:bqbiol="http://biomodels.net/biology-qualifiers/" >
      <rdf:Description rdf:about="#cacam">
        <bqbiol:hasVersion>
          <rdf:Bag
            <rdf:li rdf:resource="http://www.uniprot.org/#Q9UQM7"/>
            <rdf:li rdf:resource="http://www.uniprot.org/#Q13554"/>
          </rdf:Bag>
        </bqbiol:hasVersion>
      </rdf:Description>
    </rdf:RDF>
  </annotation>
</species>
```



libSBML

Annotation  
parser

Layout  
parser

...

## Attribution annotation

```
<dc:creator rdf:parseType="Resource">
```

```
<rdf:Bag>
```

```
<rdf:li rdf:parseType="Resource">
```

```
[[
```

```
+++
```

```
<vCard:N rdf:parseType="Resource">
```

```
<vCard:Family>F
```

```
<vCard:Given>G
```

```
</vCard:N>
```

```
+++
```

```
[<vCard:EMAIL>E
```

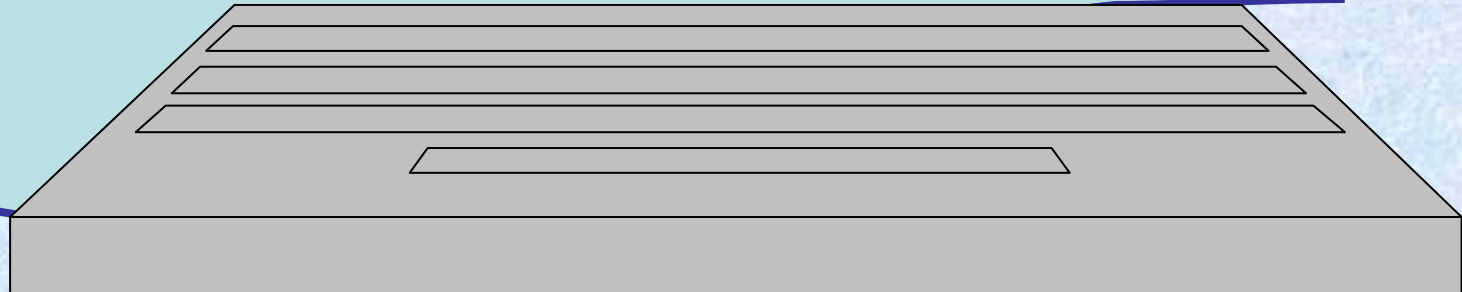
Creator

{

std::string family\_name;

std::string given\_name;

...



All classes representing SBML components with attribute sboTerm have following:

```
class KineticLaw
{
    ...
    int getSBOTerm () const;
    ...
    bool isSetSBOTerm () const;
    ...
    void setSBOTerm (int sboTerm);
    ...
    void unsetSBOTerm ();

protected:
    ...
    int      mSBOTerm;
};
```

getter/setter  
functions

SBO

storage



sboTerm="SBO:0000064"



read string "SBO:0000064"



check string

size = 11

"SBO:"

digits



convert string to an int



mSBOTerm = 64

validation  
error

C:\ "c:\libsml\win32\bin\validateSBMLD.exe" 10308-fail-01-01.xml

```
filename: 10308-fail-01-01.xml
file size: 485
read time (ms): 94
error(s): 1
```

1 Error(s):

5: (10308) The value of a sboTerm attribute must have the data type SBOTerm, which is a string consisting of the characters 'S', 'B', 'O', ':' followed by exactly seven digits. (References: L2U2 Section 3.1.8.)

Press any key to continue



# SBO Ontology Browser

SBO::Systems Biology Ontology

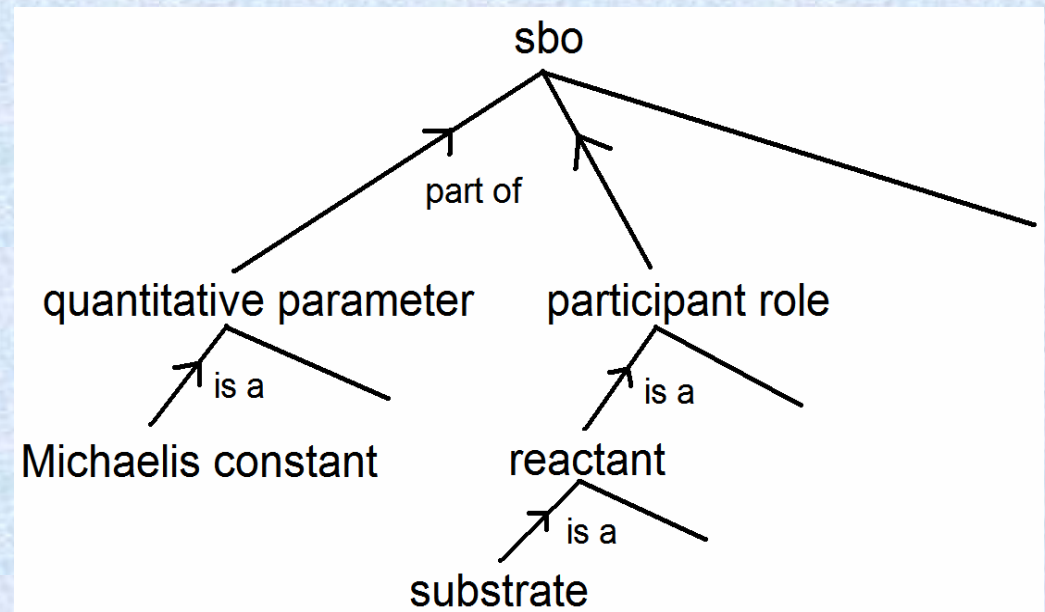
+  Refresh tree

sbo

- +  **P** [quantitative parameter](#)
- +  **P** [modelling framework](#)
- +  **P** [mathematical expression](#)
- +  **P** [event](#)
- P** [participant type](#)
  - I** [participant functional type](#)
    - +  **I** [reactant](#)
    - I** [product](#)
    - I** [modifier](#)
      - I** [catalyst](#)
      - I** [inhibitor](#)
        - I** [competitive inhibitor](#)
        - I** [non-competitive inhibitor](#)
      - I** [potentiator](#)
      - I** [messenger RNA](#)
    - I** [functional compartment](#)
  - +  **I** [participant physical type](#)
  - I** [obsolete participant type](#)

**I**: "is a" relationship

**P**: "part-of" relationship



The value of the sboTerm field on a Model must be an SBO identifier (<http://www.biomodels.net/SBO/>) referring to a modeling framework defined in SBO (i.e., terms derived from SBO:0000004, “modeling framework”). (References: L2V2 Section 4.2.1.)

The value of the sboTerm field on a KineticLaw must be an SBO identifier (<http://www.biomodels.net/SBO/>) referring rate law defined in SBO (i.e., terms derived from SBO:0000001, “rate law”). (References: L2V2 Section 4.13.5.)



Web Services

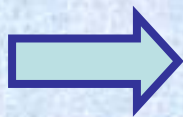
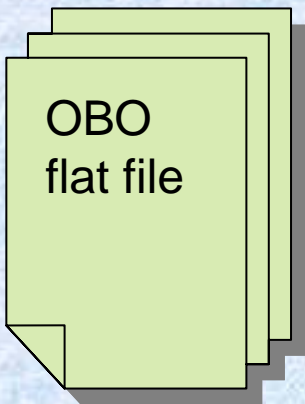
Hard code tree

```
/* create a map of parent-child sbo terms */
```

```
typedef multimap<int, int>          ParentMap;
```

```
typedef ParentMap::const_iterator  ParentIter;
```

```
typedef pair<ParentIter, ParentIter> ParentRange;
```

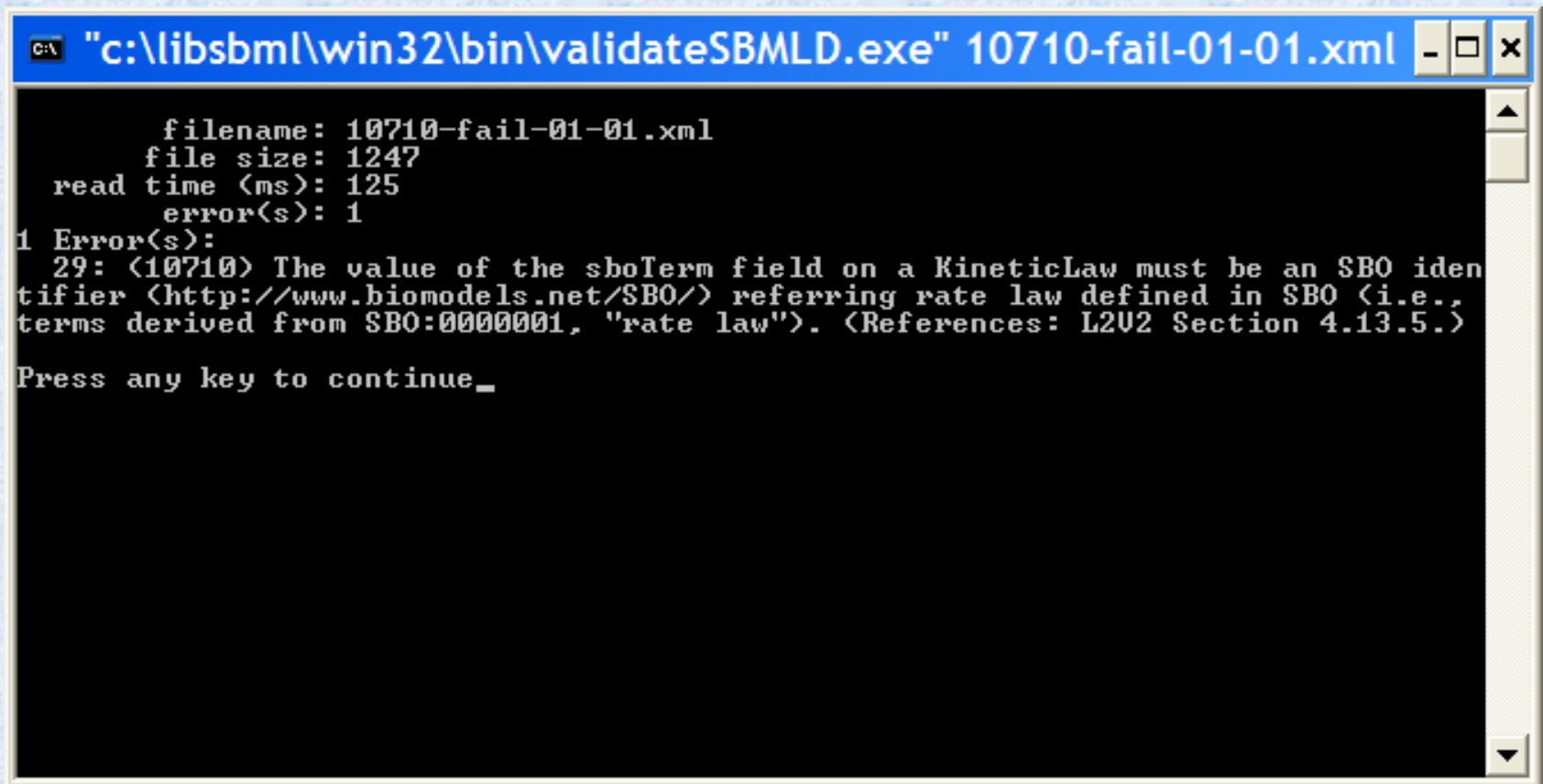


```
void  
SBML::populateSBOTree()  
{  
    mParent.insert( make_pair( 1, 64) );  
    mParent.insert( make_pair( 3, 235) );  
    mParent.insert( make_pair( 5, 64) );  
    ...  
}
```

isModellingFramework(Model->getSBOTerm())

isRateLaw(KineticLaw->getSBOTerm())

...



```
C:\ "c:\libsml\win32\bin\validateSBMLD.exe" 10710-fail-01-01.xml

      filename: 10710-fail-01-01.xml
      file size: 1247
      read time (ms): 125
      error(s): 1
1 Error(s):
 29: (10710) The value of the sboTerm field on a KineticLaw must be an SBO identifier (http://www.biomodels.net/SBO/) referring rate law defined in SBO (i.e., terms derived from SBO:0000001, "rate law"). (References: L2U2 Section 4.13.5.)
Press any key to continue_
```

What next ??

interface to  
"libSBO"

add / substitute  
MathML ?

?????



# When ??



POSSIBLE