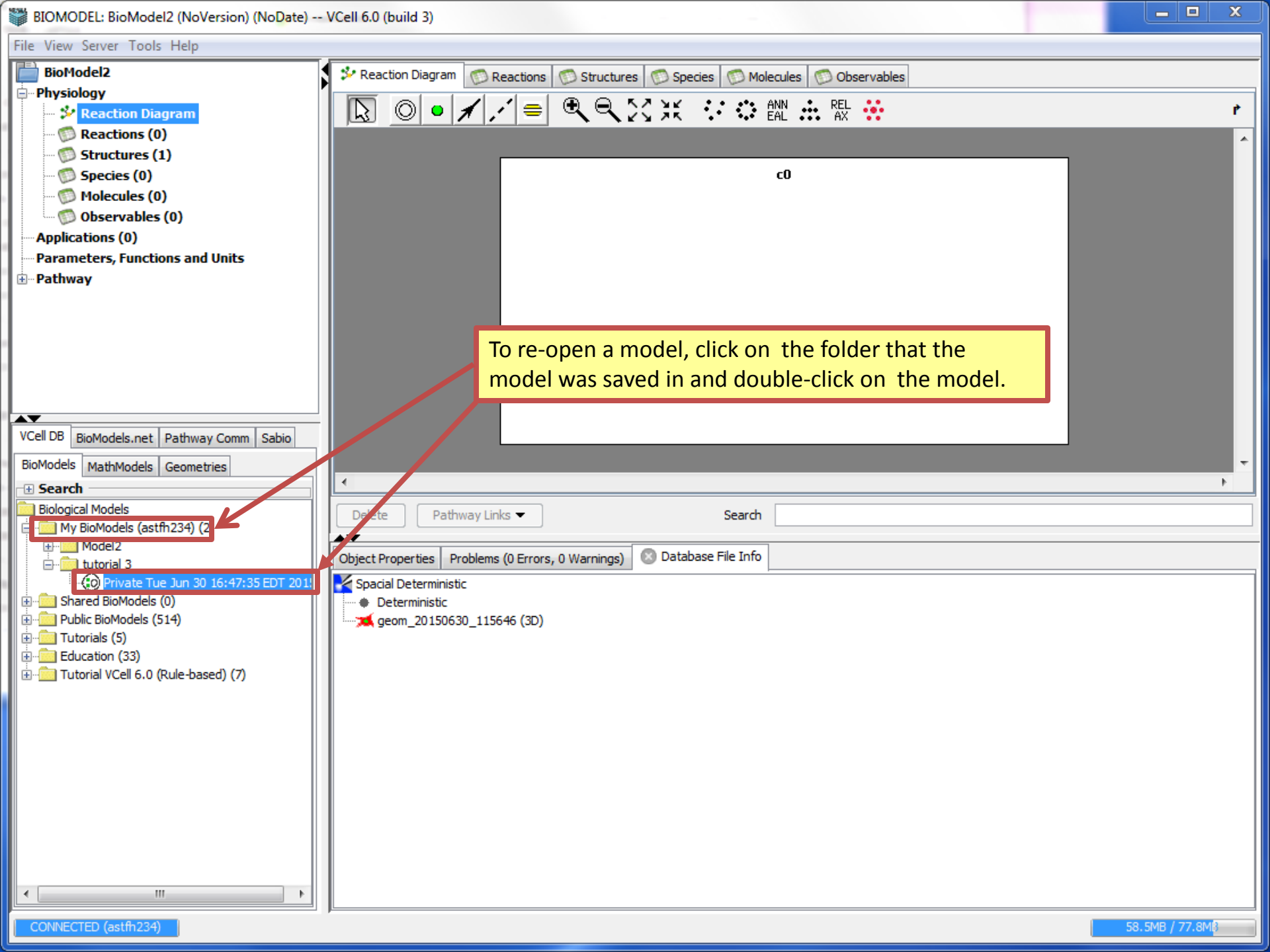
VCell Tutorial

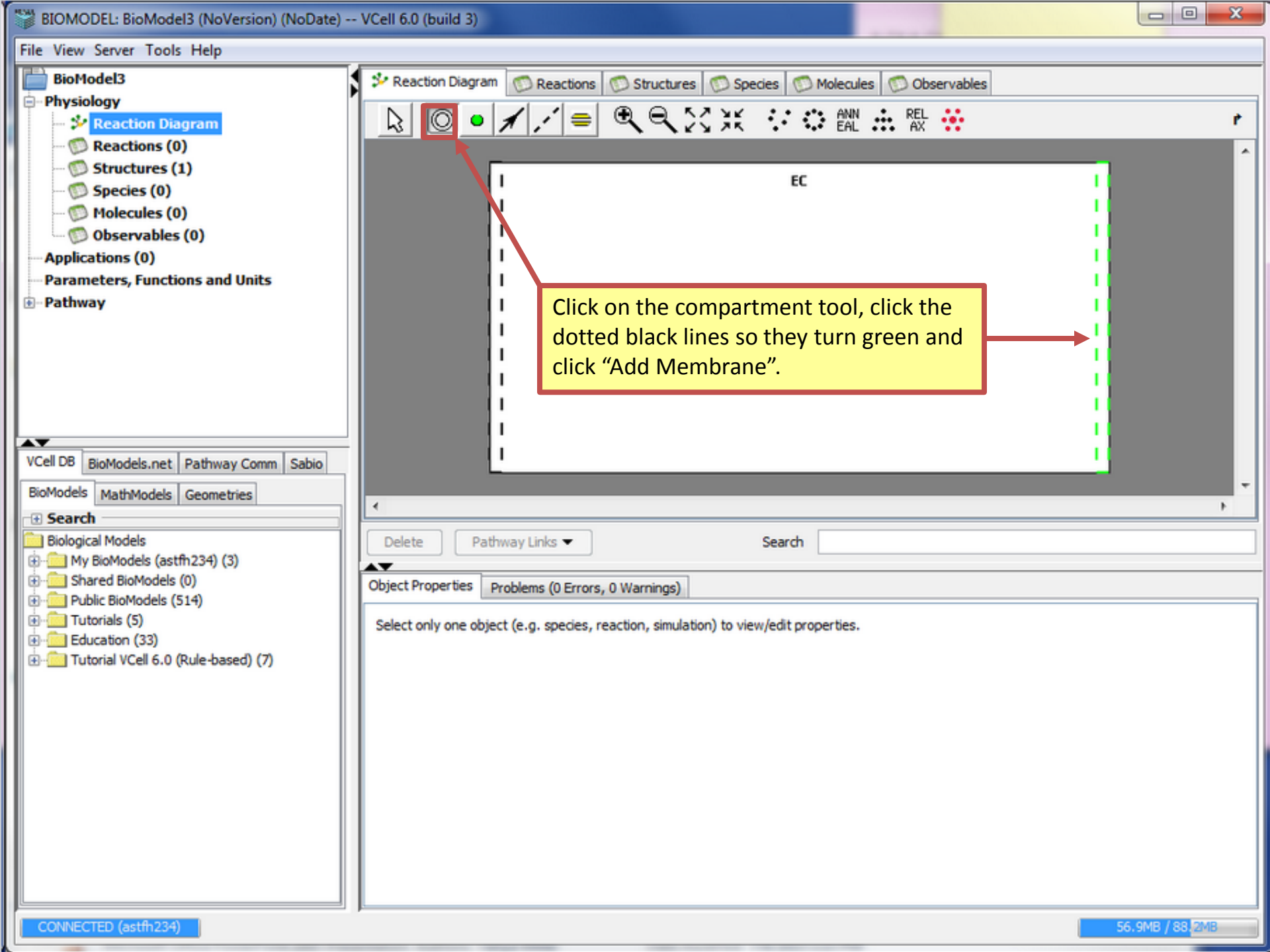
PH-GFP binding to PIP2 and IP3

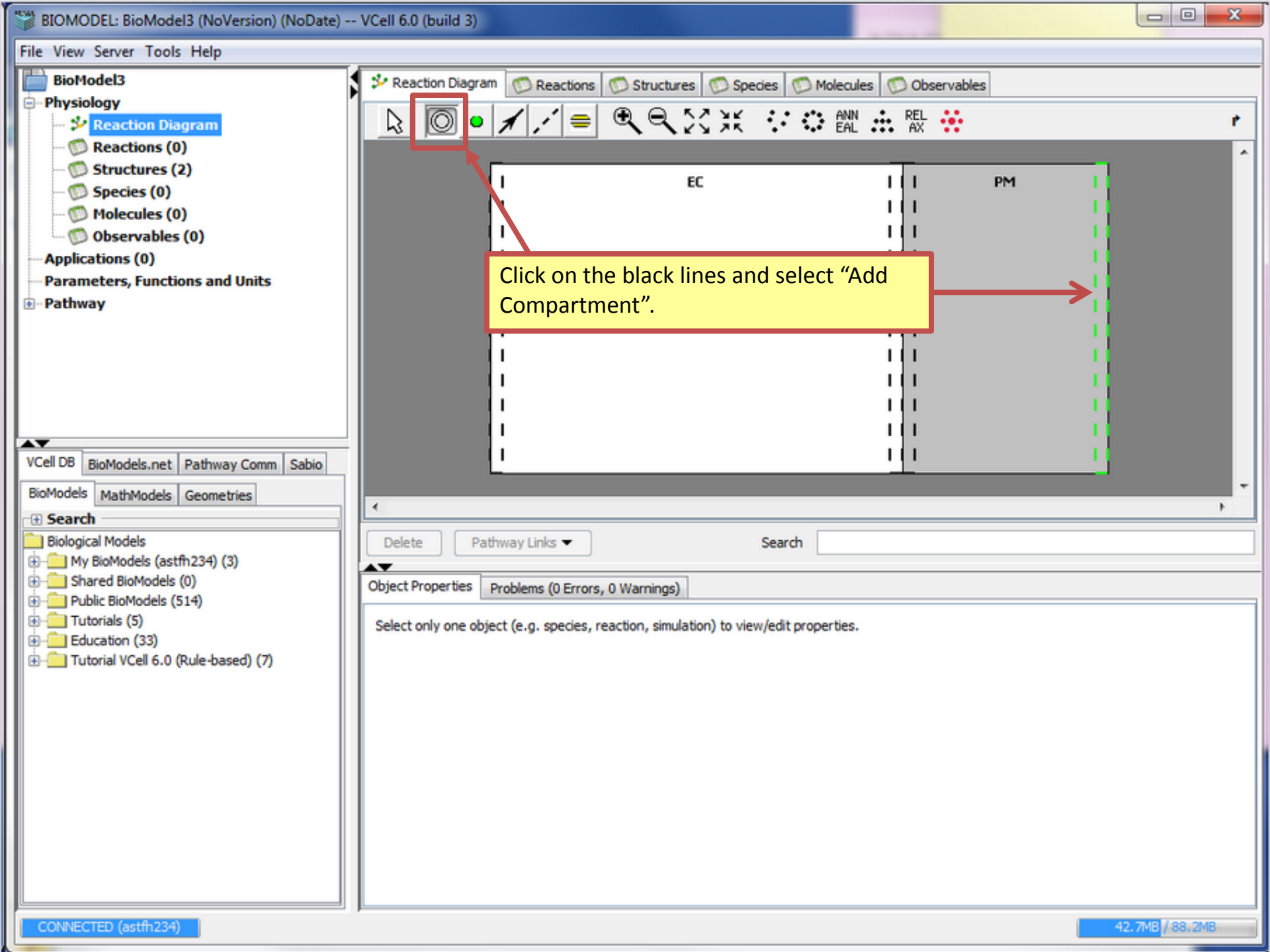
Create a biomodel and 3D spatial (PDE) application to simulate pleckstrin homology domain (PH-GFP) reporter of PIP_2 to IP_3 conversion.

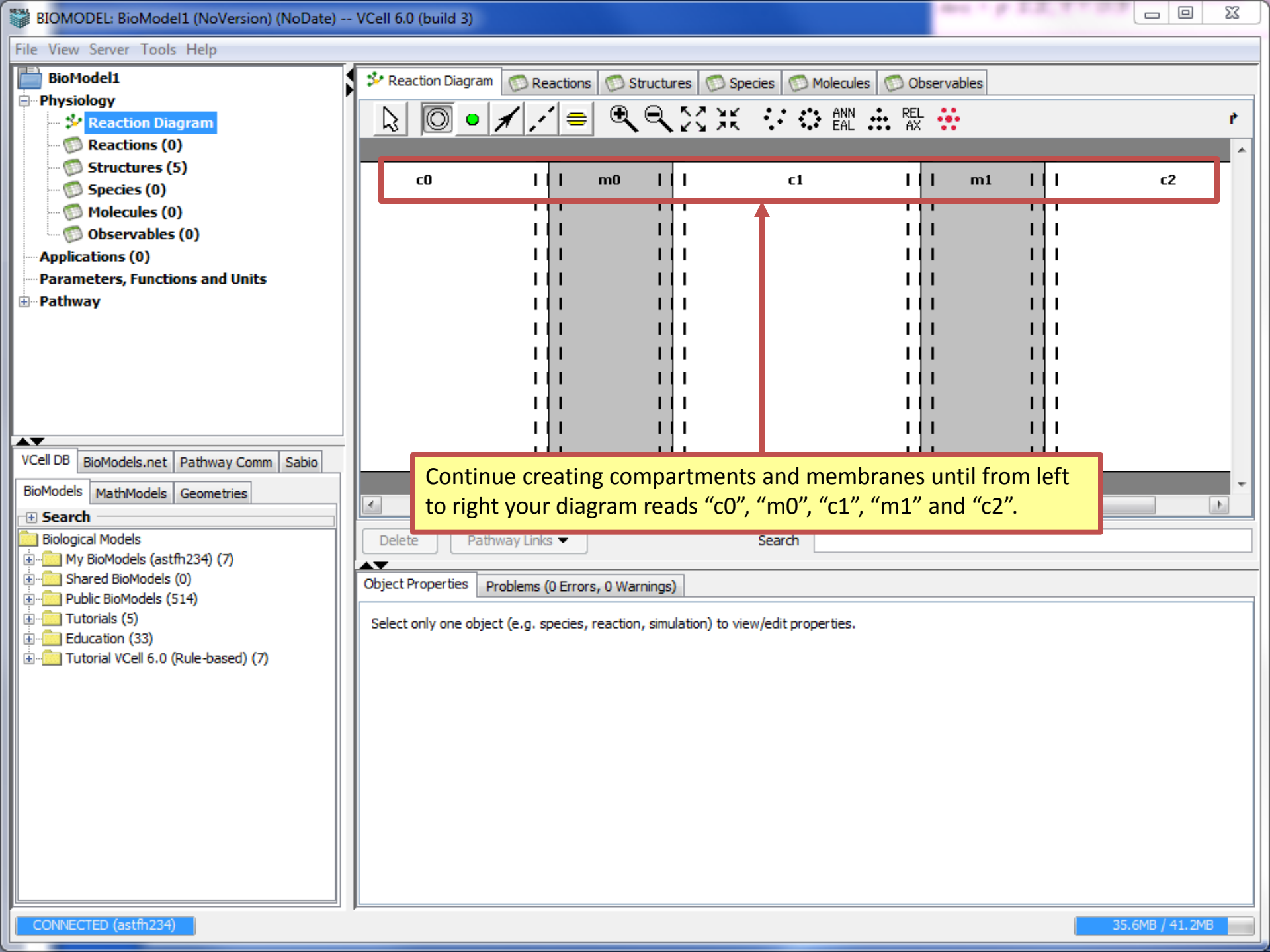
In this tutorial…

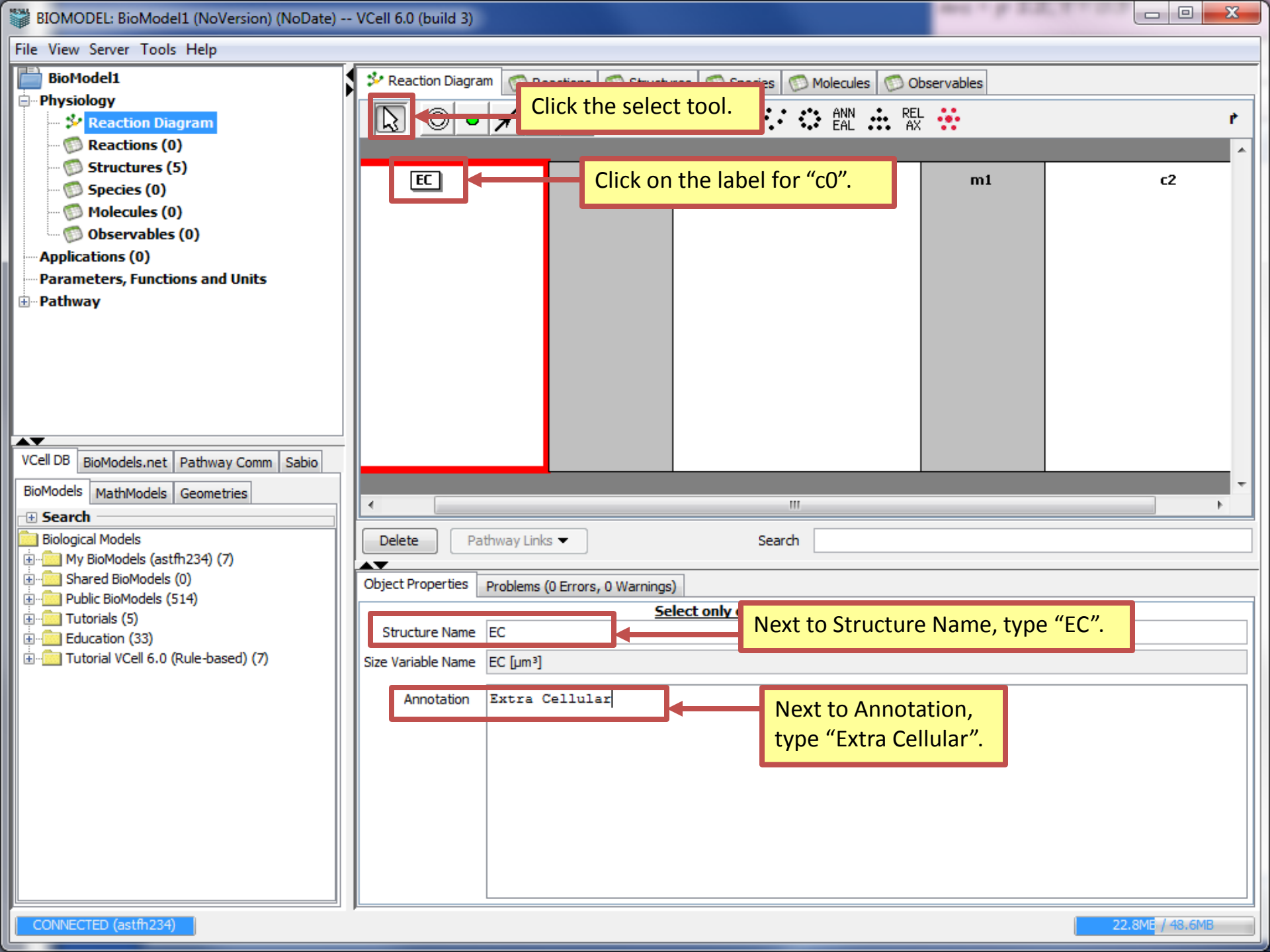
- Create a biomodel with reactions involving membrane and volume species.
- Create a compartmental (ODE) application that uses events to include time-dependent triggers.
- Create a spatial deterministic (PDE) application of a model using analytic equations to create a 3D geometry
- Define initial concentrations that are non-uniform in space and create timed events in spatial models using Boolean expressions
- Create output functions for more complex analysis of simulation results, e.g. to sum all fluorescent species in a compartment.

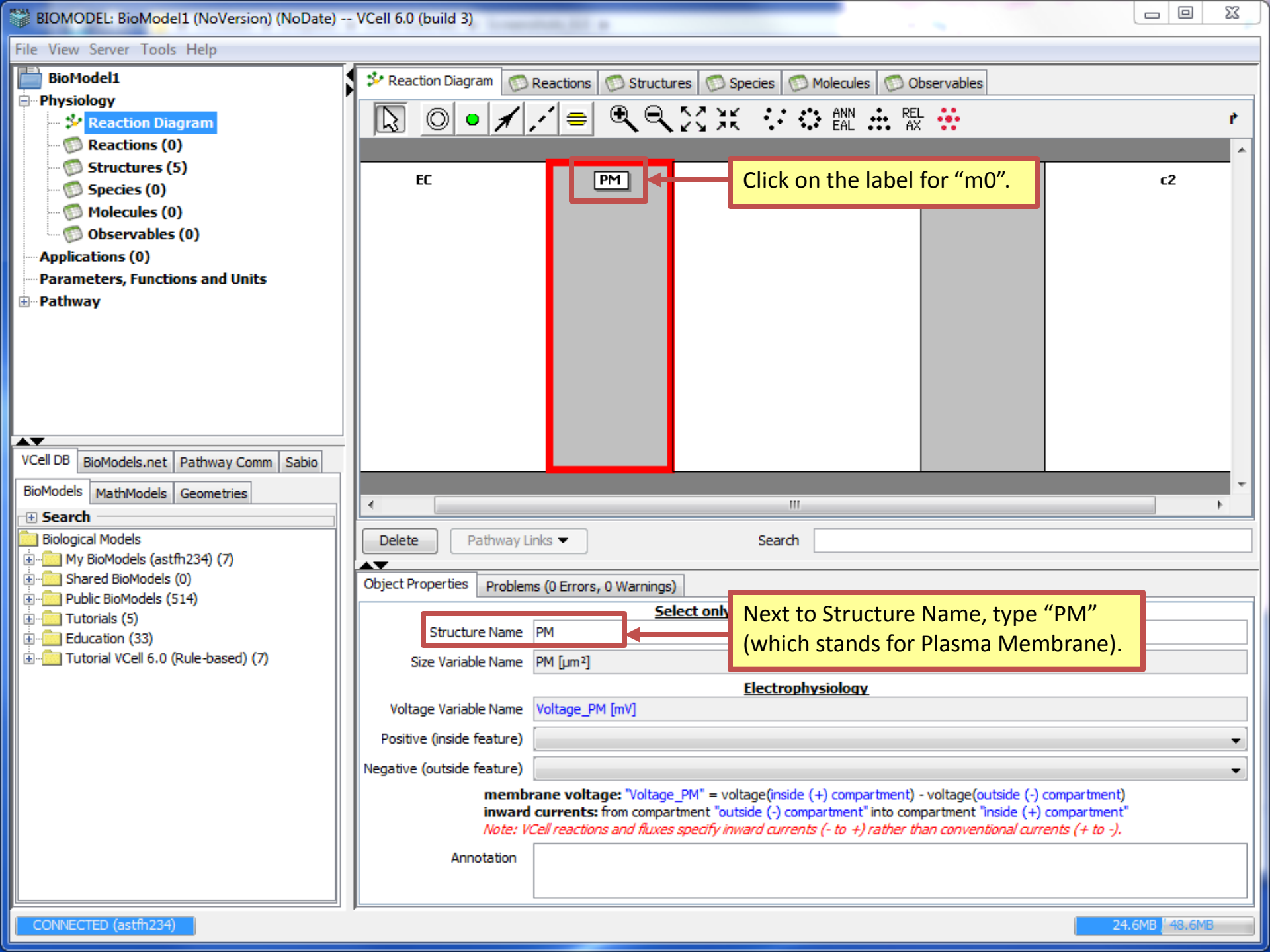

BIOMODEL: BioModel2 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel2
Physiology
Reaction Diagram
Reactions (0)
Structures (1)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
c0
To re-open a model, click on the folder that the model was saved in and double-click on the model.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (2
Model2
tutorial 3
Private Tue Jun 30 16:47:35 EDT 201
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Database File Info
Spacial Deterministic
Deterministic
geom_20150630_115646 (3D)
CONNECTED (astfh234)
58.5MB / 77.8MB

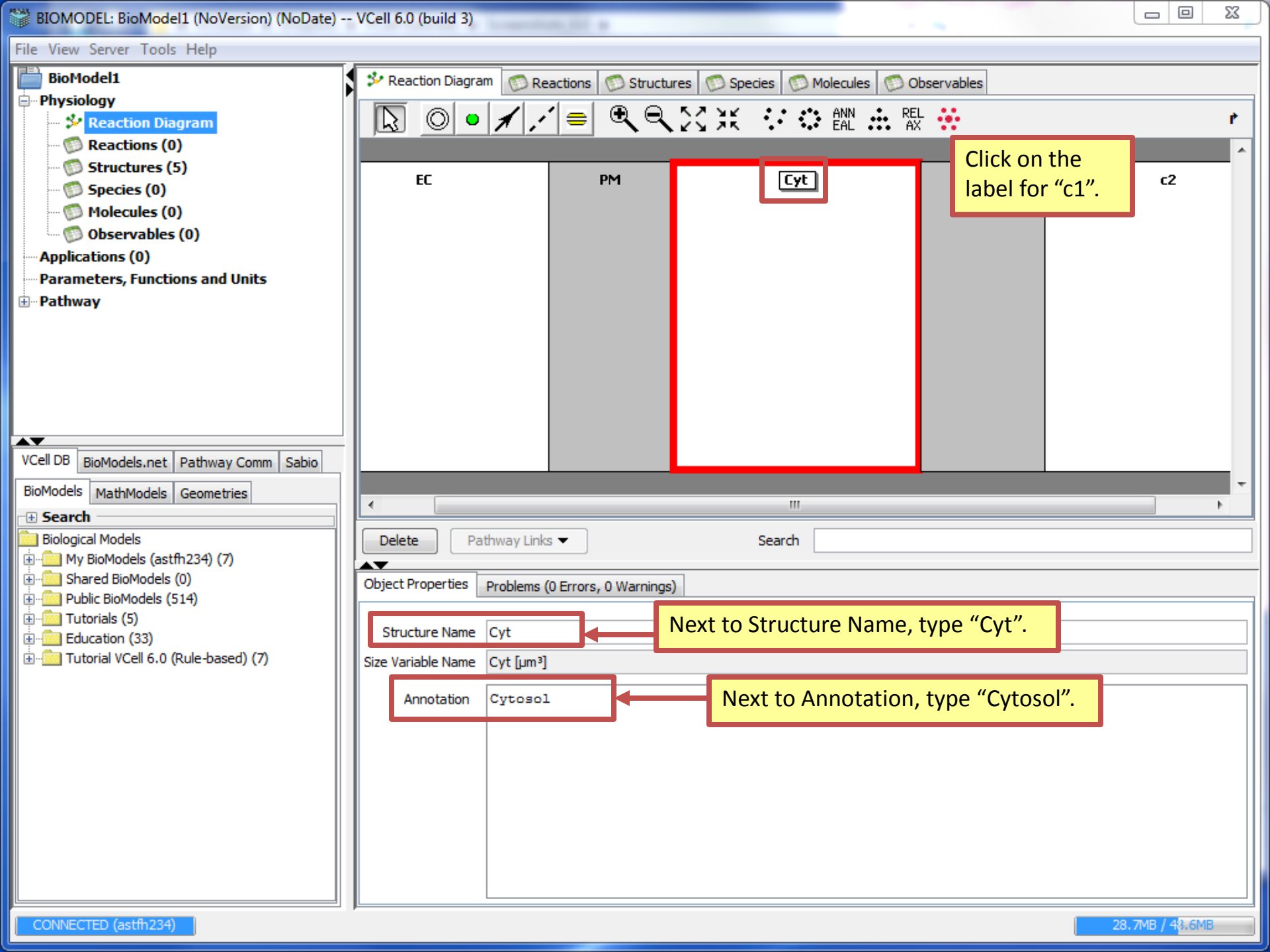

BIOMODEL: BioModel3 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel3
Physiology
Reaction Diagram
Reactions (0)
Structures (1)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
Click on the compartment tool, click the dotted black lines so they turn green and click “Add Membrane”.
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (3)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
56.9MB / 88.2MB

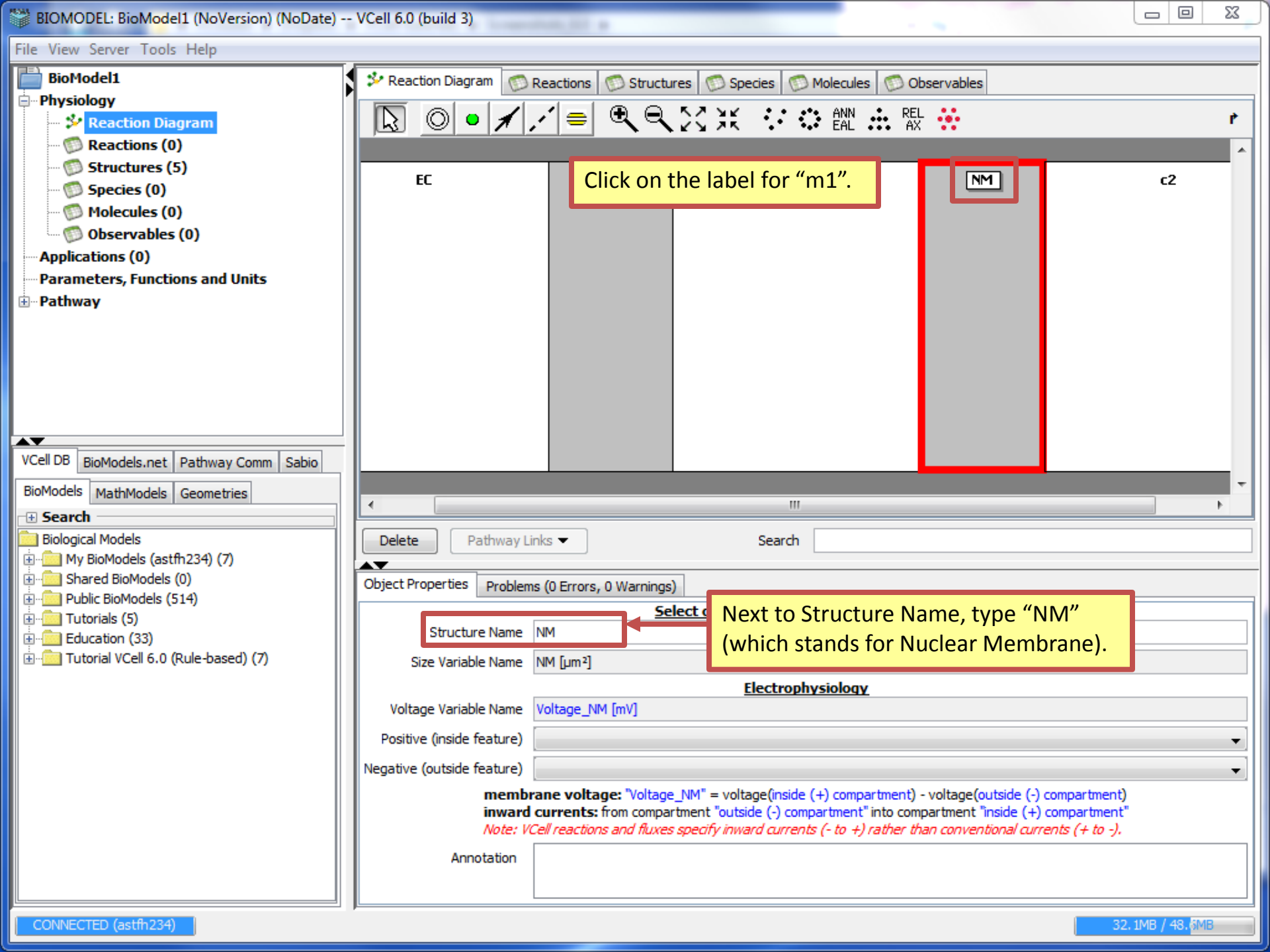

BIOMODEL: BioModel3 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel3
Physiology
Reaction Diagram
Reactions (0)
Structures (2)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Click on the black lines and select “Add Compartment”.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (3)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
42.7MB / 88.2MB

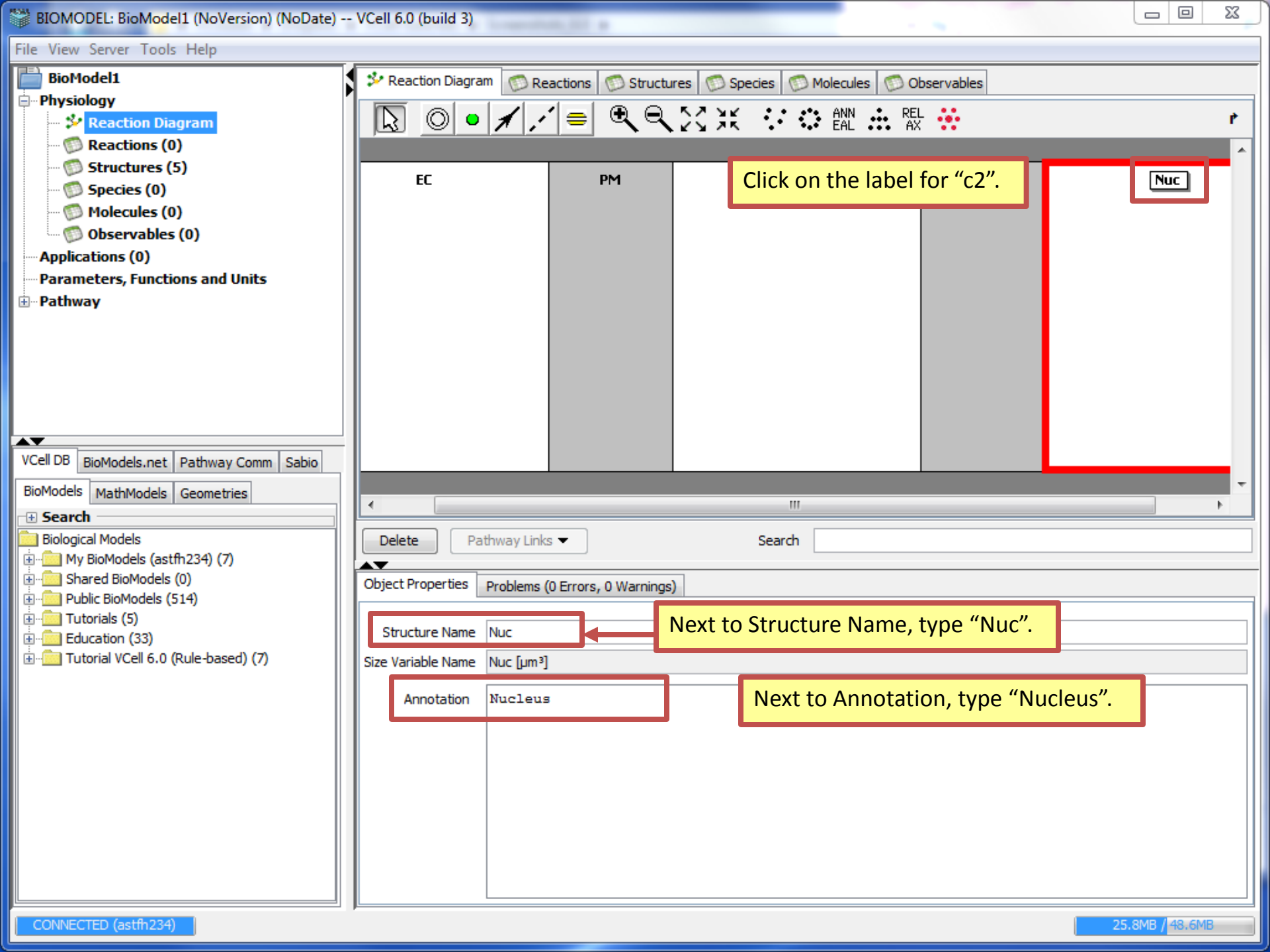

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
c0
m0
c1
m1
c2
Continue creating compartments and membranes until from left to right your diagram reads “c0”, “m0”, “c1”, “m1” and “c2”.
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
35.6MB / 41.2MB

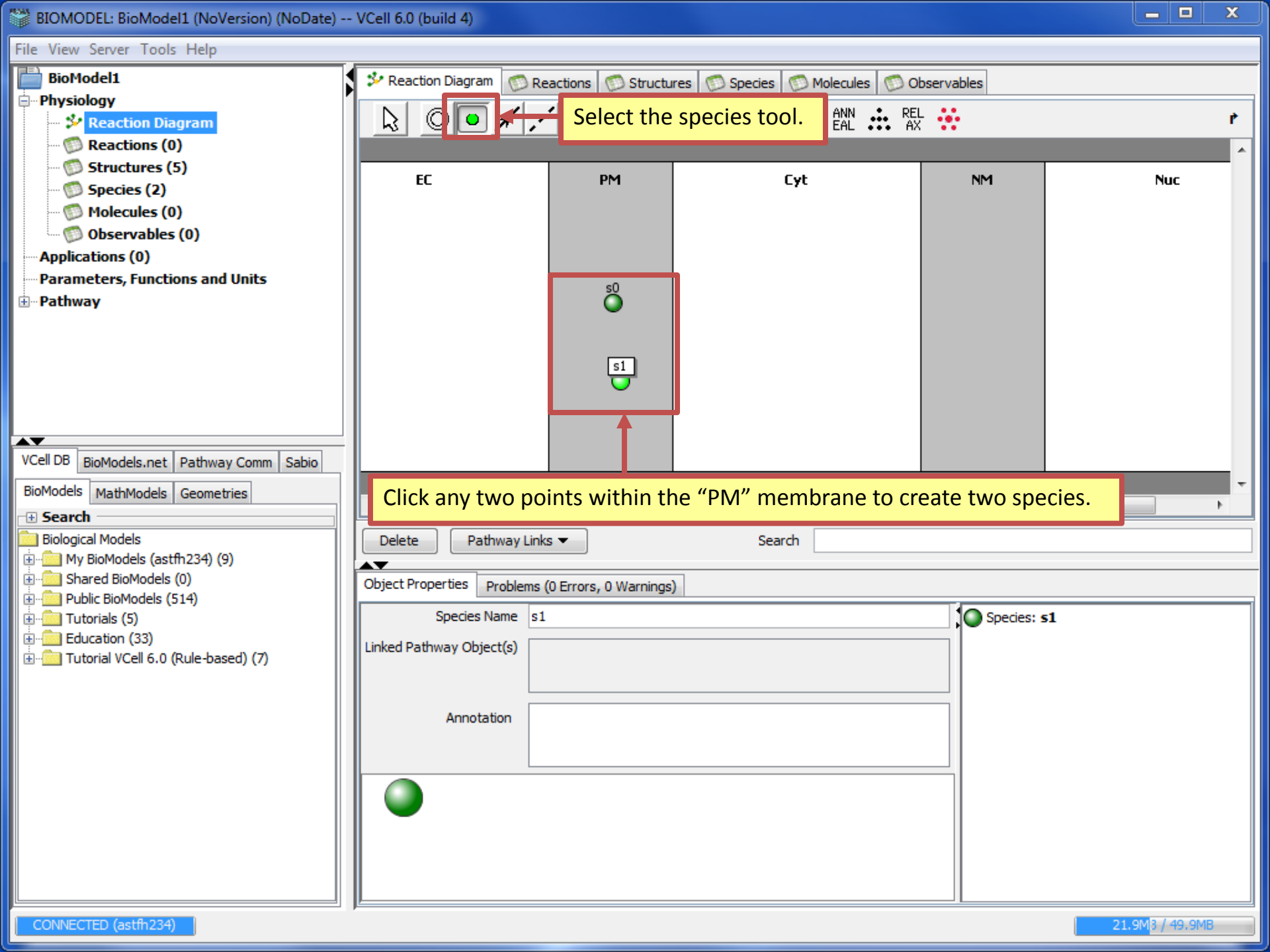

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Molecules
Observables
Click the select tool.
EC
Click on the label for “c0”.
m1
c2
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Structure Name
EC
Next to Structure Name, type “EC”.
Size Variable Name
EC [µm³]
Annotation
Extra Cellular
Next to Annotation, type “Extra Cellular”.
CONNECTED (astfh234)
22.8MB / 48.6MB

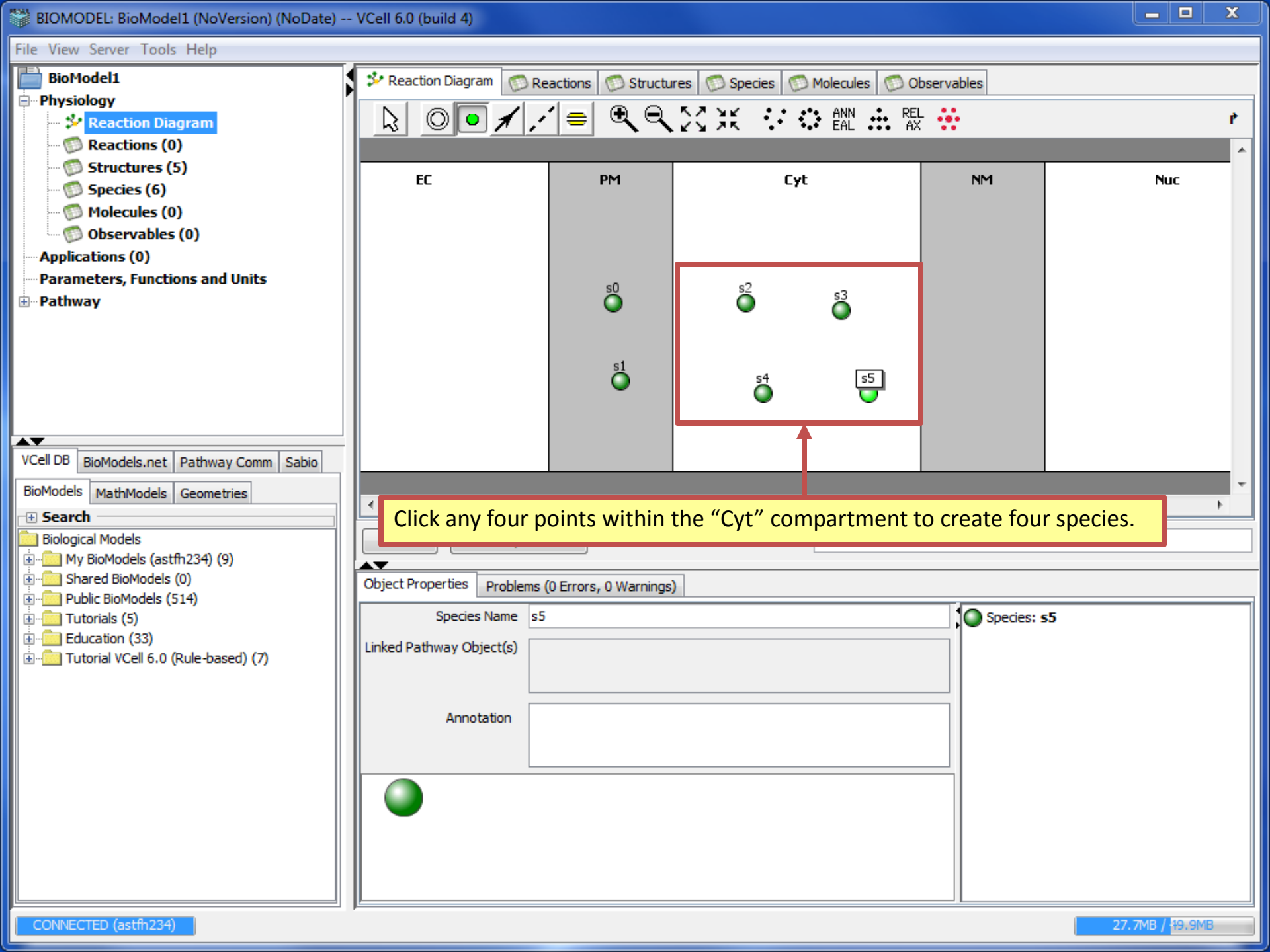

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
c2
Click on the label for “m0”.
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Structure Name
PM
Size Variable Name
PM [µm²]
Electrophysiology
Voltage Variable Name
Voltage_PM [mV]
Positive (inside feature)
Negative (outside feature)
membrane voltage: "Voltage_PM" = voltage(inside (+) compartment) - voltage(outside (-) compartment)
inward currents: from compartment "outside (-) compartment" into compartment "inside (+) compartment"
Note: VCell reactions and fluxes specify inward currents (- to +) rather than conventional currents (+ to -).
Annotation
Next to Structure Name, type “PM” (which stands for Plasma Membrane).
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
24.6MB
48.6MB

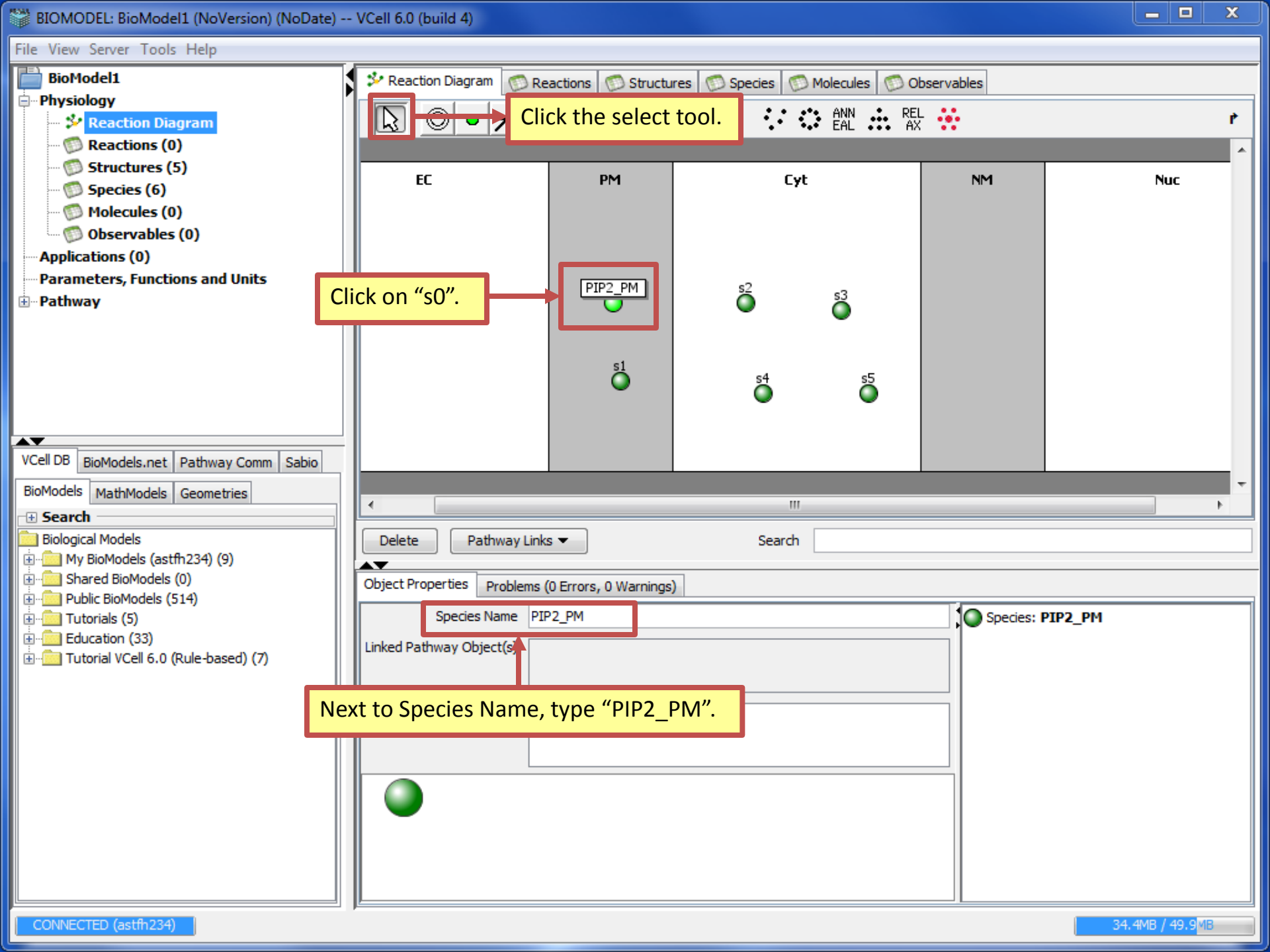

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
c2
Click on the label for “c1”.
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Structure Name
Cyt
Next to Structure Name, type “Cyt”.
Size Variable Name
Cyt [µm³]
Annotation
Cytosol
Next to Annotation, type “Cytosol”.
CONNECTED (astfh234)
28.7MB / 43.6MB

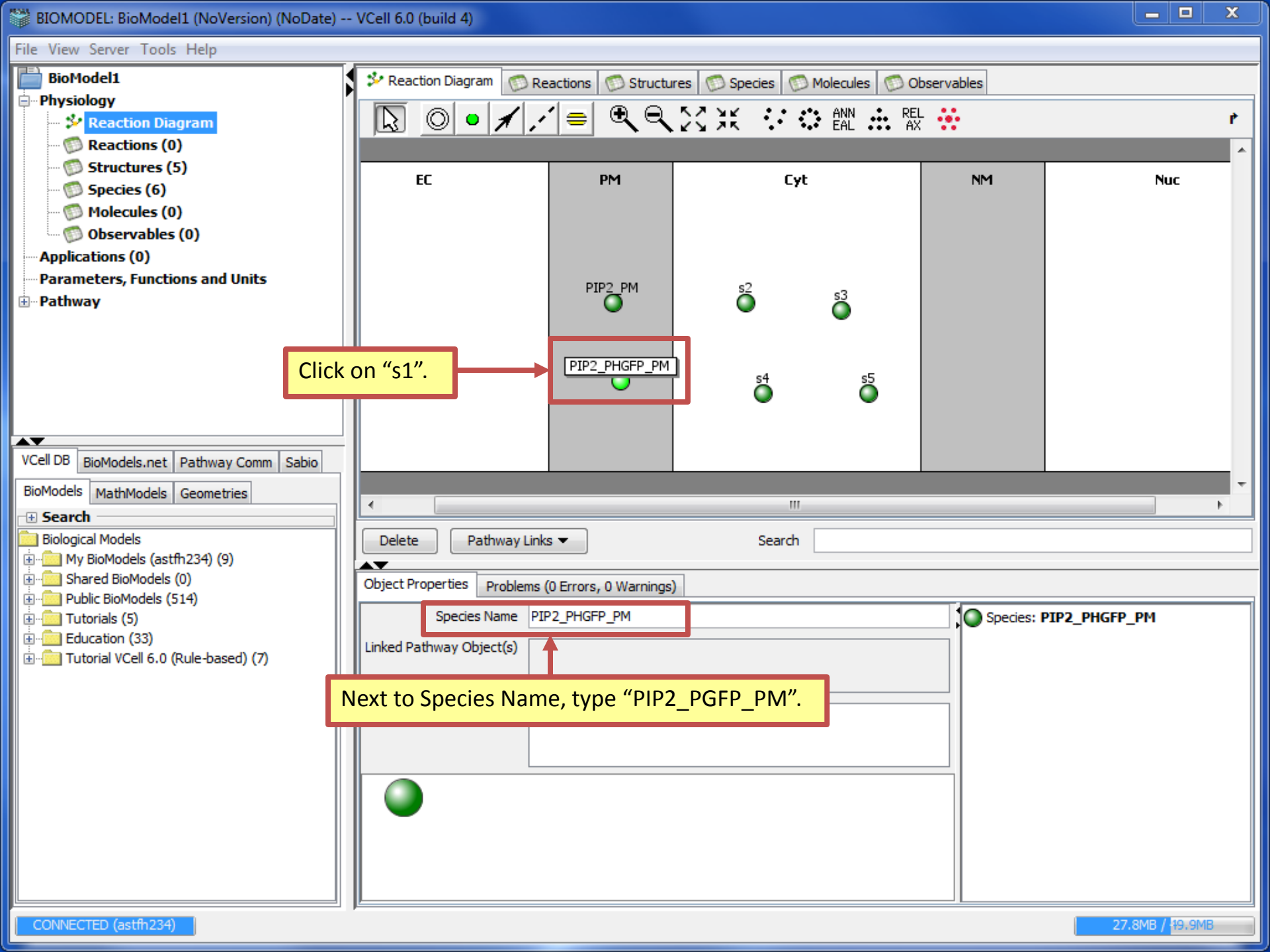

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
NM
c2
Click on the label for “m1”.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Structure Name
NM
Size Variable Name
NM [µm²]
Electrophysiology
Voltage Variable Name
Voltage_NM [mV]
Positive (inside feature)
Negative (outside feature)
membrane voltage: "Voltage_NM" = voltage(inside (+) compartment) - voltage(outside (-) compartment)
inward currents: from compartment "outside (-) compartment" into compartment "inside (+) compartment"
Note: VCell reactions and fluxes specify inward currents (- to +) rather than conventional currents (+ to -).
Annotation
Next to Structure Name, type “NM” (which stands for Nuclear Membrane).
CONNECTED (astfh234)
32.1MB / 48.6MB

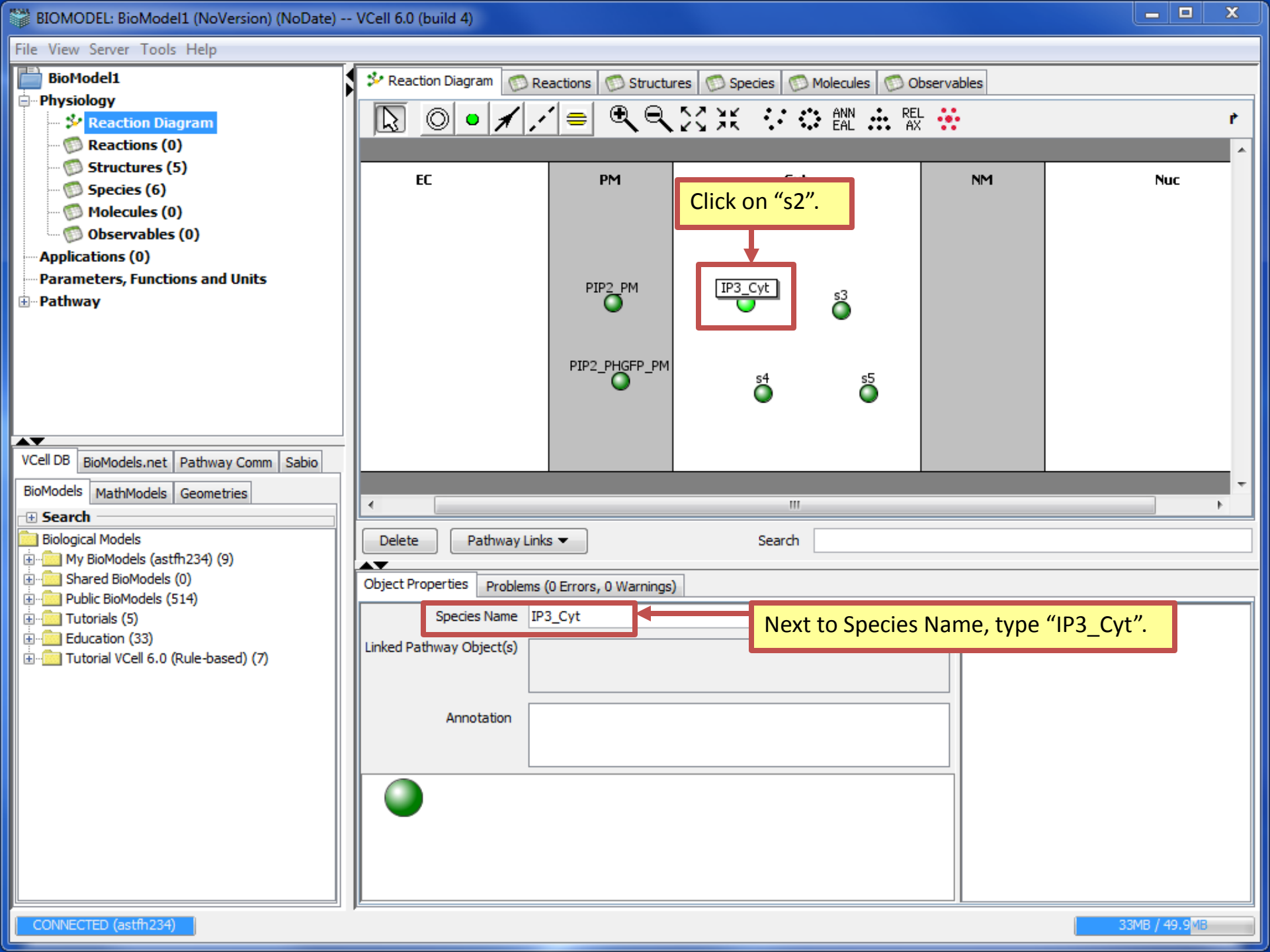

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (0)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Nuc
Click on the label for “c2”.
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Structure Name
Nuc
Next to Structure Name, type “Nuc”.
Size Variable Name
Nuc [µm³]
Annotation
Nucleus
Next to Annotation, type “Nucleus”.
CONNECTED (astfh234)
25.8MB / 48.6MB

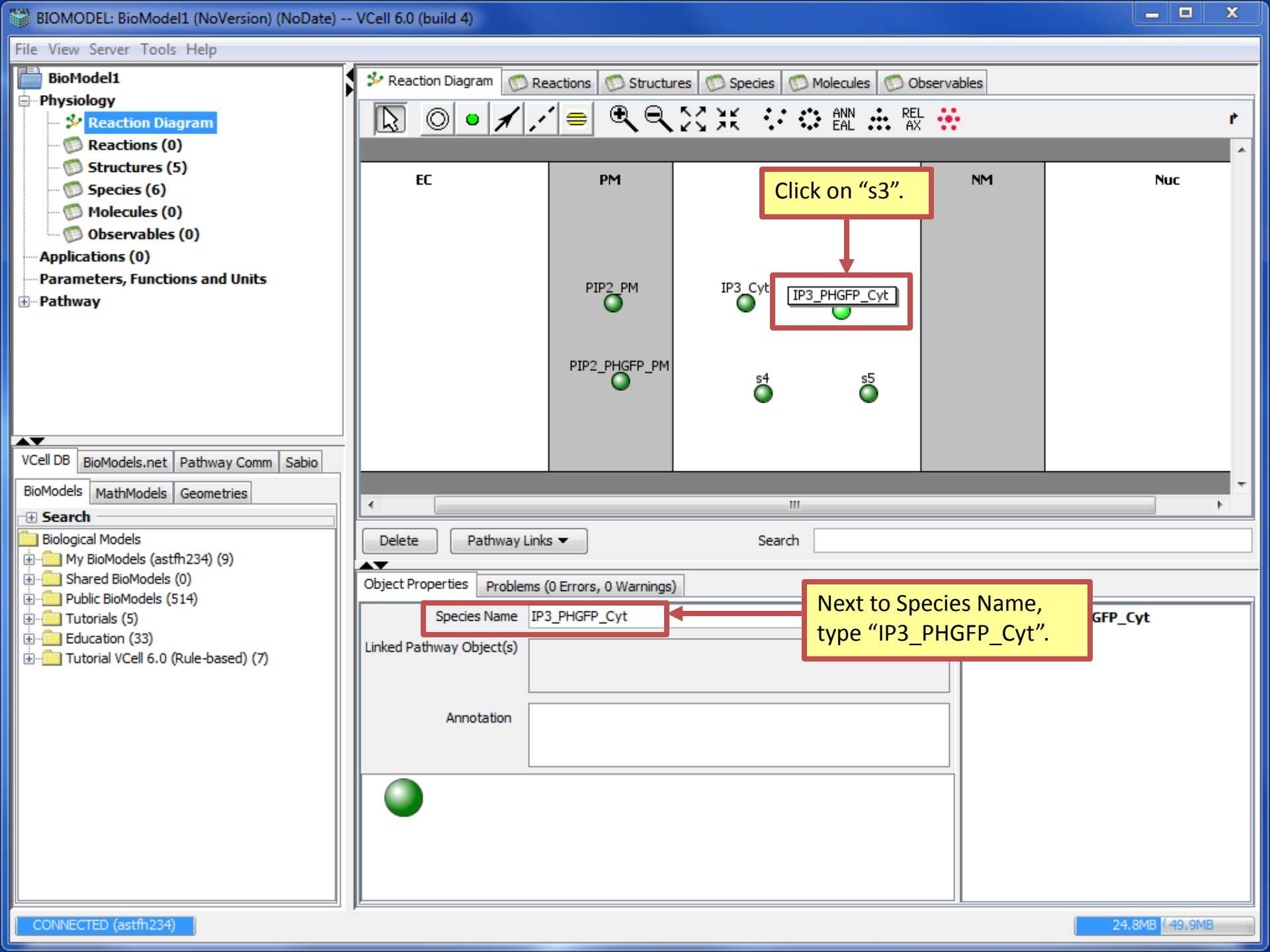

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (2)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
Select the species tool.
EC
PM
Cyt
NM
Nuc
s0
s1
Click any two points within the “PM” membrane to create two species.
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
s1
Linked Pathway Object(s)
Annotation
Species: s1
CONNECTED (astfh234)
21.9M 3 / 49.9MB

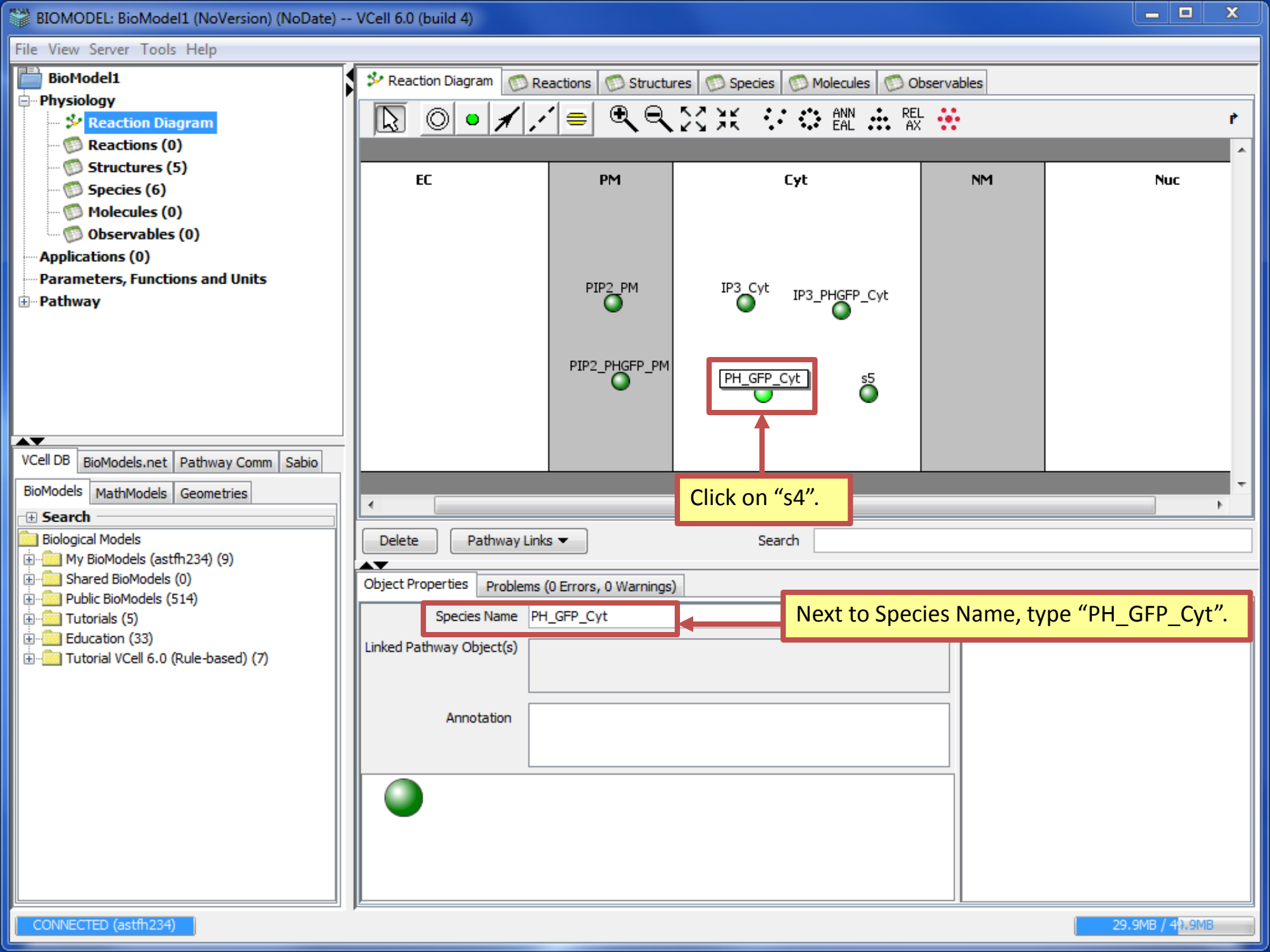

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
s0
s1
s2
s3
s4
s5
Click any four points within the “Cyt” compartment to create four species.
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
s5
Linked Pathway Object(s)
Annotation
Species: s5
CONNECTED (astfh234)
27.7MB / 49.9MB

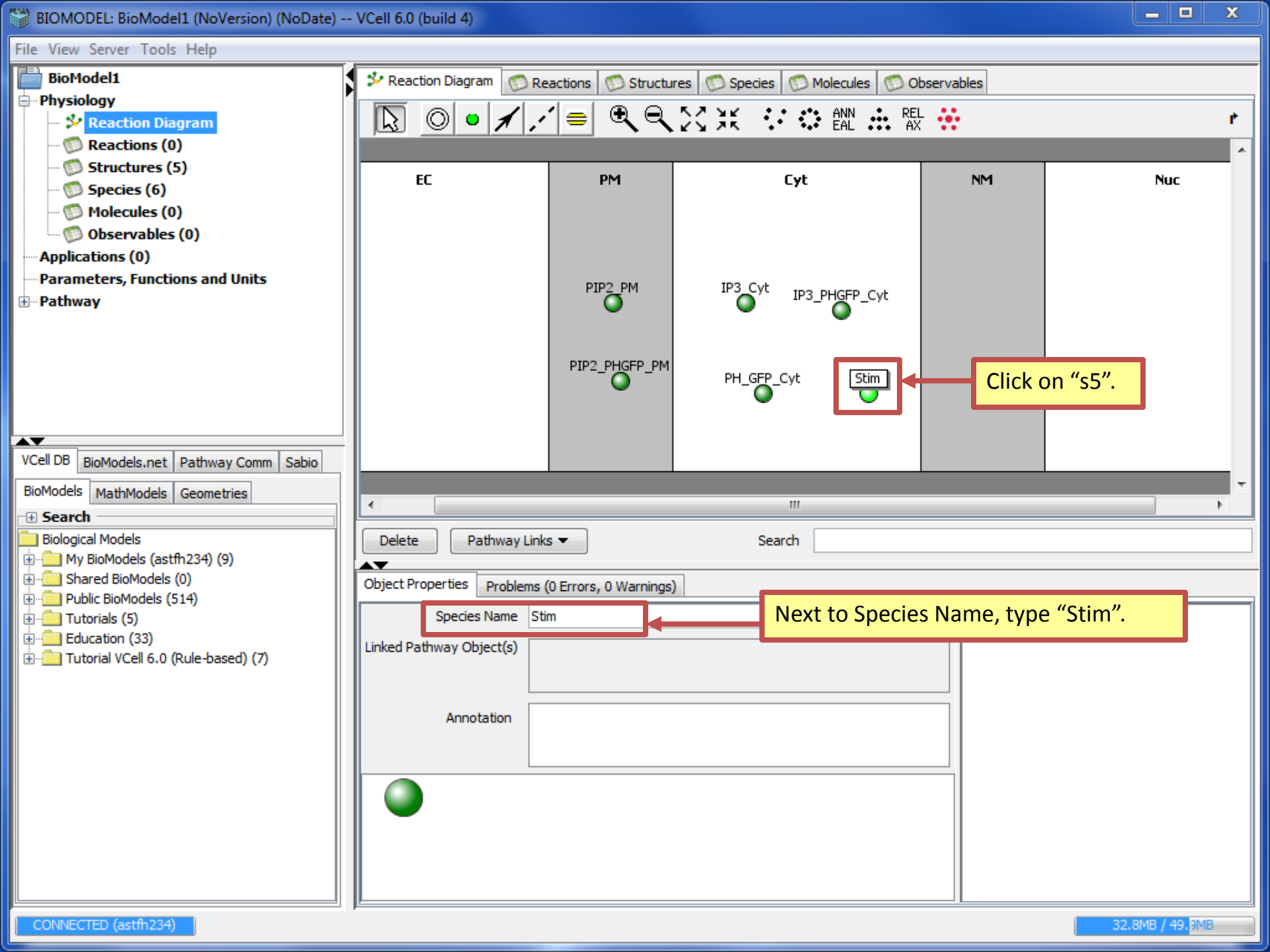

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
Click the select tool.
EC
PM
Cyt
NM
Nuc
Click on “s0”.
PIP2_PM
s1
s2
s3
s4
s5
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
PIP2_PM
Linked Pathway Object(s)
Next to Species Name, type “PIP2_PM”.
Species: PIP2_PM
CONNECTED (astfh234)
34.4MB / 49.9MB

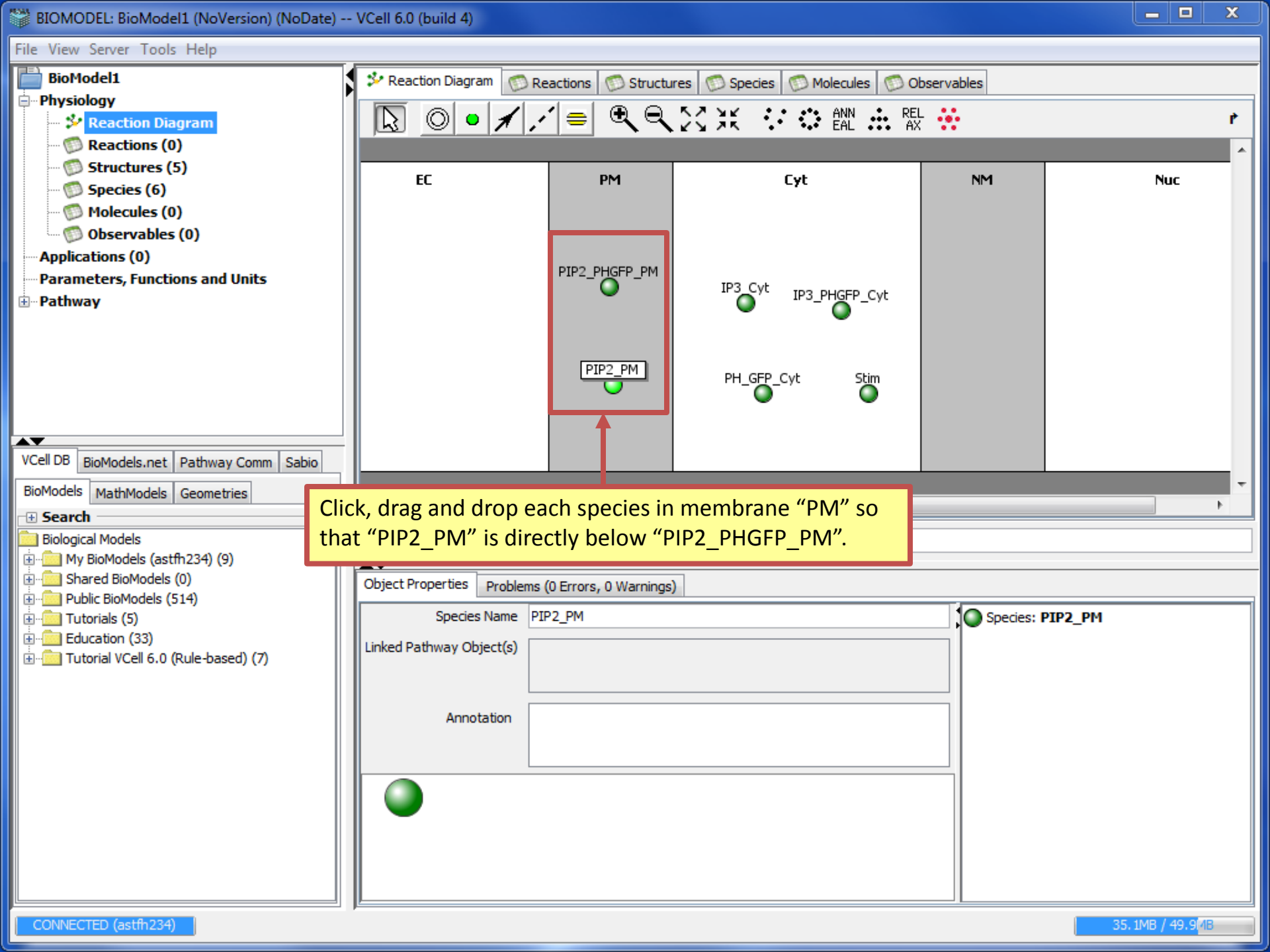

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
PIP2_PM
s2
s3
PIP2_PHGFP_PM
s4
s5
Click on “s1”.
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
PIP2_PHGFP_PM
Linked Pathway Object(s)
Species: PIP2_PHGFP_PM
Next to Species Name, type “PIP2_PGFP_PM”.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
27.8MB / 49.9MB

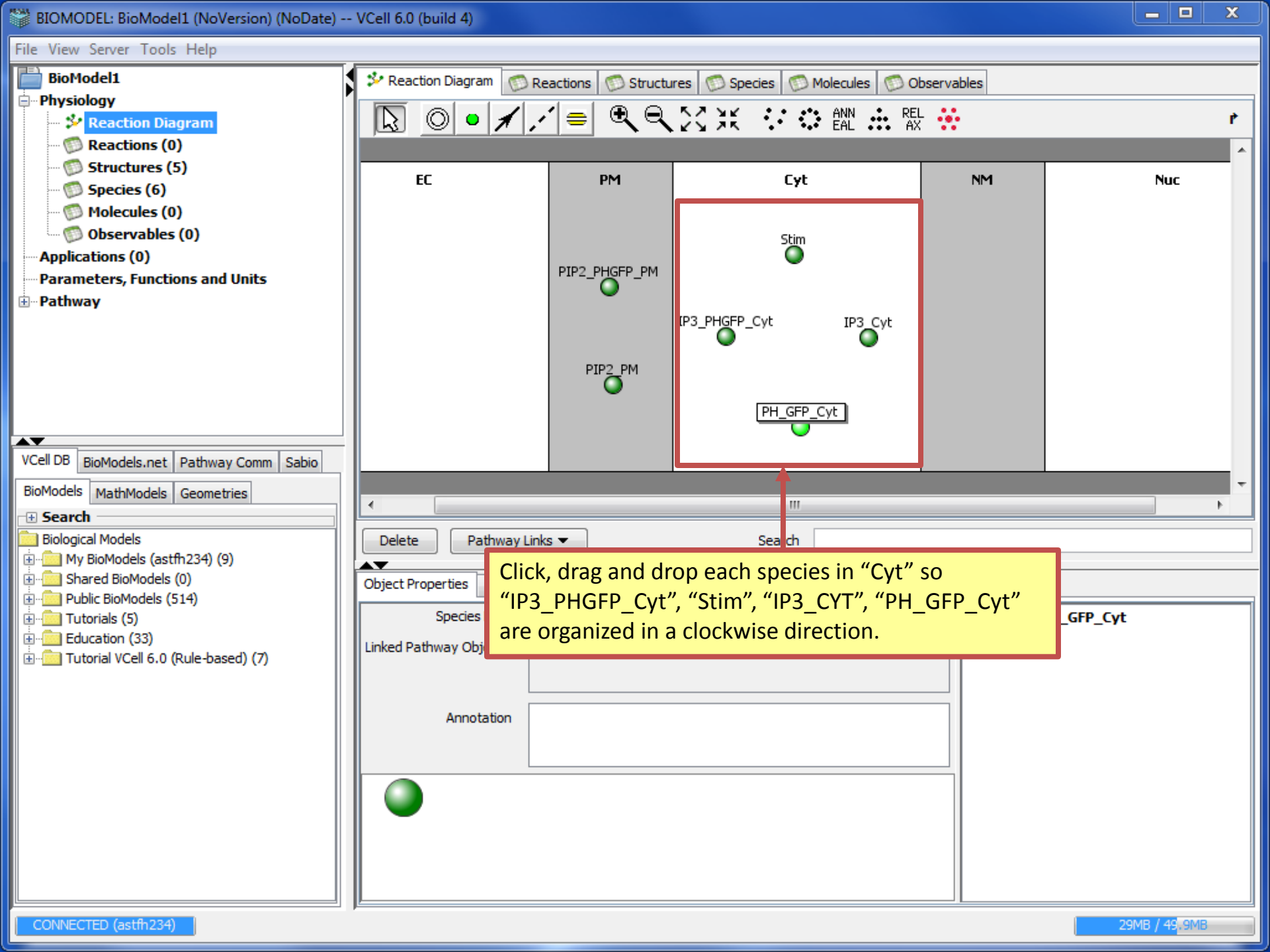

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
NM
Nuc
Click on “s2”.
PIP2_PM
IP3_Cyt
s3
PIP2_PHGFP_PM
s4
s5
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
IP3_Cyt
Next to Species Name, type “IP3_Cyt”.
Linked Pathway Object(s)
Annotation
CONNECTED (astfh234)
33MB / 49.9MB

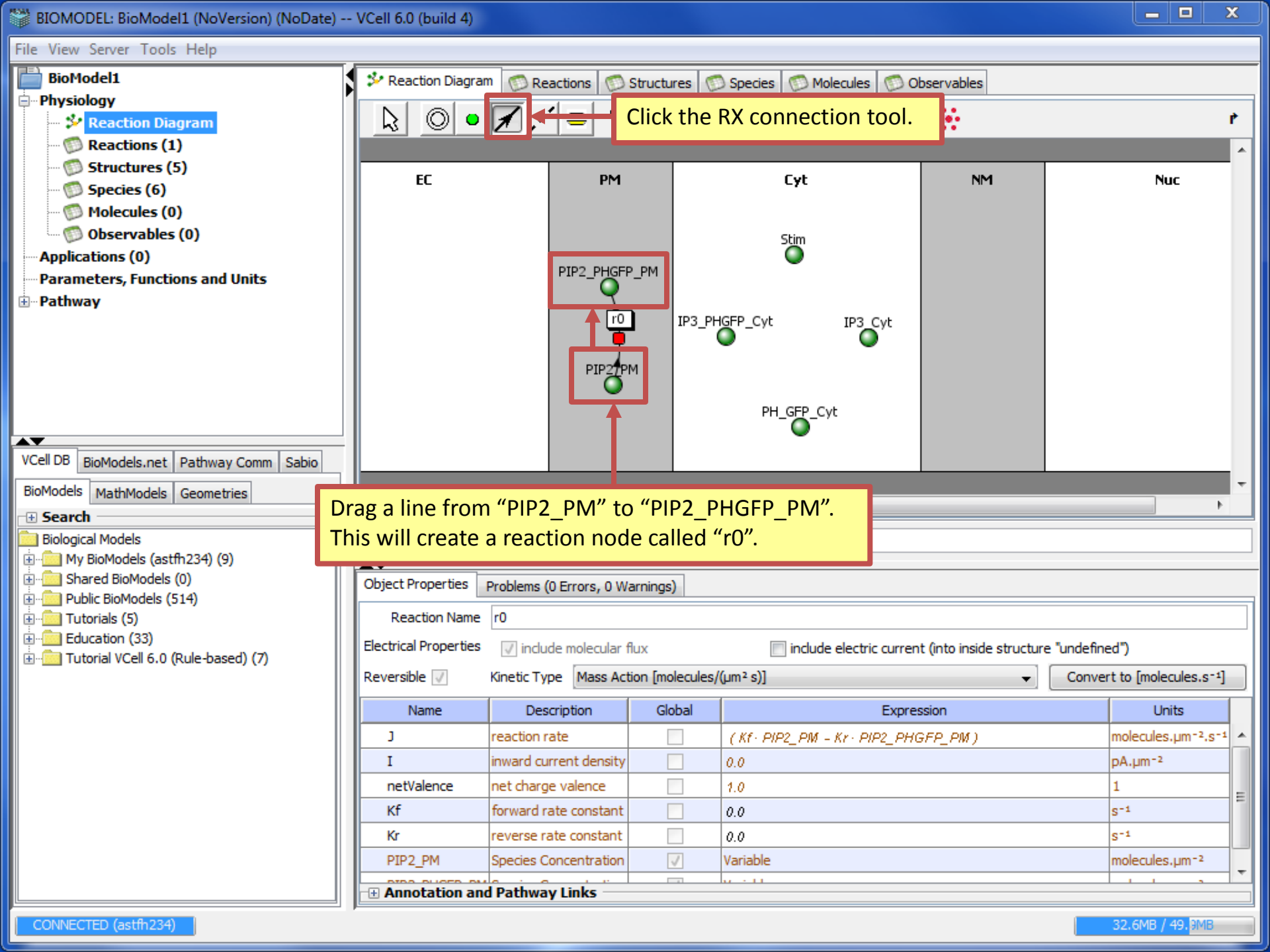

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
NM
Nuc
Click on “s3”.
PIP2_PM
IP3_Cyt
IP3_PHGFP_Cyt
PIP2_PHGFP_PM
s4
s5
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
IP3_PHGFP_Cyt
Linked Pathway Object(s)
Annotation
Next to Species Name, type “IP3_PHGFP_Cyt”.
GFP_Cyt
CONNECTED (astfh234)
24.8MB
49.9MB

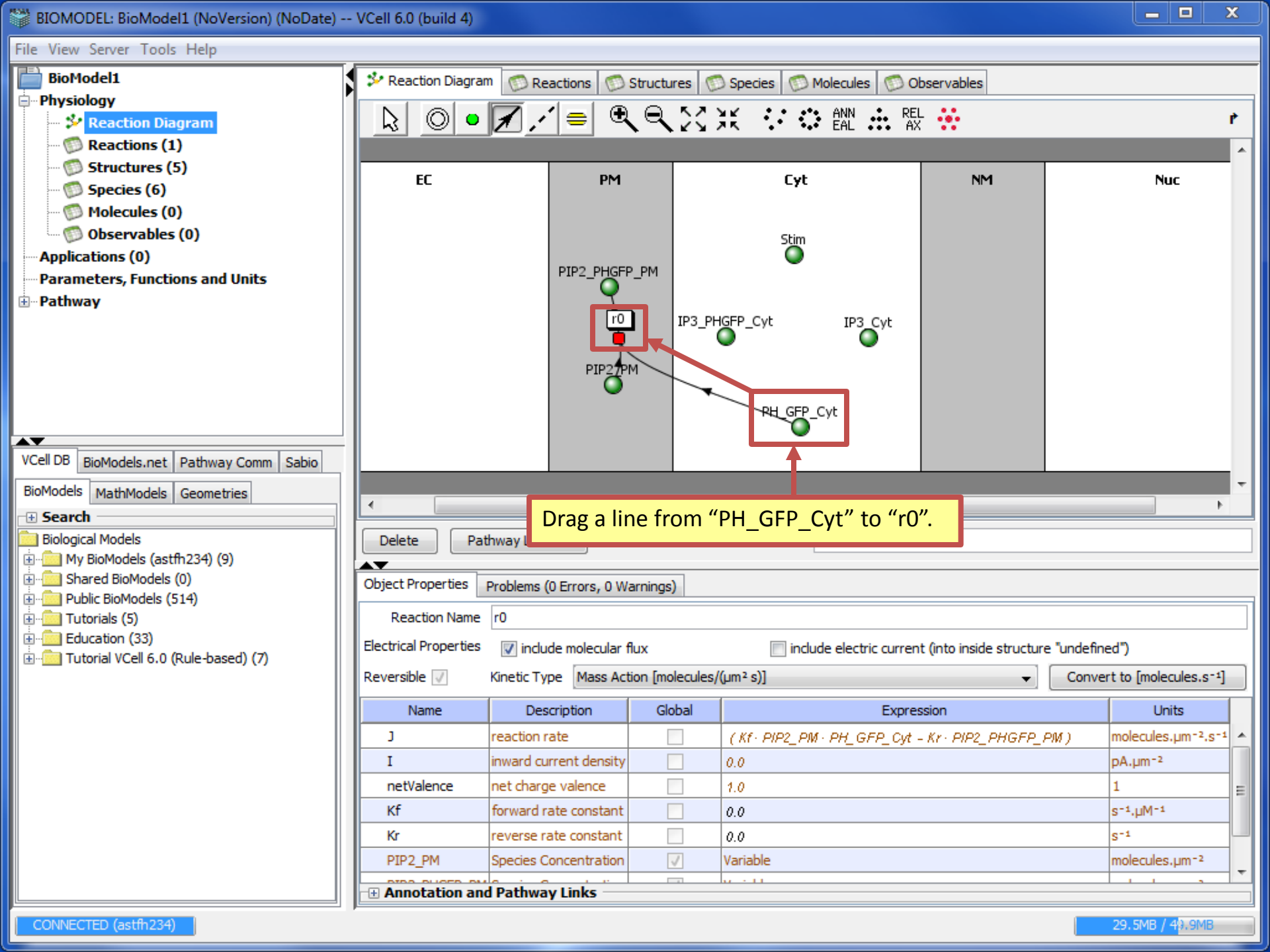

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
PIP2_PM
IP3_Cyt
IP3_PHGFP_Cyt
PIP2_PHGFP_PM
PH_GFP_Cyt
s5
Click on “s4”.
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
PH_GFP_Cyt
Next to Species Name, type “PH_GFP_Cyt”.
Linked Pathway Object(s)
Annotation
CONNECTED (astfh234)
29.9MB / 4

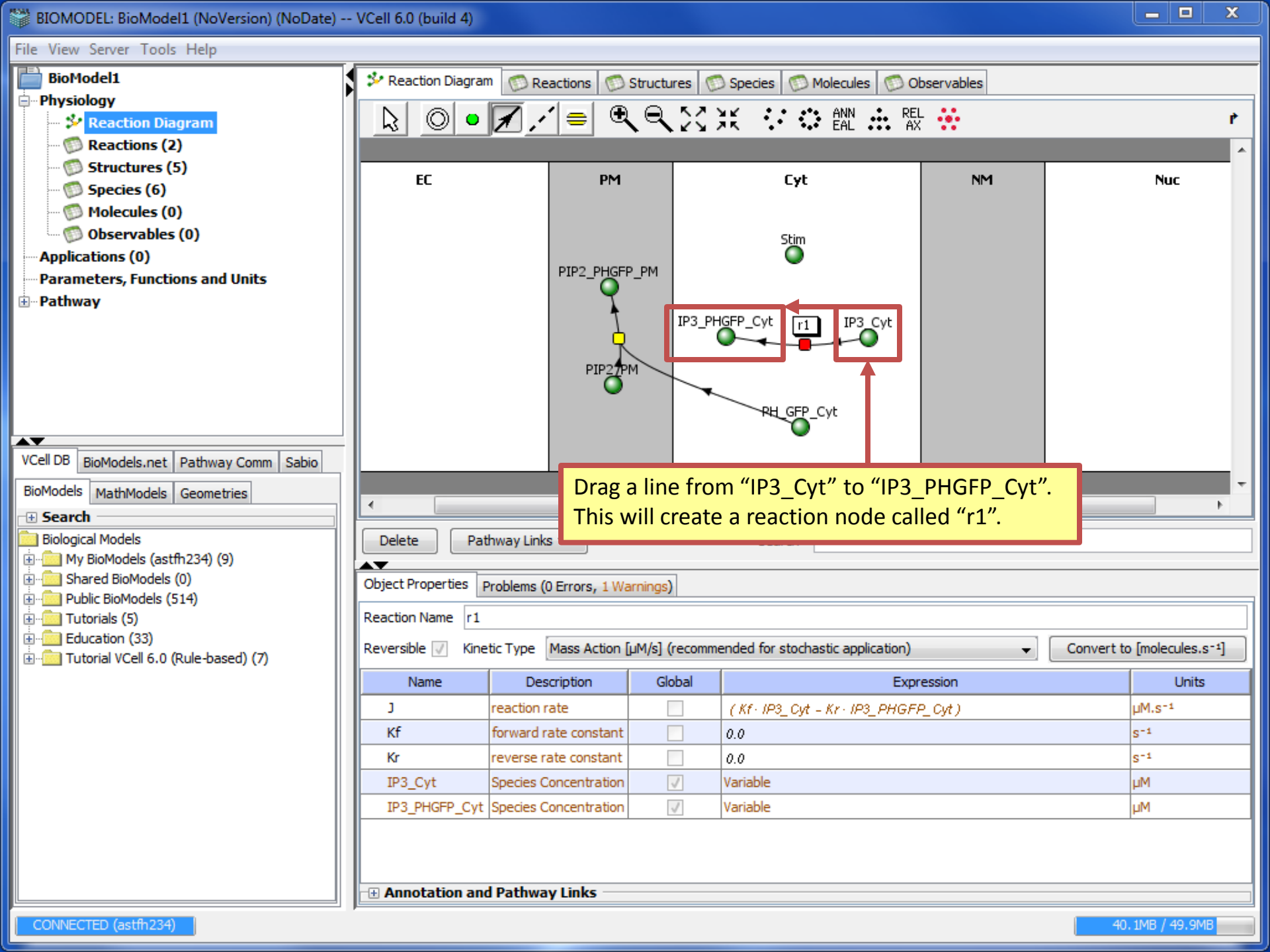

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
PIP2_PM
IP3_Cyt
IP3_PHGFP_Cyt
PIP2_PHGFP_PM
PH_GFP_Cyt
Stim
Click on “s5”.
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
Stim
Next to Species Name, type “Stim”.
Linked Pathway Object(s)
Annotation
CONNECTED (astfh234)
32.8MB / 49.

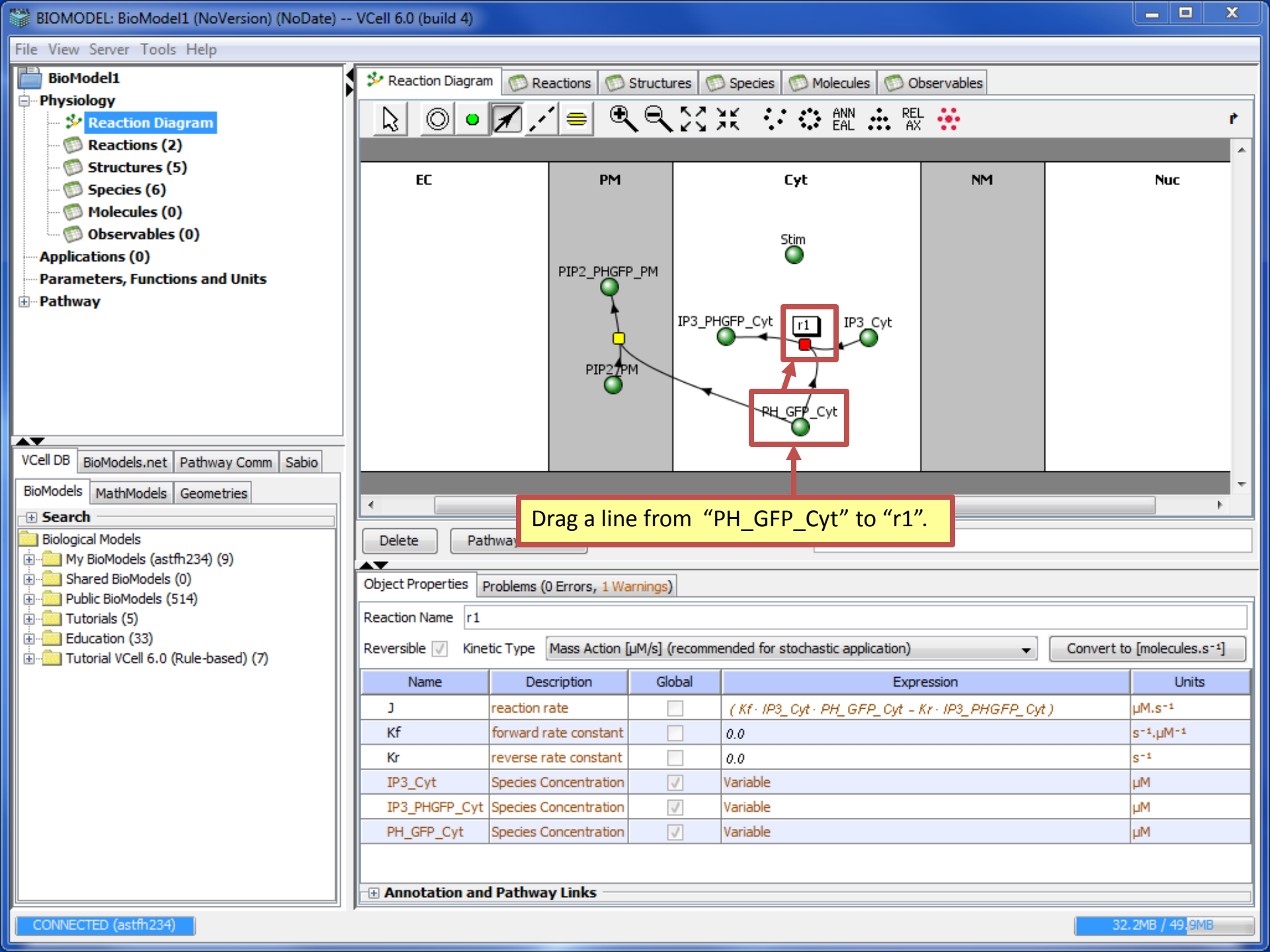

BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
PIP2_PHGFP_PM
PIP2_PM
IP3_Cyt
IP3_PHGFP_Cyt
PH_GFP_Cyt
Stim
Click, drag and drop each species in membrane "PM" so that "PIP2_PM" is directly below "PIP2_PHGFP_PM".
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Species Name
PIP2_PM
Linked Pathway Object(s)
Annotation
Species: PIP2_PM
CONNECTED (astfh234)
35.1MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (0)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Delete
Pathway Links
Search
Object Properties
Species
Linked Pathway Obj
Annotation
_GFP_Cyt
Click, drag and drop each species in “Cyt” so “IP3_PHGFP_Cyt”, “Stim”, “IP3_CYT”, “PH_GFP_Cyt” are organized in a clockwise direction.
CONNECTED (astfh234)
29MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (1)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
Click the RX connection tool.
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
r0
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Drag a line from “PIP2_PM” to “PIP2_PHGFP_PM”.
This will create a reaction node called “r0”.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Reaction Name
r0
Electrical Properties
include molecular flux
include electric current (into inside structure "undefined")
Reversible
Kinetic Type
Mass Action [molecules/(μm² s)]
Convert to [molecules.s⁻¹]
Name
Description
Global
Expression
Units
J
reaction rate
(Kf · PIP2_PM - Kr · PIP2_PHGFP_PM)
molecules.μm⁻².s⁻¹
I
inward current density
0.0
pA.μm⁻²
netValence
net charge valence
1.0
1
Kf
forward rate constant
0.0
s⁻¹
Kr
reverse rate constant
0.0
s⁻¹
PIP2_PM
Species Concentration
Variable
molecules.μm⁻²
Annotation and Pathway Links
CONNECTED (astfh234)
32.6MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (1)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
r0
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Drag a line from “PH_GFP_Cyt” to “r0”.
Delete
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 0 Warnings)
Reaction Name
r0
Electrical Properties
include molecular flux
include electric current (into inside structure "undefined")
Reversible
Kinetic Type
Mass Action [molecules/(μm² s)]
Convert to [molecules.s⁻¹]
Name
Description
Global
Expression
Units
J
reaction rate
(Kf · PIP2_PM · PH_GFP_Cyt - Kr · PIP2_PHGFP_PM)
molecules.μm⁻².s⁻¹
I
inward current density
0.0
pA.μm⁻²
netValence
net charge valence
1.0
1
Kf
forward rate constant
0.0
s⁻¹.μM⁻¹
Kr
reverse rate constant
0.0
s⁻¹
PIP2_PM
Species Concentration
Variable
molecules.μm⁻²
Annotation and Pathway Links
CONNECTED (astfh234)
29.5MB / 4


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (2)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
r1
IP3_Cyt
PIP2_PM
RH_GFP_Cyt
Drag a line from “IP3_Cyt” to “IP3_PHGFP_Cyt”.
This will create a reaction node called “r1”.
Delete
Pathway Links
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
r1
Reversible
Kinetic Type
Mass Action [μM/s] (recommended for stochastic application)
Convert to [molecules.s-1]
Name
Description
Global
Expression
Units
J
reaction rate
(Kf · IP3_Cyt - Kr · IP3_PHGFP_Cyt)
μM.s-1
Kf
forward rate constant
0.0
s-1
Kr
reverse rate constant
0.0
s-1
IP3_Cyt
Species Concentration
Variable
μM
IP3_PHGFP_Cyt
Species Concentration
Variable
μM
Annotation and Pathway Links
CONNECTED (astfh234)
40.1MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (2)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
PIP2_PM
IP3_PHGFP_Cyt
r1
IP3_Cyt
PH_GFP_Cyt
Drag a line from "PH_GFP_Cyt" to "r1".
Delete
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name r1
Reversible
Kinetic Type Mass Action [μM/s] (recommended for stochastic application)
Convert to [molecules.s⁻¹]
Name Description Global Expression Units
J reaction rate (Kf · IP3_Cyt · PH_GFP_Cyt - Kr · IP3_PHGFP_Cyt) μM.s⁻¹
Kf forward rate constant 0.0 s⁻¹.μM⁻¹
Kr reverse rate constant 0.0 s⁻¹
IP3_Cyt Species Concentration Variable μM
IP3_PHGFP_Cyt Species Concentration Variable μM
PH_GFP_Cyt Species Concentration Variable μM
Annotation and Pathway Links
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
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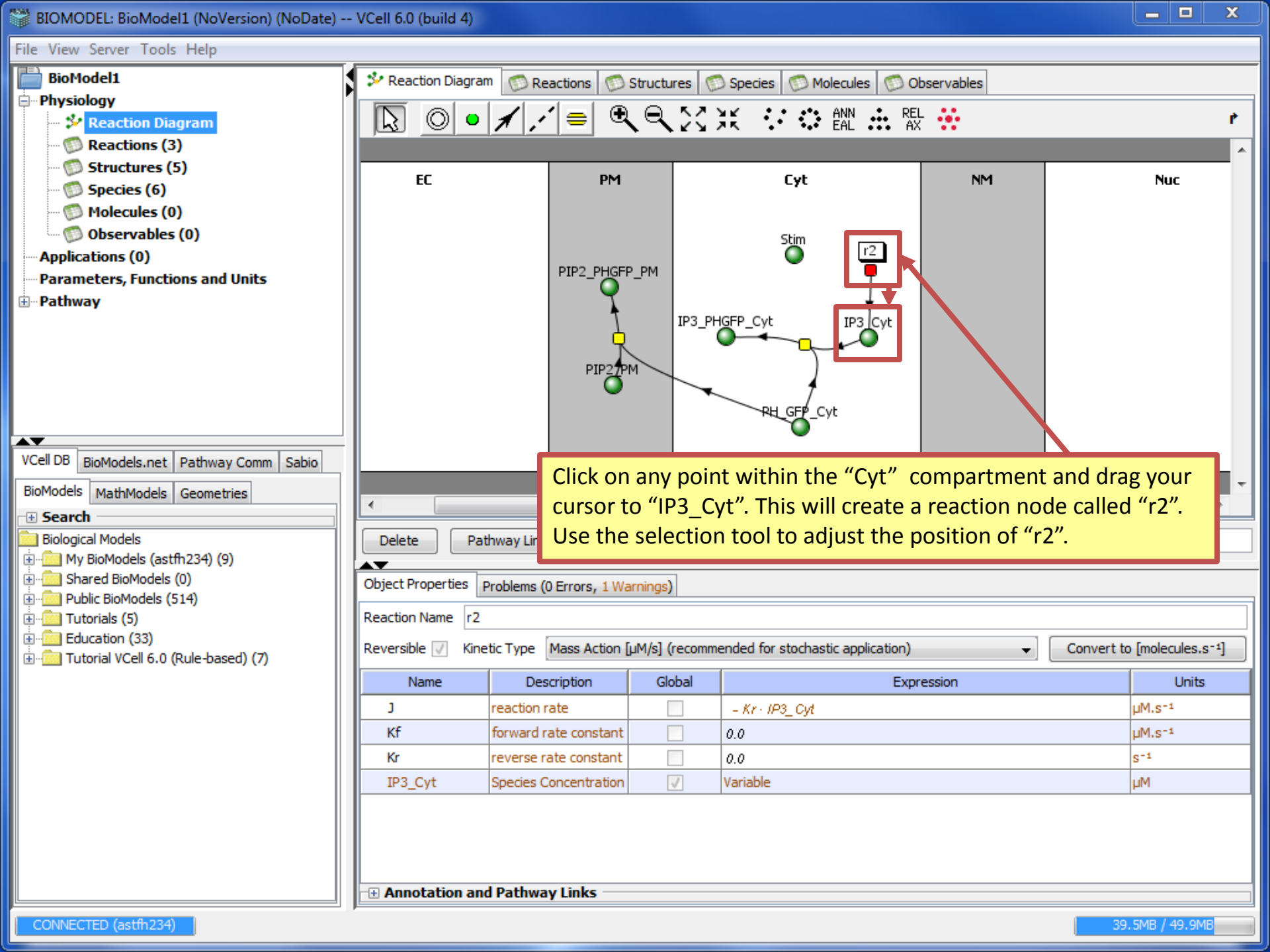
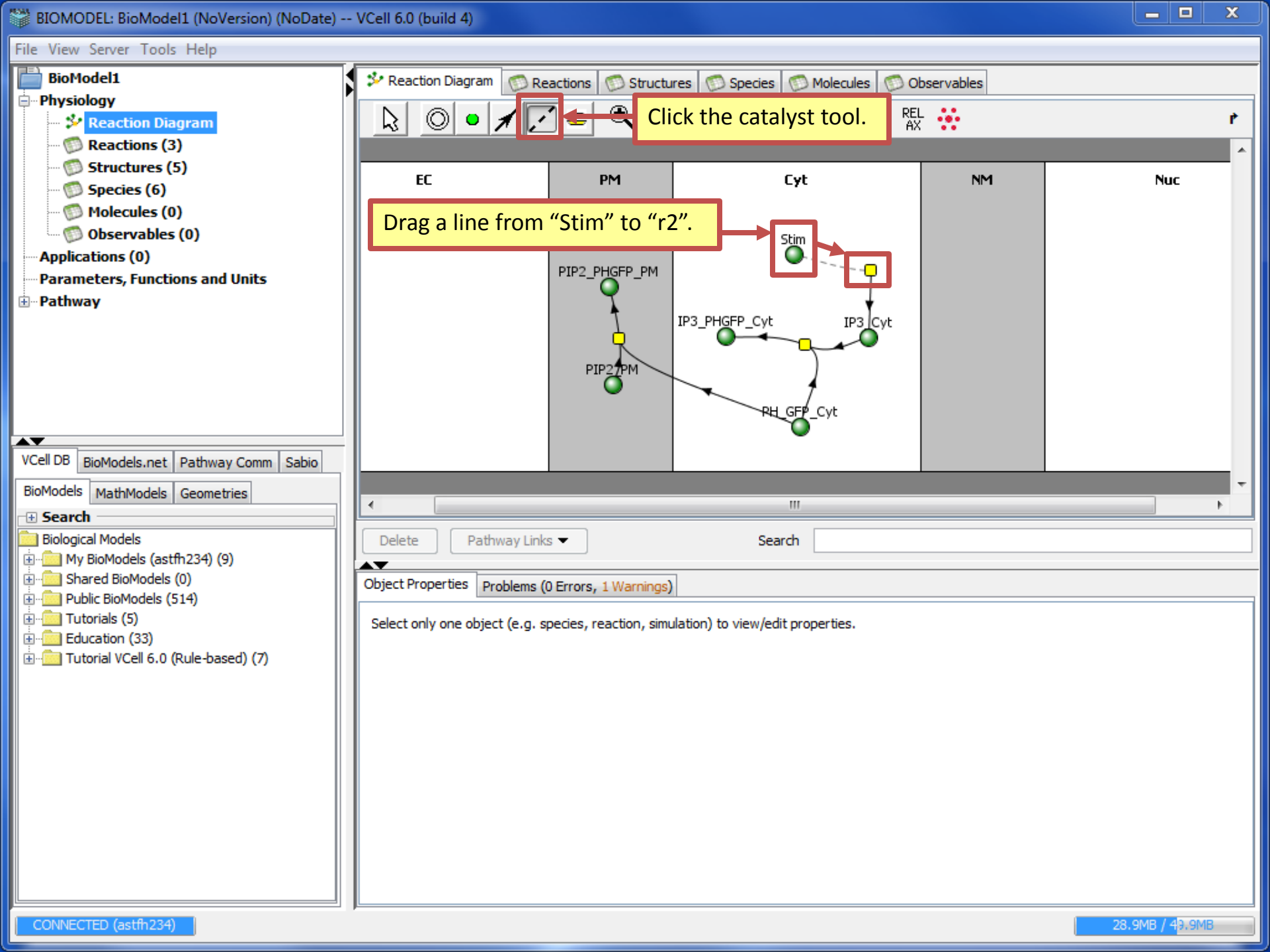
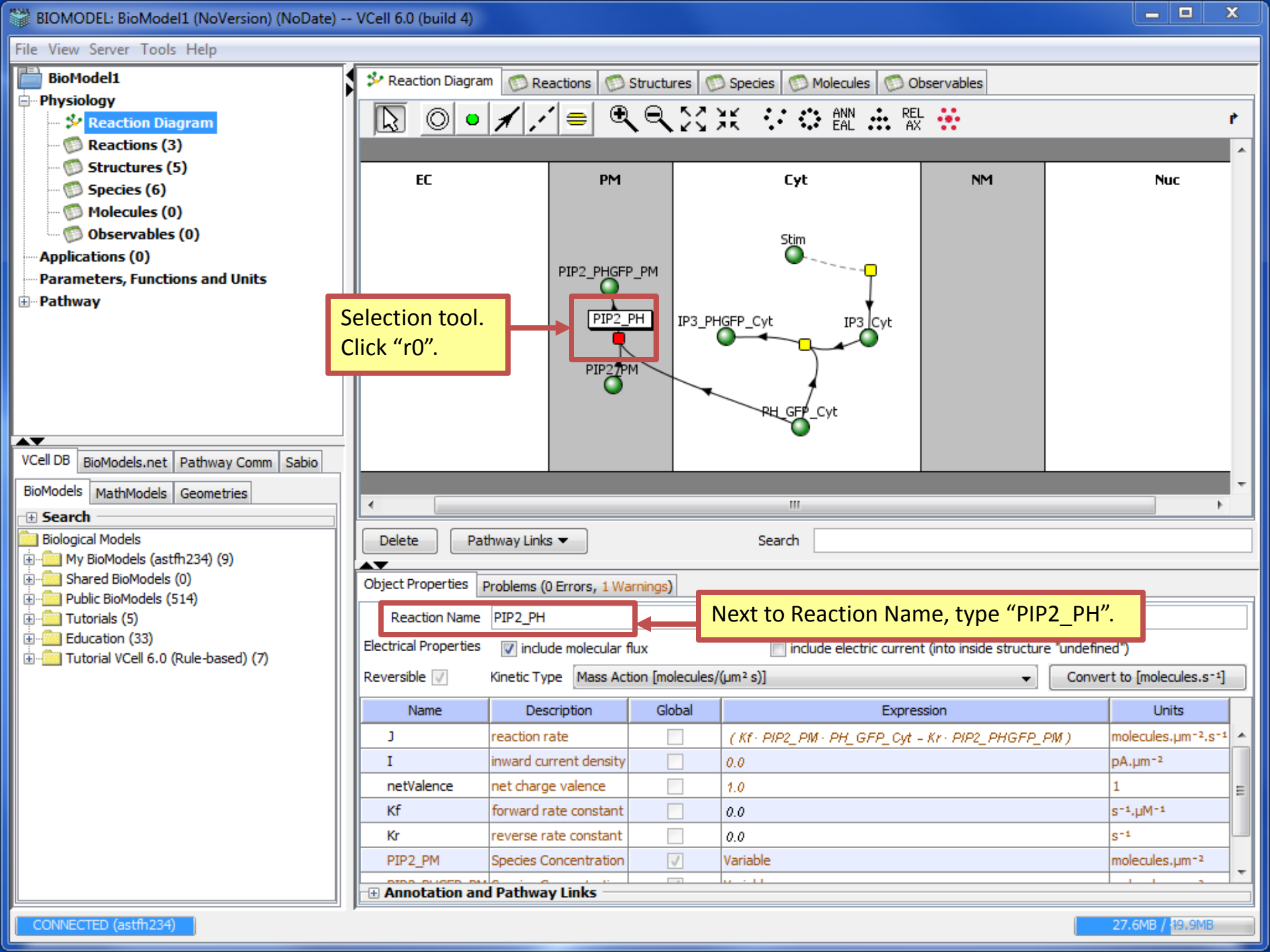
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
32.2MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
r2
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
RH_GFP_Cyt
Click on any point within the "Cyt" compartment and drag your cursor to "IP3_Cyt". This will create a reaction node called "r2". Use the selection tool to adjust the position of "r2".
Delete
Pathway Lir
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name r2
Reversible
Kinetic Type Mass Action [μM/s] (recommended for stochastic application)
Convert to [molecules.s⁻¹]
Name Description Global Expression Units
J reaction rate - Kr · IP3_Cyt μM.s⁻¹
Kf forward rate constant 0.0 μM.s⁻¹
Kr reverse rate constant 0.0 s⁻¹
IP3_Cyt Species Concentration Variable μM
Annotation and Pathway Links
CONNECTED (astfh234)
39.5MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
Click the catalyst tool.
REL
AX
EC
PM
Cyt
NM
Nuc
Drag a line from “Stim” to “r2”.
Stim
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
RH_GFP_Cyt
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
28.9MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
PIP2_PH
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Selection tool. Click "r0".
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
PIP2_PH
Next to Reaction Name, type "PIP2_PH".
Electrical Properties
include molecular flux
include electric current (into inside structure "undefined")
Reversible
Kinetic Type
Mass Action [molecules/(µm² s)]
Convert to [molecules.s⁻¹]
Name
Description
Global
Expression
Units
J
reaction rate
(Kf · PIP2_PM · PH_GFP_Cyt - Kr · PIP2_PHGFP_PM)
molecules.µm⁻².s⁻¹
I
inward current density
0.0
pA.µm⁻²
netValence
net charge valence
1.0
1
Kf
forward rate constant
0.0
s⁻¹.µM⁻¹
Kr
reverse rate constant
0.0
s⁻¹
PIP2_PM
Species Concentration
Variable
molecules.µm⁻²
Annotation and Pathway Links
VCell DB
BioModels.net
Pathway Comm
Sabio
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MathModels
Geometries
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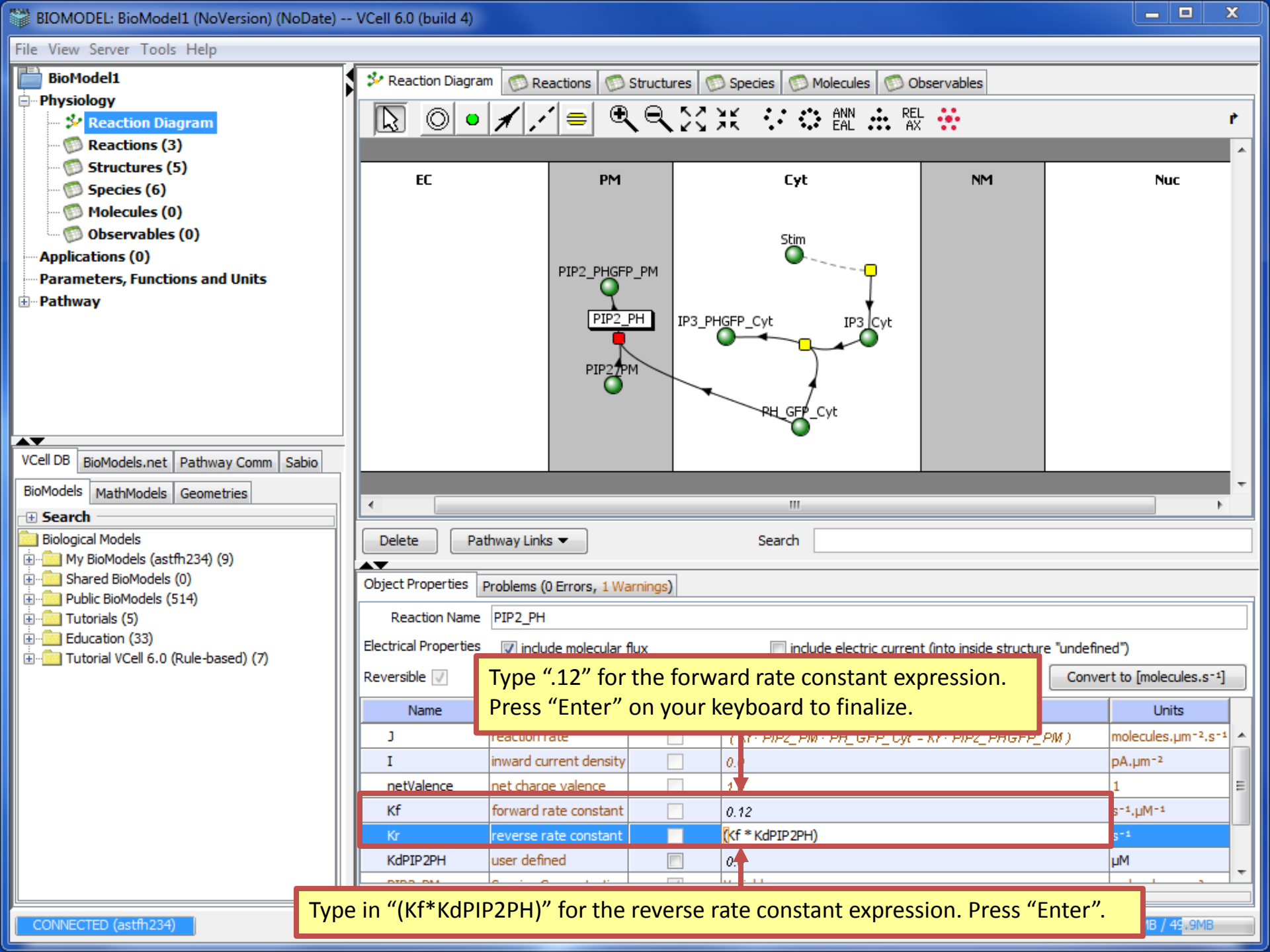
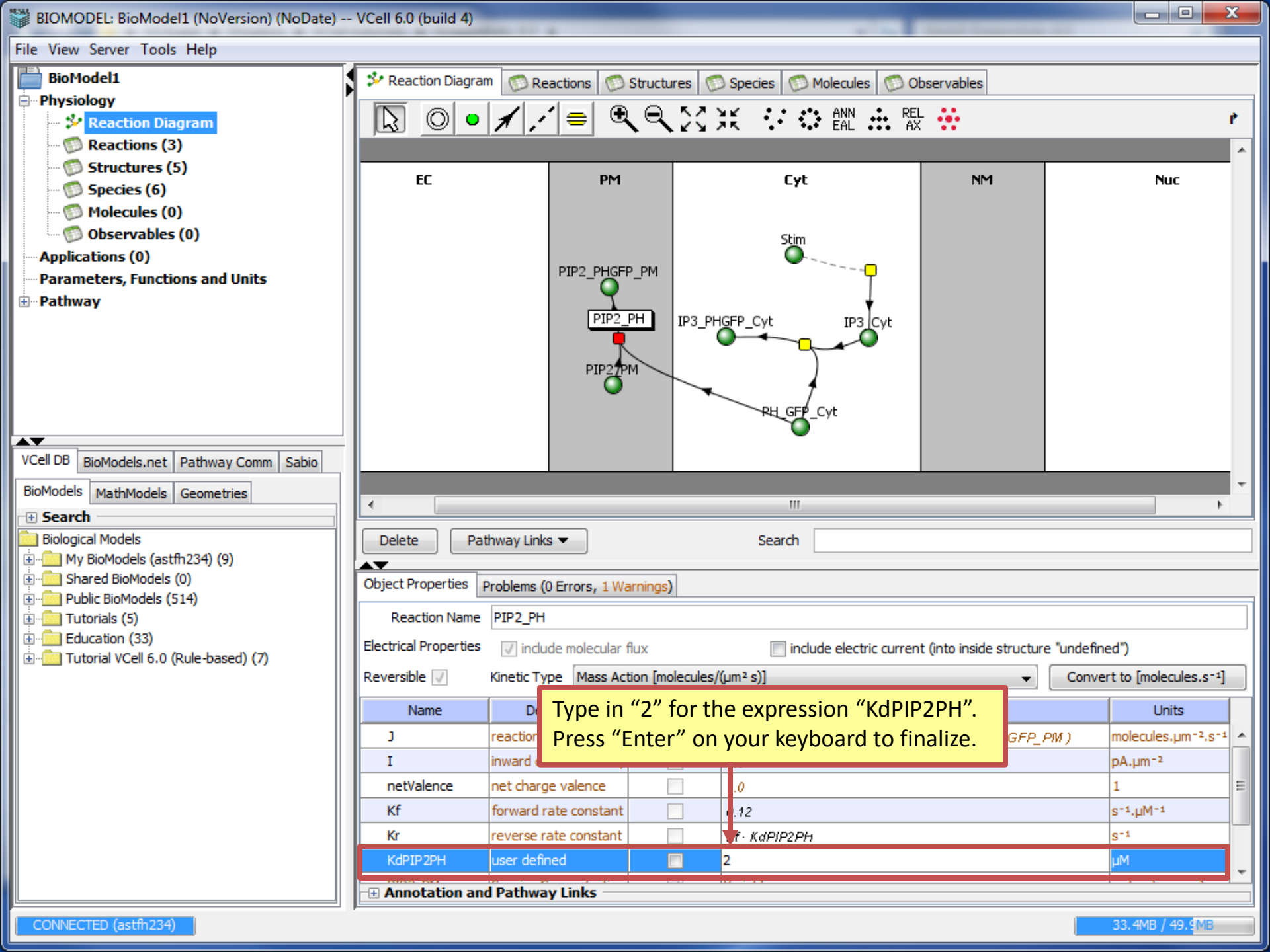
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
27.6MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
PIP2_PH
PIP2_PM
IP3_PHGFP_Cyt
IP3_Cyt
PH_GFP_Cyt
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
PIP2_PH
Electrical Properties
include molecular flux
include electric current (into inside structure "undefined")
Reversible
Convert to [molecules.s-1]
Name
Units
J
reaction rate
molecules.µm-2.s-1
I
inward current density
pA.µm-2
netValence
net charge valence
1
Kf
forward rate constant
0.12
s-1.µM-1
Kr
reverse rate constant
(Kf * KdPIP2PH)
s-1
KdPIP2PH
user defined
µM
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
Type ".12" for the forward rate constant expression.
Press "Enter" on your keyboard to finalize.
Type in "(Kf*KdPIP2PH)" for the reverse rate constant expression. Press "Enter".


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
PIP2_PH
PIP2_PM
IP3_PHGFP_Cyt
IP3_Cyt
PH_GFP_Cyt
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
PIP2_PH
Electrical Properties
include molecular flux
include electric current (into inside structure "undefined")
Reversible
Kinetic Type
Mass Action [molecules/(µm² s)]
Convert to [molecules.s⁻¹]
Name
Units
J
I
pA.µm⁻²
netValence
net charge valence
1
Kf
forward rate constant
s⁻¹.µM⁻¹
Kr
reverse rate constant
s⁻¹
KdPIP2PH
user defined
2
µM
Type in “2” for the expression “KdPIP2PH”.
Press “Enter” on your keyboard to finalize.
Annotation and Pathway Links
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
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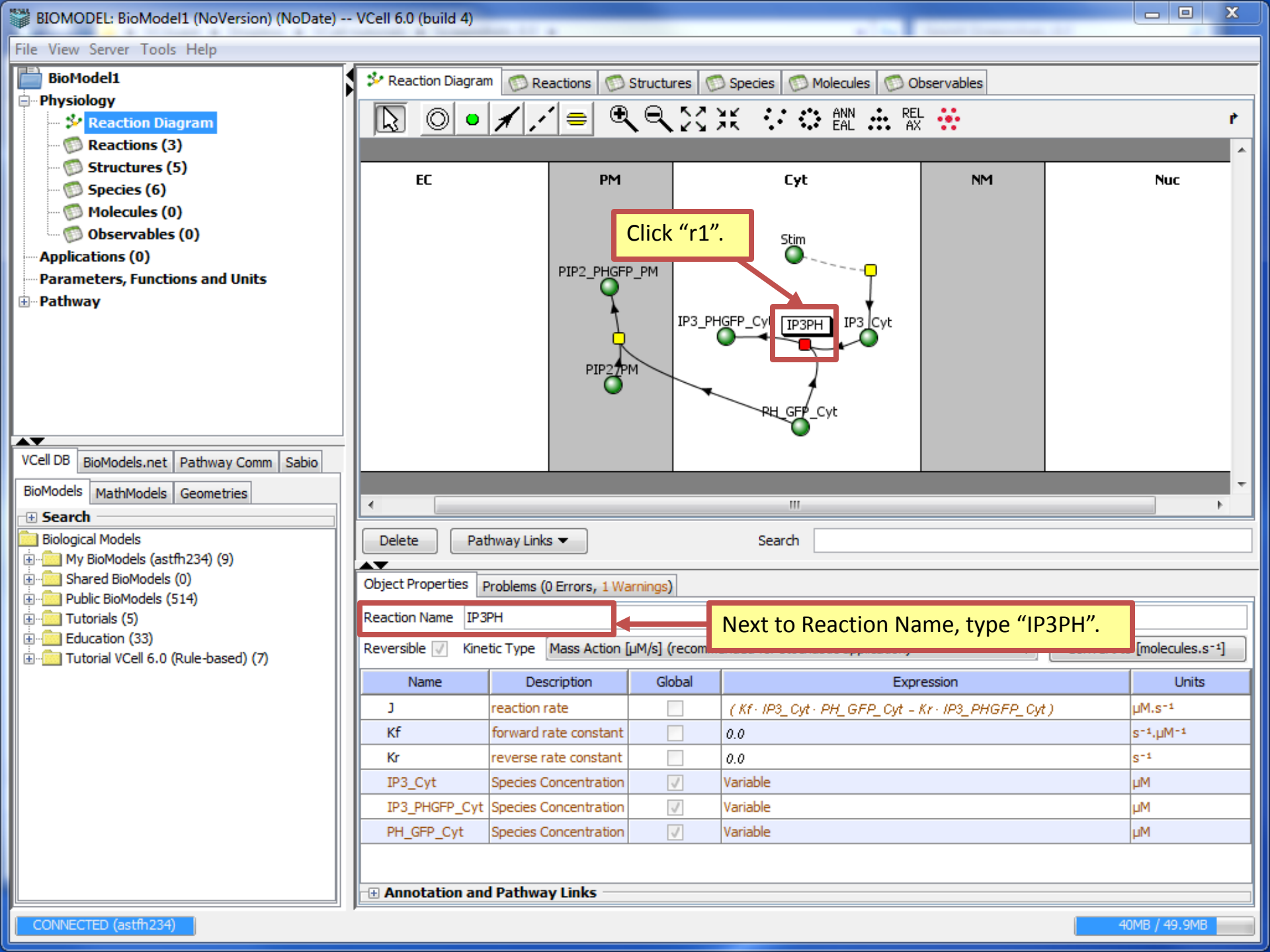
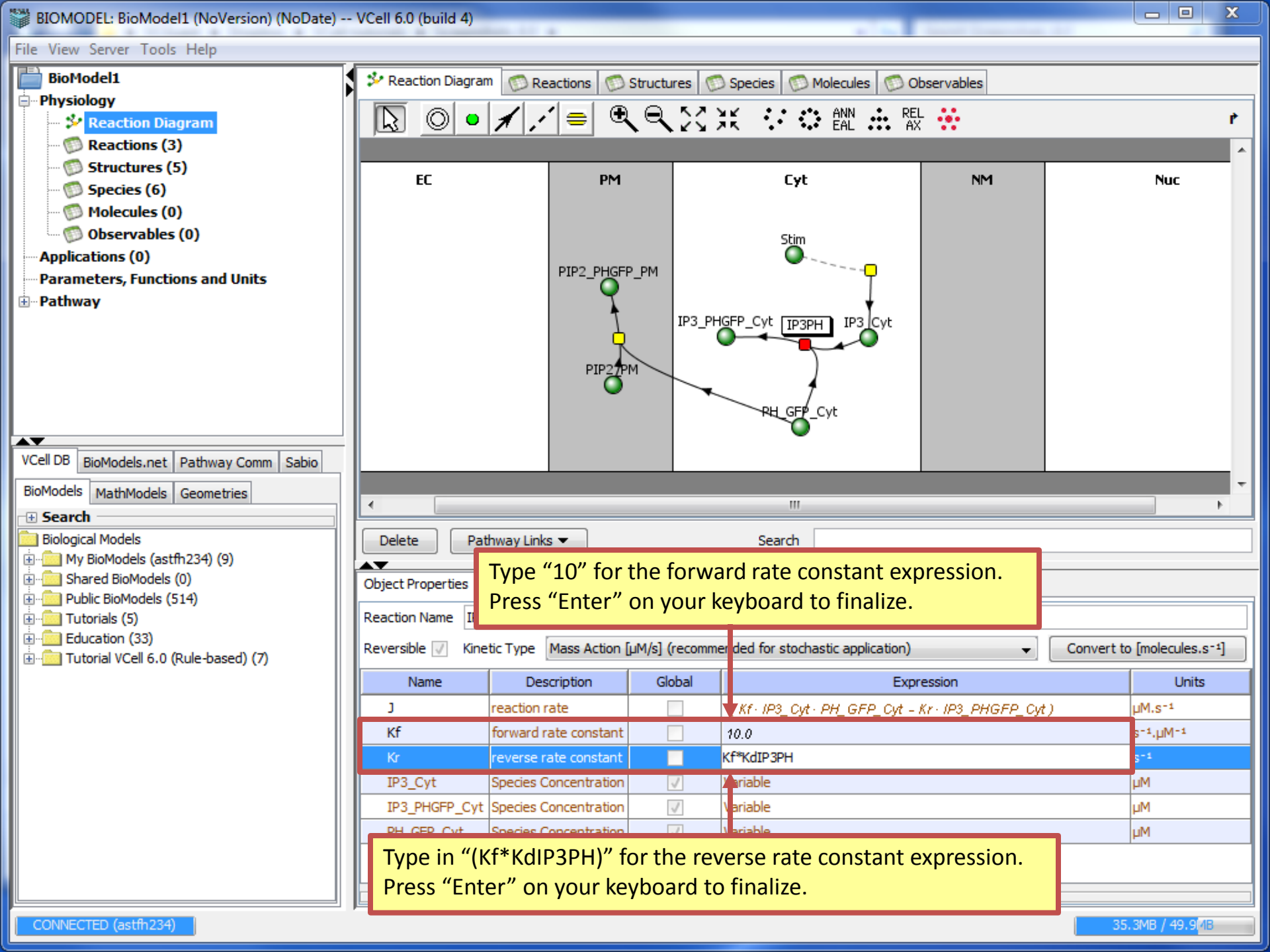
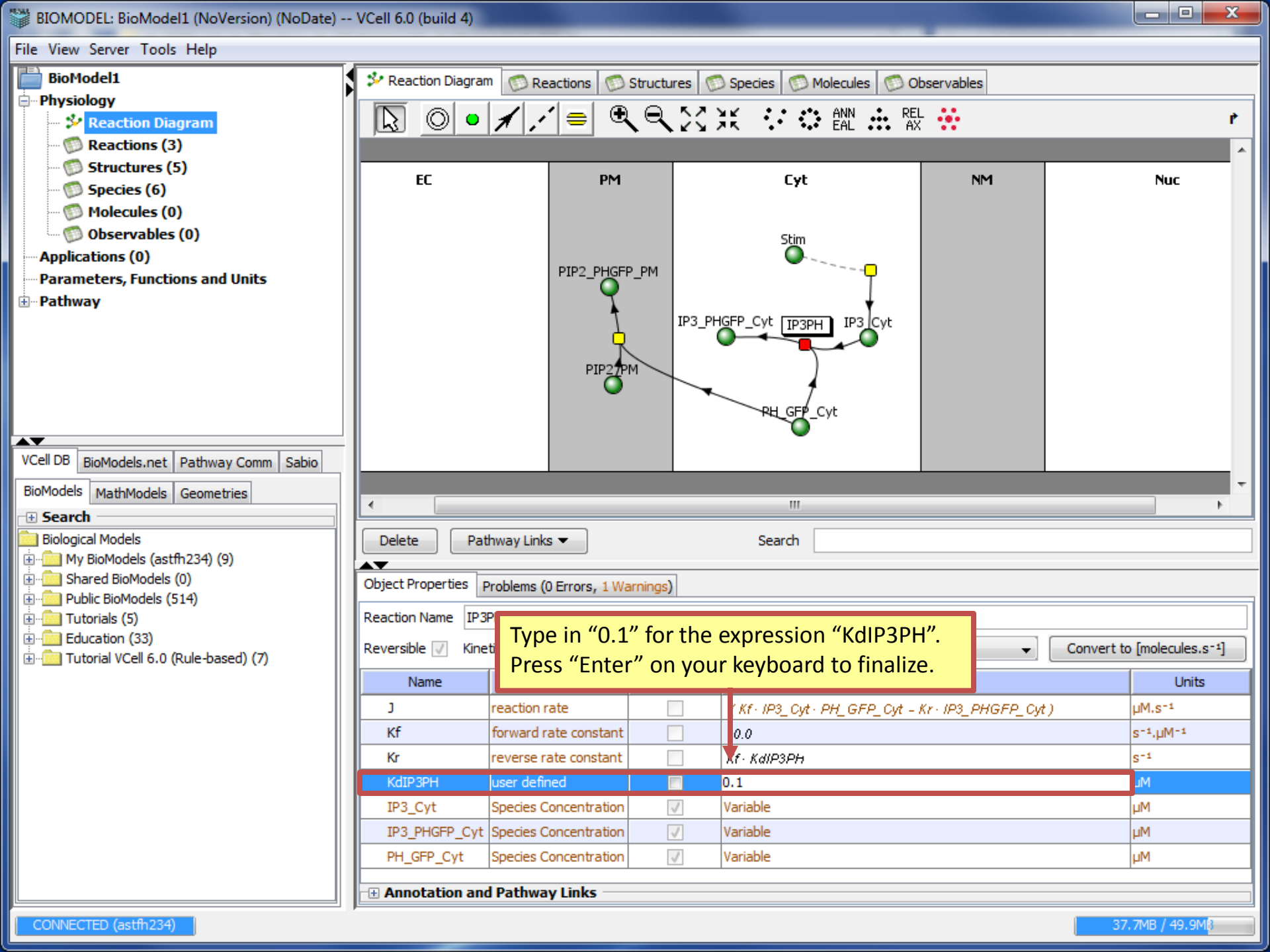
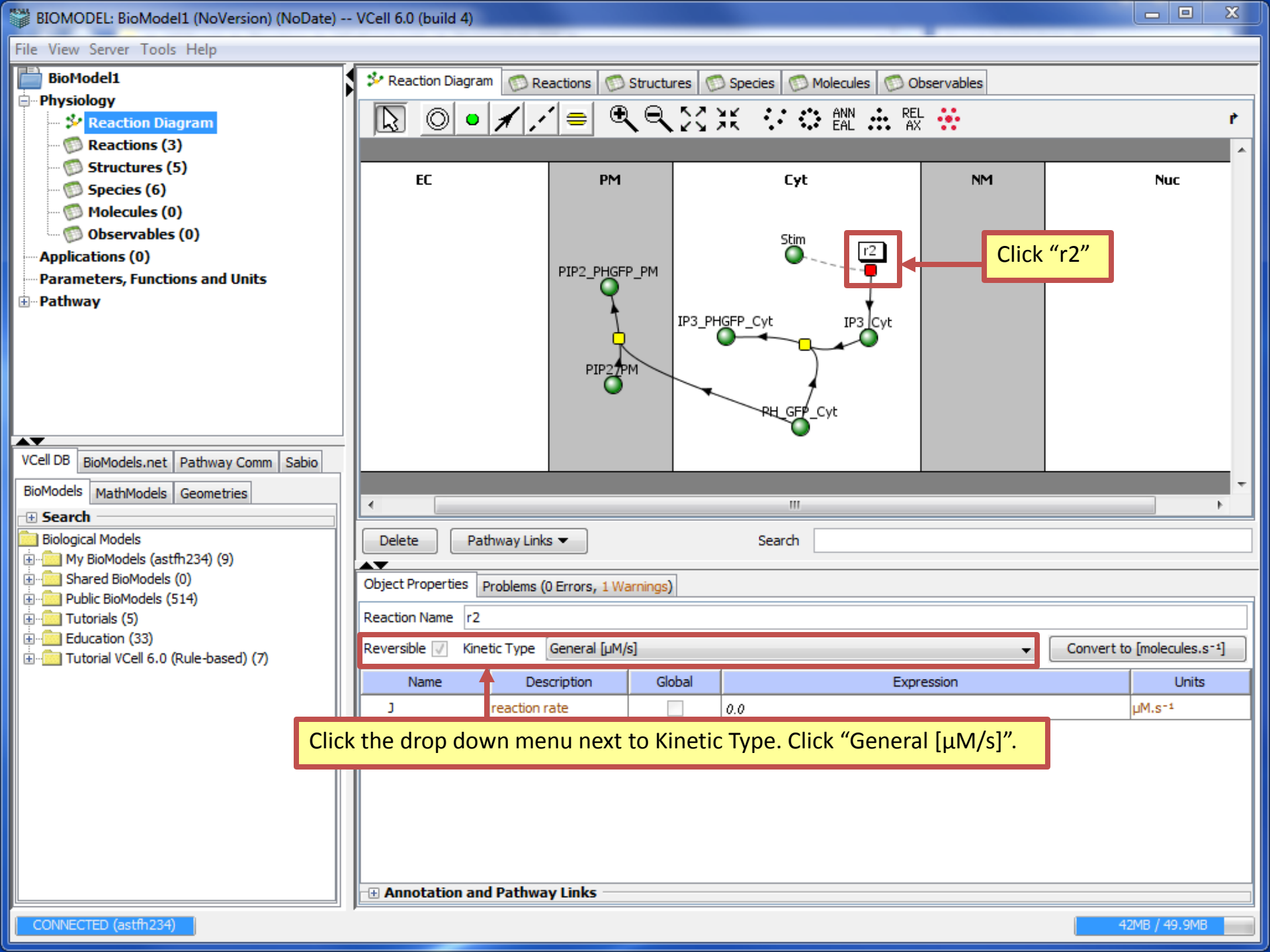
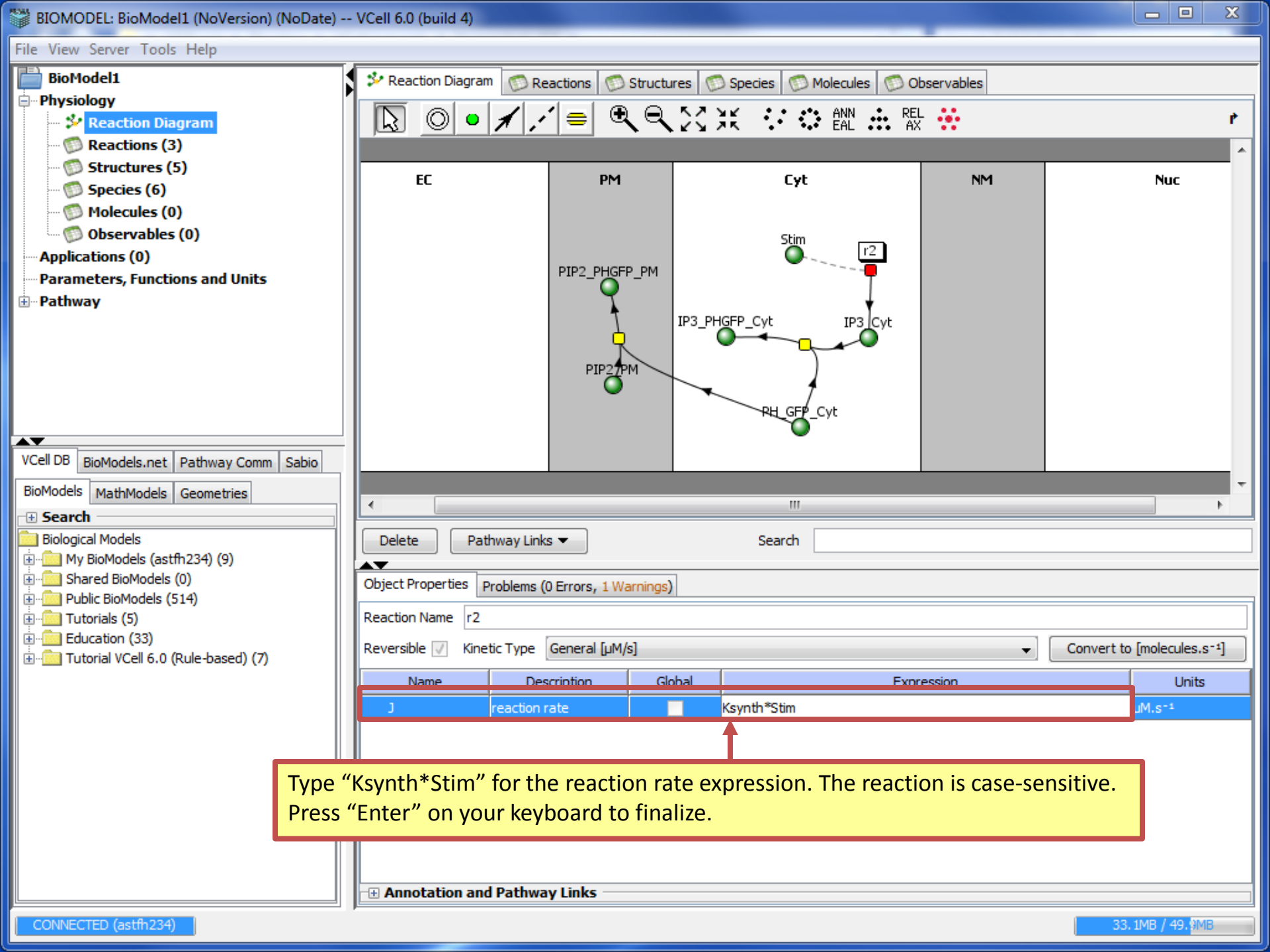
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
33.4MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Click “r1”.
Stim
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3PH
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
IP3PH
Next to Reaction Name, type “IP3PH”.
Reversible
Kinetic Type
Mass Action [µM/s] (recom
[molecules.s⁻¹]
Name
Description
Global
Expression
Units
J
reaction rate
(Kf · IP3_Cyt · PH_GFP_Cyt - Kr · IP3_PHGFP_Cyt)
µM.s⁻¹
Kf
forward rate constant
0.0
s⁻¹.µM⁻¹
Kr
reverse rate constant
0.0
s⁻¹
IP3_Cyt
Species Concentration
Variable
µM
IP3_PHGFP_Cyt
Species Concentration
Variable
µM
PH_GFP_Cyt
Species Concentration
Variable
µM
Annotation and Pathway Links
CONNECTED (astfh234)
40MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3PH
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Delete
Pathway Links
Search
Type “10” for the forward rate constant expression.
Press “Enter” on your keyboard to finalize.
Object Properties
Reaction Name
Reversible
Kinetic Type
Mass Action [µM/s] (recommended for stochastic application)
Convert to [molecules.s-1]
Name
Description
Global
Expression
Units
J
reaction rate
Kf · IP3_Cyt · PH_GFP_Cyt - Kr · IP3_PHGFP_Cyt)
µM.s-1
Kf
forward rate constant
10.0
s-1.µM-1
Kr
reverse rate constant
Kf*KdIP3PH
s-1
IP3_Cyt
Species Concentration
Variable
µM
IP3_PHGFP_Cyt
Species Concentration
Variable
µM
Type in “(Kf*KdIP3PH)” for the reverse rate constant expression.
Press “Enter” on your keyboard to finalize.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
35.3MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3PH
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Delete
Pathway Links
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
Reversible
Convert to [molecules.s⁻¹]
Type in “0.1” for the expression “KdIP3PH”.
Press “Enter” on your keyboard to finalize.
Name
Units
J
reaction rate
Kf · IP3_Cyt · PH_GFP_Cyt - Kr · IP3_PHGFP_Cyt)
µM.s⁻¹
Kf
forward rate constant
0.0
s⁻¹,µM⁻¹
Kr
reverse rate constant
Kf · KdIP3PH
s⁻¹
KdIP3PH
user defined
0.1
µM
IP3_Cyt
Species Concentration
Variable
µM
IP3_PHGFP_Cyt
Species Concentration
Variable
µM
PH_GFP_Cyt
Species Concentration
Variable
µM
Annotation and Pathway Links
CONNECTED (astfh234)
37.7MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
r2
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
RH_GFP_Cyt
Click "r2"
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
r2
Reversible
Kinetic Type
General [µM/s]
Convert to [molecules.s⁻¹]
Name
Description
Global
Expression
Units
J
reaction rate
0.0
µM.s⁻¹
Click the drop down menu next to Kinetic Type. Click "General [µM/s]".
Annotation and Pathway Links
CONNECTED (astfh234)
42MB / 49.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
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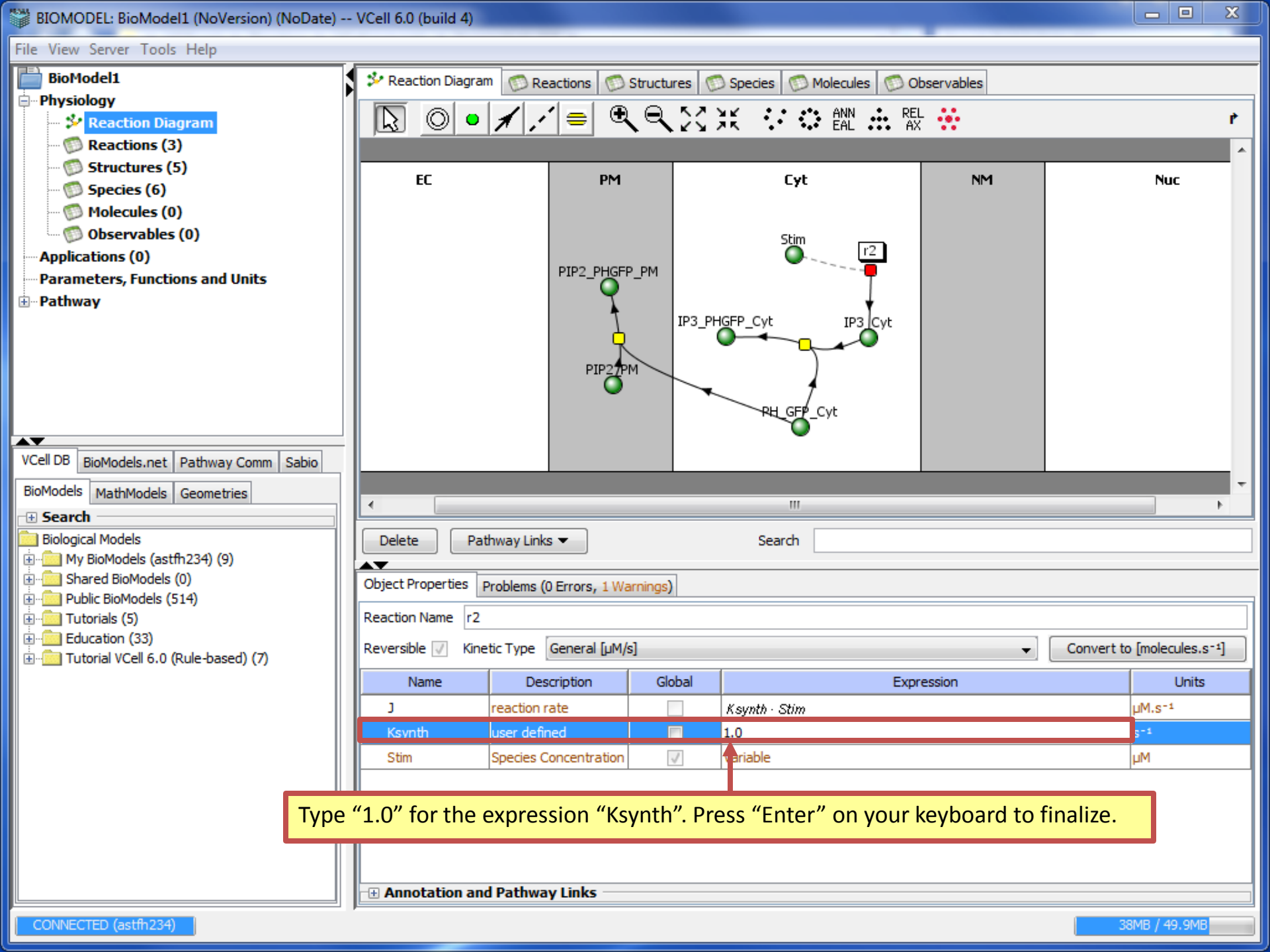
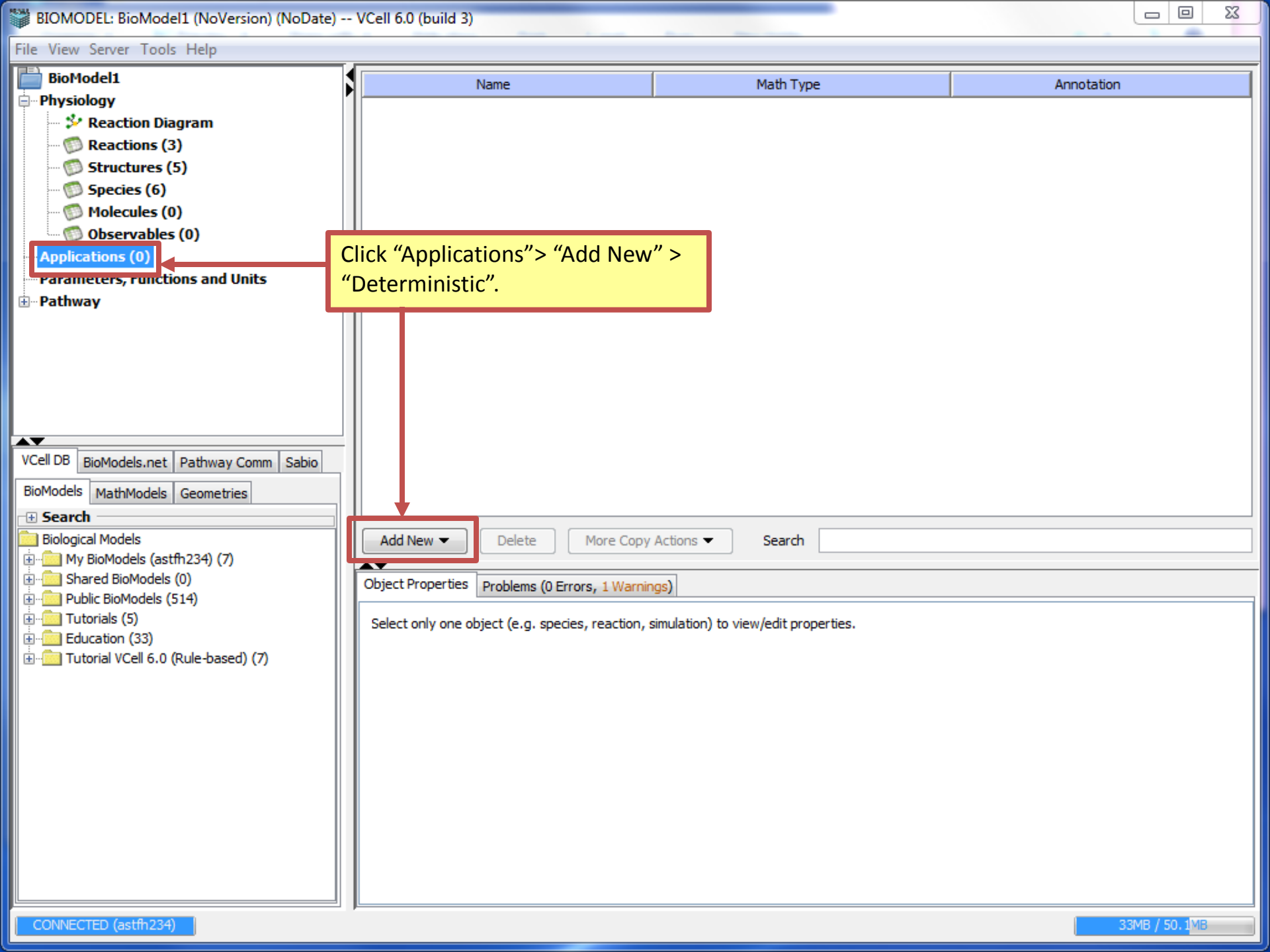
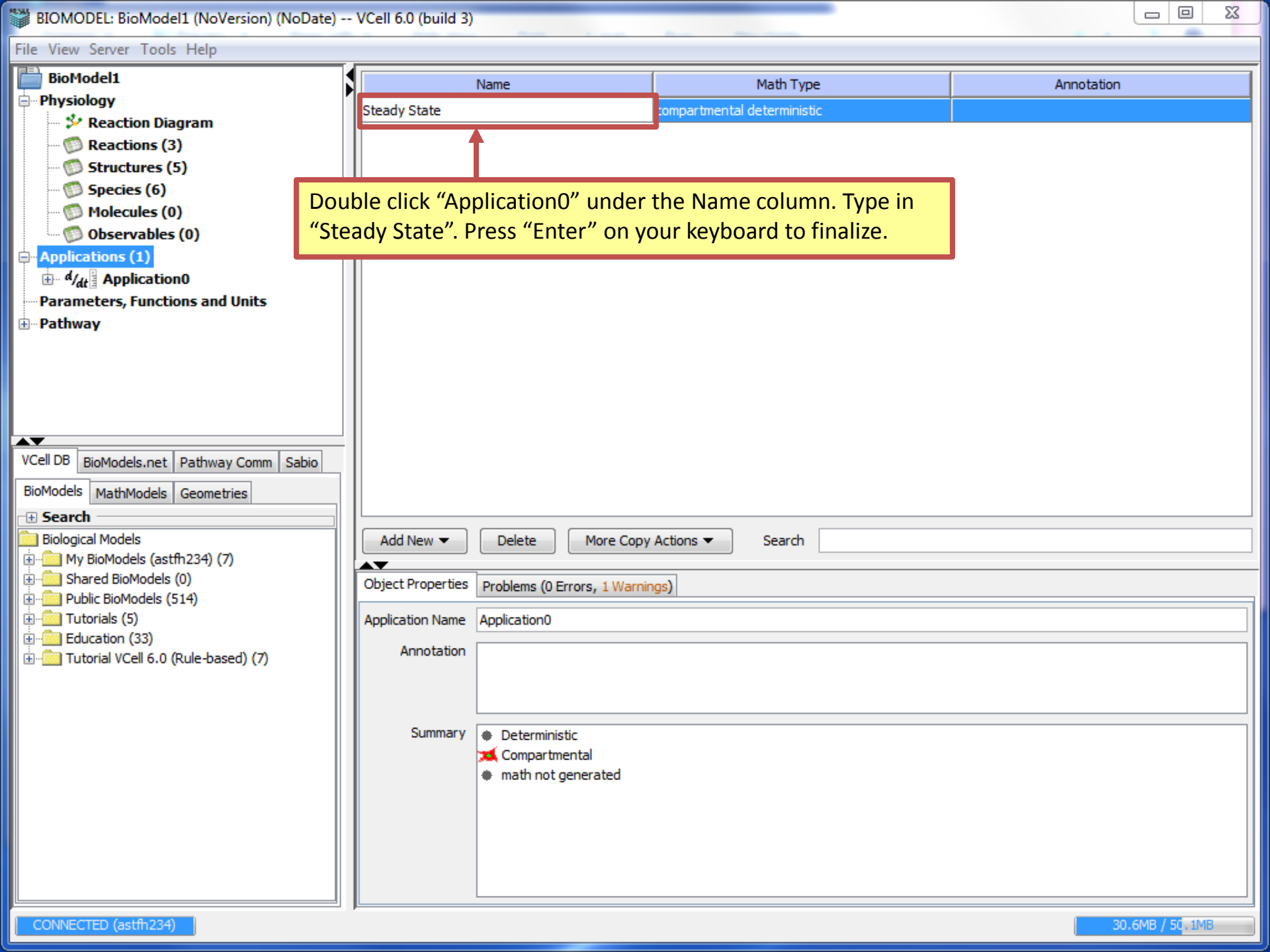
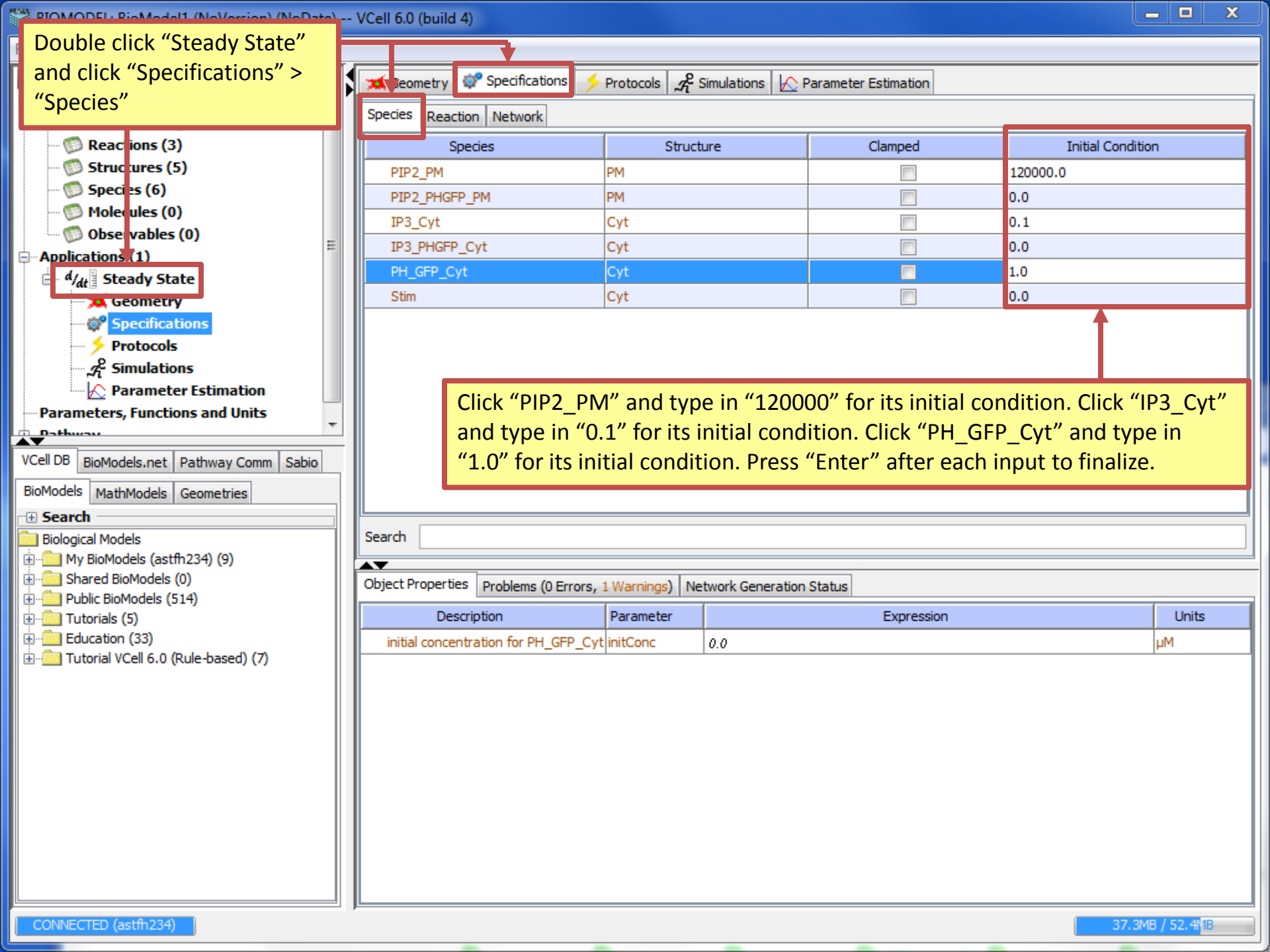
Tutorial VCell 6.0 (Rule-based) (7)
Reaction Diagram
Reactions
Structures
Species
Molecules
Observables
EC
PM
Cyt
NM
Nuc
Stim
r2
PIP2_PHGFP_PM
IP3_PHGFP_Cyt
IP3_Cyt
PIP2_PM
PH_GFP_Cyt
Delete
Pathway Links
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Reaction Name
r2
Reversible
Kinetic Type
General [µM/s]
Convert to [molecules.s⁻¹]
Name
Description
Global
Expression
Units
J
reaction rate
Ksynth*Stim
µM.s⁻¹
Type “Ksynth*Stim” for the reaction rate expression. The reaction is case-sensitive.
Press “Enter” on your keyboard to finalize.
Annotation and Pathway Links
CONNECTED (astfh234)
33.1MB / 49.9MB

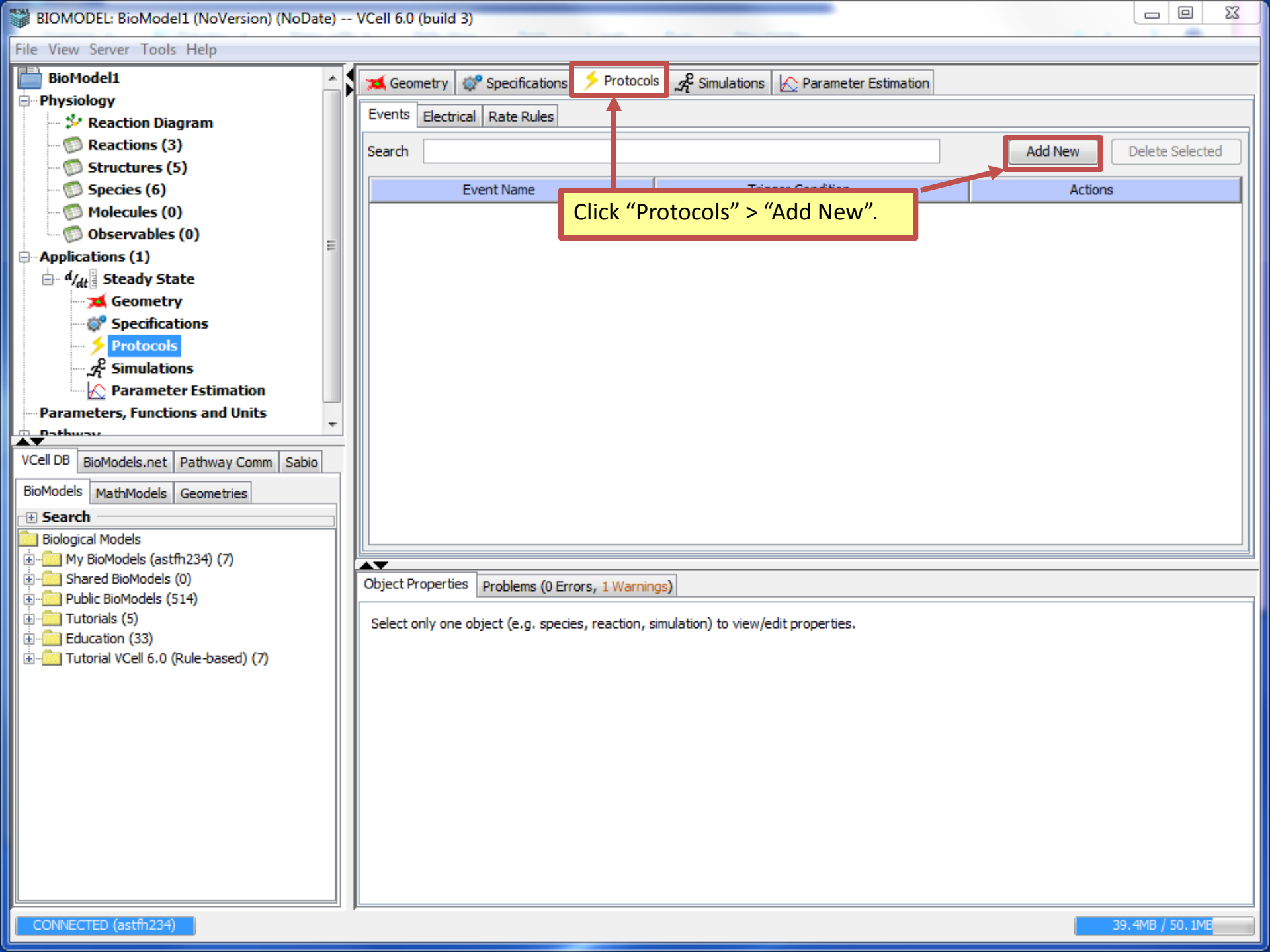


Type “1.0” for the expression “Ksynth”. Press “Enter” on your keyboard to finalize.


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (0)
Parameters, Functions and Units
Pathway
Name
Math Type
Annotation
Click “Applications”> “Add New” > “Deterministic”.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Add New
Delete
More Copy Actions
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
33MB / 50.1MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Application0
Parameters, Functions and Units
Pathway
Name
Math Type
Annotation
Steady State
compartmental deterministic
Double click “Application0” under the Name column. Type in “Steady State”. Press “Enter” on your keyboard to finalize.
Add New
Delete
More Copy Actions
Search
Object Properties
Problems (0 Errors, 1 Warnings)
Application Name
Application0
Annotation
Summary
Deterministic
Compartmental
math not generated
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
30.6MB / 50.1MB


Double click “Steady State” and click “Specifications” > “Species”
Steady State
Specifications
Species
Click “PIP2_PM” and type in “120000” for its initial condition. Click “IP3_Cyt” and type in “0.1” for its initial condition. Click “PH_GFP_Cyt” and type in “1.0” for its initial condition. Press “Enter” after each input to finalize.


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Parameters, Functions and Units
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
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Biological Models
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Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
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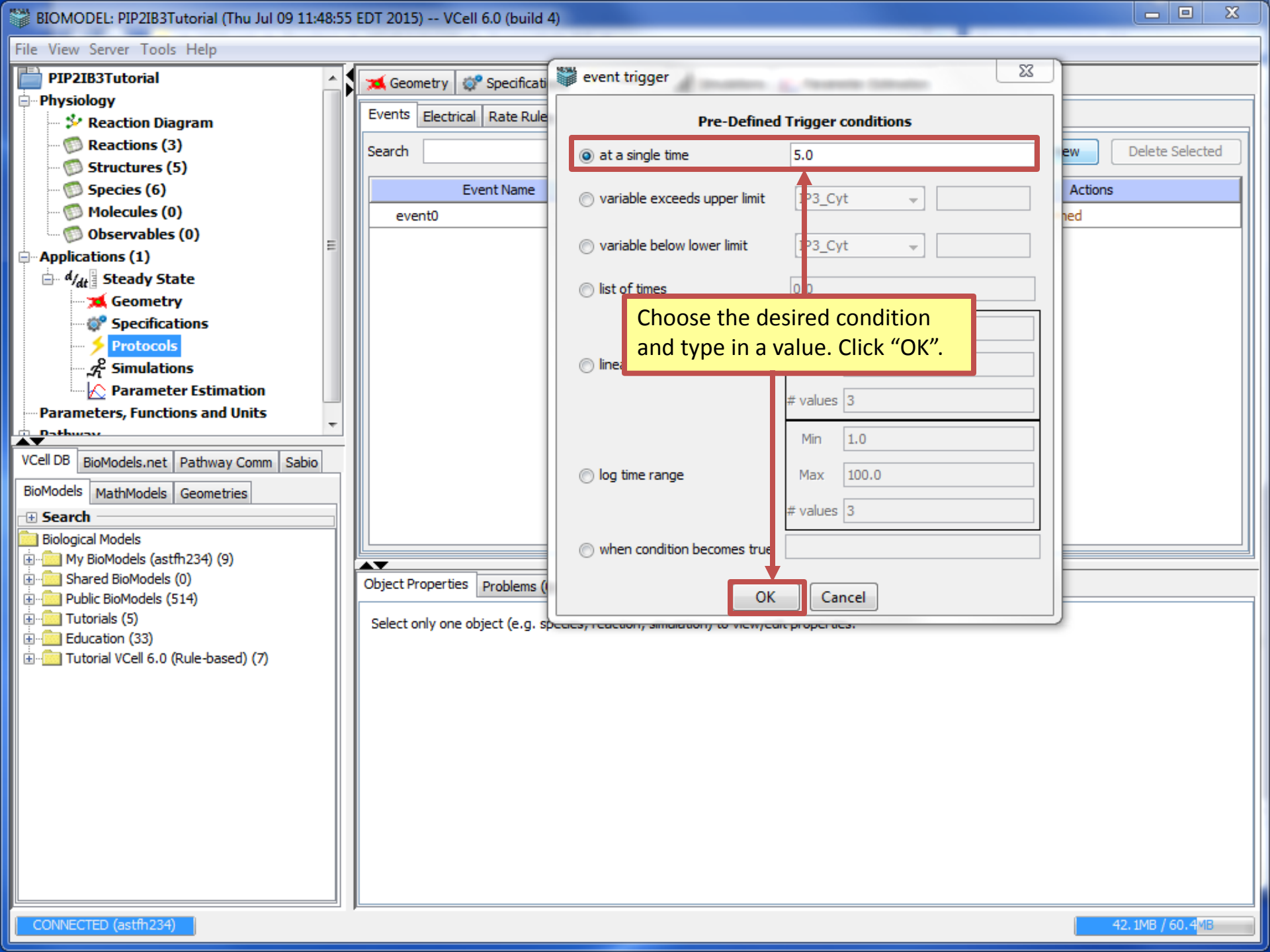
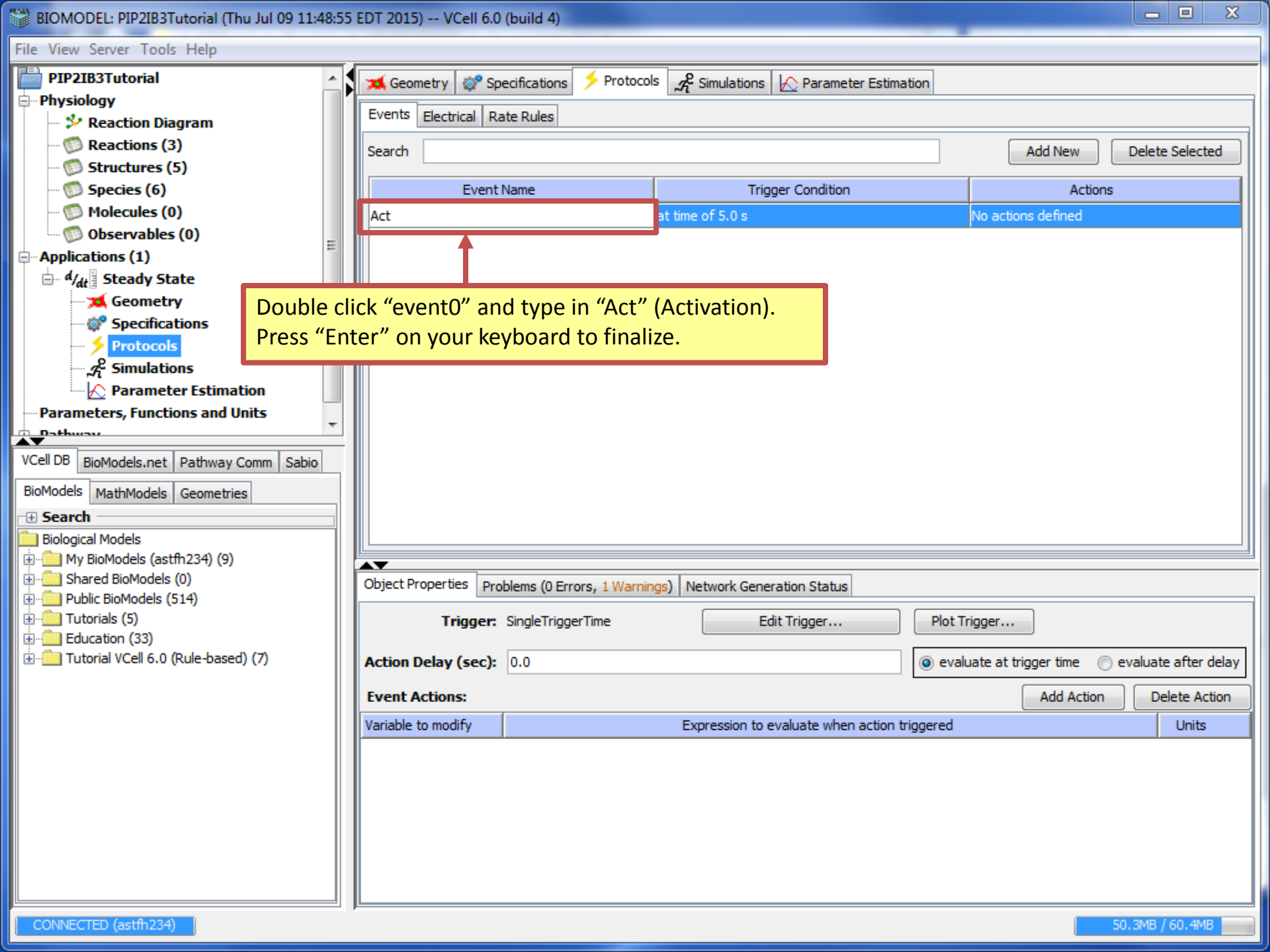
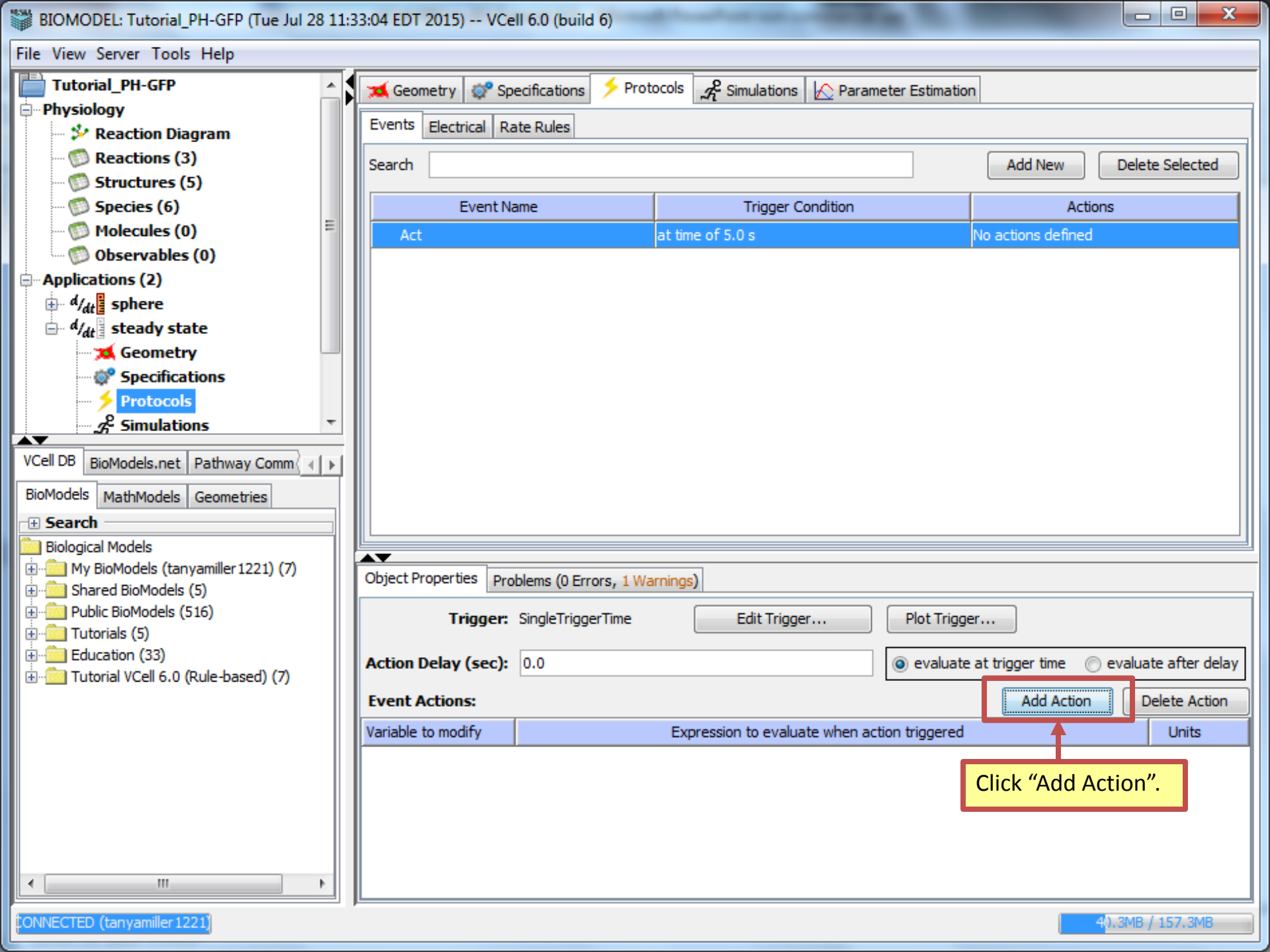
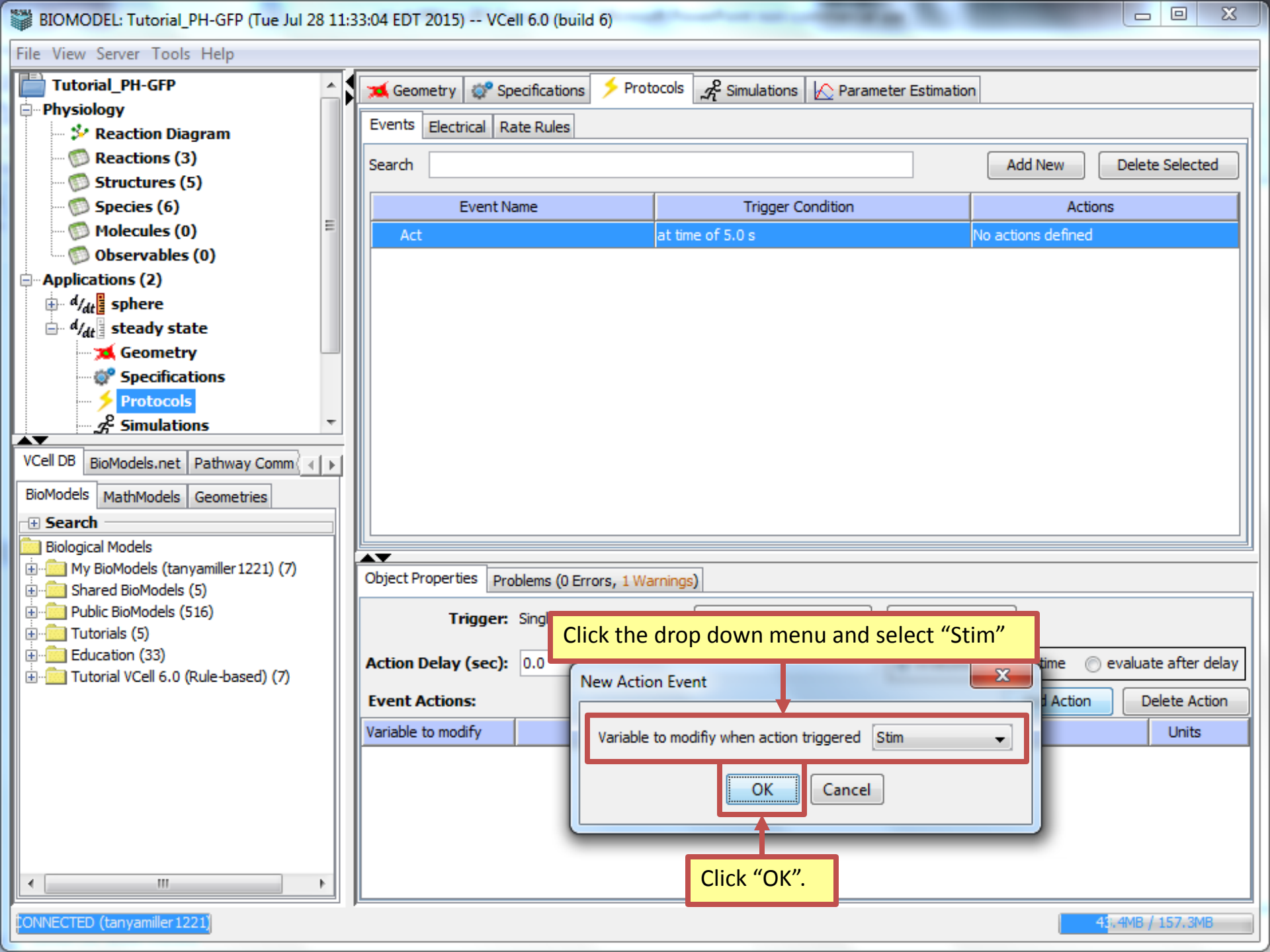
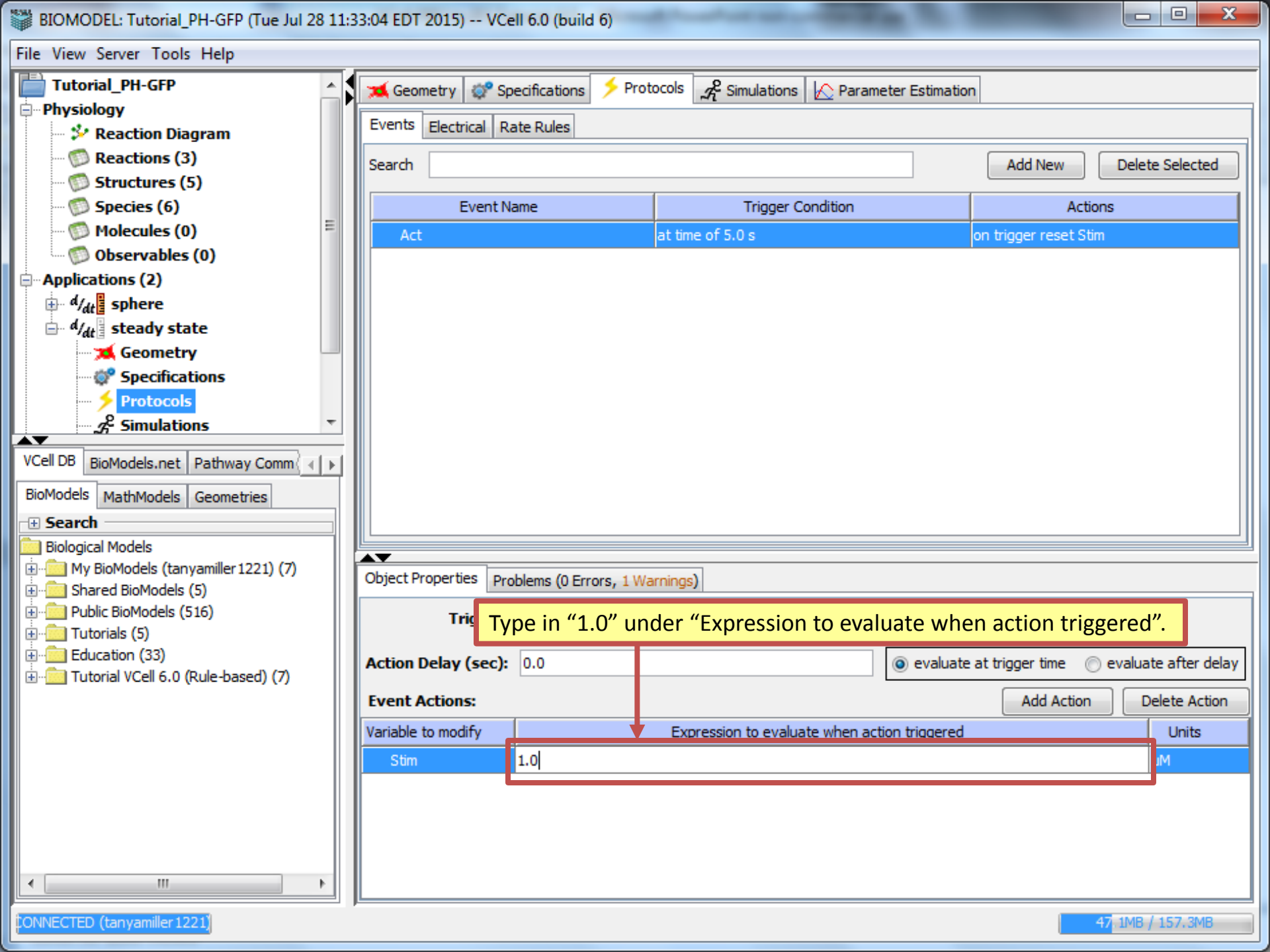
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Actions
Click “Protocols” > “Add New”.
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
39.4MB / 50.1MB

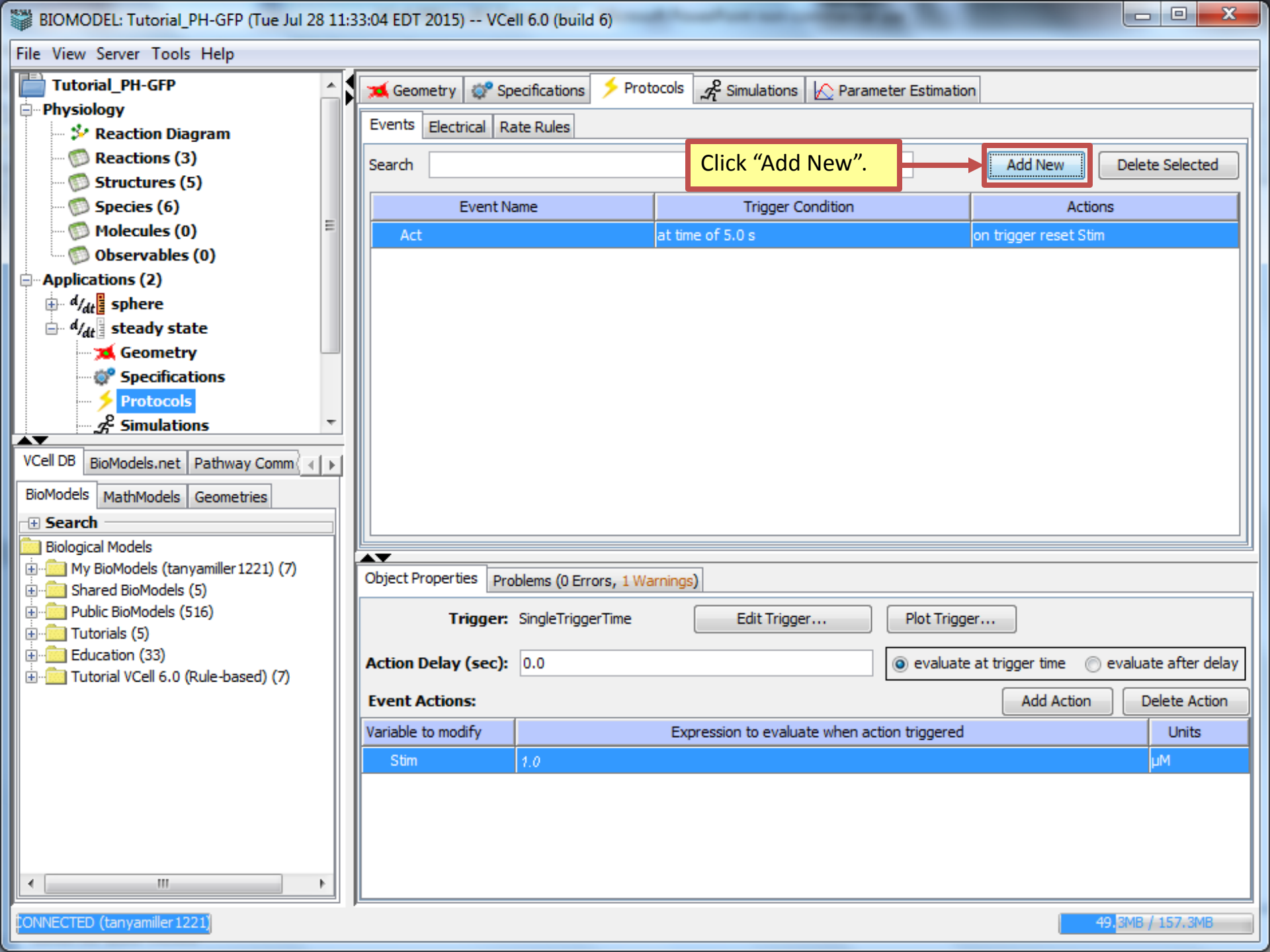

BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:48:55 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
PIP2IB3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Parameters, Functions and Units
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specificati
Events
Electrical
Rate Rule
Search
Event Name
event0
Delete Selected
Actions
Object Properties
Problems
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
42.1MB / 60.4MB
event trigger
Pre-Defined Trigger conditions
at a single time
5.0
variable exceeds upper limit
variable below lower limit
list of times
linear
values
3
log time range
Min
1.0
Max
100.0
values
3
when condition becomes true
OK
Cancel
Choose the desired condition and type in a value. Click “OK”.


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:48:55 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
PIP2IB3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Parameters, Functions and Units
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
No actions defined
Double click “event0” and type in “Act” (Activation).
Press “Enter” on your keyboard to finalize.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Trigger: SingleTriggerTime
Edit Trigger...
Plot Trigger...
Action Delay (sec): 0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
CONNECTED (astfh234)
50.3MB / 60.4MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
sphere
steady state
Geometry
Specifications
Protocols
Simulations
VCell DB
BioModels.net
Pathway Comm
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (tanyamiller1221) (7)
Shared BioModels (5)
Public BioModels (516)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
No actions defined
Object Properties
Problems (0 Errors, 1 Warnings)
Trigger: SingleTriggerTime
Edit Trigger...
Plot Trigger...
Action Delay (sec): 0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
Click “Add Action”.
CONNECTED (tanyamiller1221)
40.3MB / 157.3MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
sphere
steady state
Geometry
Specifications
Protocols
Simulations
VCell DB
BioModels.net
Pathway Comm
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (tanyamiller1221) (7)
Shared BioModels (5)
Public BioModels (516)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
No actions defined
Object Properties
Problems (0 Errors, 1 Warnings)
Trigger:
Action Delay (sec):
0.0
evaluate after delay
Event Actions:
Action
Delete Action
Variable to modify
Units
Click the drop down menu and select “Stim”
New Action Event
Variable to modifiy when action triggered
Stim
OK
Cancel
Click “OK”.
CONNECTED (tanyamiller1221)
157.3MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
sphere
steady state
Geometry
Specifications
Protocols
Simulations
VCell DB
BioModels.net
Pathway Comm
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (tanyamiller1221) (7)
Shared BioModels (5)
Public BioModels (516)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
on trigger reset Stim
Object Properties
Problems (0 Errors, 1 Warnings)
Type in “1.0” under “Expression to evaluate when action triggered”.
Action Delay (sec):
0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
Stim
1.0
CONNECTED (tanyamiller1221)
47 1MB / 157.3MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
sphere
steady state
Geometry
Specifications
Protocols
Simulations
VCell DB
BioModels.net
Pathway Comm
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (tanyamiller1221) (7)
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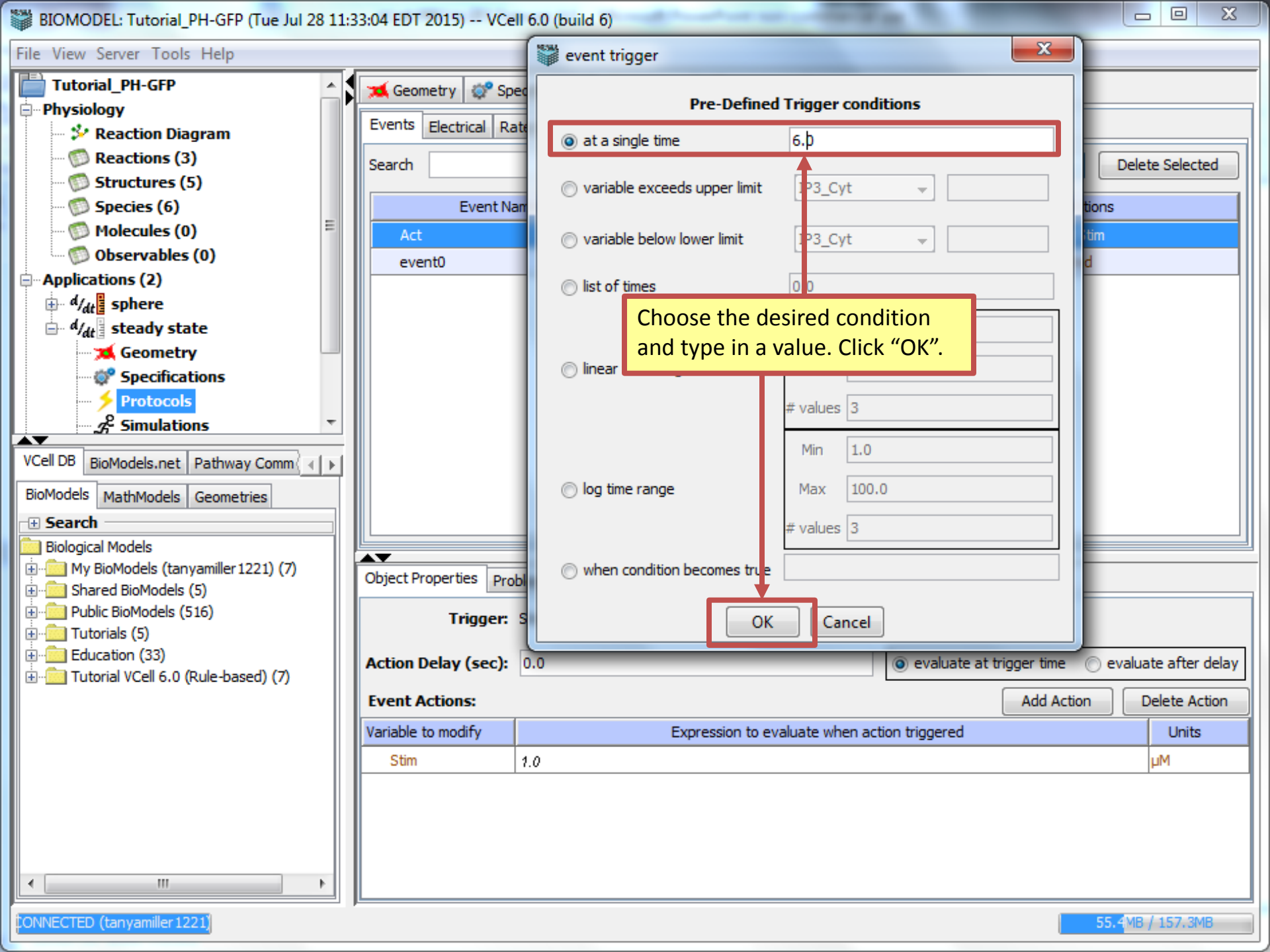
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Events
Electrical
Rate Rules
Search
Click “Add New”.
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
on trigger reset Stim
Object Properties
Problems (0 Errors, 1 Warnings)
Trigger: SingleTriggerTime
Edit Trigger...
Plot Trigger...
Action Delay (sec): 0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
Stim
1.0
µM
CONNECTED (tanyamiller1221)
49.3MB / 157.3MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
sphere
steady state
Geometry
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VCell DB
BioModels.net
Pathway Comm
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Public BioModels (516)
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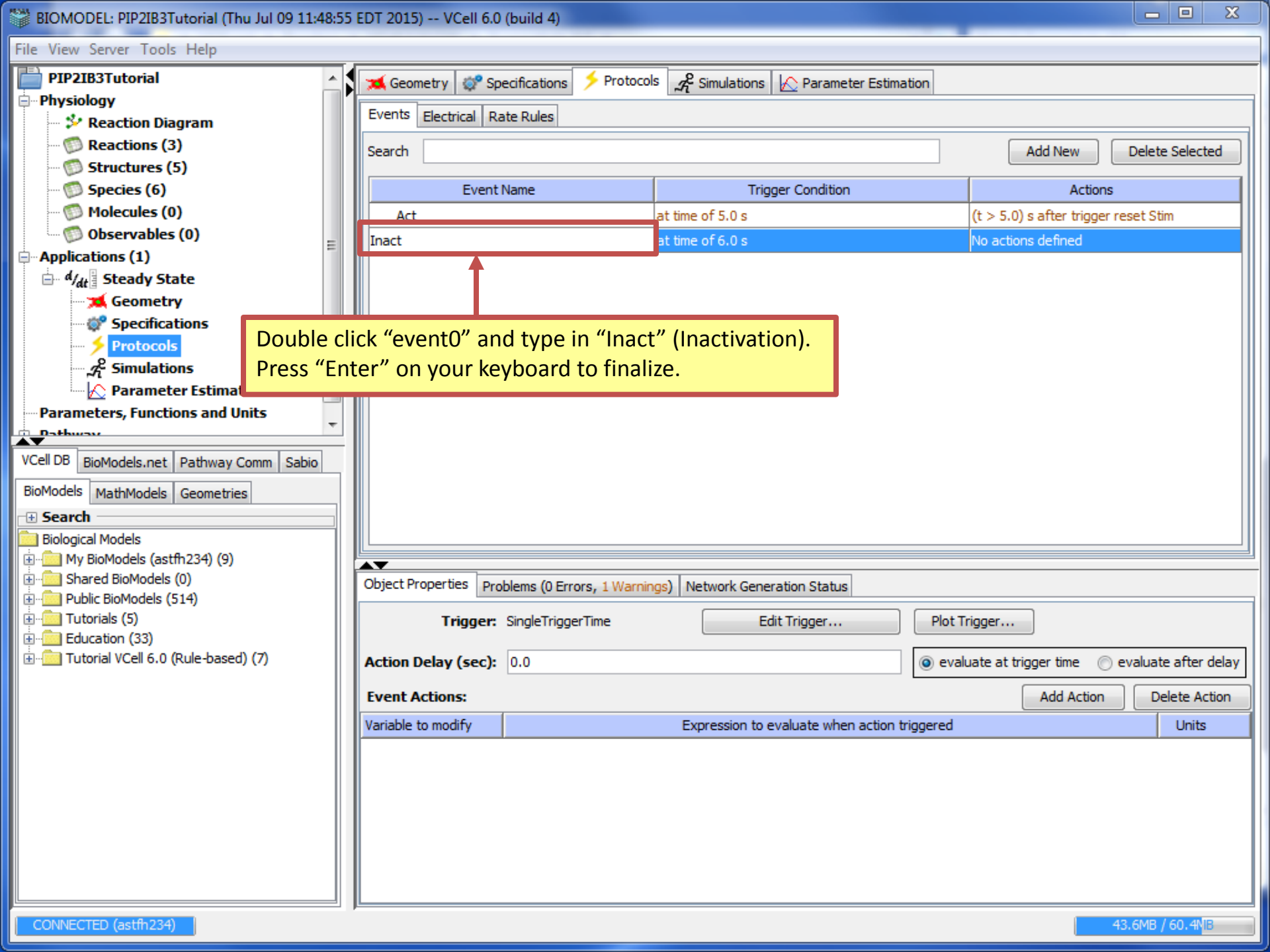
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Events
Electrical
Search
Event Nam
Act
event0
Delete Selected
Object Properties
Trigger:
Action Delay (sec):
0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
Stim
1.0
µM
CONNECTED (tanyamiller1221)
55.4MB / 157.3MB
event trigger
Pre-Defined Trigger conditions
at a single time
6.0
variable exceeds upper limit
variable below lower limit
list of times
linear
values
3
log time range
Min
1.0
Max
100.0
values
3
when condition becomes true
OK
Cancel
Choose the desired condition and type in a value. Click “OK”.


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:48:55 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
PIP2IB3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
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Parameter Estimat
Parameters, Functions and Units
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Simulations
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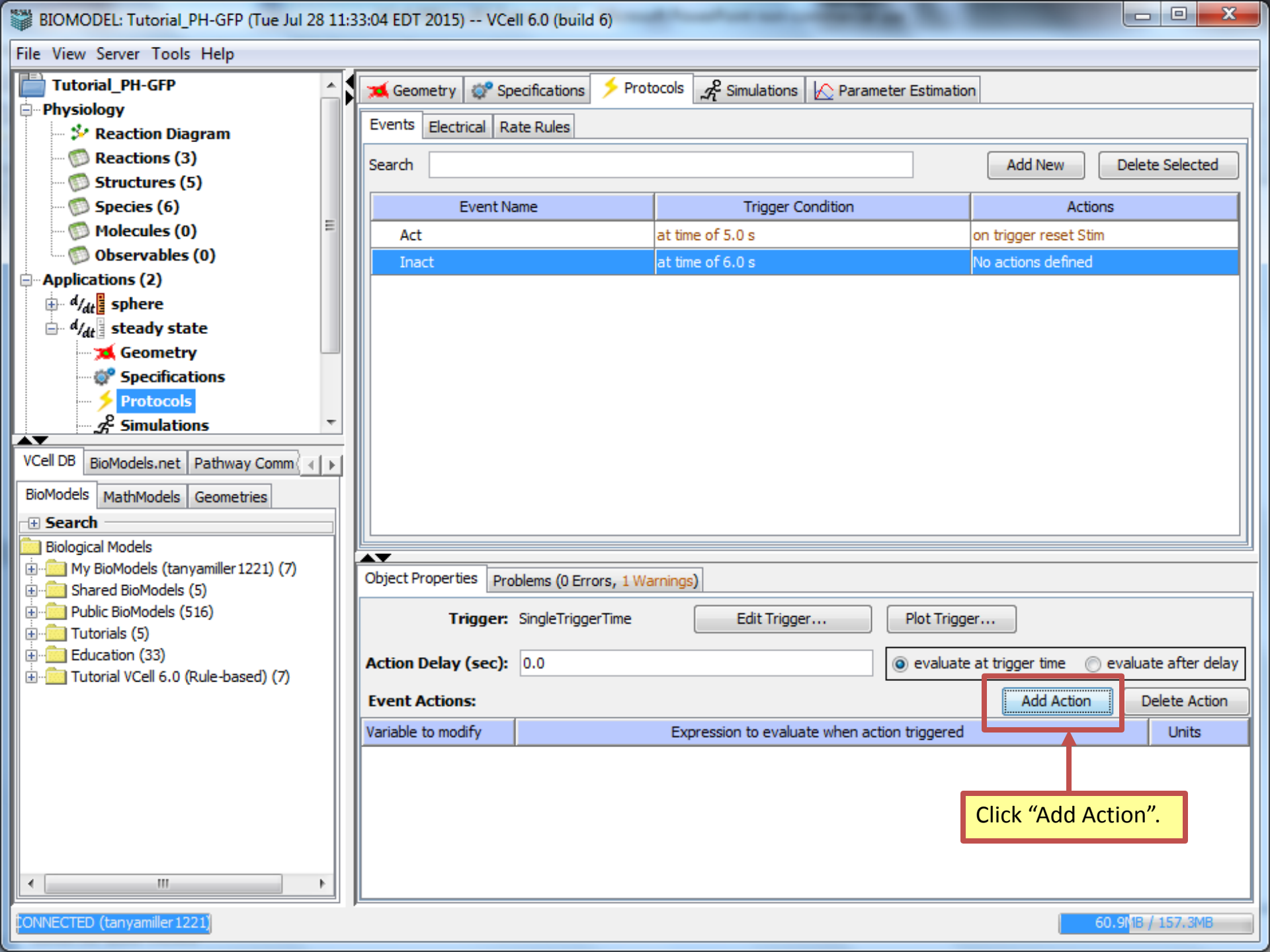
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
(t > 5.0) s after trigger reset Stim
Inact
at time of 6.0 s
No actions defined
Double click “event0” and type in “Inact” (Inactivation).
Press “Enter” on your keyboard to finalize.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Trigger: SingleTriggerTime
Edit Trigger...
Plot Trigger...
Action Delay (sec): 0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
CONNECTED (astfh234)
43.6MB / 60.4MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
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steady state
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Public BioModels (516)
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Tutorial VCell 6.0 (Rule-based) (7)
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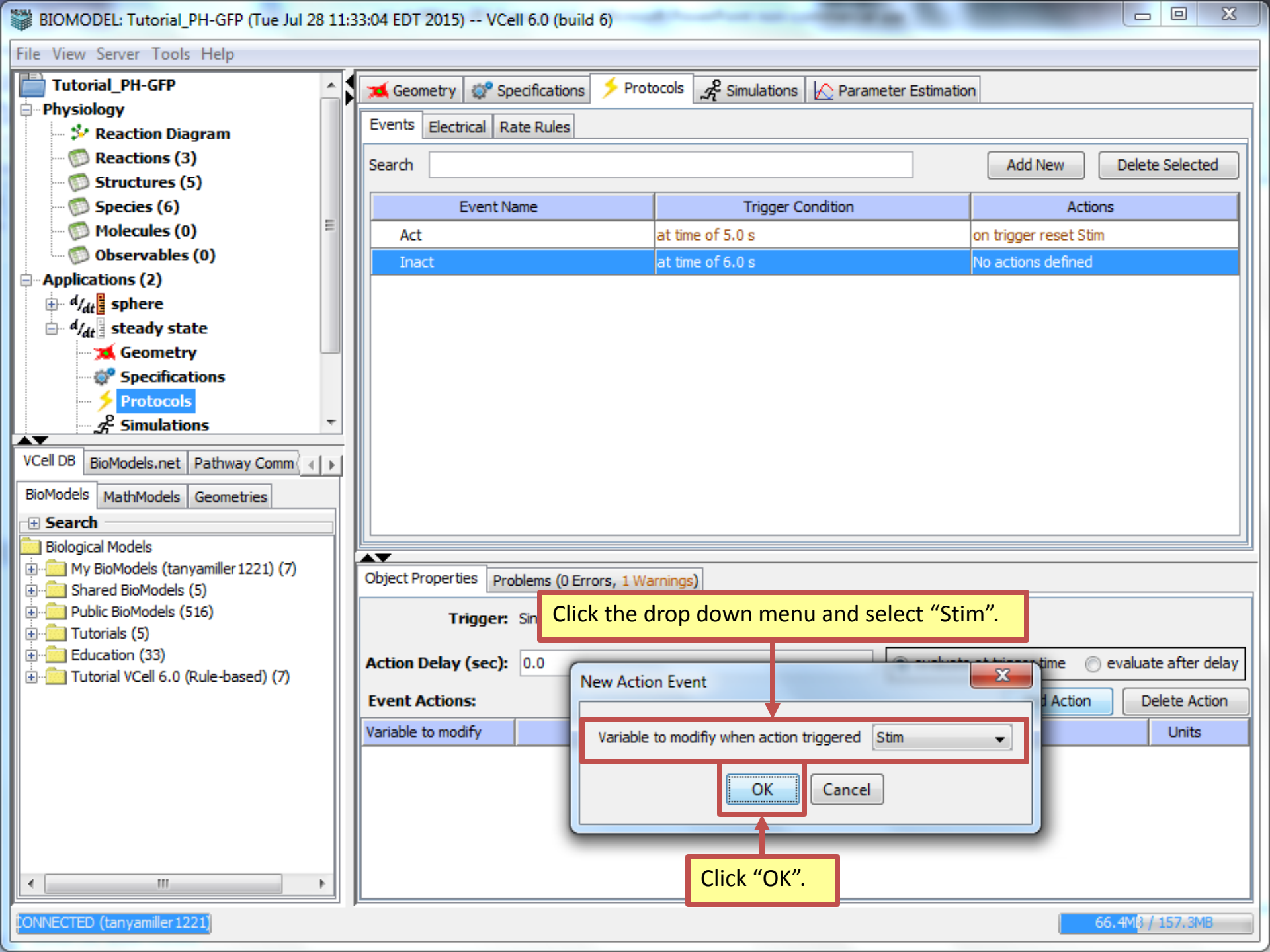
Parameter Estimation
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
on trigger reset Stim
Inact
at time of 6.0 s
No actions defined
Object Properties
Problems (0 Errors, 1 Warnings)
Trigger: SingleTriggerTime
Edit Trigger...
Plot Trigger...
Action Delay (sec): 0.0
evaluate at trigger time
evaluate after delay
Event Actions:
Add Action
Delete Action
Variable to modify
Expression to evaluate when action triggered
Units
Click “Add Action”.
CONNECTED (tanyamiller1221)
60.9MB / 157.3MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
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steady state
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Public BioModels (516)
Tutorials (5)
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Tutorial VCell 6.0 (Rule-based) (7)
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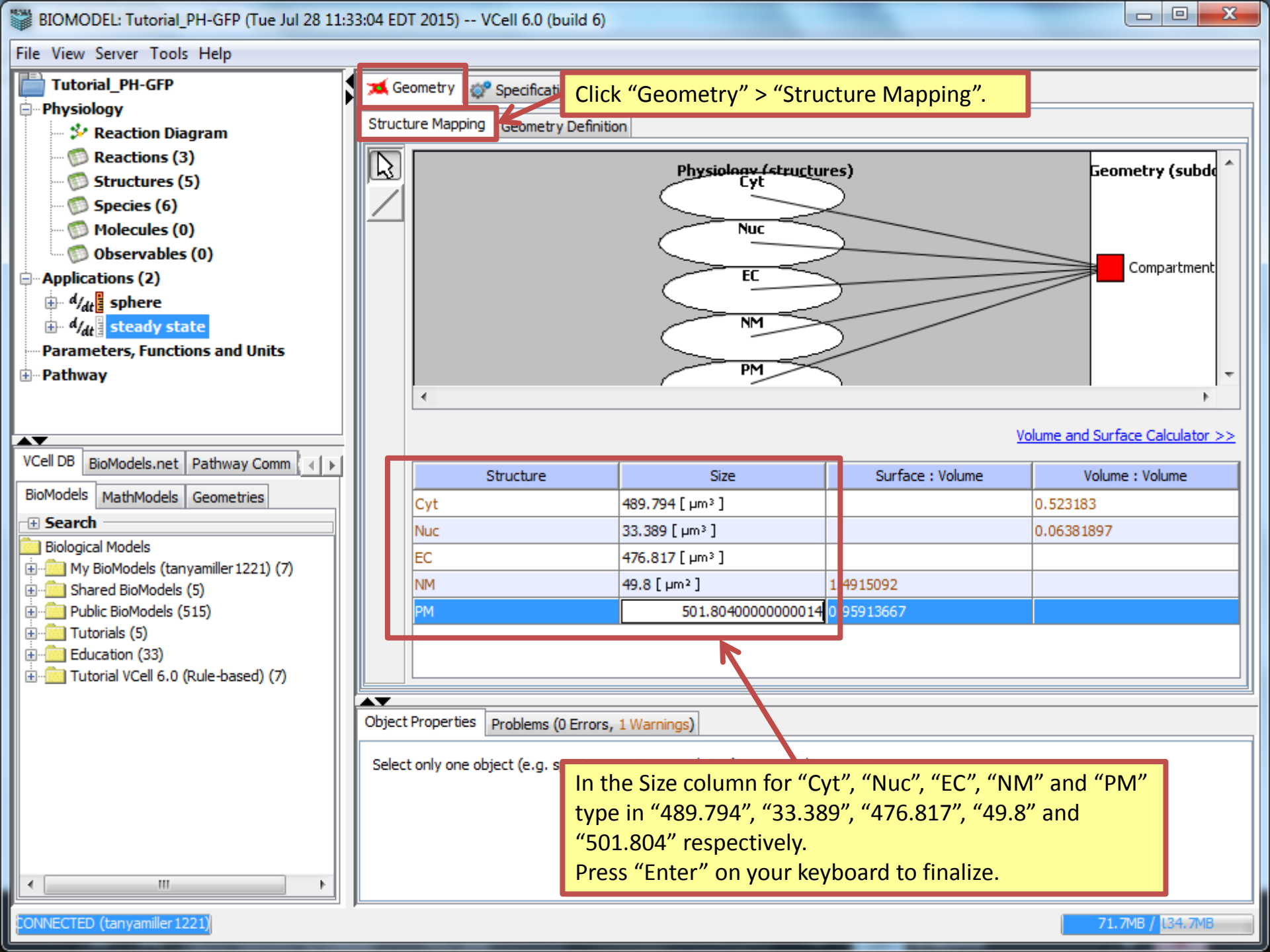
Events
Electrical
Rate Rules
Search
Add New
Delete Selected
Event Name
Trigger Condition
Actions
Act
at time of 5.0 s
on trigger reset Stim
Inact
at time of 6.0 s
No actions defined
Object Properties
Problems (0 Errors, 1 Warnings)
Trigger:
Action Delay (sec):
0.0
evaluate after delay
Event Actions:
Action
Delete Action
Variable to modify
Units
Click the drop down menu and select “Stim”.
New Action Event
Variable to modifiy when action triggered
Stim
OK
Cancel
Click “OK”.
CONNECTED (tanyamiller1221)
66.4MB / 157.3MB


BIOMODEL: Tutorial_PH-GFP (Tue Jul 28 11:33:04 EDT 2015) -- VCell 6.0 (build 6)
File View Server Tools Help
Tutorial_PH-GFP
Physiology
Reaction Diagram
Reactions (3)
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Species (6)
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Observables (0)
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sphere
steady state
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VCell DB
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Pathway Comm
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MathModels
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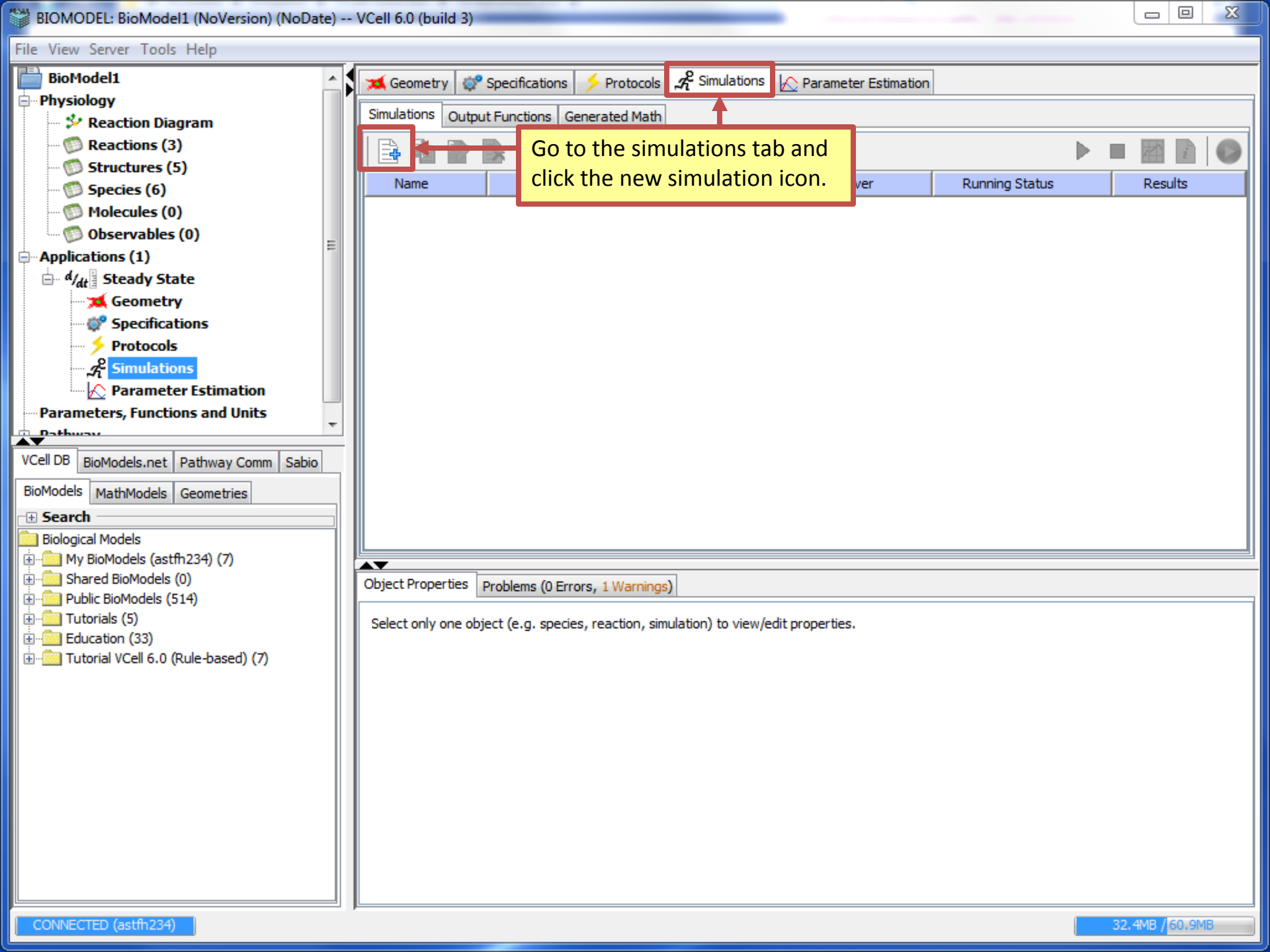
Biological Models
My BioModels (tanyamiller1221) (7)
Shared BioModels (5)
Public BioModels (515)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specificati
Structure Mapping
Geometry Definition
Click “Geometry” > “Structure Mapping”.
Physiology (structures)
Cyt
Nuc
EC
NM
PM
Geometry (subdc
Compartment
Volume and Surface Calculator >>
Structure
Size
Surface : Volume
Volume : Volume
Cyt
489.794 [µm³]
0.523183
Nuc
33.389 [µm³]
0.06381897
EC
476.817 [µm³]
NM
49.8 [µm²]
1.4915092
PM
501.80400000000014
0.95913667
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. s
In the Size column for “Cyt”, “Nuc”, “EC”, “NM” and “PM” type in “489.794”, “33.389”, “476.817”, “49.8” and “501.804” respectively.
Press “Enter” on your keyboard to finalize.
CONNECTED (tanyamiller1221)
71.7MB / 134.7MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
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Simulations
Parameter Estimation
Parameters, Functions and Units
Geometry
Specifications
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Simulations
Parameter Estimation
Simulations
Output Functions
Generated Math
Go to the simulations tab and click the new simulation icon.
Name
Running Status
Results
VCell DB
BioModels.net
Pathway Comm
Sabio
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Geometries
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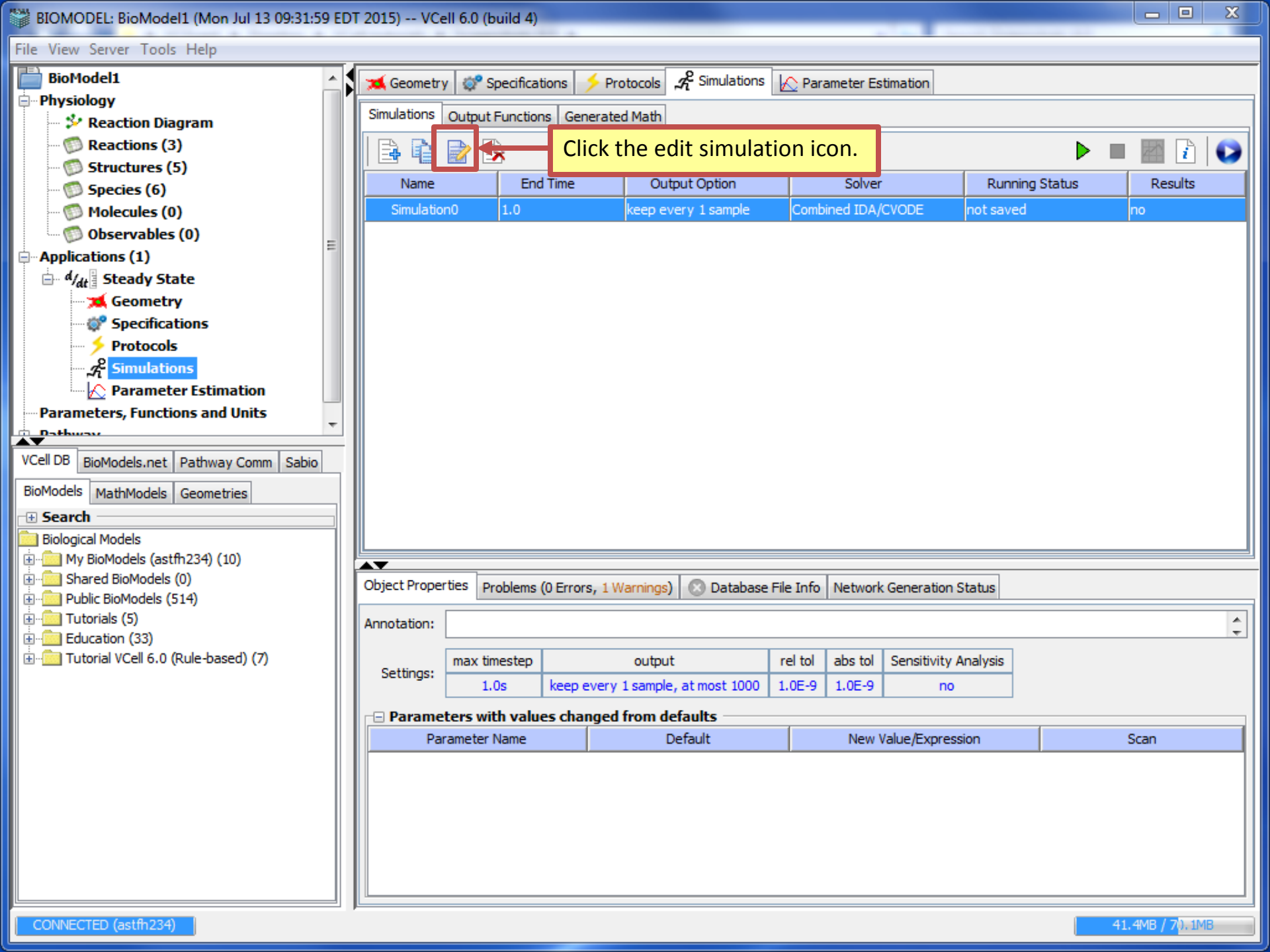
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
32.4MB / 60.9MB


BIOMODEL: BioModel1 (Mon Jul 13 09:31:59 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
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Protocols
Simulations
Parameter Estimation
Parameters, Functions and Units
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Simulations
Output Functions
Generated Math
Click the edit simulation icon.
Name
End Time
Output Option
Solver
Running Status
Results
Simulation0
1.0
keep every 1 sample
Combined IDA/CVODE
not saved
no
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
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Geometries
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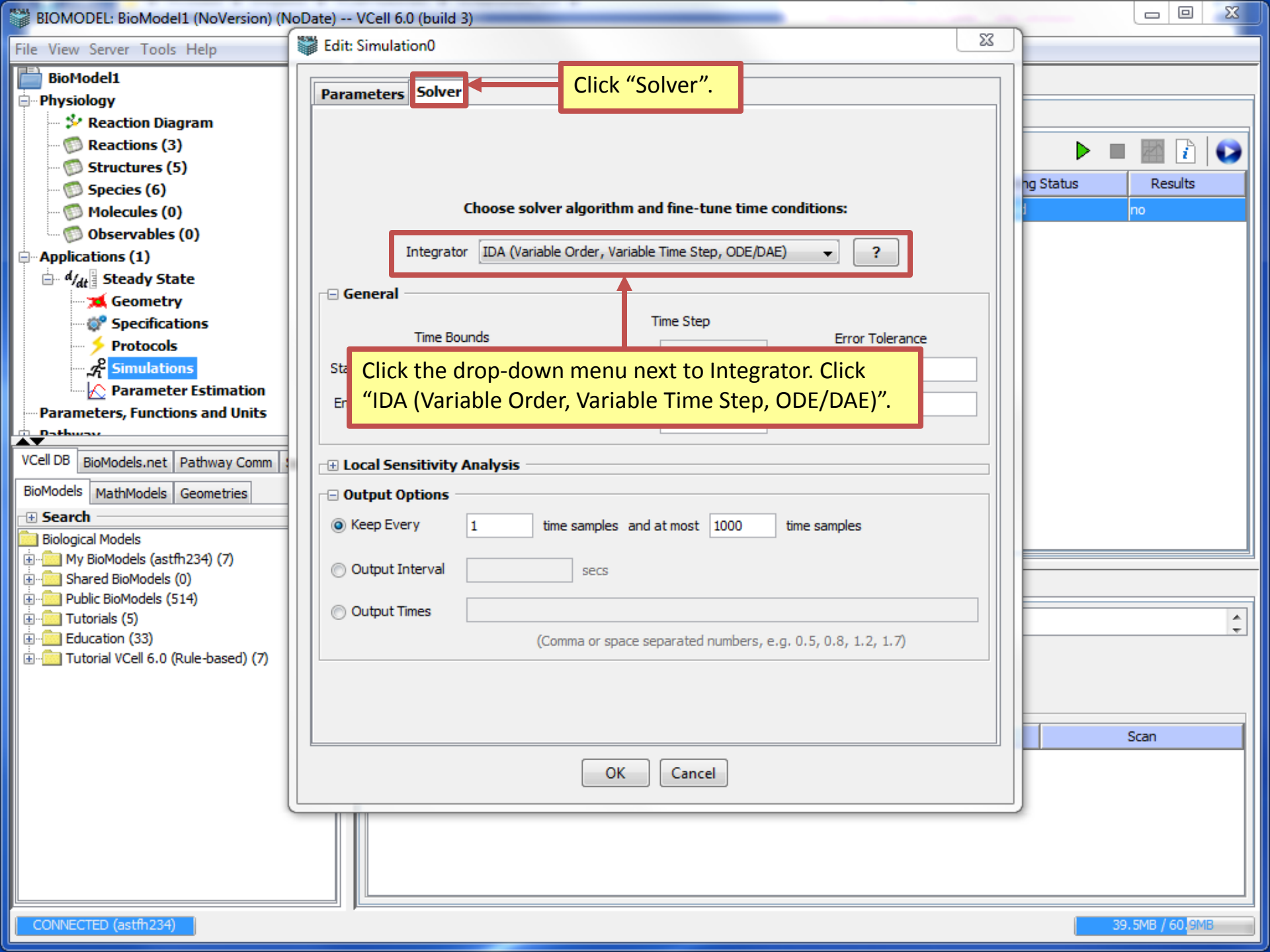
Biological Models
My BioModels (astfh234) (10)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Database File Info
Network Generation Status
Annotation:
Settings:
max timestep
output
rel tol
abs tol
Sensitivity Analysis
1.0s
keep every 1 sample, at most 1000
1.0E-9
1.0E-9
no
Parameters with values changed from defaults
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
41.4MB / 7


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
Geometry
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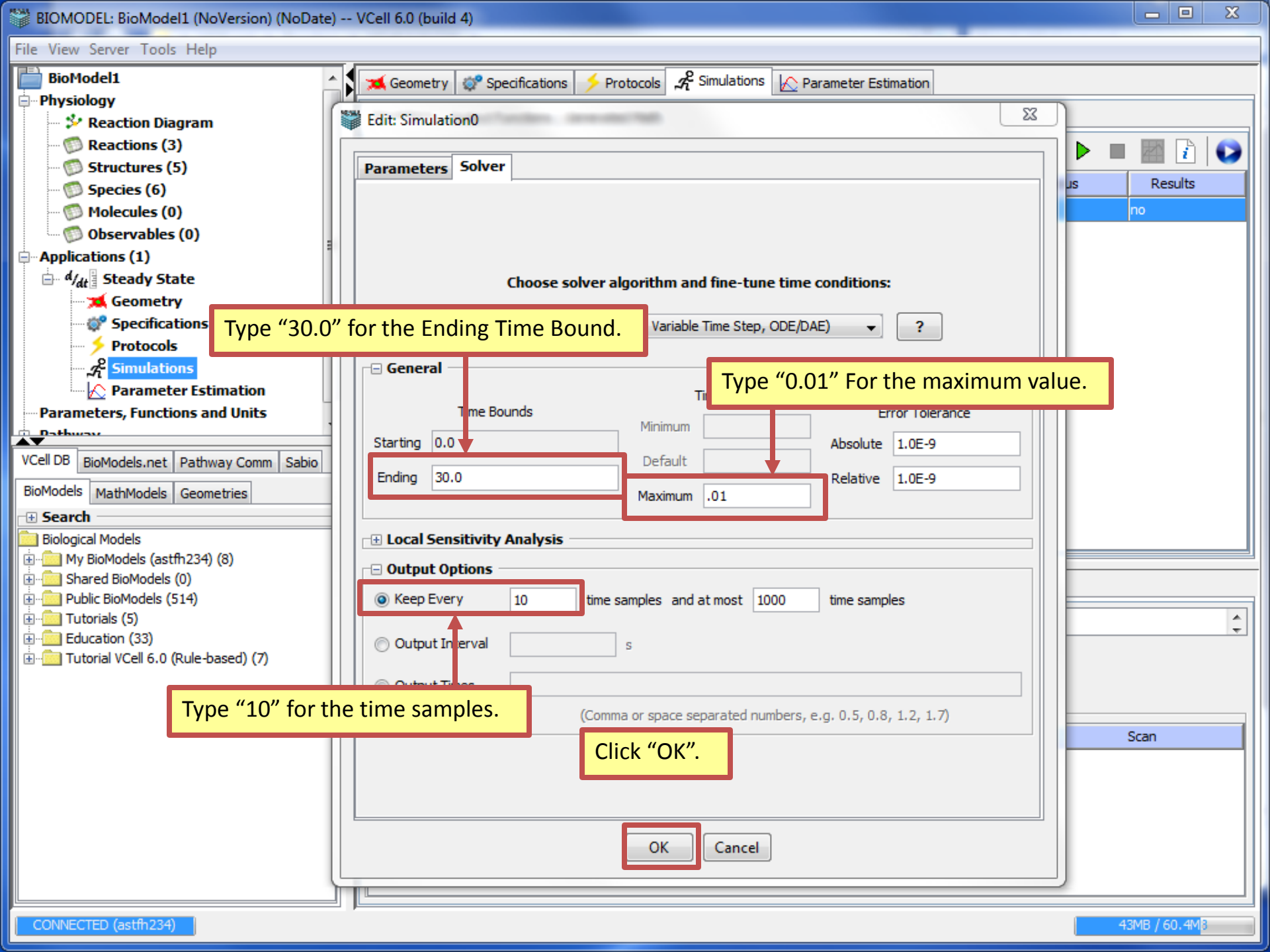
Protocols
Simulations
Parameter Estimation
Parameters, Functions and Units
VCell DB
BioModels.net
Pathway Comm
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (7)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
Edit: Simulation0
Parameters
Solver
Click “Solver”.
Choose solver algorithm and fine-tune time conditions:
Integrator
IDA (Variable Order, Variable Time Step, ODE/DAE)
?
General
Time Step
Time Bounds
Error Tolerance
Click the drop-down menu next to Integrator. Click “IDA (Variable Order, Variable Time Step, ODE/DAE)”.
Local Sensitivity Analysis
Output Options
Keep Every
1
time samples and at most
1000
time samples
Output Interval
secs
Output Times
(Comma or space separated numbers, e.g. 0.5, 0.8, 1.2, 1.7)
OK
Cancel
Status
Results
no
Scan
39.5MB / 60.9MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
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Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
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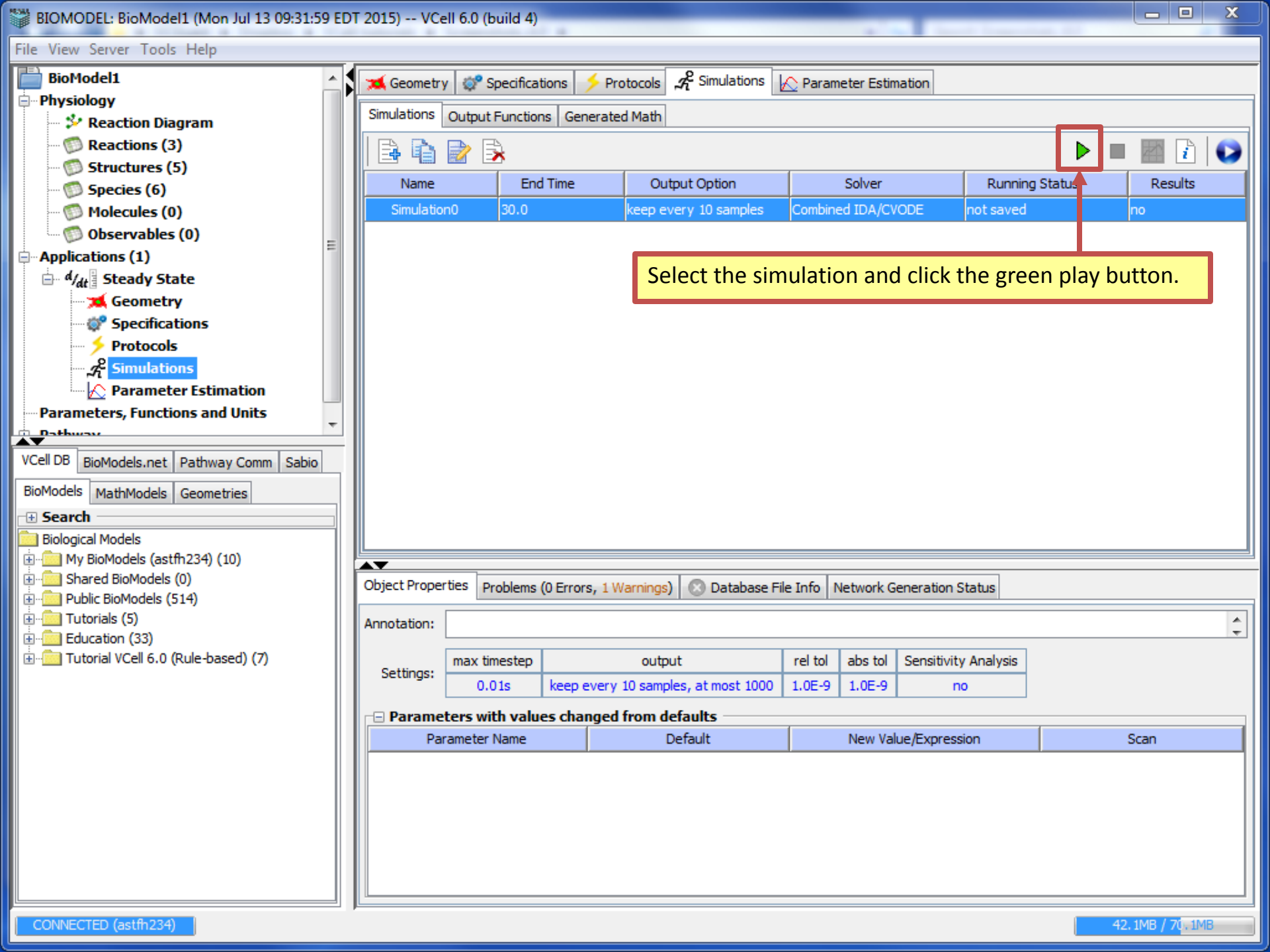
Parameter Estimation
Edit: Simulation0
Parameters
Solver
Choose solver algorithm and fine-tune time conditions:
Variable Time Step, ODE/DAE)
?
General
Time Bounds
Starting 0.0
Ending 30.0
Minimum
Default
Maximum .01
Error Tolerance
Absolute 1.0E-9
Relative 1.0E-9
Local Sensitivity Analysis
Output Options
Keep Every 10 time samples and at most 1000 time samples
Output Interval s
(Comma or space separated numbers, e.g. 0.5, 0.8, 1.2, 1.7)
OK
Cancel
Results
no
Scan
Type “30.0” for the Ending Time Bound.
Type “0.01” For the maximum value.
Type “10” for the time samples.
Click “OK”.
CONNECTED (astfh234)
43MB / 60.4MB


BIOMODEL: BioModel1 (Mon Jul 13 09:31:59 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
BioModel1
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Reaction Diagram
Reactions (3)
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Species (6)
Molecules (0)
Observables (0)
Applications (1)
Steady State
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Protocols
Simulations
Parameter Estimation
Parameters, Functions and Units
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
Simulation0
30.0
keep every 10 samples
Combined IDA/CVODE
not saved
no
Select the simulation and click the green play button.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
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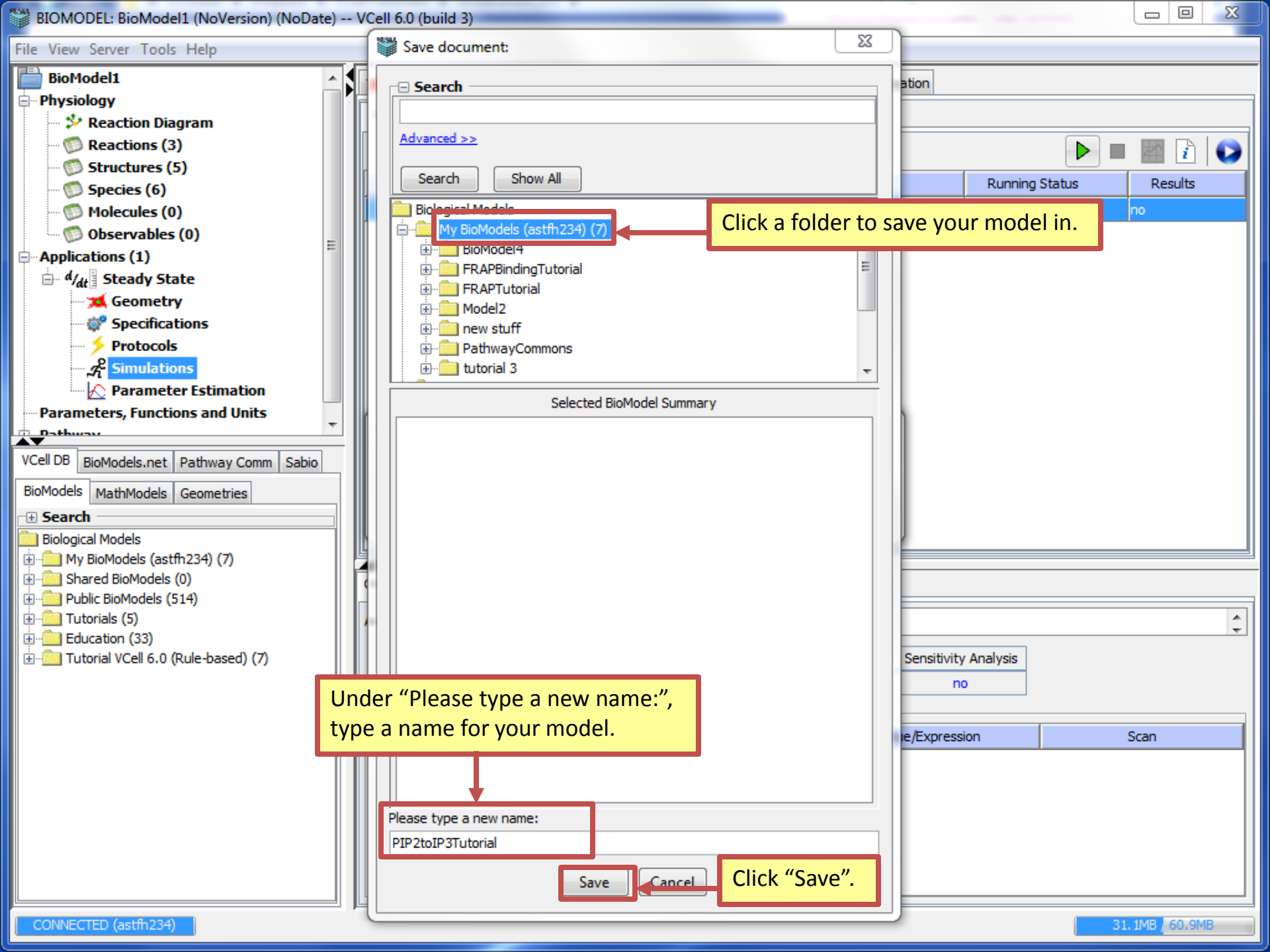
My BioModels (astfh234) (10)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Database File Info
Network Generation Status
Annotation:
Settings:
max timestep
output
rel tol
abs tol
Sensitivity Analysis
0.01s
keep every 10 samples, at most 1000
1.0E-9
1.0E-9
no
Parameters with values changed from defaults
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
42.1MB / 70.1MB


BIOMODEL: BioModel1 (NoVersion) (NoDate) -- VCell 6.0 (build 3)
File View Server Tools Help
BioModel1
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Molecules (0)
Observables (0)
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Sabio
BioModels
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Geometries
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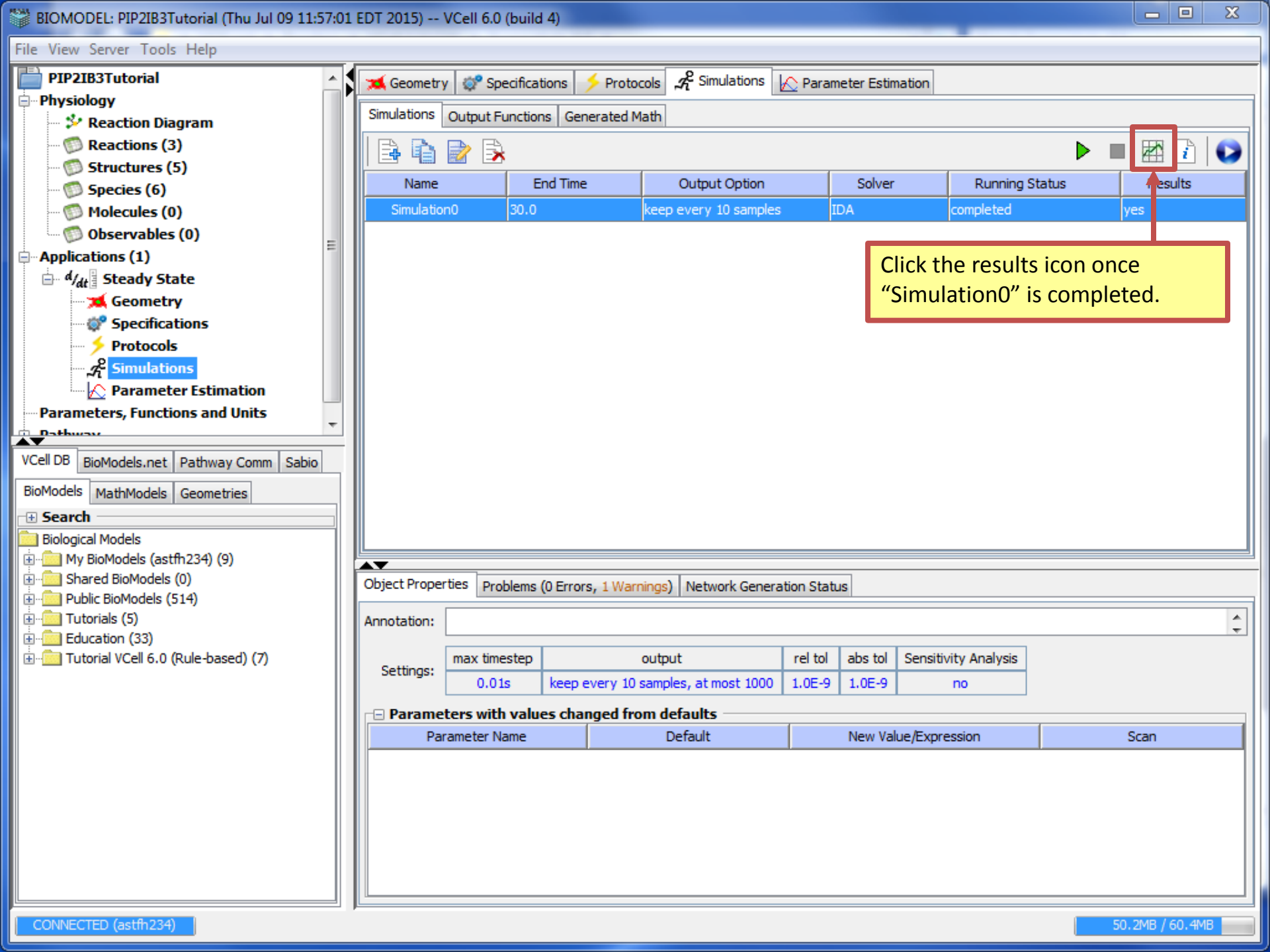
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
Save document:
Search
Advanced >>
Search
Show All
Biological Models
My BioModels (astfh234) (7)
BioModel4
FRAPBindingTutorial
FRAPTutorial
Model2
new stuff
PathwayCommons
tutorial 3
Selected BioModel Summary
Click a folder to save your model in.
Under “Please type a new name:”, type a name for your model.
Please type a new name:
PIP2toIP3Tutorial
Save
Cancel
Click “Save”.
Running Status
Results
no
Sensitivity Analysis
no
Scan
31.1MB
60.9MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
PIP2IB3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
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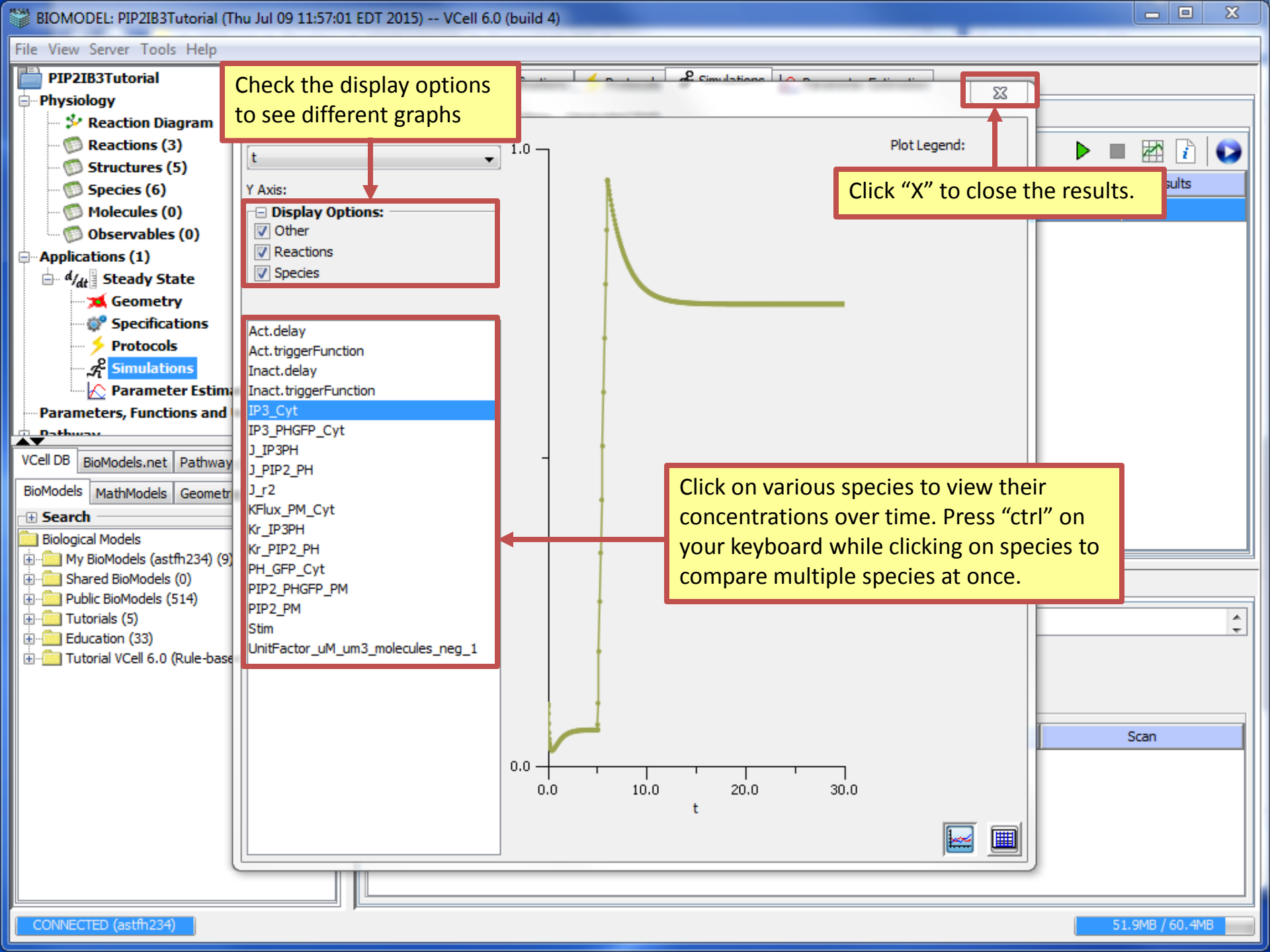
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
Simulation0
30.0
keep every 10 samples
IDA
completed
yes
Click the results icon once "Simulation0" is completed.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Annotation:
Settings:
max timestep
output
rel tol
abs tol
Sensitivity Analysis
0.01s
keep every 10 samples, at most 1000
1.0E-9
1.0E-9
no
Parameters with values changed from defaults
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
50.2MB / 60.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
PIP2IB3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
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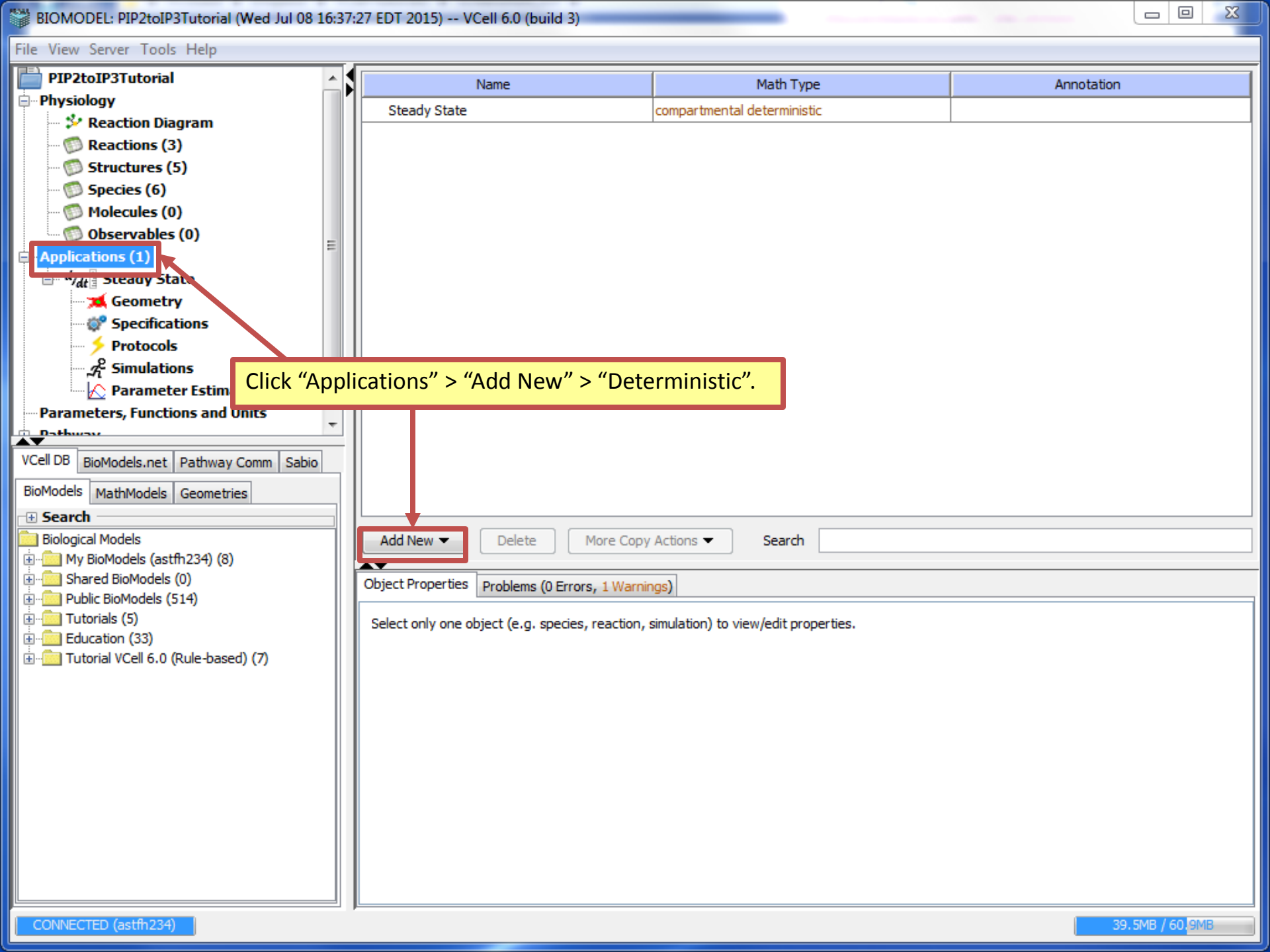
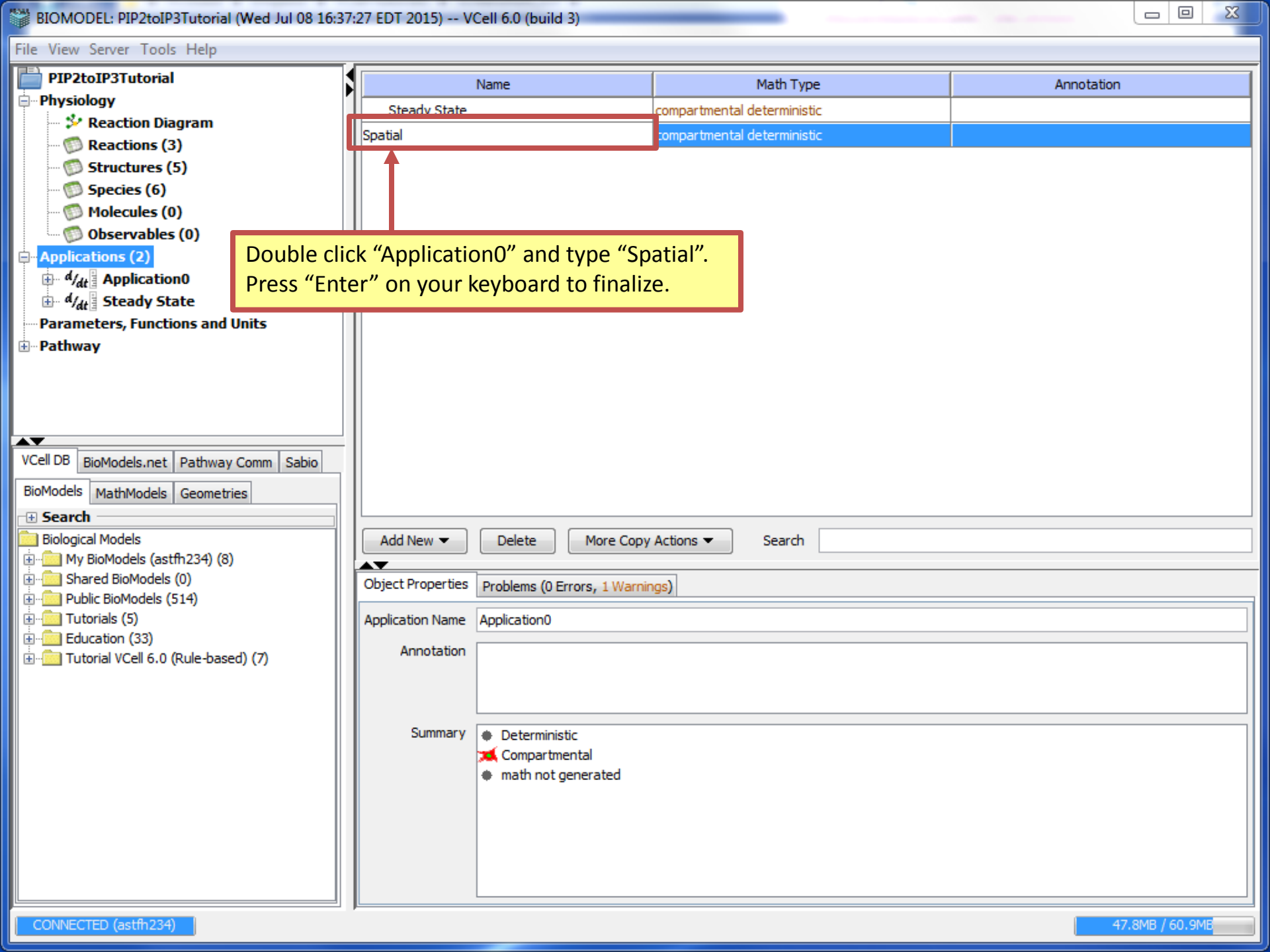
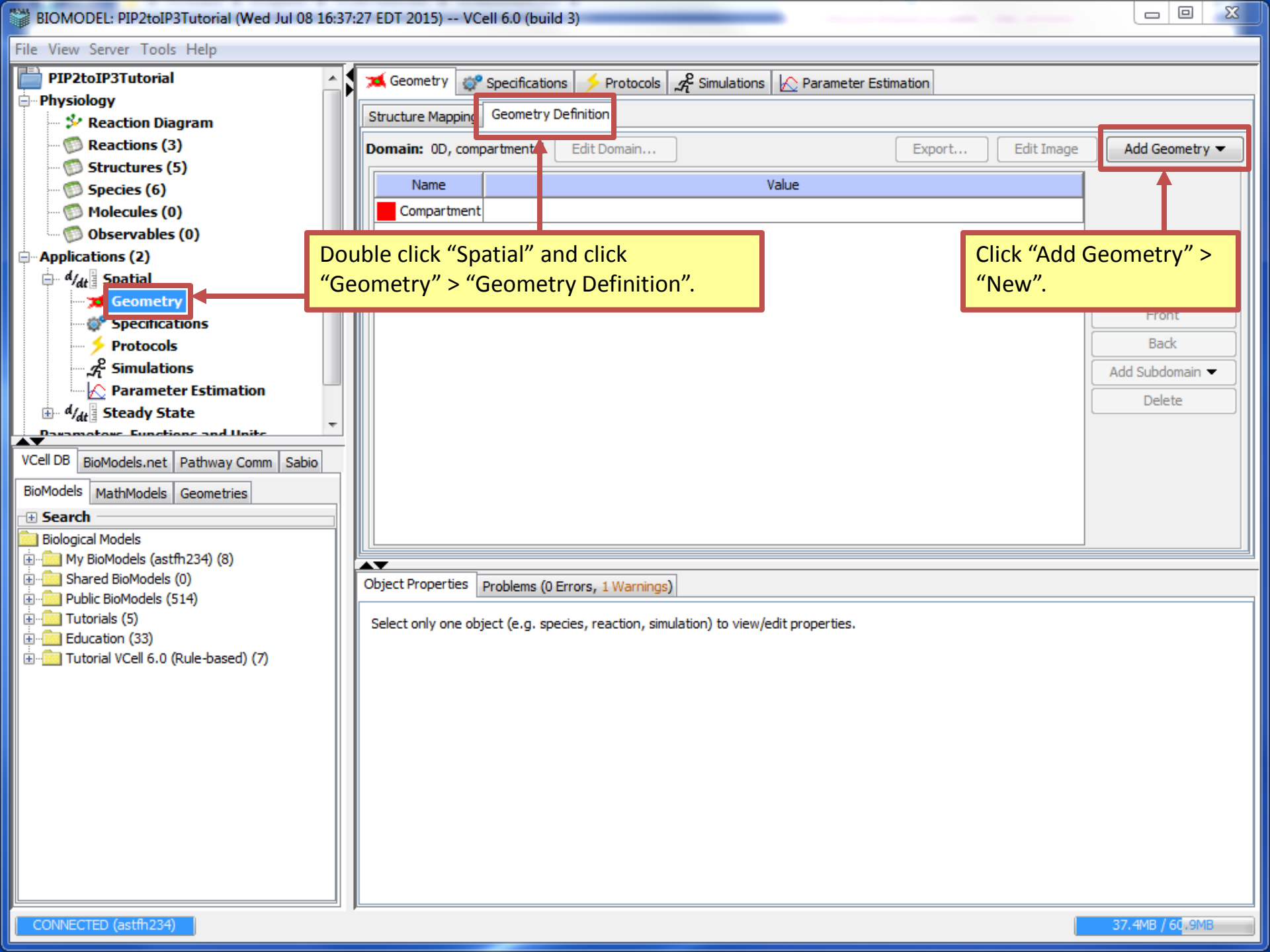
Specifications
Protocols
Simulations
Parameter Estim
Parameters, Functions and
VCell DB
BioModels.net
Pathway
BioModels
MathModels
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-base
Check the display options to see different graphs
t
Y Axis:
Display Options:
Other
Reactions
Species
Act.delay
Act.triggerFunction
Inact.delay
Inact.triggerFunction
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_PIP2_PH
J_r2
KFlux_PM_Cyt
Kr_IP3PH
Kr_PIP2_PH
PH_GFP_Cyt
PIP2_PHGFP_PM
PIP2_PM
Stim
UnitFactor_uM_um3_molecules_neg_1
Plot Legend:
Click "X" to close the results.
1.0
0.0
0.0
10.0
20.0
30.0
t
Click on various species to view their concentrations over time. Press "ctrl" on your keyboard while clicking on species to compare multiple species at once.
Scan
CONNECTED (astfh234)
51.9MB / 60.4MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
PIP2toIP3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (1)
Geometry
Specifications
Protocols
Simulations
Parameter Estim
Parameters, Functions and Units
Name
Math Type
Annotation
Steady State
compartmental deterministic
Click “Applications” > “Add New” > “Deterministic”.
Add New
Delete
More Copy Actions
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
39.5MB / 60.9MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
PIP2toIP3Tutorial
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Application0
Steady State
Parameters, Functions and Units
Pathway
Name
Math Type
Annotation
Steady State
compartmental deterministic
Spatial
compartmental deterministic
Double click “Application0” and type “Spatial”.
Press “Enter” on your keyboard to finalize.
Add New
Delete
More Copy Actions
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Application Name
Application0
Annotation
Summary
Deterministic
Compartmental
math not generated
CONNECTED (astfh234)
47.8MB / 60.9MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
PIP2toIP3Tutorial
Physiology
Reaction Diagram
Reactions (3)
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Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Structure Mapping
Geometry Definition
Domain: 0D, compartment
Edit Domain...
Export...
Edit Image
Add Geometry
Name
Value
Compartment
Front
Back
Add Subdomain
Delete
Double click “Spatial” and click “Geometry” > “Geometry Definition”.
Click “Add Geometry” > “New”.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
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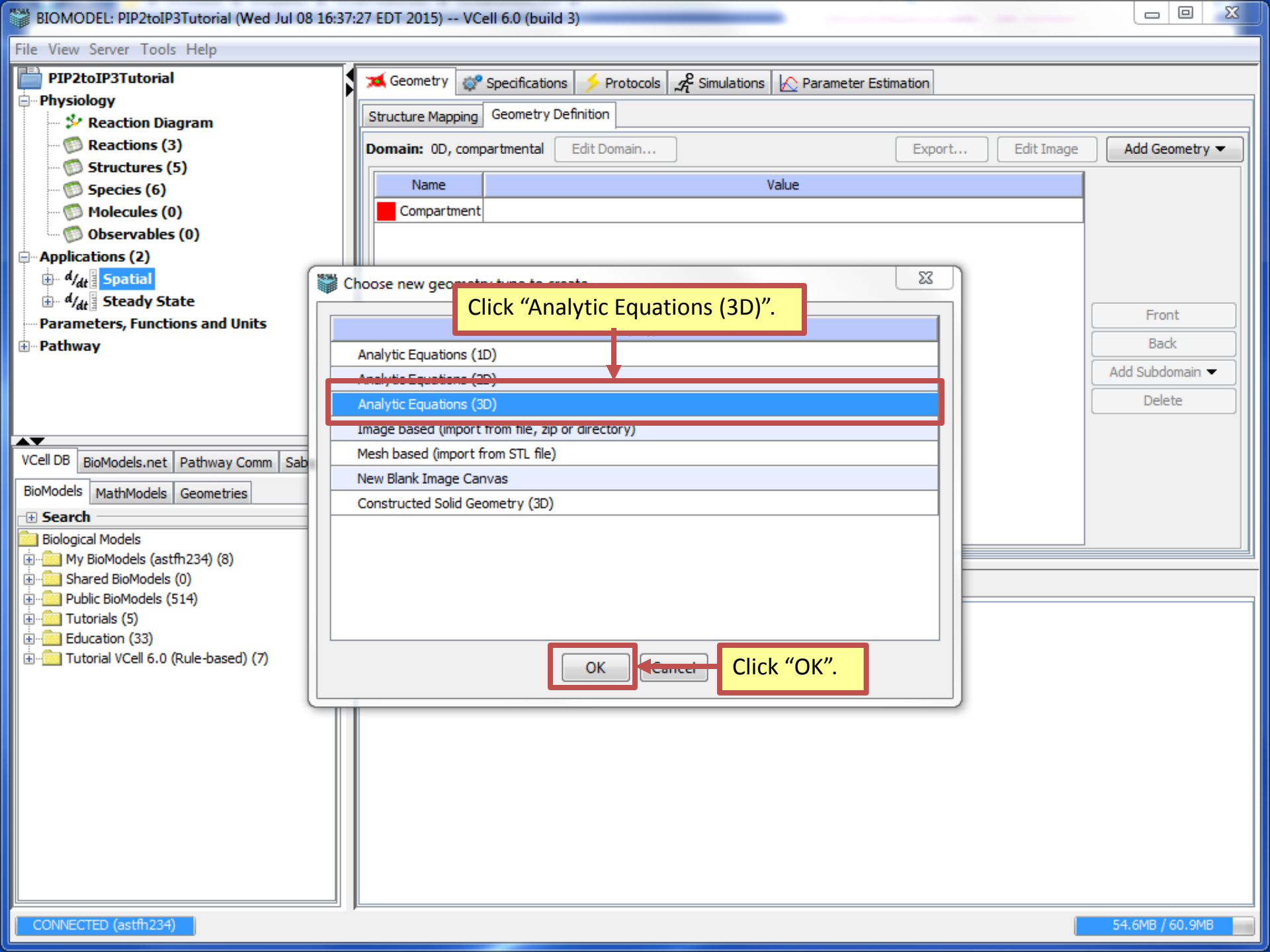
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
37.4MB / 60.9MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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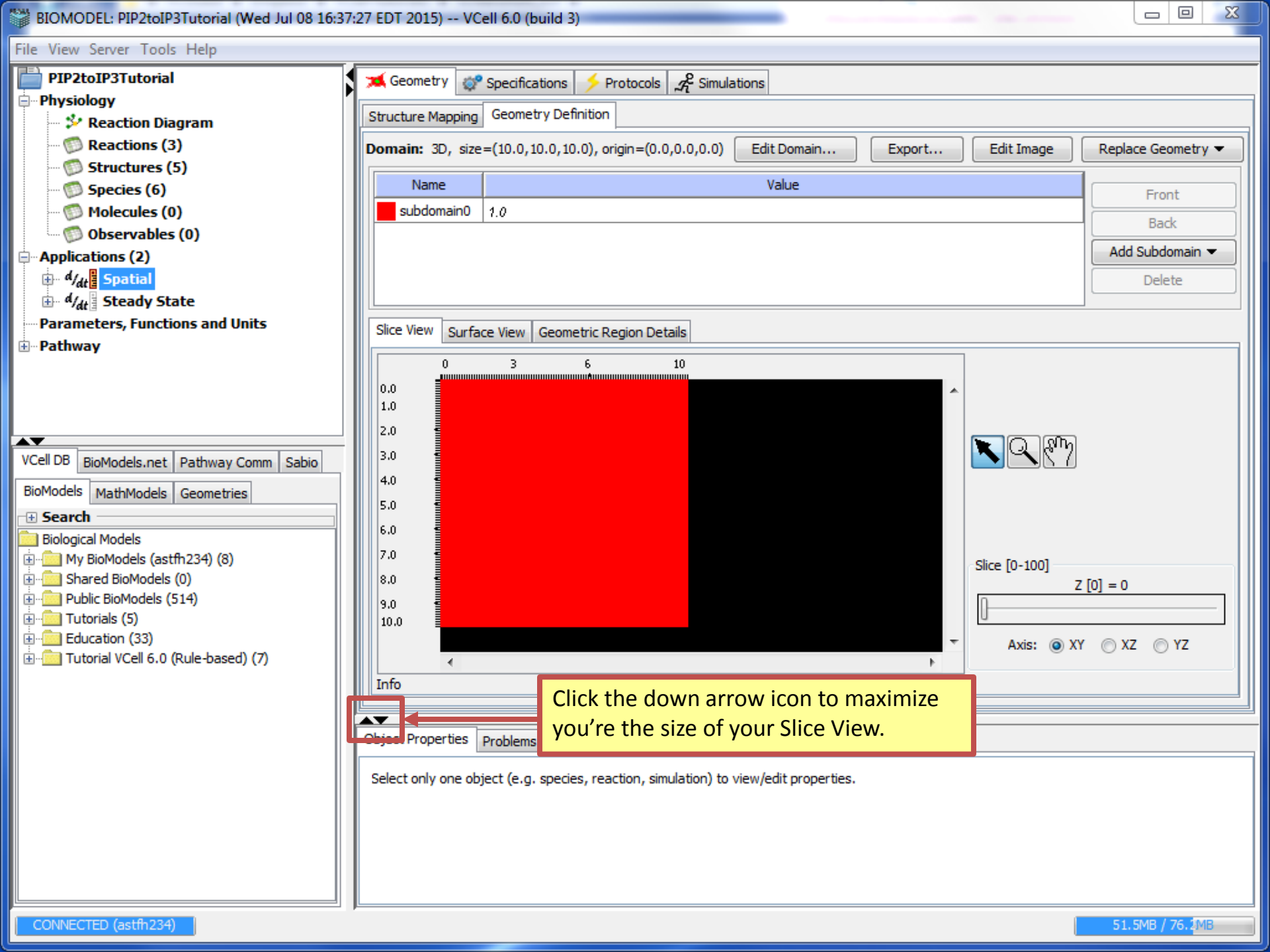
Molecules (0)
Observables (0)
Applications (2)
Spatial
Steady State
Parameters, Functions and Units
Pathway
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Structure Mapping
Geometry Definition
Domain: 0D, compartmental
Edit Domain...
Export...
Edit Image
Add Geometry
Name
Value
Compartment
Front
Back
Add Subdomain
Delete
Choose new geometry type to create
Click “Analytic Equations (3D)”.
Analytic Equations (1D)
Analytic Equations (2D)
Analytic Equations (3D)
Image based (import from file, zip or directory)
Mesh based (import from STL file)
New Blank Image Canvas
Constructed Solid Geometry (3D)
OK
Cancel
Click “OK”.
VCell DB
BioModels.net
Pathway Comm
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
CONNECTED (astfh234)
54.6MB / 60.9MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
PIP2toIP3Tutorial
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Molecules (0)
Observables (0)
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Tutorial VCell 6.0 (Rule-based) (7)
Geometry
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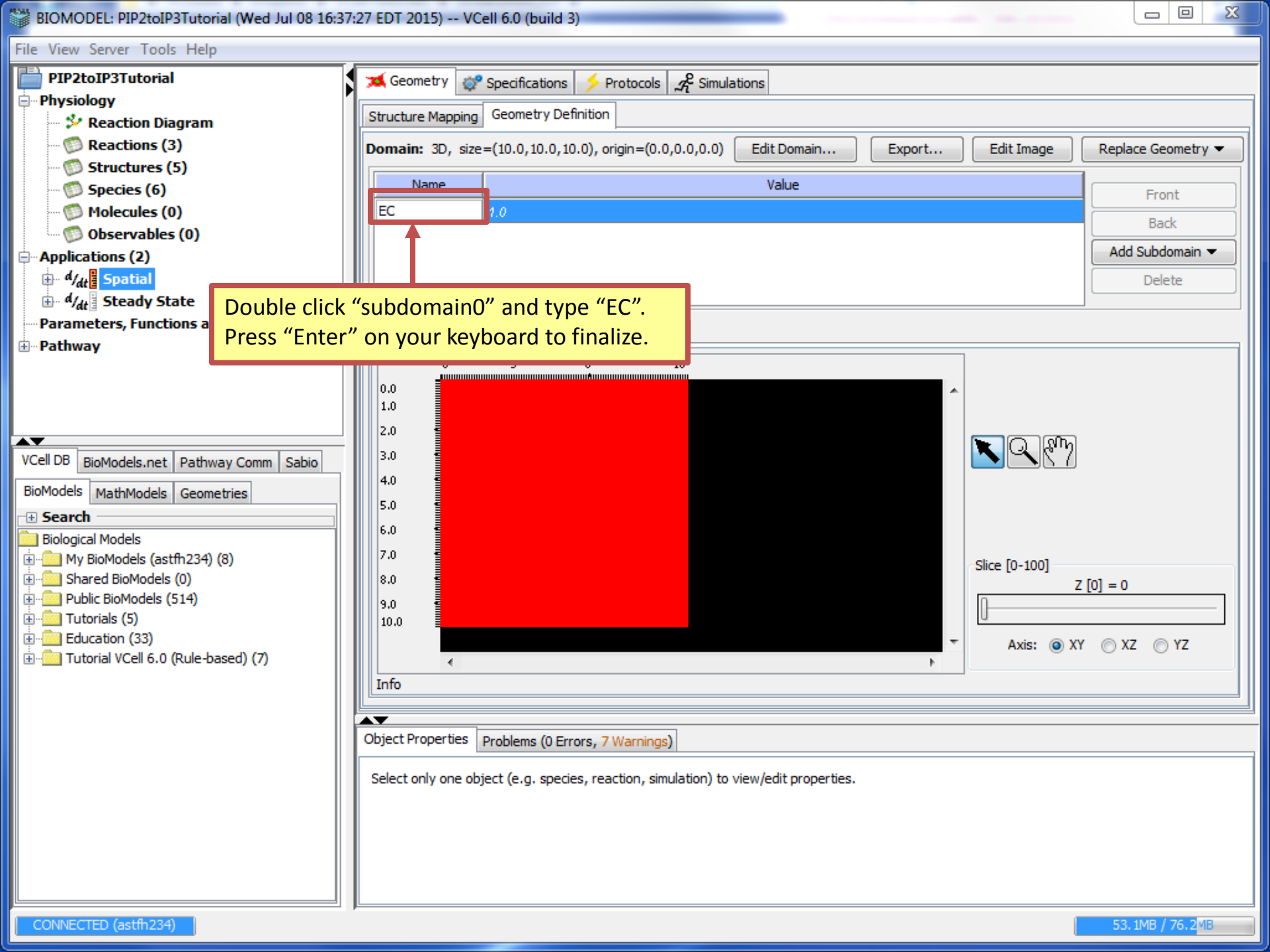
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
subdomain0
1.0
Front
Back
Add Subdomain
Delete
Slice View
Surface View
Geometric Region Details
0
3
6
10
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Slice [0-100]
Z [0] = 0
Axis: XY XZ YZ
Info
Click the down arrow icon to maximize you're the size of your Slice View.
Object Properties
Problems
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
51.5MB / 76.2MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Molecules (0)
Observables (0)
Applications (2)
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Steady State
Parameters, Functions a
Pathway
Geometry
Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
EC
1.0
Front
Back
Add Subdomain
Delete
Double click “subdomain0” and type “EC”.
Press “Enter” on your keyboard to finalize.
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Slice [0-100]
Z [0] = 0
Axis: XY XZ YZ
Info
VCell DB
BioModels.net
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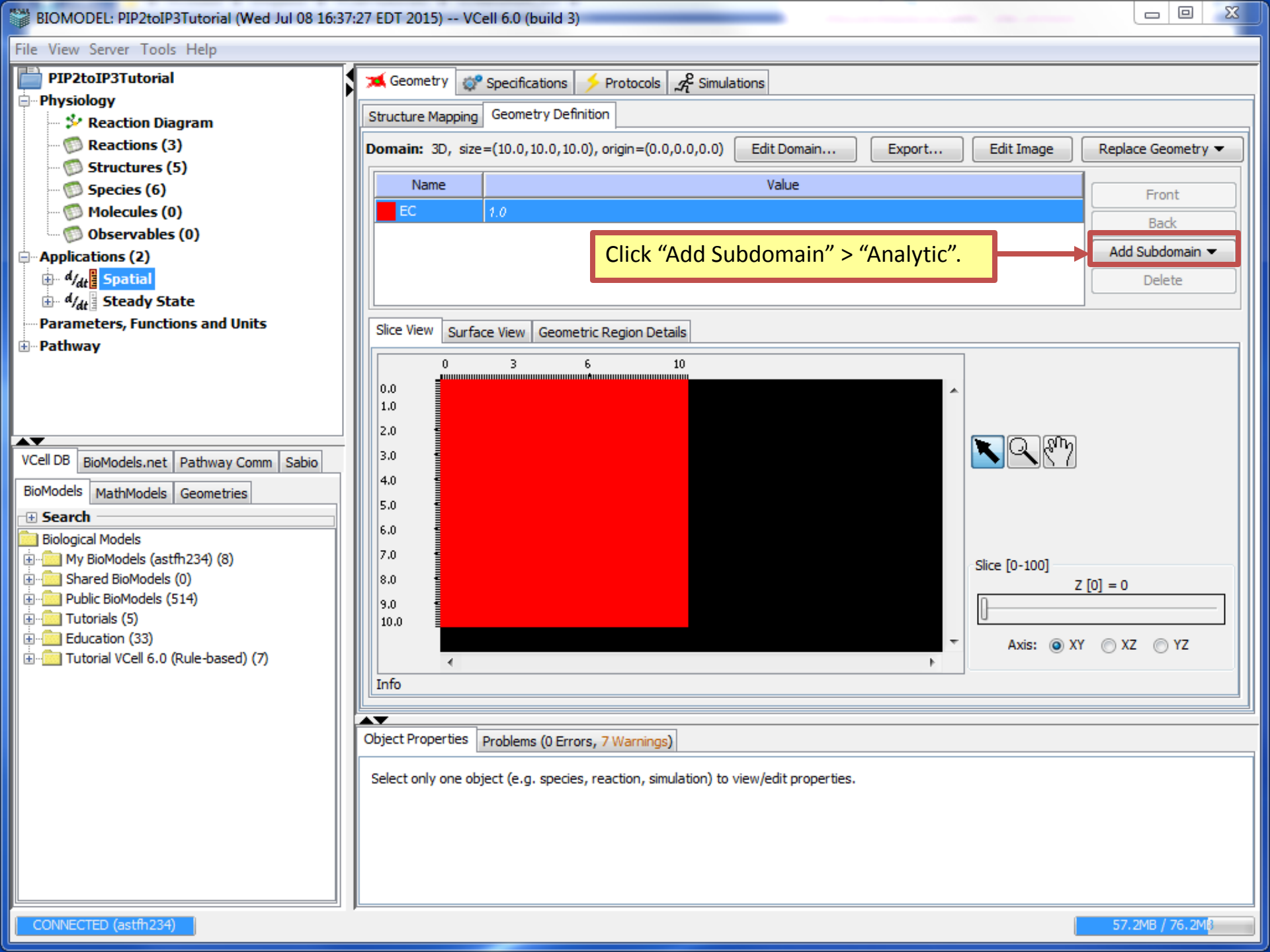
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 7 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
53.1MB / 76.2MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Observables (0)
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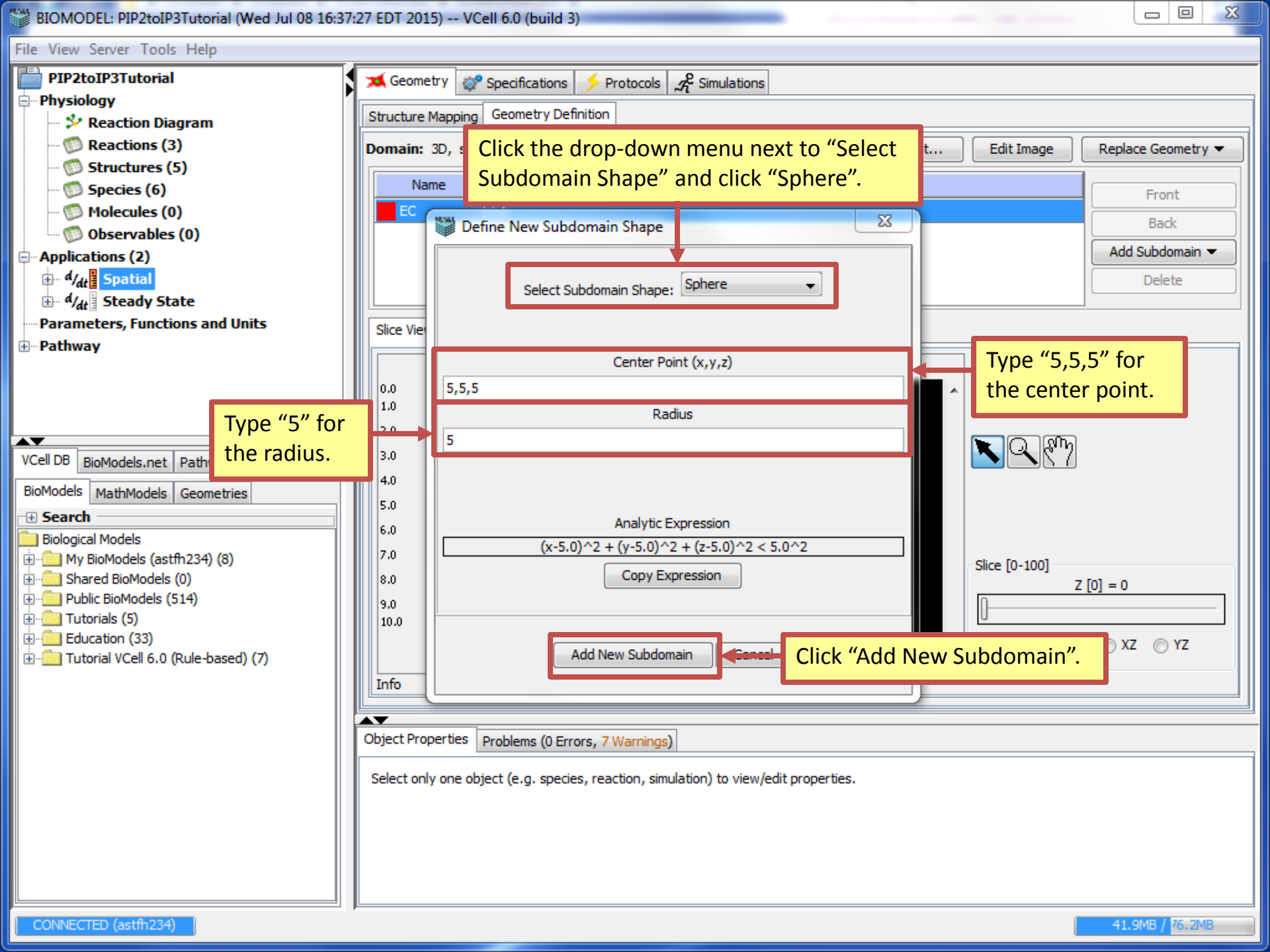
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
EC
1.0
Front
Back
Add Subdomain
Delete
Click “Add Subdomain” > “Analytic”.
Slice View
Surface View
Geometric Region Details
0
3
6
10
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Slice [0-100]
Z [0] = 0
Axis: XY XZ YZ
Info
Object Properties
Problems (0 Errors, 7 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
57.2MB / 76.2MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Observables (0)
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Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Edit Image
Replace Geometry
Front
Back
Add Subdomain
Delete
Click the drop-down menu next to "Select Subdomain Shape" and click "Sphere".
Define New Subdomain Shape
Select Subdomain Shape: Sphere
Center Point (x,y,z)
5,5,5
Radius
5
Analytic Expression
(x-5.0)^2 + (y-5.0)^2 + (z-5.0)^2 < 5.0^2
Copy Expression
Add New Subdomain
Cancel
Type "5,5,5" for the center point.
Type "5" for the radius.
Click "Add New Subdomain".
Slice [0-100]
Z [0] = 0
XZ
YZ
VCell DB
BioModels.net
BioModels
MathModels
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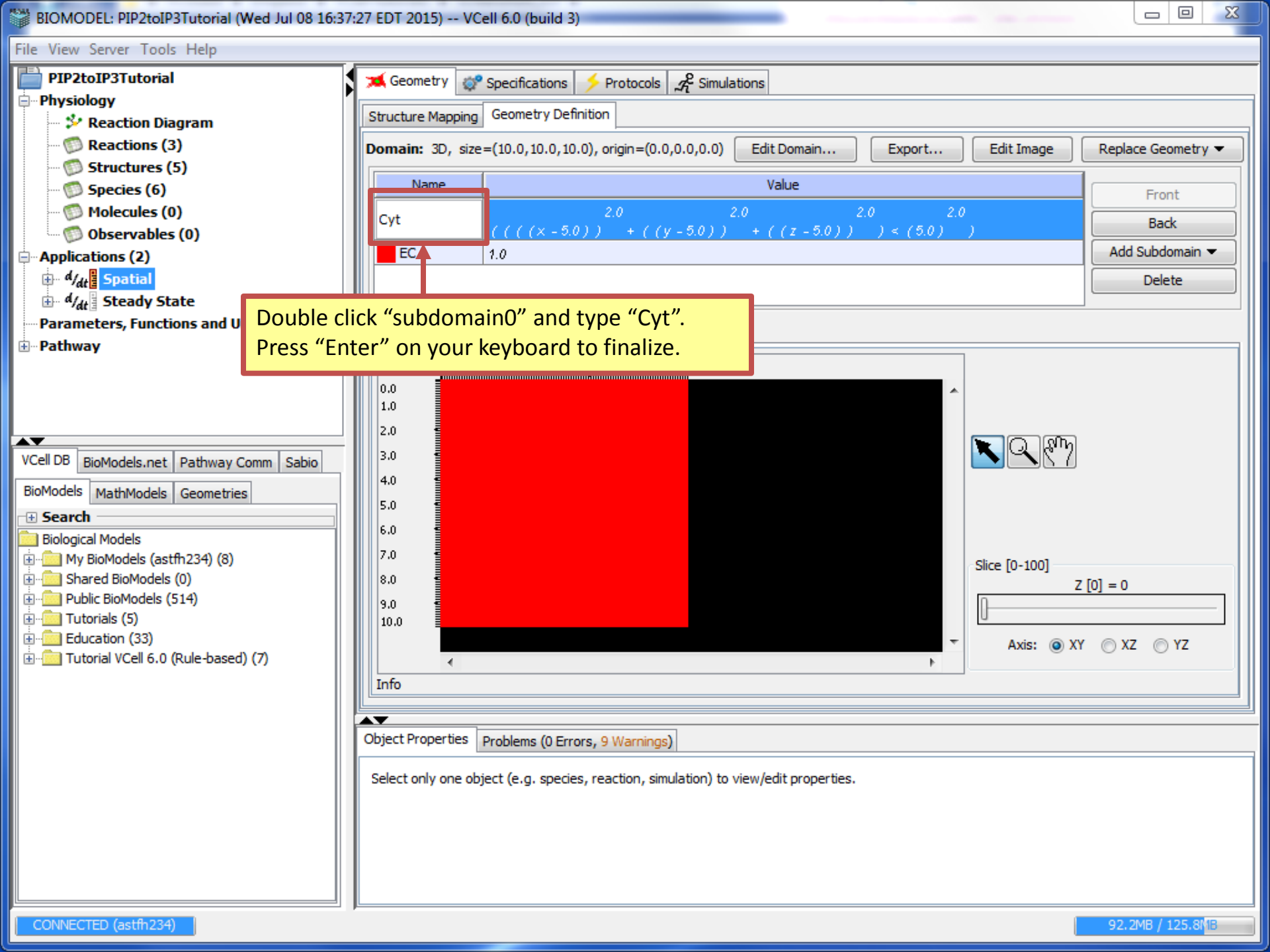
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 7 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
41.9MB / 76.2MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Molecules (0)
Observables (0)
Applications (2)
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Steady State
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Pathway
Geometry
Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
Cyt
EC
1.0
Front
Back
Add Subdomain
Delete
Double click “subdomain0” and type “Cyt”.
Press “Enter” on your keyboard to finalize.
Slice [0-100]
Z [0] = 0
Axis: XY XZ YZ
Info
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
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Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
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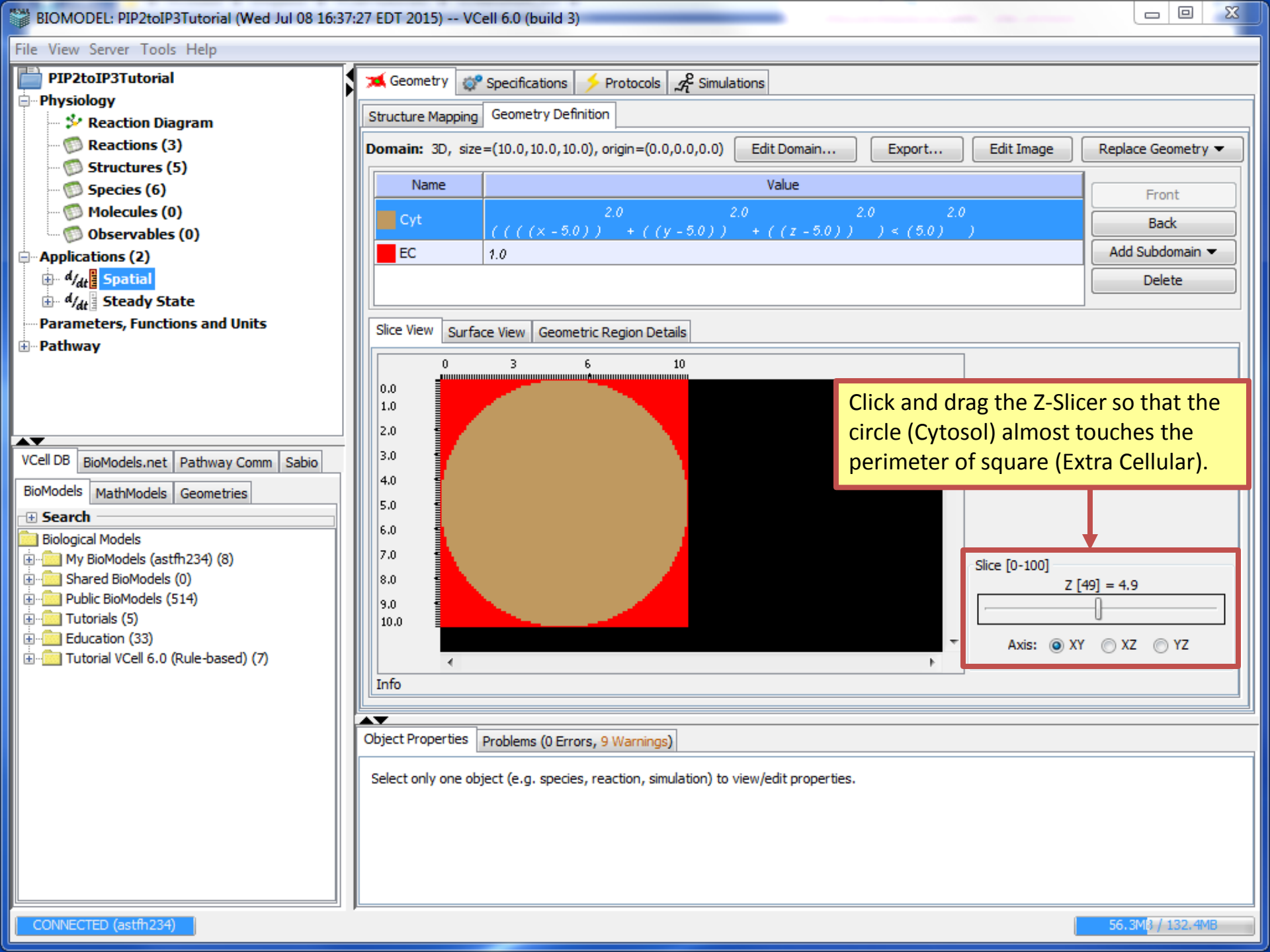
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 9 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
92.2MB / 125.8MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Species (6)
Molecules (0)
Observables (0)
Applications (2)
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VCell DB
BioModels.net
Pathway Comm
Sabio
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MathModels
Geometries
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Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
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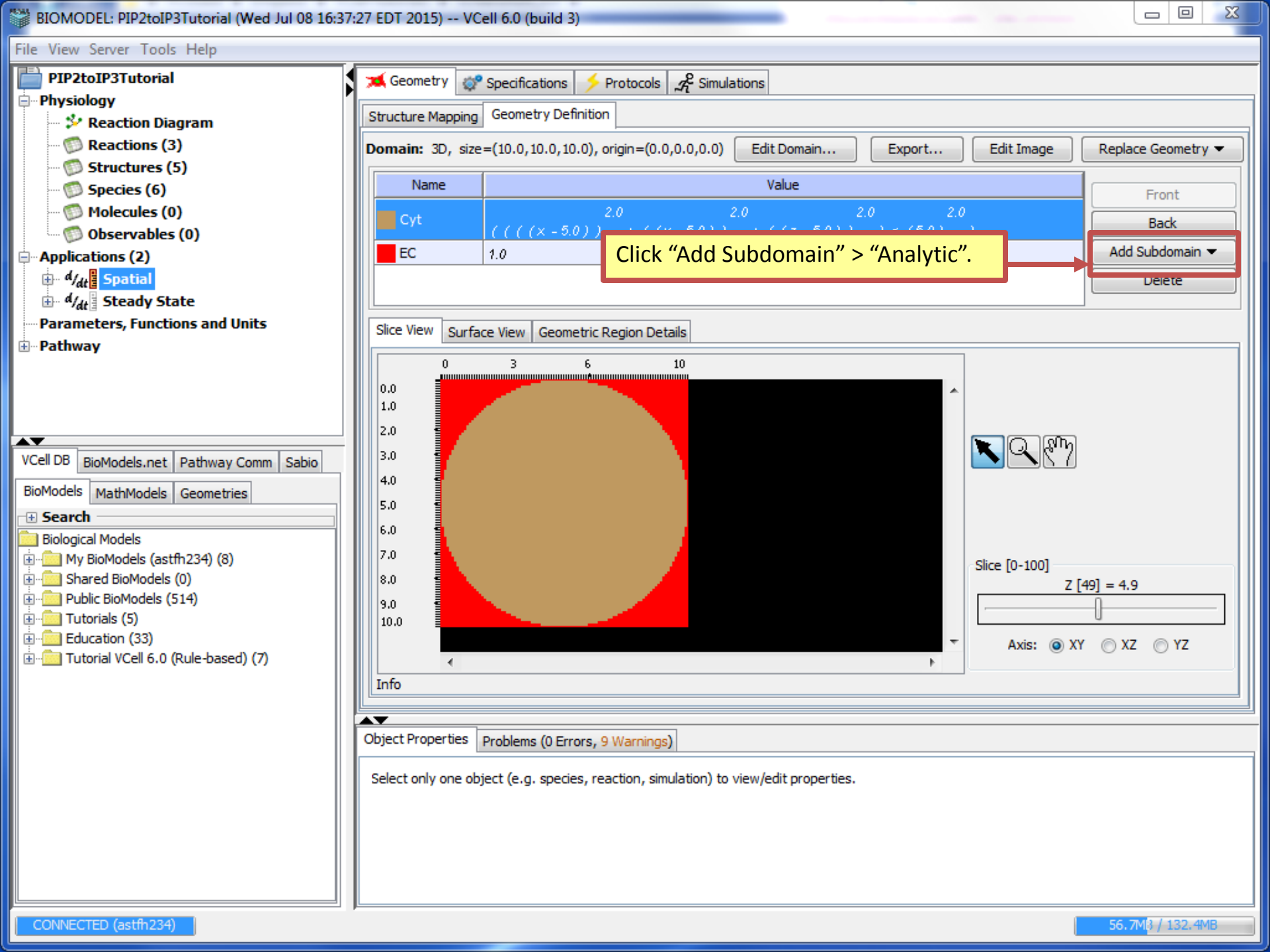
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
Cyt
EC
1.0
Front
Back
Add Subdomain
Delete
Slice View
Surface View
Geometric Region Details
0
3
6
10
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Info
Click and drag the Z-Slicer so that the circle (Cytosol) almost touches the perimeter of square (Extra Cellular).
Slice [0-100]
Z [49] = 4.9
Axis: XY XZ YZ
Object Properties
Problems (0 Errors, 9 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
56.3MB / 132.4MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
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Molecules (0)
Observables (0)
Applications (2)
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Geometries
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Shared BioModels (0)
Public BioModels (514)
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Tutorial VCell 6.0 (Rule-based) (7)
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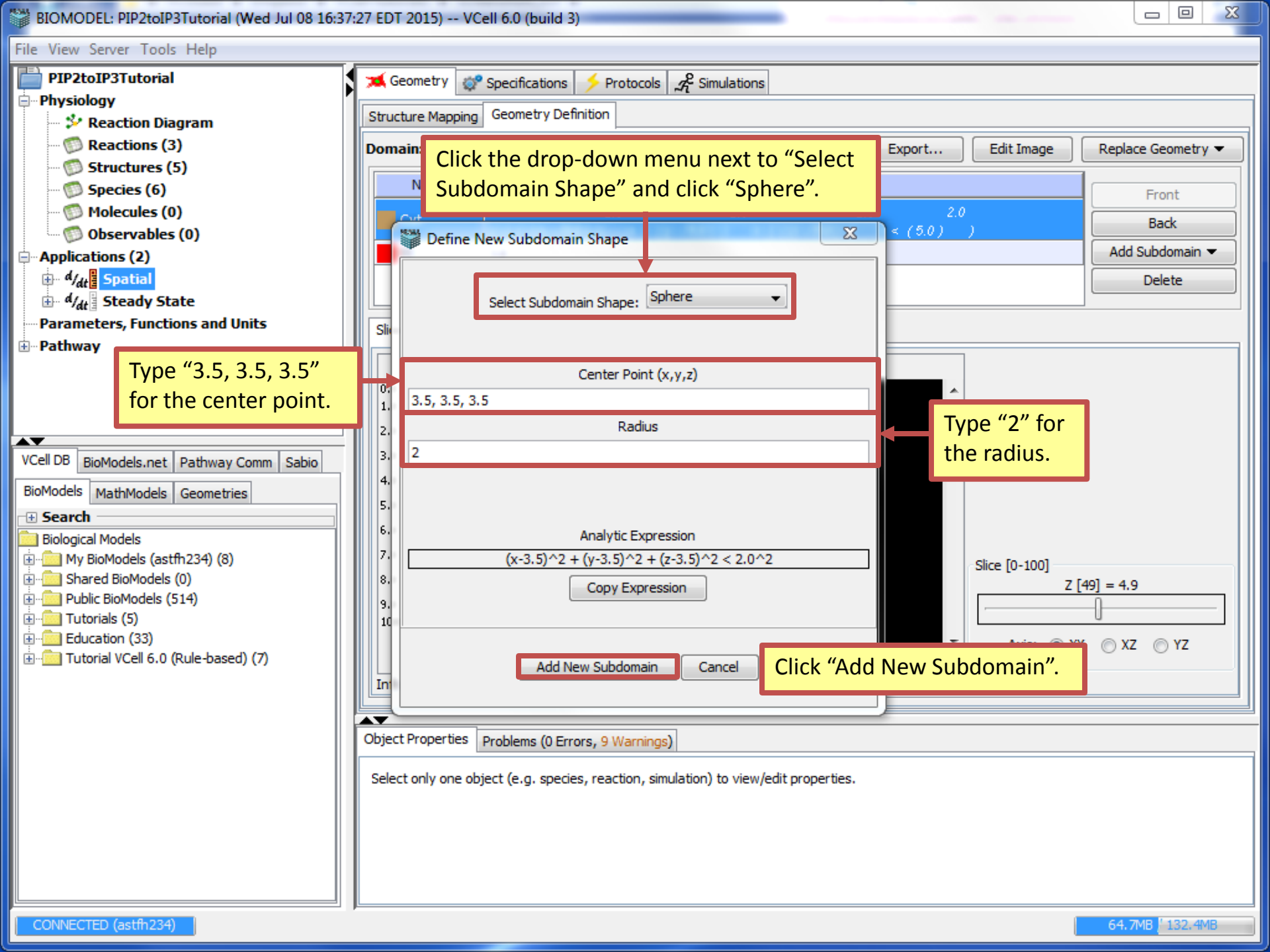
Protocols
Simulations
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
Cyt
EC
1.0
Front
Back
Add Subdomain
Delete
Click “Add Subdomain” > “Analytic”.
Slice View
Surface View
Geometric Region Details
0
3
6
10
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Slice [0-100]
Z [49] = 4.9
Axis: XY XZ YZ
Info
Object Properties
Problems (0 Errors, 9 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
56.7MB / 132.4MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Molecules (0)
Observables (0)
Applications (2)
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Steady State
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Geometry
Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Export...
Edit Image
Replace Geometry
Front
Back
Add Subdomain
Delete
Click the drop-down menu next to “Select Subdomain Shape” and click “Sphere”.
Define New Subdomain Shape
Select Subdomain Shape: Sphere
Center Point (x,y,z)
3.5, 3.5, 3.5
Radius
2
Type “3.5, 3.5, 3.5” for the center point.
Type “2” for the radius.
Analytic Expression
(x-3.5)^2 + (y-3.5)^2 + (z-3.5)^2 < 2.0^2
Copy Expression
Add New Subdomain
Cancel
Click “Add New Subdomain”.
Slice [0-100]
Z [49] = 4.9
XZ
YZ
VCell DB
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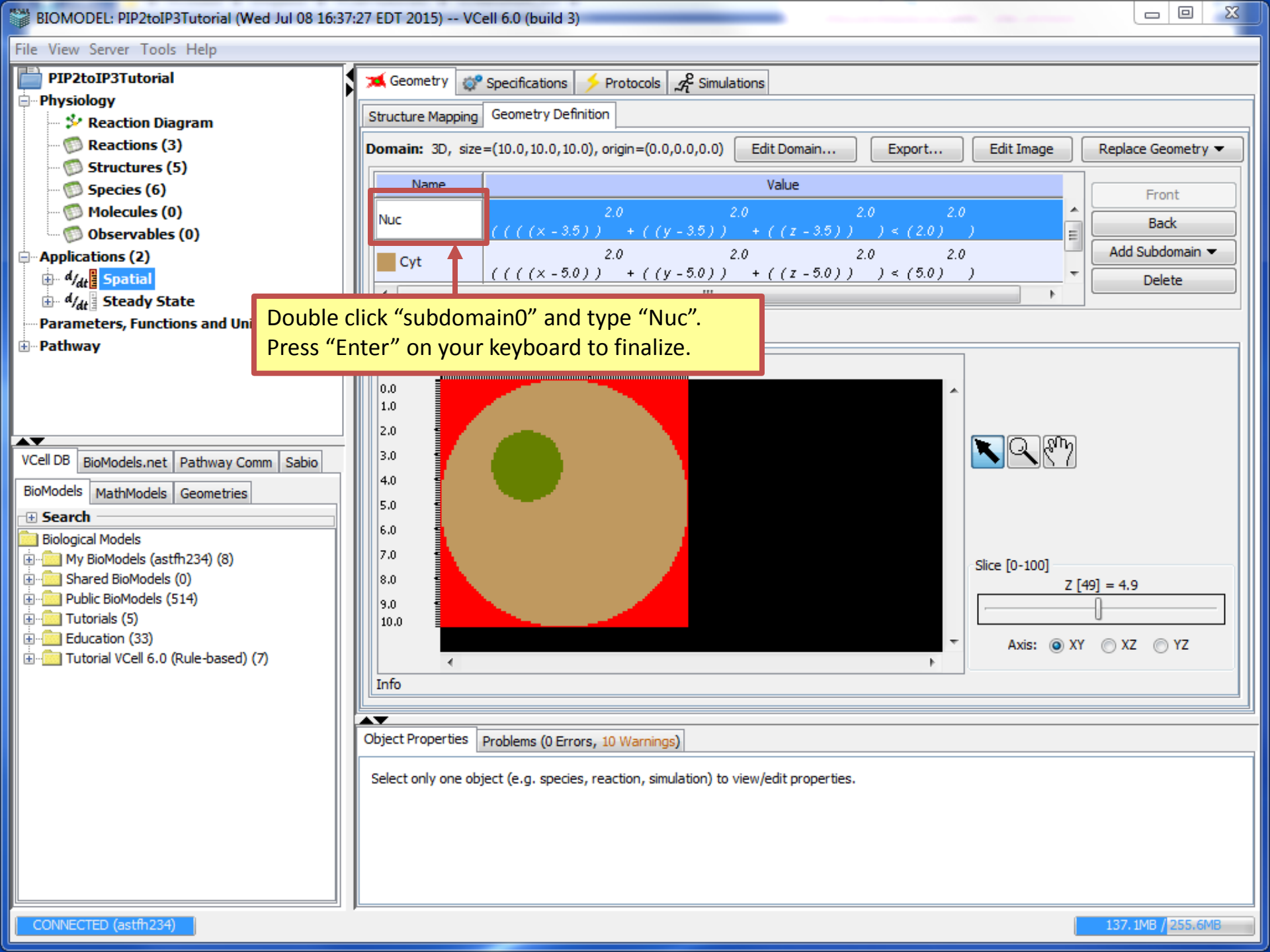
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 9 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
64.7MB
132.4MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
PIP2toIP3Tutorial
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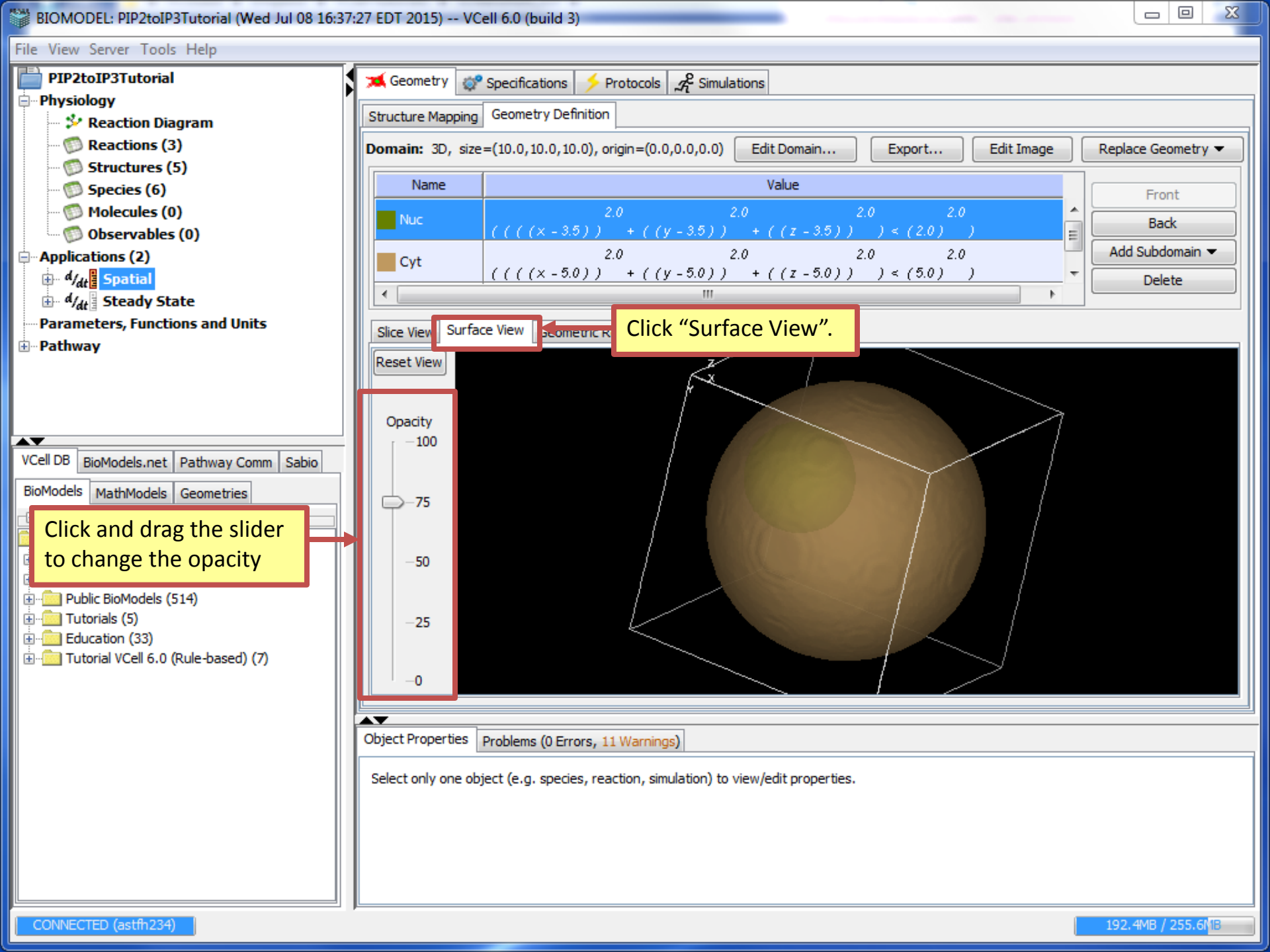
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Steady State
Parameters, Functions and Uni
Pathway
Geometry
Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
Nuc
Cyt
Front
Back
Add Subdomain
Delete
Double click “subdomain0” and type “Nuc”.
Press “Enter” on your keyboard to finalize.
Slice [0-100]
Z [49] = 4.9
Axis: XY XZ YZ
Info
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 10 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
137.1MB / 255.6MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Molecules (0)
Observables (0)
Applications (2)
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Steady State
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Pathway
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Specifications
Protocols
Simulations
Structure Mapping
Geometry Definition
Domain: 3D, size=(10.0,10.0,10.0), origin=(0.0,0.0,0.0)
Edit Domain...
Export...
Edit Image
Replace Geometry
Name
Value
Nuc
Cyt
Front
Back
Add Subdomain
Delete
Slice View
Surface View
Click “Surface View”.
Reset View
Opacity
100
75
50
25
0
Click and drag the slider to change the opacity
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
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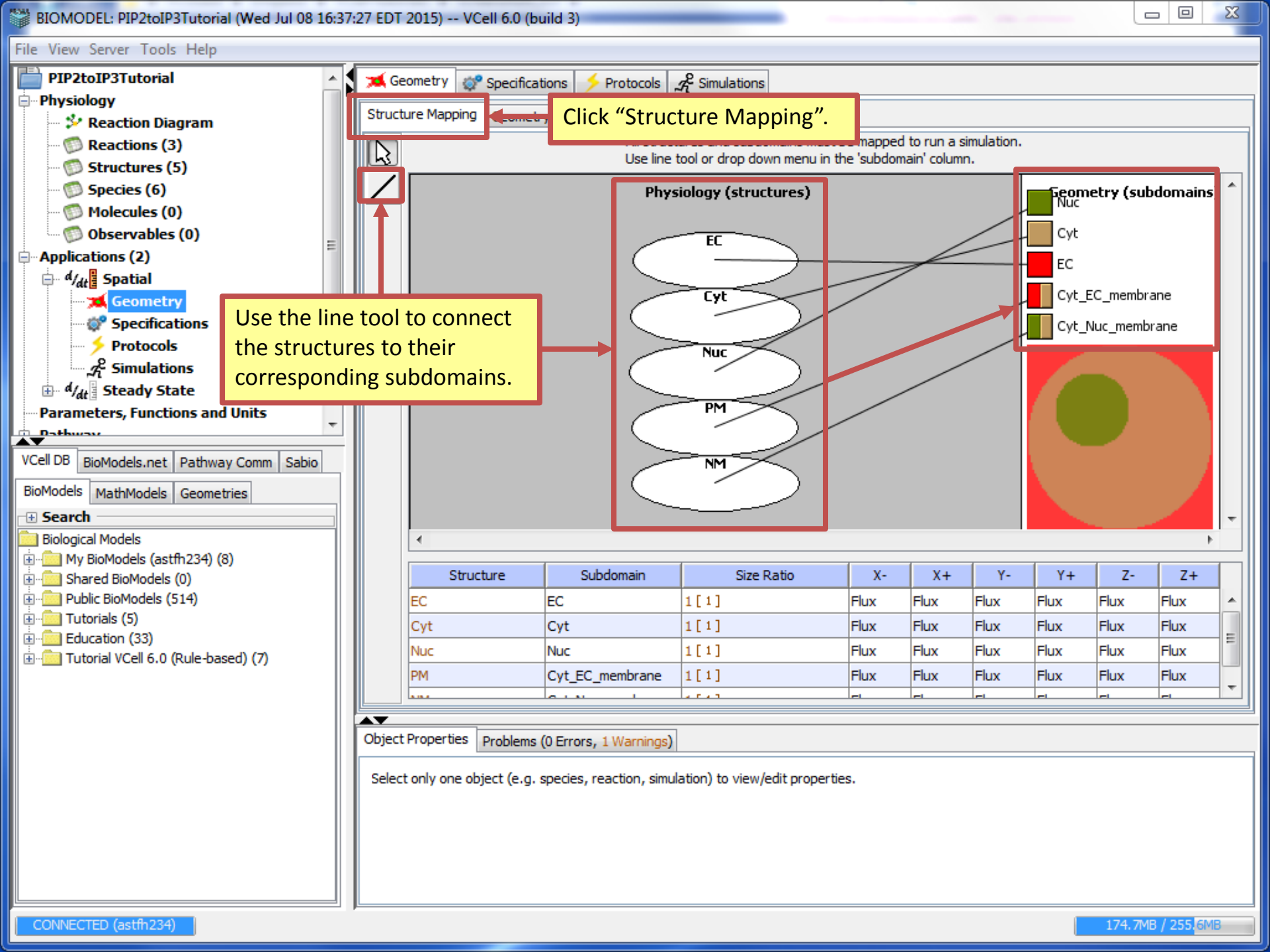
Geometries
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 11 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
192.4MB / 255.6MB


BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
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Molecules (0)
Observables (0)
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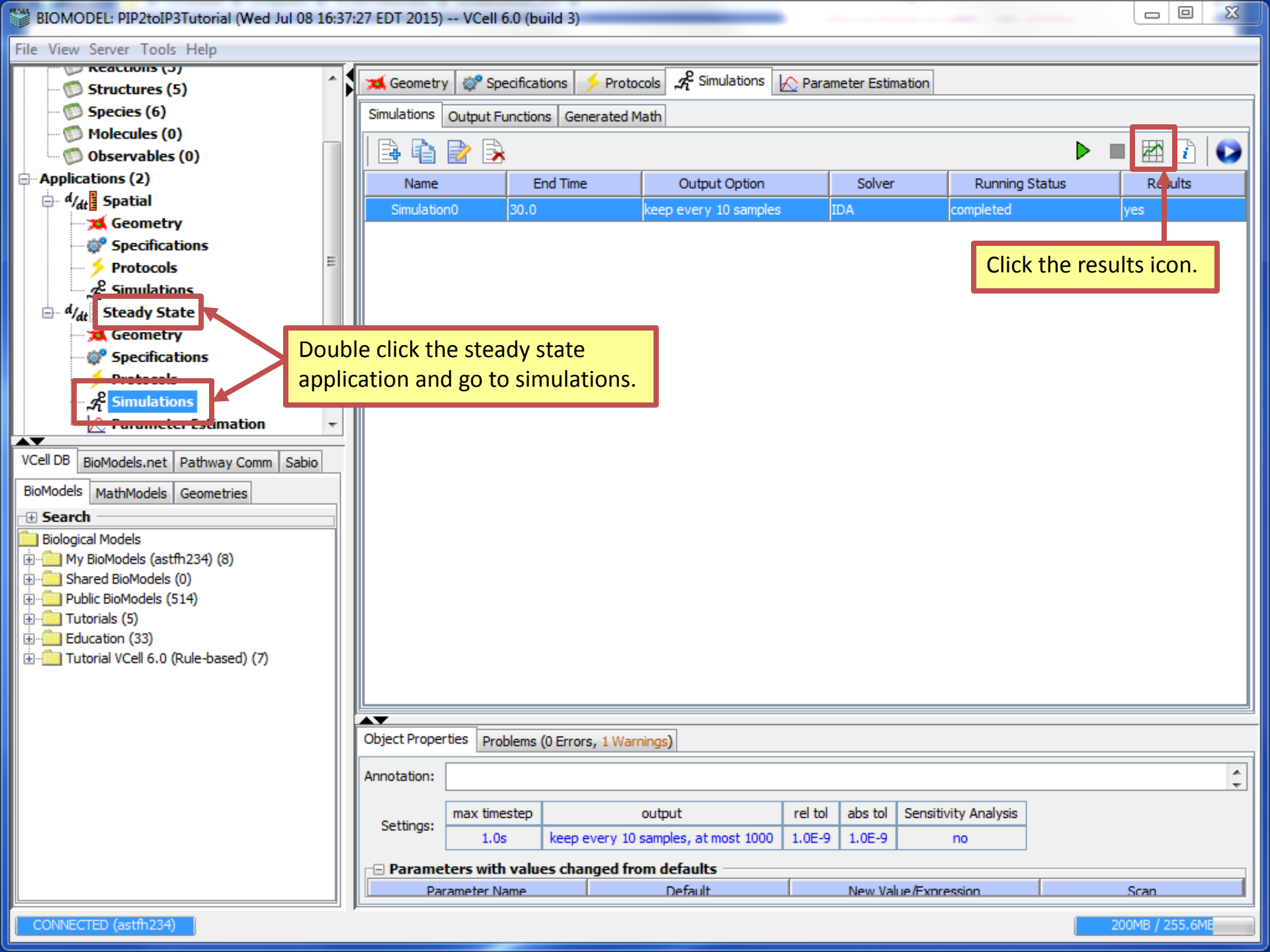
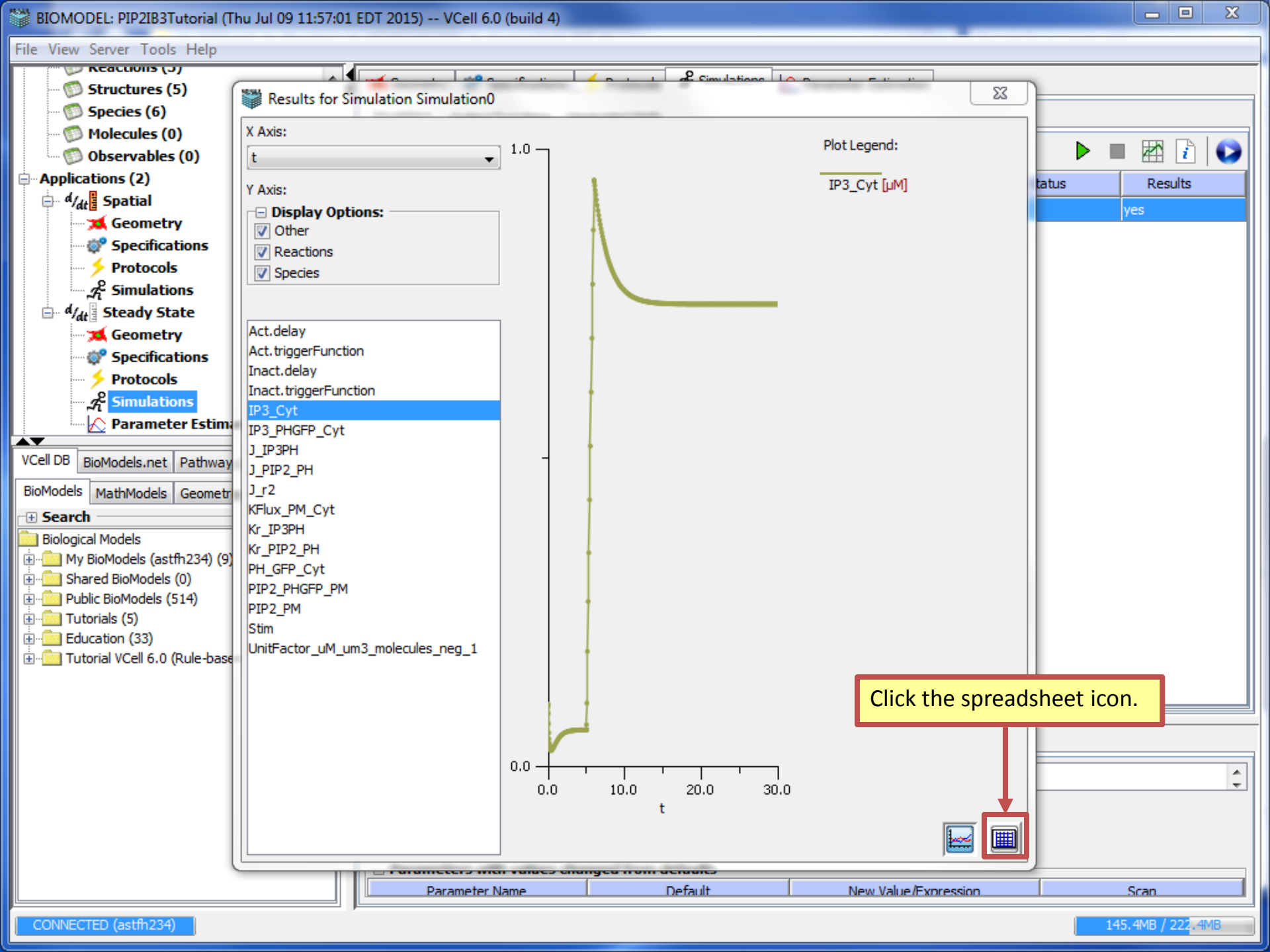
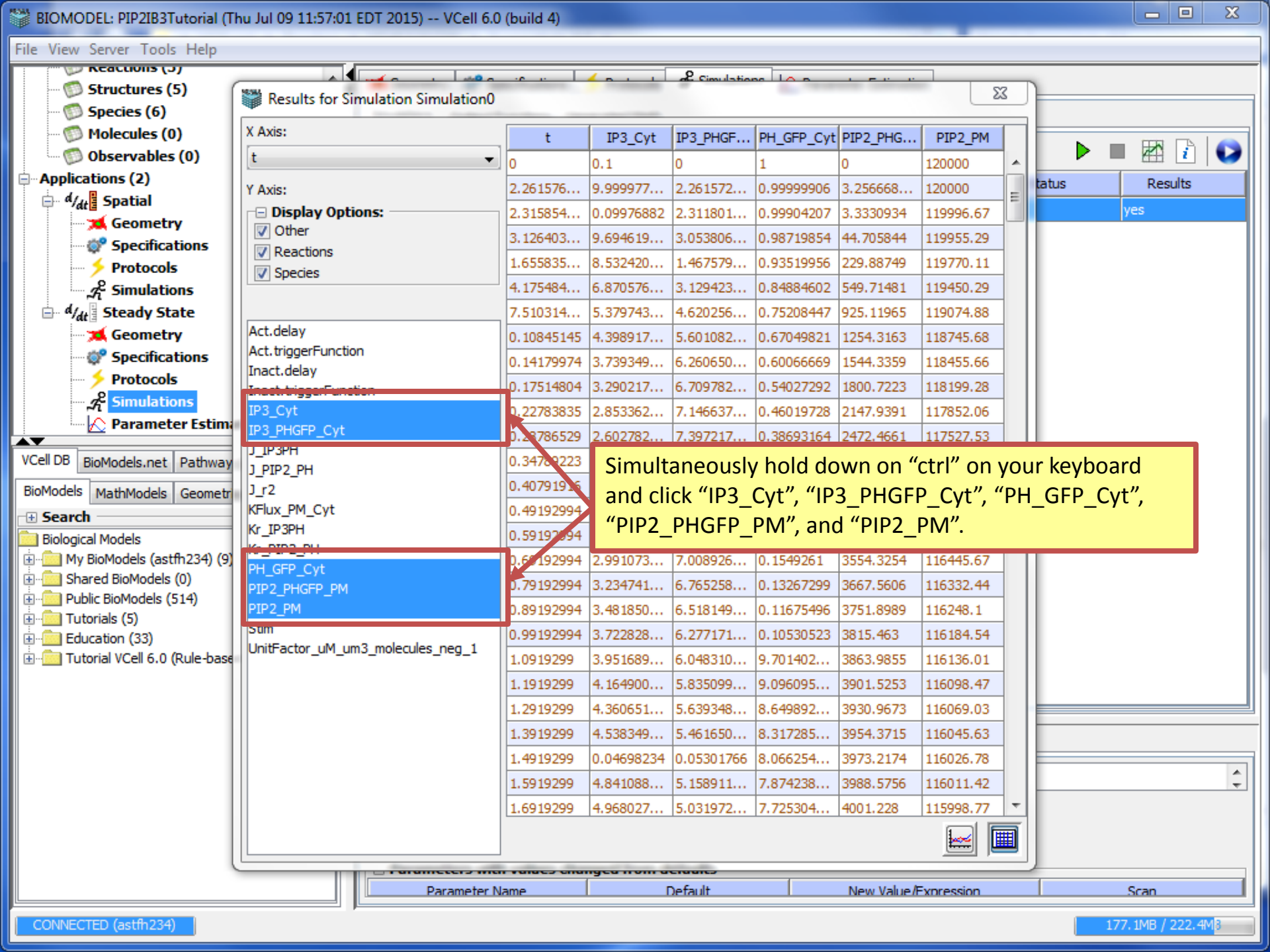
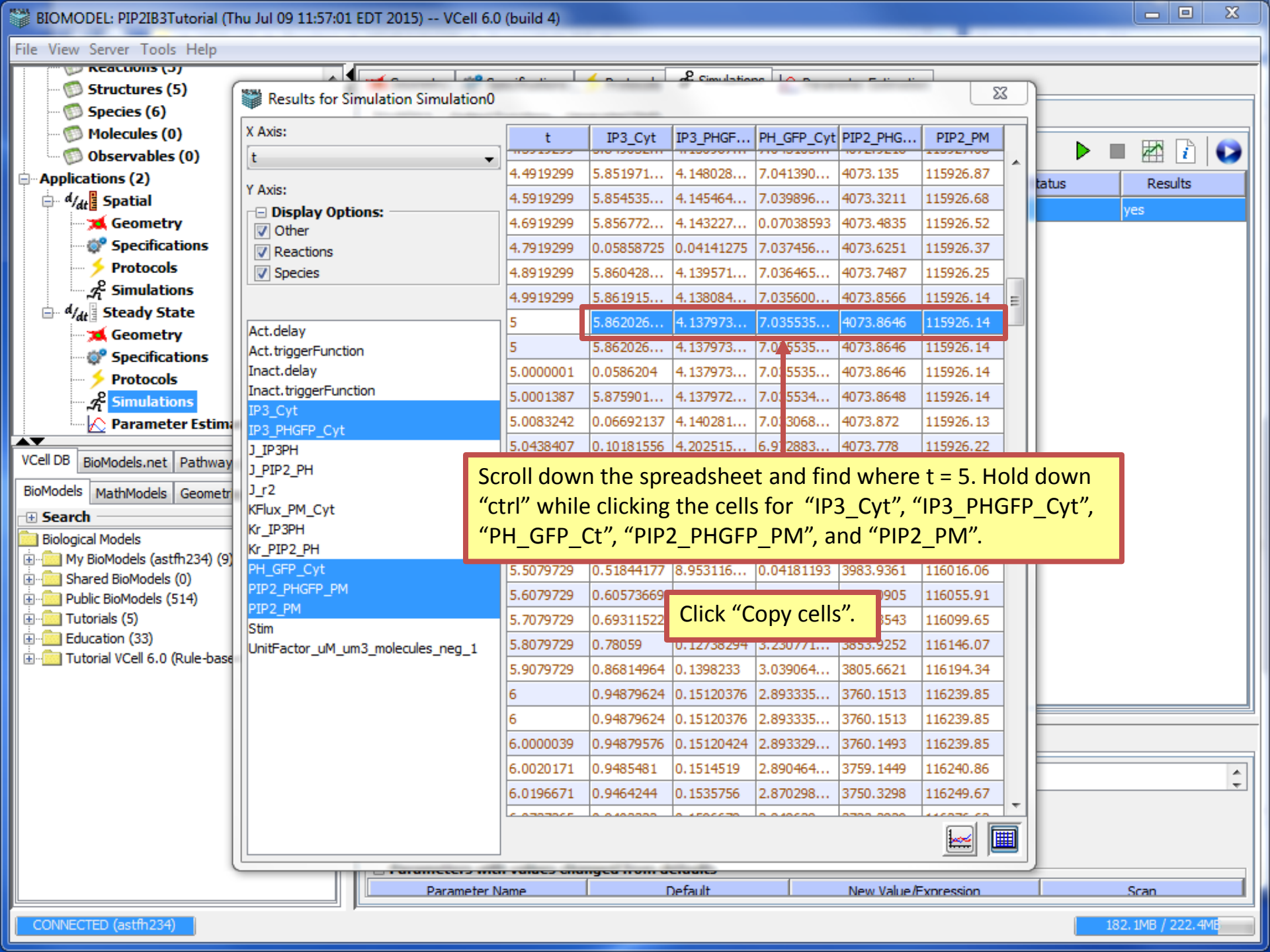
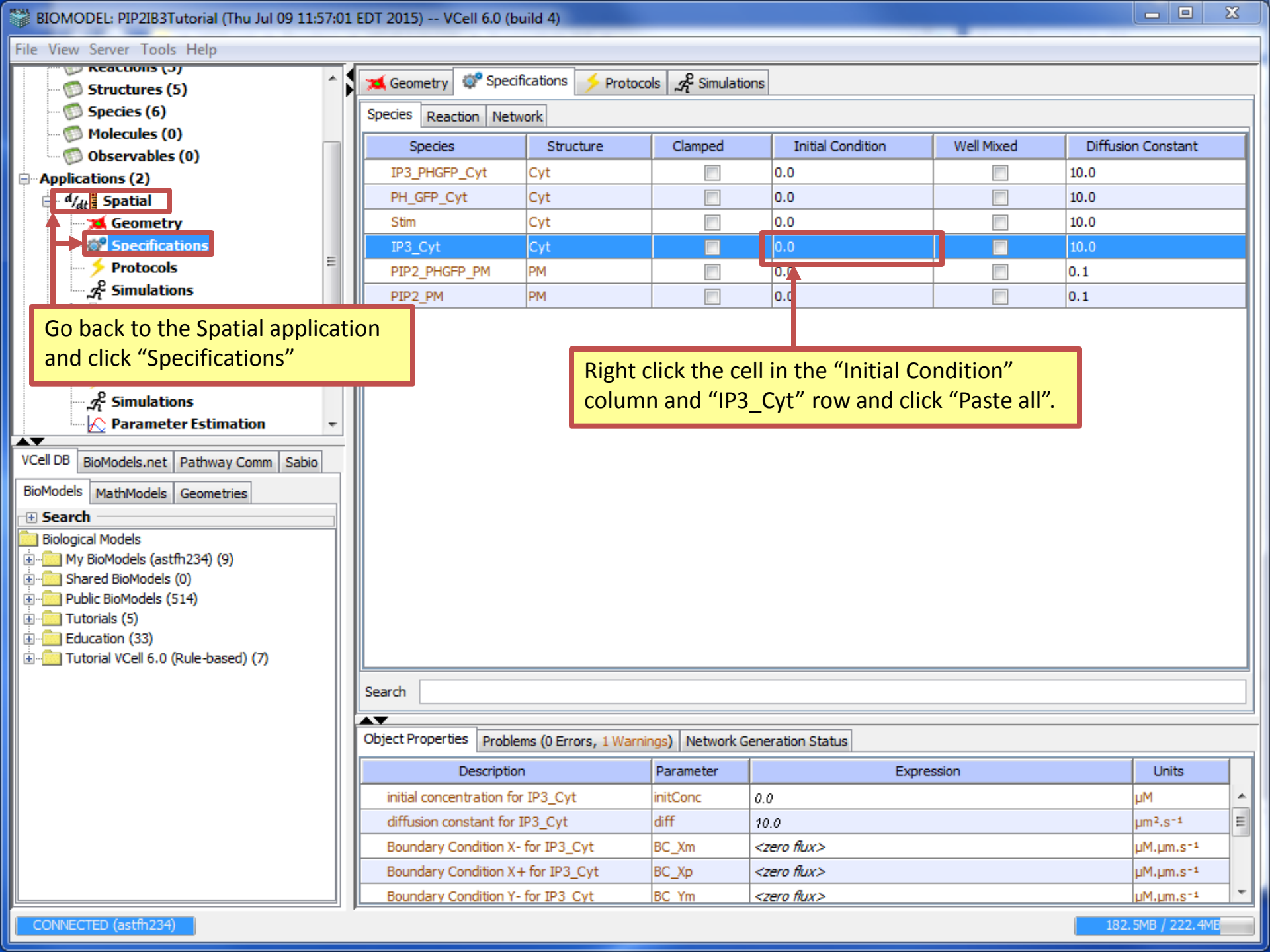
Geometry
Specifications
Protocols
Simulations
Structure Mapping
Click “Structure Mapping”.
mapped to run a simulation.
Use line tool or drop down menu in the 'subdomain' column.
Use the line tool to connect the structures to their corresponding subdomains.
Physiology (structures)
EC
Cyt
Nuc
PM
NM
Geometry (subdomains
Nuc
Cyt
EC
Cyt_EC_membrane
Cyt_Nuc_membrane
Structure
Subdomain
Size Ratio
X-
X+
Y-
Y+
Z-
Z+
EC
EC
1 [1]
Flux
Cyt
Cyt
1 [1]
Flux
Nuc
Nuc
1 [1]
Flux
PM
Cyt_EC_membrane
1 [1]
Flux
Object Properties
Problems (0 Errors, 1 Warnings)
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
174.7MB / 255.6MB

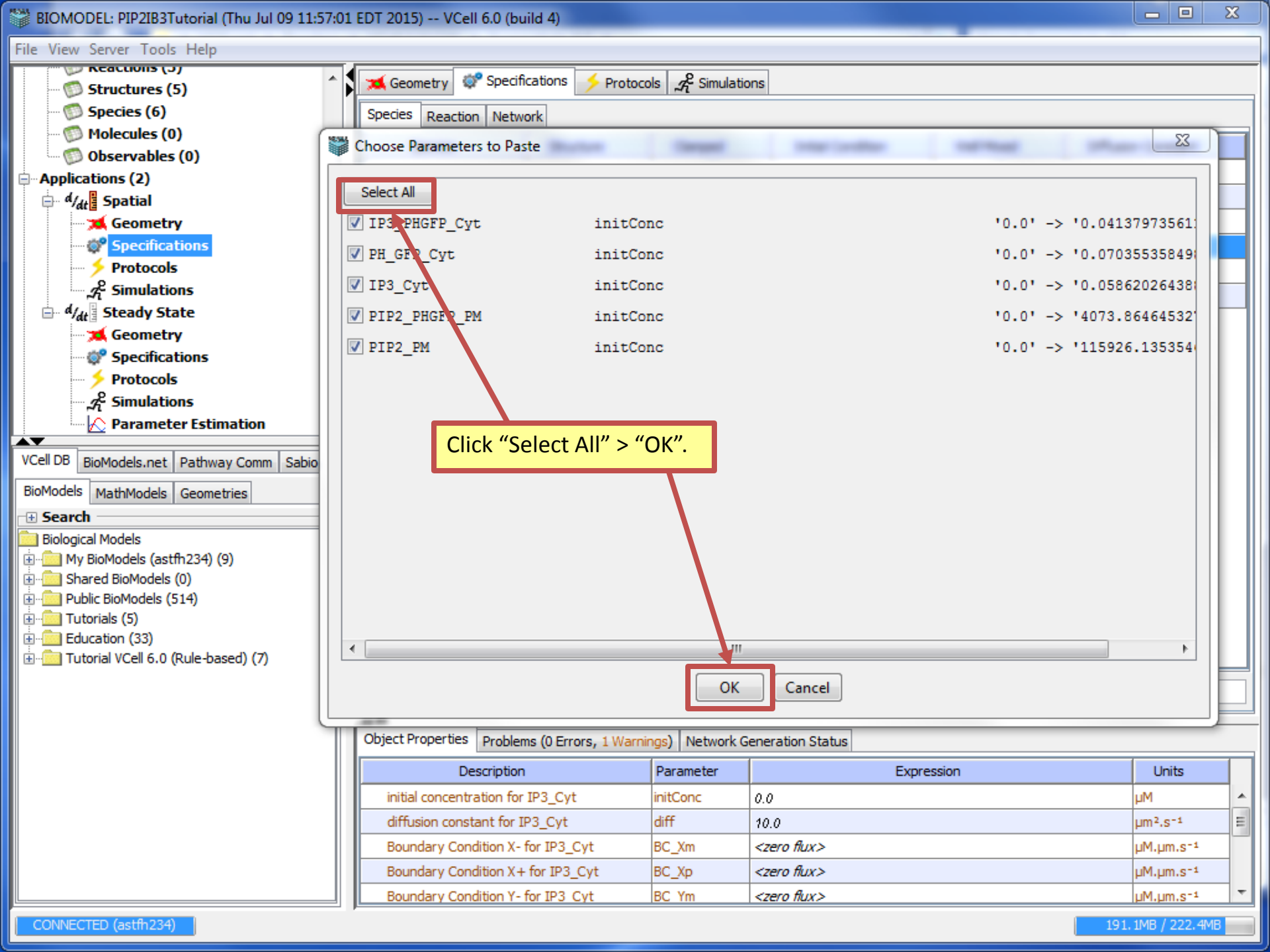

BIOMODEL: PIP2toIP3Tutorial (Wed Jul 08 16:37:27 EDT 2015) -- VCell 6.0 (build 3)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Simulations
Double click the steady state application and go to simulations.
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
Simulation0
30.0
keep every 10 samples
IDA
completed
yes
Click the results icon.
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (8)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Annotation:
Settings:
max timestep
output
rel tol
abs tol
Sensitivity Analysis
1.0s
keep every 10 samples, at most 1000
1.0E-9
1.0E-9
no
Parameters with values changed from defaults
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
200MB / 255.6MB

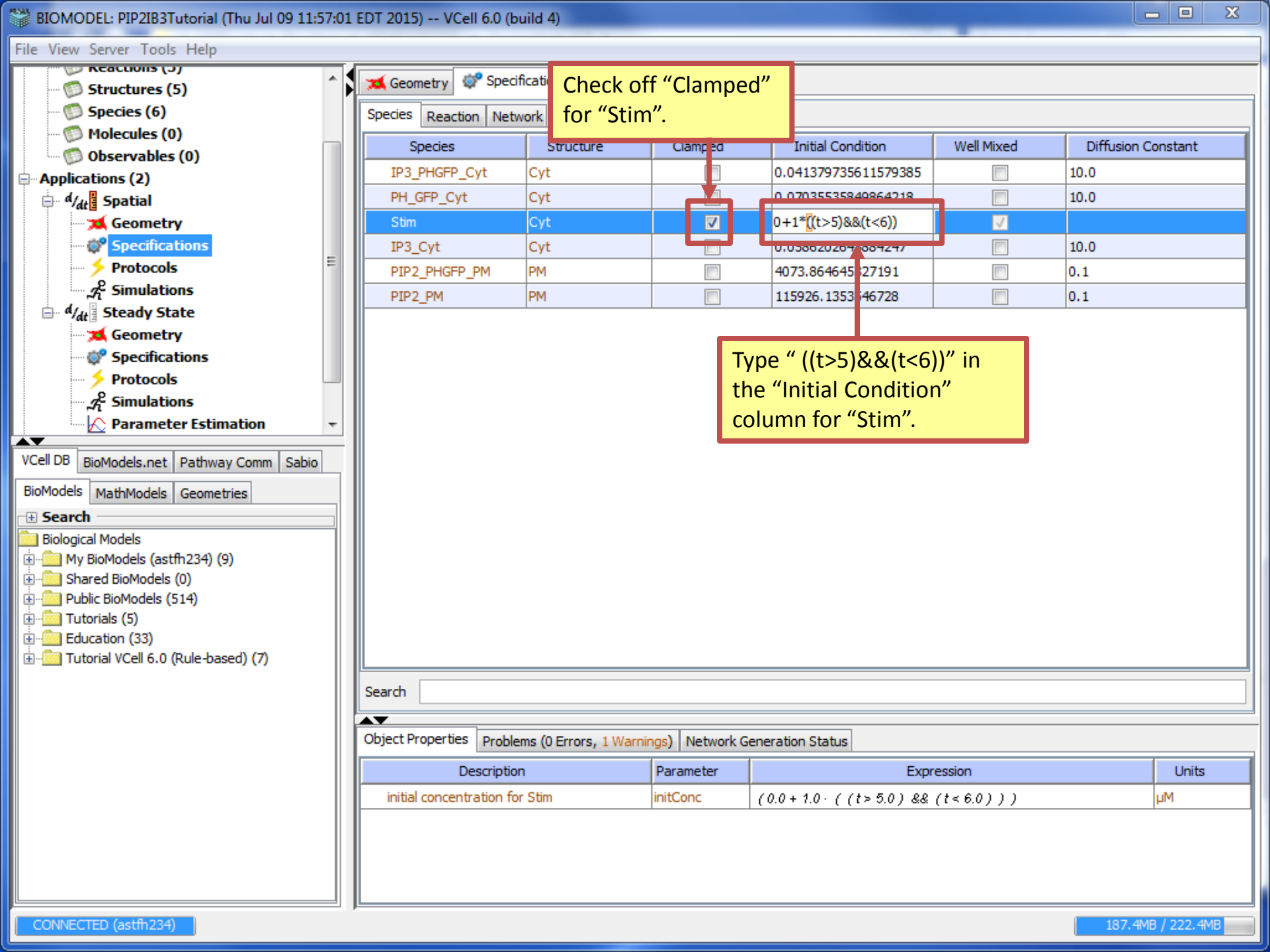

BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estim
VCell DB
BioModels.net
Pathway
BioModels
MathModels
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-base
Results for Simulation Simulation0
X Axis:
t
Y Axis:
Display Options:
Other
Reactions
Species
Act.delay
Act.triggerFunction
Inact.delay
Inact.triggerFunction
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_PIP2_PH
J_r2
KFlux_PM_Cyt
Kr_IP3PH
Kr_PIP2_PH
PH_GFP_Cyt
PIP2_PHGFP_PM
PIP2_PM
Stim
UnitFactor_uM_um3_molecules_neg_1
1.0
0.0
0.0
10.0
20.0
30.0
t
Plot Legend:
IP3_Cyt [μM]
Click the spreadsheet icon.
Simulations
Status
Results
yes
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
145.4MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estim
VCell DB
BioModels.net
Pathway
BioModels
MathModels
Geometr
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-base
Results for Simulation Simulation0
X Axis:
t
Y Axis:
Display Options:
Other
Reactions
Species
Act.delay
Act.triggerFunction
Inact.delay
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_PIP2_PH
J_r2
KFlux_PM_Cyt
Kr_IP3PH
PH_GFP_Cyt
PIP2_PHGFP_PM
PIP2_PM
Sum
UnitFactor_uM_um3_molecules_neg_1
t | IP3_Cyt | IP3_PHGF... | PH_GFP_Cyt | PIP2_PHG... | PIP2_PM
0 | 0.1 | 0 | 1 | 0 | 120000
2.261576... | 9.999977... | 2.261572... | 0.99999906 | 3.256668... | 120000
2.315854... | 0.09976882 | 2.311801... | 0.99904207 | 3.3330934 | 119996.67
3.126403... | 9.694619... | 3.053806... | 0.98719854 | 44.705844 | 119955.29
1.655835... | 8.532420... | 1.467579... | 0.93519956 | 229.88749 | 119770.11
4.175484... | 6.870576... | 3.129423... | 0.84884602 | 549.71481 | 119450.29
7.510314... | 5.379743... | 4.620256... | 0.75208447 | 925.11965 | 119074.88
0.10845145 | 4.398917... | 5.601082... | 0.67049821 | 1254.3163 | 118745.68
0.14179974 | 3.739349... | 6.260650... | 0.60066669 | 1544.3359 | 118455.66
0.17514804 | 3.290217... | 6.709782... | 0.54027292 | 1800.7223 | 118199.28
0.22783835 | 2.853362... | 7.146637... | 0.46019728 | 2147.9391 | 117852.06
0.34786223
0.40791916
0.49192994
0.59192994
0.69192994 | 2.991073... | 7.008926... | 0.1549261 | 3554.3254 | 116445.67
0.79192994 | 3.234741... | 6.765258... | 0.13267299 | 3667.5606 | 116332.44
0.89192994 | 3.481850... | 6.518149... | 0.11675496 | 3751.8989 | 116248.1
0.99192994 | 3.722828... | 6.277171... | 0.10530523 | 3815.463 | 116184.54
1.0919299 | 3.951689... | 6.048310... | 9.701402... | 3863.9855 | 116136.01
1.1919299 | 4.164900... | 5.835099... | 9.096095... | 3901.5253 | 116098.47
1.2919299 | 4.360651... | 5.639348... | 8.649892... | 3930.9673 | 116069.03
1.3919299 | 4.538349... | 5.461650... | 8.317285... | 3954.3715 | 116045.63
1.4919299 | 0.04698234 | 0.05301766 | 8.066254... | 3973.2174 | 116026.78
1.5919299 | 4.841088... | 5.158911... | 7.874238... | 3988.5756 | 116011.42
1.6919299 | 4.968027... | 5.031972... | 7.725304... | 4001.228 | 115998.77
Simultaneously hold down on "ctrl" on your keyboard and click "IP3_Cyt", "IP3_PHGFP_Cyt", "PH_GFP_Cyt", "PIP2_PHGFP_PM", and "PIP2_PM".
Results
yes
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
177.1MB / 222.4M


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estim
VCell DB
BioModels.net
Pathway
BioModels
MathModels
Geometr
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-base
Results for Simulation Simulation0
X Axis:
t
Y Axis:
Display Options:
Other
Reactions
Species
Act.delay
Act.triggerFunction
Inact.delay
Inact.triggerFunction
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_PIP2_PH
J_r2
KFlux_PM_Cyt
Kr_IP3PH
Kr_PIP2_PH
PH_GFP_Cyt
PIP2_PHGFP_PM
PIP2_PM
Stim
UnitFactor_uM_um3_molecules_neg_1
t
IP3_Cyt
IP3_PHGF...
PH_GFP_Cyt
PIP2_PHG...
PIP2_PM
4.4919299 5.851971... 4.148028... 7.041390... 4073.135 115926.87
4.5919299 5.854535... 4.145464... 7.039896... 4073.3211 115926.68
4.6919299 5.856772... 4.143227... 0.07038593 4073.4835 115926.52
4.7919299 0.05858725 0.04141275 7.037456... 4073.6251 115926.37
4.8919299 5.860428... 4.139571... 7.036465... 4073.7487 115926.25
4.9919299 5.861915... 4.138084... 7.035600... 4073.8566 115926.14
5 5.862026... 4.137973... 7.035535... 4073.8646 115926.14
5 5.862026... 4.137973... 7.035535... 4073.8646 115926.14
5.0000001 0.0586204 4.137973... 7.035535... 4073.8646 115926.14
5.0001387 5.875901... 4.137972... 7.035534... 4073.8648 115926.14
5.0083242 0.06692137 4.140281... 7.033068... 4073.872 115926.13
5.0438407 0.10181556 4.202515... 6.972883... 4073.778 115926.22
5.5079729 0.51844177 8.953116... 0.04181193 3983.9361 116016.06
5.6079729 0.60573669 116055.91
5.7079729 0.69311522 116099.65
5.8079729 0.78059 116146.07
5.9079729 0.86814964 0.1398233 3.039064... 3805.6621 116194.34
6 0.94879624 0.15120376 2.893335... 3760.1513 116239.85
6 0.94879624 0.15120376 2.893335... 3760.1513 116239.85
6.0000039 0.94879576 0.15120424 2.893329... 3760.1493 116240.86
6.0020171 0.9485481 0.1514519 2.890464... 3759.1449 116240.86
6.0196671 0.9464244 0.1535756 2.870298... 3750.3298 116249.67
Scroll down the spreadsheet and find where t = 5. Hold down "ctrl" while clicking the cells for "IP3_Cyt", "IP3_PHGFP_Cyt", "PH_GFP_Ct", "PIP2_PHGFP_PM", and "PIP2_PM".
Click "Copy cells".
Status
Results
yes
Parameter Name
Default
New Value/Expression
Scan
CONNECTED (astfh234)
182.1MB / 222.4MB

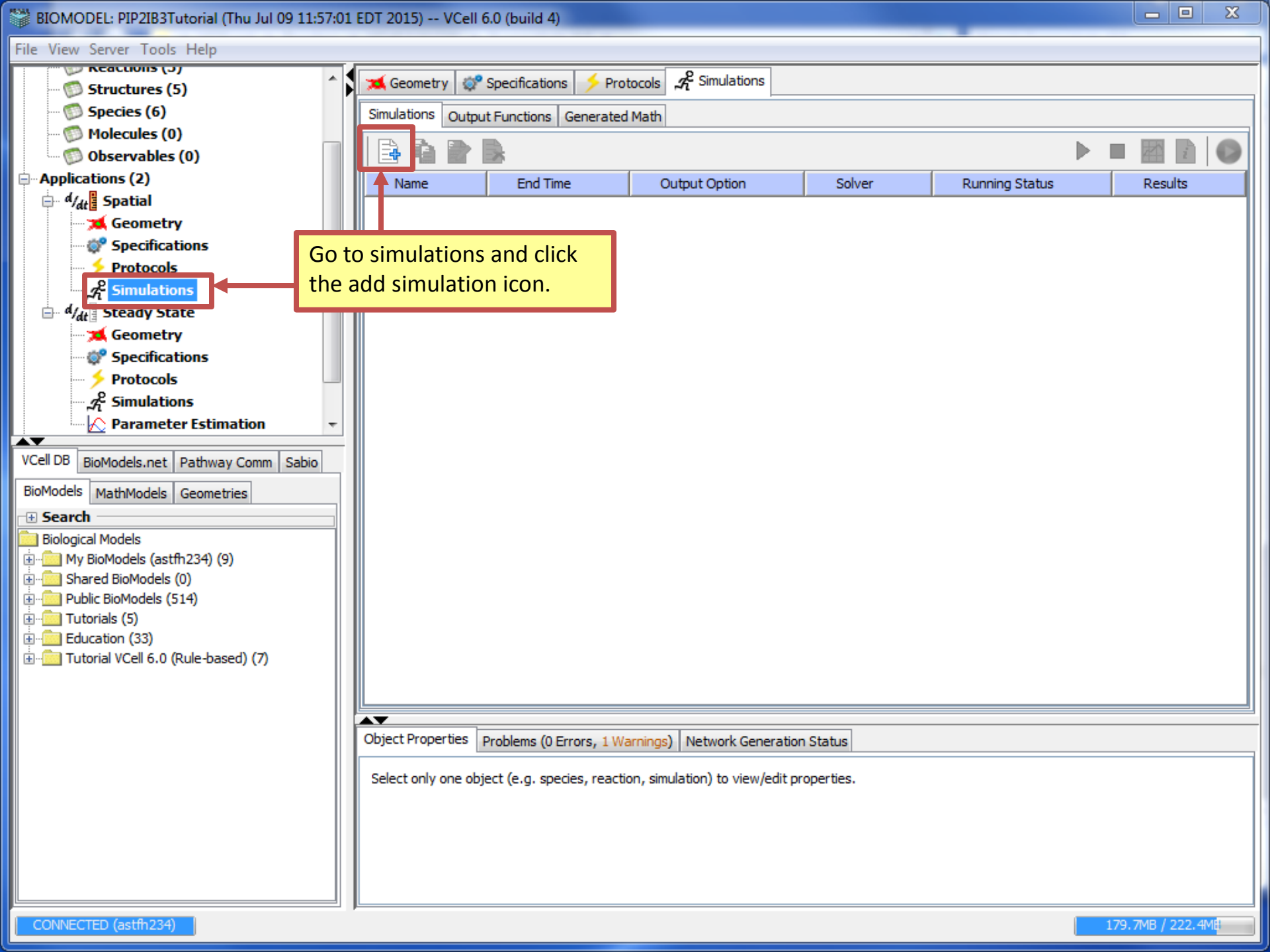

BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Simulations
Parameter Estimation
Go back to the Spatial application and click “Specifications”
Geometry
Specifications
Protocols
Simulations
Species
Reaction
Network
Species
Structure
Clamped
Initial Condition
Well Mixed
Diffusion Constant
IP3_PHGFP_Cyt
Cyt
0.0
10.0
PH_GFP_Cyt
Cyt
0.0
10.0
Stim
Cyt
0.0
10.0
IP3_Cyt
Cyt
0.0
10.0
PIP2_PHGFP_PM
PM
0.1
PIP2_PM
PM
0.1
Right click the cell in the “Initial Condition” column and “IP3_Cyt” row and click “Paste all”.
Search
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Description
Parameter
Expression
Units
initial concentration for IP3_Cyt
initConc
0.0
μM
diffusion constant for IP3_Cyt
diff
10.0
μm².s⁻¹
Boundary Condition X- for IP3_Cyt
BC_Xm
<zero flux>
μM.μm.s⁻¹
Boundary Condition X+ for IP3_Cyt
BC_Xp
<zero flux>
μM.μm.s⁻¹
Boundary Condition Y- for IP3_Cyt
BC_Ym
<zero flux>
μM.μm.s⁻¹
CONNECTED (astfh234)
182.5MB / 222.4MB

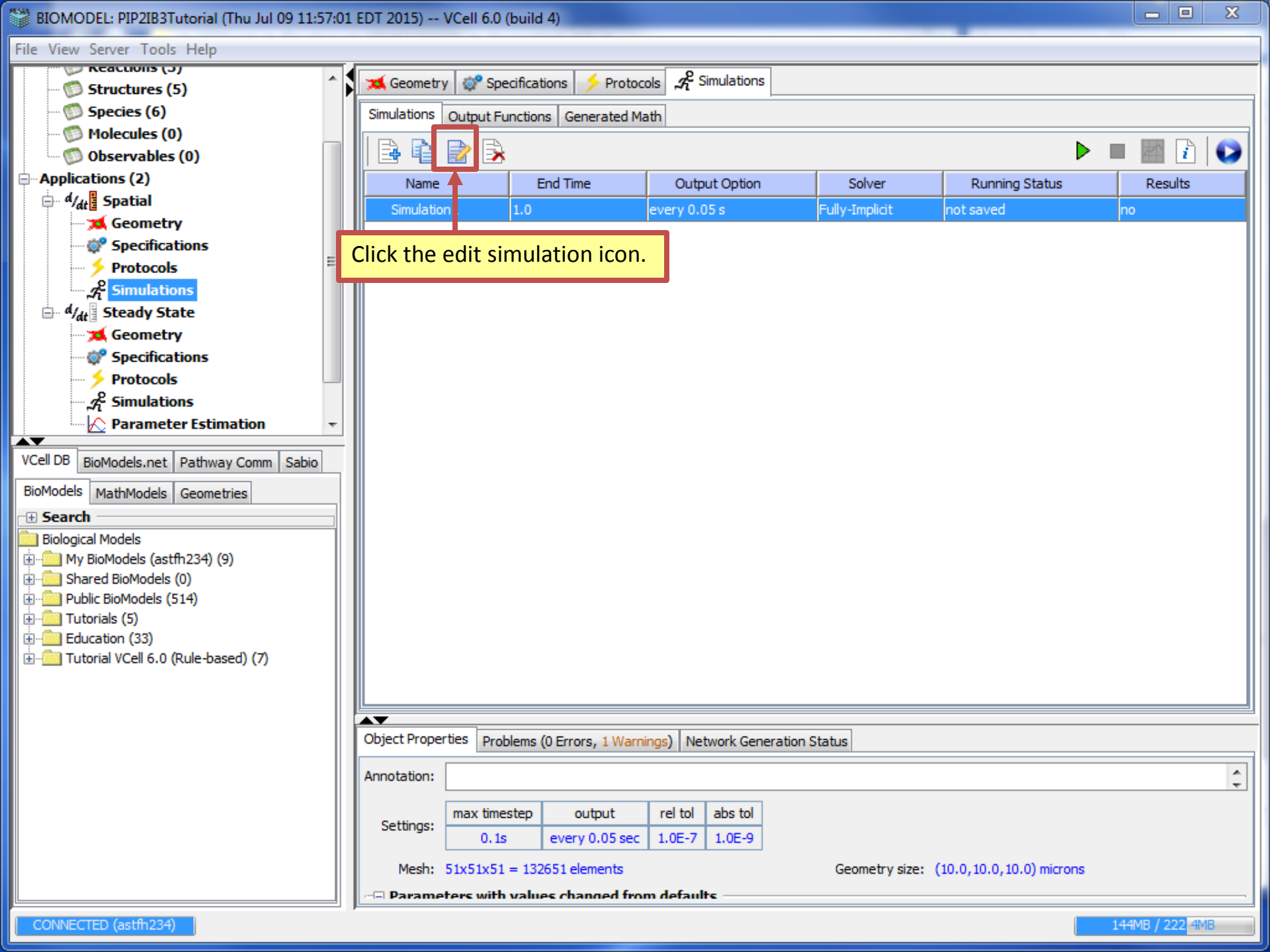

BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Species
Reaction
Network
Choose Parameters to Paste
Select All
IP3_PHGFP_Cyt initConc '0.0' -> '0.04137973561
PH_GFP_Cyt initConc '0.0' -> '0.07035535849
IP3_Cyt initConc '0.0' -> '0.05862026438
PIP2_PHGFP_PM initConc '0.0' -> '4073.86464532
PIP2_PM initConc '0.0' -> '115926.135354
Click “Select All” > “OK”.
OK
Cancel
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Description Parameter Expression Units
initial concentration for IP3_Cyt initConc 0.0 µM
diffusion constant for IP3_Cyt diff 10.0 µm².s⁻¹
Boundary Condition X- for IP3_Cyt BC_Xm <zero flux> µM.µm.s⁻¹
Boundary Condition X+ for IP3_Cyt BC_Xp <zero flux> µM.µm.s⁻¹
Boundary Condition Y- for IP3_Cyt BC_Ym <zero flux> µM.µm.s⁻¹
CONNECTED (astfh234)
191.1MB / 222.4MB

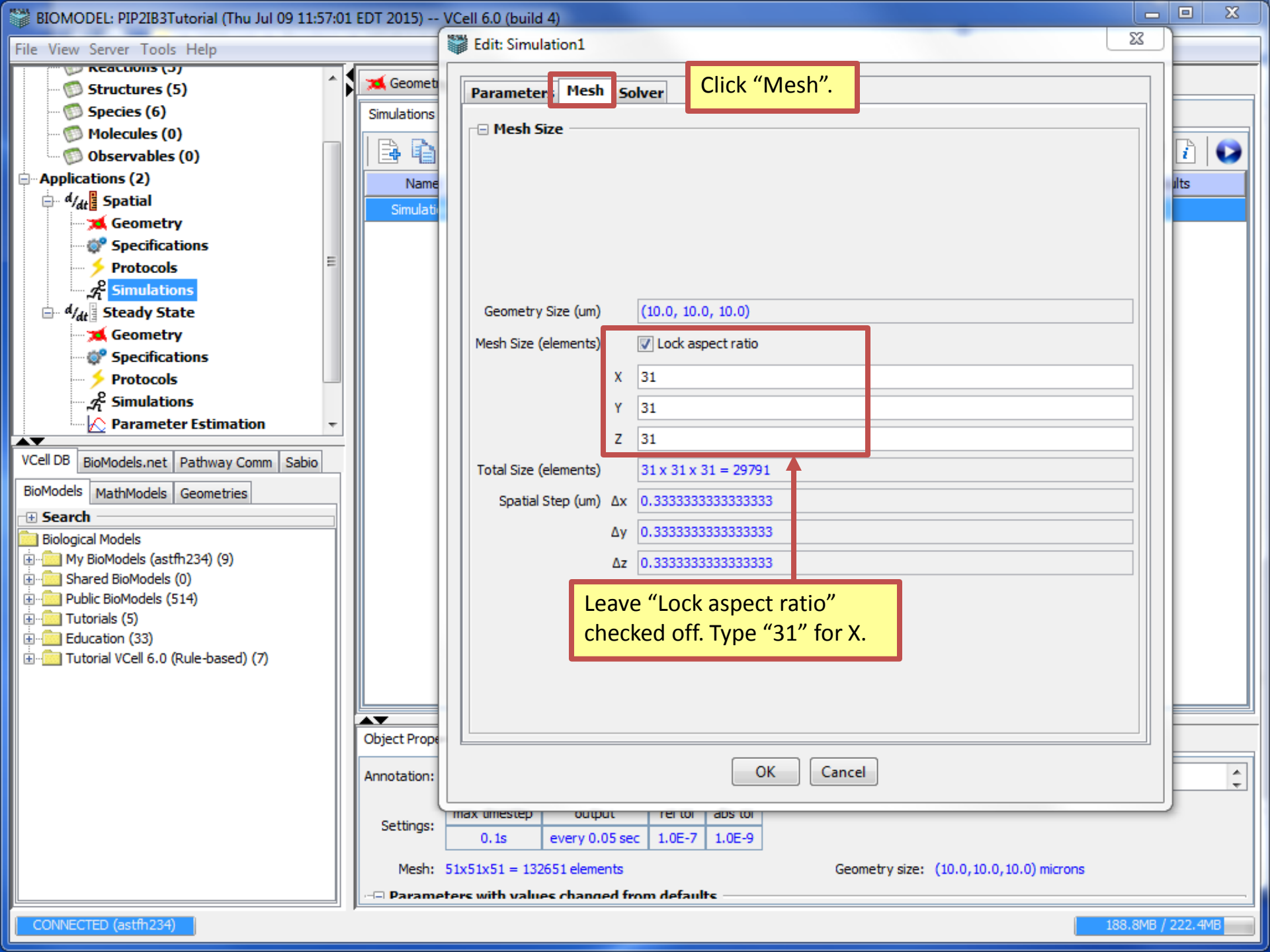


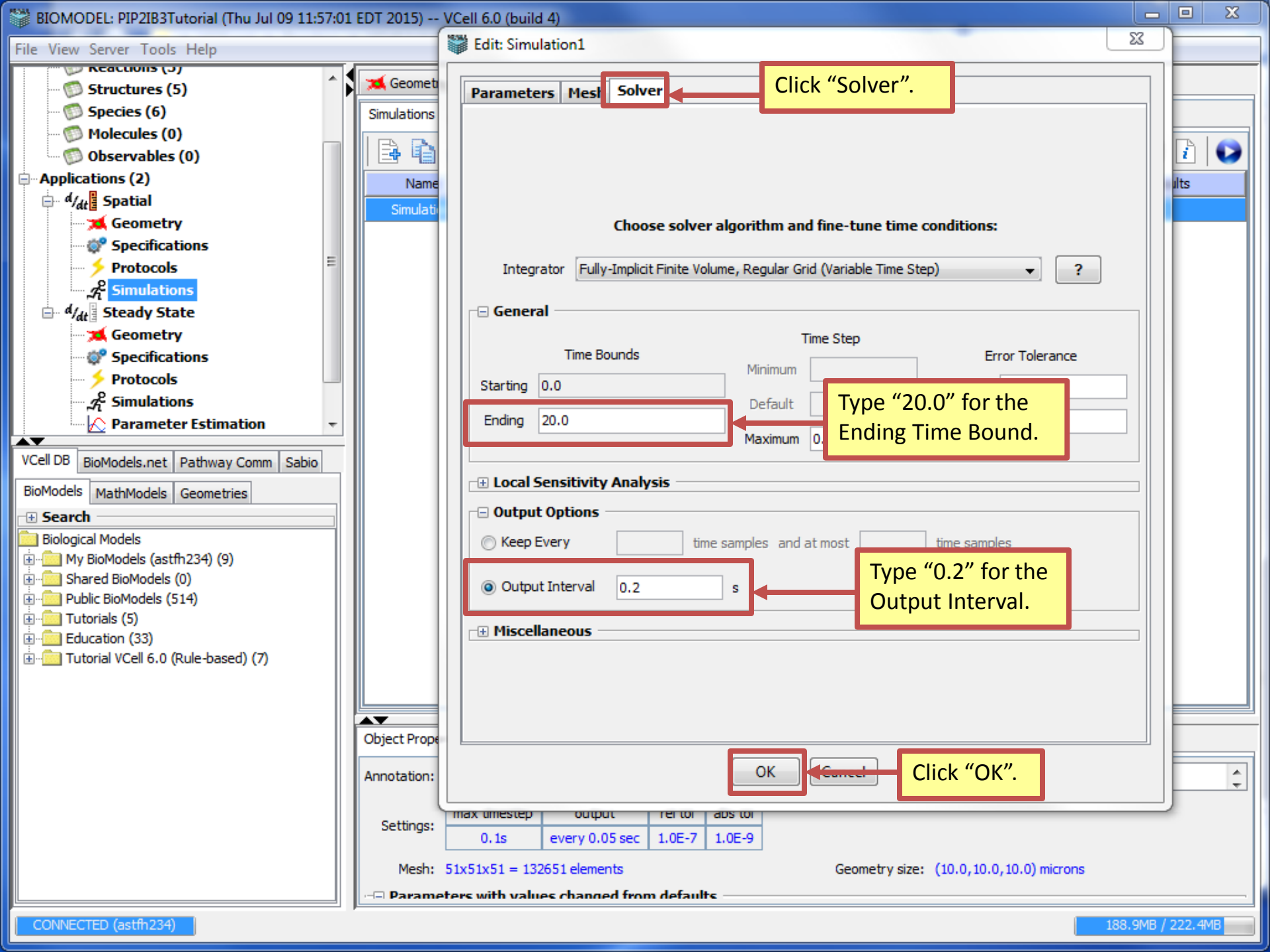
Check off “Clamped” for “Stim”.

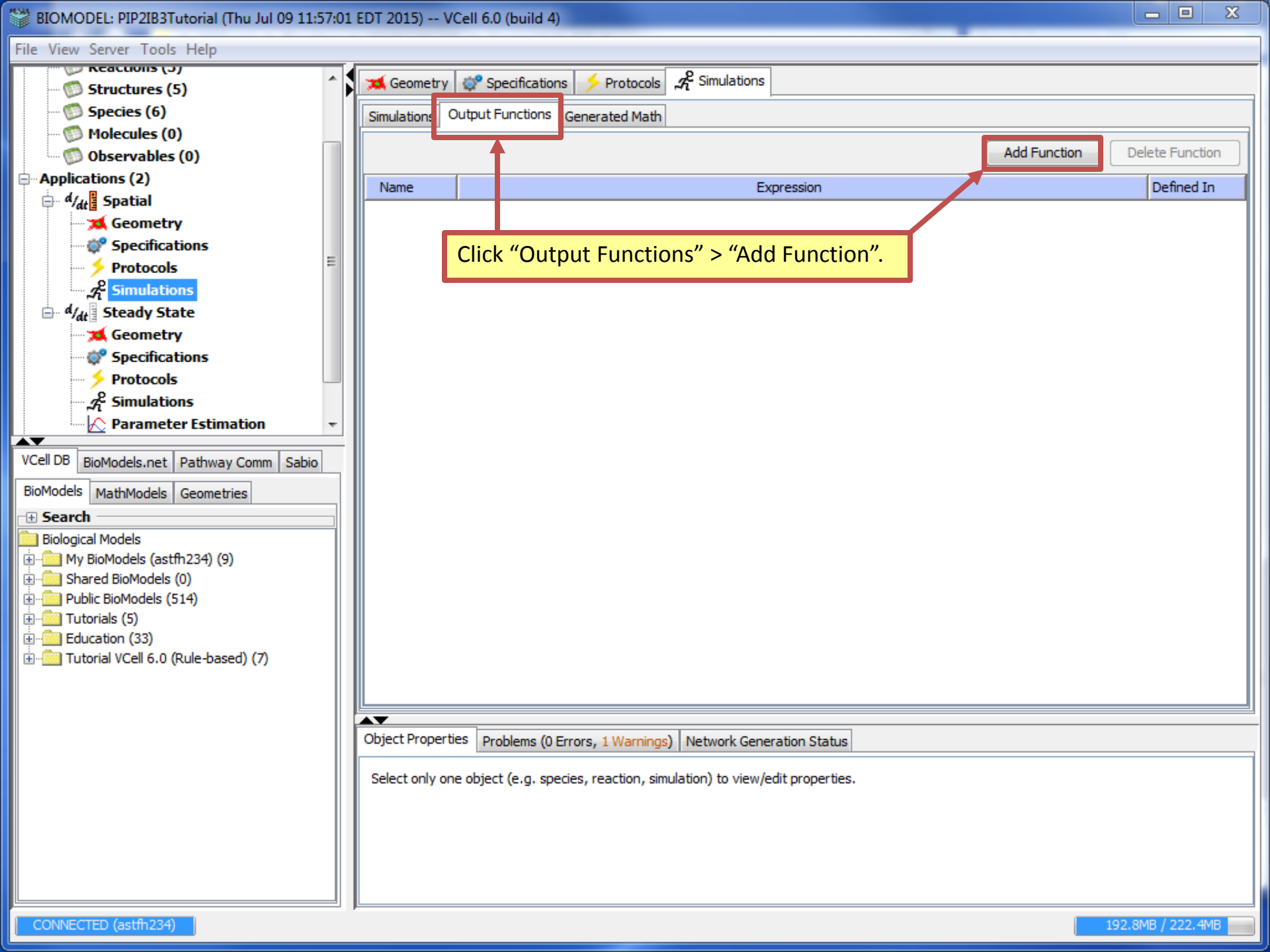
Type “ ((t>5)&&(t<6))” in the “Initial Condition” column for “Stim”.


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
Go to simulations and click the add simulation icon.
Geometry
Specifications
Protocols
Simulations
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
179.7MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
Simulation
1.0
every 0.05 s
Fully-Implicit
not saved
no
Click the edit simulation icon.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Annotation:
Settings:
max timestep
output
rel tol
abs tol
0.1s
every 0.05 sec
1.0E-7
1.0E-9
Mesh: 51x51x51 = 132651 elements
Geometry size: (10.0,10.0,10.0) microns
Parameters with values changed from defaults
CONNECTED (astfh234)
144MB / 222 4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Simulations
Name
Edit: Simulation1
Parameters
Mesh
Solver
Click “Mesh”.
Mesh Size
Geometry Size (um)
(10.0, 10.0, 10.0)
Mesh Size (elements)
Lock aspect ratio
X
31
Y
31
Z
31
Total Size (elements)
31 x 31 x 31 = 29791
Spatial Step (um) Δx
0.3333333333333333
Δy
0.3333333333333333
Δz
0.3333333333333333
Leave “Lock aspect ratio” checked off. Type “31” for X.
OK
Cancel
Object Prope
Annotation:
Settings:
max timestep
output
rel tol
abs tol
0.1s
every 0.05 sec
1.0E-7
1.0E-9
Mesh: 51x51x51 = 132651 elements
Geometry size: (10.0,10.0,10.0) microns
Parameters with values changed from defaults
CONNECTED (astfh234)
188.8MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Simulations
Name
Edit: Simulation1
Parameters
Mesh
Solver
Click “Solver”.
Choose solver algorithm and fine-tune time conditions:
Integrator
Fully-Implicit Finite Volume, Regular Grid (Variable Time Step)
?
General
Time Bounds
Time Step
Error Tolerance
Starting
0.0
Minimum
Default
Ending
20.0
Maximum
Type “20.0” for the Ending Time Bound.
Local Sensitivity Analysis
Output Options
Keep Every
time samples
and at most
time samples
Output Interval
0.2
s
Type “0.2” for the Output Interval.
Miscellaneous
OK
Cancel
Click “OK”.
Object Prope
Annotation:
Settings:
max timestep
output
rel tol
abs tol
0.1s
every 0.05 sec
1.0E-7
1.0E-9
Mesh: 51x51x51 = 132651 elements
Geometry size: (10.0,10.0,10.0) microns
Parameters with values changed from defaults
CONNECTED (astfh234)
188.9MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
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Protocols
Simulations
Steady State
Geometry
Specifications
Protocols
Simulations
Parameter Estimation
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BioModels.net
Pathway Comm
Sabio
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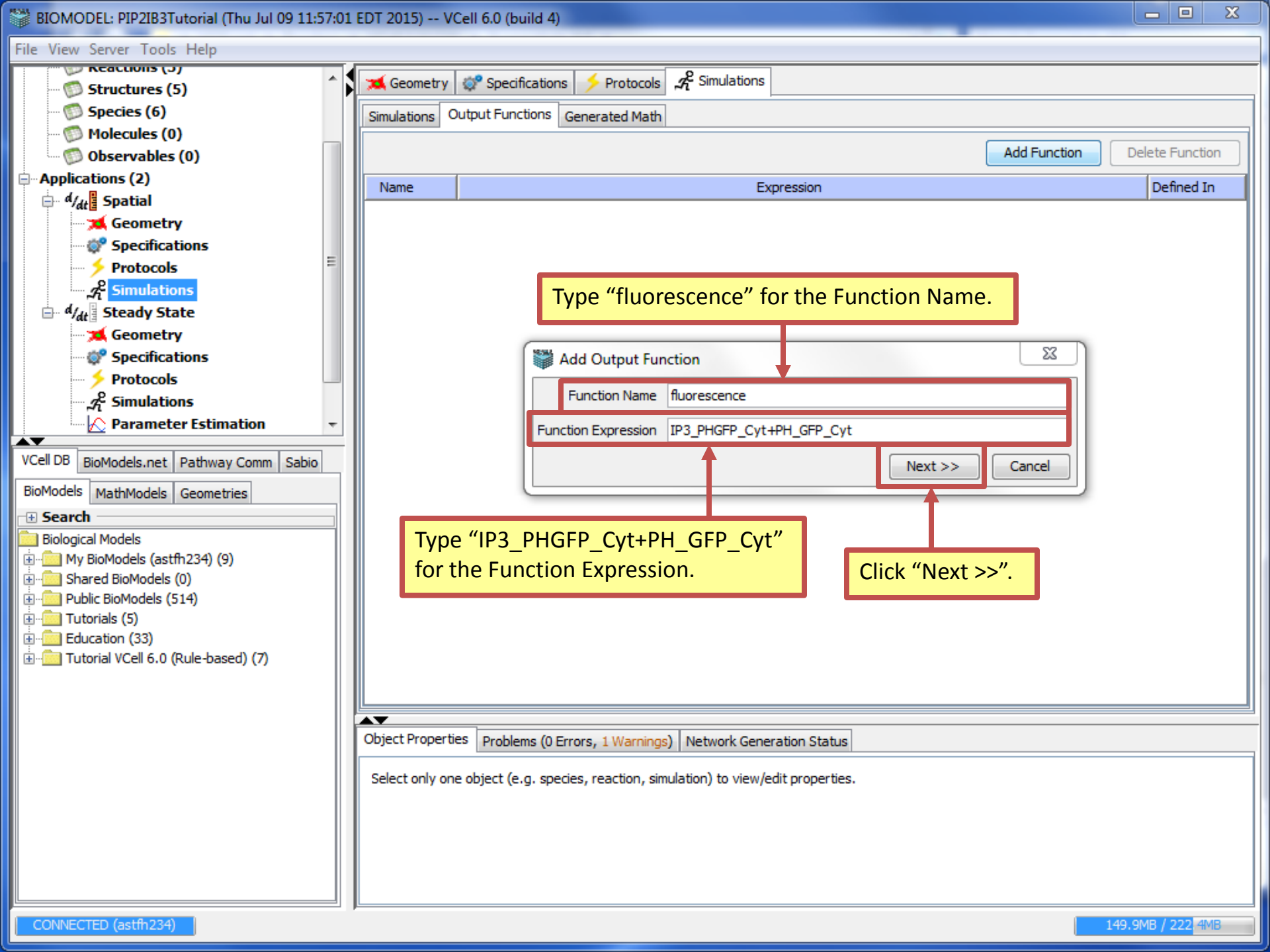
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Simulations
Output Functions
Generated Math
Add Function
Delete Function
Name
Expression
Defined In
Click “Output Functions” > “Add Function”.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
192.8MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
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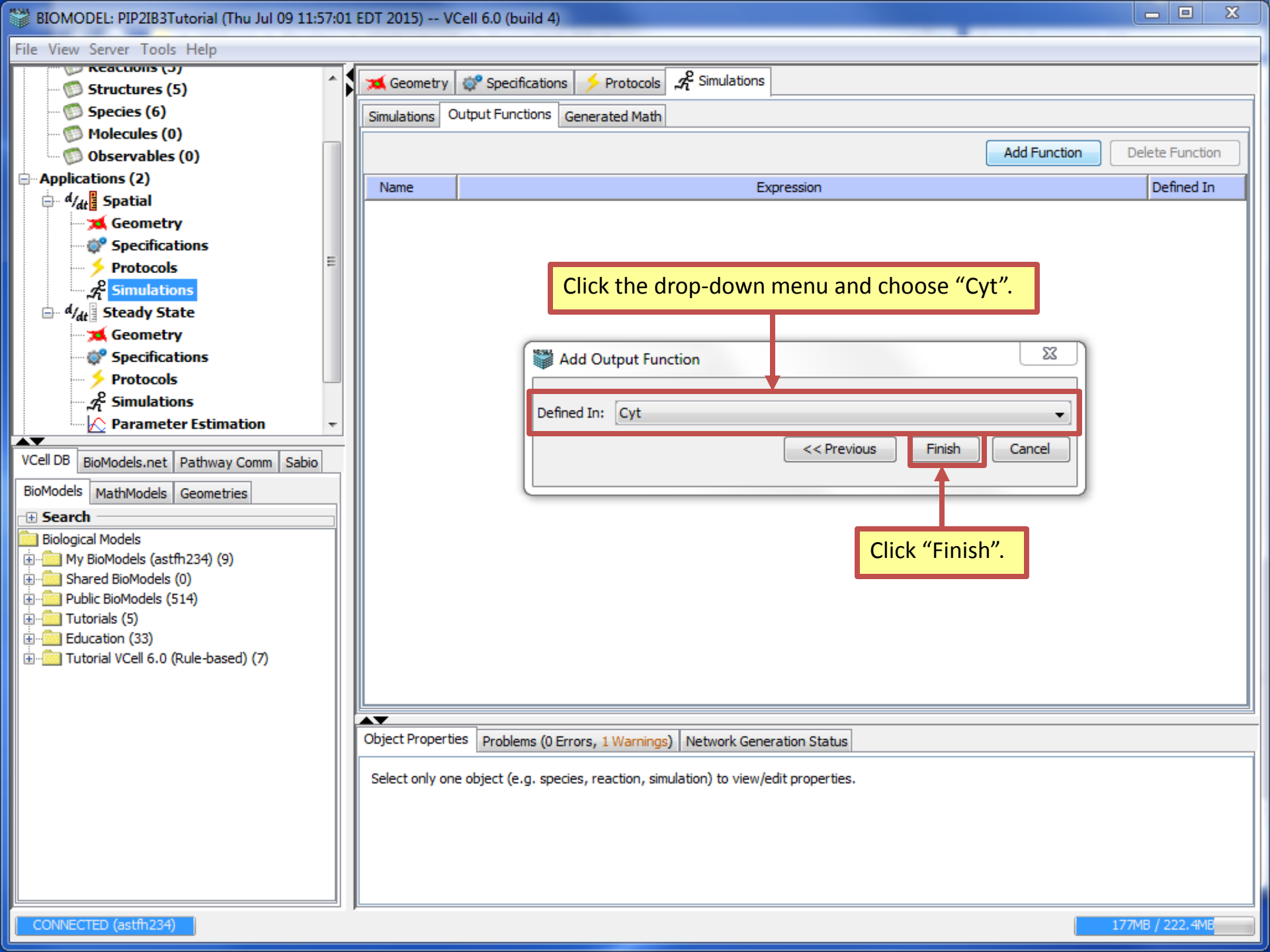
Simulations
Output Functions
Generated Math
Add Function
Delete Function
Name
Expression
Defined In
Type “fluorescence” for the Function Name.
Add Output Function
Function Name
fluorescence
Function Expression
IP3_PHGFP_Cyt+PH_GFP_Cyt
Next >>
Cancel
Type “IP3_PHGFP_Cyt+PH_GFP_Cyt” for the Function Expression.
Click “Next >>”.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
149.9MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 11:57:01 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
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Molecules (0)
Observables (0)
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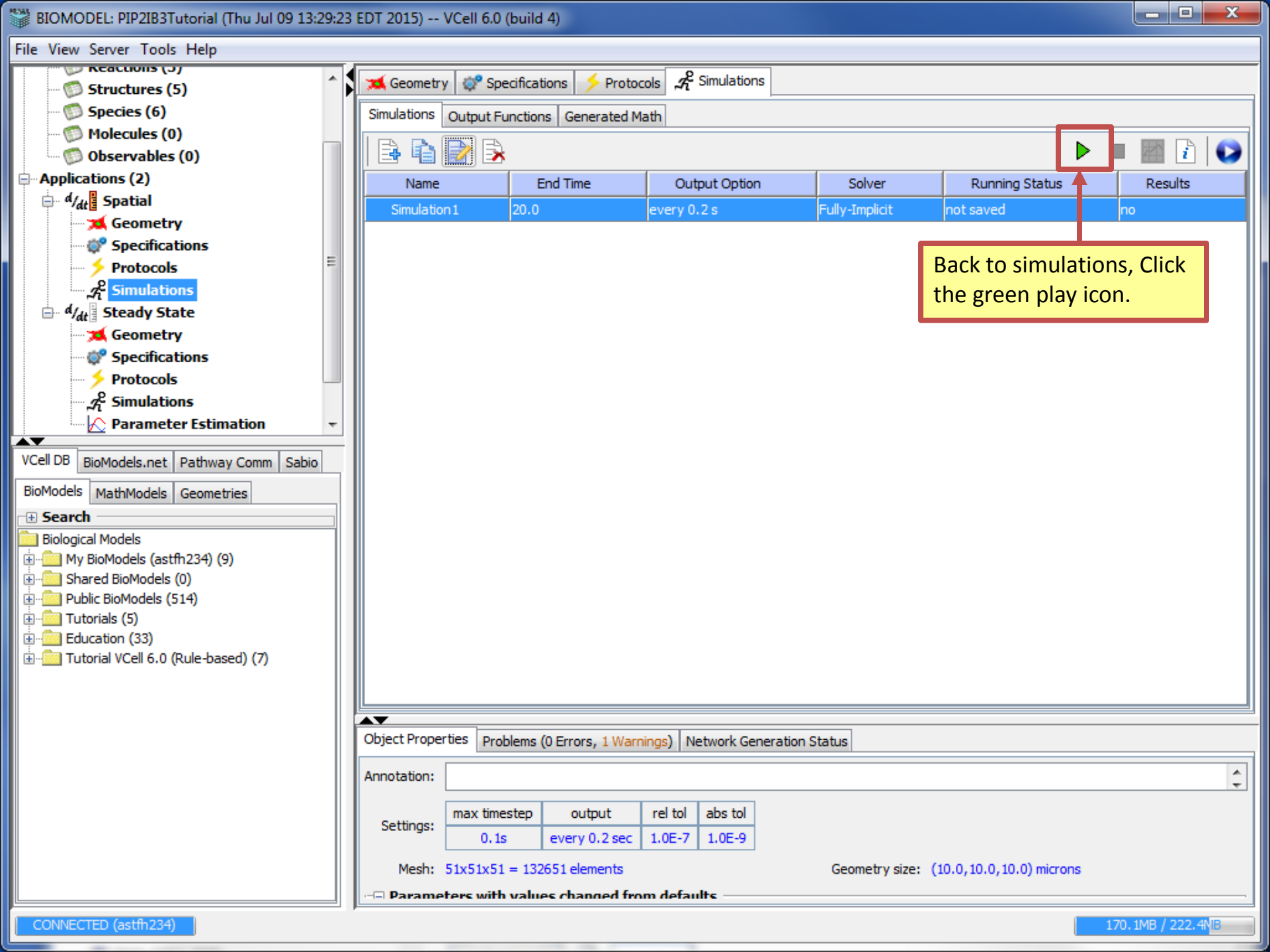
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Simulations
Output Functions
Generated Math
Add Function
Delete Function
Name
Expression
Defined In
Click the drop-down menu and choose “Cyt”.
Add Output Function
Defined In:
Cyt
<< Previous
Finish
Cancel
Click “Finish”.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Select only one object (e.g. species, reaction, simulation) to view/edit properties.
CONNECTED (astfh234)
177MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 13:29:23 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Structures (5)
Species (6)
Molecules (0)
Observables (0)
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Steady State
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MathModels
Geometries
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Biological Models
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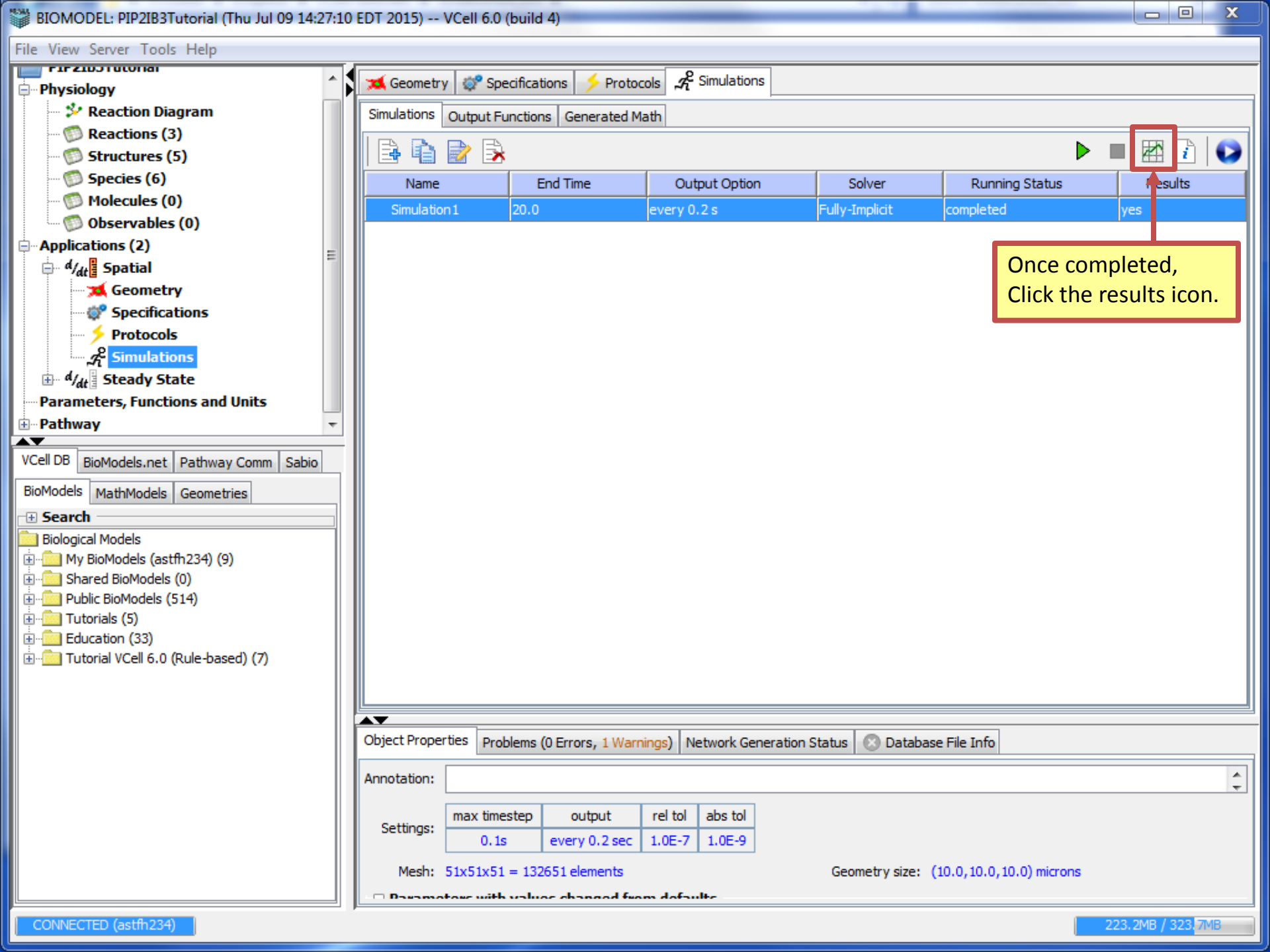
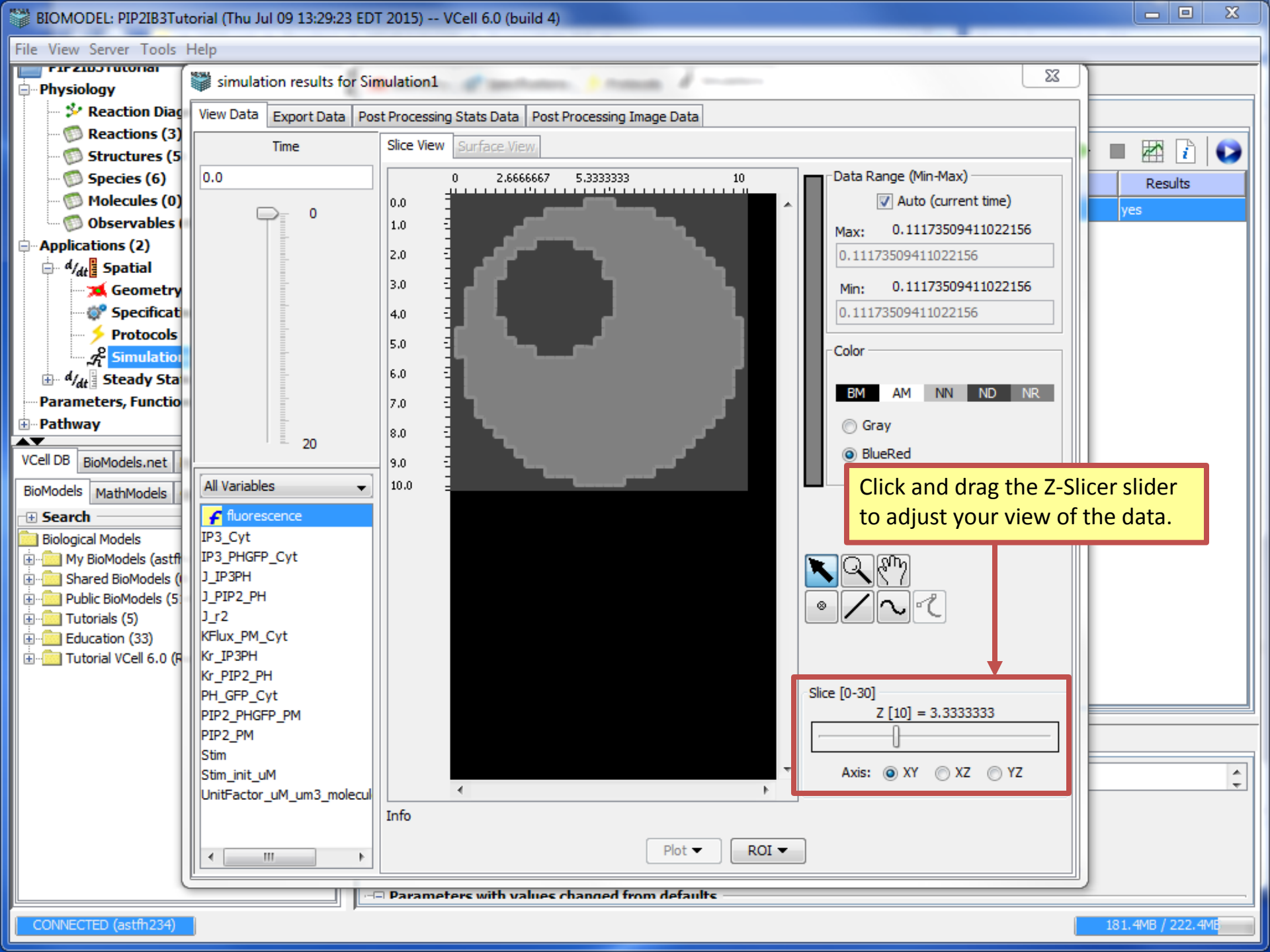
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
Simulation1
20.0
every 0.2 s
Fully-Implicit
not saved
no
Back to simulations, Click the green play icon.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Annotation:
Settings:
max timestep
output
rel tol
abs tol
0.1s
every 0.2 sec
1.0E-7
1.0E-9
Mesh: 51x51x51 = 132651 elements
Geometry size: (10.0,10.0,10.0) microns
Parameters with values changed from defaults
CONNECTED (astfh234)
170.1MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 14:27:10 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Physiology
Reaction Diagram
Reactions (3)
Structures (5)
Species (6)
Molecules (0)
Observables (0)
Applications (2)
Spatial
Geometry
Specifications
Protocols
Simulations
Steady State
Parameters, Functions and Units
Pathway
VCell DB
BioModels.net
Pathway Comm
Sabio
BioModels
MathModels
Geometries
Search
Biological Models
My BioModels (astfh234) (9)
Shared BioModels (0)
Public BioModels (514)
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (Rule-based) (7)
Geometry
Specifications
Protocols
Simulations
Simulations
Output Functions
Generated Math
Name
End Time
Output Option
Solver
Running Status
Results
Simulation1
20.0
every 0.2 s
Fully-Implicit
completed
yes
Once completed,
Click the results icon.
Object Properties
Problems (0 Errors, 1 Warnings)
Network Generation Status
Database File Info
Annotation:
Settings:
max timestep
output
rel tol
abs tol
0.1s
every 0.2 sec
1.0E-7
1.0E-9
Mesh: 51x51x51 = 132651 elements
Geometry size: (10.0,10.0,10.0) microns
CONNECTED (astfh234)
223.2MB / 323.7MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 13:29:23 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
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Reactions (3)
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Species (6)
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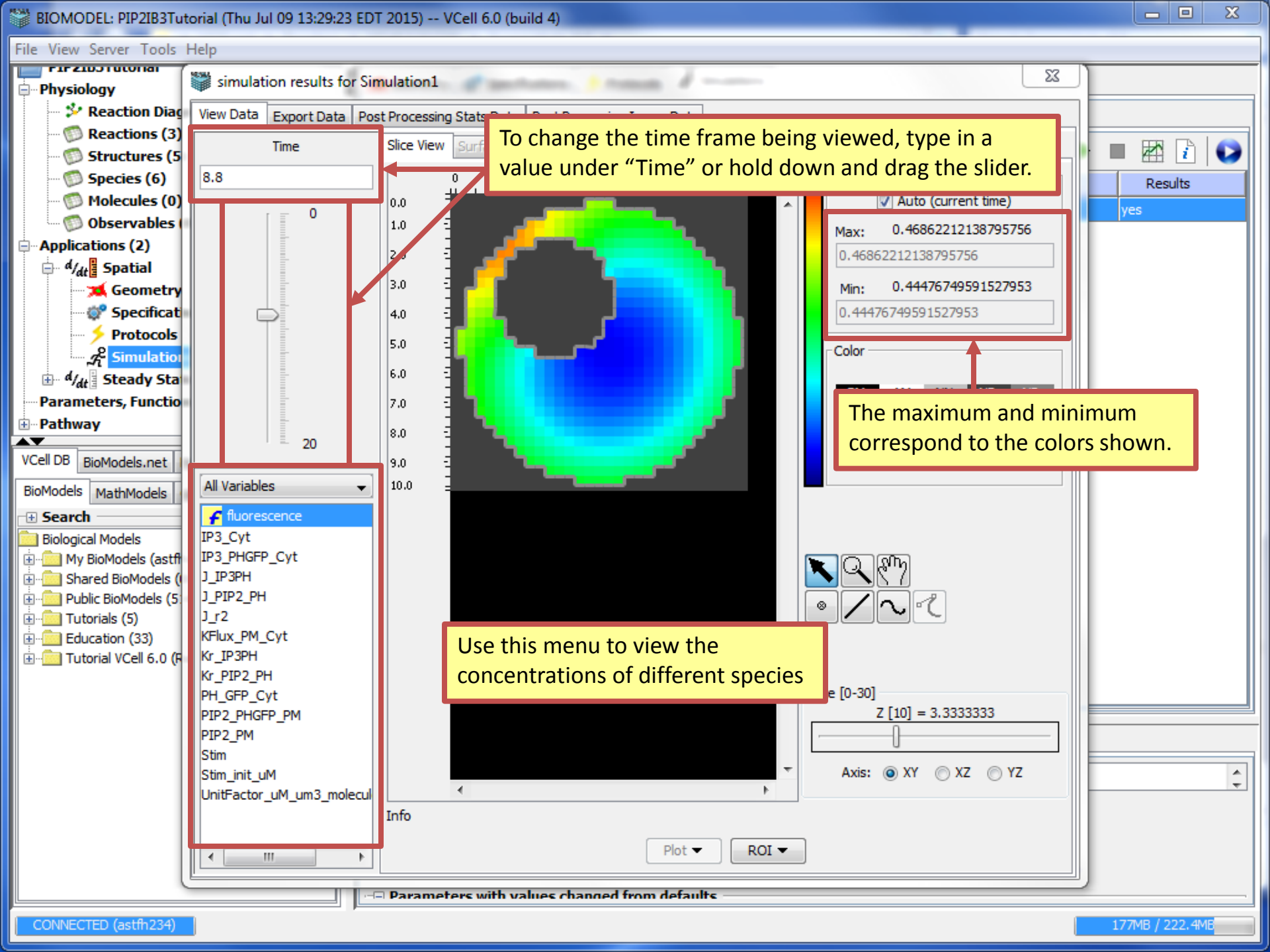
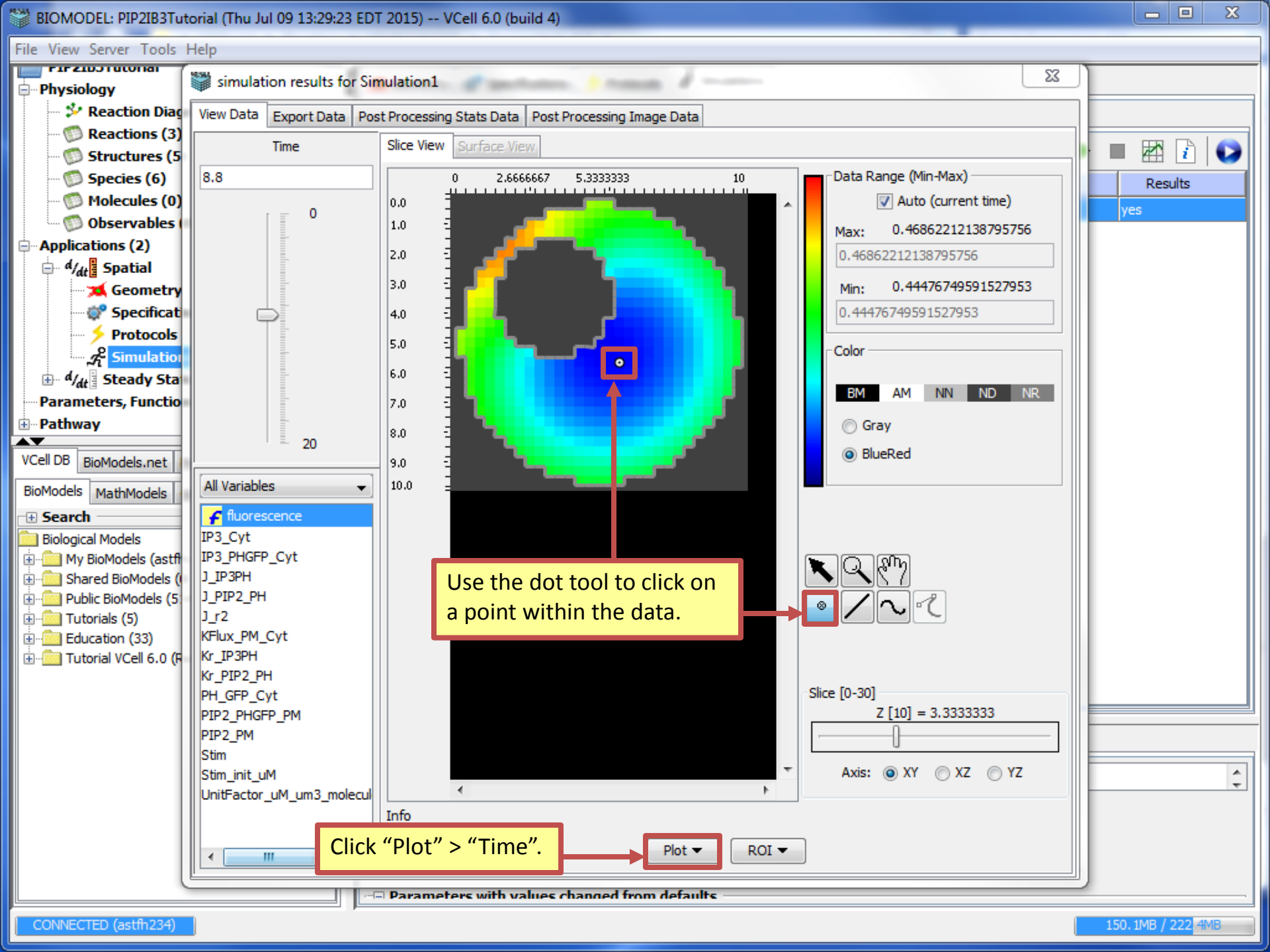
Education (33)
Tutorial VCell 6.0 (R
simulation results for Simulation1
View Data
Export Data
Post Processing Stats Data
Post Processing Image Data
Time
0.0
0
20
All Variables
fluorescence
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_PIP2_PH
J_r2
KFlux_PM_Cyt
Kr_IP3PH
Kr_PIP2_PH
PH_GFP_Cyt
PIP2_PHGFP_PM
PIP2_PM
Stim
Stim_init_uM
UnitFactor_uM_um3_molecul
Slice View
Surface View
0
2.6666667
5.3333333
10
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Info
Plot
ROI
Data Range (Min-Max)
Auto (current time)
Max:
0.11173509411022156
Min:
0.11173509411022156
Color
BM
AM
NN
ND
NR
Gray
BlueRed
Slice [0-30]
Z [10] = 3.3333333
Axis:
XY
XZ
YZ
Click and drag the Z-Slicer slider to adjust your view of the data.
Results
yes
Parameters with values changed from defaults
CONNECTED (astfh234)
181.4MB / 222.4MB



To change the time frame being viewed, type in a value under “Time” or hold down and drag the slider.

The maximum and minimum correspond to the colors shown.

Use this menu to view the concentrations of different species


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 13:29:23 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Physiology
Reaction Diag
Reactions (3)
Structures (5
Species (6)
Molecules (0)
Observables (
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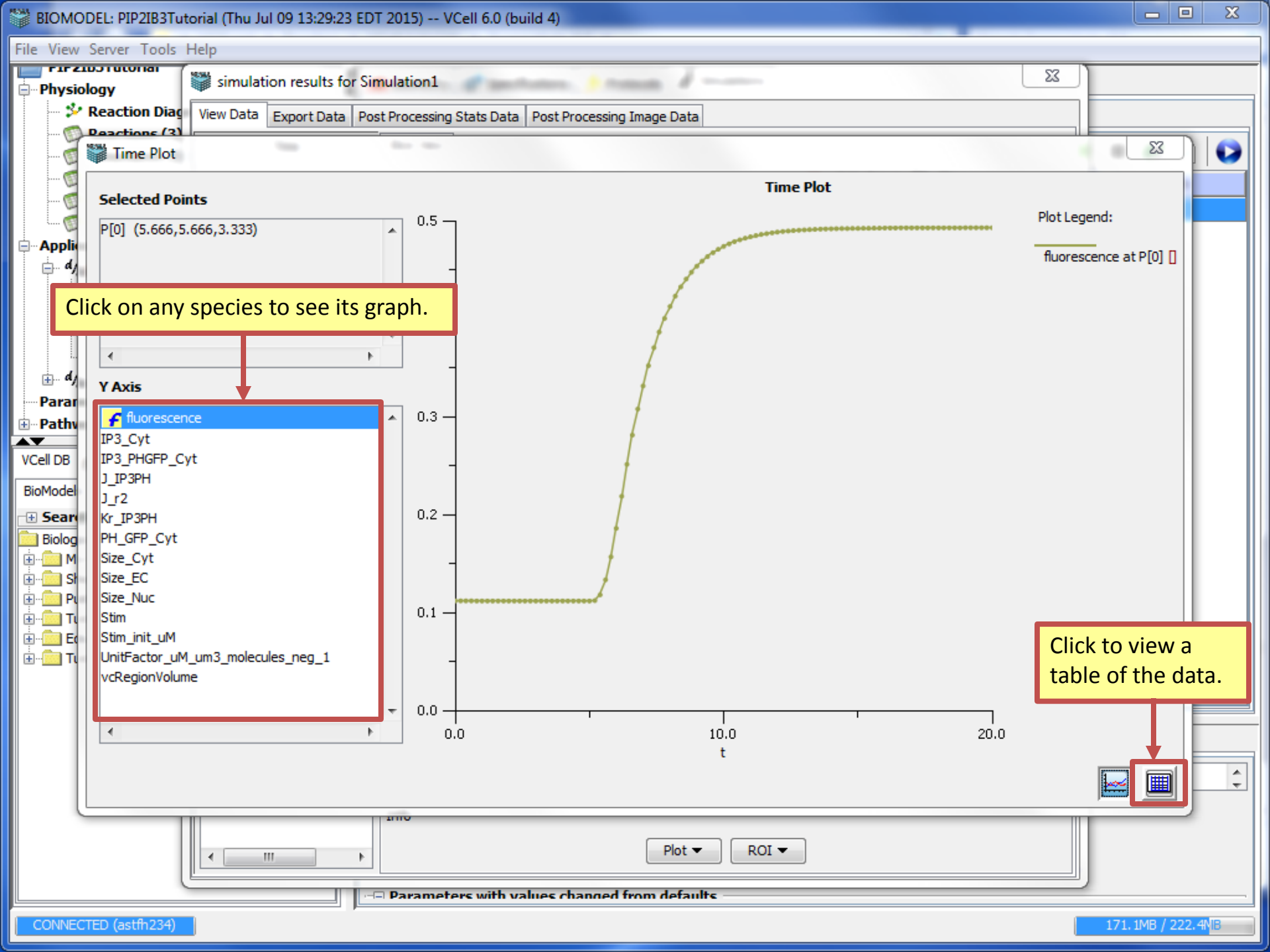
BioModels
MathModels
Search
Biological Models
My BioModels (astf
Shared BioModels (
Public BioModels (5
Tutorials (5)
Education (33)
Tutorial VCell 6.0 (R
simulation results for Simulation1
View Data
Export Data
Post Processing Stats Data
Post Processing Image Data
Time
8.8
0
20
Slice View
Surface View
0
2.6666667
5.3333333
10
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Data Range (Min-Max)
Auto (current time)
Max:
0.46862212138795756
0.46862212138795756
Min:
0.44476749591527953
0.44476749591527953
Color
BM
AM
NN
ND
NR
Gray
BlueRed
All Variables
fluorescence
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_PIP2_PH
J_r2
KFlux_PM_Cyt
Kr_IP3PH
Kr_PIP2_PH
PH_GFP_Cyt
PIP2_PHGFP_PM
PIP2_PM
Stim
Stim_init_uM
UnitFactor_uM_um3_molecul
Use the dot tool to click on a point within the data.
Slice [0-30]
Z [10] = 3.3333333
Axis:
XY
XZ
YZ
Info
Click “Plot” > “Time”.
Plot
ROI
Parameters with values changed from defaults
Results
yes
CONNECTED (astfh234)
150.1MB / 222.4MB


BIOMODEL: PIP2IB3Tutorial (Thu Jul 09 13:29:23 EDT 2015) -- VCell 6.0 (build 4)
File View Server Tools Help
Physiology
simulation results for Simulation1
View Data
Export Data
Post Processing Stats Data
Post Processing Image Data
Time Plot
Selected Points
P[0] (5.666,5.666,3.333)
Click on any species to see its graph.
Y Axis
fluorescence
IP3_Cyt
IP3_PHGFP_Cyt
J_IP3PH
J_r2
Kr_IP3PH
PH_GFP_Cyt
Size_Cyt
Size_EC
Size_Nuc
Stim
Stim_init_uM
UnitFactor_uM_um3_molecules_neg_1
vcRegionVolume
Time Plot
Plot Legend:
fluorescence at P[0] []
0.5
0.3
0.2
0.1
0.0
0.0
10.0
20.0
t
Click to view a table of the data.
Plot
ROI
Parameters with values changed from defaults
VCell DB
BioModel
CONNECTED (astfh234)
171.1MB / 222.4MB