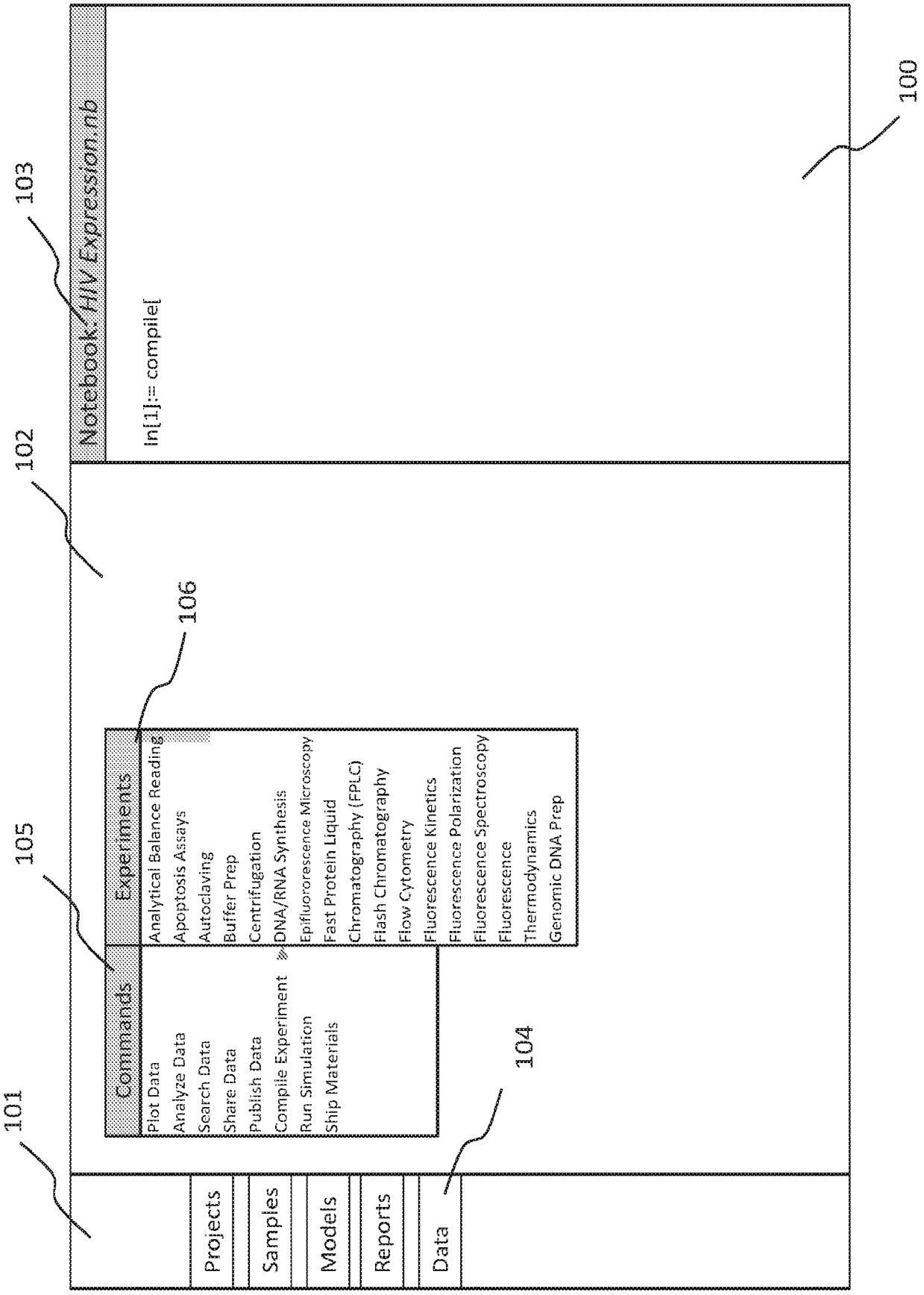

Notebook: HIV Expression.nb
In[1]:= compile[
100
103
102
106
105
Commands
Experiments
Plot Data
Analyze Data
Search Data
Share Data
Publish Data
Compile Experiment
Run Simulation
Ship Materials
Analytical Balance Reading
Apoptosis Assays
Autoclaving
Buffer Prep
Centrifugation
DNA/RNA Synthesis
Epifluororescence Microscopy
Fast Protein Liquid
Chromatography (FPLC)
Flash Chromatography
Flow Cytometry
Fluorescence Kinetics
Fluorescence Polarization
Fluorescence Spectroscopy
Fluorescence
Thermodynamics
Genomic DNA Prep
101
104
Projects
Samples
Models
Reports
Data

FIG. 1

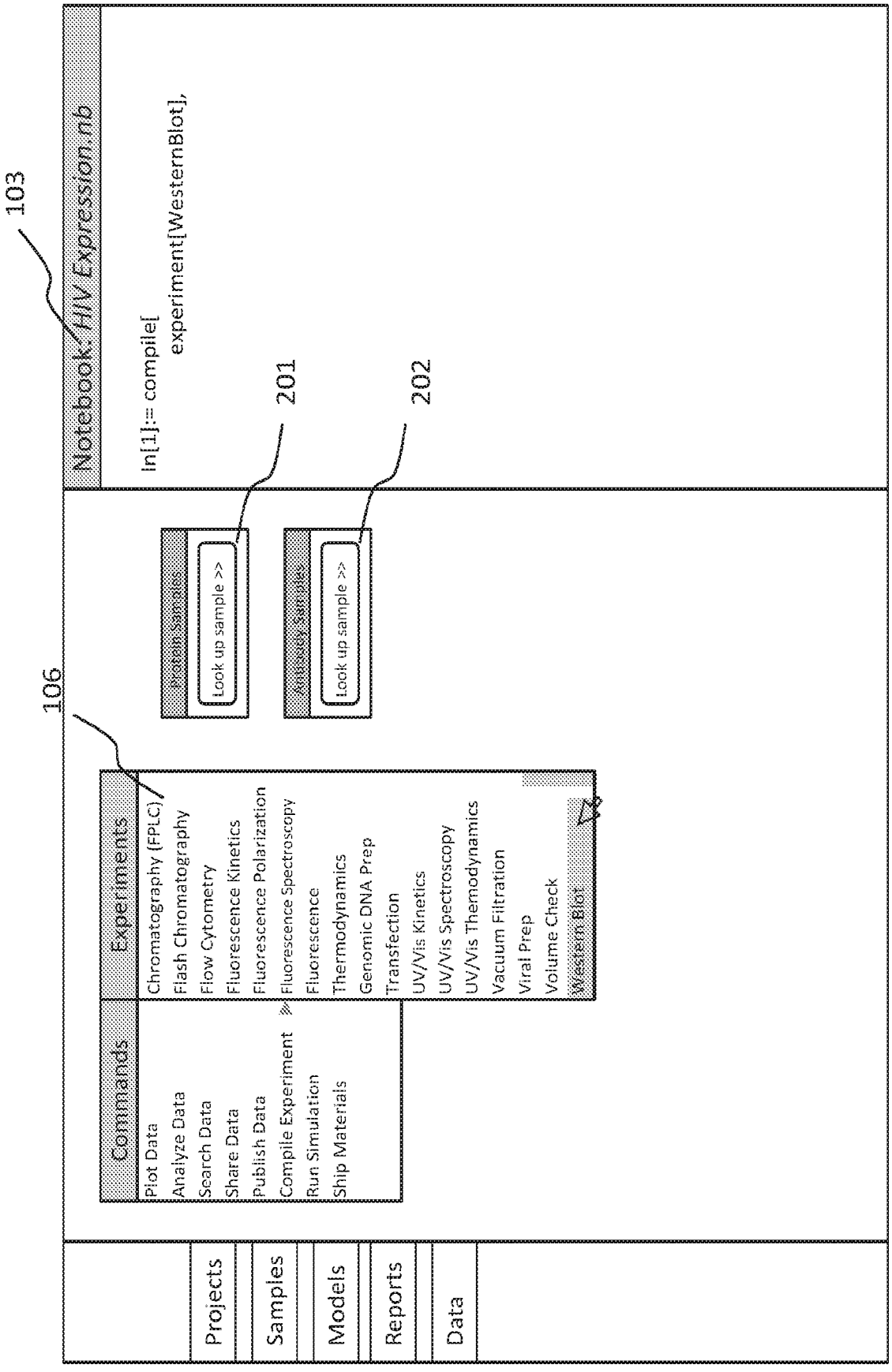

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
201
202
Look up sample >>
Look up sample >>
106
Commands
Plot Data
Analyze Data
Search Data
Share Data
Publish Data
Compile Experiment
Run Simulation
Ship Materials
Experiments
Chromatography (FPLC)
Flash Chromatography
Flow Cytometry
Fluorescence Kinetics
Fluorescence Polarization
Fluorescence Spectroscopy
Fluorescence
Thermodynamics
Genomic DNA Prep
Transfection
UV/Vis Kinetics
UV/Vis Spectroscopy
UV/Vis Thermodynamics
Vacuum Filtration
Viral Prep
Volume Check
Western Blot
Projects
Samples
Models
Reports
Data

FIG. 2

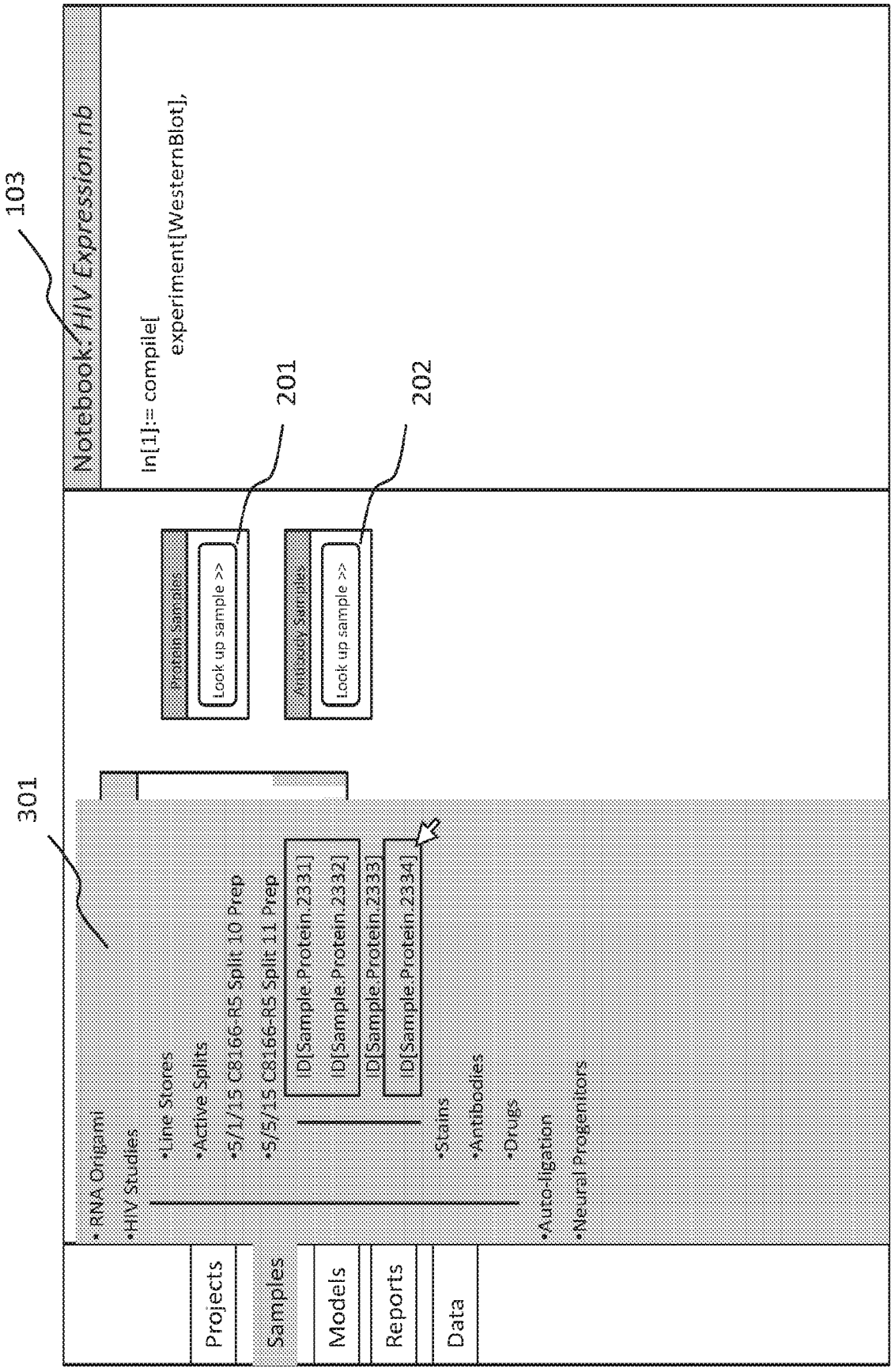

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
201
202
Protein Samples
Look up sample >>
Antibody Samples
Look up sample >>
301
• RNA Origami
•HIV Studies
•Line Stores
•Active Splits
•5/1/15 C8166-R5 Split 10 Prep
•5/5/15 C8166-R5 Split 11 Prep
ID[Sample Protein 2331]
ID[Sample Protein 2332]
ID[Sample Protein 2333]
ID[Sample Protein 2334]
•Stains
•Antibodies
•Drugs
•Auto-ligation
•Neural Progenitors
Projects
Samples
Models
Reports
Data

FIG. 3

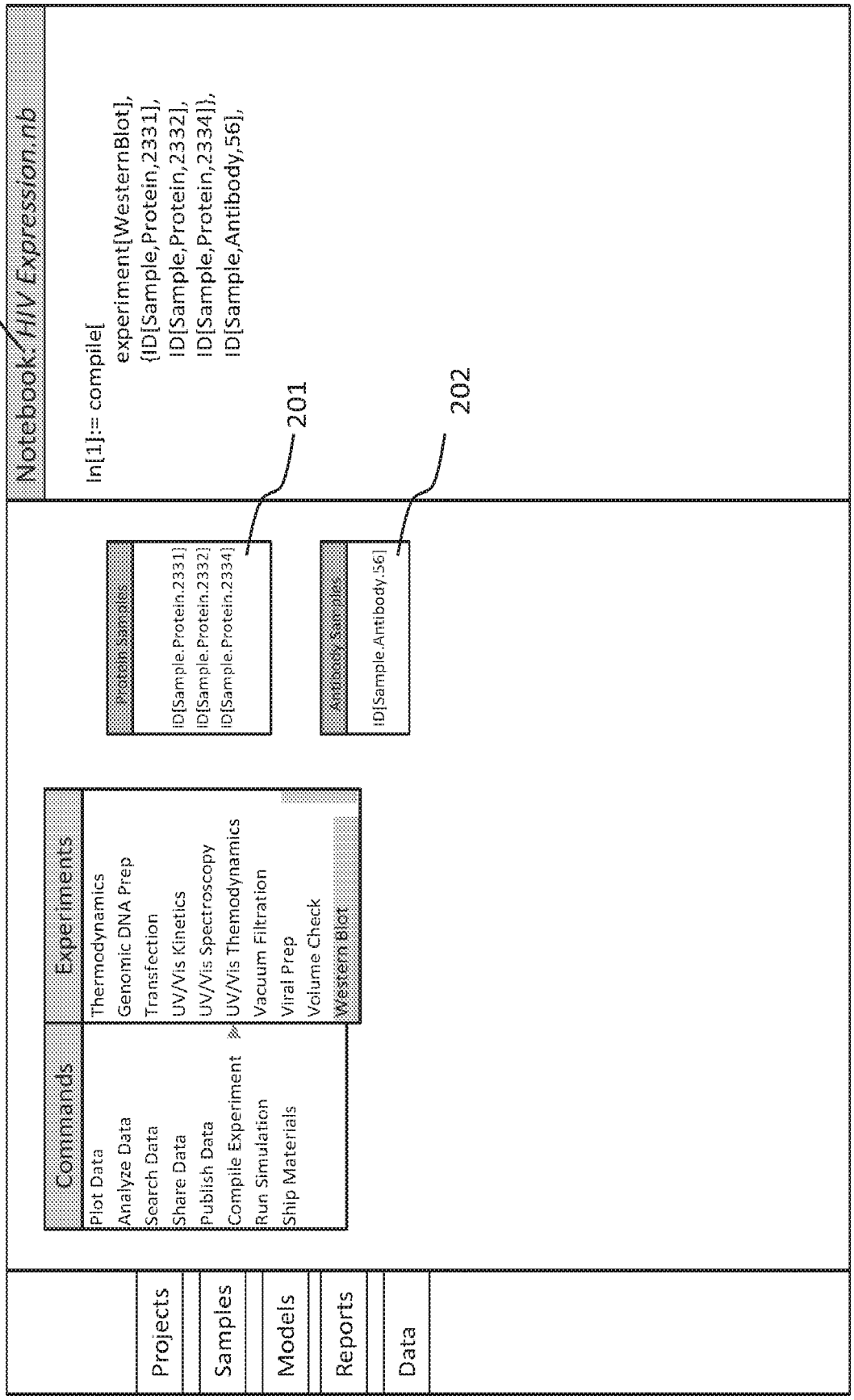

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
{ID[Sample,Protein,2331],
ID[Sample,Protein,2332],
ID[Sample,Protein,2334]},
ID[Sample,Antibody,56],
201
202
Protein Samples
ID[Sample.Protein.2331]
ID[Sample.Protein.2332]
ID[Sample.Protein.2334]
Antibody Samples
ID[Sample.Antibody.56]
Commands
Plot Data
Analyze Data
Search Data
Share Data
Publish Data
Compile Experiment
Run Simulation
Ship Materials
Experiments
Thermodynamics
Genomic DNA Prep
Transfection
UV/Vis Kinetics
UV/Vis Spectroscopy
UV/Vis Themodynamics
Vacuum Filtration
Viral Prep
Volume Check
Western Blot
Projects
Samples
Models
Reports
Data

FIG. 4

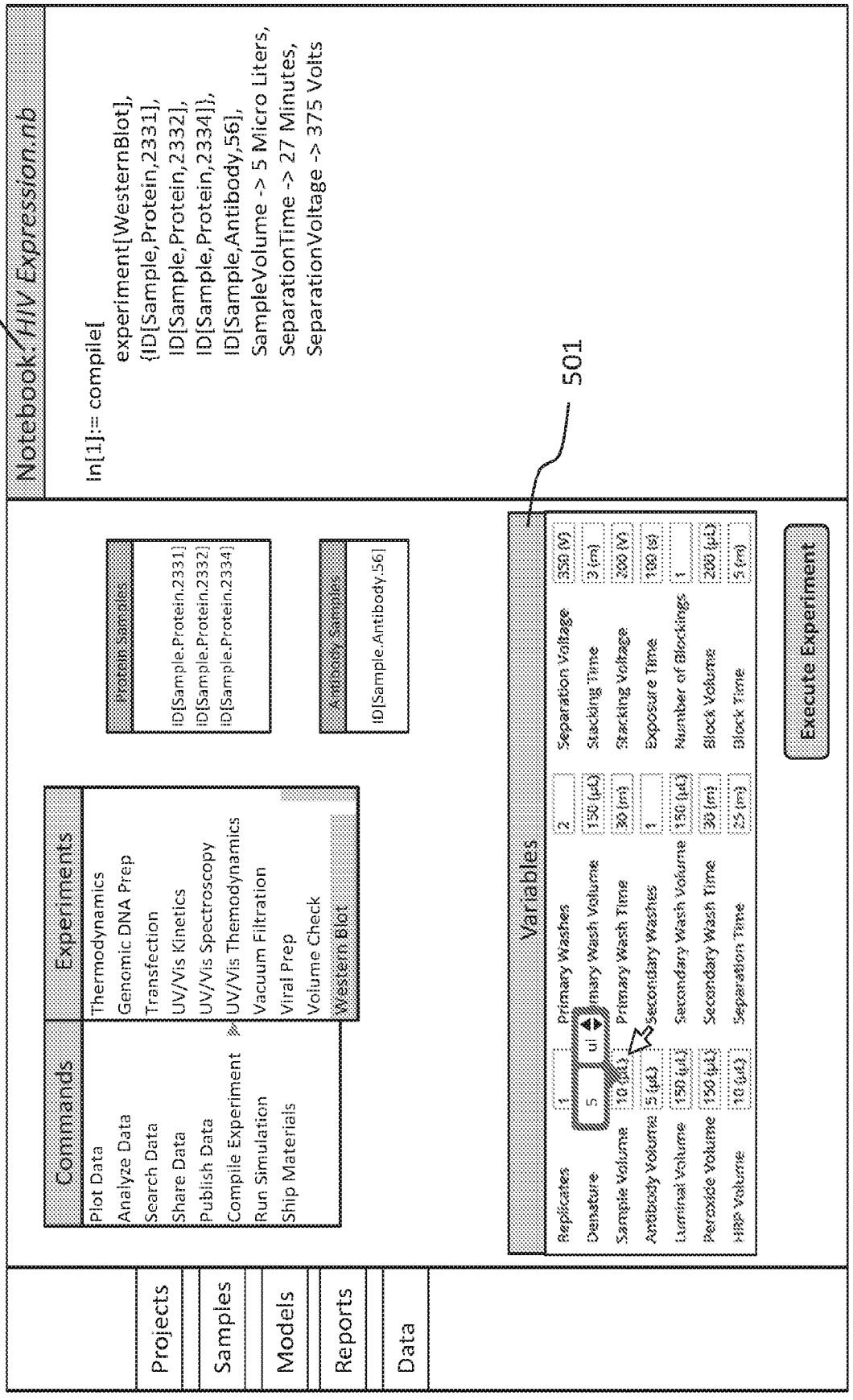

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
{ID[Sample,Protein,2331],
ID[Sample,Protein,2332],
ID[Sample,Protein,2334]},
ID[Sample,Antibody,56],
SampleVolume -> 5 Micro Liters,
SeparationTime -> 27 Minutes,
SeparationVoltage -> 375 Volts
501
Commands
Plot Data
Analyze Data
Search Data
Share Data
Publish Data
Compile Experiment
Run Simulation
Ship Materials
Experiments
Thermodynamics
Genomic DNA Prep
Transfection
UV/Vis Kinetics
UV/Vis Spectroscopy
UV/Vis Themodynamics
Vacuum Filtration
Viral Prep
Volume Check
Western Blot
Protein Samples
ID[Sample.Protein.2331]
ID[Sample.Protein.2332]
ID[Sample.Protein.2334]
Antibody Samples
ID[Sample.Antibody.56]
Variables
Replicates
Denature
Sample Volume
Antibody Volume
Luminal Volume
Peroxide Volume
HRP Volume
Primary Washes
Primary Wash Volume
Primary Wash Time
Secondary Washes
Secondary Wash Volume
Secondary Wash Time
Separation Time
Separation Voltage
Stacking Time
Stacking Voltage
Exposure Time
Number of Blockings
Block Volume
Block Time
Execute Experiment
Projects
Samples
Models
Reports
Data

FIG. 5

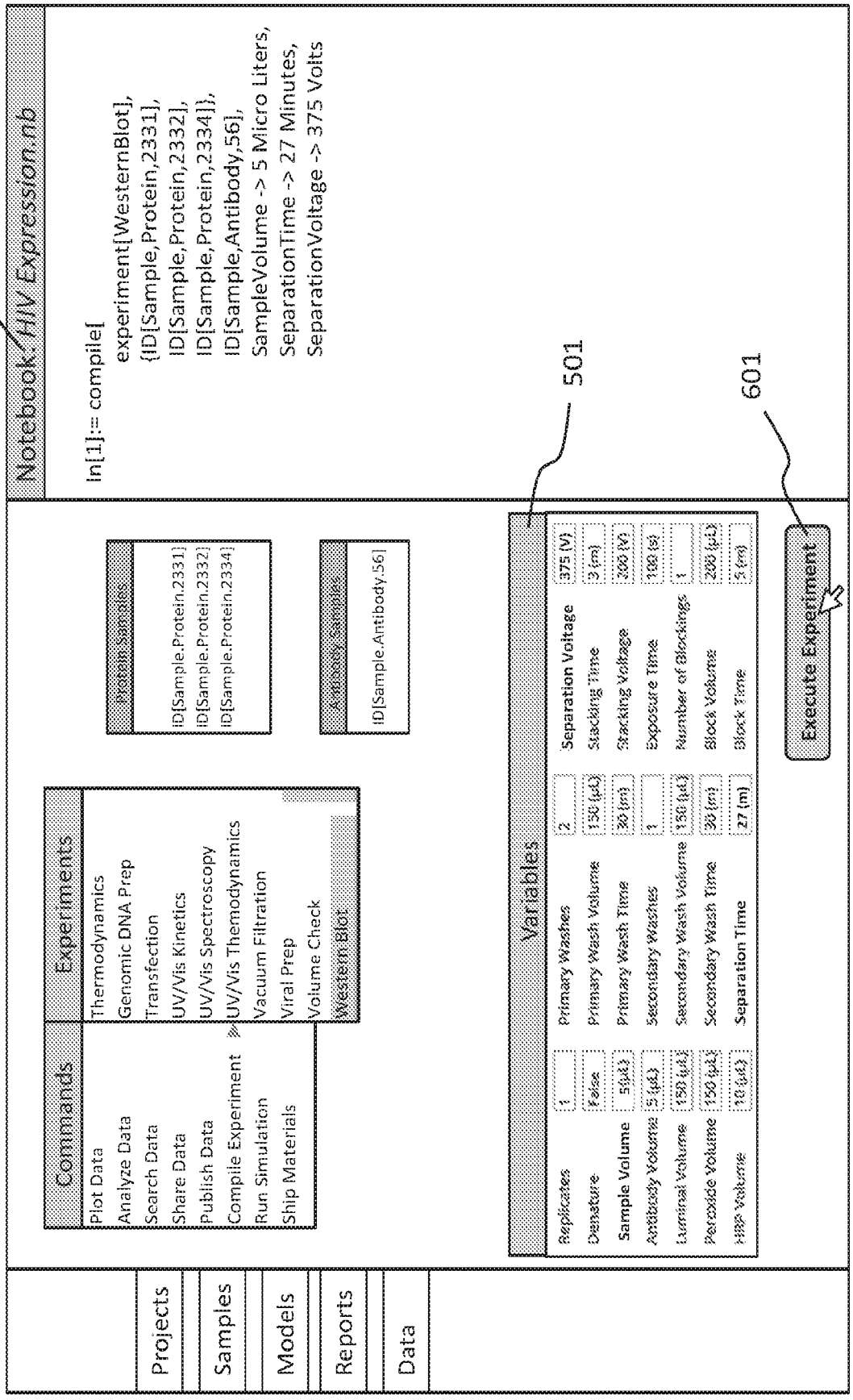

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
{ID[Sample,Protein,2331],
ID[Sample,Protein,2332],
ID[Sample,Protein,2334]},
ID[Sample,Antibody,56],
SampleVolume -> 5 Micro Liters,
SeparationTime -> 27 Minutes,
SeparationVoltage -> 375 Volts
501
601
Projects
Samples
Models
Reports
Data
Commands
Plot Data
Analyze Data
Search Data
Share Data
Publish Data
Compile Experiment
Run Simulation
Ship Materials
Experiments
Thermodynamics
Genomic DNA Prep
Transfection
UV/Vis Kinetics
UV/Vis Spectroscopy
UV/Vis Themodynamics
Vacuum Filtration
Viral Prep
Volume Check
Western Blot
Protein Samples
ID[Sample.Protein.2331]
ID[Sample.Protein.2332]
ID[Sample.Protein.2334]
Antibody Samples
ID[Sample.Antibody.56]
Variables
Replicates 1
Denature False
Sample Volume 5(µL)
Antibody Volume 5 (µL)
Luminal Volume 150 (µL)
Peroxide Volume 150 (µL)
Hap Volume 10 (µL)
Primary Washes 2
Primary Wash Volume 150 (µL)
Primary Wash Time 30 (m)
Secondary Washes 1
Secondary Wash Volume 150 (µL)
Secondary Wash Time 30 (m)
Separation Time 27 (m)
Separation Voltage 375 (V)
Stacking Time 3 (m)
Stacking Voltage 200 (V)
Exposure Time 180 (s)
Number of Blockings 1
Block Volume 200 (µL)
Block Time 5 (m)
Execute Experiment

FIG. 6A

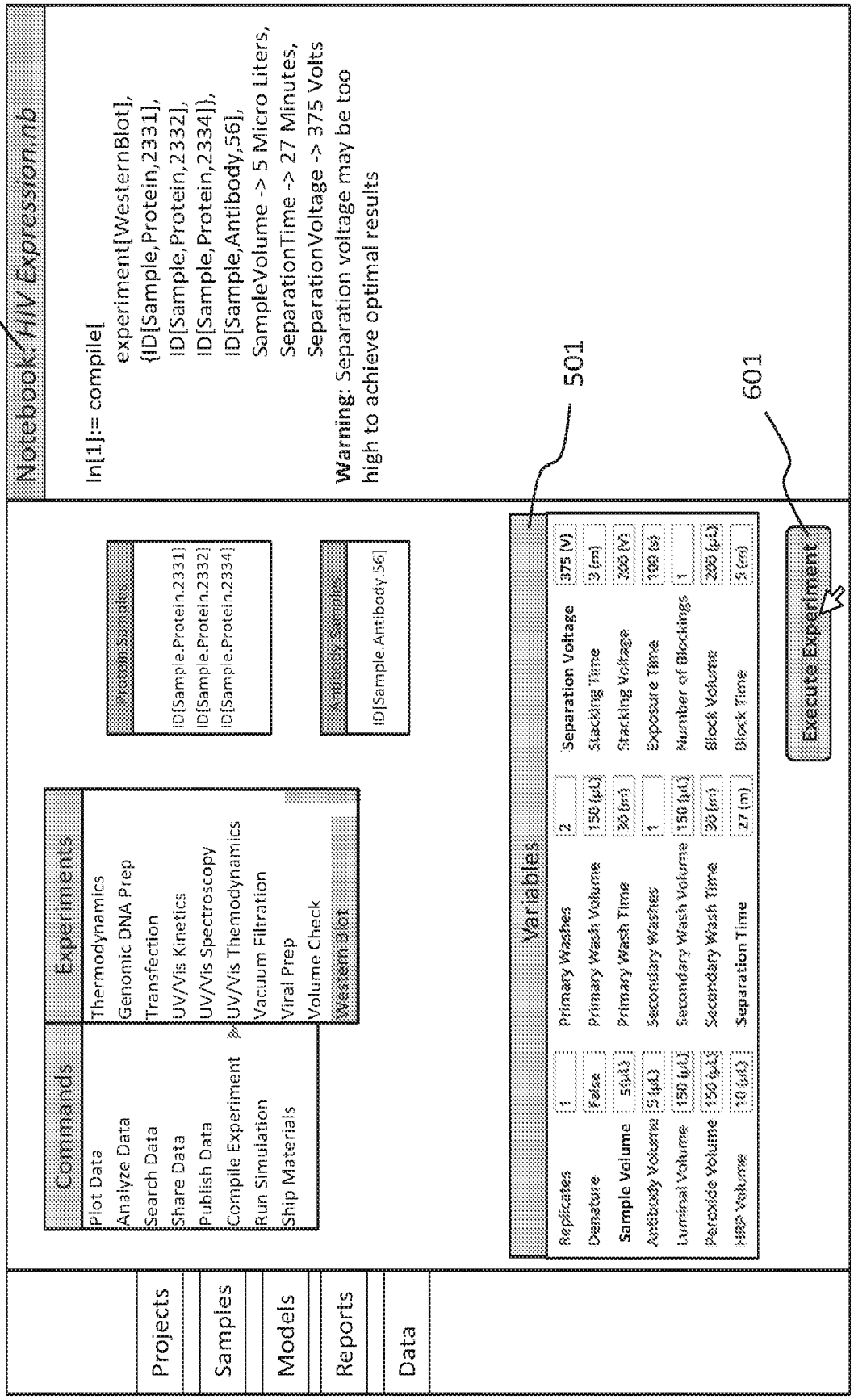

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
{ID[Sample,Protein,2331],
ID[Sample,Protein,2332],
ID[Sample,Protein,2334]},
ID[Sample,Antibody,56],
SampleVolume -> 5 Micro Liters,
SeparationTime -> 27 Minutes,
SeparationVoltage -> 375 Volts
Warning: Separation voltage may be too high to achieve optimal results
Protein Samples
ID[Sample.Protein.2331]
ID[Sample.Protein.2332]
ID[Sample.Protein.2334]
Antibody Samples
ID[Sample.Antibody.56]
501
601
Commands
Plot Data
Analyze Data
Search Data
Share Data
Publish Data
Compile Experiment
Run Simulation
Ship Materials
Experiments
Thermodynamics
Genomic DNA Prep
Transfection
UV/Vis Kinetics
UV/Vis Spectroscopy
UV/Vis Themodynamics
Vacuum Filtration
Viral Prep
Volume Check
Western Blot
Variables
Replicates 1
Denature False
Sample Volume 5(µL)
Antibody Volume 5 (µL)
Luminal Volume 150 (µL)
Peroxide Volume 150 (µL)
Hap Volume 10 (µL)
Primary Washes 2
Primary Wash Volume 150 (µL)
Primary Wash Time 30 (m)
Secondary Washes 1
Secondary Wash Volume 150 (µL)
Secondary Wash Time 30 (m)
Separation Time 27 (m)
Separation Voltage 375 (V)
Stacking Time 3 (m)
Stacking Voltage 200 (V)
Exposure Time 180 (s)
Number of Blockings 1
Block Volume 200 (µL)
Block Time 5 (m)
Execute Experiment
Projects
Samples
Models
Reports
Data

FIG. 6B

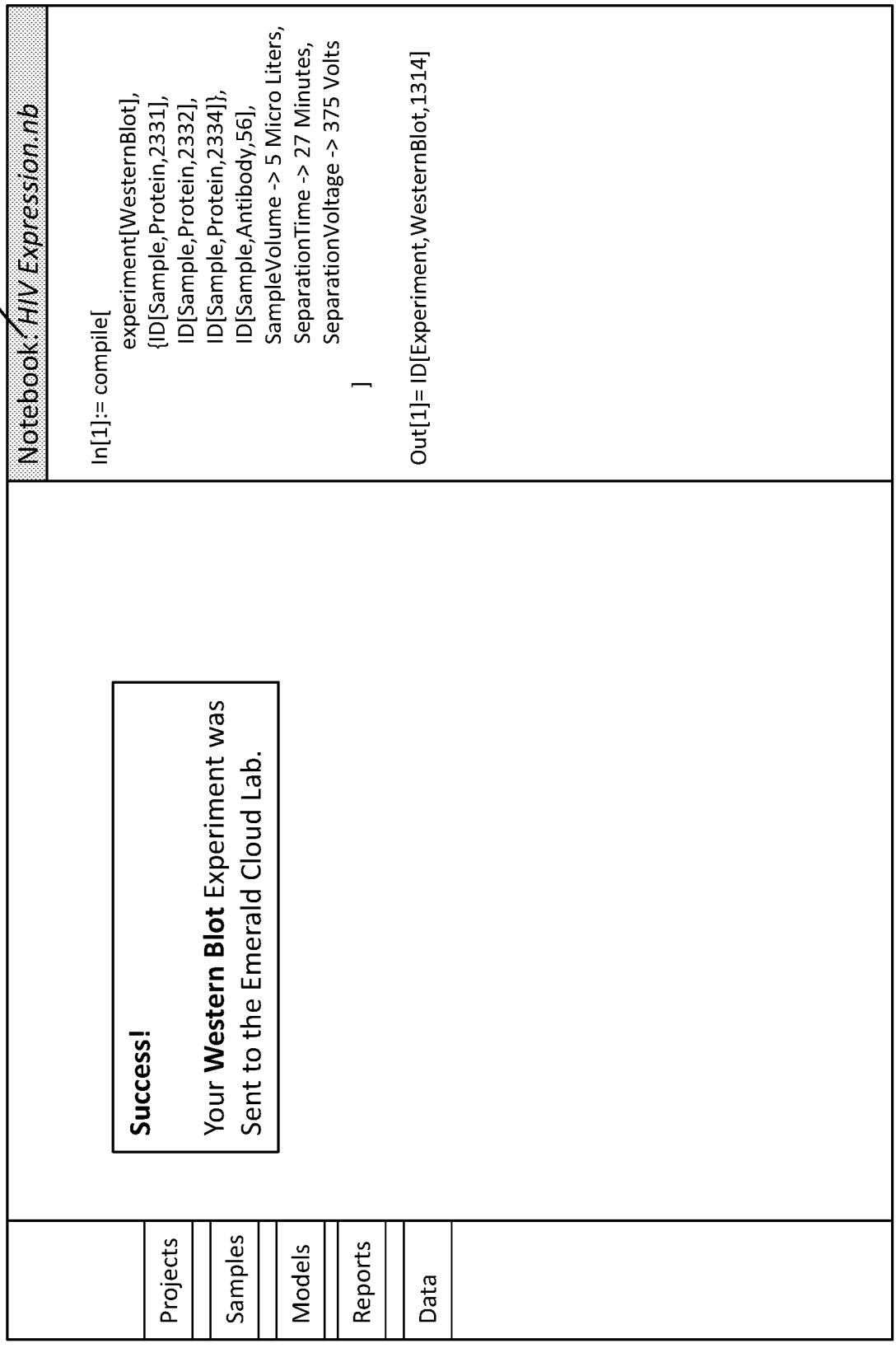

103
Notebook: HIV Expression.nb
In[1]:= compile[
experiment[WesternBlot],
{ID[Sample,Protein,2331],
ID[Sample,Protein,2332],
ID[Sample,Protein,2334]},
ID[Sample,Antibody,56],
SampleVolume -> 5 Micro Liters,
SeparationTime -> 27 Minutes,
SeparationVoltage -> 375 Volts
]
Out[1]= ID[Experiment,WesternBlot,1314]
Success!
Your Western Blot Experiment was Sent to the Emerald Cloud Lab.
Projects
Samples
Models
Reports
Data

FIG. 7

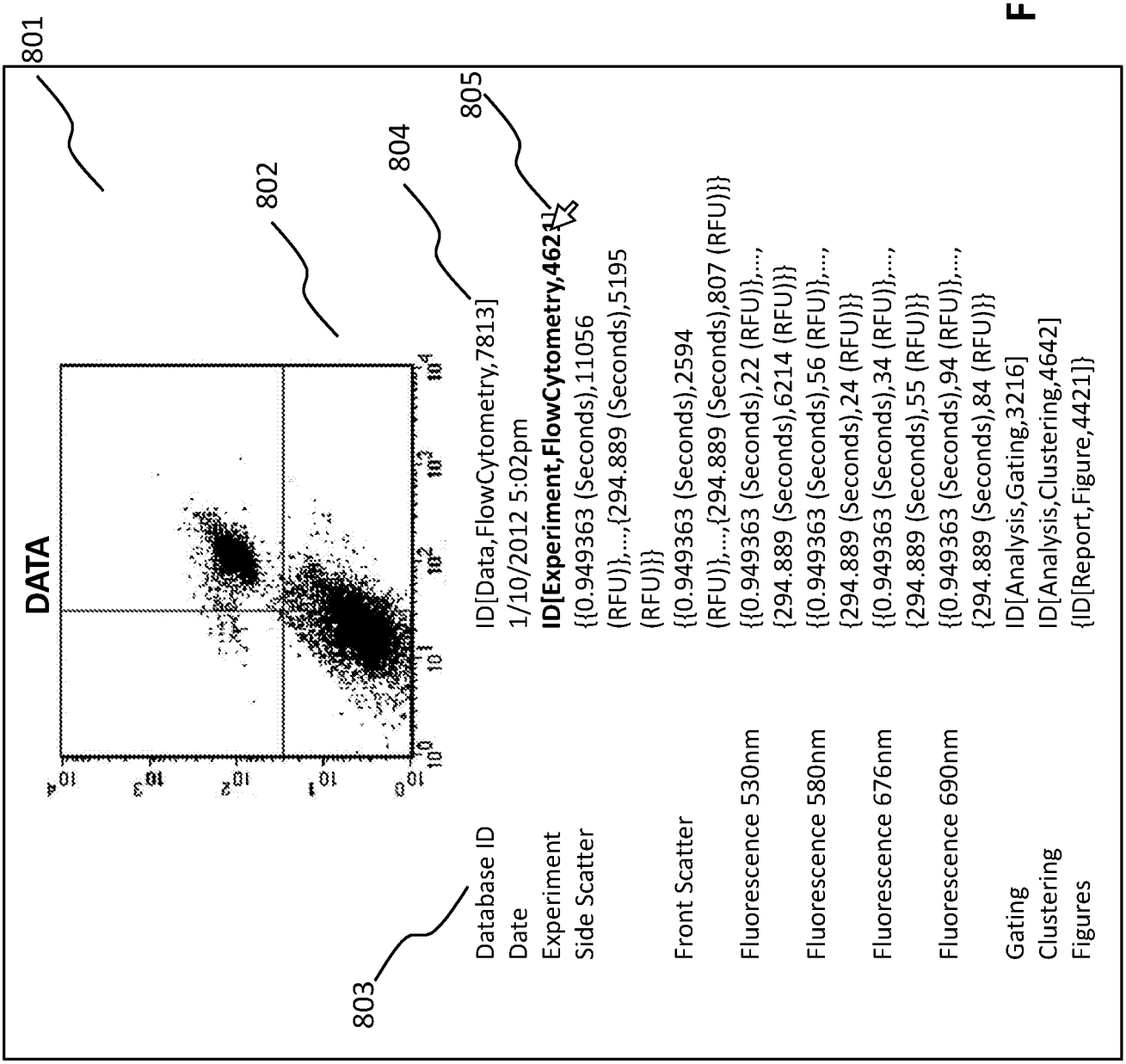

801
DATA
802
804
805
803
Database ID
Date
Experiment
Side Scatter
Front Scatter
Fluorescence 530nm
Fluorescence 580nm
Fluorescence 676nm
Fluorescence 690nm
Gating
Clustering
Figures
ID[Data,FlowCytometry,7813]
1/10/2012 5:02pm
ID[Experiment,FlowCytometry,4621]
{{0.949363 (Seconds),11056 (RFU)},...,{294.889 (Seconds),5195 (RFU)}}
{{0.949363 (Seconds),2594 (RFU)},...,{294.889 (Seconds),807 (RFU)}}
{{0.949363 (Seconds),22 (RFU)},...,{294.889 (Seconds),6214 (RFU)}}
{{0.949363 (Seconds),56 (RFU)},...,{294.889 (Seconds),24 (RFU)}}
{{0.949363 (Seconds),34 (RFU)},...,{294.889 (Seconds),55 (RFU)}}
{{0.949363 (Seconds),94 (RFU)},...,{294.889 (Seconds),84 (RFU)}}
ID[Analysis,Gating,3216]
ID[Analysis,Clustering,4642]
{ID[Report,Figure,4421]}

FIG. 8

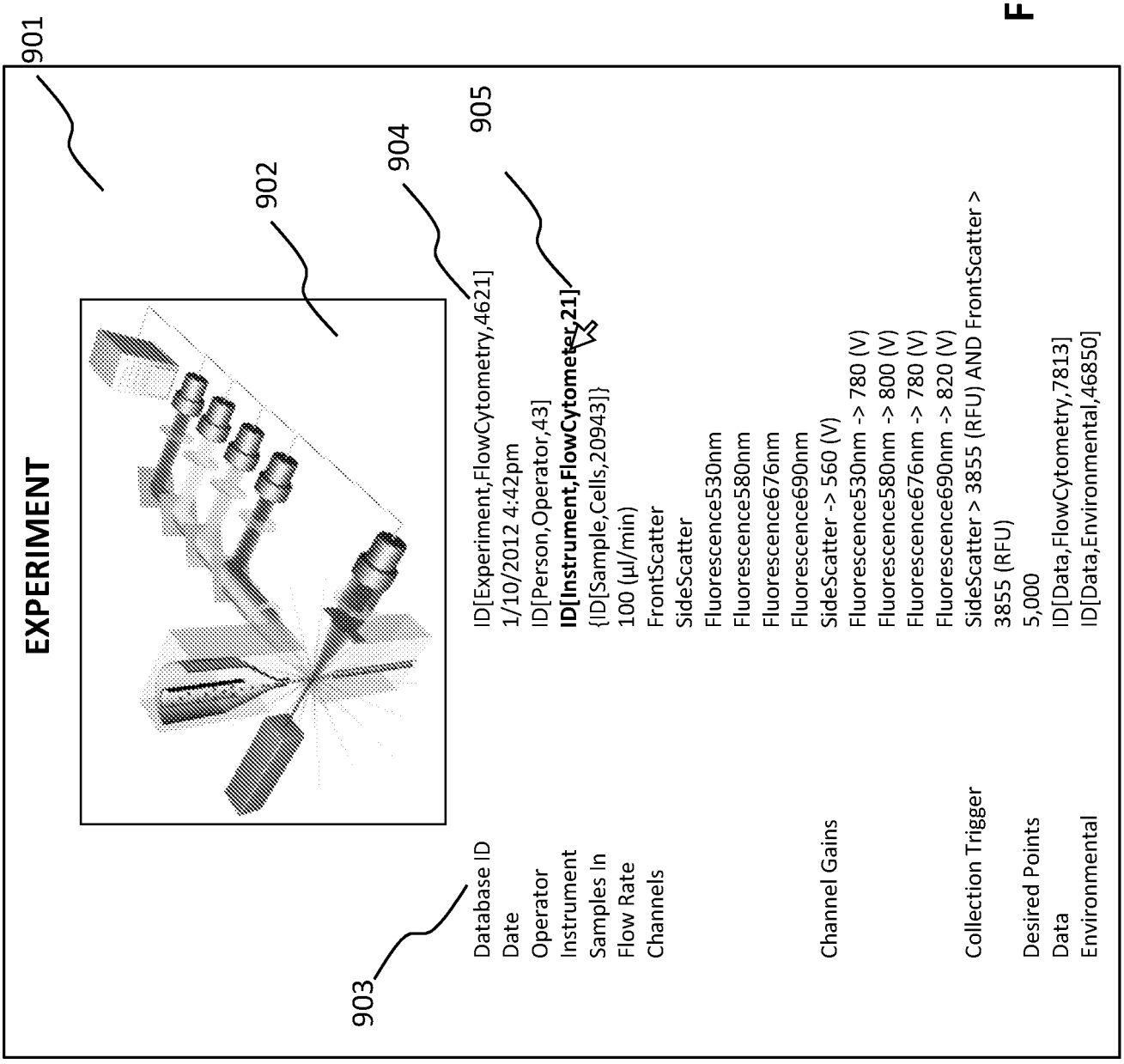

901
EXPERIMENT
902
904
905
903
Database ID
Date
Operator
Instrument
Samples In
Flow Rate
Channels
Channel Gains
Collection Trigger
Desired Points
Data
Environmental
ID[Experiment,FlowCytometry,4621]
1/10/2012 4:42pm
ID[Person,Operator,43]
ID[Instrument,FlowCytometer,21]
{ID[Sample,Cells,20943]}
100 (µl/min)
FrontScatter
SideScatter
Fluorescence530nm
Fluorescence580nm
Fluorescence676nm
Fluorescence690nm
SideScatter -> 560 (V)
Fluorescence530nm -> 780 (V)
Fluorescence580nm -> 800 (V)
Fluorescence676nm -> 780 (V)
Fluorescence690nm -> 820 (V)
SideScatter > 3855 (RFU) AND FrontScatter > 3855 (RFU)
5,000
ID[Data,FlowCytometry,7813]
ID[Data,Environmental,46850]

FIG. 9

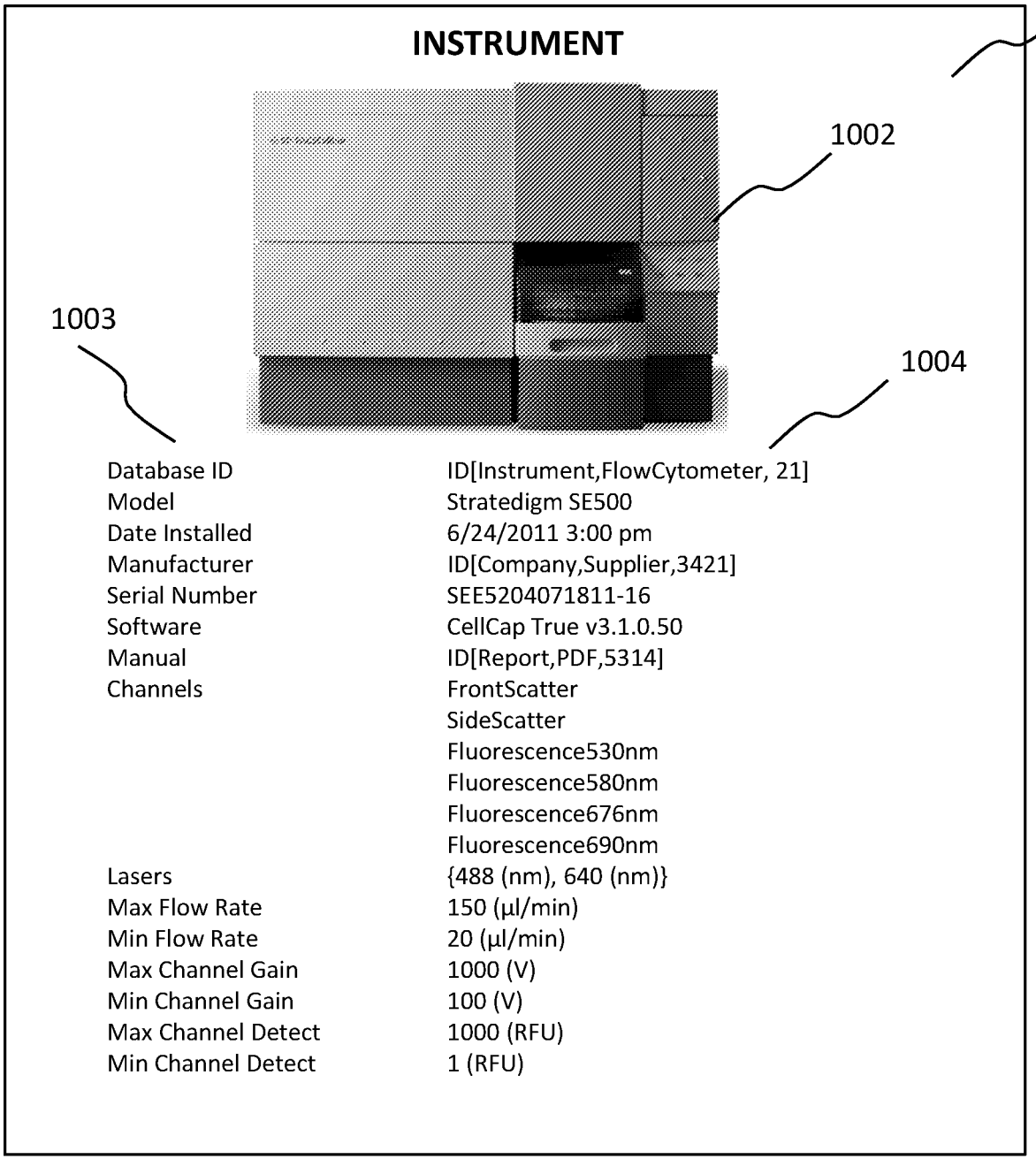

INSTRUMENT
1001
1002
1003
1004
Database ID
ID[Instrument,FlowCytometer, 21]
Model
Stratedigm SE500
Date Installed
6/24/2011 3:00 pm
Manufacturer
ID[Company,Supplier,3421]
Serial Number
SEE5204071811-16
Software
CellCap True v3.1.0.50
Manual
ID[Report,PDF,5314]
Channels
FrontScatter
SideScatter
Fluorescence530nm
Fluorescence580nm
Fluorescence676nm
Fluorescence690nm
Lasers
{488 (nm), 640 (nm)}
Max Flow Rate
150 (µl/min)
Min Flow Rate
20 (µl/min)
Max Channel Gain
1000 (V)
Min Channel Gain
100 (V)
Max Channel Detect
1000 (RFU)
Min Channel Detect
1 (RFU)

FIG. 10

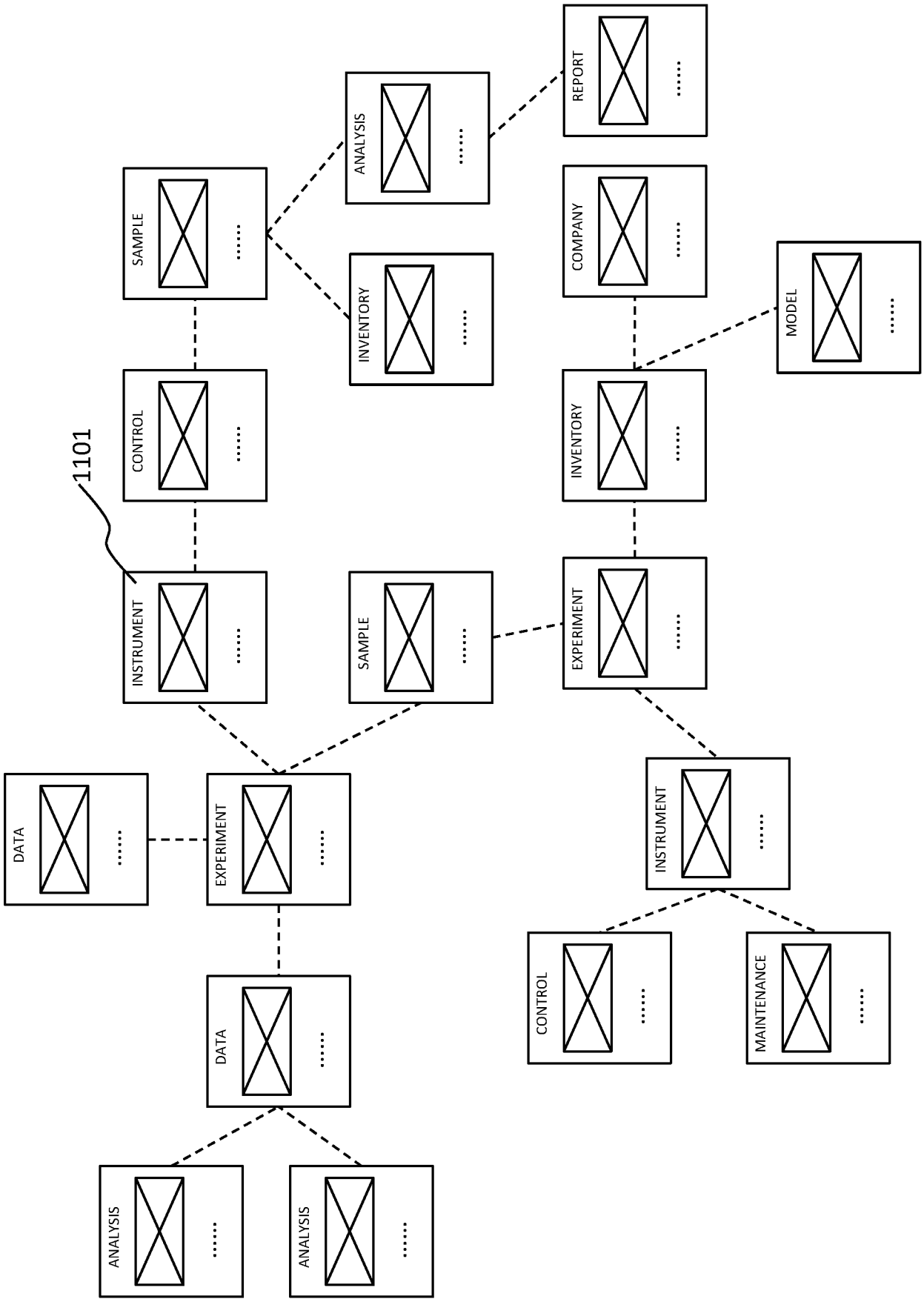

1101
INSTRUMENT
CONTROL
SAMPLE
ANALYSIS
INVENTORY
REPORT
COMPANY
MODEL
INVENTORY
EXPERIMENT
SAMPLE
DATA
EXPERIMENT
DATA
ANALYSIS
ANALYSIS
INSTRUMENT
CONTROL
MAINTENANCE

FIG. 11

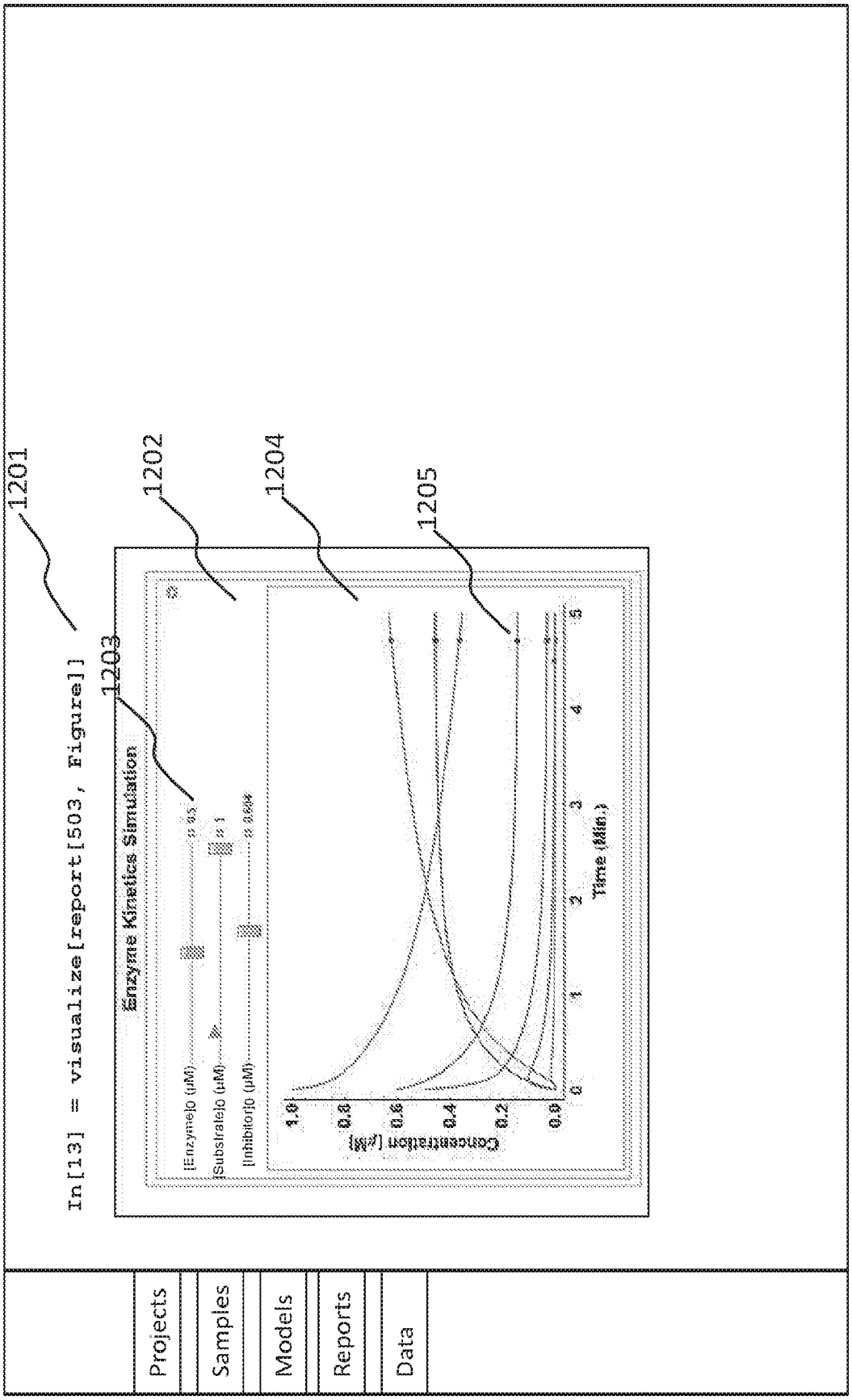

1201
In[13] = visualize[report[503, Figure]]
1202
1203
1204
1205
Enzyme Kinetics Simulation
[Enzyme]o (μM)
[Substrate]o (μM)
[Inhibitor]o (μM)
Concentration [μM]
Time (Min.)
Projects
Samples
Models
Reports
Data

FIG. 12A

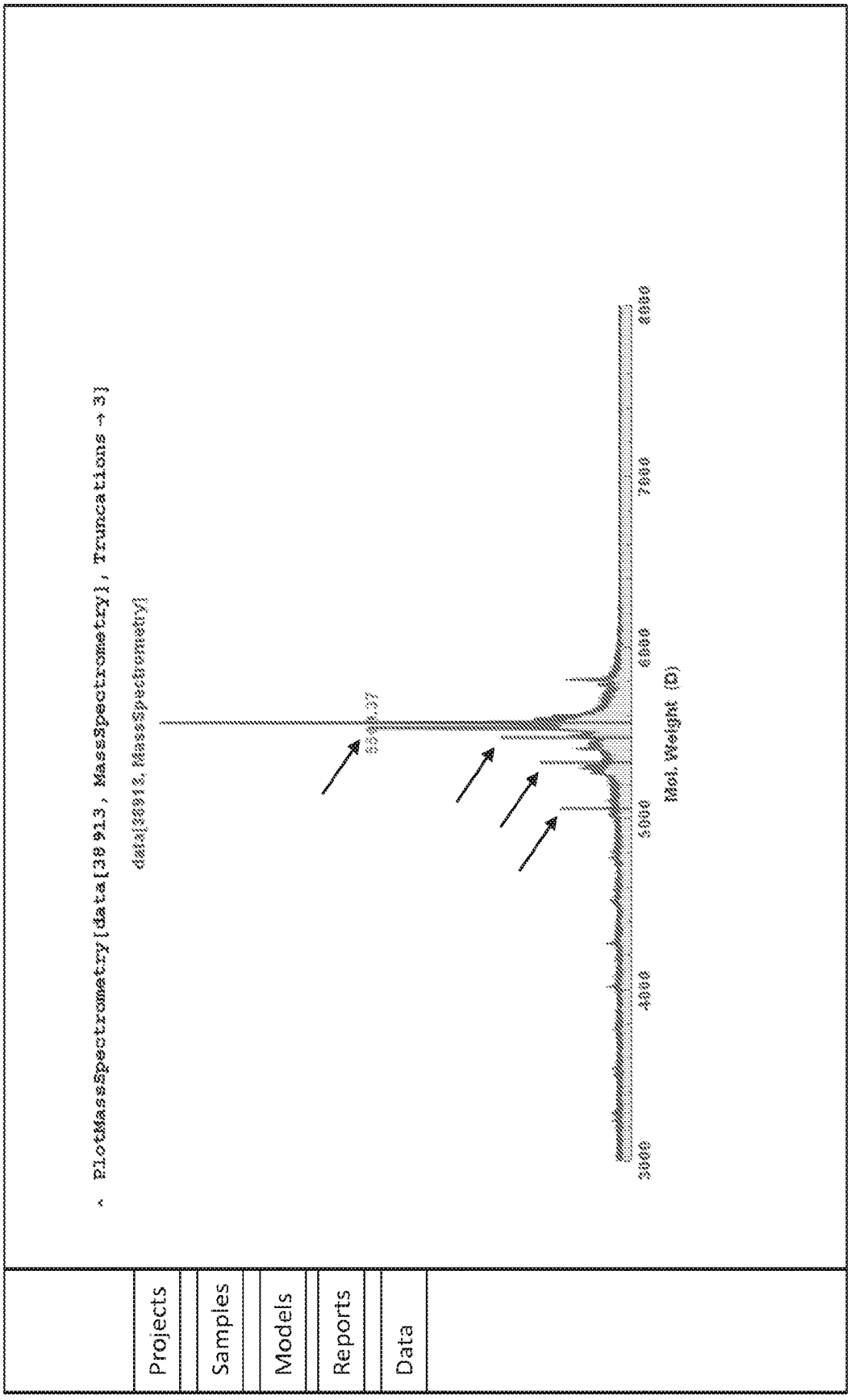

Projects
Samples
Models
Reports
Data
> PlotMassSpectrometry[data[38913, MassSpectrometry], Truncations → 3]
data[38913, MassSpectrometry]
8548.37
3000
4000
5000
6000
7000
8000
Mol. Weight (D)

FIG. 12B

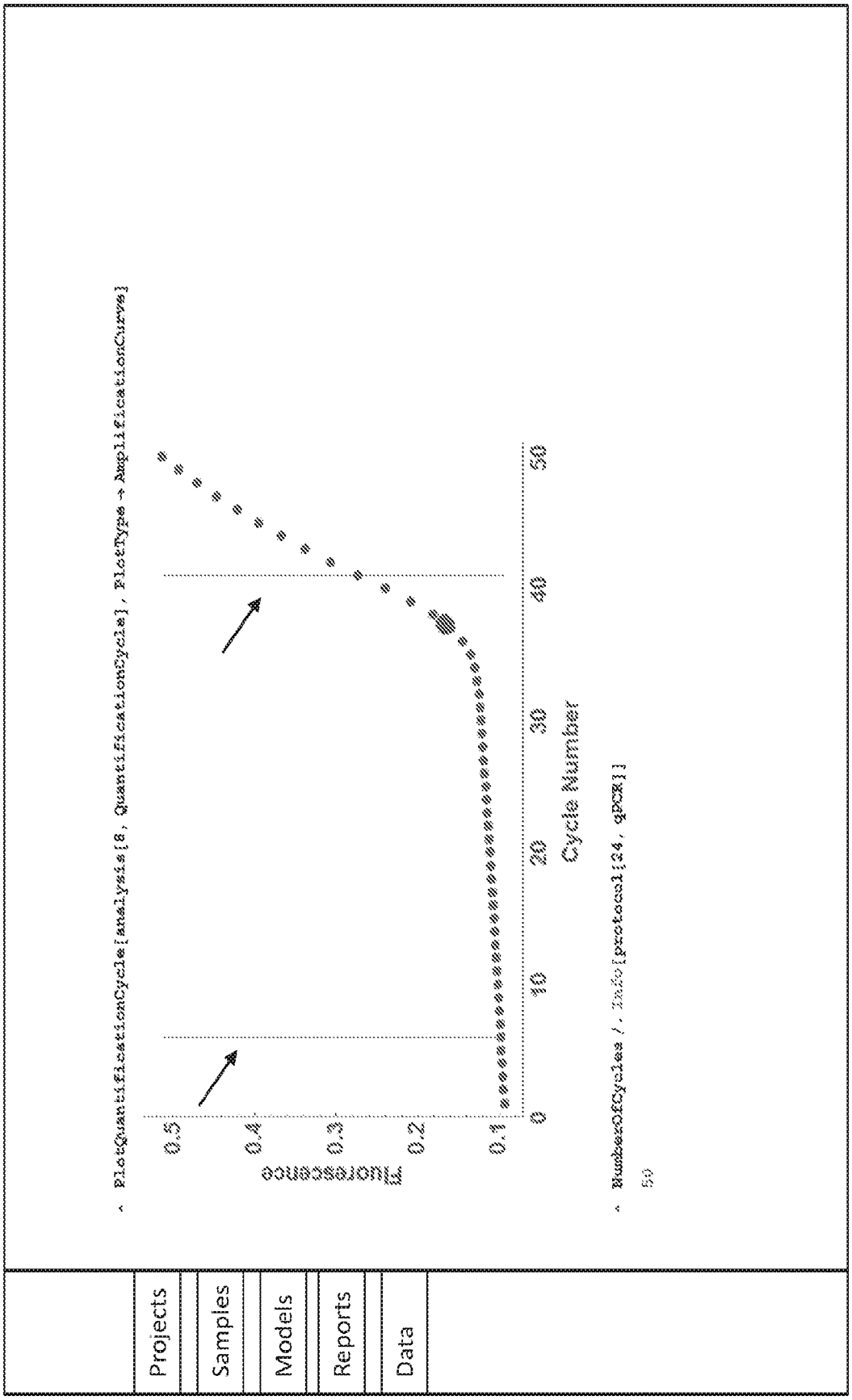

Projects
Samples
Models
Reports
Data
PlotQuantificationCycle[analysis[8, QuantificationCycle], PlotType → AmplificationCurves]
Fluorescence
0.5
0.4
0.3
0.2
0.1
0
10
20
30
40
50
Cycle Number
NumberOfCycles / . Info[protocol[24, qPCR]]
59

FIG. 12C

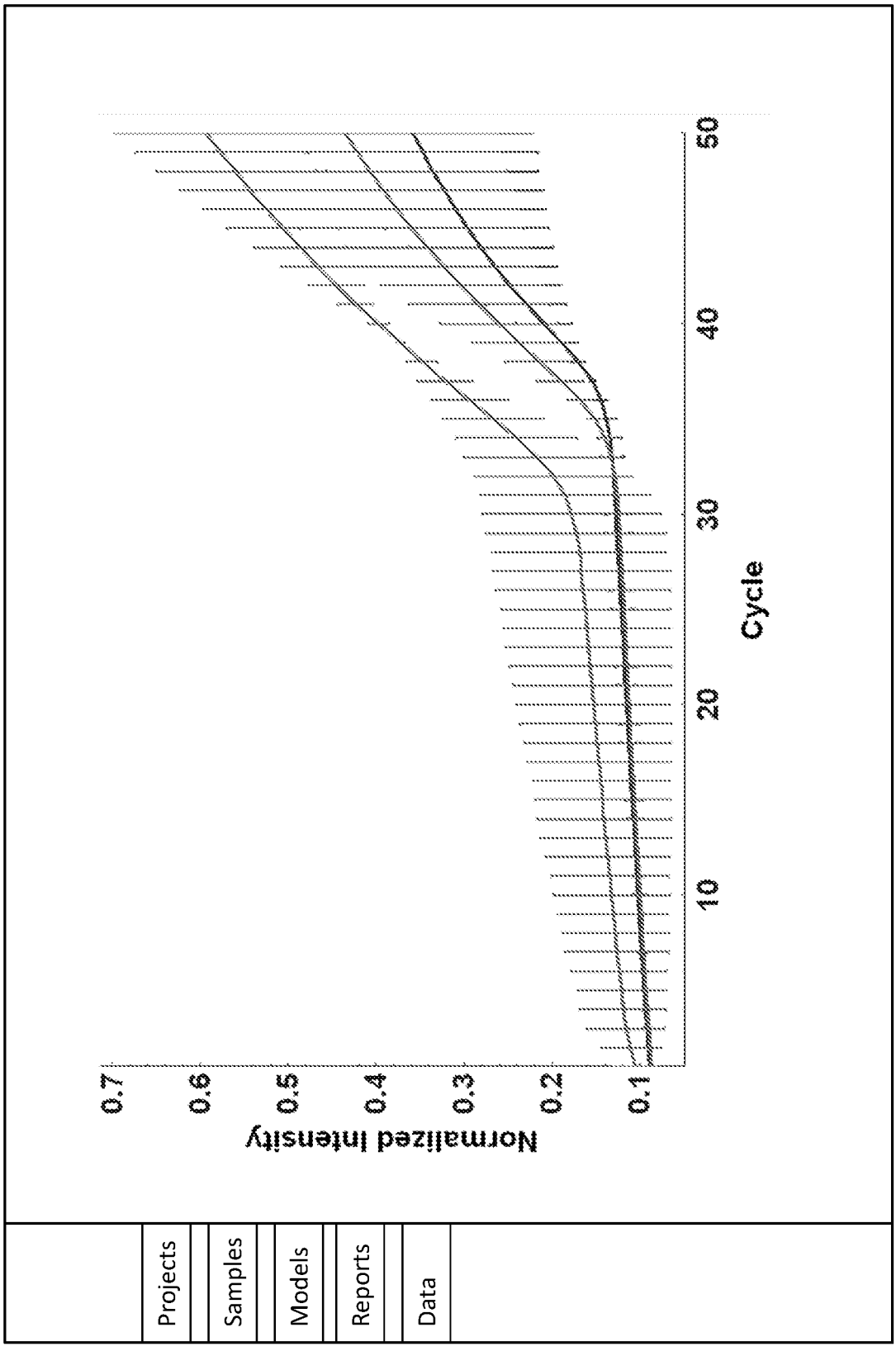

Projects
Samples
Models
Reports
Data
Normalized Intensity
0.7
0.6
0.5
0.4
0.3
0.2
0.1
10
20
30
40
50
Cycle

FIG. 12D

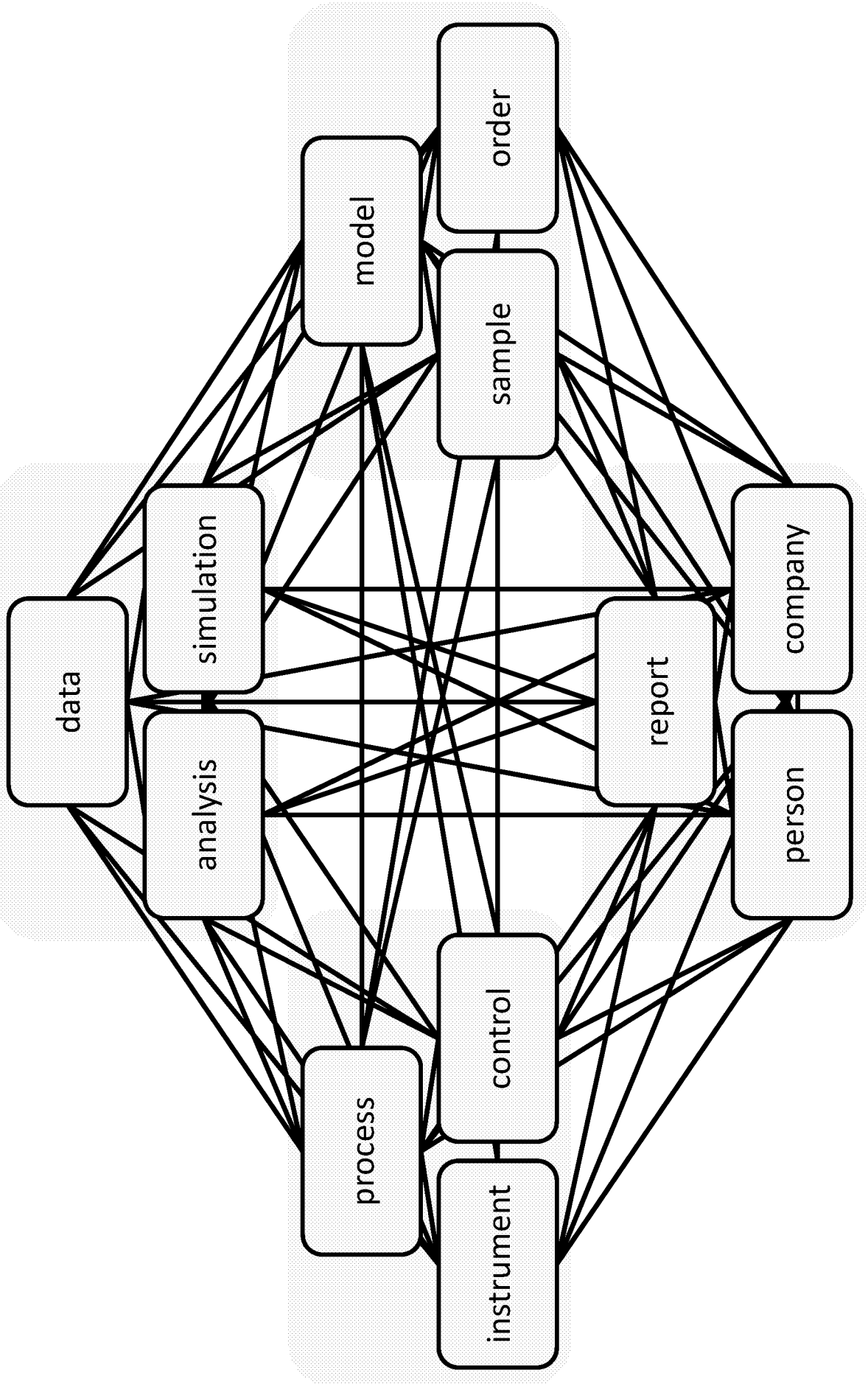

order
model
sample
simulation
data
analysis
report
company
person
process
control
instrument

FIG. 13

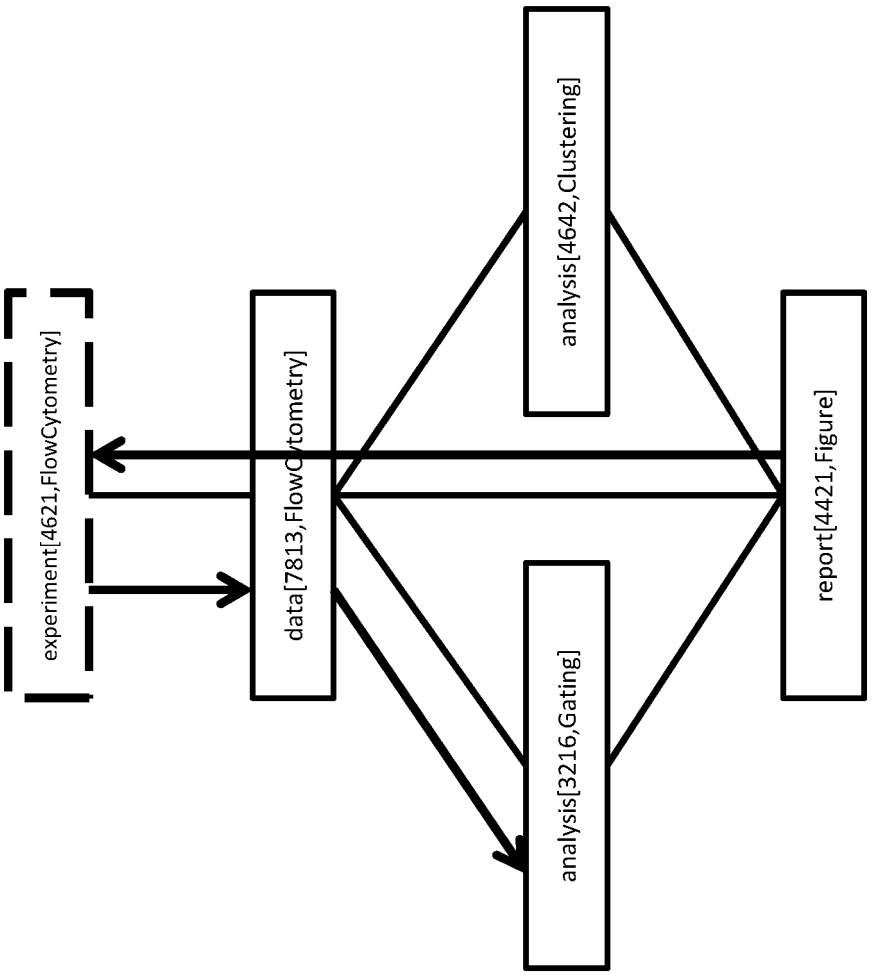

experiment[4621,FlowCytometry]
data[7813,FlowCytometry]
analysis[4642,Clustering]
analysis[3216,Gating]
report[4421,Figure]

FIG. 14

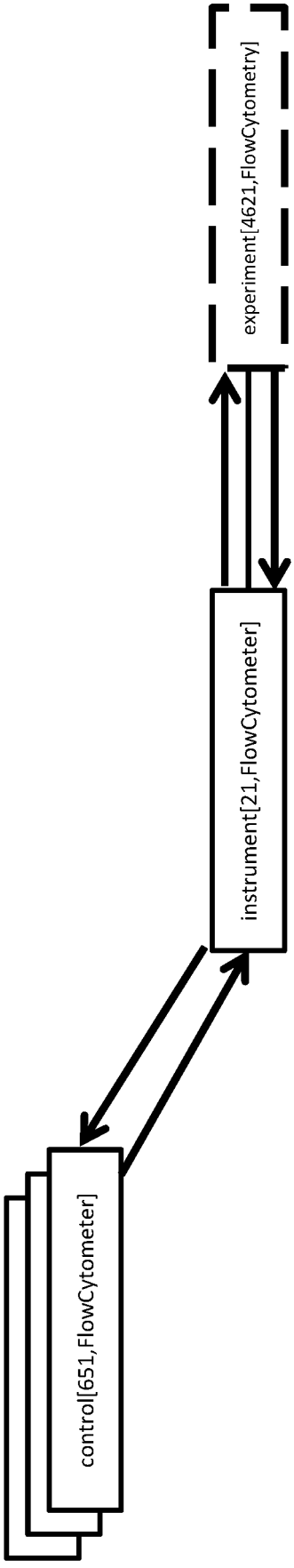

experiment[4621,FlowCytometry]
instrument[21,FlowCytometer]
control[651,FlowCytometer]

FIG. 15

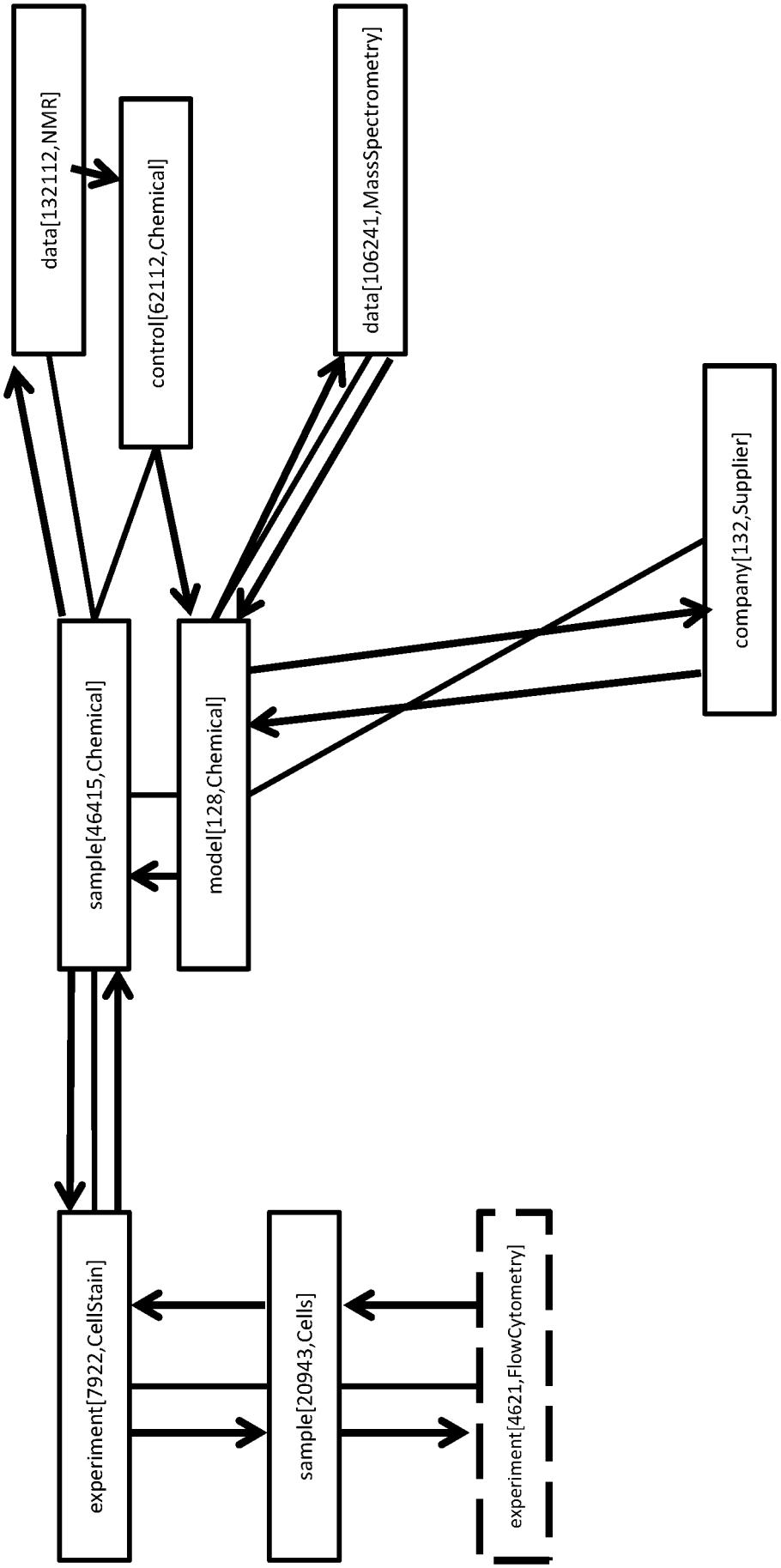

data[132112,NMR]
control[62112,Chemical]
data[106241,MassSpectrometry]
company[132,Supplier]
sample[46415,Chemical]
model[128,Chemical]
experiment[7922,CellStain]
sample[20943,Cells]
experiment[4621,FlowCytometry]

FIG. 16

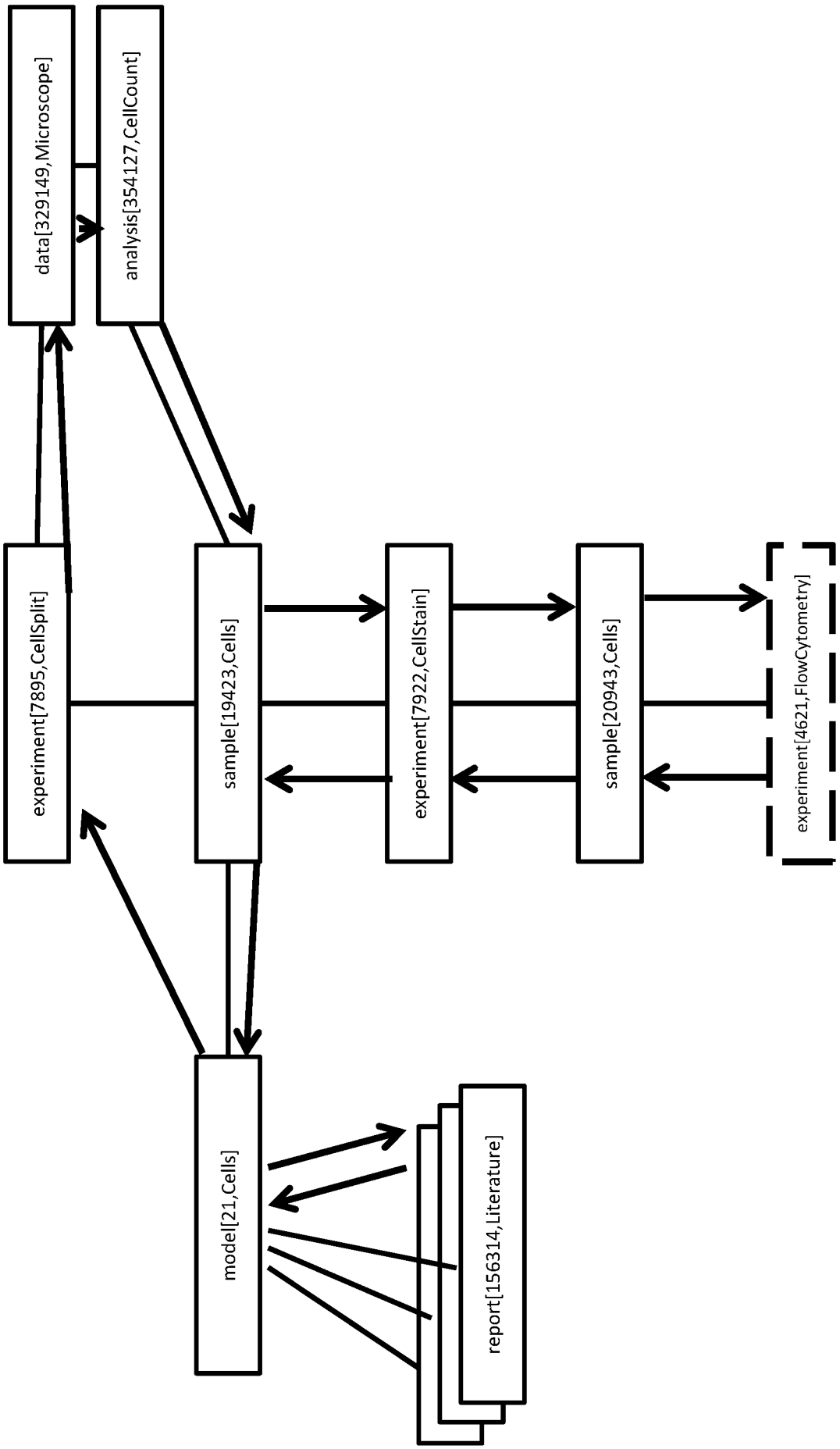

data[329149,Microscope]
analysis[354127,CellCount]
experiment[7895,CellSplit]
sample[19423,Cells]
experiment[7922,CellStain]
sample[20943,Cells]
experiment[4621,FlowCytometry]
model[21,Cells]
report[156314,Literature]

FIG. 17

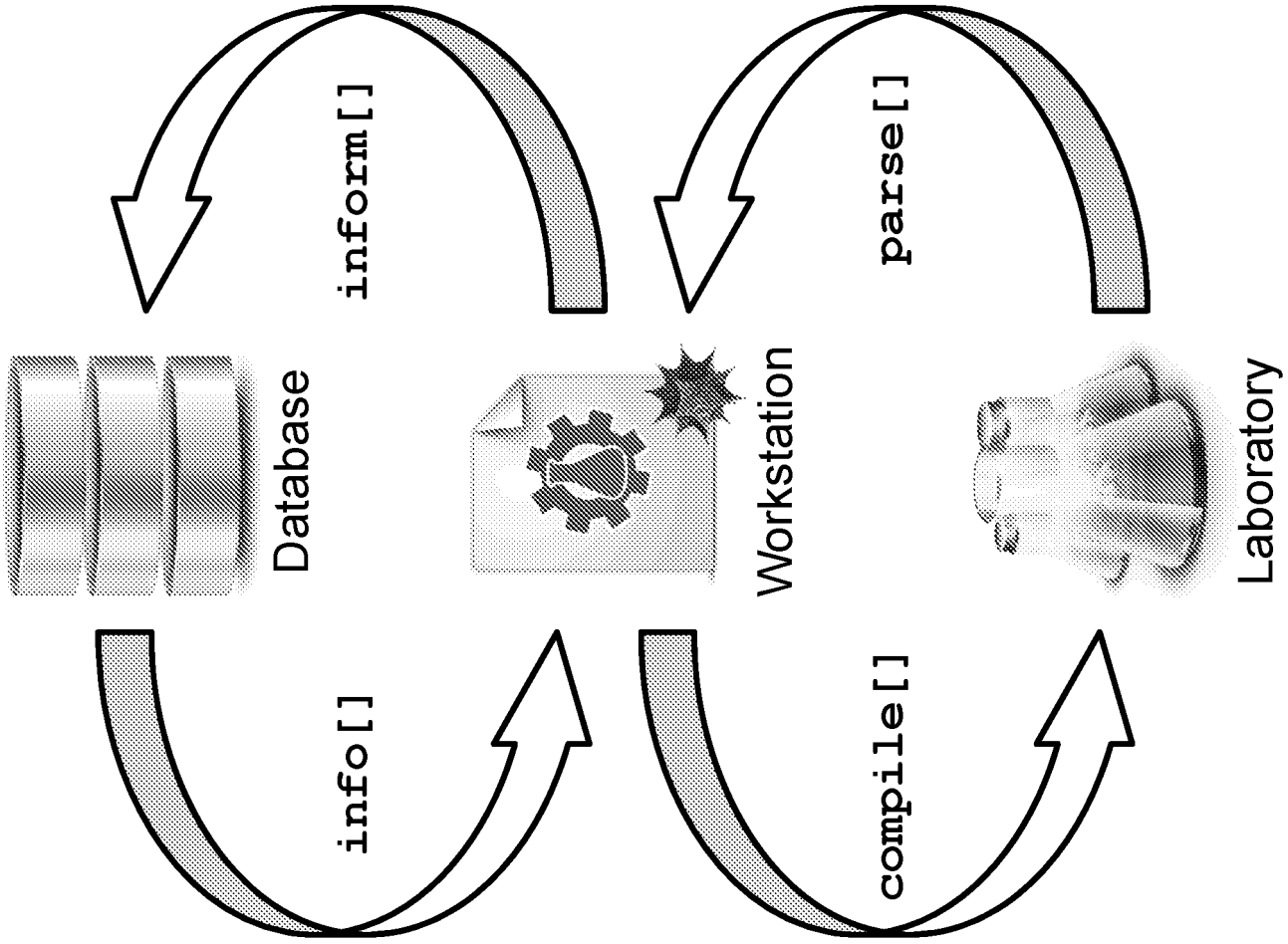

Database
Workstation
Laboratory
inform[]
parse[]
info[]
compile[]

FIG. 18

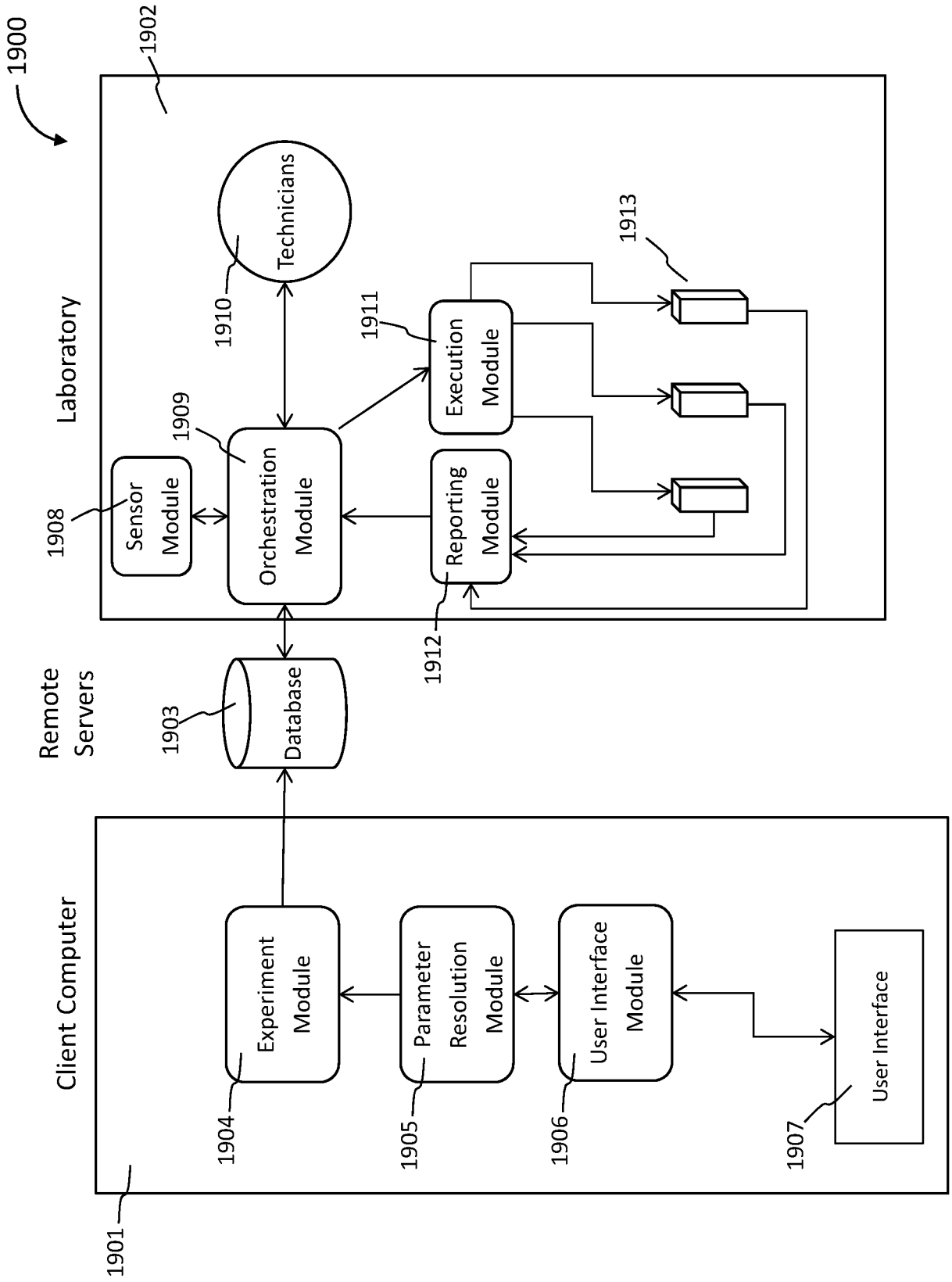

1900
1902
Laboratory
Technicians
1910
1911
Execution Module
1913
1909
Orchestration Module
1908
Sensor Module
Reporting Module
1912
Remote Servers
1903
Database
Client Computer
Experiment Module
1904
Parameter Resolution Module
1905
User Interface Module
1906
User Interface
1907
1901

FIG. 19

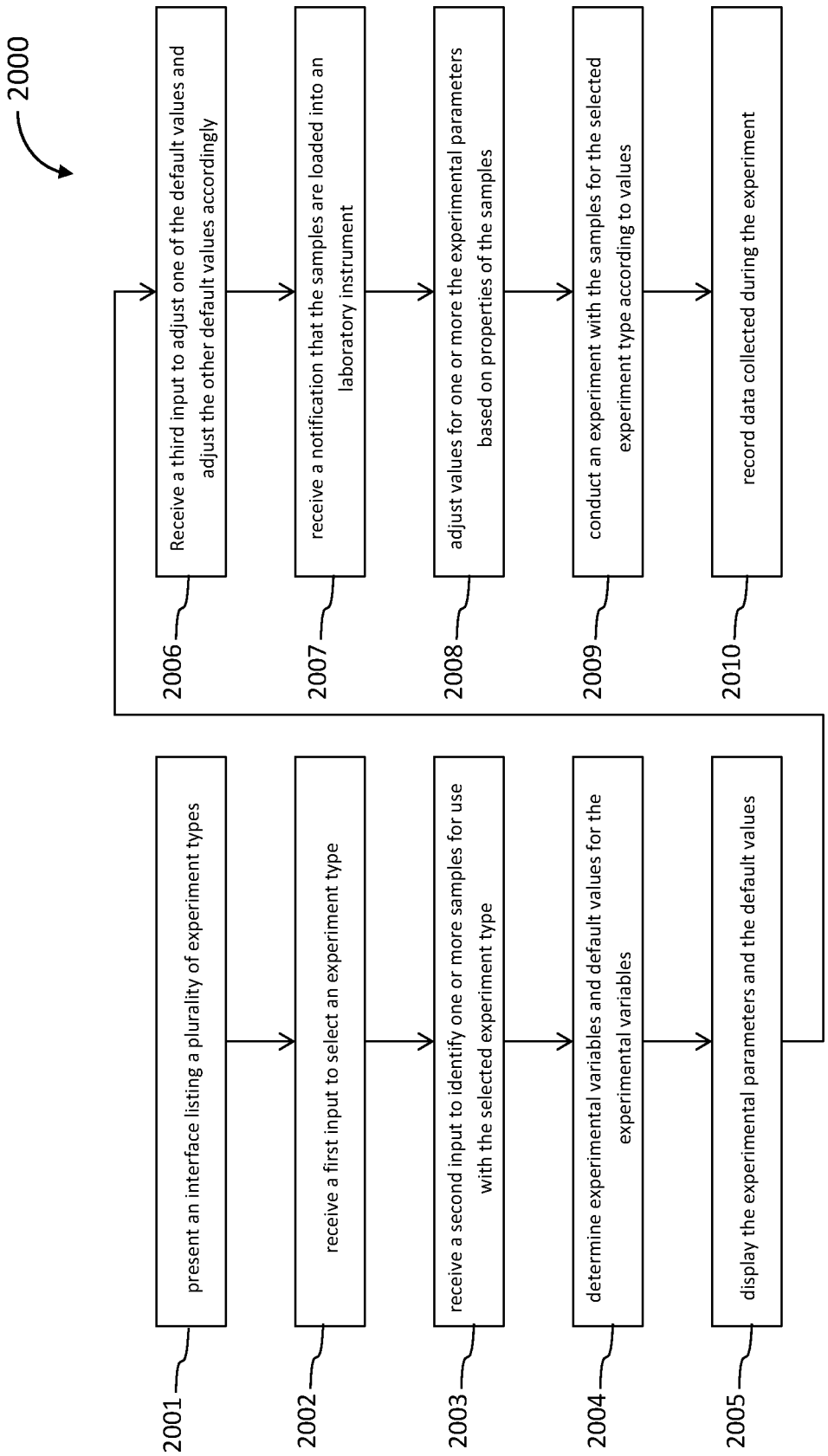

2000
present an interface listing a plurality of experiment types
2001
receive a first input to select an experiment type
2002
receive a second input to identify one or more samples for use with the selected experiment type
2003
determine experimental variables and default values for the experimental variables
2004
display the experimental parameters and the default values
2005
Receive a third input to adjust one of the default values and adjust the other default values accordingly
2006
receive a notification that the samples are loaded into an laboratory instrument
2007
adjust values for one or more the experimental parameters based on properties of the samples
2008
conduct an experiment with the samples for the selected experiment type according to values
2009
record data collected during the experiment
2010

FIG. 20