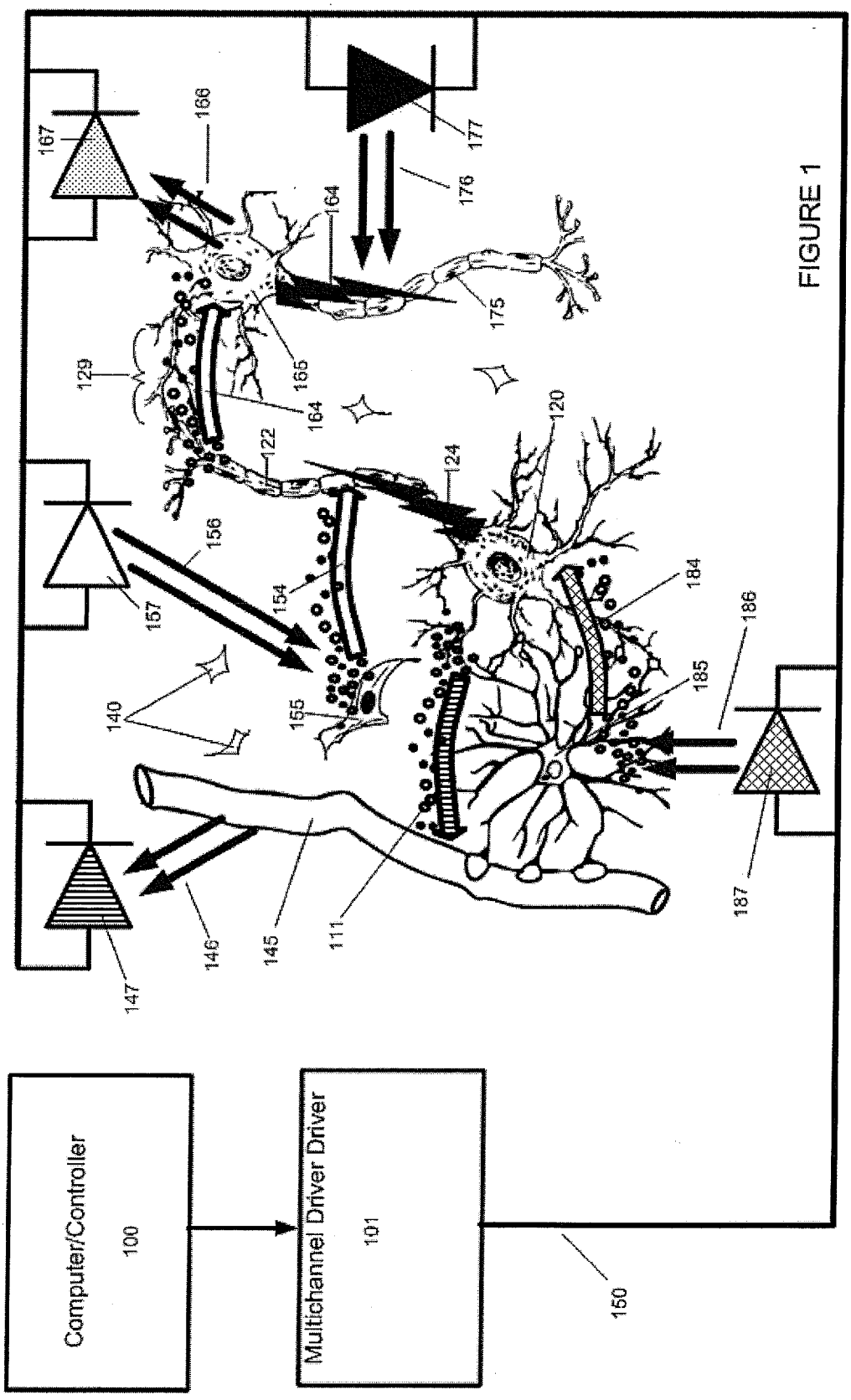

Computer/Controller
100
Multichannel Driver Driver
101
150
167
166
177
176
164
175
165
129
164
122
120
124
156
154
157
184
186
185
140
155
187
146
145
111
147

FIGURE 1

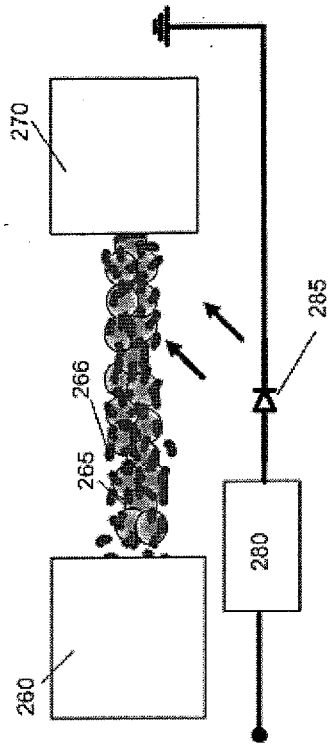


FIGURE 2B

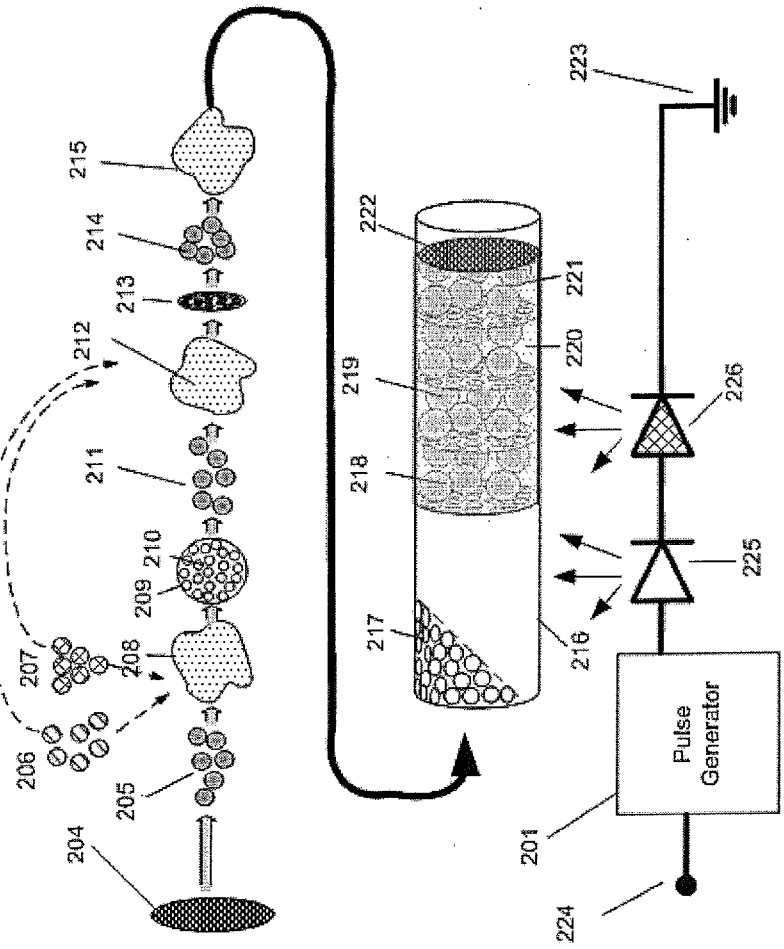


FIGURE 2A

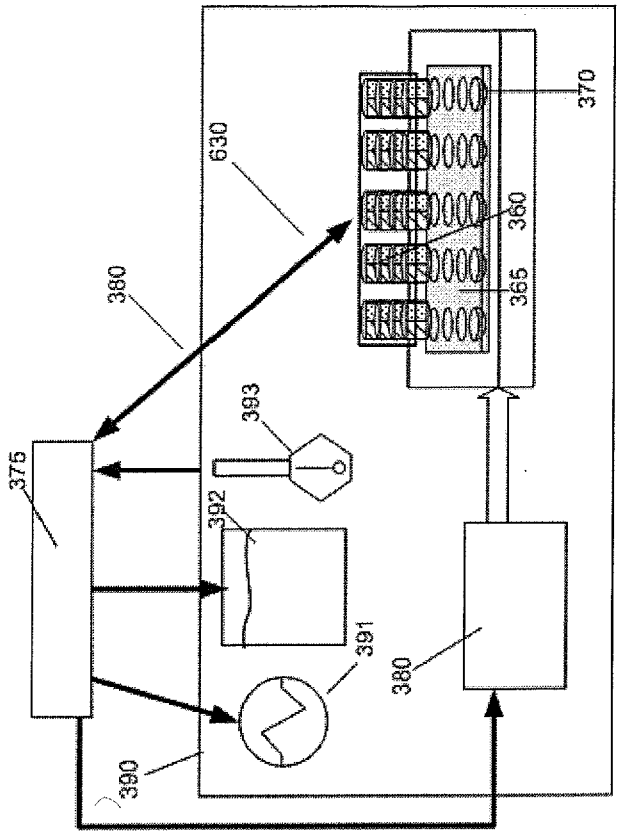


FIGURE 3B

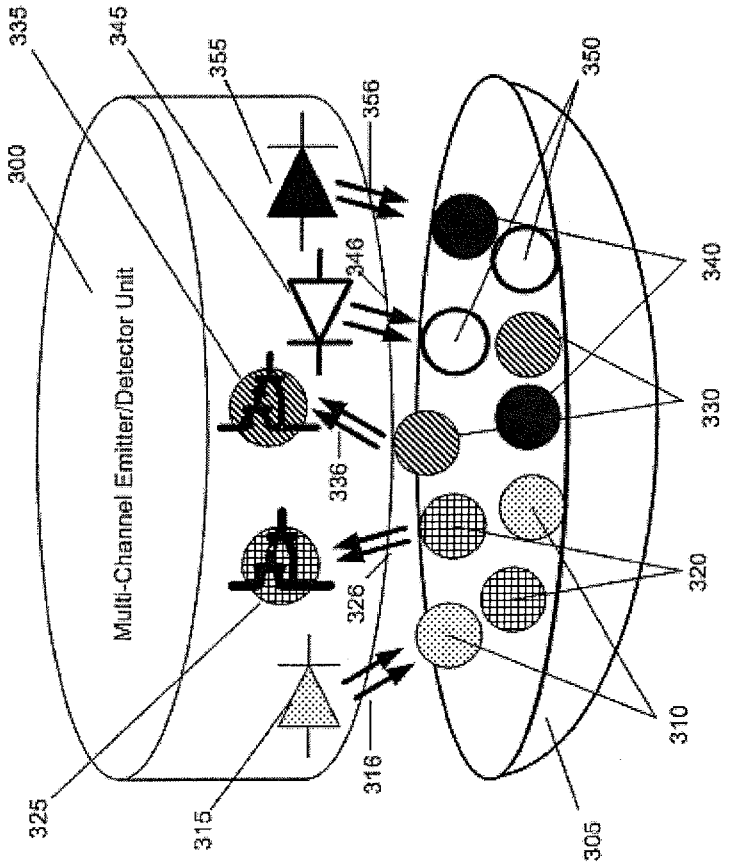


FIGURE 3A

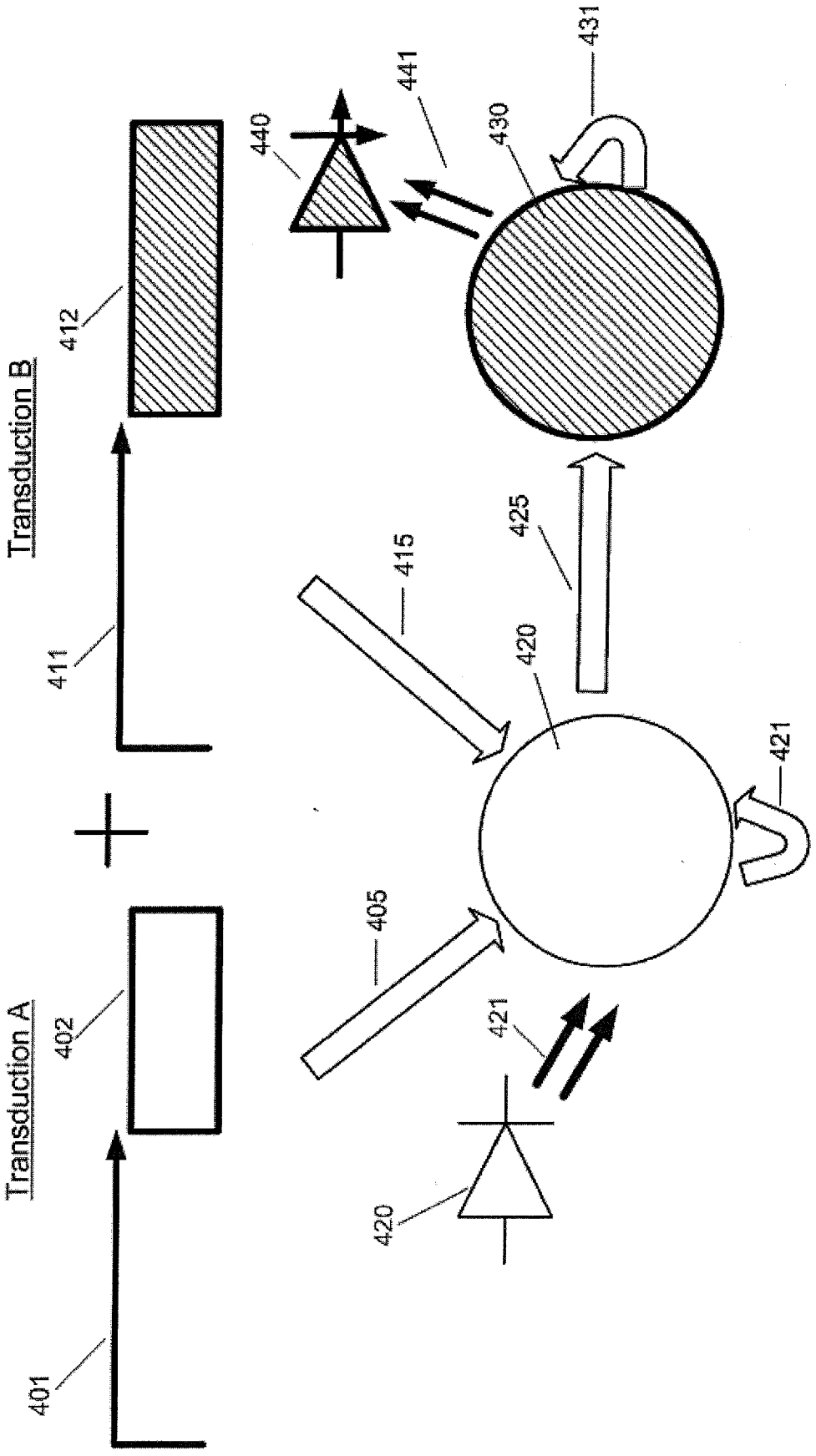

Transduction A
Transduction B
401
402
405
411
412
415
420
421
425
430
431
440
441

FIGURE 4

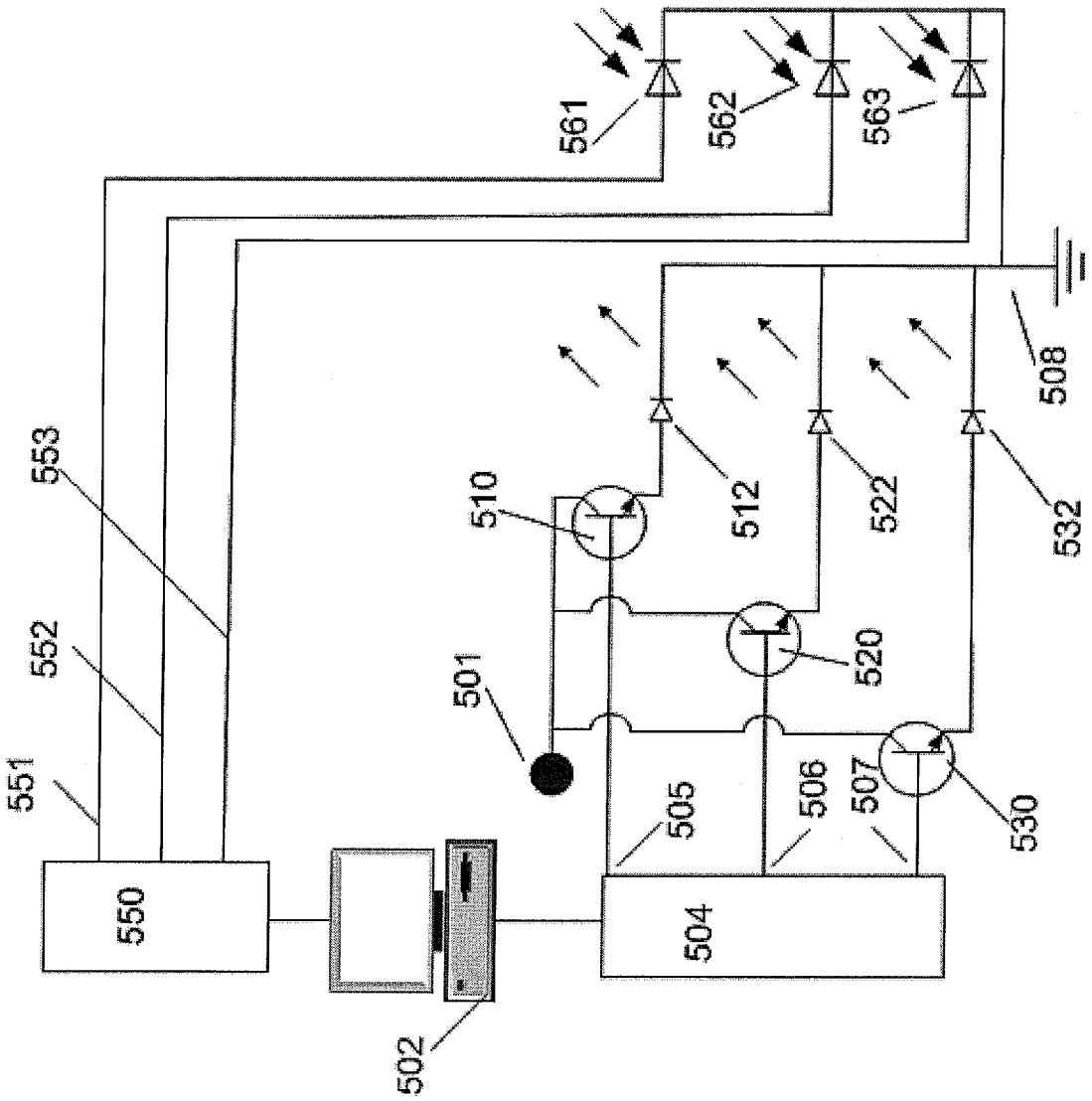

561
562
563
508
553
552
551
510
512
522
532
520
501
505
506
507
530
550
504
502

FIGURE 5

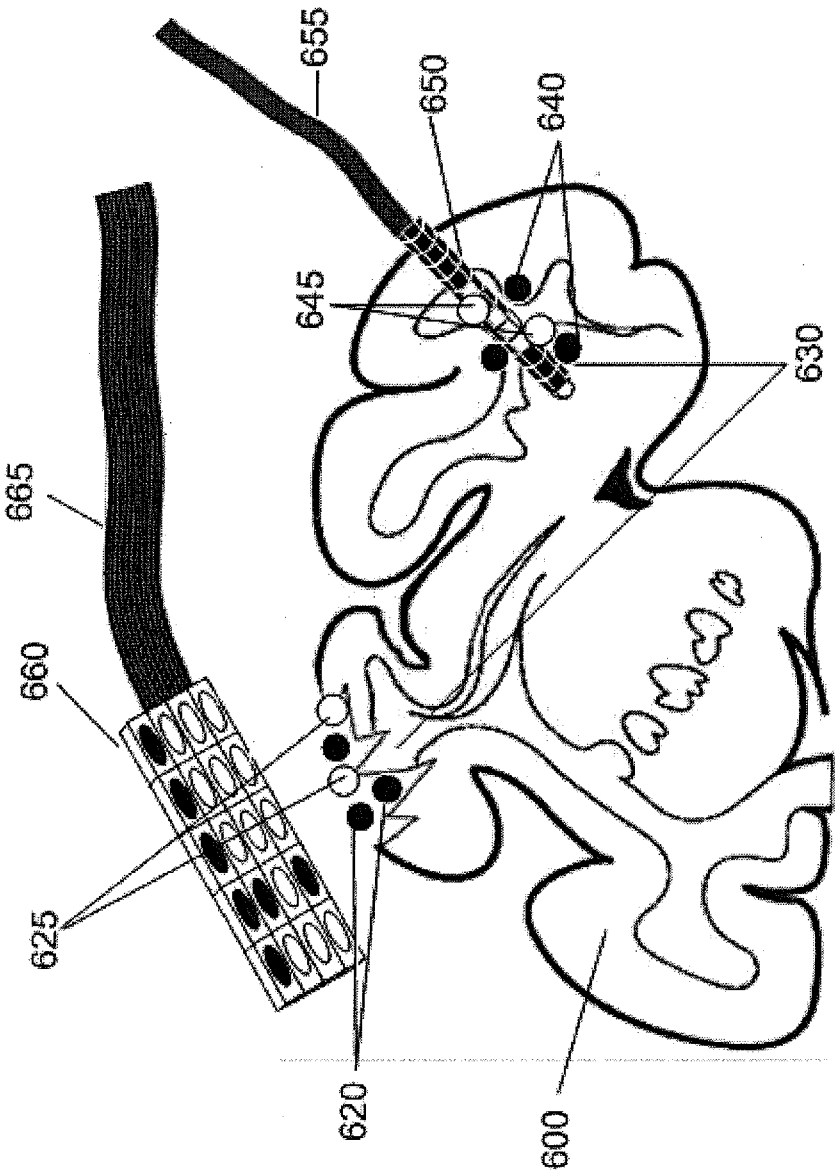


FIGURE 6

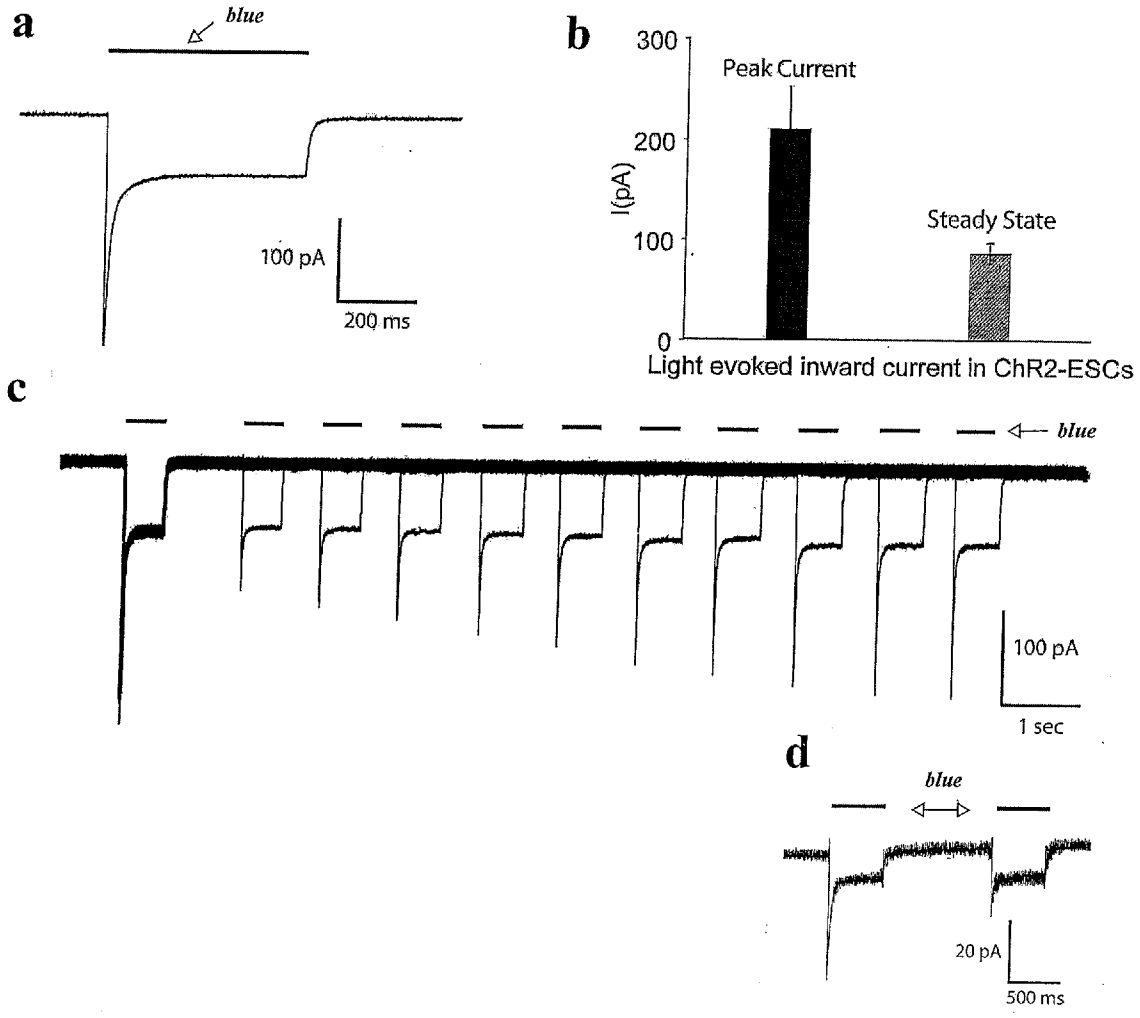

a
blue
100 pA
200 ms
b
300
200
100
0
I(pA)
Peak Current
Steady State
Light evoked inward current in ChR2-ESCs
c
blue
100 pA
1 sec
d
blue
20 pA
500 ms

FIGURE 7

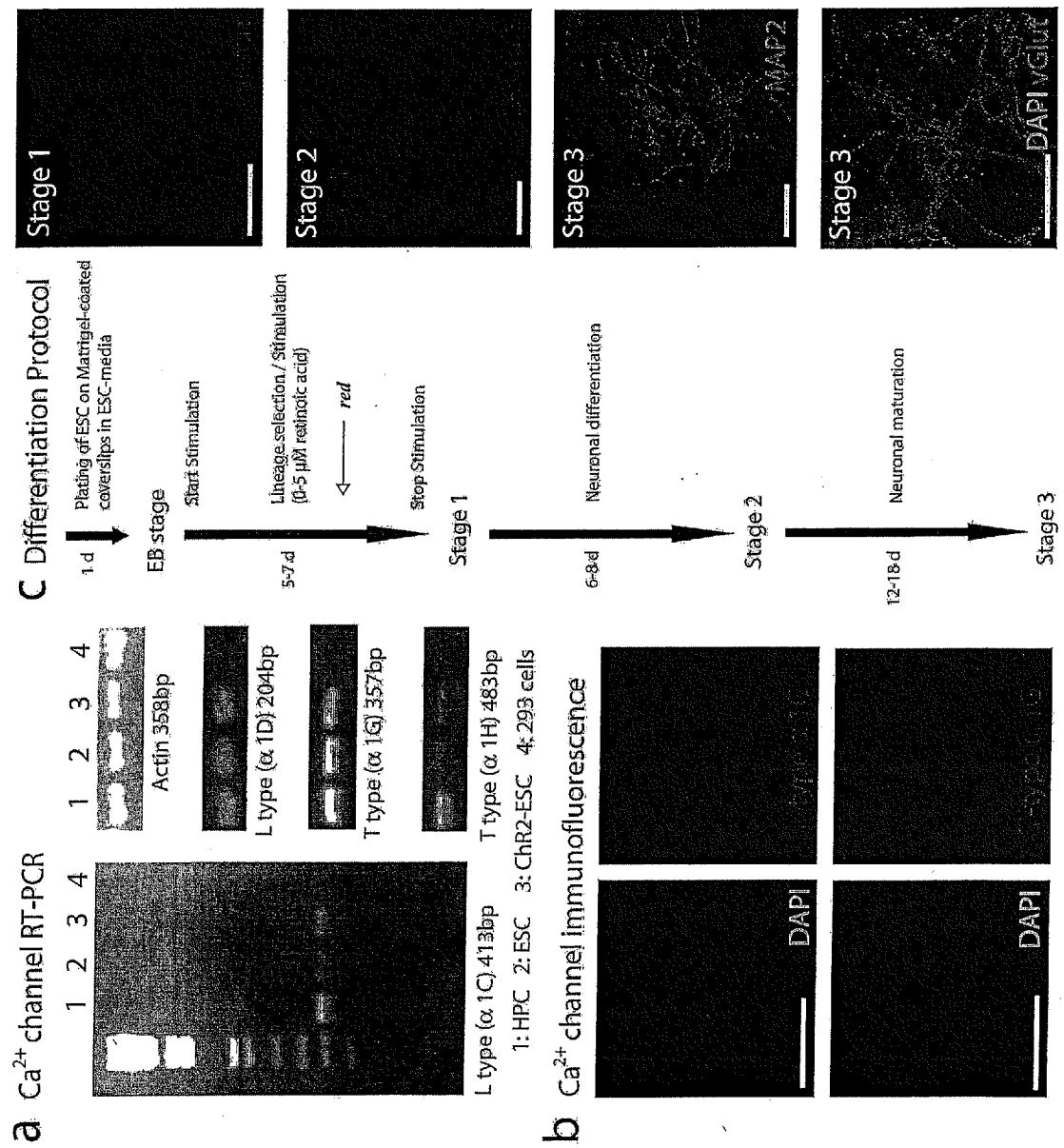

a Ca2+ channel RT-PCR
1 2 3 4
L type (α 1C) 413bp
1: HPC 2: ESC 3: ChR2-ESC 4: 293 cells
1 2 3 4
Actin 358bp
L type (α 1D) 204bp
T type (α 1G) 357bp
T type (α 1H) 483bp
b Ca2+ channel immunofluorescence
DAPI
DAPI
C Differentiation Protocol
1 d
Plating of ESC on Matrigel-coated coverslips in ESC-media
EB stage
Start Stimulation
5-7 d
Lineage selection / Stimulation (0-5 μM retinoic acid)
red
Stop Stimulation
Stage 1
6-8 d
Neuronal differentiation
Stage 2
12-18 d
Neuronal maturation
Stage 3
Stage 1
Stage 2
MAP2
Stage 3
DAPI vGlut

FIGURE 8

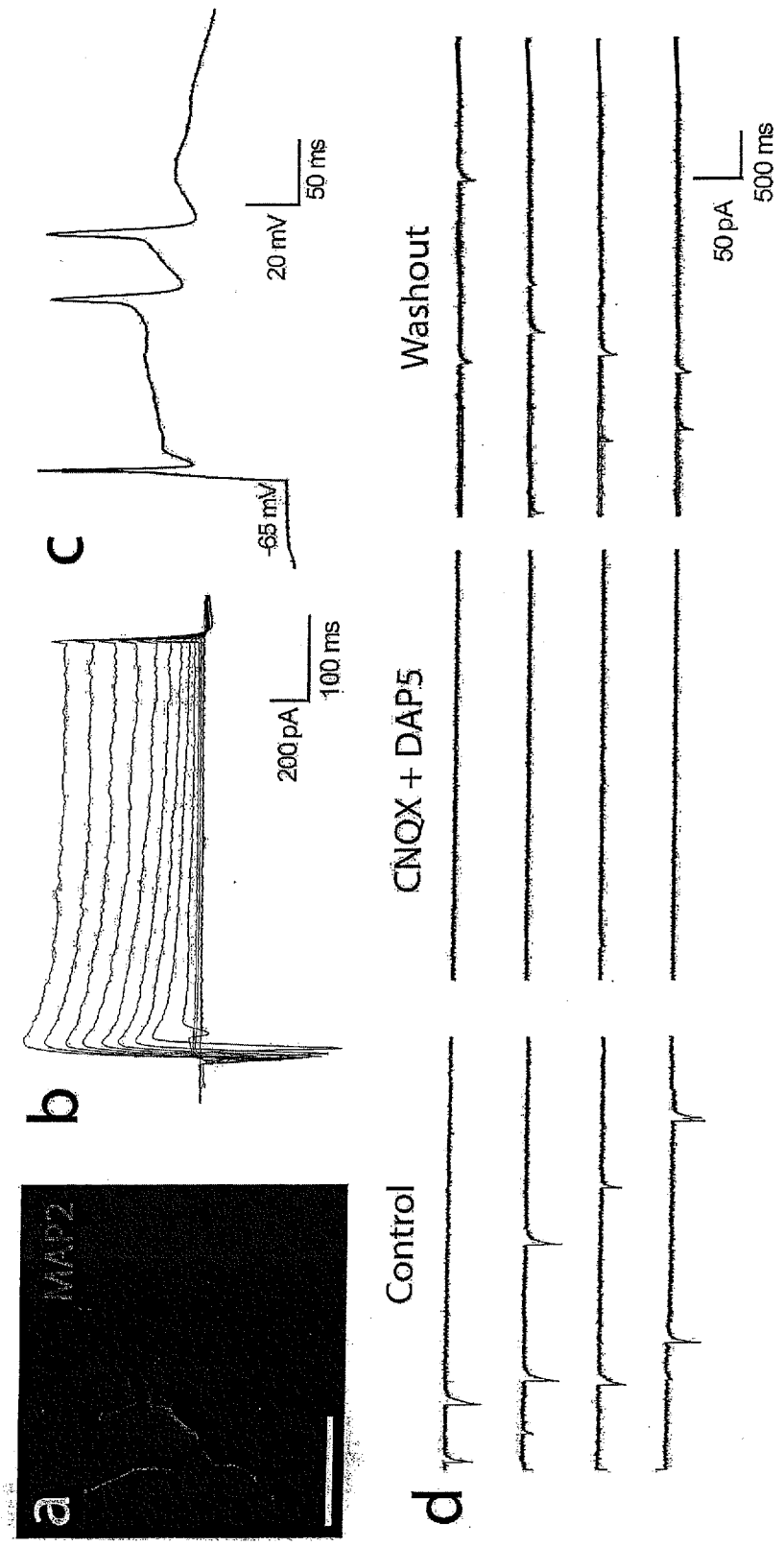
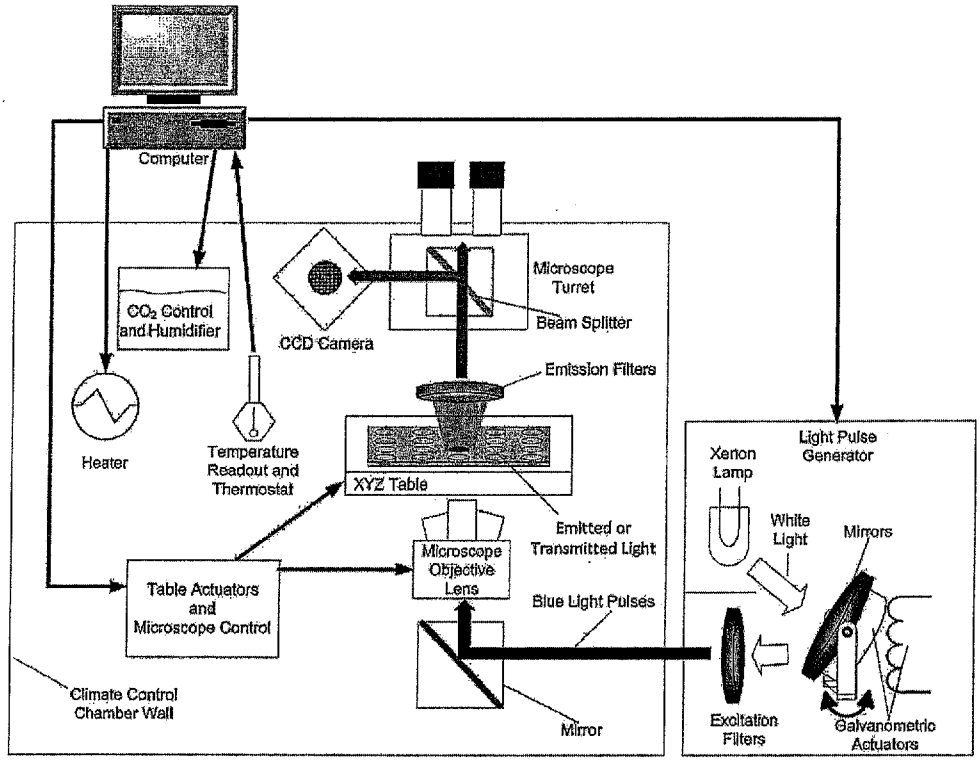

a
MAP2
b
200 pA
100 ms
c
-65 mV
20 mV
50 ms
d
Control
CNQX + DAP5
Washout
50 pA
500 ms

FIGURE 9

a


Computer
CO_2 Control and Humidifier
CCD Camera
Microscope Turret
Beam Splitter
Emission Filters
Heater
Temperature Readout and Thermostat
XYZ Table
Light Pulse Generator
Xenon Lamp
White Light
Mirrors
Emitted or Transmitted Light
Microscope Objective Lens
Table Actuators and Microscope Control
Blue Light Pulses
Climate Control Chamber Wall
Mirror
Excitation Filters
Galvanometric Actuators

b

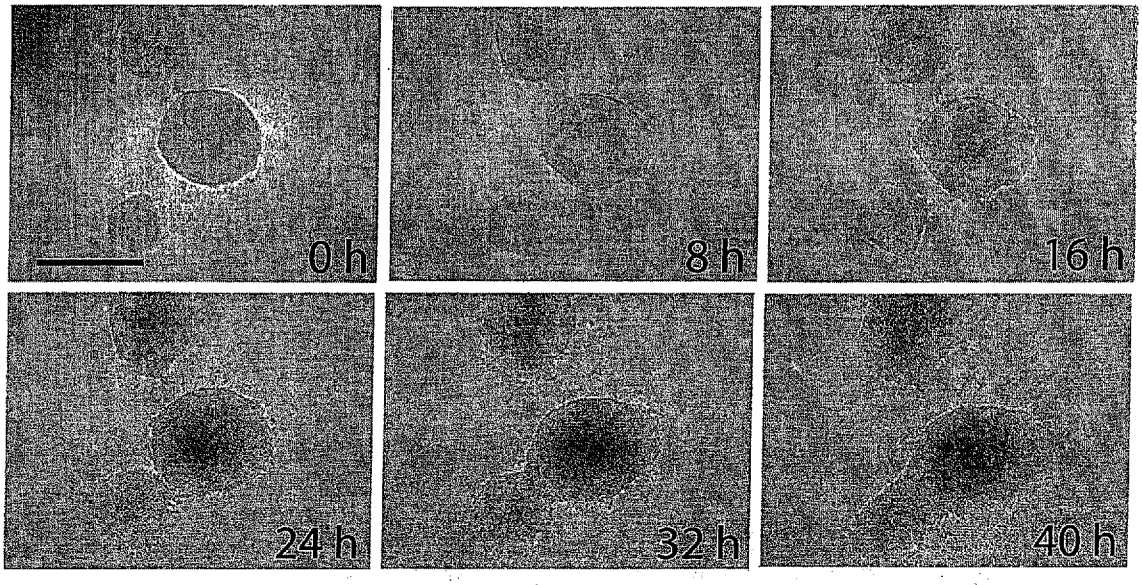

0 h
8 h
16 h
24 h
32 h
40 h

FIGURE 10

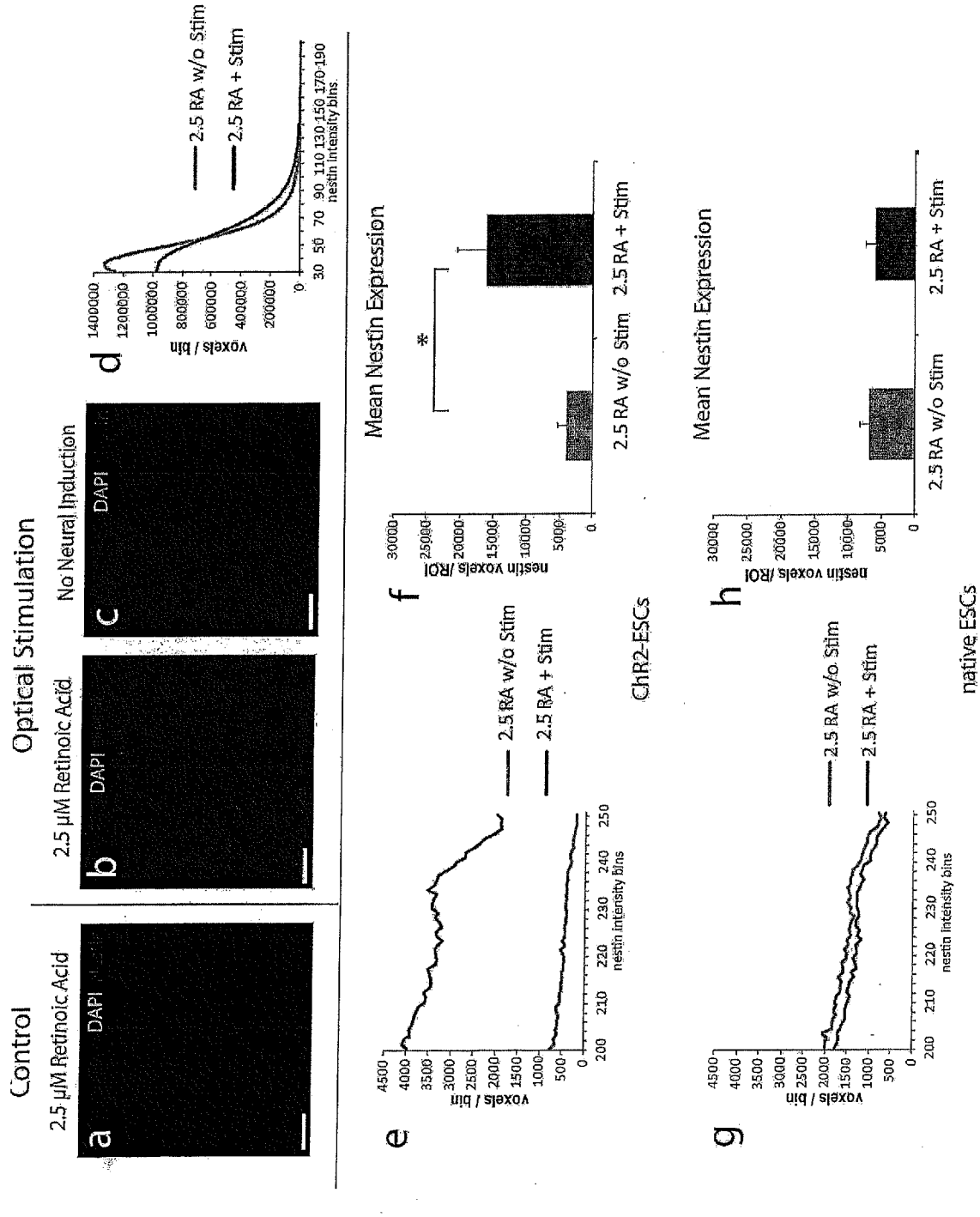

Optical Stimulation
Control
2.5 µM Retinoic Acid
No Neural Induction
2.5 µM Retinoic Acid
a
b
c
DAPI
d
2.5 RA w/o Stim
2.5 RA + Stim
voxels / bin
nestin intensity bins
e
f
Mean Nestin Expression
nestin voxels /ROI
2.5 RA w/o Stim
2.5 RA + Stim
ChR2-ESCs
g
h
native ESCs

FIGURE 11