THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1) An apparatus for exposing a substance to conditions, the apparatus including:
   a) an array of wells including a number of well channels, each well channel including a plurality of wells in the well channel, the wells containing a substance in use;
   b) one or more inlets for receiving respective fluids; and,
   c) channels coupled to the one or more inlets for selectively supplying one or more fluids to each well channel to thereby expose the substance to different conditions allowing a response of the substance to the conditions to be determined.
2) Apparatus according to claim 1, wherein each well channel includes a plurality of wells spaced apart along the well channel
3) Apparatus according to claim 1 or claim 2, wherein the fluid supplied to a first end of the well channel flows along the well channel to a second end of the well channel in a flow direction.
4) Apparatus according to any of claims 1 to 3, wherein a response in at least one well influences conditions in an adjacent well.
5) Apparatus according to any of claims 1 to 4 wherein at least some agents produced in a well are transferred to an adjacent well to thereby at least partially alter the conditions in the adjacent well.
6) Apparatus according to any one of the claims 1 to 5, wherein the apparatus includes:
   a) at least two inlets, each inlet being for receiving a respective fluid; and,
   b) a number of channels for supplying the respective fluids from the inlets to the well channels, each channel having a respective channel geometry to thereby control a relative flow of fluids so that respective proportions of the fluids are supplied to each well channel.
7) Apparatus according to claim 6, wherein for fluid flow in a flow direction, agents produced by substances in an upstream well are transferred to a downstream well.
8) Apparatus according to claim 6, wherein for no fluid flow, agents are transferred between wells by diffusion.
9) Apparatus according to any one of the claims 6 to 8, wherein a well channel geometry of each channel is arranged so that each well channel receives at least one of:
   a) an equal volume of fluid;

b) an equal flow of fluid; and,

c) equal proportions of fluid.

10) Apparatus according to claim 8 or claim 9, wherein the channel geometry includes at least one of:

a) a channel shape;

b) a channel tortuousity;

c) a channel length;

d) a channel height;

e) a channel width;

f) a channel angle; and,

g) obstructions within the channel.

11) Apparatus according to any one of the claims 6 to 10, wherein at least one channel divides to supply fluid to at least two well channels.

12) Apparatus according to any one of the claims 6 to 11, wherein at least two channels combine to supply a mixture of fluids to at least one well channel.

13) Apparatus according to any one of the claims 6 to 12, wherein the channels include mixing portions for mixing fluids contained therein.

14) Apparatus according to claim 13, wherein at least two channels combine upstream of a mixing portion.

15) Apparatus according to any one of the claims 1 to 14, wherein the apparatus includes first and second inlets for receiving respective first and second fluids, and wherein the channels are arranged so that:

i) at least one well channel receives the first fluid;

ii) at least one well channel receives the second fluid; and,

iii) at least one well channel receives a mixture of the first and second fluids.

16) Apparatus according to any one of the claims 1 to 15, wherein the apparatus includes first and second inlets for receiving respective first and second fluids, the first fluid including a factor and the second fluid including a buffer so that different well channels receive different concentrations of the factor.

17) Apparatus according to any one of the claims 1 to 16, wherein the apparatus includes, a number of inlet sets, each inlet set including at least two inlets, and each inlet set being for receiving respective fluids.

18) Apparatus according to claim 17, wherein each inlet sets receives a fluid including a respective factor.

19) Apparatus according to claim 17 or claim 18, wherein the apparatus includes:

a) a number (n) of inlet sets, each including at least two inlets, resulting in a total of at least 2n inlets; and,

b) a number (n) of inlet sets, each containing at least 2 inlets, where 1 inlet from each inlet set is further joined to a common inlet, resulting in a total of at least n+1 inlets.

20) Apparatus according to any one of the claims 17 to 19, wherein the apparatus includes:

a) a first inlet set for receiving a first factor and a buffer;

b) a second inlet set for receiving a second factor and a buffer;

c) a third inlet set for receiving a third factor and a buffer and wherein each well channel receives a respective concentration of each of the first, second and third factors.

21) Apparatus according to any one of the claims 17 to 20, wherein the fluids from one inlet set are combined by mixing with the fluids of a subsequent inlet set, thereby combining the respective fluids.

22) Apparatus according to any one of the claims 1 to 21, wherein the apparatus includes:

a) at least one seeding inlet for receiving a seeding fluid containing the substance; and,

b) at least one seeding outlet, the at least one seeding inlet and seeding outlet being in fluid communication with the well channels, thereby allowing the wells to be seeded with the substance.

23) Apparatus according to claim 22, wherein apparatus includes a number of seeding channels for connecting at least one of the at least seeding inlet and the at least one seeding outlet to the well channels.

24) Apparatus according to claim 22 or claim 23, wherein the at least one seeding inlet is connected to an opposing end of the well channels to the at least one seeding outlet.

25) Apparatus according to any one of the claims 22 to 24, wherein seeding outlet is in fluid communication with the channels, and wherein the seeding outlet is arranged to be

blocked after seeding of the well channels, thereby allowing the respective fluids to be supplied to the well channels.

26) Apparatus according to any one of the claims 1 to 25, wherein the apparatus includes at least one control device for selectively controlling at least one of:

a) supply of fluid to at least one of a well channel and a well; and,

b) sampling of fluid and/or substances from at least one of a well channel and a well.

27) Apparatus according to claim 26, wherein the control device includes a valve for selectively blocking a channel.

28) Apparatus according to any one of the claims 1 to 27, wherein the channels are microfluidic channels.

29) Apparatus according to any one of the claims 1 to 2, wherein the apparatus includes a substrate and a cover layer.

30) Apparatus according to claim 29, wherein the cover layer includes a first and second layer, and wherein at least some inlets are provided in the second layer for supplying respective fluids to channels in the first layer.

31) Apparatus according to claim 29 or claim 30, wherein the channels are defined in the cover layer.

32) Apparatus according to any one of the claims 29 to 31, wherein the wells are defined in at least one of the substrate and the cover layer.

33) Apparatus according to any one of the claims 29 to 32, wherein the cover layer includes a moulded polymeric material.

34) Apparatus according to any one of the claims 29 to 33, wherein the substrate and cover layer are coupled using at least one of:

a) adhesive coupling;

b) thermal coupling;

c) mechanical coupling;

d) plasma coupling;

e) covalent/chemical coupling;

f) electrostatic coupling; and,

g) magnetic coupling.

35) Apparatus according to any one of the claims 1 to 34, wherein at least the wells are coated.

36) Apparatus according to claim 35, wherein the coatings include at least one of:

a) a promoter;
b) an inhibitor;
c) a growth factor;
d) a clotting factor;
e) a hormone;
f) a signalling agent;
g) chemical compositions;
h) a drug;
i) a protein;
j) a ligand;
k) an antibody;
l) an organism;
m) cells;
n) mini-cells;
o) synthetic cells;
p) a liposome;
q) a micelle;
r) a polymeric micelle (polymersome)
s) a lipid;
t) a polymer;
u) a surfactant;
v) a fatty acid;
w) an ionic solution;
x) an acidic or basic solution;
y) a detection reagent;
z) a DNA molecule;
aa) an RNA molecule;
bb) a construct encoding a DNA or RNA sequence;

cc) a nucleotide;

dd) a nucleoside;

ee) a polypeptide;

ff) an amino acid;

gg) a viral particle;

hh) a plasmid;

ii) a nanoparticle;

jj) a microparticle;

kk) a magnetic particle;

ll) conditioned medium;

mm) a fraction purified from conditioned medium;

nn) a natural extract;

oo) a culture medium component;

pp) a cell culture additive;

qq) a carbohydrate;

rr) a vitamin;

ss) a metabolite;

tt) an oligonucleotide;

uu) a fusion protein;

vv) a proteoglycan; and,

ww) a pathogen.

37) Apparatus according to any one of the claims 1 to 36, wherein at least one fluid includes an agent.

38) Apparatus according to claim 37, wherein the agent includes at least one of:

a) a promoter;

b) an inhibitor;

c) a growth factor;

d) a clotting factor;

e) a hormone;

f) a signalling agent;

g) chemical compositions;

h) a drug;
i) a protein;
j) a ligand;
k) an antibody;
l) an organism;
m) cells;
n) mini-cells;
o) synthetic cells;
p) a liposome;
q) a micelle;
r) a polymeric micelle (polymersome)
s) a lipid;
t) a polymer;
u) a surfactant;
v) a fatty acid;
w) an ionic solution;
x) an acidic or basic solution;
y) a detection reagent;
z) a DNA molecule;
aa) an RNA molecule;
bb) a construct encoding a DNA or RNA sequence;
cc) a nucleotide;
dd) a nucleoside;
ee) a polypeptide;
ff) an amino acid;
gg) a viral particle;
hh) a plasmid;
ii) a nanoparticle;
jj) a microparticle;
kk) a magnetic particle;
ll) conditioned medium;

mm) a fraction purified from conditioned medium;

nn) a natural extract;

oo) a culture medium component;

pp) a cell culture additive;

qq) a carbohydrate;

rr) a vitamin;

ss) a metabolite;

tt) an oligonucleotide;

uu) a fusion protein;

vv) a proteoglycan; and,

ww) a pathogen.

39) Apparatus according to any one of the claims 1 to 38, wherein the substance includes at least one of:

a) a promoter;

b) an inhibitor;

c) a growth factor;

d) a clotting factor;

e) a hormone;

f) a signalling agent;

g) chemical compositions;

h) a drug;

i) a protein;

j) a ligand;

k) an antibody;

l) an organism;

m) cells;

n) mini-cells;

o) synthetic cells;

p) a liposome;

q) a micelle;

r) a polymeric micelle (polymersome)

s) a lipid;

t) a polymer;

u) a surfactant;

v) a fatty acid;

w) an ionic solution;

x) an acidic or basic solution;

y) a detection reagent;

z) a DNA molecule;

aa) an RNA molecule;

bb) a construct encoding a DNA or RNA sequence;

cc) a nucleotide;

dd) a nucleoside;

ee) a polypeptide;

ff) an amino acid;

gg) a viral particle;

hh) a plasmid;

ii) a nanoparticle;

jj) a microparticle;

kk) a magnetic particle;

ll) conditioned medium;

mm) a fraction purified from conditioned medium;

nn) a natural extract;

oo) a culture medium component;

pp) a cell culture additive;

qq) a carbohydrate;

rr) a vitamin;

ss) a metabolite;

tt) an oligonucleotide;

uu) a fusion protein;

vv) a proteoglycan; and,

ww) a pathogen.

40) Apparatus according to any one of the claims 1 to 39, wherein the apparatus is for monitoring at least one of:

a) response to agents;
b) cell growth;
c) cell differentiation;
d) cell viability;
e) cell morphology;
f) cell signalling;
g) protein translocation;
h) cell antigen presentation;
i) DNA synthesis;
j) cell genome;
k) cell transcriptome;
l) cell proteome;
m) cell metabolism;
n) cell electrophysiological function;
o) cell physiological function;
p) phagocytosis;
q) endocytosis;
r) gene expression;
s) protein expression;
t) carbohydrate expression;
u) biomolecular interactions;
v) receptor binding;
w) cell binding of a detection agent;
x) cell uptake of a modulation agent;
y) Cell migration;
z) Cell population organisation;
aa) Cell adhesion;
bb) Cell-cell interactions;
cc) Lipid expression;

dd) RNA synthesis; and,

ee) Tissue formation.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1) An apparatus for exposing a substance to conditions, the apparatus including:
   a) an array of wells including a number of well channels, each well channel including a plurality of wells spaced apart along the well channel, the wells containing a substance in use;
   b) a plurality of inlet sets, each inlet set including first and second inlets that receive respective first and second fluids, each inlet set receiving a respective first fluid;
   c) channels coupled to the inlets for selectively supplying one or more fluids to each well channel to thereby expose the substance to different conditions allowing a response of the substance to the conditions to be determined, wherein each channel divides to supply fluid to at least two well channels and wherein at least two channels combine to supply a mixture of fluids to at least one well channel; and,
   d) a substrate and a cover layer, wherein the wells are defined in at least one of the substrate and the cover layer, wherein the cover layer includes a first and second layer, and wherein:
      i) at least some inlets are provided in the first layer for supplying respective fluids to channels in the first layer; and
      ii) at least some other inlets are provided in the second layer for supplying respective fluids to channels in the first layer via channels in the second layer.
2) Apparatus according to claim 1, wherein a well channel geometry of each channel is arranged so that each well channel receives at least one of:
   a) an equal volume of fluid;
   b) an equal flow of fluid; and,
   c) equal proportions of fluid.
3) Apparatus according to claim 2, wherein the channel geometry includes at least one of:
   a) a channel shape;
   b) a channel tortuousity;
   c) a channel length;
   d) a channel height;
   e) a channel width;
   f) a channel angle; and,

g) obstructions within the channel.

4) Apparatus according to any one of claims 1 to 3, wherein the channels include mixing portions for mixing fluids contained therein.

5) Apparatus according to claim 4, wherein at least two channels combine upstream of a mixing portion.

6) Apparatus according to any one of claims 1 to 5, wherein, for each inlet set, the channels are arranged so that:

   i) at least one well channel receives the first fluid;

   ii) at least one well channel receives the second fluid; and,

   iii) at least one well channel receives a mixture of the first and second fluids.

7) Apparatus according to any one of claims 1 to 6, wherein the apparatus includes:

   a) a first inlet set for receiving a first factor and a buffer;

   b) a second inlet set for receiving a second factor and a buffer;

   c) a third inlet set for receiving a third factor and a buffer and wherein each well channel receives a respective concentration of each of the first, second and third factors.

8) Apparatus according to any one of claims 1 to 7, wherein the apparatus includes:

   a) at least one seeding inlet for receiving a seeding fluid containing the substance; and,

   b) at least one seeding outlet, the at least one seeding inlet and seeding outlet being in fluid communication with the well channels, thereby allowing the wells to be seeded with the substance.

9) Apparatus according to claim 8, wherein apparatus includes a number of seeding channels for connecting at least one of the at least seeding inlet and the at least one seeding outlet to the well channels.

10) Apparatus according to claim 8 or claim 9, wherein the at least one seeding inlet is connected to an opposing end of the well channels to the at least one seeding outlet.

11) Apparatus according to any one of claims 8 to 10, wherein seeding outlet is in fluid communication with the channels, and wherein the seeding outlet is arranged to be blocked after seeding of the well channels, thereby allowing the respective fluids to be supplied to the well channels.

12) Apparatus according to any one of claims 1 to 11, wherein the apparatus includes at least one control device for selectively controlling at least one of:

a) supply of fluid to at least one of a well channel and a well; and,

b) sampling of fluid and/or substances from at least one of a well channel and a well.

13) Apparatus according to claim 12, wherein the control device includes a valve for selectively blocking a channel.

14) Apparatus according to any one of claims 1 to 13, wherein the channels are microfluidic channels.

15) Apparatus according to any one of claims 1 to 14, wherein the cover layer includes a moulded polymeric material.

16) Apparatus according to any one of claims 1 to 15, wherein the substrate and cover layer are coupled using at least one of:

a) adhesive coupling;

b) thermal coupling;

c) mechanical coupling;

d) plasma coupling;

e) covalent/chemical coupling;

f) electrostatic coupling; and,

g) magnetic coupling.

17) Apparatus according to any one of claims 1 to 16, wherein at least the wells are coated.

18) Apparatus according to claim 17, wherein the coatings include at least one of:

a) a promoter;

b) an inhibitor;

c) a growth factor;

d) a clotting factor;

e) a hormone;

f) a signalling agent;

g) chemical compositions;

h) a drug;

i) a protein;

j) a ligand;

k) an antibody;

l) an organism;

m) cells;

n) mini-cells;

o) synthetic cells;

p) a liposome;

q) a micelle;

r) a polymeric micelle (polymersome)

s) a lipid;

t) a polymer;

u) a surfactant;

v) a fatty acid;

w) an ionic solution;

x) an acidic or basic solution;

y) a detection reagent;

z) a DNA molecule;

aa) an RNA molecule;

bb) a construct encoding a DNA or RNA sequence;

cc) a nucleotide;

dd) a nucleoside;

ee) a polypeptide;

ff) an amino acid;

gg) a viral particle;

hh) a plasmid;

ii) a nanoparticle;

jj) a microparticle;

kk) a magnetic particle;

ll) conditioned medium;

mm) a fraction purified from conditioned medium;

nn) a natural extract;

oo) a culture medium component;

pp) a cell culture additive;

qq) a carbohydrate;

rr) a vitamin;

ss) a metabolite;

tt) an oligonucleotide;

uu) a fusion protein;

vv) a proteoglycan; and,

ww) a pathogen.

19) Apparatus according to any one of claims 1 to 18, wherein the apparatus is for monitoring at least one of:

a) response to agents;

b) cell growth;

c) cell differentiation;

d) cell viability;

e) cell morphology;

f) cell signalling;

g) protein translocation;

h) cell antigen presentation;

i) DNA synthesis;

j) cell genome;

k) cell transcriptome;

l) cell proteome;

m) cell metabolism;

n) cell electrophysiological function;

o) cell physiological function;

p) phagocytosis;

q) endocytosis;

r) gene expression;

s) protein expression;

t) carbohydrate expression;

u) biomolecular interactions;

v) receptor binding;

w) cell binding of a detection agent;

x) cell uptake of a modulation agent;

y) Cell migration;

z) Cell population organisation;

aa) Cell adhesion;

bb) Cell-cell interactions;

cc) Lipid expression;

dd) RNA synthesis; and,

ee) Tissue formation.

20) A method for use of an apparatus according to any one of claims 1 to 19 for exposing the substance to different conditions allowing a response of the substance to the conditions to be determined, wherein the first inlets and second inlets of the plurality of inlet sets receive respective first and second fluids, wherein each inlet set receives a respective first fluid, wherein one or more of the fluids are selectively supplied to each well channel via the channels, and wherein the fluids received by inlets of the second layer are supplied to channels in the first layer via channels in the second layer.

21) A method according to claim 20, wherein, for each inlet set, the first fluid includes a factor and the second fluid includes a buffer so that different well channels receive different concentrations of the factor.

22) A method according to claim 21, wherein each inlet set receives a respective factor, and wherein:

a) a first inlet set receives a first factor and a buffer;

b) a second inlet set receives a second factor and a buffer; and,

c) a third inlet set receives a third factor and a buffer, and wherein each well channel receives a respective concentration of each of the first, second and third factors.

23) A method according to claim 22, wherein the fluids from one inlet set are combined by mixing with the fluids of a subsequent inlet set, thereby combining the respective fluids.

24) A method according to any one of claims 20 to 23, wherein at least one fluid includes an agent.

25) A method according to claim 24, wherein the agent includes at least one of:

a) a promoter;

b) an inhibitor;

c) a growth factor;

d) a clotting factor;

e) a hormone;

f) a signalling agent;

g) chemical compositions;

h) a drug;

i) a protein;

j) a ligand;

k) an antibody;

l) an organism;

m) cells;

n) mini-cells;

o) synthetic cells;

p) a liposome;

q) a micelle;

r) a polymeric micelle (polymersome)

s) a lipid;

t) a polymer;

u) a surfactant;

v) a fatty acid;

w) an ionic solution;

x) an acidic or basic solution;

y) a detection reagent;

z) a DNA molecule;

aa) an RNA molecule;

bb) a construct encoding a DNA or RNA sequence;

cc) a nucleotide;

dd) a nucleoside;

ee) a polypeptide;

ff) an amino acid;

gg) a viral particle;

hh) a plasmid;

ii) a nanoparticle;

jj) a microparticle;

kk) a magnetic particle;

ll) conditioned medium;

mm) a fraction purified from conditioned medium;

nn) a natural extract;

oo) a culture medium component;

pp) a cell culture additive;

qq) a carbohydrate;

rr) a vitamin;

ss) a metabolite;

tt) an oligonucleotide;

uu) a fusion protein;

vv) a proteoglycan; and,

ww) a pathogen.

26) A method according to any one of claims 20 to 25, wherein the substance includes at least one of:

a) a promoter;

b) an inhibitor;

c) a growth factor;

d) a clotting factor;

e) a hormone;

f) a signalling agent;

g) chemical compositions;

h) a drug;

i) a protein;

j) a ligand;

k) an antibody;

l) an organism;

m) cells;

n) mini-cells;

o) synthetic cells;

p) a liposome;

q) a micelle;

r) a polymeric micelle (polymersome)

s) a lipid;

t) a polymer;

u) a surfactant;

v) a fatty acid;

w) an ionic solution;

x) an acidic or basic solution;

y) a detection reagent;

z) a DNA molecule;

aa) an RNA molecule;

bb) a construct encoding a DNA or RNA sequence;

cc) a nucleotide;

dd) a nucleoside;

ee) a polypeptide;

ff) an amino acid;

gg) a viral particle;

hh) a plasmid;

ii) a nanoparticle;

jj) a microparticle;

kk) a magnetic particle;

ll) conditioned medium;

mm) a fraction purified from conditioned medium;

nn) a natural extract;

oo) a culture medium component;

pp) a cell culture additive;

qq) a carbohydrate;

rr) a vitamin;

ss) a metabolite;

tt) an oligonucleotide;

uu) a fusion protein;

vv) a proteoglycan; and,

ww) a pathogen.