CLAIM

We claim:

1. A micro-fluidic device comprising:

an electrode activation substrate comprising dielectrophoresis (DEP) electrodes at a surface of said substrate, wherein each said electrode is configured to be selectively activated and deactivated;

a micro-fluidic structure that, with said surface of said substrate, defines a micro-fluidic channel;

isolation pens disposed in said channel; and

capture objects sized to be placed in one of said isolation pens, each said capture object comprising a capture material that has at least a two times greater specificity for a particular type of nucleic acid material than other types of nucleic acid material.

2. The device of claim 1 further comprising lysing means for lysing biological cells in said isolation pens.

3. The device of claim 1 or 2, wherein activated ones of said electrodes generate sufficient DEP forces to trap a biological cell in said channel adjacent to said activated ones of said electrodes.

4. The device of any one of claims 1 to 3, wherein said electrodes are virtual electrodes on said surface of said substrate.

5. The device of any one of claims 1 to 3, wherein each said electrode comprises a fixed electrically conductive terminal at said surface of said substrate.

6. The device of any one of claims 1 to 3, wherein each said electrode is selectively activated and deactivated in response to a changing pattern of light directed onto said surface of said substrate.

7. The device of any one of claims 1 to 6, wherein each of said capture object comprises an identifier that uniquely identifies said capture object from every other one of said capture objects.

CLAIMS:

1. A micro-fluidic device comprising:

an electrode activation substrate comprising dielectrophoresis (DEP) electrodes at a surface of said substrate, wherein each said electrode is configured to be selectively activated and deactivated;

a micro-fluidic structure that, with said surface of said substrate, defines a micro-fluidic channel; and

a plurality of isolation pens opening to said channel, each isolation pen opening to a channel of said micro-fluidic device, and further wherein each isolation pen comprises:

an opening configured to permit exchange of a first liquid medium in said pen with a second liquid medium flowing past said opening in said channel by diffusion, and

an enclosure comprising an interior space of said isolation pen sufficiently enclosed to prevent biological cell or capture objects in said interior space from mixing with biological cell or capture objects in an interior space of another isolation pen of said plurality of isolation pens,

wherein the capture objects are sized to be placed in one of said isolation pens, and each said capture object comprise a capture material that has at least a two times greater specificity for a particular type of nucleic acid material than other types of nucleic acid material.

2. The device of claim 1, further comprising lysing means for lysing biological cells in said isolation pens.

3 The device of claim 1 or claim 2, wherein activated ones of said electrodes generate sufficient DEP forces to trap a biological cell in said channel adjacent to said activated ones of said electrodes.

4. The device of any one of claims 1 to 3, wherein said electrodes are virtual electrodes on said surface of said substrate; or, wherein each of said electrodes comprises a fixed electrically conductive terminal at said surface of said substrate.

5. The device of any one of claims 1 to 4, wherein each of said electrodes is selectively activated and deactivated in response to a changing pattern of light directed onto said surface of said substrate.

6 The device of any one of claims 1 to 5, wherein each of said capture objects comprises an identifier that uniquely identifies said capture object from every other one of said capture objects.

7. The device of any one of claims 1 to 6, further comprising a blocking object disposed substantially in an opening of said isolation pen, wherein said blocking object is configured to capture nucleic acid material.

8. A controller for controlling a micro-fluidic device comprising isolation pens each sized to contain a biological cell and a capture object configured to capture nucleic acid from said biological cell, said controller comprising:

selecting/moving means for selecting individual ones of biological cells in said micro-fluidic device and moving said selected ones of said cells into said isolation pens;

a control module configured to control lysing of said biological cells in said isolation pens; and

correlation means for generating a correlation record correlating each one of a plurality of said capture objects in said isolation pens with a corresponding one of biological cells in said isolation pens from which nucleic acid material captured by said one of said capture objects originated.

9. The controller of claim 8, wherein said correlation record correlates each one of said capture objects with a clonal colony of cells from which said corresponding one of said cells originated.

10. The controller of claim 8 or 9, wherein said selecting/moving means is part of a dielectrophoresis (DEP) device for generating DEP forces in said device that selectively trap any desired one of said biological cells in said device.

11. The controller of claim 8 or 9, wherein said selecting/moving means comprises an optoelectronic tweezers device; or, wherein said selecting/moving means comprises an OEW device.

12. The controller of claim 8 or 9, wherein the selecting/moving means is configured for creating an individual light trap trapping said individual cell by projecting a light pattern into a common space inside said micro-fluidic device.

13. The controller of claim 12, wherein the selecting/moving means is configured for moving said individual light trap from said common space into said isolation pen.

14. The controller of any one of claims 8 to 13, wherein the controller is programmed to analyze images of said biological cells for identifying individual biological cells having a particular characteristic.

15. The controller of any one of claims 8 to 14, wherein said control module configured to control lysing is configured for:

flowing a lysing reagent through a channel in said micro-fluidic device in which said isolation pen is located,

directing a beam of electromagnetic energy at said individual cell,

electroporating said individual cell,

changing a temperature of said individual cell sufficiently to lyse said individual cell, or

applying sufficient acoustic energy to said individual cell to lyse said individual cell.