While the invention has been particularly shown and described above with reference to several preferred embodiments and variations thereon, it is to be understood that additional variations could be made in the invention by those skilled in the art while still remaining within the spirit and scope of the invention, and that the invention is intended to include any such variations, being limited only by the scope of the appended claims.

What is claimed is:

1. A cell sorting apparatus for manipulation of cells comprising:

an array of geometric sites arranged across a substrate in a defined pattern, each site being dimensioned and configured to hold a single cell, wherein each site includes a capture mechanism comprising a well that is capable of selectively capturing the single cell, and further wherein each site includes a release mechanism comprising an actuator disposed within a chamber attached to the well for selectively releasing the single cell from the site.

2. The apparatus of claim **1**, wherein each site has a unique address and is independently controllable with respect to another site.

3. The apparatus of claim **1**, wherein each well is sized and shaped to hold only the single cell.

4. The apparatus of claim **1**, wherein the well has an inner diameter ranging from about 10 to 50 microns.

5. The apparatus of claim **1**, wherein each well is connected by a narrow channel to the chamber.

6. The apparatus of claim **5**, wherein the narrow channel has a width of about 5 to 8 microns.

7. The apparatus of claim **1**, wherein the actuator comprises a heating element.

8. The apparatus of claim **7**, wherein the heating element is configured to induces bubble nucleation sufficient to create a volume expansion within the chamber to eject the cell out of the well.

9. The apparatus of claim **8**, wherein the heating element comprises two wide low-resistance lines connected by a high-impedance line resistor.

10. The apparatus of claim **8**, wherein the wide low-resistance lines are about 12 mm long and about 1.5 mm wide.

11. The apparatus of claim **10**, wherein the total resistance of each line is about 7.7 Ohms.

12. The apparatus of claim **11**, wherein a surface temperature of the heating element is above a superheat limit of a liquid inside the chamber to induce bubble nucleation.

13. The apparatus of claim **9**, wherein the resistor is formed from platinum.

14. The apparatus of claim **13**, wherein the resistor is about 3–6 microns wide, and about 500–3000 microns long.

15. The apparatus of claim **14**, wherein the resistor has a roughened surface to induce bubble nucleation.

16. The apparatus of claim **15**, wherein a surface temperature of the resistor is sufficient to induce bubble nucleation.

17. The apparatus of claim **16**, wherein the surface temperature of the resistor is about 100° C. to about 280° C.

18. The apparatus of claim **13**, wherein the resistor contains at least one hole for inducing bubble nucleation therein.

19. The apparatus of claim **8**, wherein the bubble is about 200 microns in diameter.

20. Method of making a cell sorting apparatus, comprising the steps of:

forming a well on one surface of a first substrate, the well being configured and dimensioned to hold a single cell;

forming a chamber on an opposite surface of the first substrate;

forming a channel in the first substrate to connect the well and chamber together and permit fluid communication there between;

forming a heating element on a second substrate;

positioning the heating element under the chamber; and

attaching the first substrate onto the second substrate such that the second substrate forms the bottom of the chamber.

21. The method of claim **20**, wherein the steps of forming the well, channel and chamber further comprise etching the first substrate.

22. The method of claim **21**, wherein the first substrate comprises a silicon wafer.

23. The method of claim **21**, wherein the steps of etching further comprise:

growing thermal oxide onto a first surface of a the silicon wafer substrate;

patterning the oxide using a first mask that defines the shape of the well;

spinning photoresist on top of the oxide;

patterning the oxide using a second mask that defines the shape of the channel;

etching the wafer to form the channel using the second mask;

etching the wafer to form the well using the first mask;

depositing photoresist on an opposite surface of the silicon wafer substrate;

patterning the photoresist using a third mask that defines the shape of the chamber; and

etching the wafer to form the chamber, the chamber having sufficient depth to connect with the channel.

24. The method of claim **20**, wherein the step of forming the heating element comprises:

spinning photoresist onto the second substrate;

patterning the photoresist with a mask that defines the shape of a heating element;

selectively removing the photoresist to expose a region of the second substrate in the shape of the heating element; and

depositing a metallic conductor on the exposed region.

25. The method of claim **24**, wherein the step of depositing a metallic conductor further comprises:

evaporating at least one metal onto the second substrate; and

selectively removing the metal from the substrate.

26. The method of claim **25**, wherein the step of selectively removing the metal further comprises treating the substrate with acetone to remove excess photoresist and metal deposited on the photoresist.

27. The method of claim **20**, wherein the second substrate comprises glass.

28. The method of claim **20**, wherein the step of attaching the first substrate onto the second substrate further comprises joining the first and second substrates together with an adhesive.