What is claimed is:

1. A method of controlling a needle actuator to interact with a cell, the method comprising:

providing an actuator comprising a tower, a stage and a needle, wherein the needle is mounted on the stage;

applying an electrostatic potential between the tower and the stage so as to move the stage closer to the tower to retract the needle;

moving the actuator towards the cell;

reducing the electrostatic potential so as to allow the stage and needle to move towards the cell;

applying calibration data to detect when the needle has pierced the cell; and

reducing the electrostatic potential further once it has been detected that the needle has pierced the cell.

2. The method of Claim 1, wherein the cell is a biological cell.

3. The method of Claim 1, wherein the needle is a micro-needle and the stage is a micro-stage.

4. The method of Claim 1, wherein the cell is held by a cell trap.

~~5. The method of Claim 1, further comprising~~

~~applying an electrostatic potential between the tower and the stage to retract the needle towards the stage.~~

~~6~~ 5. The method of Claim 1, ~~further comprising~~wherein the reducing of the electrostatic potential further is performed ~~to allow the stage and needle to move towards the cell~~ while monitoring ~~the potential and displacement of the stage to detect~~ a fluctuation in voltage versus displacement values that ~~to~~ indicates that the needle has pierced the cell.

~~7~~ 6. The method of Claim 1, wherein the calibration data comprises data defining voltages for displacements stored against types of cells.

~~8~~ 7. The method of Claim 1, wherein the actuator is provided on an array of actuators, each interacting with an individual cell of a plurality of cells.

~~9~~ 8. The method of Claim 4, wherein the cell trap comprises a plurality of microchambers, each microchamber arranged to hold a cell.

~~10~~ 9. The method of Claim ~~6~~ 5, wherein a laser interferometer is used to indicate that the needle has pierced the cell.

~~11~~ 10.A method of generating calibration data for target voltage potentials associated with cell-type data, the method comprising:

providing a calibration apparatus comprising a manipulator and a cell trap, the manipulator comprising a tower, a stage, and a needle, wherein the needle is mounted on the stage;

identifying a cell type to be calibrated;

applying a voltage, thereby providing a change in electrostatic force between the tower and the stage so as to pull the stage towards the tower in a retracted position;

moving the manipulator to within a defined range of the cell trap configured to house the cell type;

changing the voltage to allow the stage and mounted needle to be forced away from the tower and the retracted position while measuring the displacement of the stage;

determining when the needle has reached a target region; and

recording actuation data for use in cell injection for the identified cell type.

~~12~~ 11.The method of Claim ~~11~~ 10, further comprising:

receiving a user input of the cell type to a controller provided on the calibration apparatus.

~~13. The method of Claim 11, further comprising:~~

~~applying a voltage to an actuator provided on the calibration apparatus,~~

~~so as to pull the stage towards the tower in a retracted position.~~

~~14~~ 12.The method of Claim ~~11~~ 10, further comprising:

~~moving the manipulator to within the defined range of the cell trap,~~ ~~wherein~~ determining if the manipulator is within the defined range using a camera provided on the calibration apparatus when moving the manipulator to within the defined range of the cell trap ~~is programmed to determine if the manipulator is within the defined range~~.

~~15~~ 13.The method of Claim ~~14~~ 12, wherein the camera on the calibration apparatus is programmed to determine if the manipulator is within ~~the~~ a defined range of a periphery of the cell trap.

~~16. The method of Claim 11, further comprising~~

~~reducing the voltage to allow the stage and mounted needle to be forced away from the tower and the retracted position while measuring the displacement of the stage.~~

~~17~~ 14.The method of Claim ~~16~~ 10, wherein measuring the displacement of the stage is performed by a laser interferometer provided in the calibration apparatus.

~~18~~ 15.The method of Claim ~~11~~ 10, wherein the actuation data is selected from a group consisting of a record target voltage, a target vertical actuation displacement, a point of penetration, a point of poking, a Voltage-Displacement characteristic curve distortion, and combinations thereof.

~~19~~ 16.A non-transitory computer-readable medium in which a program is stored for causing a computer to perform a method for generating calibration data for target voltage potentials associated with cell-type data, the method comprising:

providing a calibration apparatus comprising a manipulator and a cell trap, the manipulator comprising a tower, a stage, and a needle, wherein the needle is mounted on the stage;

identifying a cell type to be calibrated;

providing an electrostatic force between the tower and the stage so as to pull the stage towards the tower in a retracted position;

moving the manipulator to within a defined range of the cell trap configured to house the cell type;

changing the ~~voltage~~ electrostatic force to allow the stage and mounted needle to be forced away from the tower and the retracted position while measuring the displacement of the stage;

determining when the needle has reached a target region; and

recording actuation data for use in cell injection for the identified cell type.

~~20~~ 17.The non-transitory computer-readable medium ~~method~~ of Claim ~~19~~ 16, further comprising:

receiving a user input of the cell type to a controller provided on the calibration apparatus.

~~21. The method of Claim 19, further comprising~~

~~applying a voltage to an actuator provided on the calibration apparatus, so as to pull the stage towards the tower in a retracted position.~~

~~22~~ 18.The non-transitory computer-readable medium ~~method~~ of Claim ~~19~~ 16, further comprising:

~~moving the manipulator to within the defined range of the cell trap, wherein~~ determining if the manipulator is within the defined range using a camera provided on the calibration apparatus when moving the manipulator to within the defined range of the cell trap ~~is programmed to determine if the manipulator is within the defined range~~.

~~23~~ 19.The non-transitory computer-readable medium ~~method~~ of Claim ~~22~~ 18, wherein the camera on the calibration apparatus is programmed to determine if the manipulator is within ~~the~~ a defined range of a periphery of the cell trap.

~~24. The method of Claim 19, further comprising~~

~~reducing the voltage to allow the stage and mounted needle to be forced away from the tower and the retracted position while measuring the displacement of the stage.~~

~~25~~ 20.The non-transitory computer-readable medium ~~method~~ of Claim ~~24~~ 16, wherein measuring the displacement of the stage is performed by a laser interferometer provided in the calibration apparatus.

~~26~~ 21.The non-transitory computer-readable medium ~~method~~ of Claim ~~19~~ 16, wherein the actuation data is selected from a group consisting of a record target voltage, a target vertical actuation displacement, a point of penetration, a point of poking, a Voltage-Displacement characteristic curve distortion, and combinations thereof.

~~27~~ 22.A method for controlling a cell injection device, the method comprising:

providing an apparatus comprising a cell injection device, a cell trap, and a storage device, the cell injection device comprising a tower, a stage, and a needle, wherein the needle is mounted on the stage;

identifying a cell type to be injected;

retrieving actuation data from the storage device;

applying a voltage, thereby providing an electrostatic force between the tower and the stage so as to pull the stage towards the tower in a retracted position;

moving the cell injection device to within a defined range of the cell trap configured to house the cell type;

applying a varying target actuation voltage based on retrieved actuation data to allow the stage and mounted needle to be forced away from the tower and the retracted position;

determining when the needle has reached a target region; and

adjusting the voltage to move the needle towards the retracted position.

~~28~~ 23.The method of Claim ~~27~~ 22, further comprising:

receiving a user input of the cell type to a controller provided on the apparatus.

~~29. The method of Claim 27, further comprising~~

~~applying a voltage to an actuator provided on the injection device, so as~~

~~to pull the stage towards the tower in a retracted position.~~

~~30~~ 24.The method of Claim ~~27~~ 22, further comprising:

~~moving the injection device to within the defined range of the cell trap, wherein~~ determining if the cell injection device is within the defined range using a camera provided on the apparatus when moving the cell injection device to within the defined range of the cell trap~~is programmed to determine if the injection device is within the defined range~~.

~~31~~ 25.The method of Claim ~~30~~ 24, wherein the camera on the apparatus is programmed to determine if the injection device is within ~~the~~ a defined range of a periphery of the cell trap.

~~32~~ 26.The method of Claim ~~27~~ 22, wherein the actuation data is selected from a group consisting of a record target voltage, a target vertical actuation displacement, a point of penetration, a point of poking, a Voltage-Displacement characteristic curve distortion, and combinations thereof.

~~33~~ 27.A non-transitory computer-readable medium in which a program is stored for causing a computer to perform a method for controlling a cell injection device, the method comprising:

providing an apparatus comprising a cell injection device, a cell trap, and a storage device, the cell injection device comprising a tower, a stage, and a needle, wherein the needle is mounted on the stage;

identifying a cell type to be injected;

retrieving actuation data from the storage device;

providing an electrostatic force between the tower and the stage so as to pull the stage towards the tower in a retracted position;

moving the cell injection device to within a defined range of the cell trap configured to house the cell type;

applying a varying target actuation voltage based on retrieved actuation data to allow the stage and mounted needle to be forced away from the tower and the retracted position;

determining when the needle has reached a target region; and

adjusting the electrostatic force ~~voltage~~ to move the needle

towards the retracted position.

~~34~~ 28.The non-transitory computer-readable medium ~~method~~ of Claim ~~33~~ 27, further comprising:

receiving a user input of the cell type to a controller provided on the apparatus.

~~35. The method of Claim 33, further comprising~~

~~applying a voltage to an actuator provided on the injection device, so as to pull the stage towards the tower in a retracted position.~~

~~36~~ 29.The non-transitory computer-readable medium ~~method~~ of Claim ~~33~~ 27, further comprising:

~~moving the injection device to within the defined range of the cell trap, wherein~~ determining if the cell injection device is within the defined range using a camera provided on the apparatus when moving the cell injection device to within the defined range of the cell trap~~is programmed to determine if the injection device is within the defined range~~.

~~37~~ 30.The non-transitory computer-readable medium ~~method~~ of Claim ~~36~~ 29, wherein the camera on the apparatus is programmed to determine if the injection device is within ~~the~~ a defined range of a periphery of the cell trap.

~~38~~ 31.The non-transitory computer-readable medium ~~method~~ of Claim ~~33~~ 27, wherein the actuation data is selected from a group consisting of a record target voltage, a target vertical actuation displacement, a point of penetration, a point of poking, a Voltage-Displacement characteristic curve distortion, and combinations thereof.