CLAIMS

1. A device comprising:

a substrate comprising a plurality of channels configured to transport one or more substances and a collimated light source capable of interacting with the one or more substances, wherein the plurality of channels comprises:

a first channel oriented vertically upwards with respect to gravity within the substrate,

a second channel in operable communication with the first channel and oriented horizontally within the substrate,

a third channel in operable communication with the second channel and oriented vertically upwards with respect to gravity within the substrate, and

a fourth channel in operable communication with the third channel and oriented horizontally within the substrate;

wherein the first, second, third and fourth channels are oriented in such a manner as to provide a path for movement of the one or more substances through the substrate from the first channel to the second channel to the third channel to the fourth channel,

wherein the device is arranged for the one or more substances to be injected into the first channel disposed vertically upwards with respect to gravity within the substrate through a bottom horizontal planar surface having an opening to the first channel, in a vertical direction to maintain directional and volumetric continuity with the first channel.

2. The device of claim 1, , wherein the bottom horizontal planar surface has at least one shorter length from one edge to another edge compared to at least one length from one edge to another edge on a vertical planar surface of the substrate.

3. The device of claim 1, wherein the bottom horizontal planar surface has a smaller or equal surface area compared to a surface area on a vertical planar surface of the substrate.

4. The device of claim 1, wherein the first channel comprises an opening disposed at an exterior surface of the substrate and in such a manner as to provide a path for the one or more substances to enter vertically into the substrate and to move vertically within the first channel.

5. The device of claim 1, wherein a cross section of the first channel and a cross section of the opening have the same area, a smaller area, or a larger area.

6. The device of claim 1, wherein the first channel and the opening are shaped, sized and oriented in a manner to maintain directional and volumetric continuity.

7. The device of claim 1 wherein the collimated light source is oriented to interact with particles or cells in the fourth channel.

8. The device of claim 1, wherein the collimated light source is oriented to propagate in the direction of, opposite the direction of, orthogonal to the direction of, or diagonal to the movement of the one or more substances in the fourth channel.

9. The device of claim 1, wherein the fourth channel allows for imaging and analysis of particles or cells in multiple focal planes.

10. The device of claim 1, wherein the fourth channel allows for imaging and analysis of particles or cells in multiple focal planes during movement of the one or more substances.

11. The device of claim 1, wherein the fourth channel allows for imaging and analysis of particles or cells during movement of the one or more substances.

12. The device of claim 1, wherein the fourth channel allows for imaging and analysis of particles or cells during movement of the one or more substances and from multiple angles and/or orientations.

13. The device of claim 1, wherein the fourth channel allows for imaging and analysis of particles or cells during movement of the one or more substances and from multiple focal planes, angles, and/or orientations by one or more imaging devices.

14. The device of claim 1, arranged for one or more of an electrical force, an optical force, and/or a fluidic force to move cell(s) or particle(s) in one or more channels.

15. The device of claim 1, arranged for one or more of an electrokinetic force, an electrophoretic force, and/or a dielectrophoretic (DEP) force to move cell(s) or particle(s) in one or more channels.

16. The device of claim 1, further comprising one or more imaging device, wherein at least one of the imaging devices is capable of being moved in a manner to change the focal plane being imaged in the fourth channel.

17. The device of claim 1, wherein cell(s) or particle(s) in the fourth channel are capable of being moved by a change in optical and/or fluidic forces, and the region of the cell being imaged in the fourth channel is changed as the particle moves.

18. The device of claim 1, wherein the fourth channel is located at a distance from two or more outer surfaces of the substrate allowing for imaging and analysis of multiple image slices of a cell or a particle as a focal plane moves relative to the cell or particle.

19. The device of claim 1, wherein the fourth channel is located at a distance from two or more outer surfaces of the substrate allowing for imaging and analysis of multiple image slices of a moving cell or a particle as it moves through a focal plane.

20. The device of claim 1, wherein the fourth channel is located at a distance from two or more outer surfaces of the substrate allowing for imaging and analysis of multiple image slices of a suspended or static cell or particle.

21. The device of claim 1, wherein the one or more substances is/are capable of being moved by pressure, vacuum, peristalsis, electrokinetic force, electrophoretic force, magnetic force, optical force, or any combination thereof.

22. The device of claim 1 further comprising a dichroic mirror to direct light to or away from an imaging device imaging and/or analyzing cells or particles in the fourth channel.

23. The device of claim 1 further comprising a dichroic mirror to direct a collimated or focused light source to interact with cells or particles in the fourth channel.

24. The device of claim 1 further comprising a dichroic mirror to direct a collimated or focused light source away from an imaging device, another light source, or another part of the device.

25. The device of claim 1, wherein the plurality of channels comprises a fifth channel disposed horizontally, vertically, or diagonally within the substrate.

26. The device of claim 1, wherein the plurality of channels comprises a fifth channel, which splits into two or more channels or wells to sort cells or particles.

27. The device of claim 1, wherein the fourth channel is located closer to the top of the substrate than either the first channel, the second channel, or the third channel.

28. The device of claim 1, wherein the fourth channel is located from 100 microns to 100 mm from the top of the substrate.

29. The device of claim 1, wherein the first channel ranges from 0.1 mm to 100.0 mm in length.

30. The device of claim 1, wherein the second channel ranges from 0.1 mm to 100.0 mm in length.

31. The device of claim 1, wherein the third channel ranges from 0.05 mm to 100.0 mm in length.

32. The device of claim 1, wherein the fourth channel ranges from 0.1 mm to 100.0 mm in length.

33. The device of claim 1, wherein the first channel is greater in length than the second channel, the third channel, or the fourth channel.

34. The device of claim 1 further comprising a cell or particle interrogation unit.

35. The device of claim 1 further comprising a cell or particle collection channel.

36. The device of claim 1 further comprising an imaging device selected from at least one of a bright field imager, a light scatter detector, a single wavelength fluorescent detector, a spectroscopic fluorescent detector, a CCD camera, a CMOS camera, a photodiode, a photodiode array (PDA), a spectrometer, a photomultiplier tube or tube array, a photodiode array, a chemiluminescent detector, a bioluminescent detector, a standard Raman spectroscopy detection system, surface enhanced Raman spectroscopy (SERS), coherent antistokes Raman spectroscopy (CARS), and/or coherent stokes Raman spectroscopy (CSRS).

37. The device of claim 1 further comprising a tube end arranged for injecting the one or more substances into an opening disposed at an exterior surface of the substrate and in such a manner as to provide a path for the one or more substances to enter into the substrate and to move within the first channel, wherein a cross section of the opening has an equal, larger, or smaller area than a cross section of the tube end.