WHAT IS CLAIMED IS:

1. A system for the detection and measurement of spectroscopic properties of light from a sample, wherein the system comprises:

a microfluidic housing having a microfluidic channel, the microfluidic channel configured to accommodate a scalable fluid flow of sample;

an optical train comprising a dispersing element; and

an image sensor,

wherein the light from the fluid flow of sample in the microfluidic channel is spectrally dispersed by the dispersing element and the spectroscopic properties of light are measured over time on the image sensor as a function of relative motion between the sample and the image sensor, further wherein superimposed measurements of light are mathematically decomponented to determine the identity and concentration of multiple constituents in the sample.

2. A system according to claim 1, wherein the light is selected from the group comprising ~~comprises~~ light scattered from a sample following illumination of a sample, light emitted as chemiluminescence by a chemical process within a sample, light transmitted through a sample as a result of selective absorption of light following direction of a broadband light source at the sample, light emitted as fluorescence following excitation of a sample, and wherein the sample comprises one or more fluorescent label, or a combination thereof.

~~3. A system according to claim 1, wherein the light comprises light emitted as chemiluminescence by a chemical process within a sample.~~

~~4. A system according to claim 1, wherein the light comprises light transmitted through a sample as a result of selective absorption of light following direction of a broadband light source at the sample.~~

~~5. A system according to claim 1, wherein the light comprises light emitted as fluorescence following excitation of a sample, and wherein the sample comprises one or more fluorescent label.~~

6~~2~~3. A system according to claim 5~~2~~, wherein the sample is excited by a light source, wherein the light source is selected from the group comprising: a laser, a light-emitting diode (LED), an arc lamp, a high intensity light bulb, or a combination thereof.

~~7. A system according to claim 6, wherein the light source comprises a laser.~~

~~8. A system according to claim 6, wherein the light source comprises a light-emitting diode (LED).~~

~~9. A system according to claim 6, wherein the light source comprises an arc lamp.~~

~~10. A system according to claim 6, wherein the light source comprises a high intensity light bulb.~~

~~11~~4. A system according to claim 1, wherein the sample comprises either or both of a single-phase flow and a droplet.

~~12~~5. A system according to claim 1, wherein the sample comprises a discrete target, a discrete target comprising a bead, a discrete target comprising a cell, or a combination thereof.

~~13. A system according to claim 12 wherein the discrete target comprises a bead.~~

~~14. A system according to claim 12, wherein the discrete target comprises a cell.~~

~~15. A system according to claim 1, wherein the sample comprises a droplet.~~

~~16~~6. A system according to claim 1, wherein the sample is present within an emulsion.

~~17~~7. A system according to claim ~~16~~6, wherein the sample is present within an emulsion within a microfluidic device.

~~18~~8. A system according to claim 1, wherein the spectroscopic properties of light comprise wavelength and/or intensity.

~~19~~9. A system according to claim 1, wherein the image sensor ~~comprises~~ is selected from the group comprising: a single monochrome light sensor, a pixel array of light sensors, a pixel array of light sensors in one dimension (a line), a pixel array of light sensors in two dimensions (a grid), a Time Delay Integration (TDI) sensor, or a combination thereof.

~~20. A system according to claim 1, wherein the image sensor comprises a pixel array of light sensors.~~

~~21. A system according to claim 20, wherein the pixel array of light sensors is in one dimension (a line).~~

~~22. A system according to claim 20, wherein the pixel array of light sensors is in two dimensions (a grid).~~

~~23. A system according to claim 1, wherein the image sensor comprises a Time Delay Integration (TDI) sensor.~~

~~24~~10. A system according to claim 1, wherein the dispersing element ~~comprises~~ is selected from the group comprising: a diffraction grating, a plane transmission grating, a plane reflection grating, a dispersive prism, or a zero- deviation (direct view) prism device.

~~25. A system according to claim 24, wherein the diffraction grating comprises a plane transmission grating.~~

~~26. A system according to claim 24, wherein the diffraction grating comprises a plane reflection grating.~~

~~27. A system according to claim 1, wherein the dispersing element comprises a dispersive prism.~~

~~28. A system according to claim 1, wherein the dispersing element comprises a zero-deviation (direct view) prism device.~~

~~29~~11. A system for the scalable detection and measurement of spectroscopic properties of light from each sample present among multiple samples, simultaneously, wherein the system comprises:

a microfluidic housing having a plurality of microfluidic channels, the microfluidic channels configured to accommodate a fluid flow of sample;

an optical train comprising a dispersing element; and

an image sensor,

wherein the light from each fluid flow of sample in each microfluidic channel is spectrally dispersed by the dispersing element and the spectroscopic properties of light are measured over time on the image sensor as a function of relative motion between each particular sample and the image sensor, further wherein superimposed measurements of light are mathematically decomponented to determine the identity and concentration of multiple constituents in the sample.

~~30~~12. A system according to claim ~~29~~11, wherein the light ~~comprises~~ is selected from the group comprising light scattered from a sample following illumination of the sample, light emitted as chemiluminescence by a chemical process within a sample, light transmitted through a sample as a result of selective absorption of light following direction of a broadband light source at the sample, light emitted as fluorescence following excitation of a sample, and wherein the sample comprises one or more fluorescent label, or a combination thereof.

~~31. A system according to claim 29, wherein the light comprises light emitted as chemiluminescence by a chemical process within a sample.~~

~~32. A system according to claim 29, wherein the light comprises light transmitted through a sample as a result of selective absorption of light following direction of a broadband light source at the sample.~~

~~33. A system according to claim 29, wherein the light comprises light emitted as fluorescence following excitation of a sample, and wherein the sample comprises one or more fluorescent label.~~

~~34~~13. A system according to claim ~~33~~12, wherein the sample is excited by a light source, wherein the light source is selected from the group comprising: a laser, a light-emitting diode (LED), an arc lamp, a high intensity light bulb, or a combination thereof.

~~35. A system according to claim 34, wherein the light source comprises a laser.~~

~~36. A system according to claim 34, wherein the light source comprises a light-emitting diode (LED).~~

~~37. A system according to claim 34, wherein the light source comprises an arc lamp.~~

~~38. A system according to claim 34, wherein the light source comprises a high intensity light bulb.~~

~~39~~14. A system according to claim ~~29~~11, wherein each of the multiple samples comprises either or both of a single-phase flow and a droplet.

~~40~~15. A system according to claim ~~29~~11, wherein each of the multiple samples comprises a discrete target, a discrete target comprising a bead, a discrete target comprising a cell, or a combination thereof.

~~41. A system according to claim 40, wherein the discrete target comprises a bead.~~

~~42. A system according to claim 40, wherein the discrete target comprises a cell.~~

~~43. A system according to claim 29, wherein each of the multiple samples comprises a droplet.~~

4416. A system according to claim 2911, wherein the multiple samples are present within an emulsion.

4517. A system according to claim 4416, wherein the multiple samples are present within an emulsion within a microfluidic device.

4618. A system according to claim 2911, wherein the spectroscopic properties of light comprise wavelength and/or intensity.

4719. A system according to claim 2911, wherein the image sensor comprises is selected from the group comprising: a pixel array of light sensors, a pixel array of light sensors in one dimension (a line), a pixel array of light sensors in two dimensions (a grid), a Time Delay Integration (TDI) sensor, or a combination thereof.

48. A system according to claim 47, wherein the pixel array of light sensors is in one dimension (a line).

49. A system according to claim 47, wherein the pixel array of light sensors is in two dimensions (a grid).

50. A system according to claim 29, wherein the image sensor comprises a Time Delay Integration (TDI) sensor.

5120. A system according to claim 2911, wherein the dispersing element comprises is selected from the group comprising: a diffraction grating, a plane transmission grating, a plane reflection grating, a dispersive prism, or a zero- deviation (direct view) prism device.

52. A system according to claim 51, wherein the diffraction grating comprises a plane transmission grating.

53. A system according to claim 51, wherein the diffraction grating comprises a plane reflection grating.

54. A system according to claim 29, wherein the dispersing element comprises a dispersive prism.

55. A system according to claim 29, wherein the dispersing element comprises a zero-deviation (direct view) prism device.

5621. A method for the detection and measurement of spectroscopic properties of light, comprising the system according to any one of claims 1-5520.

5722. A kit for performing the method according to claim 5621.

23. A system according to claim 1, further comprising a monitor camera system that observes a flow of the sample, having a monitor light source system which illuminates the sample from an epi-illumination position.

24. A system according to claim 11, further comprising a monitor camera system that observes each flow of sample, having a monitor light source system which illuminates each sample from an epi-illumination position.

25. A system according to claim 23, wherein the sample is excited by the monitor light source system.

26. A system according to claim 24, wherein the sample is excited by the monitor light source system.

27. A system according to claim 1, wherein the monitor camera system is optionally strobed to image rapidly streaming droplets or particles.

28. A system according to claim 11, wherein the monitor camera system is optionally strobed to image rapidly streaming droplets or particles.

29. A system according to claim 9, wherein where the image sensor is a TDI sensor, measurements of light over time are superimposed on the TDI during successive periods of time.

30. A system according to claim 19, wherein where the image sensor is a TDI sensor, measurements of light over time are superimposed on the TDI during successive periods of time.

31. A system according to claim 11, wherein each of the multiple samples have an image extent projected onto a separate area of the image sensor.