CLAIMS

1. An apparatus for analysing a liquid sample comprising particles, comprising:

a first chamber and a second chamber wherein:

the first chamber is a sample chamber comprising:

a sample space for receiving the sample;

a light input for input of light into the first chamber for interaction with the sample; and

an exit aperture arranged for scattered and/or reflected light to pass from the first chamber;

the second chamber is a detection chamber comprising:

an input aperture for receiving light;

and a detector for detecting, or a detector aperture for receiving, light to be detected;

wherein the exit aperture of the first chamber and the input aperture of the second passage define a passage between the first chamber and the second chamber such that, in operation, light passes from the first chamber to the second chamber via the passage, and

wherein the first chamber and the second chamber provide at least one light integrating volume, and wherein the first chamber is configured such that in operation the liquid sample is present in the first chamber and isolated from the second chamber.

2. An apparatus according to claim 1, wherein at least one of a) or b):

a) the first chamber further comprises a light beam exit port aligned with the light input and optionally leading to a beam dump;

b) the light input comprises a light input aperture.

3. An apparatus according to claim 1 or 2, wherein the first chamber is a light integrating chamber and the second chamber is a light integrating chamber.

4. An apparatus according to any preceding claim, wherein the walls of the first chamber are reflective.

5. An apparatus according to any preceding claim, wherein the first chamber is configured to receive a removable sample cell for containing the sample

~~6. An apparatus according to claim 5, wherein the sample space is configured such that the removable sample cell substantially fills the sample space when inserted.~~

~~7. An apparatus according to claim 5 or 6, wherein the sample cell comprises at least one substantially opaque, reflective wall that includes at least one substantially transparent aperture arranged such that, when the sample cell is received in the first chamber the aperture or at least one of the apertures of the sample cell is aligned with the light input of the first chamber and/or such that the aperture or at least one of the apertures of the sample cell is aligned with the exit aperture of the first chamber.~~

~~8. An apparatus according to any preceding claim, wherein the light input and the exit aperture are arranged such that, in operation, at least some, optionally substantially all, of the light from the light input is reflected and/or scattered at least once before passing through the exit aperture.~~

~~9. An apparatus according to any preceding claim, wherein walls of the second chamber are reflective such that in operation at least some, optionally substantially all, of the light entering via the optical path undergoes at least one reflection before detection by the detector.~~

~~10. An apparatus according to any preceding claim, wherein the walls of the first chamber and/or the second chamber comprise a reflective material, optionally titanium oxide, aluminium, or silver.~~

~~11. An apparatus according to any preceding claim, wherein the walls of the first chamber and/or second chamber comprise a diffusive coating configured to produce diffuse light.~~

~~12. An apparatus according to any preceding claim, wherein the detector comprises a light receiving element.~~

~~13. An apparatus according to claim 12, wherein the arrangement of the optical path and the second chamber defines an optical axis from the input aperture to a point or region on a wall of the second chamber opposing the input aperture, and the light receiving element of the detector is located in an off-axis position with respect to said optical axis.~~

~~14. An apparatus according to any preceding claim, wherein the light input comprises, or is configured to receive light from a light source, optionally a laser and/or an LED.~~

~~15. An apparatus according to any preceding claim, wherein the light input comprises, or is configured to receive light from, a light source and the light source is configured to input light with a known modulation.~~

1~~6~~. A system for analysing a plurality of liquid samples comprising particles, the system comprising:

a plurality of sample chambers, a detection chamber and a coupling mechanism operable to rotate the sample chambers to place a sample chamber of the plurality of sample chambers into a coupled configuration with the detection chamber such that, in the coupled configuration, ~~the apparatus comprises~~ there is an optical path between said sample chamber and the detection chamber:

wherein each sample chamber comprises:

a sample space for receiving a sample of the plurality of liquid samples;

a light input for input of light into the sample chamber for interaction with the sample; and

an exit aperture arranged for the light to pass from the sample chamber via the optical path to the detection chamber when said sample chamber is in the coupled configuration with the detection chamber;

and the detection chamber comprises:

an input aperture for receiving light from the optical path when the sample chamber is in the coupled configuration with the detection chamber.

and a detector for detecting, or a detector aperture for receiving, light to be detected;

wherein said sample chamber and the detection chamber comprise at least one light integrating volume, and wherein the sample chamber is configured such that in operation the liquid sample is present in the sample chamber and isolated from the detection chamber.

~~17~~2. A system as claimed in claim 1~~6~~, wherein the coupling mechanism is operable to sequentially place each sample chamber into the coupling configuration with the detection chamber.

~~18~~3. A system as claimed in claims 1~~6~~ or ~~17~~2, ~~wherein the coupling mechanism is operable to rotate the sample chambers, optionally,~~ wherein the coupling mechanism comprises a carousel mechanism.

~~194~~. A system as claimed in any of claims 1~~6~~ to ~~183~~, further comprising a driving arrangement arranged to drive the coupling mechanism, optionally, wherein the driving arrangement comprises mechanical or electro-mechanical means.

5. A system as claimed in any preceding claim, wherein at least one of a) or b):

a) the sample chamber further comprises a light beam exit port aligned with the light input and optionally leading to a beam dump;

b) the light input comprises a light input aperture.

6. A system according to any preceding claim, wherein walls of the sample chamber are reflective.

7. A system according to any preceding claim, wherein the light input and the exit aperture are arranged such that, in operation, at least some, optionally substantially all, of the light from the light input is reflected and/or scattered at least once before passing through the exit aperture.

8. A system according to any preceding claim, wherein walls of the detection chamber are reflective such that in operation at least some, optionally substantially all, of the light entering via the optical path undergoes at least one reflection before detection by the detector.

9. A system according to any preceding claim, wherein the walls of the sample chamber and/or the detection chamber comprise at least one of:

(i) a reflective material, optionally titanium oxide, aluminium, or silver;

(ii) a diffusive coating configured to produce diffuse light.

10. A system according to any preceding claim, wherein the detector comprises a light receiving element.

11. A system according to claim 10, wherein the arrangement of the optical path and the detection chamber defines an optical axis from the input aperture to a point or region on a wall of the detection chamber opposing the input aperture, and the light receiving element of the detector is located in an off-axis position with respect to said optical axis.

~~20~~12. A method of using a system according to Claim 1 to detect~~ing~~ particles in a liquid sample, comprising:

inputting light into one of the plurality of~~a~~ sample chambers for interaction with a sample, wherein ~~the~~ said one of the plurality of sample chambers is or comprises or forms part of an integrating volume that directs substantially all light scattered by the sample to ~~a separate~~ the detection chamber; and

detecting light received in the detection chamber from the sample chamber to obtain a measurement representative of the presence and/or quantity of particles in the liquid sample,

the method further comprising rotating the sample chamber to place the sample chamber into a coupled configuration with the detection chamber such that, in the coupled configuration, there is an optical path between the sample chamber and the detection chamber.

~~21~~13. A method according to claim ~~20~~12, comprising performing repeating the inputting of light and obtaining of a measurement at a plurality of different times thereby to determine a variation in a property of particles in the sample as a function of time and/or as a function of treatment of the sample.

~~22~~14. A method according to claim ~~20~~ 12 or claim ~~2~~13, wherein at least one of a) or b):

a) the particles comprise micro-organisms;

b) the sample comprises at least one of blood, blood plasma, urine, water, bacterial growth fluid, cerebrospinal fluid (CSF), pus, or joint aspirate

~~23. A cuvette or other removable sample container comprising at least one reflective wall and at least one aperture, for entry and exit of light, wherein the cuvette or other removable sample container provides a light integrating volume.~~

~~.24. A cuvette or other removable sample container configured for reception by the first chamber of the apparatus of any of claims 1 to 15 or for reception by the sample chambers of any of claims 16 to 19.~~

~~25. A sample container for use with one or more detectors and/or detection chambers, the sample container comprising:~~

~~a containing portion for containing a liquid sample;~~

~~a sample cassette comprising a plurality of sample chambers, and~~

~~a liquid distribution mechanism for distributing the contained liquid sample from the containing portion to the plurality of sample chambers, wherein each of the plurality of sample chambers is configured to be placed into a coupled configuration with the one or more detectors and/or detection chambers.~~