

What is Claimed:

1. An imaging system, comprising:
 - a sample region configured to receive a sample;
 - a laser illumination train configured to provide a laser illumination to the sample region so to effect fluorescence of a sample in the sample region;
 - an optical illumination train configured to provide imaging illumination to illuminate a sample in the sample region for imaging;
 - a fluorescence train configured to receive illumination directed from the sample region;
 - a sample region lens in optical communication with the sample region,
 - the sample region lens being configured to direct an illumination collected from the sample region to the fluorescence train,
 - the sample region lens being configured to direct an illumination from the optical illumination train to the sample region;
 - optionally, a forward scatter detector configured to collect scattered light from the sample region; and
 - an image capture train configured to collect an image of a sample in the sample region illuminated by the imaging illumination.
2. The imaging system of claim 1, wherein the laser illumination train comprises a plurality of lasers operating at different wavelengths.
3. The imaging system of claim 2, wherein the system is configured such that a laser of plurality of lasers provides illumination to a location within the sample region that is associated with ~~that~~said laser, and

optionally wherein the system is configured so as to provide illumination from one or more of the lasers based, at least in part, on one or more time intervals indicative of the sample's motion through the sample region.

4. The imaging system of claim 3, wherein the fluorescence train, wherein the fluorescence train comprises a plurality of fluorescence collection pinholes, each of the fluorescence collection pinholes being associated with a different one of the plurality of lasers.
5. The imaging system of any one of claims 1-4,

wherein the illumination received by the fluorescence train in connection with a given sample defines a fluorescence profile of the sample, and

wherein the image capture train is operated in response to the fluorescence profile of the sample.
6. The imaging system of claim 5, wherein the system is configured to collect, with the image capture train, at least one image of a sample having a fluorescence profile meeting one or more predetermined fluorescence criteria.
7. The imaging system of any one of claims 1-6,

wherein the system is configured to collect, with the image capture train, an image of a sample based, at least in part, on one or more time intervals indicative of the sample's motion through the sample region, and

optionally wherein the system is configured to provide imaging illumination to illuminate the sample based, at least in part, on one or more time intervals indicative of the sample's motion within the sample region.
8. The imaging system of any one of claims 1-7, wherein the system is configured such that (1) a first location within the sample region receives illumination from the optical illumination train having a first set of optical properties and (2) a second location within the sample region receives illumination from the optical illumination train having a second set of optical properties.

9. The imaging system of any one of claims 1-8, wherein the system is configured to generate a fluorescence profile of the sample from illumination received by the fluorescence train and operate the image capture train in response to the fluorescence profile.
10. The imaging system of any one of claims 1-9, wherein the laser illumination is generally along a first orientation relative to the sample region.
11. The imaging system of any one of claims 1-10, wherein the sample region lens directs, generally along a second orientation relative to the sample region, illumination collected from the sample region to the fluorescence train, or illumination from the optical illumination train to the fluorescence train.
- ~~12. The imaging system of claim 11, wherein the sample region lens directs, generally along the second orientation relative to the sample region, illumination from the optical illumination train to the fluorescence train.~~
- ~~13.~~12. The imaging system of any one of claims 1-~~12~~11, wherein the image capture train collects, generally along a third orientation relative to the sample region, the image of the sample in the sample region.
- ~~14.~~13. The imaging system of any one of claims 1-~~13~~12, wherein the imaging system comprises a forward scatter detector configured to collect scattered light from the sample region, the scatter detector configured to collect, generally along a fourth orientation relative to the sample region, scattered light from the sample region.
- ~~15.~~14. The imaging system of any one of claims 1-~~14~~13, wherein the optical illumination train provides illumination characterized as being donut-shaped in configuration.
- ~~16.~~15. A method, comprising:
- with a sample communicated within a sample region;
- exciting the sample with excitation illumination from a plurality of lasers operating at different wavelengths so as to generate a fluorescence profile of the sample;

illuminating the sample with imaging illumination from an optical illumination train configured to provide imaging illumination to illuminate the sample for imaging;

with a sample region lens, (1) directing, to a fluorescence train, illumination emitted from the sample in response to the excitation illumination, and (2) directing, to the sample region, imaging illumination from the illumination train; and

collecting, with an image capture train, an image of the sample when the fluorescence profile of the sample meets one or more predetermined fluorescence criteria.

~~17.16.~~ 16.16. The method of claim ~~16.15~~, wherein collecting the image is based, at least in part, on one or more time intervals indicative of the sample's motion through the sample region.

~~18.17.~~ 17.17. The method of any one of claims ~~16-17~~15-16, wherein (1) a first location within the sample region receives imaging illumination from the optical illumination train having a first set of optical properties and (2) a second location within the sample region receives imaging illumination from the optical illumination train having a second set of optical properties, wherein the optical properties of the imaging illumination received by the sample vary depending on the sample's location within the sample region.

~~19. The method of claim 18, wherein the optical properties of the imaging illumination received by the sample vary depending on the sample's location within the sample region.~~

~~20.18.~~ 19.18. The method of any one of claims ~~16-19~~15-17, further comprising collecting, with a forward scattering detector, light scattered by the sample.

~~21.19.~~ 20.19. The method of any one of claims ~~16-20~~15-18, wherein the excitation illumination is directed to the sample region generally along a first orientation relative to the sample region.

~~22.20.~~ 21.20. The method of claim ~~21~~19, wherein the sample region lens directs the excitation illumination to the fluorescence train generally along a second orientation relative to the sample region.

23.21. The method of claim ~~22~~20, wherein the sample region lens directs the imaging illumination to the sample region generally along the second orientation relative to the sample region.

24.22. The method of claim ~~23~~21, wherein the image capture train collects, generally along a third orientation relative to the sample region, the image of the sample in the sample region.

25.23. The method of any one of claims ~~16-24~~15-22, further comprising collecting, with a forward scatter detector, scattered light from the sample region, wherein the forward scatter detector collects the scattered light generally along a fourth orientation relative to the sample region.

~~26. The method of claim 25, wherein the forward scatter detector collects the scattered light generally along a fourth orientation relative to the sample region.~~

27.24. The method of any one of claims ~~16-26~~15-23, wherein the imaging illumination is characterized as being donut-shaped in configuration.