What Is Claimed:

1. A system for analyzing biological material comprising:

a light source configured to emit excitation light onto a biological material sample, the excitation light having a wavelength that causes a fluorophore in proximity to or within the biological material to undergo a fluorescent emission or phosphorescent emission;

an optical communication path positioned to obtain an optical signal indicative of the fluorescent emission or phosphorescent emission associated with the fluorophore;

a time-of-flight sensor comprising a plurality of pixels configured to receive the signal indicative of the fluorescent emission or phosphorescent emission from the optical communication path, each pixel of the plurality of pixels configured to provide a signal associated with a photo-response of the pixel based at least in part on the optical signal; and

one or more processors in communication with the time-of-flight sensor, the one or more processors configured to determine a fluorescent lifetime or a fluorescent intensity of the fluorophore based at least in part on the photo-response of each pixel.

2. The system as defined in claim 1, further comprising a sample staging site for holding a sample of a biological material.

3. The system as defined in claim 1, wherein the light source and time-of-flight sensor are part of a Light Detection and Ranging (LiDAR) subsystem, and wherein the one or more processors are configured to determine the fluorescent lifetime or the fluorescent intensity of the fluorophore based on the fluorescent emission or phosphorescent emission of the fluorophore.

4. The system as defined in claim 1, wherein the one or more processors are further configured to determine a magnitude characteristic of a biological parameter based on the fluorescent lifetime or the fluorescent intensity.

5. The system as defined in claim 1, wherein the system includes a plurality of samples, each sample being associated with an optical communication path, wherein the pixels of the time-of-flight sensor are divided into a plurality of zones, each optical communication path associated with each sample being in

communication with at least one of the plurality of zones, and wherein the time-of-flight sensor and the one or more processors are configured to receive fluorescent emissions or phosphorescent emissions from each sample and determine the fluorescent lifetime or the fluorescent intensity of a fluorophore from each sample.

6. The system as defined in claim 5, further comprising a plurality of staging sites for holding the plurality of samples.

7. The system as defined in claim 1, wherein the light source comprises a laser, a laser diode or a light emitting diode (LED), and wherein the light source is configured to emit the excitation light at a modulation rate; and

wherein the modulation rate is selected based at least in part on the fluorescent lifetime of the fluorescent emission or phosphorescent emission associated with the fluorophore.

8. The system as defined in claim 1, wherein the signal indicative of the photo-response comprises a signal indicative of a response phase for the pixel, and wherein the response phase for a pixel is determined based at least in part by performing operations, the operations comprising:

determining a first response for the pixel from a first analog integrator;

determining a second response for the pixel using a second analog integrator;

determining the response phase based at least in part on the first response and the second response.

9. The system as defined in claim 8, wherein one or more processors are configured to determine the fluorescent lifetime based at least in part on the response phase.

10. The system as defined in claim 1, wherein the system further includes a tray that defines a plurality of sample staging sites, the system further comprising an array of plungers that move relative to the tray, the plungers being spaced apart so as to align with the sample staging sites on the tray, the plungers being configured to move towards the sample staging sites for contacting the biological material located in the sample staging sites, the plungers being in communication with the optical communication path for delivering the excitation light to the biological material and for delivering the fluorescent emission or phosphorescent emission produced by the fluorophore to the time-of-flight sensor.

11. The system as defined in claim 1, wherein the light source and the

time-of-flight sensor operate at a frequency that permits multiple determinations of the fluorescent lifetime or the fluorescent intensity of the fluorophore in less than about 1 second.

12. The system as defined in claim 1, wherein the system includes a fluorophore source, and wherein the fluorophore source is configured to place a plurality of fluorophores in association with the biological material, and wherein the time-of-flight sensor and one or more processors are configured to determine the fluorescent lifetime or the fluorescent intensity of the plurality of fluorophores.

13. The system as defined in claim 1, wherein the time-of-flight sensor and one or more processors are configured to determine the fluorescent lifetime without calibrating the light source between testing of consecutive samples of the biological material.

14. The system as defined in claim 1, wherein the fluorescent emission or phosphorescent emission of the fluorophore is indicative of a parameter related to cellular metabolism, such as a dissolved gas, an ion, a protein, a metabolite, a nucleic acid, an enzyme, pH, an oxidation state, a viscosity, temperature, NAD(P)H, a salt, or a mineral.

15. The system as defined in claim 14, wherein the parameter comprises pH and wherein the flurophore exhibits a fluorescent lifetime of less than 5 nanoseconds.

16. The system as defined in claim 14, wherein the system is further configured to determine a concentration of the parameter or a rate of change of the parameter.

17. A method for analyzing biological material comprising:

exposing the biological material to excitation light in a manner that causes a fluorophore in association with the biological material to produce a fluorescent emission or phosphorescent emission;

communicating the fluorescent emission or phosphorescent emission to a time-of-flight sensor;

determining a fluorescence lifetime or a fluorescence intensity of the fluorophore;

and

determining a magnitude characteristic of a biological parameter that is related to the determined fluorescent lifetime or the fluorescence intensity.

18. The method as defined in claim 17, wherein the biological material contains living cells comprising bacteria cells, fungus cells, yeast cells, prokaryotic cells, eukaryotic cells, animal cells, human cells, immune cells, or immortal cells.

19. The method as defined in claim 17, wherein the parameter comprises a dissolved gas, an ion, a protein, a metabolite, a nucleic acid, a lipid, a substrate, a salt, or a mineral.

20. The method as defined in claim 17, wherein a plurality of fluorophores are placed operative association with a corresponding plurality of samples of the biological material, each sample of the biological material being individually exposed to excitation light in a manner that causes a fluorophore in each sample of biological material to undergo the fluorescent emission or phosphorescent emission, and wherein the plurality of the fluorescent emissions or phosphorescent emissions are sensed and communicated to the time-of-flight sensor for determining the fluorescence lifetime or the fluorescence intensity of the fluorophore from each sample simultaneously.