CLAIMS

We claim:

1. An imaging system, comprising;

a sample stage comprising a surface to support a sample container, the sample container having a plurality of sample locations;

an optical stage having an objective lens, the optical stage being positionable relative to the sample stage to image samples at the sample locations;

an actuator physically coupled to at least one of the sample stage and the optical stage to move the sample stage relative to the optical stage to focus the optical stage onto a current sample location; and

a drive circuit to determine a focus setting for a next sample location and to provide a drive signal to the actuator before the optical stage is positioned to image a sample at the next sample location, wherein at least one parameter of the drive signal is determined using a difference between a focus setting for the current sample location and the determined focus setting for the next sample location.

2. The imaging system of claim 1, wherein the actuator is physically coupled to the sample stage to move the sample stage to adjust a distance between the sample stage and the optical stage.

3. The imaging system of claim 1, further comprising a plurality of actuators physically coupled to the sample stage to adjust a tilt of the sample stage.

4. The imaging system of claim 1, wherein the actuator is physically coupled to the optical stage to move the optical stage to adjust a distance between the sample stage and the optical stage.

5. The imaging system of claim 1, wherein the actuator comprises at least one of a piezoelectric device, a voice coil, and a drive motor.

6. The imaging system of claim 1, wherein the focus setting for a next sample location is determined using a history file comprising a predetermined focus setting for each of the plurality of sample locations.

7. The imaging system of claim 6, wherein the history file is created by measuring a focus distance to each of the plurality of sample locations during a previous imaging operation.

8. The imaging system of claim 1, further comprising an off-axis focus system to emit a light beam to impinge on the next sample location before at least one of the optical stage and the sample stage is positioned to image the sample at the next location.

9. The imaging system of claim 8, wherein the off-axis focus system comprises a light source, and a differential splitting window to split the light emitted from the light source for off-axis imaging.

10. The imaging system of claim 8, wherein the off-axis focus system comprises a light source, a pin-hole mask positioned in the path of light emitted from the light source, and a

differential splitting window to split the light emitted from the light source for off-axis imaging.

11. The imaging system of claim 8, wherein the off-axis focus system generates a plurality of light beams to allow off-axis sampling in more than one scan direction.

12. The imaging system of claim 11, further comprising a reducing wedge to cause reflections of the off-axis beams to be redirected to within a desired area on an image sensor.

13. The imaging system of claim 1, wherein the sample container comprises a flow cell or a slide.

14. The imaging system of claim 1, wherein the at least one parameter of the drive signal comprises at least one of current, voltage and duty cycle.

15. A method of focus tracking, comprising:

determining a first in-focus position of a sample stage for a current sample location on a sample container being scanned;

determining a second in-focus position of the stage for a next sample location to be scanned;

computing a difference between the first and second in-focus positions; and

sending a drive signal to a stage actuator to move the sample stage relative to an optical stage from the first in-focus position to the second in-focus position at a time *t* before the stage is positioned to image at the next sample location, wherein at least one

parameter of the drive signal is determined using the difference between the first and second in-focus positions.

16. The method of claim 15, wherein determining a second in-focus position of the stage comprises querying a history file comprising a predetermined focus setting for each of a plurality of coordinate sets on the sample container.

17. The method of claim 16, wherein the history file is created by measuring a focus distance to each of the plurality of coordinate sets on the sample container during a previous imaging operation.

18. The method of claim 15, further comprising computing a slope of the sample container based on the difference between the first and second in-focus positions, wherein the parameter of the drive signal is determined using the slope.

19. The method of claim 18, further comprising determining a third in-focus position of the stage for a sample location previously scanned.

20. The method of claim 19, wherein the slope of the sample container is determined using the first, second and third in-focus positions.

21. The method of claim 15, wherein determining a second in-focus position comprises using an off-axis focus system to emit a light beam to impinge on the next sample location before at least one of the optical stage and the sample stage is positioned to image the sample at the next location.

22. The method of claim 15, wherein moving the sample stage relative to the optical stage from the first in-focus position to the second in-focus position comprises moving the sample stage to adjust the distance between the sample and the optical stage.

23. The method of claim 15, wherein moving the sample stage relative to the optical stage from the first in-focus position to the second in-focus position comprises moving the optical stage to adjust the distance between the sample and the optical stage.

24. The method of claim 15, wherein the time t is determined using the difference between the first and second in-focus positions.

25. The method of claim 15, wherein the stage actuator comprises a voice coil and the method further comprises determining a maximum amount of drive output that can be applied to the voice coil and limiting the amount of current in the drive signal using the maximum amount of drive output.

26. The method of claim 15, wherein the at least one parameter of the drive signal comprises at least one of current, voltage and duty cycle.

27. A method of focus tracking, comprising:

determining a first in-focus position of a sample stage for a current sample location on a sample container being scanned;

determining a second in-focus position of the stage for a next sample location to be scanned;

computing a slope of the sample container using the first and second in-focus positions; and

sending a drive signal to a stage actuator to move the sample stage relative to an optical stage, wherein the drive signal is generated using the slope of the sample container.

28. The method of claim 27, further comprising determining a third in-focus position of the stage for a prior sample location scanned, and wherein the slope is computed using the first, second, and third sample locations.

29. The method of claim 27, wherein determining a second in-focus position comprises querying a history file comprising a predetermined focus setting for each of a plurality of coordinate sets on the sample container.

30. The method of claim 27, wherein the history file is created by measuring a focus distance to each of the plurality of coordinate sets on the sample container during a previous imaging operation.

31. The method of claim 27, wherein determining a second in-focus position comprises using an off-axis focus system to emit a light beam to impinge on the next sample location before at least one of the optical stage and the sample stage is positioned to image the sample at the next location.