CLAIMS

1. A method for acquiring images of objects (122) distributed within a specimen (119) affixed to a surface of a slide (102) using a camera (202) having an objective lens (202) with an optical axis (204) that forms a non-orthogonal angle with the surface of the slide (102), the specimen (119) having an uneven height relative to the slide surface, the method comprising:

acquiring a first plurality of images of a first linear portion of the specimen (119);

evaluating a focus of objects (122) within the first linear portion (130) of the specimen (119) captured in the first plurality of images, including determining whether a total number of out-of-focus objects exceeds a threshold number and determining a best focus height of the specimen (119) along the first linear portion (130);

calculating a z focus height curve (810) of the best focus height of the specimen (119) along the first linear portion (130);

if the total number of out-of-focus objects in the first plurality of images exceeds the threshold number, then re-imaging the first linear portion (130) of the specimen (119) to acquire a second plurality of images, wherein a height of the objective lens relative to the slide surface is varied during acquisition of the second plurality of images based on the z focus height curve (810); and

if the total number of out-of-focus objects in the first plurality of images does not exceed the threshold number, then acquiring a second plurality of images of a second linear portion (130) of the specimen (119) directly adjacent to the first linear portion (130), wherein a height of the objective lens relative to the slide surface is varied during acquisition of the second plurality of images based on the z focus height curve (810) ~~and~~

~~acquiring a second plurality of images of the first linear portion or of a second linear portion of the specimen different from the first, wherein a height of the objective lens relative to the slide surface is varied during acquisition of the second plurality of images based on the evaluated focus of the objects captured in the first plurality of images~~.

2. The method of claim 1, wherein a height of the objective lens relative to the slide surface (102) is substantially constant during acquisition of the first plurality of images.

3. The method of claim 1 or 2, wherein evaluating the focus of the objects captured in the first plurality of images comprises determining whether a total number of out-of-focus objects exceeds a threshold number.

43. The method of claim 1 or 2any of claims 1-3, wherein evaluating the focus of the objects captured in the first plurality of images comprises determining respective heights of the out-of-focus objects relative to the slide surface.

54. The method of claim 34, wherein evaluating the focus of the objects in the first plurality of images comprises determining whether the respective out-of-focus objects are located at a height relative to the slide surface that is outside of an in-focus range of the objective lens during acquisition in the first plurality of images.

56. The method of claim 3 or 44 or 5, wherein evaluating the focus of the objects in the first plurality of images comprises determining whether the respective out-of-focus objects are located at a height relative to the slide surface that is higher than a maximum height or lower than a minimum height, respectively, of an in-focus range of the objective lens during acquisition in the first plurality of images.

67. The method of any of claims 1-61-5, wherein evaluating the focus of the objects in the first plurality of images includes determining respective locations of out-of-focus objects within the first linear portion (130).

78. The method of any of claims 1-67, wherein one or both of the camera (202) and slide (102) is moved laterally relative to the other one during acquisition of the images.

89. The method of claim 78, wherein the height of the objective lens (202) relative to the slide surface is varied by increasing and/or decreasing a height of the slide surface relative to the camera as a function of a linear position of the camera with respect to a lengthwise location of the respective linear portion (130).

910. The method of claim 78, wherein the height of the objective lens (202) relative to the slide surface is varied by increasing and/or decreasing a height of the camera (202) relative to the slide surface as a function of a linear position of the camera (202) with respect to a lengthwise location of the respective first or second linear portion (130).

11. The method of any of claims 1-10, wherein the second plurality of images is acquired of the second linear portion.

1012. The method of any of claims 1-910, wherein the second plurality of images is acquired of the secondfirst linear portion, the method further comprising

evaluating a focus of the objects captured in the second plurality of images including determining whether a total number of out-of-focus objects exceeds a threshold number and determining a best focus height of the specimen (119) along the next linear portion (130);

calculating a second z focus height curve (810) of the best focus height of the specimen along the second linear portion (130); and

acquiring a third plurality of images of a the secondthird linear portion (130), the third linear portion (130) being directly adjacent to the second linear portion (130), wherein a height of the objective lens (202) relative to the slide surface is varied during acquisition of the third plurality of images based on the second z focus height curve (810)

wherein the height of the objective lens relative to the slide surface is varied during acquisition of the third plurality of images based on the evaluated focus of the objects captured in the second plurality of images.

1113. The method of any of claims 1-1012, wherein the second linear portion (130) is directly adjacent to the first linear portion (130).

14. The method of claim 3, further comprising:

acquiring the second plurality of images of the first linear portion if the total number of out-of-focus objects in the first plurality of images exceeds the threshold number, and

acquiring the second plurality of images of the second linear portion if the total number of out-of-focus objects in the first plurality of images does not exceed the threshold number.

15. A method for acquiring images of objects distributed within a specimen affixed to a surface of a slide using a camera having an objective lens with an optical axis that forms a non-orthogonal angle with the surface of the slide, the specimen having an uneven height relative to the slide surface, the method comprising:

acquiring a first plurality of images of a linear portion of the specimen;

evaluating a focus of the objects captured in the first plurality of images;

(c) acquiring a second plurality of images of the same or a different linear portion of the specimen, wherein a height of the objective lens relative to the slide surface is varied during acquisition of the second plurality of images based on the evaluated focus of the objects captured in the first plurality of images; and

(d) repeating (a) – (c) until images of substantially the entire specimen have been acquired.

16. The method of claim 15, wherein evaluating the focus of the objects captured in the first plurality of images comprises determining whether a total number of out-of-focus objects exceeds a threshold number.

17. The method of claim 15 or 16, wherein evaluating the focus of the objects in the first plurality of images comprises determining whether the respective out-of-focus objects are located at a height relative to the slide surface that is higher than a maximum height or lower than a minimum height, respectively, of an in-focus range of the objective lens during acquisition in the first plurality of images.

18. The method of any of claims 15-17, wherein evaluating the focus of the objects in the first plurality of images includes determining respective locations of out-of-focus objects within the respective linear portion.

19. The method of any of claims 15-18, wherein one of the camera and slide is moved laterally relative to the other one during acquisition of the respective first and second pluralities of images.

20. The method of claim 19, wherein the height of the objective lens relative to the slide surface is varied by increasing and/or decreasing a height of the slide surface relative to the camera as a function of a linear position of the camera with respect to a lengthwise location of the respective linear portion.

21. The method of claim 19, wherein the height of the objective lens relative to the slide surface is varied by increasing and/or decreasing a height of the camera relative to the slide surface as a function of a linear position of the camera with respect to a lengthwise location of the respective linear portion.

22. The method of any of claims 15-21, wherein the second plurality of images are obtained from the different linear portion, and wherein the different linear portion is directly adjacent to the linear portion of which the first plurality of images was acquired.

1223. A system for acquiring images of objects (122) distributed within a specimen (119) affixed to a surface of a slide (102), the specimen (119) having an uneven height relative to the slide surface, the system comprising:

a camera (202) having an objective lens (202) with an optical axis (204), wherein the camera (202) is positioned such that the optical axis (204) forms a non-orthogonal angle with the surface of the slide (102); and

an image processor operatively coupled with the camera (202), wherein the image processor; and

wherein the system is configured to perform the method of any of claims 1-11

receive a first plurality of images of a first linear portion of the specimen acquired by the camera;

evaluate a focus of objects within the linear portion of the specimen captured in the first plurality of images;; and

cause the camera to acquire a second plurality of images of the first linear portion or of a second linear portion of the specimen different from the first, wherein a height of the objective lens relative to the slide surface is varied during acquisition of the second plurality of images based on the evaluated focus of the objects captured in the first plurality of images.

24. The system of claim 23, wherein a height of the objective lens relative to the slide surface is substantially constant during acquisition of the first plurality of images.

25. The system of claim 23 or 24, wherein the image processor evaluates the focus of the objects captured in the first plurality of images at least in part by determining whether a total number of out-of-focus objects exceeds a threshold number.

26. The system of any of claims 23-25, wherein the image processor evaluates the focus of the objects captured in the first plurality of images at least in part by determining respective heights of the out-of-focus objects relative to the slide surface.

27. The system of claim 26, wherein the image processor evaluates the focus of the objects in the first plurality of images at least in part by determining whether the respective out-of-focus objects are located at a height relative to the slide surface that is outside of an in-focus range of the objective lens during acquisition in the first plurality of images.

28. The system of claim 27 or 28, wherein the image processor evaluates the focus of the objects in the first plurality of images at least in part by determining whether the respective out-of-focus objects are located at a height relative to the slide surface that is higher than a maximum height or lower than a minimum height, respectively, of an in-focus range of the objective lens during acquisition in the first plurality of images.

29. The system of any of claims 23-28, wherein the image processor evaluates the focus of the objects in the first plurality of images at least in part by determining respective locations of out-of-focus objects within the first linear portion.

30. The system of any of claims 23-29, wherein one or both of the camera and slide are configured to move laterally relative to the other one during acquisition of the images.

31. The system of claim 30, wherein the height of the objective lens relative to the slide surface is varied by increasing and/or decreasing a height of the slide surface relative to the camera as a function of a linear position of the camera with respect to a lengthwise location of the respective linear portion.

32. The system of claim 30, wherein the height of the objective lens relative to the slide surface is varied by increasing and/or decreasing a height of the camera relative to the slide surface as a function of a linear position of the camera with respect to a lengthwise location of the respective first or second linear portion.

33. The system of any of claims 23-32, wherein the second plurality of images is acquired of the second linear portion.

34. The system of any of claims 23-32, wherein the second plurality of images is acquired of the first linear portion, the image processor being further configured to

evaluate a focus of the objects captured in the second plurality of images; and

cause the camera to acquire a third plurality of images of the second linear portion, wherein the height of the objective lens relative to the slide surface is varied during acquisition of the third plurality of images based on the evaluated focus of the objects captured in the second plurality of images.

35. The system of any of claims 23-34, wherein the second linear portion is directly adjacent to the first linear portion.