CLAIMS

1. Apparatus for ophthalmic treatment, comprising:

an optical unit, comprising:

a camera, which is configured to capture an image of an eye of a patient;

a laser, which is configured to emit pulses of laser radiation; and

beam conditioning and scanning optics, which are configured to focus and direct the laser radiation to impinge on an anterior surface of the eye; and

a controller, which is configured to analyze the image so as to identify a limbus of the eye, and to control the optical unit so that the laser radiation impinges on a set of one or more locations on the anterior surface of the eye that are in a vicinity of the limbus with a pulse duration that is less than 1 μs and an energy that is less than 5 mJ per pulse, whereby the laser radiation stimulates stem cells at the one or more locations.

2. The apparatus according to claim 1, wherein the laser radiation is focused to impinge on each of the one or more locations with a beam diameter no greater than 1 mm.

3. The apparatus according to claim 1, wherein the pulse duration is less than 100 ns.

4. The apparatus according to claim 3, wherein the pulse duration is less than 10 ns.

5. The apparatus according to claim 4, wherein the pulse duration is less than 5 ns.

6. The apparatus according to claim 1, wherein the energy per pulse is less than 3 mJ.

7. The apparatus according to claim 1, wherein the laser radiation is focused to impinge on each of the one or more locations with a fluence less than 0.4 J/cm^2.

8. The apparatus according to any of claims 1-7, wherein the controller is configured to actuate the laser so as to apply multiple pulses to each of the one or more locations.

9. The apparatus according to claim 8, wherein the multiple pulses comprise no more than 200 pulses at each location.

10. The apparatus according to claim 9, wherein the multiple pulses comprise no more than 100 pulses at each location.

11. The apparatus according to claim 8, wherein the multiple pulses deliver the laser radiation with a cumulative energy that is no greater than 100 mJ at each location.

12. The apparatus according to claim 11, wherein the cumulative energy is no greater than 70 mJ.

13. The apparatus according to claim 12, wherein the cumulative energy is no greater than 40 mJ.

14. The apparatus according to any of claims 1-7, wherein the one or more locations on the anterior surface of the eye are displaced by at least 1 mm from the limbus.

15. The apparatus according to claim 14, wherein the one or more locations on the anterior surface of the eye are displaced by at least 2 mm from the limbus.

16. The apparatus according to any of claims 1-7, wherein the beam conditioning and scanning optics are configured to direct the laser radiation to impinge on the anterior surface of the eye at an oblique angle relative to a direction of an optical axis of the eye.

17. The apparatus according to claim 16, wherein the beam conditioning and scanning optics comprise a ring mirror, which is positioned around the optical axis of the eye so as to reflect the beam toward multiple locations in the vicinity of the limbus at oblique angles.

18. Apparatus for ophthalmic treatment, comprising:

an optical unit, comprising:

a camera, which is configured to capture an image of an eye of a patient;

a laser, which is configured to emit pulses of laser radiation; and

beam conditioning and scanning optics, which are configured to focus and direct the laser radiation to impinge on an anterior surface of the eye; and

a controller, which is configured to analyze the image so as to identify a limbus of the eye, and to control the optical unit so that the laser radiation impinges on a set of one or more locations on the anterior surface of the eye in a vicinity of the limbus with a pulse duration that is between 1 ms and 500 ms and an energy that is less than 100 mJ per pulse, whereby the laser radiation stimulates stem cells at the one or more locations.

19. The apparatus according to claim 18, wherein the laser radiation is focused to impinge on each of the one or more locations with a beam diameter no greater than 1 mm.

20. The apparatus according to claim 18, wherein the pulse duration is less than 50 ms.

21. The apparatus according to claim 20, wherein the pulse duration is less than 10 ms.

22. The apparatus according to claim 21, wherein the pulse duration is less than 5 ms.

23. The apparatus according to claim 18, wherein the energy per pulse is less than 50 mJ.

24. The apparatus according to claim 20, wherein the energy per pulse is less than 5 mJ.

25. The apparatus according to claim 18, wherein the laser radiation is focused to impinge on each of the one or more locations with a fluence less than 30 J/cm^2.

26. The apparatus according to any of claims 18-25, wherein the controller is configured to actuate the laser so as to apply multiple pulses to each of the one or more locations.

27. The apparatus according to claim 26, wherein the multiple pulses comprise no more than 2000 pulses at each location.

28. The apparatus according to claim 27, wherein the multiple pulses comprise no more than 500 pulses at each location.

29. The apparatus according to claim 28, wherein the multiple pulses comprise no more than 200 pulses at each location.

30. The apparatus according to claim 26, wherein the multiple pulses deliver the laser radiation with a cumulative energy that is no greater than 10 J at each location.

31. The apparatus according to claim 30, wherein the cumulative energy is no greater than 1 J.

32. The apparatus according to claim 31, wherein the cumulative energy is no greater than 400 mJ.

33. The apparatus according to any of claims 18-25, wherein the one or more locations on the anterior surface of the eye are displaced by at least 1 mm from the limbus.

34. The apparatus according to claim 33, wherein the one or more locations on the anterior surface of the eye are displaced by at least 2 mm from the limbus.

35. The apparatus according to any of claims 18-25, wherein the beam conditioning and scanning optics are configured to direct the laser radiation to impinge on the anterior surface of the eye at an oblique angle relative to a direction of an optical axis of the eye.

36. The apparatus according to claim 35, wherein the beam conditioning and scanning optics comprise a ring mirror, which is positioned around the optical axis of the eye so as to reflect the beam toward multiple locations in the vicinity of the limbus at oblique angles.

37. Apparatus for treating an eye of a patient, the apparatus comprising:

an optical unit, comprising:

a laser, which is configured to emit laser radiation;

one or more mirrors positioned around an optical axis of the eye; and

beam conditioning and scanning optics, which are configured to focus and direct the laser radiation to reflect from the one or more mirrors so as to impinge on an anterior surface of the eye at an oblique angle relative to the optical axis; and

a controller, which is configured to control the optical unit so that the laser radiation impinges on the eye at the oblique angle in a set of one or more locations in a vicinity of the limbus with a fluence selected so as to stimulate stem cells at the one or more locations.

38. The apparatus according to claim 37, wherein the one or more mirrors comprise a ring mirror, which surrounds the optical axis.

39. The apparatus according to claim 37 or 38, wherein the controller is configured to control the optical unit so that the laser radiation impinges on and stimulates the stem cells in a epithelium of the eye.

40. The apparatus according to claim 37 or 38, wherein the controller is configured to control the optical unit so that the laser radiation impinges on and stimulates the stem cells in a stroma of the eye.

41. The apparatus according to claim 37 or 38, wherein the controller is configured to control the optical unit so that the laser radiation impinges on and stimulates the stem cells in an endothelium of the eye.