CLAIMS

WHAT IS CLAIMED IS:

1. An apparatus to treat refractive error of an eye, comprising:
a structure to contact the eye; and
a light source coupled to the structure;
wherein the light source is configured to direct light energy toward a retina of the eye to treat the refractive error of the eye.

2. The apparatus of claim 1, wherein the light source emits violet light.

3. The apparatus of claim 1, wherein the structure comprises a contact lens and optionally wherein the light source is one or more of embedded in the contact lens, located on an anterior surface of the contact lens, or located on a posterior surface of the contact lens.

4. The apparatus of claim 1, wherein the light energy comprises violet light energy comprising a wavelength within a range from about 360 nm to about 400 nm.

5. The apparatus of claim 1, wherein the light energy comprises violet light energy and the light source is configured to direct the violet light energy to the retina with an irradiance within a range from about 0.1 mW/cm^2 to 5 mW/cm^2 .

6. The apparatus of claim 1, wherein the light source illuminates a pupil of the eye with light energy in the range 0.1 nit to 10 nits and optionally within the range from 0.5 nits to 10 nits.

7. The apparatus of claim 1, wherein the contact lens comprises one or more of a structure anterior to the light source to reflect light to the retina of the eye, a structure posterior to the light source to focus light onto the retina of the eye, a lens structure posterior to the light source to focus light onto the retina of the eye, or a diffractive structure posterior to the light source to diffract light toward the retina of the eye.

8. The apparatus of claim 1, wherein the contact lens comprises a lens body, the lens body comprising one or more of a soft contact lens, a hydrogel contact lens, a hard contact lens, a rigid gas permeable contact lens, a polymethyl methacrylate contact lens, or an orthokeratology contact lens.

9. The apparatus of claim 1, wherein the light energy comprises light energy violet light energy and the contact lens is configured to direct the violet light energy onto a cornea and toward the retina with an amount sufficient to promote a curvature change to the cornea of the eye.

10. The apparatus of claim 1, wherein the structure comprises a contact lens comprising a posterior surface comprising a posterior radius of curvature sized to fit a cornea of the eye, and an anterior surface comprising an anterior radius of curvature configured to correct vision of the eye, and optionally wherein the anterior surface comprises a second anterior radius of curvature oriented in relation to the anterior radius of curvature to correct an astigmatism of the eye.

11. The apparatus of claim 1, wherein the structure to contact the eye comprises an implantable structure and wherein the implantable structure comprises a covering disposed over the light source and optionally wherein the implant is configured to be turned on and off by a person who received the implant.

12. The apparatus of claim 1, wherein the light source comprises one or more of a radioluminescent light source, a light emitting diode, a laser diode, a radioactive material, or a phosphorescent material and optionally wherein the radioactive material comprises tritium or radium.

13. The apparatus of claim1, wherein the structure to contact the eye comprises an optically transmissive material comprising a transmittance of at least 40% at 360 nm.

14. The apparatus of claim 1, wherein the light source is arranged in a pattern on the structure to contact the eye, the pattern comprising one or more of: a spatial pattern on the structure to contact the eye, a spatial pattern located on an optically used portion of a contact lens, a spatial pattern on an inner portion of the contact lens to transmit light to the retina when the pupil constricts, a circular pattern, or a radial pattern and optionally wherein the structure to contact the eye comprises a contact lens.

15. The apparatus of claim 1, wherein the apparatus comprises a contact lens comprising a posterior surface shaped to receive a cornea of the eye, a contact lens material comprising an index of refraction configured to transmit violet light from the source toward the retina, the contact lens comprising an anterior surface shaped to correct a refractive error of the eye in combination with the index of refraction and the posterior surface and optionally wherein the contact lens is configured to correct higher order aberrations comprising optical aberrations above third order and optionally wherein the contact lens comprises a multifocal contact lens configured to correct presbyopia.