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Engineering eyes for 20/10 and for presbyopia treatments

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20/20 acuity has been the standard for refractive corrections for over a century. Studying subjective visual acuity along with objective wave aberrations of 288 eyes of US navy aviators at the Navy Medical Center at San Diego revealed: nature's best 20/10 eyes of US aviators have exceptionally good optical quality (MTF) for all pupil conditions (day or night), and are almost aberration-free within around 4 mm pupil; the 20/20 eyes have compromised optical quality (MTF) and elevated aberrations and; contrast thresholds are determined for seeing acuity of 20/25, 20/30, and 20/40. This talk presents some of these fundamental discoveries, and their use as the foundation for engineering vision for 20/10 and for treatment of presbyopia. Commercial products of these advanced designs are emerging: wavefront custom eyeglasses and sunglasses based on 20/10 optics (Krypton Vision Inc. Fremont, USA) and wavefront progressive Mini-Well Ready IOLs (Sifi Medtech, Catania, Italy). Fundamental optical designs as well as clinical results will be shared.

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