7x50 binocular performs precisely as the 7x42 (both curves are on top of each other), and the 8x56 (red curve) is clearly inferior to the 10x56 format, and pushed even below the 10x50. A somewhat higher magnification may therefore be employed to compensate for the reduced eye pupil diameters. The ideal handheld binocular for low light observations has now become a 10x50 or 10x56, rather than the 8x56 which suits the younger observer.

Berek's theory of contrast-based binocular performance offers a variety of additional features: Threshold-distances can be computed to determine (and compare) the maximum distance at which a target of given contrast remains visible. The influence of coating technology (which affects light transmission and stray light) on the binocular performance can be studied, and in section 10.5 we will demonstrate how this idea may be adapted to apply to astronomy and predict the limiting magnitudes of stars.

Yet, a couple of implicitly made assumptions, on which the performance model is based, should be called into attention: The thresholds of visibility of a target are evaluated while assuming that this target is already well in focus of a binocular, which is firmly mounted and pointing into the target's direction. In real life applications, neither the precise direction nor the distance of the object is usually known. Binoculars with wide angles of view and high depths of field (section 10.8) would then support the observer's task of sighting the target. Apart from that, any atmospheric seeing effects, which affect the contrast of a distant target, are neglected. These factors are going to be addressed in section 10.6.

10.4.1 Which approach to binocular performance is correct?

While in daylight and during the night, the resolution based approach to binocular performance of section 10.2 and the contrast-based efficiency of section 10.4 are yielding consistent results, alarming discrepancies persist in twilight: The former clearly prefers binoculars of higher magnifications, while the latter is scoring instruments with larger objective diameters higher.

To understand the origin of that apparent contradiction, we have to recall in which way the raw-data, which led to the respective performance models, were raised: Köhler and Leinhos made test persons identify fine detail on Landolt rings, while Berek's visual data were obtained during field tests, in which test persons had to sight targets near the contrast threshold.

As previously discussed in section 8.6, human vision is undergoing a transition from daylight vision (photopic vision, conducted by the cone cells) to low light vision (scotopic vision of the rod cells), and the crossover regime during twilight is known as mesopic vision. Cone cells are particularly centered around the central (foveal) area of the visual field, which offers peak resolution values during daylight, while the rods occupy the extra-foveal areas of the retina, offering lower resolution but higher sensitivity.

Resolution-based visual experiments are forcing the test person into a foveal vision mode, in which she attempts to discern the finest possible details. In such a situation, an over-magnification of the instrument (as it is commonly the case with binoculars in twilight) would still generate a performance gain, as long as the contrast of the objects on the test chart remains sufficiently high. For the sighting of a target near its contrast-threshold, however, mesopic vision may partially apply extra-foveal vision to profit from the higher sensitivity of the rod cells. In this case, when resolution becomes secondary to brightness, an increase of the aperture, and hence additional light, is more profitable than an increase in magnification.