Figure 2.16   The probability of detection of targets of (a) contrast = 0.058, size = 19 min arc; (b) contrast = 0.08, size = 10 min arc; (c) contrast = 0.044, size = 10 min arc; within a single fixation pause, plotted against deviation from the visual axis. Each curve can be used to form a visual detection lobe for each target by assuming radial symmetry about the visual axis.

The visual detection lobe has a maximum at the fovea; the probability of detecting the target decreasing as the target is located further off-axis. Different targets have different visual detection lobes. A large-area, high-contrast hole in some sheet material will have a large visual detection lobe while a small-size, low-contrast hole will have a small lobe. The size of the visual detection lobe matters because, provided the interfixation distance is related to it and the total search area is fixed, the total time taken to cover the search area is inversely proportional to the size of the visual detection lobe. Other important factors for determining visibility are the luminance contrast, and the colour of the target relative to the background.

There is also the question of what happens when the area to be searched contains other items. For searching uniform, empty fields, it is the visibility of the target off-axis that determines the search time. Where there are other items present, the visibility of the target alone is not enough to predict the search time. The other factor that must be considered is the conspicuity of the target, i.e. how easy it is to distinguish the targets from the other items. For high conspicuity, the defects should differ from the other items in the field on as many dimensions as possible, e.g. size, contrast, shape, colour and movement.

Many of the lighting techniques used for visual search are aimed at either increasing the visual size or luminance contrast of the defect, either by casting shadows (Figure 2.17) or by using specular reflections (Figure 2.18). Probably the most widely applicable aspect of lighting which aids visual search is to increase the illuminance on the search area. While illuminance is generally a useful method of reducing search times, it should not be used without thought. If the effect of increasing illuminance is to decrease the luminance contrast, or effective visual size of the targets or to produce confusing visual information in the search area, visual search performance will be worsened.