frequency is too low, we do not perceive it. The range of spatial frequencies that are visible, as measured by our sensitivity to contrast at each frequency, is described by a contrast sensitivity function, that is, "a graph depicting a person's ability to see targets of various spatial frequency; on the x-axis is the spatial frequency of the test target; on the y-axis is . . . the minimum contrast needed to see the test target"

Mannan, Ruddock, & Wooding, 1997; Reinagel & Zador, 1999). Mannan et al. (1997) found that spatially localized measures of high-spatial frequency content, local luminance contrast, and edge density only weakly differentiated randomly selected locations from actual eye fixation locations. Reinagel and Zador (1999) found somewhat higher contrast around viewers' fixation points compared with randomly selected areas from those images, with the heightened contrast diminishing within 4° of fixation. Similarly, Krieger et al. (2000) found that fixated regions had greater luminance variability (i.e., contrast). They also observed a slightly greater tendency to fixate higher spatial frequency regions than predicted by chance. Together, these results suggest that higher contrast and higher spatial frequencies exert a weak but consistent effect on where viewers fixate during picture viewing.

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Eye Movements

Analysis of Global Eye Movement Parameters

To reduce skewing in the data by extreme outliers, we excluded the 1st and 99th percentiles of the fixation duration and saccade length distributions from the analyses. The resulting data set contained a total of 39,485 saccade-and-fixation pairs. Fixations ranged in duration from 69–899 ms (*M* □ 280 ms, *SD* □ 130 ms). Saccades ranged in length from 0.02° to 11.72° (*M* □ 2.25°, *SD* □ 1.95°). The alpha level was set at .05 for all statistical tests.

Mean total fixations per trial. This analysis was done only for the search task data because it is relevant to explaining the search time results, and because the number of fixations in the memory task was constrained by a time limit. We performed a two-way within-subjects ANOVA on the mean fixations per trial in the search task. This analysis showed no significant effect of window radius, peripheral filtering level, or the interaction of the two (radius main effect), *F*(1.42, 18.52 [box epsilon]) □ 3.22, *p* □ .05, Cohen's *f* □ 0.18; filtering main effect, *F*(2, 26) □ 1; interaction, *F*(4, 52) □ 1. Planned comparisons of all Window Radius □

As in the other analyses, window radius also had a clear effect on saccade length, which did not interact with level of peripheral filtering. However, in contrast to the other analyses, there was also equation. Including additivity in the equation allows the window radius and filtering level axes to each form a different curve, and the interaction term allows the function to include a flat surface between these two axes. This flat region is one of the most important attributes of the function because it represents the set of

the nature of the effects of peripheral resolution level and window radius in reducing mean saccade length and propose three possible

Figure 8 plots the differences between the distributions for the control condition and each of the experimental conditions, showing the increase or decrease in the relative frequency of saccades for each retinal eccentricity. Although this graph clearly shows differences among the window radius conditions, there is no conerror conditions was slight. Thus, the discrepancy between the peaks of the control-minus-experimental saccade length distributions and their respective experimental-condition window radii cannot be explained by window placement error, and the hypothesis that the eyes are attracted to the window edge is unsupported.

General influence of peripheral resolution on saccade length. An alternative hypothesis is that above-threshold filtering in the periphery generally disrupts saccadic activity. Because we know that mean saccade length is shortened by above-threshold filtering, the simplest model would predict a general proportional shortening of all saccades, with greater shortening caused by a small7.4(small7y3h-)]TJ T* [ndowraduswandperipheralresolutio.lhypothesis
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hood of making saccades beyond the edge of the high-resolutionwindow is what we would expect based on the local saliencyhypothesis, becaus crease relative to the control distribution at all eccentricities within saccade length data, the following procedures were used. Saccades were rank ordered by length and put in bins of 300 □ 15 cases. For tional and saccade target selection. The data support the third explanation, with the eyes going less frequently to peripheral locations where high spatial frequencies are attenuated, and thus going more frequently to locations in the high-resolution window. A more complete model of such a saliency competition would also predict where in the high-resolution window such saccades are redistributed. We rejected a hypothesis that the shortened saccades would have landing positions distributed according to the relative salience of objects in that region, as indicated by the control condition; the shortened saccades tended to be redistributed among more distant locations within the unfiltered region than those in the control condition—symmetrically centered between the point of gaze and the window radius. However, an adequate explanation for this redistribution requires further research.

We also investigated the related issue of the link between saccade targeting and fixation durations. We proposed three hypotheses regarding this relationship: (a) fixations preceding sac-

Findlay, J., & Walker, R. (1999). A model of saccade generation based on