The School of Psychology invites you to a Special Seminar with

Dr. Bat-Sheva Hadad
Department of Psychology, Ben-Gurion University of the Negev

on:

Normal development and Susceptibility of High-level Visual Processes to Early Visual Deprivation

Thursday, November 11, 2010, 10:00, Faculty room

Hubel and Wiesel’s classical studies in animals suggest that pattern deprivation during a critical period shortly after birth causes deficits in visual outcome. Moreover, because of binocular competition between a weaker deprived eye and a stronger fellow eye, these deficits are greater after monocular than after binocular deprivation. Studies examining grating acuity, contrast sensitivity, and peripheral vision in children deprived of all patterned visual input during early infancy by congenital cataracts support these general principles. Thus, these children later show visual deficits, and the deficits are greater after monocular than after binocular deprivation.

In contrast to these studies, my research is focused on investigating the normal development and the outcome of early dense bilateral congenital cataracts on higher-level visual processes mediated by neuronal processing in extrastriate cortex of both the dorsal and ventral streams. Our studies reveal deficits in some of these higher-level processes in such patients. However, much to our surprise, the results show that some higher-level aspects of vision are entirely normal after early deprivation. For example, pattern-deprived patients are entirely normal in their sensitivity to biological motion, an aspect of vision that receives input from compromised dorsal and ventral visual pathways. In addition, for at least some higher-level aspects of vision, instead of binocular competition as proposed by Hubel and Wiesel, we find binocular collaboration such that vision is better after monocular than after binocular deprivation.

Together, these studies suggest that the rules established for basic aspects of vision, such as acuity, do not necessarily apply to higher-level visual processes. The results allow making new inferences about the relations between the normal pattern of development and the consequences of early visual deprivation: (a) the development of both the dorsal and ventral streams depends on normal visual input; (b) early visual input is necessary to preserve the neural infrastructure for later visual learning, even for visual capabilities that will not appear until later in development; (c) whether the development of a visual capability will be spared or affected adversely by early deprivation cannot be predicted by rate of development, complexity of processing, or the levels involved in the hierarchy of the visual system, and finally (d) after monocular deprivation, interactions between eyes are complementary rather than competitive for high-level vision. These findings have important implications for understanding both normal and abnormal visual development.