

## How the Baby Learns to See: Critical Periods Re-visited



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### Abstract:

Newborns can see but there are serious limitations on their vision. We have investigated the role of visual experience in driving the many, protracted visual changes. We have done so by taking advantage of a natural experiment: children born with dense cataracts in one or both eyes that blocked all patterned visual input until the cataracts were removed during infancy and the eyes given compensatory contact lenses. Even when the babies missed only a few months of visual input, they later develop a host of deficits in both low-level (e.g., acuity, peripheral vision), and high-level (e.g., perceiving the direction of motion, face processing) vision. For low-level vision, the deficits are worse in the deprived eye when the deprivation was monocular rather than binocular, a pattern suggesting that the visual nervous system is tuned during early infancy not only by patterned visual input but also by the balance of input between the right and left eyes. Surprisingly, for high-level vision, the deficits are *smaller* after monocular than after binocular deprivation. To understand this paradox, we are exploring the possible re-organization of hearing in the cataract patients and how its interaction with vision may differ between bilateral and unilateral patients. Overall, the results indicate that perceptual development is perturbed by imbalances, be they between the eyes or between the senses. Nevertheless, there is residual plasticity in adulthood that allows some recovery.

### Brief Bio:

Daphne Maurer is a Distinguished University Professor from McMaster University, Canada. Although officially retired, she continues to do fundamental research on how perception develops and matures, beginning from birth and influenced by the experience of seeing. Now based in Toronto, she also is working on an effective system for checking the vision of kindergarten children to detect the approximately 15% who have as-yet-undetected eye problems. She has almost 200 peer-reviewed publications and many awards. Beyond her academic research, she is active in setting Canadian national policy on the ethics of research with humans.