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### Visual Development: Chronology and Mechanism

Study of the developing visual system provides an important perspective on the functioning of vision and on its neuronal substrate. It also has provided new insights into the causes of pathological development and the treatments thereof. Most of the research on neuronal structure and function has out of necessity been performed on animal preparations. In recent years, however, we, in our laboratory and in a clinical setting, have developed noninvasive procedures for studying visual development in human infants and children. These procedures have yielded previously unavailable normative data on the development of basic visual functions. The methods are being utilized in clinics to assess effects of pathology on the vision of infants and children and to monitor therapy. They have provided data which reflect the development of the visual nervous system and raise new questions about such developments.

Behavioral methods being used include measures of looking preferences, of optokinetic nystagmus, and of gross motor responses, such as reaching for targets. Optical procedures are used to assess refractive error, accommodation, and movements of the eyes. Using these methods, we have developed procedures for measuring visual resolution, including grating, vernier, and stereo acuities, and other procedures for assessing binocularity. Applications of these procedures have revealed the normal course of development from birth through the first few years of life, as well as aberrations, resulting from naturally occurring anomalies, such as strabismus, occlusion, and other pathologies. We have, in turn, attempted to correlate these data with changes known to occur in the developing nervous system of animals and inferred to occur in that of human infants and children. Recently, we have begun to work on behavioral problems entailed in teleoperation and virtual world technology.

Held R. Visual-haptic mapping and the origin of cross-modal identity. *Optom Vis Sci.* 2009 Jun;86(6):595-8. Review.

Gwiazda J, Thorn F, Held R. Accommodation, accommodative convergence, and response AC/A ratios before and at the onset of myopia in children. *Optom Vis Sci.* 2005 Apr;82(4):273-8.

Thorn F, Gwiazda J, Held R. Myopia progression is specified by a double exponential growth function. *Optom Vis Sci.* 2005 Apr;82(4):286-97.

Vera-Diaz FA, Gwiazda J, Thorn F, Held R. Increased accommodation following adaptation to image blur in myopes. *J Vis.* 2004 Dec 28;4(12):1111-9.

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### Additional Publications



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