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Lateral-Line Detection of Underwater Objects: From Goldfish to Submarines[1] J. LEO VAN HEMMEN, Physik Department T35, TU Muenchen — Fish and some aquatic amphibians use their mechanosensory lateral-line system to navigate by means of hydrodynamic cues. How a fish determines an object's position and shape only through the lateral-line system and the ensuing neuronal processing is still a challenging problem. Our studies have shown that both stimulus position and stimulus form can be determined within the range of about one fish length and are encoded through the response of the afferent nerves originating from the detectors. A minimal detection model of a vibrating sphere (a dipole) has now been extended to other stimuli such as translating spheres, ellipsoids, or even wakes (vortex rings). The theoretical model is fully verified by experimental data. We have also constructed an underwater robot with an artificial lateral-line system designed to detect e.g. the presence of walls by measuring the change of water flow around the body. We will show how a simple model fits experimental results obtained from trout and goldfish and how a submarine may well be able to detect underwater objects by using an artificial lateral-line system.

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