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A freeze-fracture study of the skate electroreceptor. T. J. SEJNOWSKI AND M. L. YODLOWSKI.

The sensory epithelium lining the ampulla of Lorenzini in the skate (Raja} was examined with the freeze-fracture technique. At its apical surface, the tops of the sensory cells protrude from the surrounding supporting cells; extensive and complete tiers of tight junctions encircle the apex of each sensory cell. This anastomotic system may be responsible for the electrical isolation observed between the inside and outside of the sensory epithelium. There is a striking difference in particle size and density on the P face of the sensory cell across the tight junction complex. The apical surface has a low density of large particles which may represent the Ca++ channels believed to mediate sensory transduction. The lateral surface has a very high density of small particles.

Each receptor cell makes several ribbon synapses on a sensory axon applied to its basal surface. The ribbon is a flat plate of fuzzy material covered with synaptic vesicles extending from near the tip of the synapse, which invaginates the axon, to the upper arch of the synapse, where its membrane is reflected around supporting cell processes. Near the tip, the vesicles stop abruptly at a narrow constriction, where there is a striking row of large particles on the E face of the postsynaptic axon particle aggregates of this type often represent receptors, so the constricted region may be the active zone of this synapse. In the vesicle-free zone around the tip there are large particles on the P face of the presynaptic sensory cell and the P face of the axon. The large particles in the two membranes are coextensive and arranged in a crystalline array, indicating an intermembrane junction rather than an active zone. At the top of the synaptic arch, dimples are commonly seen on the P face of the receptor cell. Since they are seen in the same region where coated vesicles are found in thin section, these dimples may be sites of endocytosis.