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INFLUENCE OF RESTING ACTIVITY OF SENSORY CELLS ON SENSORY THRESHOLD.

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Using neurone and receptor analogs we investigated how far random resting sensory cell activity would help overcome neuronal thresholds in a sensory channel. Receptor analog characteristic was linear; signal input pulses were square voltages, S, given in series of 100; noise input, N, was gaussian without d.c. component; spectrum flat from 1-500 c/s, down 3 db at 0.35 and 900 c/s. Using a pulse height analyzer with adapter (cf. van der Mark, and Derksen, above) pulse interval histograms were determined for r.m.s. noise values of 0.3-1.0 times receptor threshold, and signal strengths of 0.05-0.30 times threshold. Signals *of* 5% of threshold produced clear shifts in the histograms. The receptor was made to excite a neurone analog generating an output pulse when receptor output pulse intervals fell below a critical value. Neurone output pulses evoked by each of the 100 receptor input pulses were counted and averaged. For noise inputs of 40-70% of threshold, signal/noise ratio at neurone output, σ/ν approximates signal/threshold ratio at receptor input; in this range, $\sigma/\nu \approx S/N$; it falls off on either side of it. In the case of resting activity, the larger the number of N channels over which averaging takes place, the smaller the minimum detectable signal; for 10^4 channels a signal of 1% of neuronal threshold would give $\sigma/\nu = 1$. In the cat, the ratios between threshold of retinal receptor and of lateral geniculate cell to just discernible intensity are 40:1 and 3:1 suggesting such a data processing mechanism.

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