# Modulation of Neurotransmitter Activity by Metric Perturbations: a Gedanken Study

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**Abstract**

In this note the authors investigate the mechanism of [2] in more detail, focusing on neurotransmitter activity at a synapse.

The axon tract has a "resonant" gravitational wave frequency [3], but no "resonant" temperature [4]. This is equivalent to the statements that the temperature response (T2-T1) increases monotonically, whereas the frequency response (T2-T1) has a peak and then decays.

The resonant frequency in Figure 17 of 2021 JAMP is 0.002 Hz. The corresponding peak difference (T2-T1) is 7e-5 seconds. At 25 degrees Centigrade, the peak difference (T2-T1) is 2.5e-4 seconds. This yields a net peak difference of 7e-5 + 25e-5 = 32e-5 seconds or 0.32 milliseconds. An action potential is 1.3 ms long and an additional refractory period of 1 ms exists [3]. This shows that temperature and g-wave effects could combine to produce a 25% change in the peak difference (T2-T1).

Suppose this was a positive difference. That is, the peak difference got elongated by 25% due to temperature and g-wave. In these additional 0.32 ms when the second pulse didn't yet strike the axon bouton, the probability of vesicle release would get affected. We undertake to calculate it.

If the probability is p for a vesicle to undergo exocytosis upon being hit by a pulse [1], and pulses arrive every deltaT seconds, then in T seconds, T/deltaT pulses have arrived. For each the probability of release was p and therefore the expected number of vesicles released is p times T/deltaT. But now consider the elongation of the inter-pulse duration by an amount 0.32ms. Even though these two pulses considered here are on different fibers, there will be coupling effects that will preserve the timing. So in T seconds, T/(deltaT+0.32ms) pulses only have arrived. Thus the expected number of vesicles released is p times T/(deltaT+0.32ms) which is less than before (when the temperature was normal and there was no g-wave influence).

Therefore a positive difference inhibits neurotransmitter activity. Likewise, a negative difference would enhance it.

**References**

**1.** Stevens, Charles F. "Quantal release of neurotransmitter and long-term potentiation." Cell 72 (1993): 55-63.

**2.** Chawla, Aman, and Salvatore Domenic Morgera. "Mechanism of universal quantum computation in the brain." arXiv preprint arXiv:2211.07353 (2022).

**3.** Chawla, Aman, Salvatore Domenic Morgera, and Arthur D. Snider. "Fields, geometry and their impact on axon interaction." Journal of applied mathematics and physics 9, no. 04 (2021): 751.

**4.** Chawla, A. (2025). Effect of Temperature on Ephaptic Coupling. Zenodo. https://doi.org/10.5281/zenodo.14771688