

Abstract Submitted  
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**Large number of receptors may reduce cellular response time variation**<sup>1</sup> XIANG CHENG, LINA MERCHAN, MARTIN TCHERNOOKOV, Department of Physics, Emory University, ILYA NEMENMAN, Departments of Physics and Biology, Computational and Life Sciences Initiative, Emory University — Cells often have tens of thousands of receptors, even though only a few activated receptors can trigger full cellular responses. Reasons for the overabundance of receptors remain unclear. We suggest that the large number of receptors results in a competition among receptors to be the first to activate the cell. The competition decreases the variability of the time to cellular activation, and hence results in a more synchronous activation of cells. We argue that, in simple models, this variability reduction does not necessarily interfere with the receptor specificity to ligands achieved by the kinetic proofreading mechanism. Thus cells can be activated accurately in time and specifically to certain signals or ligands. We predict the minimum number of receptors needed to reduce the coefficient of variation for the time to activation following binding of a specific ligand. Further, we predict the maximum number of receptors so that the kinetic proofreading mechanism still can improve the specificity of the activation. These predictions fall in line with experimentally reported receptor numbers for multiple systems.

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