Noise-stabilized Turing Patterns in a Synthetic Biofilm[1] K.
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Engineering, Massachusetts Institute of Technology — Deterministic Turing instabilities have been proposed to be a major source of pattern formation in biology,
but have been hard to document rigorously, in part because of the requirement for
a large ratio of the inhibitor to activator diffusion coefficient. A recently developed
theory of stochastic Turing patterns predicts that stochastic or noise-stabilized Turing patterns occur over a larger region of parameter space and do not require as
large a separation of diffusion rates. We apply this theory to a biofilm whose signaling molecules have been forward-engineered to exhibit activation and inhibition.
Outside of the range of deterministic Turing patterns, we observe noise-stabilized
patterns that exhibit a power spectrum power law tail with exponent $-2.3 \pm .4$
consistent with theory. Our results are the first report of a spatial pattern in gene
expression stabilized by copy number fluctuations.

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