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Aspects of Turing's Pattern Formation Mechanism On Growing Domains

The prospect of long range signalling by diffusible morphogens initiating large scale pattern formation has been contemplated since the initial work of Turing in the 1950s and has been explored theoretically and experimentally in numerous developmental settings. However, Turing's pattern formation mechanism exhibits sensitivity to the details of the initial conditions suggesting that, in isolation, it cannot robustly generate pattern within noisy biological environments. Aspects of developmental self-organisation, in particular a growing domain, have been suggested as a mechanism for robustly inducing a sequential cascade of self-organisation, thus circumventing the difficulties of sensitivity. This proposition is explored in detail for generalisations of Turing's model which include further biological aspects, for example, the inclusion of gene expression dynamics or intrinsic noise.