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Patterning in development and the role of short and long range signalling

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Many biological systems rely on both long range and short range signals in order to produce proper cell patterns during development. These patterns, such as alternating cell fates, are defined by different gene and protein expression levels. However, the relative contribution of these two signalling modes in establishing proper patterns is not well understood. Using vulval development of two nematode worm species, *C. elegans* and *C. briggsae*, as motivation, we derive an asymptotic PDE based on a simplified signalling network consisting of EGF, Notch and Wnt. We demonstrate that additional long range signals can provide a framework for understanding species-specific differences and that variations in short range signalling can amplify long range signals. These results suggest that long and short range signals have critical roles to play in proper cell patterning in development. This work is joint with Helen Chamberlin and Carly Williamson.

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