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Modelling hormone-regulated plant root growth

Researchers at the Centre for Plant Integrative Biology are using systems approaches to investigate plant root growth and development. In this talk, we present a multiscale model that describes how the hormone GA regulates growth in the root elongation zone. The model includes: (i) hormone diffusion and dilution, (ii) a genetic regulatory network that details how the hormone affects the DELLA proteins, (iii) a description of how the DELLA proteins influence the cell-wall remodelling enzymes, and finally (iv) a submodel linking cell-wall remodeling to growth. Using detailed morphological measurements, our model shows that cell growth causes significant hormone dilution which can lead to spatial variations in the key growth-regulating proteins. By modelling this feedback loop, we provide understanding of the phenotypes observed in wild-type and mutant plants.