



## **ABSTRACT**

“Modeling plant developmental systems and their evolution”

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Plants are amazingly complex systems of interacting molecular components. Fortunately, biological systems exhibit a high degree of modularity, enabling the study of particular subsystems in relative isolation. I propose to establish a lab at PSB to study aspects of plant growth and development from a mathematical modeling perspective, focusing on the development of lateral roots in *A. thaliana*. The *Arabidopsis* root system is in many respects an ideal model system to study developmental processes in plants. Computer models are increasingly being used in the study of root development, mainly to study fluxes and distributions of auxin, the trigger for many plant developmental processes. However, the downstream molecular events leading to e.g. lateral root initiation (LRI) are not considered in the current models. Recently, several mutants have been identified that show aberrant patterning of the early lateral root primordium. The discovery of such genes gives us a foothold to start modeling the molecular mechanisms underlying lateral root formation.

As T.G. Dobzhansky famously noted, nothing in biology makes sense except in the light of evolution. It is known that the evolution of plants has been heavily impacted by gene and genome duplications. Most of the genes involved in plant development come in families, of which the members often exhibit a considerable overlap in function. As a result, the study of LRI and other developmental processes in plants often requires the use of double, triple or even quadruple mutants. Of special interest for plant development are the Aux/IAA transcriptional regulators and ARF transcription factors, key regulators of auxin responses in plants. I intend to study the duplication and functional divergence of Aux/IAAs and ARFs and the impact thereof on the evolution of developmental processes in plants from a systems biology perspective.