

CABDyN / INET Oxford SEMINAR SERIES

Oxford Martin School – Trinity 2015

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‘Graph-based analysis of cellular patterning in plants’

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Tuesday 28th April, 12.30 -14.00

Seminar Room 1, Oxford Martin School

ABSTRACT:

Intercellular communication forms the basis of cellular patterning and self-organization in plants. Understanding the organizational properties of these cellular arrangements is key to uncovering organ function and structure-function relationships. To achieve this, we are looking at plant organs as complex systems of interacting cells and quantifying the topological properties of these systems using graph theory. Image analysis of whole mount 3D segmented organs is used to extract complete cellular connectivity networks, where nodes represent cells and the edges their physical associations. Edges in these graphs are never broken as plant cells are physically glued to one another through shared cell walls, and cannot migrate as do animal cells. The discretization and abstraction of complex cellular patterning allows for quantitative topological analyses. Centrality-based analyses of these structural networks readily identify local irregularities in cellular patterning due to biological noise. Despite these local aberrations, the global topological properties of cellular patterning remain tightly regulated at a whole organ level. A role for path length in the control of communication across plant organs is also emerging. Finally, the topological analysis of mutants enables the contribution of gene activity towards patterning to be quantified on both local and global levels.