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University of Calgary, 2500 University Dr. N.W., Calgary, Alberta T2N 1N4, Canada. *Constraints  
of space in plant development: Where fractal forms come from?*

Like all forms in nature, plants are subject to the properties of space in which they are embedded. On the one hand, space prevents configurations that would place more than one component in the same location at the same time. A generalization of this constraint limits proximity and density of organs. On the other hand, space provides a means for a plant to create three-dimensional forms by differentially controlling their growth. This results from a connection between the metric properties of surfaces and their curvature. Three strategies are used by plants to develop within the constraints of space: expansion to another dimension, egalitarian partitioning of space, and competition for space. Each of these strategies is closely related to the emergence of fractal forms. They will be illustrated with the examples of curved surfaces of leaves and petals, self-similar branching structures of compound leaves and inflorescences, and tree architectures. The examples highlight the fundamental role of the constraints of space in plant development, and the complementary role of genetic regulation and space-dependent emergent phenomena in shaping a plant. (Received September 17, 2013)