

co-ordinated with the Director of the Institute / Research Unit

**Scientific Computing Research Unit**

**PSP-Element:**

G-503890-001

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**Title of the highlight:**

Complexity and integrated 'omics' data analysis

**Keywords:**

'Omics' data , Plant systems biology , Systems theory , Complexity , Large-scale modelling

**Central statement of the highlight in one sentence:**

Lessons from complexity theory and systems theory need to be taken into account dealing with high-throughput data from various 'omics' technologies

**Text of the highlight:**

High-throughput experimental technology has provided insight into the inner functioning of plants. The current experimental technology facilitates the study of plant systems in a holistic manner, measuring observables from the genome, proteome, and metabolome up to the level of the ecosystem. The call for a systemic view in plant research is being made from multiple research fields. Although not yet fully developed for tree research, data sources are also rapidly growing in this area. Nevertheless, there are challenges and pitfalls in dealing with such increases in data. Some of these difficulties are deeply rooted in the complexity of the evolutionary systems. The lessons from complexity theory are rooted in studies performed several decades ago. Honouring principles that were formulated before bioinformatics and systems biology had been introduced facilitates the derivation of analytical methods with the potential to overcome these challenges in several ways.

**Publication:**

**W. zu Castell**, D. Ernst, Experimental omics data in tree research: facing complexity, *Trees* 26 (2012), 1723-1735.

**Taking account of the HMGU mission:**

Research on complex biological systems needs methods taking the complexity of the object of consideration into account. High-throughput 'omics'-technologies provide powerful experimental approaches which need to be properly dealt with using data analysis and data synthesis.

**The internal HMGU co-operation partners with whom the highlight was compiled, if appropriate:**

Institute of Plant Physiology, G-504900-001