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High-throughput chemical genomics in plants

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Slatyer seminar room R.N. Robertson Building (Bldg. 46), Linnaeus Way, ANU



Leaf epidermal pavement cells have been attracting interest in recent years as a model system for cell shape formation in plants. Plant cell shape, seen as an integrative output, is of considerable interest in various fields, such as cell wall research, cytoskeleton dynamics and biomechanics. We are using the complex geometry of this specialised cell type as an output for high-throughput screening in plants. To this end, we have established a high-throughput cellular-level phenotyping pipeline incorporating robotised microscopic image acquisition and unsupervised image processing to detect and extract pavement cell geometries. The shapes of large numbers of cells are then quantified using elliptic Fourier analysis – a morphometric technique to represent shape outlines in a high-dimensional space with the use of a Fourier transform. The encoded information is then analysed to search for differences using data-mining techniques and statistical testing. We have successfully used this set up to conduct a bioassay, screening a large library of diverse small molecules with the aim of discovering new drugs targeting diverse cellular processes in plants, eg. cytoskeleton

dynamics and cell wall deposition. In a parallel endeavour, we have increased the phenotyping potential of the pipeline and are using chlorophyll fluorescence imaging to simultaneously search for novel chemical modulators of photosynthesis with potential agrochemical applications. Of particular interest are chemicals targeting components of the light reactions of photosynthesis, as well as agents which enhance photosynthesis.

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