aPPF
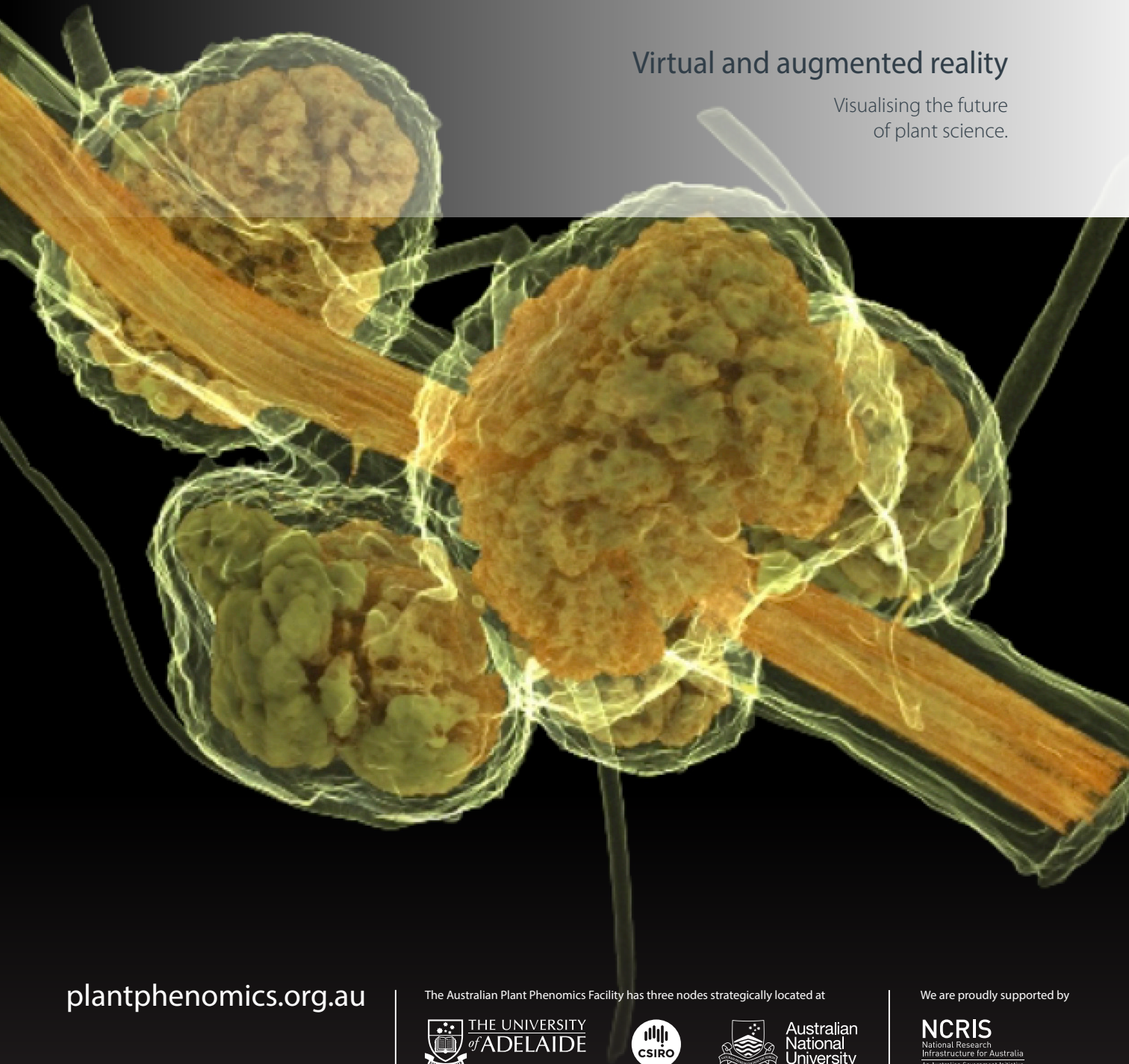## Australian Plant Phenomics Facility

Virtual and augmented reality

Visualising the future
of plant science.

Virtual reality is the new frontier in scientific visualisation

VIRTUAL AND AUGMENTED REALITY

Enabling sustainable, high-yield food production at scale requires transitioning from conventional agricultural methods to digital, data-driven, precision agriculture.

New technologies are providing the tools to make 3D, plant-level measurements on tens of thousands of plants in the lab or field, in thousands of bands of colour, through time. These measurements can now be augmented with huge time-series datasets from low-cost distributed sensor networks, genomics data and new computational pipelines. These types of high complexity, high time-frequency datasets are crucially important for enabling precision agriculture, the next generation of plant research and tackling climate change. However, modern plant science and agricultural datasets have become so complex that researchers struggle to analyse and visualise these data in meaningful ways.

To address this challenge, the ANU node of the Australian Plant Phenomics Facility (APPF) is developing new tools for novel workflows, decision support and for visualising and interacting with complex 3D research data and point clouds in virtual and augmented reality (VR and AR).

VR and AR represent immense opportunities including:

- Revolutionising research, education and data visualisation
- Industry collaborations to develop new data management platforms and to enable precision agriculture
- Real-time data visualisation and operational support for growth facilities, horticulture and precision agriculture
- Virtual training for lower cost, higher impact and educational scenarios
- Landscape modelling and visualisation for regenerative agriculture including mapping of digital data and modelled outcomes onto the real landscape in AR
- Real-time decision support for farmers and land managers

Existing projects include:

- EcoVR - A tool for recreating any forest or field site in VR with time-lapse sensor and phenomics data overlaid on a 3D model of the landscape
- lasVR - Enables VR interaction with time-series point cloud data of any size or resolution
- Lab and RootVR - Prototype workflows for new methods of visualising operational data and interacting with 3D datasets
- RegenVR - Data driven physics-based landscape modelling for regenerative agriculture and carbon drawdown

Expertise at the Plant Phenomics Group

The APPF node at the Australian National University (ANU) has unique expertise in phenomics, bioinformatics, hardware and software development and data visualisation. This provides essential research support to APPF customers, linking phenomics data to underlying genomic variation. The node offers modern PC2 facilities and provides the only quarantine certified plant growth facilities in the ACT region. With a strong history of supporting ground-breaking plant research, including the development of open source, high throughput phenomics infrastructure, software, visualisation for plant science researchers nationally and internationally.

Cover image: Soy root nodule.
X-ray CT Data: Topp Lab, Danforth Plant Sciences
Visualisation: Dristhi VR

Discover more: plantphenomics.org.au

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