

# Your partner in space

Dr Sarah Pearce | Deputy Director, CSIRO Astronomy and Space Science  
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Fresh Juices  
BEER & WINE  
Smoothies  
Banana, Mango, Berry  
Homemade Pastries, Curries + soups  
WINTER  
New Menu Coming





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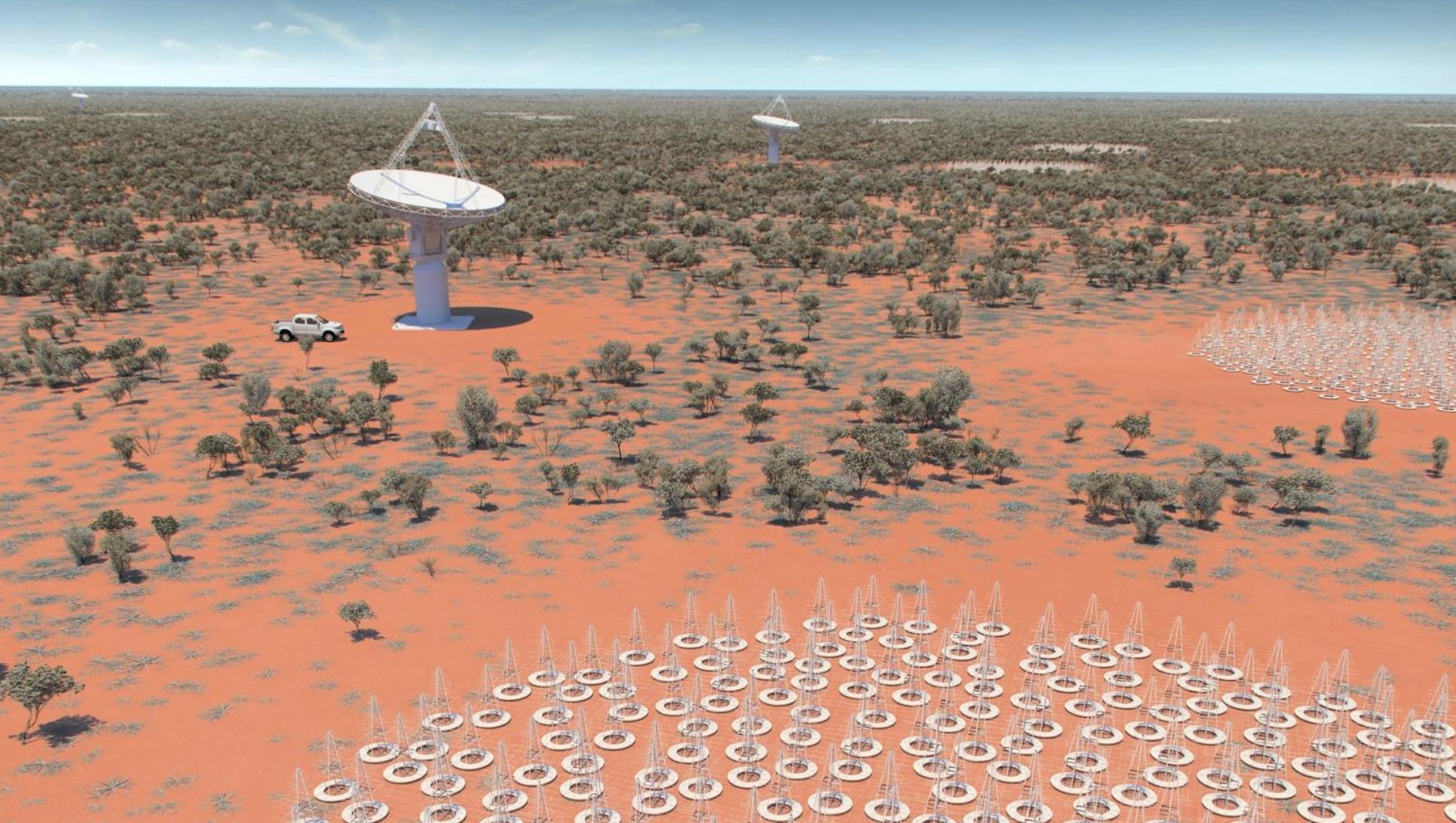
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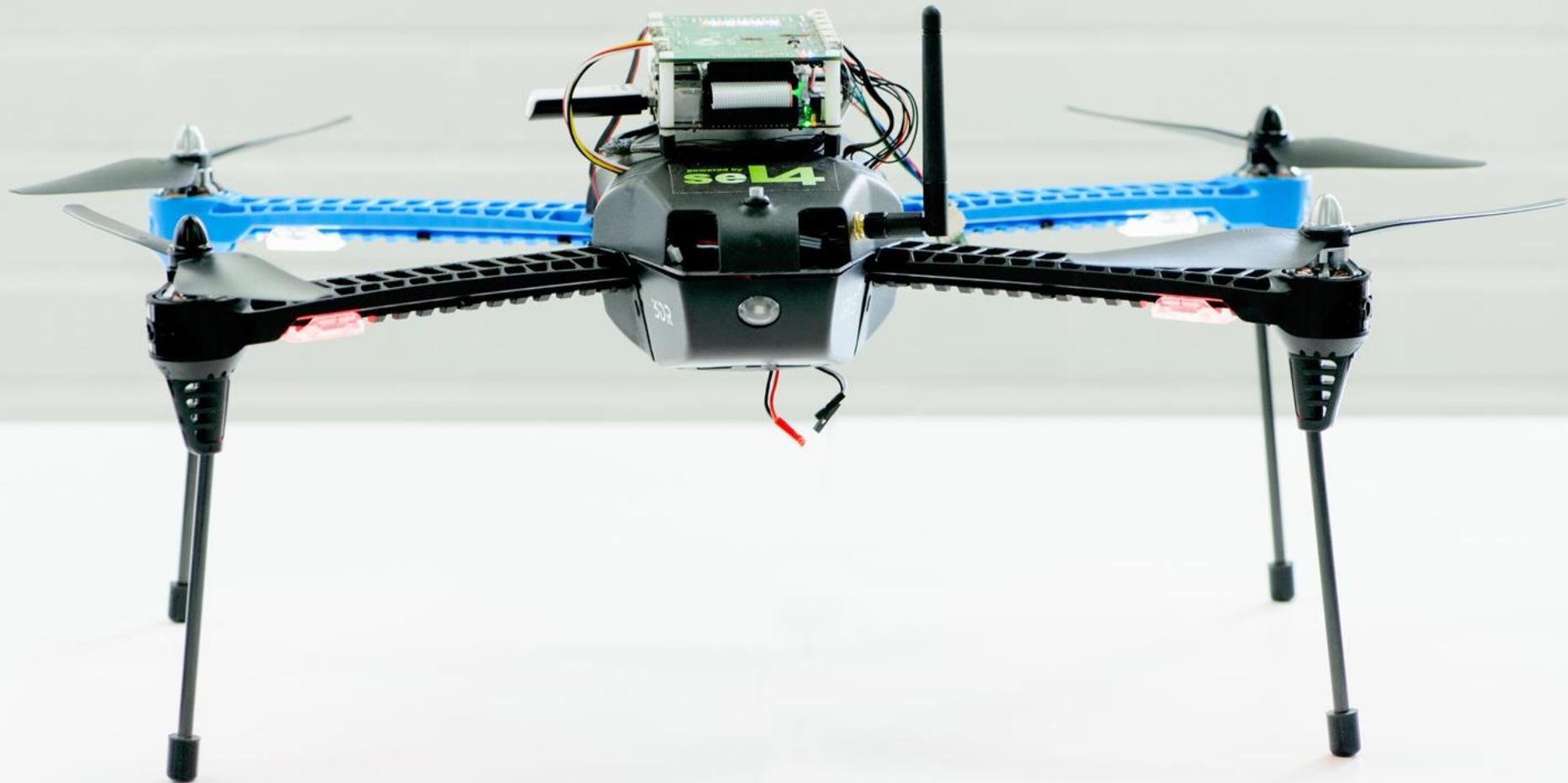
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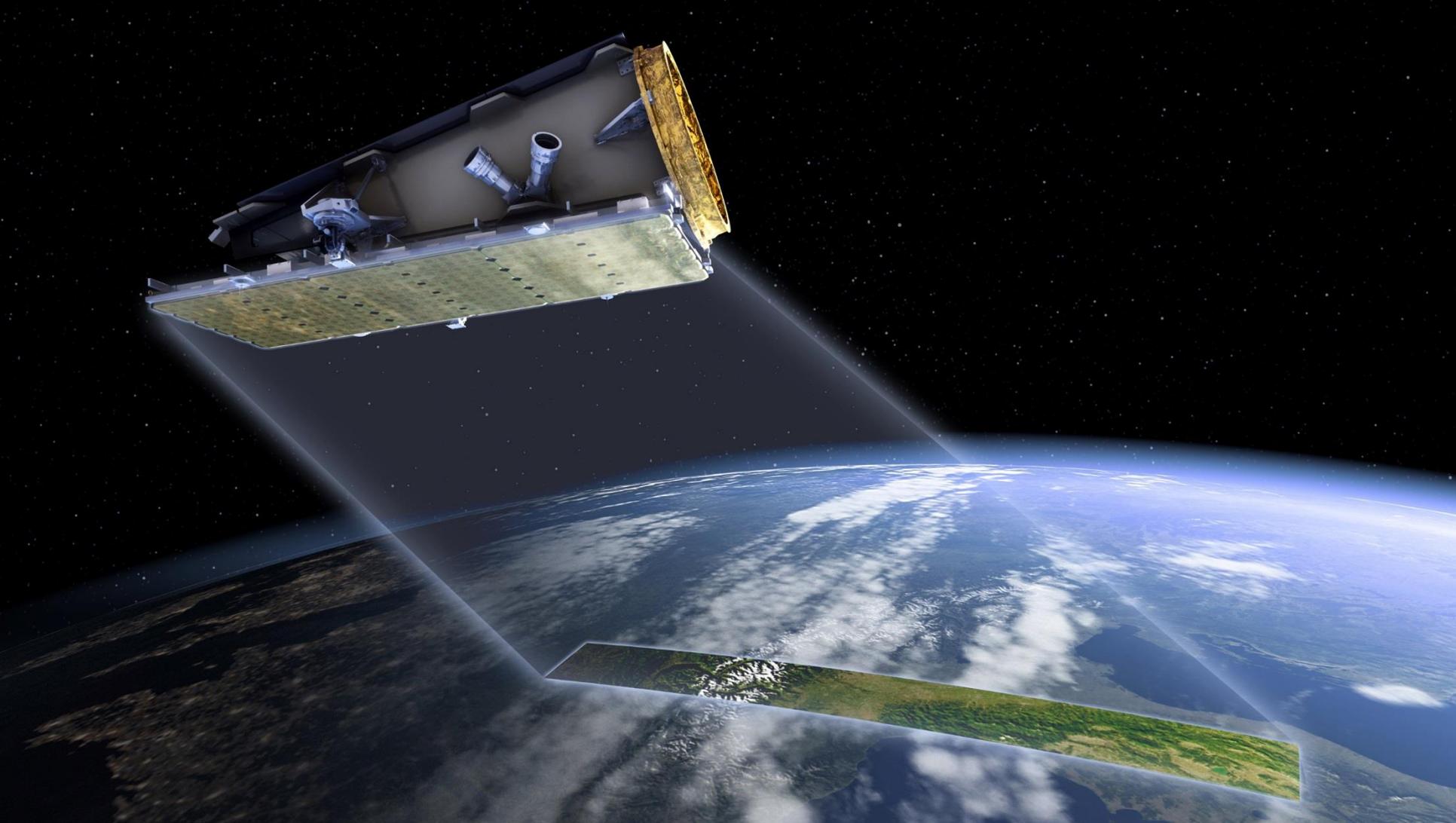
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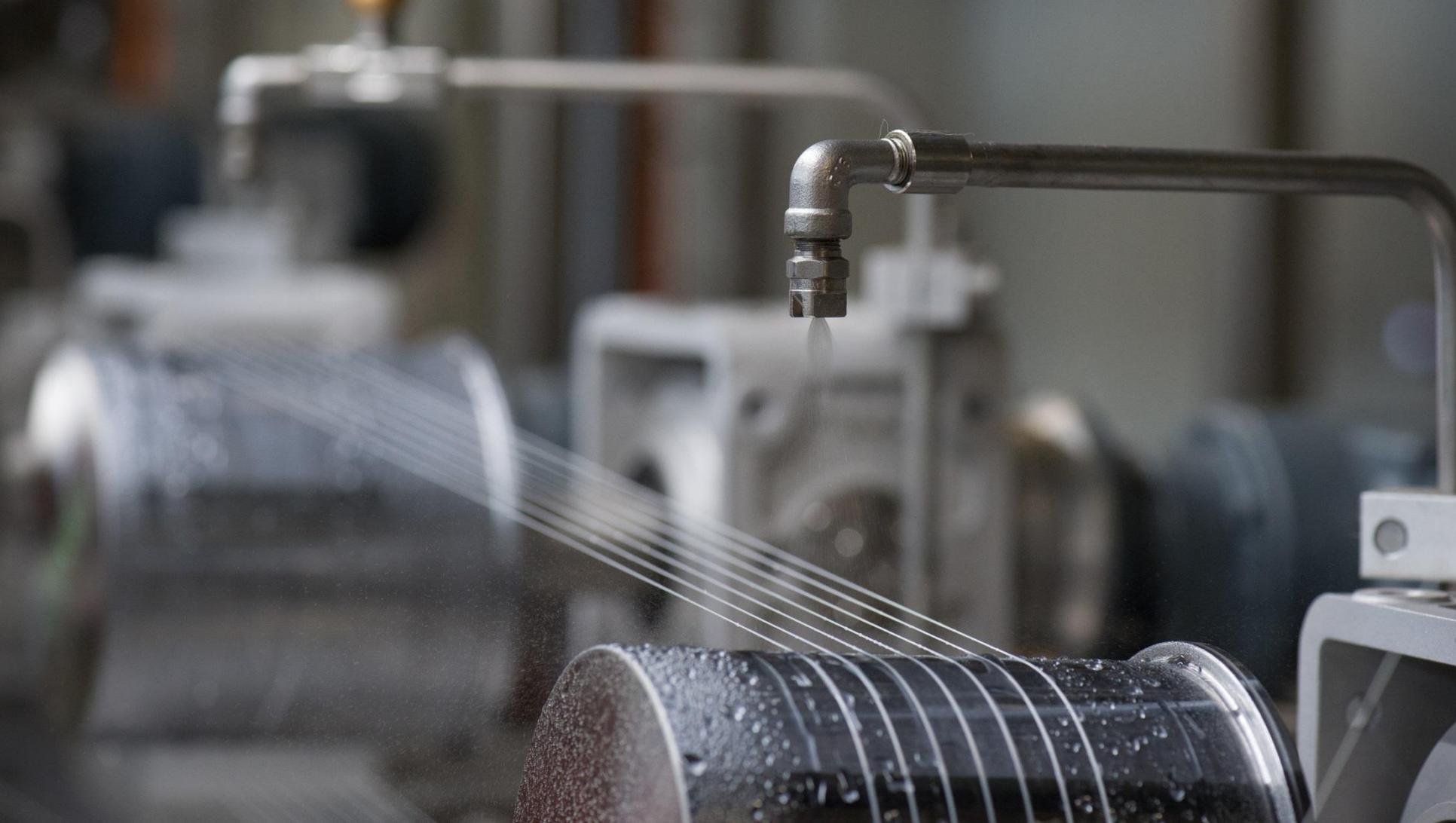














POWERED BY





## **Presentation by Sarah Pearce to 4th South Australia Space Forum, 22 November 2017**

I would like to begin by acknowledging the Kaurna people as the Traditional Owners of the land that we're meeting on today, and pay my respect to their Elders past and present.

It's great to be here in Adelaide again after the success of IAC2017, what a fantastic event, thank you South Australia for being such wonderful hosts.

Our Chief Executive Larry Marshall was thrilled to participate in IAC2017 and was disappointed not to be able to join us here today.

Earlier this month Larry addressed the National Press Club and spoke about some of the challenges our nation is facing.

Digitisation. Automation. Globalisation.

And there are others.

Like national security, and cybersecurity.

And mitigating and adapting to a changing climate.

These are of course challenges that South Australia is facing too.

For most Australians it may not immediately come to mind, but the space sector has a great deal to offer in addressing these challenges.

And with challenges come opportunities, including the opportunity to grow new businesses and jobs.

Here in South Australia you're already leading the way, with companies like:

- Fleet Space
- Inovor
- Myriota [Dr Alex Grant speaking later]
- Neumann Space [Dr Patrick Neumann speaking later], and
- Silentium Defence

You're probably familiar with CSIRO, your national science agency.

For 100 years we've been working with Australian industry and governments to solve some of our biggest national challenges:

- From controlling pests – like rabbits with myxomatosis – to tackling swarms of flies with dung beetles.
- Re-inventing industries like wool and cotton to give Australia an unfair advantage.
- And transforming the world with breakthrough inventions like ultrasound imaging and fast WiFi.

Perhaps our best kept secret is that we can do the same for every Australian industry, every Australian business, and every Australian individual. Even you.

Each year we partner with thousands of companies, governments, research organisations and universities to solve challenges, and to develop and take new technologies to market.

In South Australia we have 380 staff across three campuses. But wherever you are, you have access to more than 5000 CSIRO staff who are based around Australia and around the world – from offices in Silicon Valley and Chile to Asia and Europe.

And, like never before, we're listening to your needs.

We recently met with more than 20 small-to-medium enterprises in the growing Australian space industry at a Space 2.0 workshop.

We wanted to explore how CSIRO's expertise and facilities can help this vibrant ecosystem of start-ups to grow, and position Australia at the centre of 'new space'.

One of the insights we gleaned was that people were familiar with our work in managing complex facilities, space tracking and radio astronomy:

- We've been working with NASA and other international space agencies for more than 50 years supporting missions exploring our Solar System.
- We've nurtured the field of radio astronomy since its emergence in the 1940s.
- we're now working with an international collaboration of more than 20 countries to realise the Square Kilometre Array.

But CSIRO's space activities aren't all about looking up.

Many of the workshop participants were surprised by the breadth of what we do that is relevant to our growing local space industry:

- From managing big data, data analytics, cybersecurity, and the internet of things.
- To 3D metal printing, and the development of coatings technology, robotics and sensors.
- And deep expertise in Earth observation data processing methods, applications and services.
- We've been working with Boeing for 30 years, including being named a Supplier of the Year last year,

But technical capabilities alone aren't enough. The most successful innovation is driven by partnerships.

Let me give you some examples.

Our world-leading infrastructure and expertise in handling **big data** allows us to deliver unprecedented insights:

- With the latest radio telescopes such as ASKAP recording more than 200 terabytes of data each day, astronomers need to develop ways to cut through the data deluge and be able to pick out the important bits.
- To solve this problem, one of our international science teams has developed a cloud-based computing system that uses machine learning techniques to 'teach' the system all the things that we know about astronomy.
- The huge advantage of building this type of system is that it provides a machine with a level of intelligence to be able to make connections that traditional programs couldn't.
- It can 'learn' from its mistakes and achieve more accurate results over time.

With the data revolution upon us, **cybersecurity** is more important than ever before.

- In May, a cubesat featuring a secure software system base called **sel4**, developed by our Data61 team, was launched from the International Space Station for the QB50 project.
- The cubesat, developed by UNSW, is currently taking measurements of conditions in the lower thermosphere.
- sel4 is essentially a small operating system called a 'microkernel'. It enforces separation between trusted and untrusted parts of a software system

- It is already being used in autonomous helicopters and trucks.
- On the cubesat, the seL4 software is being used to stabilise and manage its position while in orbit, similar to a flight system for an aeroplane.
- seL4's predecessor, OKL4, created by the same team, has been deployed on billions of mobile and connected devices, including all recent iOS devices.

As I'm sure you well know, **Earth observation** satellites provide us with a wealth of data about our planet, from which we can derive valuable insights for managing natural environments, and creating agricultural and industrial opportunities.

On the upstream data supply side:

- In Adelaide in September we announced that CSIRO would be taking a 10% share of the **NovaSAR** synthetic aperture radar satellite due to be launched in early 2018.
- We'll be running this as a national facility – so time on the satellite will be available to researchers across Australia, based on the merit of their proposals.
- This partnership will provide our collaborators with access to near-real-time radar Earth observation data over Australia's Exclusive Economic Zone and also worldwide.
- This data could be used in disaster response and for development of new applications, for South Australia and the nation. Particularly salient as we head into bushfire season.
- Towards the end of a huge week at IAC2017, Defence Industry Minister Pyne announced the first four projects initiated through **HASS** – the High Altitude Sensor Systems program.
- We provided \$2.7 million in seed funding to establish HASS through the Defence Materials Technology Centre.
- The program aims to develop new sensor and on-board data processing technology for unmanned aerial systems and small-satellite platforms
- Why? In order to build Australian industry and enhance our national Defence capabilities.
- Colleagues from DST Group here in Edinburgh are supporting the strategic development of the program through participation in the program's Technical Advisory Group and Strategic Committee.

On the downstream data analytics and applications development side:

- More than 35 organisations are currently working in partnership with our researchers on projects using satellite-derived data.
- Like the **algal early warning system** we built with the NSW Department of Primary Industries to monitor the water quality of more than 2000 lakes across the state.
- The system was created using data sets gathered from the LANDSAT 7 and LANDSAT 8 satellites, and harnesses the computing power of the Australian Geoscience Data Cube at the National Computational Infrastructure.
- It's updated in real time as new data is received, and uses a traffic light system for easy understanding of each lake's health status.
- And it allows policy makers and water authorities to better make judgements about water allocations to maintain healthy lake systems.

Away from Earth observation and into advanced manufacturing.

At our Clayton campus in Melbourne we've been using **3D metal printing** techniques for many years:

- In 2015 we opened Lab22, which allows businesses to come and use our additive manufacturing facilities for fast prototyping.
- This is something that would be too expensive for small businesses to invest in while they're scaling up, but something that your national science agency does as part of our mission to support Australian industry.
- Take, for instance, Albins Performance Transmissions in Victoria, a key supplier to Thales for the Hawkei protected mobility vehicle.
- Albins needed to deliver a cast prototype part for the Hawkei in record time, so they approached us to see if we could make a casting mould within two days.
- Working from a digital file, our team in Lab 22 manufactured a mould over a weekend.
- The part was then cast using the mould – all within the one-week deadline for the finished part.
- We're now bringing our Lab22 experience to South Australia, working with the recently announced 3D additive printing network here in Adelaide.

**Carbon fibre** is a material of the future, with ultra-low weight, superb stiffness, and high conductivity:

- It's being used in everything from bicycles and tennis rackets; to aviation and space.
- But carbon fibre is only made by a handful of manufacturers around the world, each with their own secret, patented recipe.
- Earlier this month, in his National Press Club address, our Chief Executive Larry Marshall announced that, in partnership with Deakin University, we've created carbon fibre from scratch.
- The CSIRO – Deakin team has taken the first step towards reinventing generations of new jobs in carbon fibre manufacturing here in Australia.

So, how can we help your organisation, you might ask.

In the past two years we've launched, with the support of the National Innovation and Science Agenda, three new initiatives to help you bring your ideas to fruition:

- Data61, our new business unit specialising in data science research and engineering. You can collaborate directly with Data61 and all of our business units, they have deep domain expertise.
- There's Main Sequence Ventures, a venture capital company looking to invest in Australian deep tech ideas from publicly-funded organisations and SMEs who partner with a publicly-funded organisation.
- Make sure you see Martin Duursma from the Main Sequence team while you're here today for more details.
- And there's Australia's national sci-tech accelerator program, ON, for taking your idea to the next level. The program is open to all publicly-funded organisations in Australia.

- Like Silentium Defence from the University of Adelaide. Their new passive radar technology allows troops on the ground to see without being seen.
- James and Simon recently completed the 3-month ON Accelerate program, which gave them the tools to better understand their customers and help them grow their business.
- Silentium is now on their journey to commercialisation with a \$200k grant from the SA State Government.

This is all in addition to our SME Connect program, and the range of partnerships, joint ventures, co-investing and licensing options we have to offer.

In order to solve our challenges, and compete in a global market for opportunities, partnerships have been and will be the key to Australia's success.

CSIRO is your partner in space.

And we're listening to your needs.

Let's work together to address the challenges you face and the opportunities you see.

Thank you.