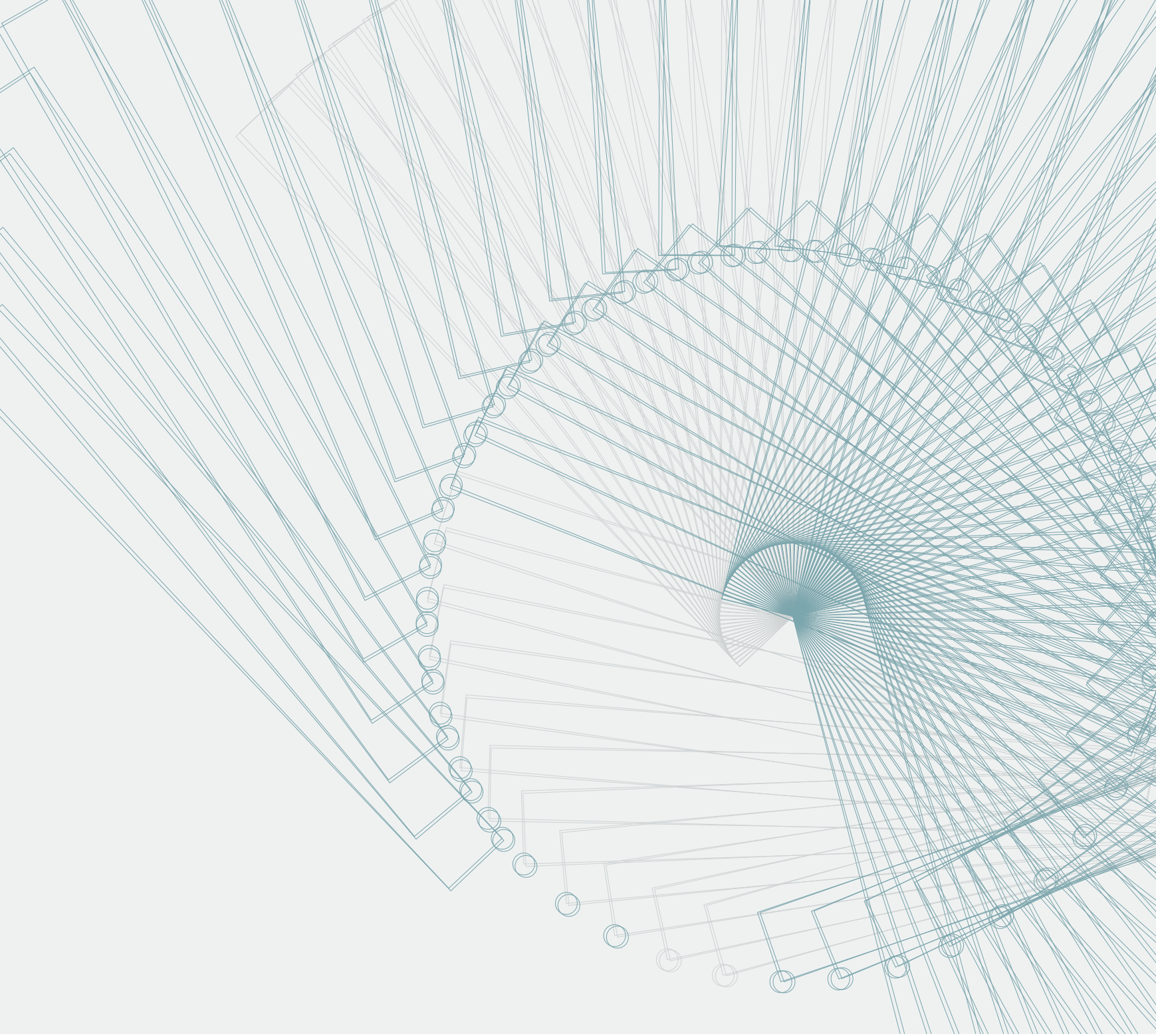
PAWSEY
SUPERCOMPUTING
RESEARCH CENTRE

ANNUAL OVERVIEW
FOR THE YEAR
2021-2022

PAWSEY.ORG.AU

Accelerating Discovery

2022



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The Pawsey Supercomputing Research Centre is supported by the Australian Government through a $70 million grant made under the Industry Research and Development Act and administered by the Department of Industry, Innovation and Science. Pawsey is also supported by the Australian Government under the National Collaborative Research Infrastructure Strategy (NCRIS) through the Department of Education. The Centre would also like to acknowledge the support provided by the Western Australian Government and its Partner organisations.

Chairman's Foreword

The development of a world-class facility does not occur by accident, but through a vision of what could be, a strategy to get there, and investment to pave the way.

For the Pawsey Supercomputing Research Centre, that original vision was very closely linked to Australia's ambitions in radio astronomy.

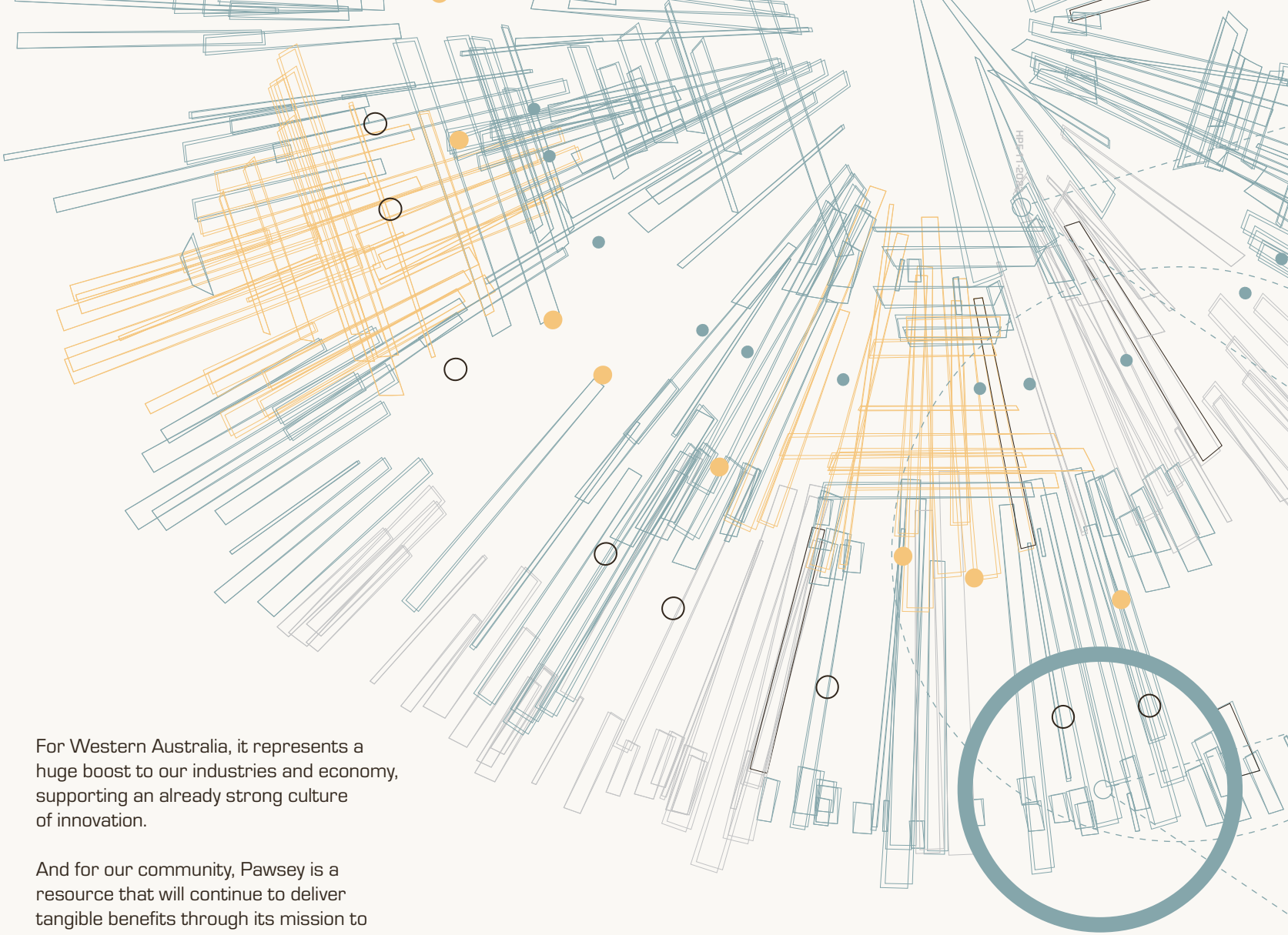
Our early years were marked by a series of strategic investments by both the Federal and State Government designed to develop high performance computing capability to advance work in this field — even before the true potential of high performance computing was fully understood.

Today, we reap the rewards of this vision, strategy and investment, with a world-class supercomputing facility that is poised to deliver not only for radio astronomy and space exploration, but in domains as diverse as energy and resources, engineering, bioinformatics and health sciences.

In my first year as Chair of the Pawsey Board, I am delighted to be working with an organisation that is leading Australia's response for HPC, with the introduction of our new supercomputer Setonix and advances in infrastructure that will support the next generation of research.

The success to date is a credit to the previous Chair, John Langoulant AO, the commitment of our partners in Australia's national science agency, CSIRO, WA's four public universities, and the efforts of our Executive Director Mark Stickells and the entire Pawsey team.

I see Pawsey as offering Australia an opportunity that cannot be missed — to have an internationally relevant facility that expands our capability as a nation, and which will be a magnet for talent and expertise.



For Western Australia, it represents a huge boost to our industries and economy, supporting an already strong culture of innovation.

And for our community, Pawsey is a resource that will continue to deliver tangible benefits through its mission to enable science and advance discovery.

It is an absolute privilege to be involved with Pawsey and its people, and I look forward to an exciting future with the organisation, as it takes its next steps on the world stage.

Tim Shanahan
Chairman

Executive Director's Report

I'm delighted to be able to share with the supporters of Pawsey Supercomputing Research Centre our year in review — and what a year it has been.

In these pages, you will read about the remarkable undertaking that has been our preparation for our new supercomputer Setonix, the centrepiece of a $70 million investment by the Australian Government.

Setonix, which will be fully installed by early 2023, has required an extensive upgrade of the technical infrastructure at Pawsey, with a multi-year capital refresh designed to support a leap forward in compute power and storage infrastructure to prepare our Centre to be exascale-ready.

Besides commencing the installation of a state-of-the-art HPE Cray EX supercomputer, we have upgraded networking architecture to support the next generation of high performance computing and introduced one of the largest research data storage systems in the world.

The year has also seen Pawsey achieve an international first in the global race toward quantum computing.

We have partnered with Quantum Brilliance to install the first rack-mounted, room-temperature diamond accelerator, allowing us to pioneer research on the interface between classical and quantum computing.

It's another amazing achievement and a glimpse of how we are engaging in the future of advanced computing.

But beyond our technological growth, we have also grown as an organisation, and I would like to reflect here on the contribution of our people and our culture to our success.

The expertise of our team in HPC and big data is world-class, and our culture of innovation and knowledge sharing consistently demonstrates that expertise to the wider community.

We are increasingly recognised for the value that Pawsey and our people bring both to Western Australia and to the national HPC landscape and this in turn has enabled us to be more confident and bolder in our approach.

We know that Pawsey is on the cusp of the biggest computing power advance in the nation's history with the installation of Setonix, and we are already seeing the competitive advantage it will deliver through our ability to understand and interrogate massive data sets.

This technology will help us contribute to the bigger story of Australian and Western Australian science that is being written through the SKA project, in the endeavours of researchers to tackle climate change, and by the extraordinary developments we are making in areas such as food security and healthcare.

It will also connect us even more deeply to Country and land on which we operate.

One of my proudest moments this year was the opportunity to meet Margaret Whitehurst, the Wajarri Yamatji artist and Elder whose work features on the Setonix and Magnus cabinets.

Pawsey recognises 60,000 years of unbroken First Nations' traditions and science and we are honoured to be able to contribute to a greater understanding of Australia, its history and its future, through our work.

In closing, I would like to thank you, our supporters and stakeholders, and note that our success is, as always, the result of collaborative effort.

Throughout this year we have been supported by the direct investment by the Western Australian Government, the Australian Government, and through our enduring partnership with The University of Western Australia, Curtin University, Edith Cowan University, Murdoch University and Australia's national science agency, CSIRO.

I am grateful to our partners and funders, and to our Board for its strategic vision, as well as to our team.

Mark Stickells
Executive Director

AUGUST

130PB

of multi-tier storage procured

SEPTEMBER

Setonix Phase 1

arrived, and its artwork revealed

NOVEMBER

A new visualisation lab

was made available to researchers

JANUARY

A total of 158 projects

received supercomputer allocations in 2022 at Pawsey based on merit allocation committee decisions: 58 projects from NCMAS, 63 projects from Pawsey Partner scheme, and 37 from Energy & Resources scheme

Wajarri Yamatji visual artist Margaret Whitehurst produced the artwork for Setonix, inspired by the stars that shine over Wajarri Country in Western Australia's Mid-West.

FEBRUARY

Nebula

the new web-based remote visualisation cluster, launched

MARCH

Quantum Education

and Research Program launched in partnership with UWA

MAY

The First room-temperature

on-premises quantum computer in a supercomputing centre installed in collaboration with Quantum Brilliance

June

Setonix Phase 1

welcomed its first researchers

June

Acacia's multi-tier storage

and Banksia's offline storage made available to researchers

A year of Highlights

//COLLABORATIONS

OCTOBER
Partnered with CSC, the host site for LUMI

OCTOBER
DReSA (Digital Research Skills Australasia) launched, as a collaborative effort to provide a portal for trainers and learners in digital research skills

OCTOBER
Announced the Carpentries partnership for digital research skills

SEPTEMBER
Partnered with QCIF, a new Australia Apollo service for collaborative genome annotation launched

November
Joined OpenMP to help develop this standard parallel programming model

DECEMBER
PaCER projects announced, as a collaboration with researchers to provide early access to Pawsey's supercomputing tools and infrastructure, training and exclusive hackathons focused on HPC performance at scale

DECEMBER
Pawsey featured in the Beyond the Milkyway VR experience at the launch of the WA Museum 2022 program

February
Pawsey hosted the Minister for Science and Technology Hon Melissa Price and four WA Superstars in STEM, as part of the announcement of additional funding to support Science & Technology Australia and its commitment to support women in STEM

March
WA Deputy Premier Minister Roger Cook visited the Centre

//PEOPLE

SEPTEMBER
Pawsey visited by Wajarri Yamatji visual artist **Margaret Whitehurst** who produced the artwork for Setonix. The Wajarri Yamatji people are the traditional owners of CSIRO's Murchison Radio-astronomy Observatory where one part of the world's largest radio astronomy project, the SKA, will be built

November
We delivered the first PaCER Conference (P'Con) preparing Australian computational researchers for the next era of supercomputing

November 21– January 22
Pawsey welcomed its **largest intern cohort** to date with 47 interns working on 38 projects from 15 universities and institutions across Australia

November
Pawsey team published and presented its paper on Energy-based Accounting Model for Heterogeneous supercomputers during SC21

DECEMBER
Pawsey appointed a new Chairman

November – February
Intern mentors took the lead in more than **200 hours of core training streams**

May

WA Data Science Innovation Hub joined Pawsey in organising Data Science Week events, which saw over 500 participants

June

Pawsey presented with Quantum Brilliance at the first Emerging Disruptive Technology Assessment Symposium for Quantum Computing launched in Canberra and organised by the Department of Defence

May

Executive Director of Digital, National Facilities & Collections at CSIRO Prof Elanor Huntington joined the Pawsey board together with Prof Chris Moran Deputy Vice-Chancellor, Research, Curtin University

July

Pawsey established two new communities of practice around HPC, in bioinformatics and artificial intelligence and machine learning

1. Quantum computer
2. Minister for Industry and Science Ed Husic
3. Data Science Week
4. Minister for Science Roger Cook
5. Wajarri Yamatji artist Margaret Whitehurst
6. Former Minister for Science and Technology Melissa Price

Beyond our Horizon

HPE-11-2022

HPDS11-2022

INTRODUCING AUSTRALIA'S FASTEST SUPERCOMPUTER

By the end of 2022, Setonix will be completely installed and benchmarked against the most powerful systems on the planet, positioning the Pawsey Supercomputing Research Centre as the leading tier 1 supercomputing centre in Australia. In 2023, Setonix will be fully powered and available to researchers from around Australia and the globe.

POWERING BREAKTHROUGH RESEARCH

We continue to influence breakthrough research in radio astronomy, through our support for the SKA project, which seeks to answer questions about the beginning of the universe. Building on a fundamental and leading-edge relationship with radio astronomy, Pawsey is at the frontier of significant international technical and scientific challenges, supporting researchers as they answer today's most pressing questions across health, agriculture and climate science.

TAKING A QUANTUM LEAP

We have installed the world's first room-temperature, diamond-based quantum computer through our partnership with Quantum Brilliance. The quantum computer will be integrated with Setonix, giving our researchers and collaborators the opportunity to develop cutting-edge quantum applications. We continue to upskill the researchers of the future, delivering the UWA/Pawsey Quantum Computing education programs, with the goal of contributing to and creating an Australian 'quantum mindset'.

GREENING SUPERCOMPUTING

Upgrading our infrastructure not only improves the user experience of our researchers, but will also make our systems more energy efficient. In 2023, we expect Setonix to become one of the most energy efficient high performance computing and data systems in the world. And we're not stopping there. We've invested in studies to ensure our geothermal cooling system and solar panels continue to power the Pawsey Centre, while actively exploring the future use of novel battery and novel hydrogen energy to support our operations.

SUPPORTING NEXT-GENERATION RESEARCHERS AND TECHNOLOGISTS

Pawsey has provided and enabled thousands of hours of advanced computing training for users and researchers, as well as for Pawsey's staff and interns, and more broadly has partnered to provide education outreach to teachers and students, as well as to the Australian public. The continued growth of the Pawsey training and education portfolio is building deep technology skills as well as foundational awareness about HPC-related career options in research, science and other industries that demand digital and data skills.

PUSHING FOR ETHICAL AND INCLUSIVE HIGH PERFORMANCE COMPUTING

We are passionate about being a leader of ethical and inclusive high performance computing. Acknowledging the Custodians of the Land on which the Pawsey Centre exists and engaging with First Nations people is important to us. With a refurbished engagement and collaboration hub at Pawsey, we are looking forward to launching new programs in 2023 and beyond that will connect with the community, share the stories of our impactful research, and use storytelling to support arts and cultural pursuits.

Life-changing outcomes

Mind-Blowing Solutions to Universal Problems

//CASE STUDY

PREDICTING TRAUMATIC BRAIN INJURIES FROM ICU DATA

THE WORLD'S FIRST OPERATIONAL TRAUMATIC INTRACRANIAL HYPERTENSION PREDICTION ALGORITHM.

Project leader Shiv Meka
Partner Institution WA Department of Health
Systems Topaz supercomputer and Nimbus Cloud
Areas of Science Artificial Intelligence, Predictive Medicine, Public Health and Health Services

PIC-11-2022

A brain injury can lead to increased intracranial pressure — pressure around the brain — a dangerous and life-threatening development.

To assist hospitals to better manage brain injuries, Intensive Care Specialist and Director of Research at Royal Perth Hospital, Dr Robert McNamara, examined whether specific patient data could provide clues that could help doctors anticipate problems before they worsened.

He partnered with Department of Health Head Data Scientist, Shiv Meka, to develop an algorithm that analyses specific data gathered from ICU patients, looking at multiple aspects of their brain function data to predict whether the pressure will rise around a patient's brain.

40,000
hours of data collected

200+
patients at three hospitals

90%
algorithm accuracy

More than 40,000 hours of data were collected from over 200 patients at Royal Perth Hospital, Royal Prince Alfred Hospital and Royal Melbourne Hospital.

Up to 20 different model types were trialled before Mr Meka and his team developed a model that became the world's first operational traumatic intracranial hypertension prediction algorithm.

The architecture was designed to process all patient data and provide the necessary information to predict intracranial hypertension, with 90 per cent accuracy using survival analysis. Pawsey's supercomputers trained the model, and its cloud infrastructure facilitated the substantial workflows and computational tasks for the prediction aspect of the research.

The next phase of Dr McNamara's research begins in December 2022, when clinicians begin to use the model to apply interventional methods prior to an intracranial hypertension event and to identify whether this improves patient outcomes.

Partner institution:

Government of **Western Australia**
Department of **Health**

//case study

Furthering space exploration with edge devices

Project leader Mark Lou
Partner Institution Quantum Brilliance (QB)
Systems Nimbus cloud / Magnus supercomputer / Quantum Brilliance hardware
Areas of Science Quantum

DNA-11-2022

HPE-11-2022

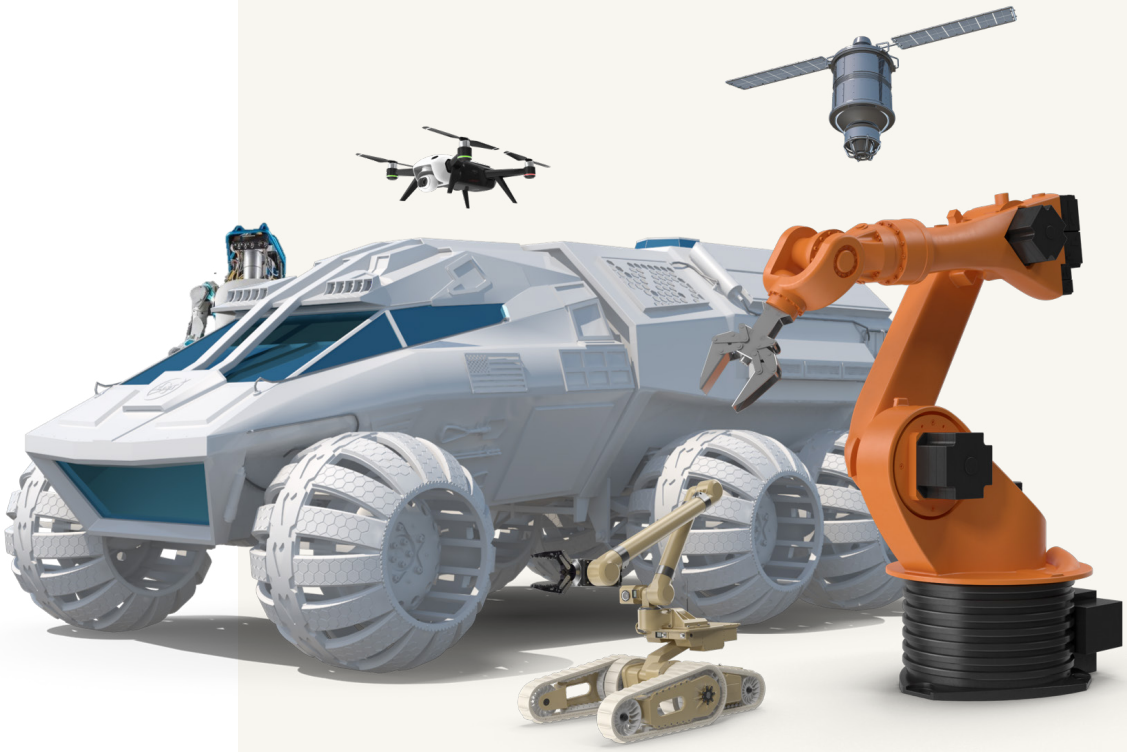
Cloud computing, wireless access points and virtual private networks (VPNs) are just three examples of edge computing devices that have become mainstream technologies.

However, edge technology does not yet have the computational ability necessary to handle complex algorithms, limiting applications for heavy-duty computing.

Quantum computing could change that. As part of the Quantum Pioneers Program, Pawsey is partnering with Quantum Brilliance to enable industry and research teams to explore the possibilities.

One organisation in the Program is Trellis Data, an Australian company democratising machine learning (ML) and artificial intelligence (AI). The company's machine learning platform, the Trellis Intelligence Platform, enables users to accomplish the complex task of designing, training, and testing a deep neural network.

The collaboration between Pawsey, Quantum Brilliance and Trellis Data is exploring whether Trellis' post-processing algorithms, which due to their computational complexities must make trade-offs between speed and



accuracy when applied at the edge, can be improved by quantum algorithms. Pawsey's supercomputers can speed up prototyping of algorithms via simulations and deliver feedback faster to researchers, while also validating Quantum Brilliance's room-temperature diamond quantum hardware. The research could put once unthinkable algorithms within reach of edge computing.

Partner institution:

QUANTUM BRILLIANCE

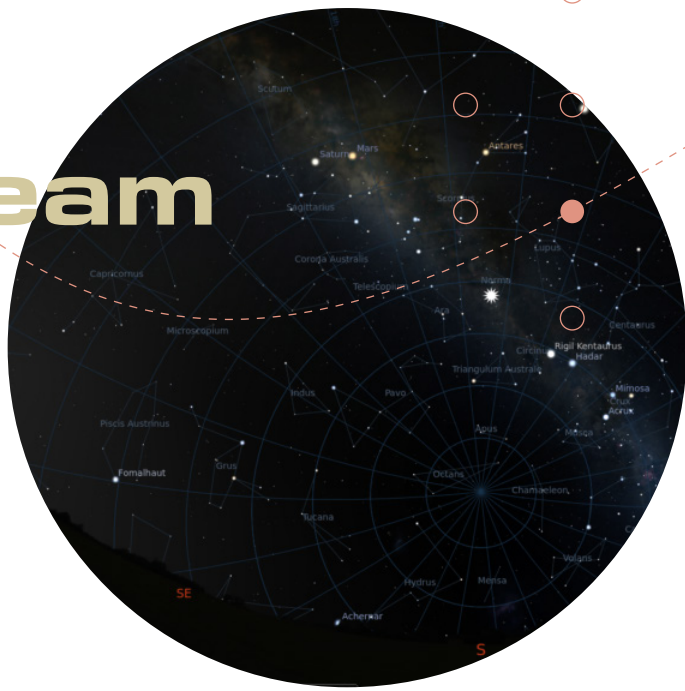
4.2 Trillion
+ messages searched

1
QPU replaces
10,752 GPU cores

50%
reduction in power consumption

//CASE STUDY

A BRIGHT NEW BEAM IN OUR GALACTIC BACKYARD



Project leader Dr Natasha Hurley-Walker
Partner Institution ICRAR, Curtin University
Systems Garrawarla supercomputer / Galaxy supercomputer / Storage
Areas of Science Astronomy, Radio Astronomy

What in the universe is releasing regular giant bursts of energy, just a few thousand light years away?

A research team at Curtin University has used the Murchison Widefield Array (MWA) telescope, located at the Murchison Radio-astronomy Observatory on Wajarri Yamatji Country, to map radio waves throughout the cosmos, detecting emissions from a beaming object that is close in astronomical terms — just 4,000 light years away from Earth.

When it 'turns on', the object unleashes a giant burst of energy three times an hour and appears to release an ultra-powerful magnetic field, briefly becoming one of the brightest radio sources in the sky.

The challenge for the Curtin team is to crack the mystery and understand exactly what this transient object is. Dr Hurley-Walker is monitoring the object using the MWA telescope and Pawsey's supercomputers to see if it will turn back on.

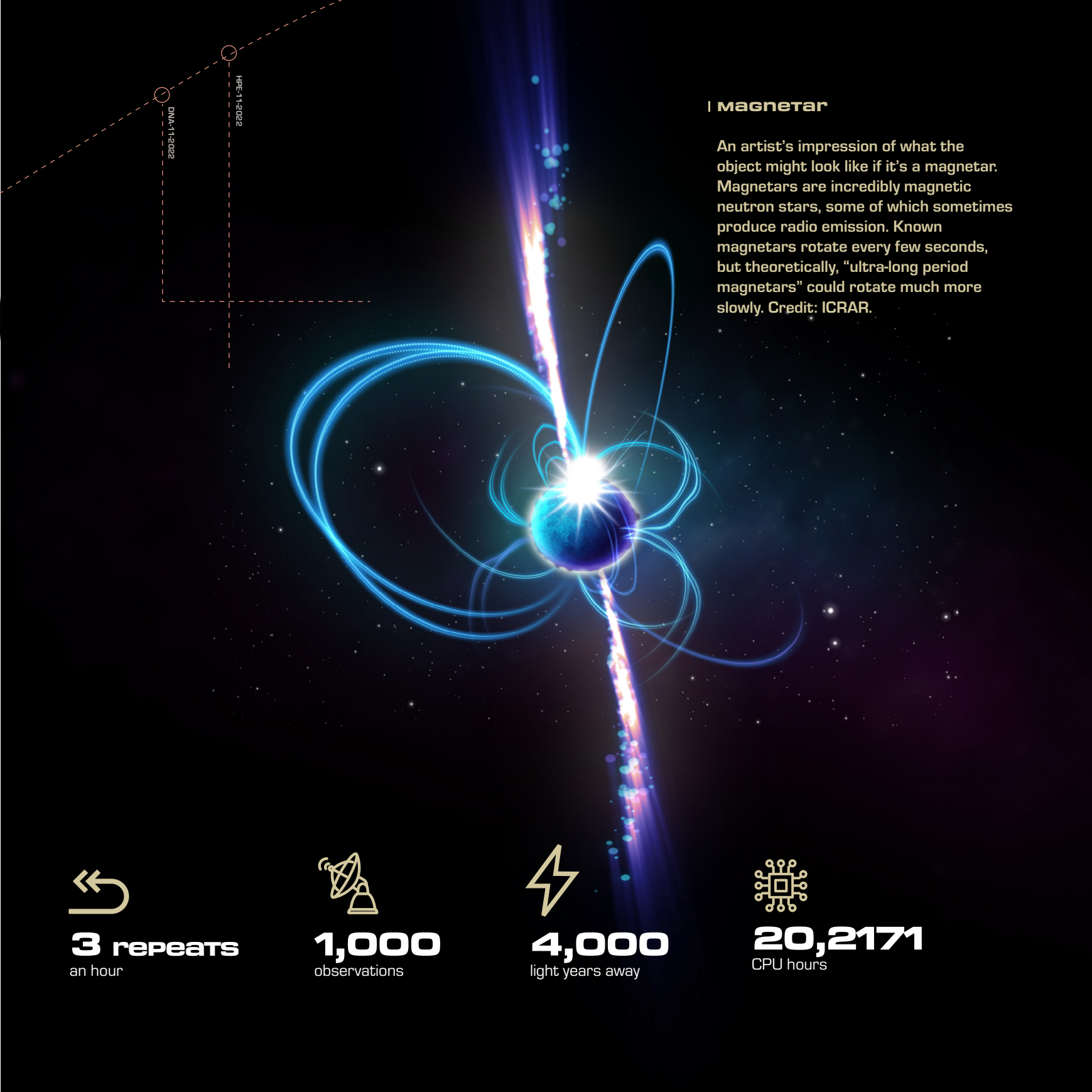
The Pawsey Centre collects and stores all the data the MWA has produced in the last 10 years, which is crucial for analysing these energy bursts.

The capability to look back through such a massive dataset is unique in astronomy, and Pawsey's trove of MWA data may unlock this and many other cosmic mysterious discoveries from the MWA and the SKA Observatory in the near future.

The new radio is transient in the sky, as it would have been seen at the MWA during the night in March 2018, when it was active. The source is shown with a large white star marker, but would be invisible to the naked eye. Image source: Stellarium

Partner institution:

ICRAR
International Centre for Radio Astronomy Research



Magnetar

An artist's impression of what the object might look like if it's a magnetar. Magnetars are incredibly magnetic neutron stars, some of which sometimes produce radio emission. Known magnetars rotate every few seconds, but theoretically, "ultra-long period magnetars" could rotate much more slowly. Credit: ICRAR.

3 repeats
an hour

1,000
observations

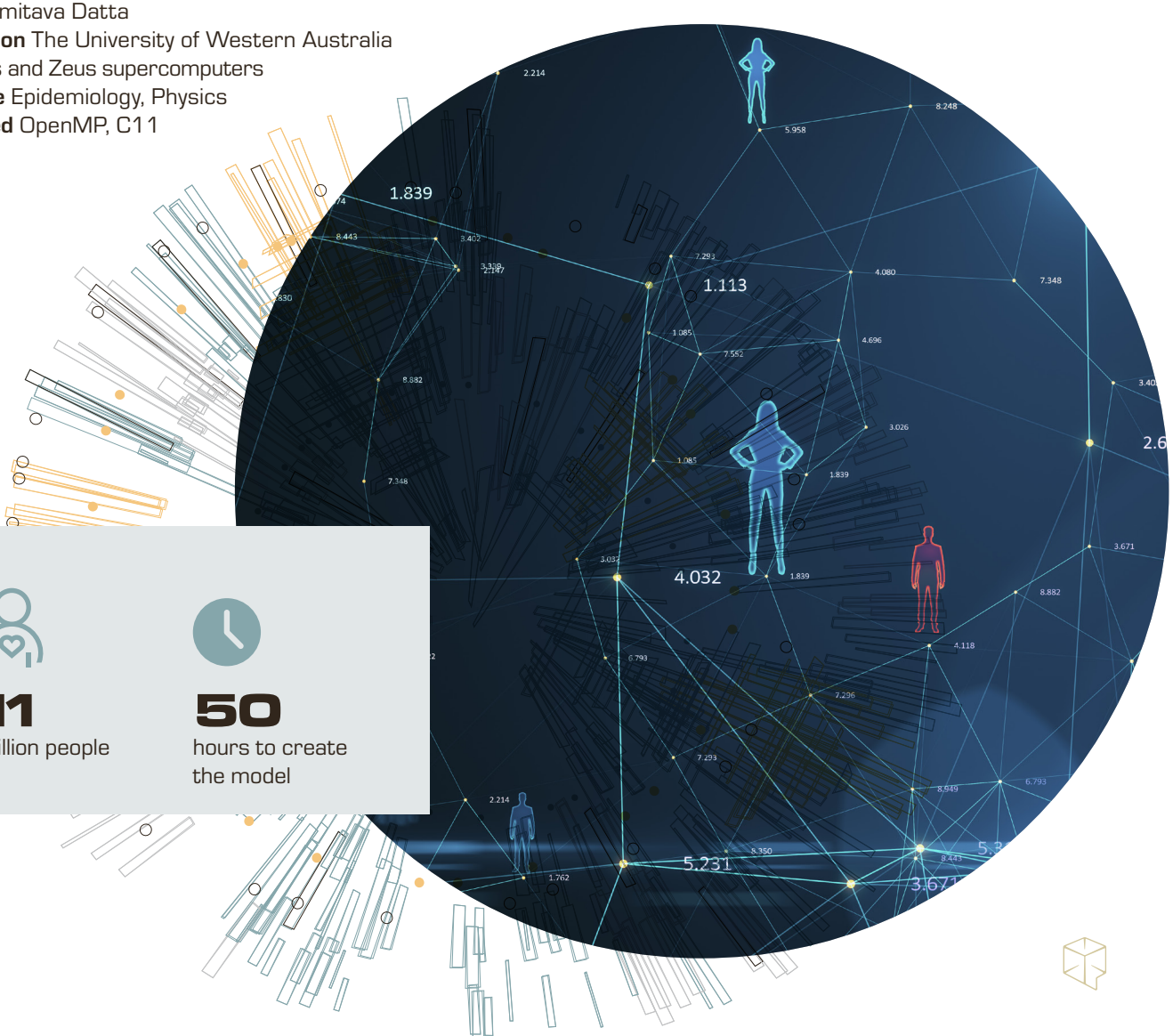
4,000
light years away

20,2171
CPU hours

//CASE STUDY

Tracking COVID-19 spread using epidemiological modelling

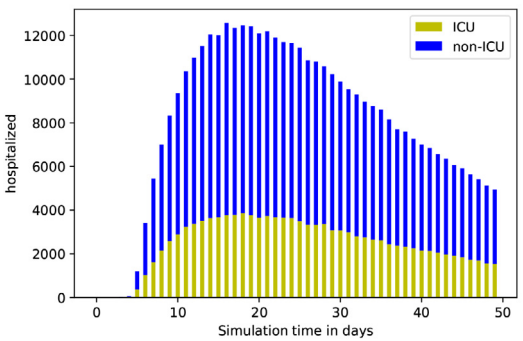
Project leader Amitava Datta
Partner Institution The University of Western Australia
Systems Magnus and Zeus supercomputers
Areas of Science Epidemiology, Physics
Applications used OpenMP, C11



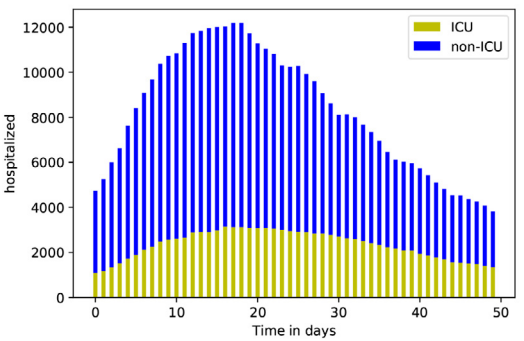
3
Cities

11
million people

50
hours to create the model



The hospitalisation and ICU figures from researchers' simulation



Daily hospitalisation and ICU admission summary from NY State Government. Imaged sourced by the researchers

The COVID-19 pandemic has put global healthcare systems under immense strain and there is a need for research to better inform decisions and help future-proof pandemic responses.

Researchers from the Department of Computer Science and Software Engineering at The University of Western Australia (UWA) used an agent-based modelling framework and the computing power of Pawsey's supercomputers to develop a first-of-its-kind epidemiological model that can better shape the healthcare system's plan to combat COVID-19.

Agent-based modelling is a computational model for simulating the actions and interactions of autonomous decision-makers. It has been used to assist authorities in anticipating and managing COVID-19 outbreaks.

The team at UWA, with the Department of Physics at the State University of New York (SUNY), developed a simulation to closely reflect the spread of COVID-19 in the state of New York in the early days of the pandemic.

By comparing the model to New York State's actual COVID-19 figures, UWA and SUNY identified where the accuracy of their model diverged, with the expectation that the revised model would help to better predict future trends in hospitalisation and admittance to ICU.

The model will help local communities and cities prepare for future demands on healthcare and better inform the necessary provision of services that will keep economies moving.

Partner institution:

THE UNIVERSITY OF WESTERN AUSTRALIA

//CASE STUDY

cancer killers in 3D

Project leader Dr Maja Divjak
Partner Institution Peter MacCallum Cancer Centre
Systems Nebula visualisation cluster
Areas of Science 3D Imaging and Reconstructing, Data Science, Medical Data Analytics, Visualisation

Biomedical animation can break down barriers between the empirical research completed by people in white coats and the patients who benefit from that research.

The Pawsey Centre is supporting a team at the Peter McCallum Cancer Centre in changing how biomedical animation is completed.

Dr Maja Divjak, an award-winning biomedical animator, created 3D animations of the cellular and molecular mechanisms explaining the innovative cancer treatment, CAR T-cell therapy.

The treatment uses specially modified T-cells to precisely target certain cancer cells. It is available to adults with Diffuse Large B-cell Lymphoma and children with Acute Lymphoblastic Leukaemia.

Dr Divjak's animation informs patients about their treatment options while displaying the capability of this revolutionary new treatment in an approachable way.

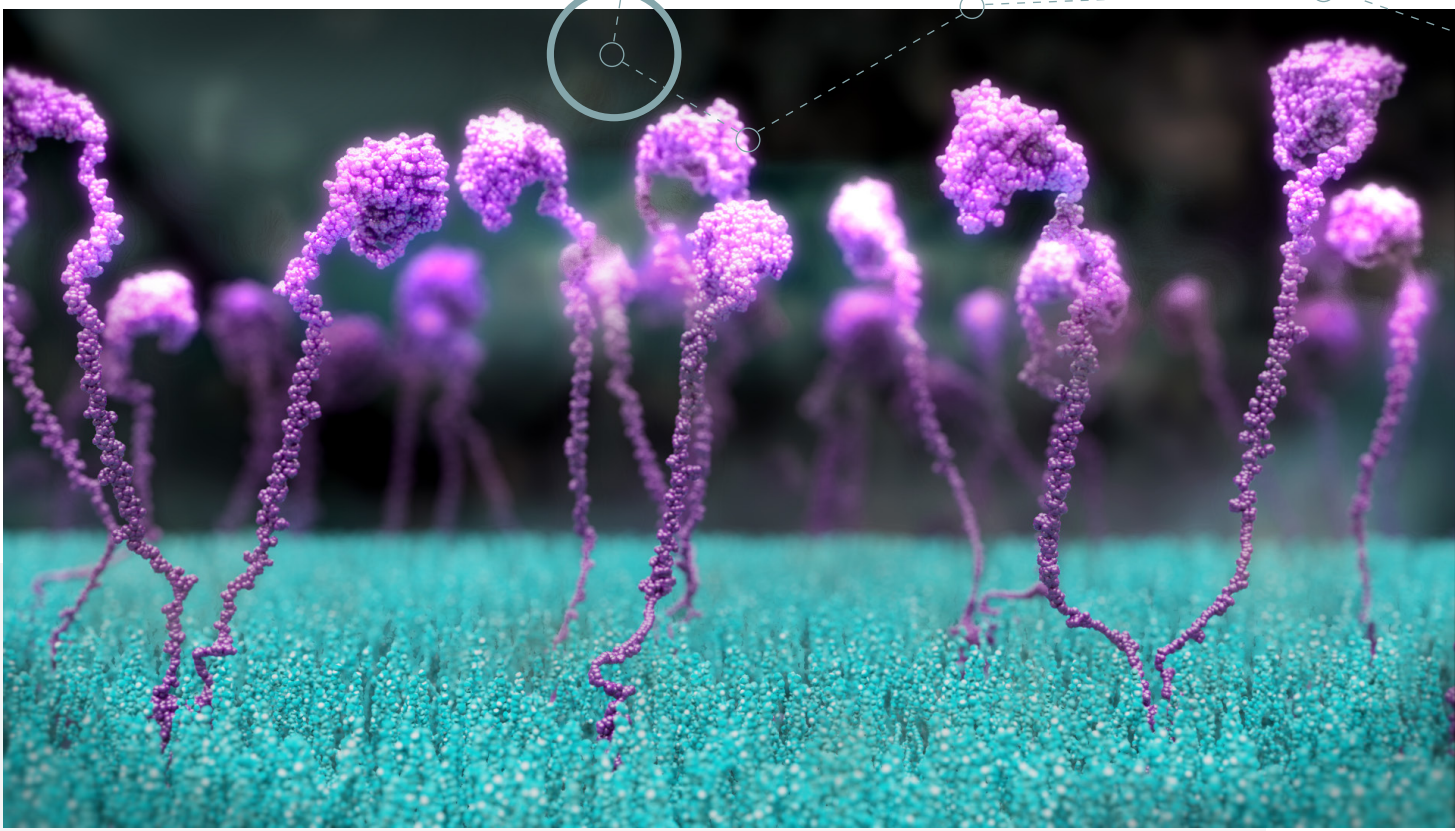
Backed by Pawsey's Nebula cluster and Pawsey's Visualisation team, Dr Divjak rendered her animation between two and four times faster, allowing her to output animated scenes in less than half the usual time.

This project would not be possible without the support of Pawsey's visualisation team members Ali Zamani and Yathu Sivarajah.

Partner institution:

Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

Chimeric Antigen Receptors (CARs, purple) on the surface of a killer T-cell (blue). Credit: Dr Maja Divjak, Peter MacCallum Cancer Centre



1 Billion
T-cells per patient

1080P
resolution

4X
render speed

1 Terabyte
of data

PROJECTS AND PUBLICATIONS

3,219
researchers

158
projects

400
publications

Our multidisciplinary team of experts supports researchers in Australia and around the world. This year, 3,219 researchers accessed our facilities to support 158 projects. Their breakthroughs were shared in 400 publications, with projects encompassing astronomy, chemistry, life science, material science, engineering, physics and earth science. Our researchers featured in Nature, Science Direct, The Astrophysical Journal, and Advancing Earth and Space Science, to name just a few.

Our team collaborated with supercomputing centres and vendors around the world on the development and adoption of new supercomputing technologies. We are grateful to our international collaborators from LUMI, CSC, LLNL, AMD, and HPE for providing support and access to their next-generation platforms.

DNA-11-2022

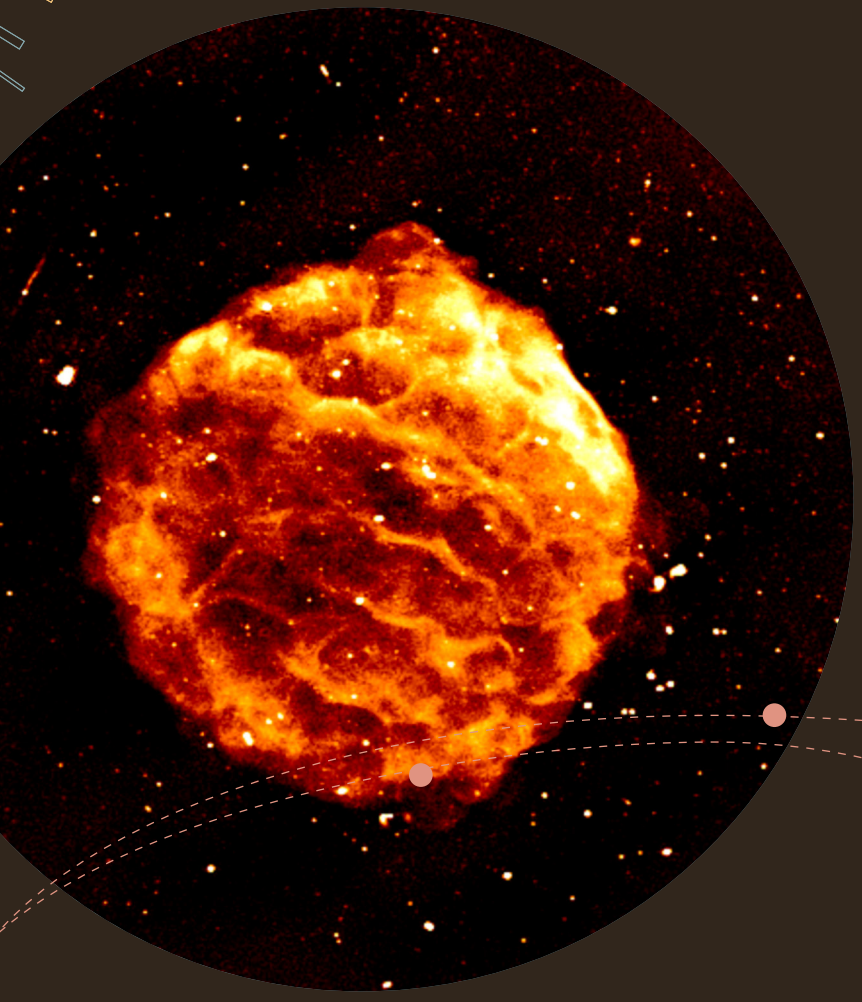
Technology Refresh

To ensure Pawsey continues to provide internationally competitive supercomputing and data services, a $70 million capital refresh project grant was awarded by the Federal Government in 2018 to secure the next generation of supercomputers, data and supporting infrastructure for Australia's research communities.

The centrepiece of that program, Setonix, will become the fastest public research supercomputer in the Southern Hemisphere. The commissioned first stage has already produced a highly detailed image of a remnant using data from CSIRO's ASKAP radio telescope. Stage 2 will be delivered by late 2022 and will be operational in 2023.

Pawsey also procured and installed one of the largest research-focused object storage systems in the world, with 130 petabytes of online and offline storage, the second-biggest acquisition in Pawsey's capital refresh behind Setonix itself.

In addition, two new visualisation facilities are now available – a state-of-the-art Visualisation Lab for researchers to interact with large scientific data on a high-resolution large display, and the Nebula cluster, which enables researchers to visualise their data on a Windows interface. This allows researchers to complete their workflow at Pawsey without the need to transfer data elsewhere. The support of Pawsey specialists, such as Dr. Pascal Elahi, makes such groundbreaking research possible.



This radio continuum (943.5 MHz) ASKAP image is of the galactic supernova remnant G261.9+5.5, located somewhere between 10,000 and 15,000 light years away. It was originally discovered by CSIRO scientist E. R. Hill in 1967, however not much is known about it. The morphology of the remnant revealed in the ASKAP image will aid studying the remnant and its surrounding medium in unprecedented detail. Researchers hope to retrieve more information about the remnant's age, size and type from this data.

Allocation overview

696M+
hours were requested across all allocation schemes

559M
core hours were allocated

158
projects were granted a NCMAS allocation

63
projects from Pawsey Partner scheme

58
projects from NCMAS

37
from Energy & Resources scheme

ACCESS TO PAWSEY SUPERCOMPUTERS

Pawsey provides supercomputing access to researchers largely through competitive merit allocation schemes. Through these schemes, the Centre strives to:

- maximise the overall research impact of Pawsey supercomputing resources
- promote scientific advantage in priority domains, such as radio astronomy, energy and resources
- provide leading-edge supercomputing resources for researchers in Pawsey partner institutions, and
- enable wider adoption of, and benefit from supercomputing across Australia.

ALLOCATION

In the 2022 calendar year, 58 projects were granted supercomputer access through the National Computational Merit Allocation Scheme (NCMAS). Pawsey allocated 100 million core hours to these projects.

Additionally, 63 projects were granted access to Pawsey systems through the Partner allocation scheme, reserved for partner institutions and WA Government organisations.

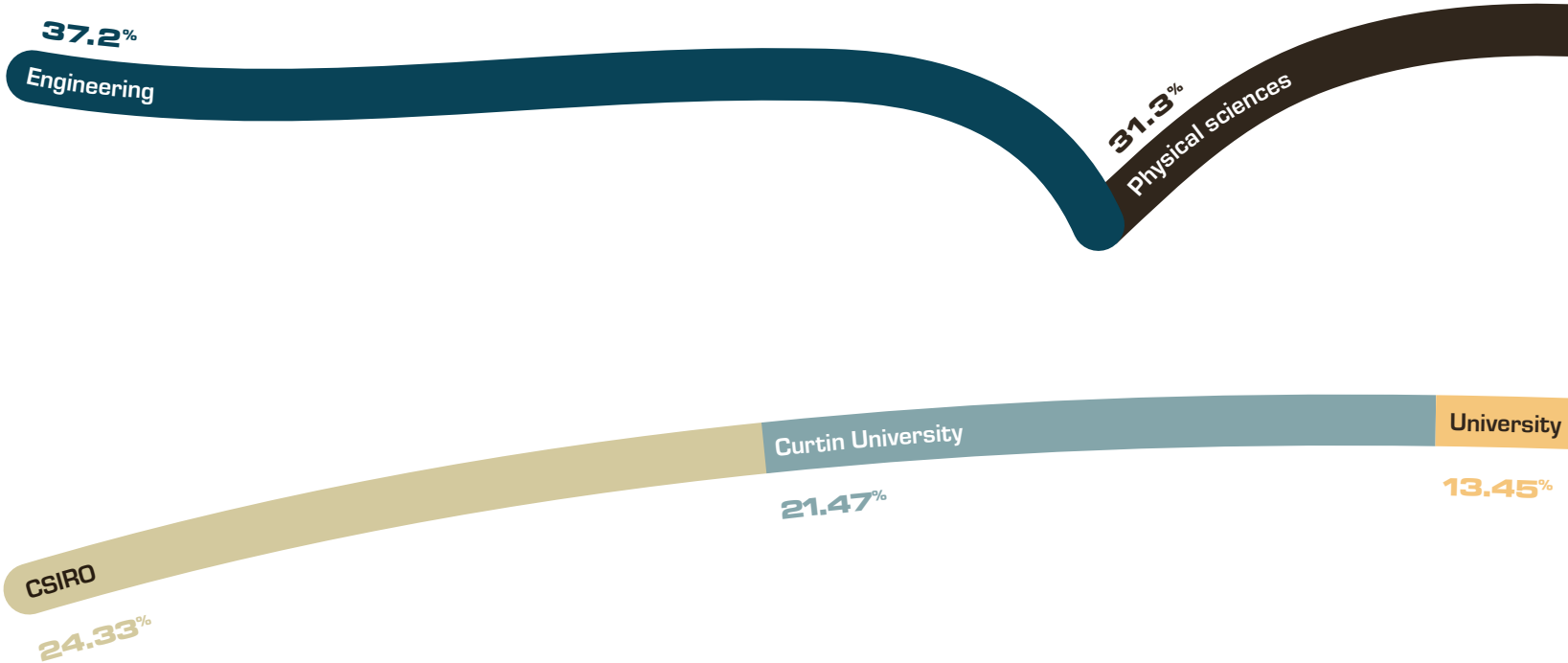
Researchers were given access to Setonix halfway through the 2022 allocations.

In the 2021-22 financial year, Pawsey worked with CSIRO's ASKAP data processing team to prepare for the migration to Setonix. ASKAP was one of the first research groups in the world with access to Setonix's AMD Milan CPU architecture as well as the HPE Cray EX test and development system.

Both Magnus and Galaxy can be accessed until the migration to Setonix is complete and Magnus is decommissioned. Stage 2 of Setonix will boost the core hours available for projects.

//2022 DISCIPLINES

OUR SYSTEMS PROCESS DATA FOR A VARIETY OF DISCIPLINES



//2022 INSTITUTIONS

USAGE BY INSTITUTIONS GATHERED FROM MAGNUS, GALAXY, ZEUS AND GARRAWARLA

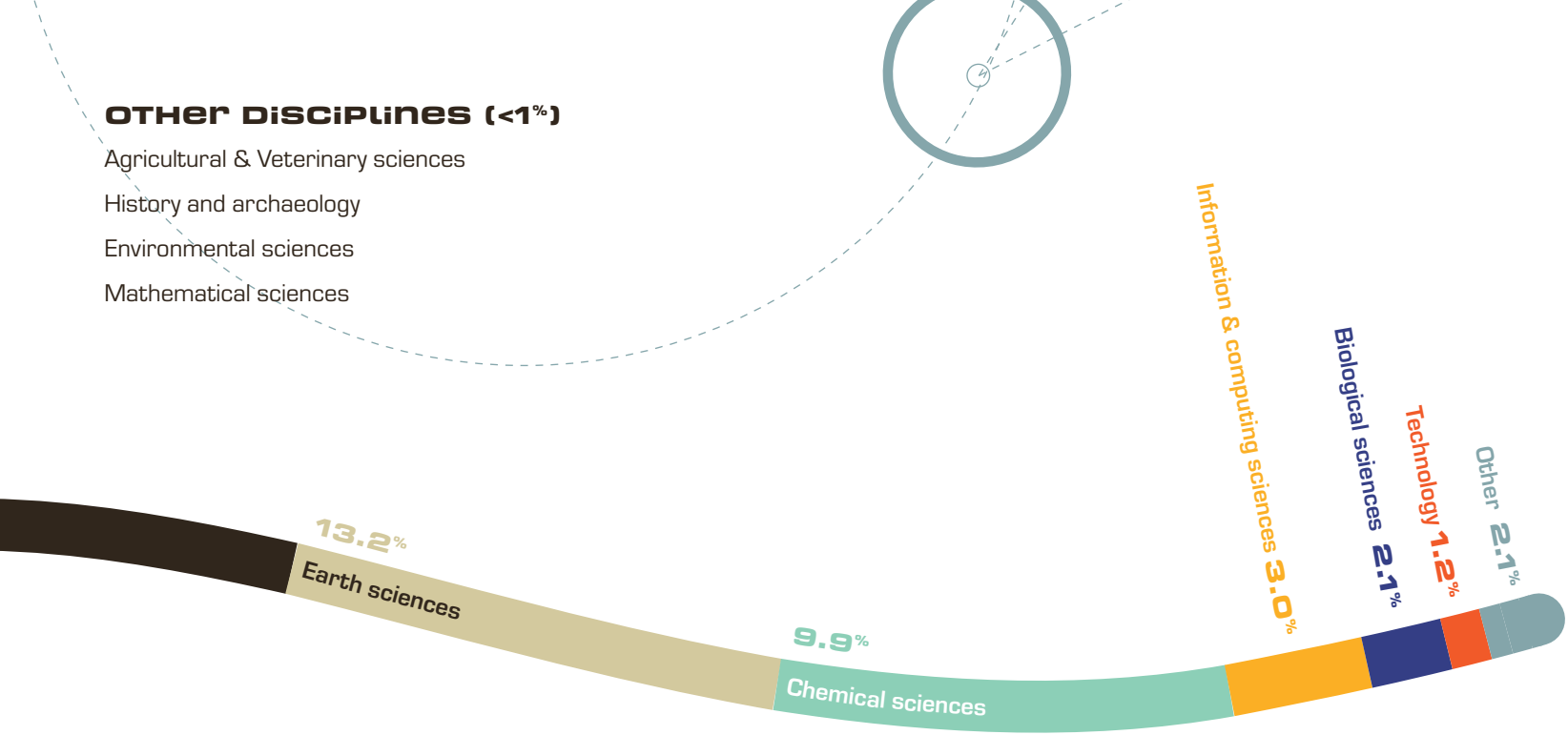
Other Disciplines (<1%)

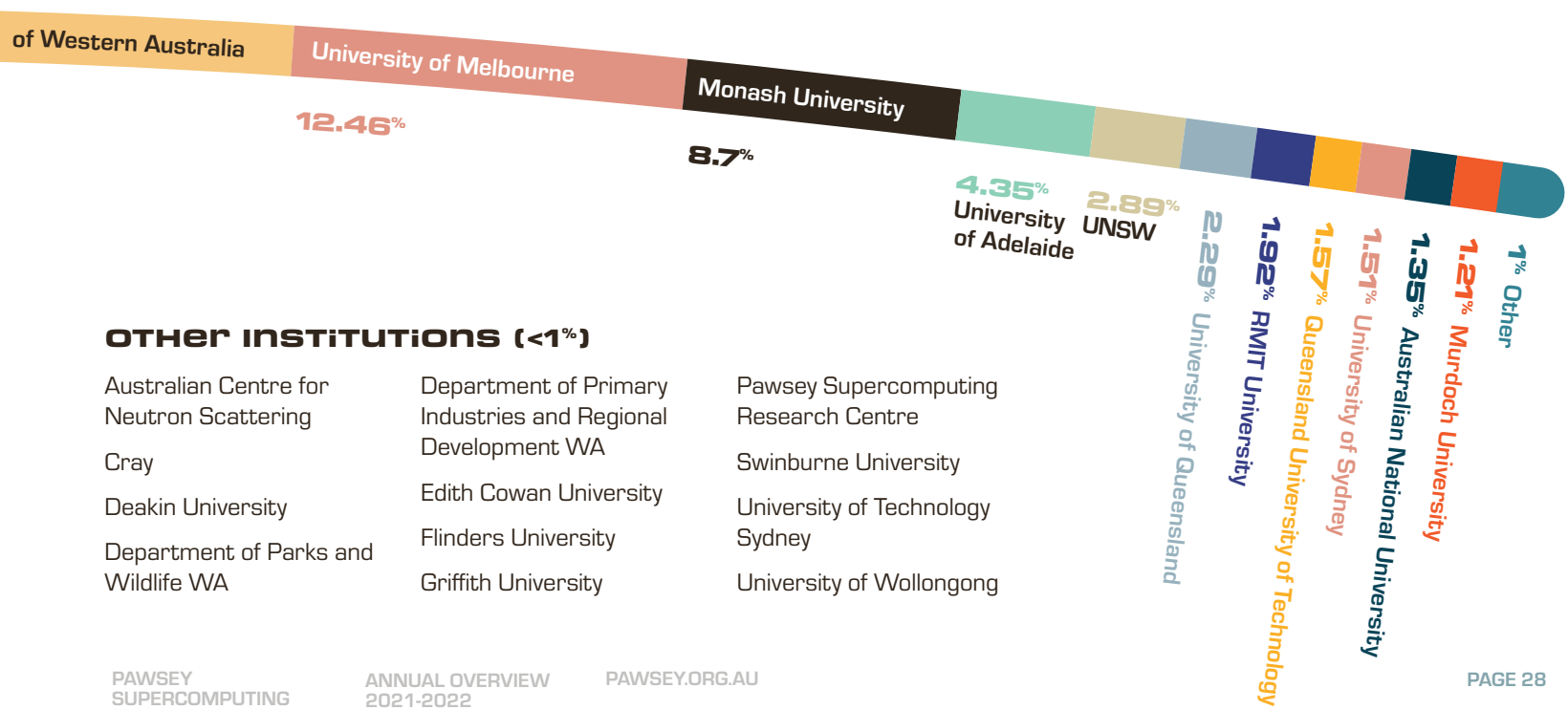
Agricultural & Veterinary sciences

History and archaeology

Environmental sciences

Mathematical sciences





Other Institutions (<1%)

Australian Centre for Neutron Scattering

Cray

Deakin University

Department of Parks and Wildlife WA

Department of Primary Industries and Regional Development WA

Edith Cowan University

Flinders University

Griffith University

Pawsey Supercomputing Research Centre

Swinburne University

University of Technology Sydney

University of Wollongong

Inclusive innovation

DIVERSITY AND INCLUSION

Inclusion is in Pawsey's DNA and its Diversity and Inclusion Committee sets the direction to ensure appropriate education and action for its staff, HPC users and interns.

The Pawsey Centre is a founding member of the Australasia chapter of Women in High Performance Computing and uses its membership to promote diversity and share expertise. Our staff are 24% female, as well as 30% of our interns and intern mentors.

Inclusion and diversity are causes particularly important to Pawsey's intern mentors, who designed and developed a training module called 'Science: Unintended Consequences'. This training was delivered to the 2021/2022 interns and to the Pawsey D&I Committee and other staff, and was offered during Data Science Week. Pawsey also hosted and/or participated in dozens of STEM-focused events and training, such as the National Youth Science Forum, the STEM Astronomy Girls program, and the Young Indigenous Women's STEM Academy.

Pawsey is a member of the industry body Supercomputing Asia, where Executive Director Mark Stickells and Marketing and Events Officer Aditi Subramanya co-chair the organisation's diversity committee. Mark is also a member of CEOs for Gender Equity.

COMMUNITY BUILDING

Pawsey is building connections between HPC professionals, scientists and researchers, politicians and the general community to better understand their needs and to create opportunities to promote success.

The Centre plays a key role in developing DReSA, a national portal focused on improving discoverability and accessibility of digital research skills training events, materials, and trainers.

Our data visualisation services help researchers gather real-time insights and allow data to be more easily interpreted by translating it into meaningful or recognisable forms. About 200 projects have benefited from Pawsey's visualisation services, and 2,925 remote visualisation sessions were performed by 162 users.

Pawsey works to make science and technology accessible to mainstream society. Our name is linked to the Innovation Excellence category of the AIM WA Pinnacle Awards, while the touring **Beyond the Milky Way** virtual reality documentary showcases Pawsey and the telescopes at CSIRO's Murchison Radio-astronomy Observatory. Pawsey has hosted international delegations from the SKAO, including SKAO Director-General Phil Diamond. Additionally, more community of practise spaces were launched this year, creating a platform to connect researchers in emerging research fields, such as artificial intelligence and machine learning.

Skill Development and Data Literacy

Pawsey delivered almost half of its 6,394 training and upskilling hours live, reaching more than 10,000 people to develop skills in scripting, containers and other topics. This included training for Setonix, which was a series of six 'live' modules, commencing the day Setonix came online for researchers. Additionally, recordings were made available through Pawsey's YouTube channel as well as partner channels. Throughout the year, Pawsey organised more than 50 events reaching over a thousand people around topics such as WA's digital economy, sustainable data management and new trends in HPC.

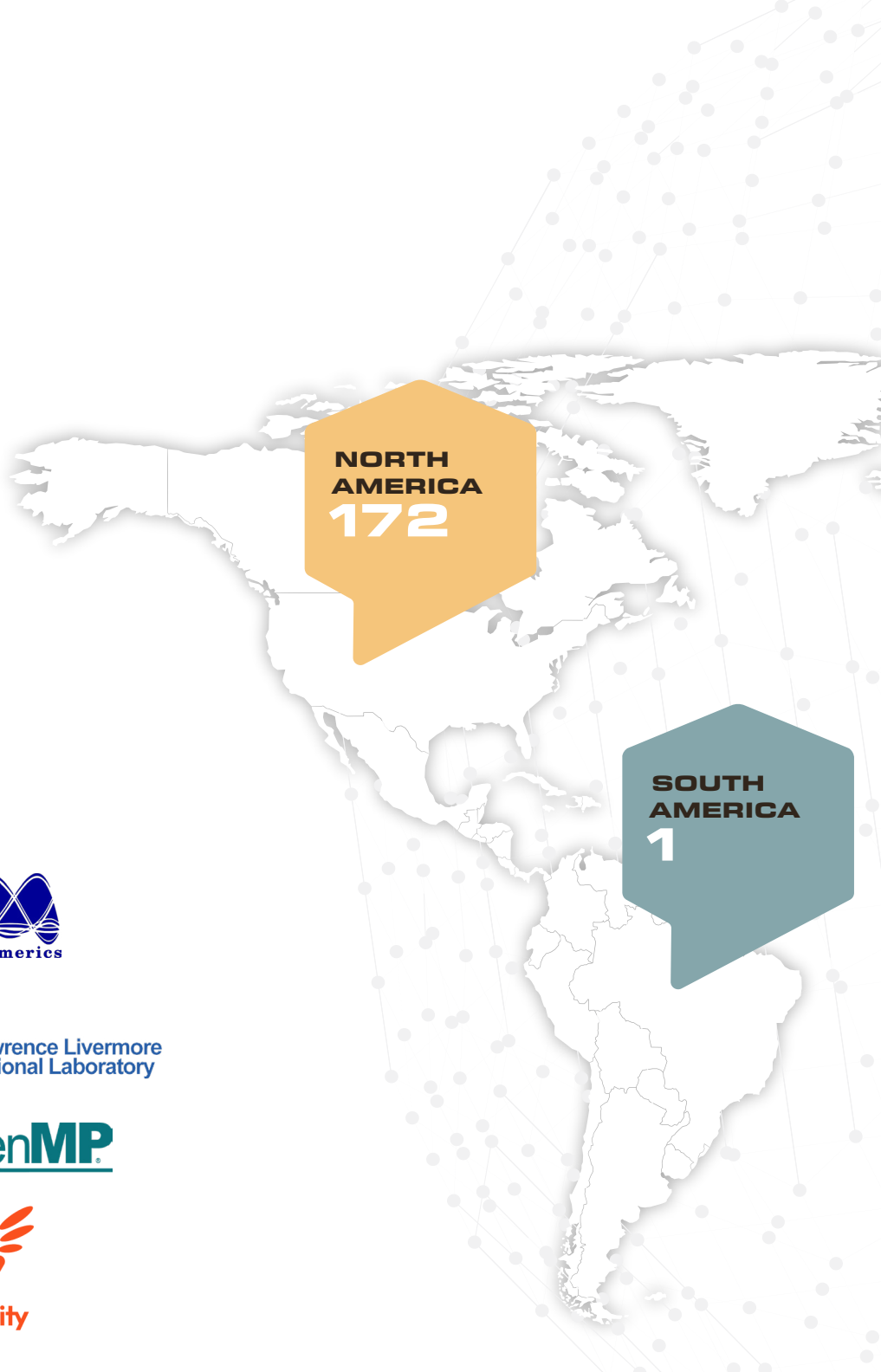
The Pawsey Summer Internship Program
Pawsey's intern program included 47 interns, the largest intake to date. The group worked on 38 projects across 15 universities and institutions across Australia. Intern alumni and mentors also played a larger role than ever, leading more than 200 hours of core training streams during the 10-week program, and providing one-on-one coaching on poster design and presentations.

PaCER Conference (P'Con)
The first annual PaCER (Pawsey Centre for Extreme Scale Readiness) Conference was a collaboration that connected PaCER researchers with experts in supercomputing. Pawsey offered a rich training and conference program, with many events open to all researchers and scientists to allow the sharing of ideas, technical problems and solutions.

STEM at Pawsey
A new initiative to help school students crystalise data as a working concept was introduced in 2021. Pawsey held masterclasses for teachers and presented with teaching partners at conferences, as well as launched a new website, Learn@Pawsey.

The website engaged students by allowing them to create and share real anonymised data, and the program opened the door to face-to-face school visits, reaching hundreds of students. It introduced them not only to data but also 'scientists', Pawsey's Learn@Pawsey partners.

GLOBAL PROJECTS



INTERNATIONAL COLLABORATIONS

AMD

CSC

FluidNumerics

Hewlett Packard Enterprise

HPC-AI ADVISORY COUNCIL
NETWORK OF EXPERTISE

Lawrence Livermore National Laboratory

LUMI

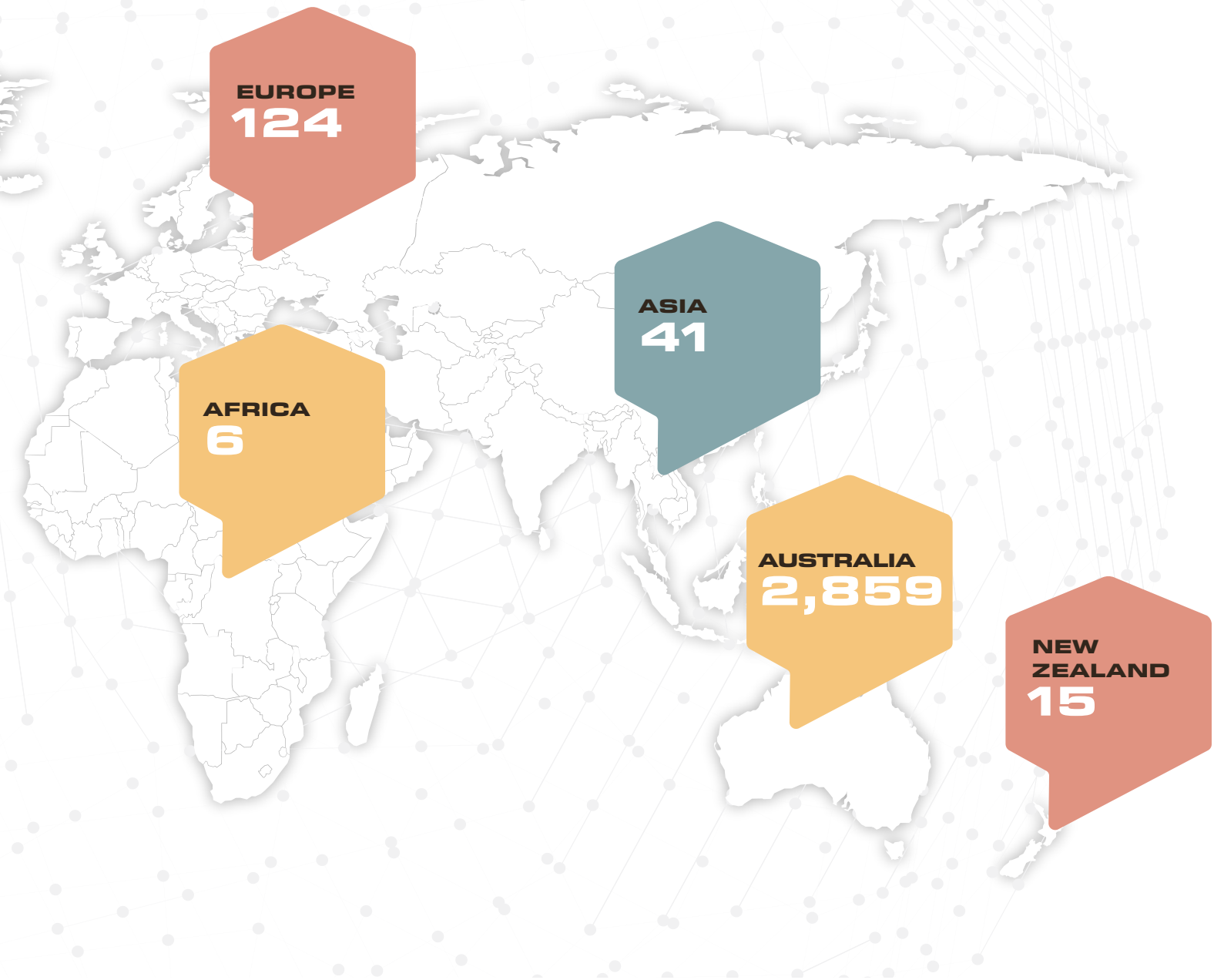
SG NSCC SINGAPORE National Supercomputing Centre

OpenMP

QUANTUM BRILLIANCE

SKAO

Versity


EUROPE
124
ASIA
41
AFRICA
6
AUSTRALIA
2,859
NEW
ZEALAND
15

METEORITES

by Wajarri Yamatji artist Margaret Whitehurst.

The artwork for Setonix, inspired by the stars that shine over Wajarri country in Western Australia's Mid West, where one part of the world's largest radio astronomy project, the SKA, will be built.

Pawsey

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