



e RESEARCH SA

ANNUAL REPORT. 2013

**eResearch SA**

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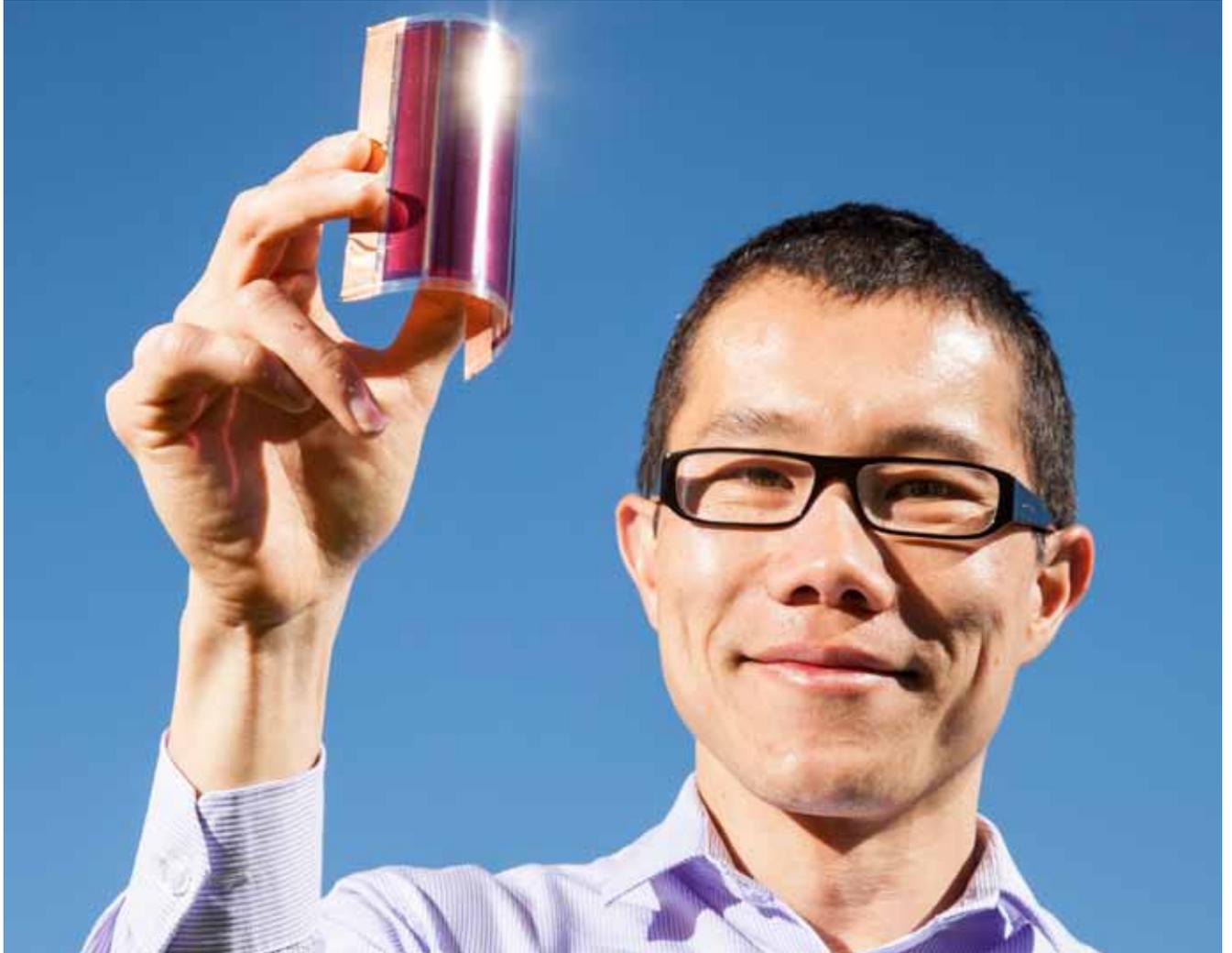
2013 was a transformational year for eResearch SA. It marked the beginning of our transition to service provision - our aim is to provide South Australia's researchers with powerful eResearch tools that make a positive impact on their research outcomes.

# About eResearch SA

eResearch SA is a service provider offering expert computing technology knowledge, services and facilities to the research, government and business sectors in South Australia.

eResearch SA's services include high-performance computing, data management and storage, cloud computing, software development and consultancy. By providing access to a suite of advanced ICT tools and services that are reliable, easy to use and secure, we enable all researchers to explore new and innovative research opportunities that would not otherwise be accessible.

eResearch SA is a collaborative joint venture between the University of Adelaide, Flinders University and the University of South Australia. We were established in 2007 to coordinate the implementation of national and state eResearch strategies in South Australia.



eResearch technologies  
break down barriers so  
that exciting research  
innovations can emerge.



# Our services



## HIGH-PERFORMANCE COMPUTING

eResearch SA runs and manages South Australia's most powerful public research high-performance computing (HPC) system, 'The Tizard Machine'. Tizard is capable of 40 trillion calculations per second.

With this state of the art supercomputer and user support we make it easy for you to access the best high-performance computing resources in South Australia.



## CLOUD COMPUTING

Our Cloud Computing services put cost effective, secure, scalable infrastructure at your fingertips, allowing you to host your own databases, applications and other online resources without purchasing any new hardware.

Discipline specific Virtual Labs and eResearch Tools allow you to easily harness the cloud with web based interfaces.



## DATA MANAGEMENT AND STORAGE

We have long history of working with researchers in South Australia and in that time we have built a reputation as the leading provider of sophisticated storage solutions to research groups with very large data sets. We provide facilities and support for researchers who need flexible and inexpensive data solutions. Using our services, you can store, access, transfer, backup, and share your data with your colleagues.



## CONSULTANCY AND BUSINESS ANALYSIS

eResearch SA offers expert computing technology knowledge services and facilities to the research, government and business sectors. Talk to us to discover how our consultancy and business analysis services can minimise your research budget spend on computing and data storage and accelerate your research outcomes.



## SOFTWARE DEVELOPMENT

Our expert software developers can deliver customised solutions to suit your needs. eResearch SA has played a critical role in helping to develop software for some of South Australia's leading research projects.



## COLLABORATION

eResearch SA works collaboratively to represent South Australia's eResearch interests nationally by: participating in programs, forums and consultations; providing a South Australian base for national eResearch programs and entities; coordinating cross-institutional responses to national opportunities; and working with other eResearch service providers to offer 'joined up' services to South Australia.

# Director's report



eResearch SA is in a period of significant change and renewal. Our involvement in two national eResearch infrastructure-building projects has had a transformational impact on our business offering.

As we look to 2014 eResearch SA is focused on building its capability to become a provider of 'eResearch as a service' to the South Australian research community, enabling researchers with eResearch technologies for the conception, design and execution of research.

2013 marks an important milestone in our transition to service provision. Setting the foundation for this transition was 'the big build' where we purchased and installed over \$5 million of cloud, storage and networking infrastructure.

The backbone of any successful eResearch initiative is an infrastructure of fast, high-capacity networks, protected with firewalls and scalable data storage that gives researchers open, yet secure access to the data they need.

The South Australian eResearch network capability provides that backbone.

It means that institutions can plug directly into eResearch SA's network and gain access to our services at 40 Gigabytes per second, rather than standard internet-based connectivity, which is slower and less reliable. With connectivity now 40 times faster, researchers are better able to harness big data.

Connected to that fast network, our Cloud Computing services put cost effective, secure, scalable computing infrastructure at researcher's fingertips,

allowing them to host their own databases, applications and other online resources without purchasing or installing any new hardware.

Our storage capacity of 4.3 petabytes is the largest research data storage capability in South Australia, allowing us to provide data management, storage and access services for datasets of all sizes.

We are delivering real tools and services that researchers can use now, and will be able to access more and more easily as the infrastructure grows and expands. As we look forward into 2014 and 2015 the future is about establishing the foundation of excellent service provision and expanding our capability.

I would like to thank our technology partners Hitachi and Dell for their

commitment to providing excellent and reliable hardware. They have worked with us to build a strong and flexible technology foundation that will support researchers in South Australia into the future.

I would also like to thank the research community of South Australia for their continued support.

Finally, I would like to thank our most important asset – the staff at eResearch SA for their enthusiasm and hard work over the course of 2013.



Mary Hobson  
Director, eResearch SA

# eResearch projects



## **Supercomputers break down minerals research**

For Australia's mining industry, understanding how mineral surfaces react to different environments is vital in both the extraction of valuable minerals, as well as environmental remediation.

In such a complex and technical area of knowledge, Professor Andrea Gerson's research is proving invaluable for mining companies.

"I'm looking at two ends of the same process. One is extracting valuable metals and the other is reducing the environmental impact," Professor Gerson said.

"Much of my work is on the surface reactions of different types of minerals which can be broadly divided into two

parts – one is looking at weathering and that's related to environmental remediation, and the other is focused on minerals processing and that's to do with extraction."

"Both of these processes are enormously valuable for mining companies as they are key to their operations."

"Quite often companies aren't necessarily sure how minerals and rock types will react with each other and how these interactions may be useful. They may not consider them to be immediately valuable, but they may be extremely important in environmental remediation."

Professor Gerson's work involves complex molecular modeling of rock surfaces, which wouldn't be possible without the supercomputing facilities provided by eResearch SA.

"Molecular modeling of minerals surfaces requires us to look at how materials such as water, oxygen or mineral processing chemicals interact with the surfaces to better understand the mechanisms of what is taking place," she said.

"The desired outcome is if you can understand the basic mechanisms you have a feel for what you can do to either improve them in terms of minerals processing or retard them, which is often the desired outcome for environmental applications."

"One of the issues with this modeling is that it's computer intensive, so if you only have a limited CPU, you can only look at a very small model so it's not necessarily very realistic."

"The way that rock surfaces and minerals react is very specific, so the more

exact the model the more accurate the outcome."

"Having access to greater computer power provided through eResearch SA helps us put in place a more realistic model in terms of the number of atoms you can have in the system and that improves the predictive power of the calculations." Professor Gerson said another benefit of working with eResearch SA was gaining access to molecular modeling software.

"Over the years, the interaction with eResearch SA has been extremely good and the service provided has been excellent. It has given us access to facilities that otherwise wouldn't have been readily accessible," she said.

# eResearch projects



## **High performance computing helps reduce noise pollution**

Making the world a quieter place is the goal of researchers studying aeroacoustics at the University of Adelaide. Aeroacoustics studies noise generation created by objects that move in air or water – primarily the noise of large machines such as wind turbines, submarines and aircraft.

“Understanding how noise is generated enables us to determine how to change the design of a machine to reduce its noise output without affecting its efficiency,” said Associate Professor Con Doolan from the School of Mechanical Engineering.

High performance computers, which A/ Prof Doolan and his team access from eResearch SA, are essential to carrying

out the numerical calculations required to understand this area of research.

“To understand noise generation we need to solve the fluid or air flow motion over an object – for example a wing, fin or rotating blade,” he said.

“Supercomputers allow us to solve these complicated calculations on a large scale so we can apply our theories to real world problems. The best example of this is an Australian Research Council (ARC) Linkage Project we’ve been doing with the Australian Submarine Corporation to understand submarine hydrofoil noise.”

“With the use of high performance computing we’ve been able to create a novel submarine hydrofoil noise prediction model which will assist submarine engineers design new machines with reduced hydrofoil noise.”

To create the noise prediction model, A/Prof Doolan and his team used eResearch SA’s Tizard high performance computing system to generate computer data flow on a complicated three-dimensional shape.

“Supercomputers are critical to our work,” Doolan said.

“So much so that our school now has priority access to 900 computer processing units on Tizard. All we have to do is login from a desktop to gain access.”

A/Prof Doolan has worked closely with eResearch SA since commencing the aeroacoustics program in 2005 after completing a Post-Doc in helicopter aerodynamics in Glasgow.

“On my return to Australia I realised that few of the universities here offered aeroacoustics so I applied for grants and

started a new aeroacoustics program in Australia that has grown into Australia’s largest,” he said.

“There was a strong case for a program to be based in South Australia due to the state’s interest in submarines and wind turbines.

“I have accessed eResearch SA’s high performance computing facilities from day one, using Hydra, Corvus and now Tizard.

“Having an organisation like eResearch SA here in Adelaide is fantastic.

“It would be impossible to do the type of research that we’re doing without them – it is a major factor in achieving our research outcomes.”

# eResearch projects



## **Giving hope to threatened species**

For the species at the centre of Doctor Damien Fordham's research, the outcomes are a matter of life or death.

As a global change biologist with an interest in the causes and consequences of extinction, the University of Adelaide researcher develops sophisticated simulation models to anticipate the likelihood of at-risk species being eliminated.

"The models couple ecological and climatic-geophysical processes to predict the likely extinction risk and loss of biodiversity due to human impacts on the biosphere," he said.

"These models take into account the impact of interactive factors such as climate change, shifting land-use,

wildlife exploitation and elevated rates of competition and predation by invasive organisms.”

With the complex inputs required for the modelling, Dr Fordham’s research group turned to eResearch SA for a solution for the powerful computation required to process the multifaceted inputs.

Through eResearch SA, they purchased some servers which eResearch SA set up as a cluster of 6 Windows (Win 7 Enterprise) and 1 Linux (Ubuntu server) virtual machines (VM) – each VM has multiple processing cores (varies from 6-12) and large RAM (32-60GB), with about 200GB of local disk storage, coupled with multi-terabyte network storage.

Dr Fordham said without access to the facilities provided by eResearch SA, the

complexity of modelling wouldn’t have been possible.

“Modelling species interactions and ecological responses to synergies of human impacts is very complex and consequently simulation models can take weeks to months to run even when spread across large numbers of multiple processes,” he said.

“You can try and run these models on a high-end laptop or desktop computer but the processing times are enormous, making the task impossible.

“We have been able to develop novel, mechanistic modelling frameworks that allow conservation scientists to better connect predictions of extinction risk due to climate change to on-ground design and implementation of effective measures to protect biodiversity.

“I frequently use the eResearch SA supercomputer to investigate the likely effect of climate change and other human-mediated impacts on biodiversity and to test different climate adaption scenarios. These include developing models for rare and threatened birds, reptiles, mammals, plants and invertebrates.”

The world-leading research has developed techniques that are now being adopted by researchers across the globe.

# eResearch projects



## **Storage power sheds light on the mysterious world of lizards**

For 30 years, Professor Michael Bull has been working to unlock the secrets of the sleepy lizard in order to understand more about disease transmission and prevention.

It's a task that has been made all the more difficult by the lizards' extreme lack of activity.

"If you sit and watch sleepy lizards for any length of time, nothing much happens and that means it takes an extremely long time to extract very little data using conventional observation techniques," Professor Bull said.

"We became extremely frustrated by this so we set-up some automatic recorders on the back of 60 lizards, which record

the number of steps they take every two minutes as well as recording GPS locations.

“That provided us with two-year’s worth of data on how much the lizards moved each two minutes of each day for their entire activity period, about 100 days, as well how the lizards interacted with each other.”

With such enormous amounts of data, Professor Bull sought out eResearch to provide a storage solution for the information.

“We had generated a huge amount of data that was sitting in large excel files and we were looking for facilities to store these data because we thought they may be a valuable resource for other researchers,” he said.

“Subsequently, we have been in contact with other researchers at the University of Melbourne who are interested in how local variations in climate impact on activity patterns. We’ve been able to give them access to the database and are now collaborating with them on a large research paper.

“We’ve also had researchers from the University of California, Davis accessing the data. They are interested in movement patterns and how animals move around in the environment and the paths they take.

“What we’ve been able to do is provide a rich data source beyond anything they had seen before, so they’re also exploring the data and developing generalisations on lizard behavior patterns.”

Professor Bull said the support from eResearch SA had been invaluable in the storage and sharing of data with other researchers.

“Being able to hand over these huge data sets and knowing that they’re in the very capable hands of eResearch SA’s staff is extremely comforting,” he said.

“It has been a very straightforward process and for a researcher who is more focused on extracting findings from the data, that’s exactly what you want.

“It has also been invaluable in providing me with the opportunity to send the database to other groups of people who can extract novel insights that we don’t have the analytical power or understanding to get.”

# eResearch SA Board

eResearch SA is governed by a Board comprised of the Deputy Vice-Chancellors (Research) of the three South Australian universities, an independent Chair, and the eResearch SA Director as a non-voting member.

## Mr Bruce Linn, Chair

Bruce Linn is an experienced Company Director, Chairman and former CEO who heads a successful governance and strategic management consulting business operating in Australia and the USA.

Formerly CEO of Finlaysons Lawyers, his previous executive roles include CE for EDS (now HP Enterprise Services), responsible for all State Government business of EDS in Australia and CEO of Camtech, one of Australia's leading Internet & Electronic Payments technology innovators.

A Science graduate of The University of Adelaide, he is a technologist with over 35 years experience in strategy, governance, leadership, business management and commercialisation of a broad range of technologies including IT, telecommunications, Internet and social media.

Immediate past President of the Australian Institute of Company Directors (SA/NT Division), his current Directorships include the Council of The University of South Australia where he Chairs the Finance Committee and the Foundation Committee, the boards of SABRENet Limited, ITEK Ventures Pty Ltd and SA Heart Centres Pty Ltd. He is Chairman of Anglicare SA, eResearch SA and St. Peter's Girls' School. He is a fellow of the Australian Institute of Company Directors and the Australian Computer Society.

## Professor Mike Brooks, Deputy Vice-Chancellor and Vice-President (Research), University of Adelaide

Professor Mike Brooks was appointed to the position of Deputy Vice-Chancellor and Vice-President (Research) in July 2008, following almost a year as Pro Vice-Chancellor (Research Strategy).

A former Head of the School of Computer Science, Mike is a leading international researcher in computer vision and image analysis, and his work has seen wide commercial use in the security and defence industries. He has published numerous influential papers and won many ARC Discovery Grants for his research. Professor Brooks is a Fellow of the Australian Computer Society and serves on the Board of National ICT Australia. The role of the DVC(R) is to provide leadership and vision in achieving the University's research and research training strategic goals.

One of the key responsibilities is the development of strategies to facilitate growth in University revenue to support research-related activity.

**Professor David Day, Deputy Vice-Chancellor (Research), Flinders University**

Prior to his appointment at Flinders University, Professor David Day was the Dean of the Faculty of Science and Executive Dean of the Faculties of Science, Agriculture and Veterinary Science at the University of Sydney.

Previously, he was a Professor at the Australian National University where he became Head of the School of Biochemistry and Molecular Biology. He subsequently held the Chair of Biochemistry at the University of Western Australia.

He has served on the Australian Research Council and on the Executive of the Plant Science CRC at ANU. He was

a founder of the Australian Research Council Centre of Excellence in Plant Energy Biology, and is a member of its Scientific Advisory Board.

**Mr Paul Sherlock, Chief Information Officer (Library and IT), University of South Australia**

Paul is the University's first Chief Information Officer and he has overall responsibility for the University's Library and IT services. Prior to joining the University in 2001 Paul held senior ICT management roles at the Defence Science & Technology Organisation (DSTO) and BHP.

Paul is Director and Chair of SABRENet Ltd. and the Project Director for the Federal Government funded National Research Network (NRN) Project. He is also a member of the Australian National Data Service (ANDS) Steering Committee, a Member of the National eResearch Collaboration Tools and

Resources (NeCTAR) Project Board and the Treasurer at the Australian Access Federation (AAF). Paul is a former President of the Council of Australian University Director's of IT (CAUDIT) and was a founding Member and President of the Australian Access Federation (AAF).

He was also formerly a Member of the Australian eResearch Infrastructure Committee (AeRIC). Paul leads CAUDIT's benchmarking activity and is the author of the complexity index which is used by CAUDIT members to make meaningful comparisons of benchmarking data across the ANZ HE sector and internationally.

Paul was a member of the AARNet Advisory Committee between 1998 and 2014 (including as Deputy Chair 2004-2008) and is a past faculty member of the CAUDIT Leadership Institute (2004-2008).

# Financial report

**For year ending 31 December 2013**

## OPERATING INCOME

Member & Participant Subscriptions	900,000
HPC & Data Storage	483,538
Reimbursements	39,980
Hosting	15,128
Other Project Income	170,461
Other Income	167,180

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TOTAL OPERATING INCOME	1776,288
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## OPERATING EXPENSE

Admin	266,941
Infrastructure	69,523
Software	3,184
Salaries and Staff Costs	1,374,388

TOTAL OPERATING EXPENSES	1,714,036
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TOTAL NET PROFIT / LOSS FROM OPERATIONS	62,252
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Talk to us about  
harnessing eResearch  
technologies so that you  
can realise your research  
potential.



eRESEARCHSA