In this issue

Million Dollar Legacy 2
The Chappell bequest

Brief News 3
Innovation winners, an extra-terrestrial honour

Antarctic Diamonds 4
Greg Yaxley discusses a recently discovered Antarctic Kimberlite

Profiles 6
Keith Crook shares field notes and stories

Alumni Awards 7
Recognising some stellar careers

RSES Rock Stars 8
Recent awards and appointments

2013 RSES reunions: Alumnus reunions were held at RSES in Canberra and at AGU in San Francisco during 2013 to help celebrate the 40th anniversary of the Earth Sciences department at the ANU.
ROCK SOLID MILLION DOLLAR GIFT

On Monday 26 August, RSES Director Ian Jackson, had the pleasure of receiving, on behalf of ANU and RSES, a cheque for more than $1 million from the estate of former ANU academic, the late Bruce Chappell. This extremely generous gift to the University by one of our own was presented by Bruce’s sister Connie Treloar, in the presence of her son Cliff and his wife Lynne.

Mr Cliff Treloar, Prof Margaret Harding, Director Ian Jackson, Ms Mari Scicchitano, Mrs Lynne Treloar, Ms Helen Cocker, Mrs Connie Treloar and Mr Don Cameron.

Bruce joined the Geology Department as a lecturer in the early 1960s, and graduated with an ANU PhD in 1967. At the event Ian related his first experience of Bruce as a lecturer in second-year mineralogy and petrology. Bruce was awarded an ANU DSc in 1990, promoted to Professor in 1992, and retired in 1997. The following year, his sustained research contributions were recognised by election to Fellowship of the Australian Academy of Science. Bruce passed away in 2012 and is sorely missed by many colleagues and former students in the RSES community and beyond.

There are many dimensions to Bruce’s legacy – foremost amongst which is his influential published work - much of it with long-time collaborator Allan White - in understanding the compositional variations and origins of granitic rocks. Bruce’s generous bequest ensures perpetual status for the Allan White Scholarship for PhD study in petrology, and will help ensure the long-term future of the School’s valuable palaeontological collection. Earnings from the Chappell Endowment will also contribute in other ways, consistent with Bruce’s wishes, to the advancement of petrology and the training of future generations of researchers.

Inaugural winners of the Allan White Scholarship Helen Cocker (2012) and Mari Scicchitano (2013) presented the Treloars with a token of the School’s appreciation for attending and helping celebrate the legacy of Bruce Chappell. Click here to support the Chappell Endowment.

From the Director

As many of you will know first-hand, the School held a successful reunion in Canberra in October 2013, followed by a well-attended reception during the AGU meeting in San Francisco in December. I wish to thank the many alumni, and alumni in the making - present staff and students - who participated in these enjoyable events. Such functions are testimony to the School’s interest in re-engaging with its large community of staff and student alumni. We value your interest in the School and its achievements, and look forward to your continuing support for our research, research training and undergraduate teaching.

Ian Jackson – Director

Staff Reunion

Early members of Jaeger’s Department of Geophysics and Geochemistry, Research School of Physical Sciences, at the October 2013 reunion.

Back: Bill Compston and Ian McDougall.
Front: Mervyn Paterson, Frank Stacey and Ross Taylor.
The Seismometers in Schools Program, (part of the AuScope AGOS Project) has won the Education category of the Australian Innovation Challenge. Earthquake data recorded by seismometers in high schools around Australia are being deposited in international data centres under a program to attract students to the earth sciences. Students have observed earthquakes with epicentres as far afield as Europe. Australian National University geophysicist Malcolm Sambridge, project leader of the Australian Seismometers in Schools Network, says Geoscience Australia is monitoring the data to supplement readings obtained by the national network it runs. Dr Natalie Balfour and Dr Michelle Salmon from RSES have been busy installing the equipment and conducting training sessions for science teachers. So far 38 schools from across Australia have been installed with the seismometers with a total of about 30,000 students involved in the program. The network is being used to teach students geology, physics, engineering and information technology and give them experience in a real-world scientific effort.

Innovation Challenge Winners

Blast from the past

Terry Davies was a senior technical officer in Ian McDougall’s Potassium Argon Mass Spectrometry lab from the 1970s until late 1980s when he became the school Technical Services Manager. Terry’s last construction projects before his retirement in 1997 included Jaeger 7(1995) and the SHRIMP building phase 1(1996).

In January, Terry visited the School and was delighted to see the new facilities, including the purpose built SHRIMP facilities (Jaeger 5) and the latest award winning Jaeger 8 building incorporating teaching and research facilities.

Brown family visit

Back: Gavin Young, Roger Brown, David Brown and Mike Rickard. Front: Ken Campbell and Daphne Campbell.

The visit of David and Roger Brown (sons of David Brown, the Founding Professor of the Department of Geology) was a chance for our School to show off the new D.A. Brown teaching area.

Bob Liebermann goes extraterrestrial - \( \text{KAISi}_3\text{O}_8 \)

We congratulate Bob (ANU Senior Research Fellow 1970 -1976) on this latest honour: a new mineral classified as Liebermannite – from the Zagami meteorite.

RIP Renata Brauer

1924- 2013

Renata Brauer passed away on Christmas Day 2013. Renata was a dedicated and much-loved librarian who worked at RSES for many years until her retirement in 1985. Several members of the School attended her funeral and expressed our condolences to her husband, Arne.

Hales Gift

Artist Megan Hales poses with her portrait of her late Grandfather, Anton Hales which was gifted to RSES on its 40th anniversary in 2013.
Geologists have discovered the first Antarctic kimberlite, an innocuous-looking volcanic rock precious to scientists and jewelers alike.

“Kimberlites are the main host of diamonds,” says Dr Greg Yaxley. Almost all diamond mines are kimberlite mines, with the notable exception of the Argyle mine in North Western Australia.

“They are quite rare, but are distributed across the different continents. Until now, they hadn’t been found in Antarctica.”

In the late 80s, Yaxley’s colleague, Dr Geoff Nicholls, was studying metamorphic rocks at the foot of the Prince Charles Mountains in Antarctica when he stumbled across an unusual patch of rocks adjacent to the Lambert glacier.

“They were different and interesting so Geoff sampled them. He didn’t know what they were at the time. It wasn’t until much later we realised they were kimberlite,” says Yaxley, who helped to identify the rocks almost 25 years after they were found.

In addition to the gem-carrying capacity of these rocks, kimberlites are precious to geologists too.

“Kimberlites are samples of the deep mantle. They form by partial melting of the Earth’s mantle at least 200 kilometres down, and are brought to the surface in a violent process driven by volatile release. This creates a diatreme or carrot-shaped body sticking down into the Earth’s crust, with a very small, round surface expression, making them hard to find.

“If we understand the chemical composition and characteristics of kimberlites, and the processes that form them, we can learn what the mantle is like down that deep. Kimberlites are a window to the mantle.”

Yaxley says not to expect a mining boom in environmentally-protected Antarctica any time soon – there is not always a diamond in the rough.

“If you find a kimberlite, you get excited about it but the chances of it being diamondiferous are actually quite small, only around 10 per cent. You can spend your whole life mining kimberlite and never see a diamond, quite easily.”

A coral reef in Canberra

The way coral reefs form can give us clues to the health of the ocean around them, as well as Earth’s climate more generally. Dr Stephen Eggins is part of a team looking at how ocean acidity changes the makeup of coral ecosystems.

Carbon in the atmosphere is absorbed by the ocean, making the water more acidic. The more carbon in the atmosphere, the higher the acidity of the ocean, which affects the rate at which the coral grows.

The research that Dr Eggins is involved in grows coral in sea water with varying levels of acidity to see how they may be affected by future rises in atmospheric carbon.

Listen to Dr Eggins’s interview with ABC radio here.
Thinking outside the sandbox

Icing sugar, bicarbonate of soda, several kilos of corn flour and bag loads of salt. No, it’s not a recipe for the worst tasting cake in the world but something Professor Stephen Cox has cooked up to help undergraduate earth science students understand how the Earth’s crust deforms.

“On an earth science field trip you are often doing what we call ‘post-mortem science’ where you look at what is there now and infer what happened a long time ago,” says Professor Cox. “This is a way of using materials such as quartz sand and table salt to simulate what we see offshore in sedimentary basins.”

Cox worked with the RSES engineering and electronics workshops to design and build a deformation sandbox, made possible through a Vice Chancellor’s Teaching Enhancement Grant.

The sandbox is filled with materials of different densities to simulate layers of sedimentary rock. Force is applied to the chamber to see how the layers respond.

“With this sandbox, students can see things happening and moving and engage with it better. They can see faults where layers have broken and slid past each other, and see some big folds grow. It simulates in a scaled down version of what can happen in real rocks at great depths and high temperatures.”

Deformation sandboxes have been used experimentally by researchers since the thirties, but Cox was keen to move them out of the laboratory and into the classroom.

“We looked at some of the designs for the experimental ones, which are very big, very expensive computer controlled systems. RSES has wonderful engineering and electronics workshops, so we scaled the designs down and used our workshop expertise.”

The sandbox will be used in second and third year classrooms for the first time in 2014, helping students to see in a few minutes what Mother Nature creates in millions of years.

“In second and third year we will do experiments where layers of salt, and other materials such as icing sugar and corn flour simulate the properties of layered sedimentary rocks”. Cox hopes the sandbox will not only give students an insight in to the Earth’s processes, but also to the scientific method.

“We want the students to learn about how to conduct an experiment – setting up, designing, running it and analysing the results – not only by themselves, but as a team. They will learn a lot of skills that they might not get from an ordinary lab class.”

Pollution archives in Coral

Fertilizer applied to crops doesn’t necessarily stay on land. The skeletons of coral on the Great Barrier Reef are the proof. Recent research by Dr Jennie Mallela, shows that the levels of phosphorous in coral located close to shore have increased over recent decades. This increase is related to the increased discharge of phosphorous coming from adjacent land.

Read more in PLOS ONE.

Continental Life Rafts

The idea of large tectonic plates slowly drifting across the planet, forming and destroying continents, is now well established in science, but exactly how pieces of old mantle and crust interplay with newer freshly melted material is a hot topic in modern geoscience. Alex McCoy-West is currently completing his PhD looking at the processes that formed New Zealand.

Read more in the ScienceWise magazine.

Ice Age Rainfall

Dr Linda Ayliffe and Associate Professor Mike Gagan along with colleagues in Australia, Indonesia and the United States have recently revealed that well-known climate oscillations in the Northern Hemisphere also appeared as rainfall variations in tropical Australasia at the end of the last ice age around 20,000 years ago.

Read more in Nature Communications.
In the front room of his coastal house in Eden, Dr Keith Crook sits among piles of identical and meticulously labelled field diaries. Apparently this is only a fraction of his collection: “There’s a huge pile upstairs; I keep all my notes in these field diaries.”

“Keith has kept some pretty amazing records of his research - his photographs and notebooks are all identified and labelled,” says his wife, Dr Anne Felton, a geologist who also has long connections with the ANU.

Keith originally completed his PhD at the University of New England and spent several years at the University of Alberta before joining the ANU Geology Department two years after its formation.

“These field diaries date from when I was appointed as a lecturer at ANU in 1961 and, if you read through this list of places – all through Australia, North America, Russia, Papua New Guinea – it goes from book to book right through to today.”

One of the more detailed sections of Keith’s notebooks spans the late sixties and early seventies, when he spent a significant amount of time down on the NSW south coast. After being introduced to the geological wonders of the area by PhD student Hans Steiner, Keith began taking third-year geology students to the area around Eden on mapping exercises.

“The first third-year field trip was in 1969,” remembers Anne. “It was my honours year and I was chaperoning a female student. In the early seventies field camps of a week or more were set up in order to help students with rock and mineral recognition and to gain the skills they needed in the field.”

“The coastal area from the Victorian border right up to Ulladulla is like a ready-made teaching laboratory,” says Keith. “The rocks are easily accessible and very diverse. The third-years had enough basic training to be to be given some quite challenging projects - not only mapping but actual research questions to answer while they were in the field.”

The maps Keith and his students created over those years were incorporated into the Geological Survey of New South Wales’ geological maps, which are still aiding researchers to this day. Dr Gavin Young, one of Keith’s students who went on these field trips, recently used the maps to locate the fossil of a lobe-finned Devonian aged fish over 2.5 metres long, which Gavin named Edenopteron keithcrooki in honour of Keith.

“There wasn’t much difference to how students would do fieldwork today,” Keith says of how things have changed over the years. “The main difference was we used to camp in the department tents back in those days, whereas students who do fieldwork in this area now enjoy the relative luxury of a caravan park.”

The benefits of being part of such a close knit group of students and staff went far beyond the knowledge gained in the field, says Anne. “For me the advantage was not just the training, but the working relationships that developed between the students and staff. There was a great camaraderie fostered by the field trips, particularly when they were being done under canvas because you were putting up your tents, cooking and eating together, then exploring the field together.”

“The most significant part of it all was the scope,” Keith says. “We covered a lot of ground that had not been looked at before and saw a variety of features we hadn’t expected. It was stimulating the whole time.”

Seeing the field diaries stacked around Keith and knowing the stories contained in this fraction of his records, one can only guess at the stories contained in the piles of diaries upstairs.

Casey Hamilton
At the Fall Annual Meeting of the American Geophysical Union (AGU) in December 2013, three of the School’s present or former staff were elected to Fellowship of the American Geophysical Union. Such recognition of outstanding contributions to research in the earth sciences is bestowed annually on just a tiny fraction (0.1%) of the AGU membership.

**Michael Perfit (Research Fellow 1977-1982)**
Mike Perfit’s Fellowship citation reads ‘for groundbreaking petrology and geochemistry on mid-ocean ridge and island arc magmatic systems and their temporal and spatial variations’. His research has focused on the petrogenesis of mid-ocean ridge basalts, island arc lavas, magma genesis, and oceanic spreading centers. He has taken more than 35 dives to depths up to 12,000 feet in the deep-sea submersible ALVIN during his research. He has participated on over 20 oceanographic research cruises and served as co-chief scientist on several more. Mike Perfit is a professor, and former chair in the Department of Geological Sciences at the University of Florida, Gainesville, Florida where he has worked since 1982.

**Andrew Roberts (Director RSES 2010-2012; currently Dean ANU College of Physical and Mathematical Sciences)**
Andrew Roberts’ Fellowship citation reads ‘for his pioneering work in environmental magnetism and climate change, and for developing advanced new methods in rock magnetism’. Andrew Roberts has broad research interests in magnetism and palaeomagnetism, marine geoscience, geochronology and tectonics. After 13 years at the University of Southampton, culminating in a stint as Head of the School of Ocean and Earth Sciences and Deputy Director of the National Oceanography Centre, Andrew Roberts returned to the southern hemisphere in 2010. At ANU, in parallel with his distinguished performance as School Director and College Dean, he has led a major rejuvenation of the School’s palaeomagnetic laboratory.

**Peter Zeitler (Postdoctoral Fellow/Research Fellow 1983-1987)**
Peter Zeitler’s Fellowship citation reads ‘for his pioneering contributions to thermochronology and its application to a new understanding of orogeny’. Peter has worked extensively on refinement of analytical techniques for thermochronology and their application to an understanding of regional-scale tectonics and geodynamics. Recent research has focused on the Himalaya-Tibet region of Central Asia, and on the role of surface processes. Since 1988 Peter Zeitler has been in the Department of Earth & Environmental Sciences, Lehigh University, Bethlehem, Pennsylvania. He was appointed a full professor in 1996 and served as department chair for a number of years. In 2006 he was appointed the Iacocca Professor in Lehigh’s College of Arts and Sciences.

**Neil Williams PSM FTSE (BSc 1st Class Hons 1970, Research Fellow 1976-1980)**
Neil Williams has been awarded the Haddon Forrester King Medal and Lecture by the Australian Science Academy. It is recognition of a “lifelong commitment to the role geoscience can play in our society”. The citation recognizes Neil Williams’ distinguished career across academia, the minerals exploration industry and government. “Dr Williams’ leadership of the national geoscience agency from 1995 to 2010 represents an original and sustained contribution to earth sciences and has placed Australia in a global leadership position in the use and application of high quality science to manage natural resource issues.” In recognition of the value of his continuing contribution to the education of the next generation of economic geologists, Neil was also appointed as the 2014 Thayer Lindsley Lecturer by the International Society of Economic Geologists.

We are proud to share in the recognition of the outstanding achievements of these four distinguished alumni

Share your story: rses.alumni@anu.edu.au
ROCK STARS

Professor Yuri Amelin
2014 Fellow of the Geochemical Society and European Association of Geochemistry

We congratulate Yuri on his selection as a Fellow. This honorary title is “bestowed upon outstanding scientists who have, over some years, made a major contribution to the field of geochemistry.” Yuri is noted for measuring ages of geological materials with ultra-high precision.

Professor Richard Arculus
2014 Fellow of the Geochemical Society and European Association of Geochemistry

Richard is noted for his career-long studies of the role of convergent plate margin magmatism in the differentiation of the Earth. In pursuit of this research, over the past 20 years he has taken a lead community role in exploration voyages and ocean drilling in the western Pacific. This honorary title acknowledges Richard’s outstanding contribution to scientific research.

Dr Rhodri Davies
2014 Outstanding Young Scientist Award Geodynamics Section of the European Geosciences Union

We congratulate Rhodri on this award which recognises his ‘vital contributions to the field of mantle dynamics.’ He has developed sophisticated tools for numerically simulating mantle convection across a range of scales, whilst also demonstrating the power of these to improve our understanding of mantle and lithosphere dynamics.

Dr Gavin Young
2014 Mawson Medal and Lecture Australian Academy of Science

This prestigious award recognises the outstanding contributions Gavin has made in the field of early fossil vertebrates and the application of paleontology to solving problems in biostratigraphy, biogeography and historical geology. His field work and mapping in central Australia (Amadeus Basin) resulted in the discovery of the oldest known vertebrate fossils on the planet.

Sue Kesson Gift

Dr Sue Kesson, an experimental petrologist, former staff member and alumnus (PhD 1973) has generously funded an Experimental Petrology Student Travel Grant. This will enable a PhD student to visit an international or Australian laboratory to conduct experiments and learn new experimental methods.

We thank Sue for her generous support.

STOP PRESS

Edward (Ted) Irving, 1927–2014

It is with great sadness that we pass on the news that Edward A. “Ted” Irving died of cancer in Saanichton, British Columbia, Canada, on February 25, 2014, at the age of 86 years.

It was whilst working in J.C. Jaeger’s Geophysics Department in the ANU’s Research School of Physical Sciences, that Ted wrote the classic 1956 paper “Palaeomagnetic and palaeoclimatological aspects of polar wandering” which was the first publication establishing the use of paleomagnetism alone and combined with paleoclimatology to prove continental drift. Ted received many international awards recognising his outstanding contribution to science.

A tribute to Ted Irving will be published in the next newsletter.

If you would like to discuss ways in which you can support Earth Sciences at ANU please contact Mary Anne King on 61 2 6125 1120 or via email at maryanne.king@anu.edu.au