



Ten Treasures From Physics



Apoxyomenos

2011 marks 100 years since the passing of the 1911 Act of Parliament that established The University of Western Australia (UWA). To commemorate this occasion, UWA and the Centenary Planning Committee, chaired by Dr Sue Boyd released a book called the 100 Treasures from UWA (www.treasures.uwa.edu.au/treasures).

Physics is well represented among the 100 treasures which include our 1962 bronze replica of Lysippus' Greek statue Apoxyomenos which was a gift from the University of Rome that stands in the atrium of the Physics building, the George Benson designed bas-reliefs that feature Archimedes, Galileo, Newton, Kelvin, and Einstein on the original Physics building,

and the School of Physics led UWA Second Life project, the globally popular 3D interactive virtual representation of UWA.

The aforementioned are valuable, beautiful, memorable, and have a historical and community importance. However, we in the School believe that there is much more to treasure, which led to the effort initiated by the School Manager Jay Jay Jegathesan to recognize an additional ten treasures from our School. The following list resulted from nominations by staff:

1. Sapphire Clocks

Contained in the vaults of UWA's School of Physics is a collection of clear sapphires valued at AUD\$100,000. These industrially produced sapphires made from crystallised aluminium oxide are transparent, and not blue like the sapphires a celebrity might wear. They are cut into various smooth rounded shapes and although they are aesthetically pleasing their function is totally scientific.

Ultra-stable low noise microwave whispering gallery resonances are excited in the sapphires, and provide some of the most precise frequency references in the world. The electromagnetic oscillations created in these industrial sapphires are analogous to a bell which rings for an extended period of time with a very pure tone. The Frequency Standards and Metrology Group within the School hold world records for frequency stability. The sapphire oscillators are commonly

referred to as "clocks" even though they do not record time.

The frequency stability of the sapphire oscillators has allowed researchers in the School to conduct tests of theories such as Special Relativity to unprecedented levels of accuracy. They are also important participants in the European Space Agency's "Atomic Clock Ensemble in Space" mission. Of equal importance has been the commercialization of the technology by local company Poseidon Scientific Instruments, leading to applications in telecommunication and advanced radar systems.

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Physics Sapphires

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Bas-reliefs featuring famous physicists

Heads Up



**Head of School
Winthrop Professor Ian McArthur**

2012 will mark the commencement of a bold new initiative for undergraduate studies at UWA. Professional accreditation in Medicine, Dentistry, Law and Engineering will be via postgraduate degree programmes, meaning that all entrants must first complete an undergraduate degree via a Bachelor of Science, Arts, Commerce, Design or Philosophy.

All undergraduates will be required to undertake “broadening units”, meaning studies in disciplines well outside their main field of study. The aim is to provide students with the tools to be better able to meet the needs of an increasingly globalised community and workplace. In addition, development of research and communication skills will be embedded as key elements of all undergraduate majors.

For the Physics major, this has meant some significant changes, the most radical being the reduction in the number of mathematics units that students can take

whilst accommodating the broadening requirements. For this reason, the School will be moving to replace one-year Honours by a two-year Masters (doubling the amount of coursework and research project time). This will allow some backfill of content squeezed out of the old undergraduate major and will also allow students to broaden out with additional advanced coursework. Students will also be able to tackle a meatier research project that has a better chance of resulting in a publication.

So there has been a lot of work being undertaken by the dedicated individuals on our Curriculum Executive as we prepare for this bold new era. A delicate balancing act has been necessary, because there was potential for significant distraction from the research activities that are so important to our prosperity.

The School was recently honoured by a visit by His Royal Highness, the Duke of Edinburgh, to be briefed on the joint UWA/Rio Tinto research project for the development of a cryogenic airborne gravity gradiometer. Prince Philip specifically requested to visit the project, and was conducted through the Gradiometer Lab by Technical Director Frank van Kann from Physics and Project Manager Geoff Wells from Rio Tinto. Prince Philip showed a keen interest and asked a lot of very probing questions, and his charming manner and quick wit made everyone feel very comfortable.

The Gradiometer project with Rio Tinto is one of a number of research projects in the School with an industry focus, including further development of MRI imaging of iron in human organs with Resonance Health. These projects not only demonstrate to our students and the public that physics is relevant to the real world; they also provide valuable income in very tough times for the University sector in terms of Government support. The “balanced research portfolio” held by the School, ranging from industry-funded applied research to ARC-funded fundamental research (which, whilst bringing prestige, does not bring a lot of dollars to run the School and pay salaries), has been very important in seeing it through recent times as the effect of Government funding and the GFC have ravaged university budgets.

As second semester draws to a close, we are all looking forward to our annual Christmas Party on Wednesday 21st December, and we would be delighted if alumni would like to join us. For details and bookings, please contact Lee Triplett via email (lee.triplett@uwa.edu.au). If we don't see you there, I wish you and your family a happy festive season.

Ian

EDITORIAL

It is always a great feeling to release a Physics Alumni Newsletter, especially one which carries as its lead article, ‘*Ten Treasures From Physics*’.

Initially, the idea to have a story on this subject was an afterthought, and it was planned to be a list on a single page with some minor descriptions and photos. However as more work was done and as more research went into all the amazing things and people that surround us in the School, this grew to 5 pages and the cover story of the newsletter.

Many people were instrumental in the creation of this newsletter, foremost among them being our indomitable leader, Ian. In reading about the 8th Treasure, the Physics *Heads of State*, one can see that only the Founding Professor of Physics has led the School for a longer period than Ian.

Ian has been the inspiration behind many of the successes of the School highlighted in this and past issues of the newsletter, and has worked overtime to put the final polish on this issue. The one portion I have kept secret from him is my editorial, as he would not have allowed me to say all this about him if he knew beforehand.

I also want to thank Gabriella Tobar, a work experience student from Methodist Ladies College who assisted in getting the ball rolling on this newsletter and Jake Dennis, my sub-editor who worked very hard in pulling together the many things necessary in the lead up to publication.

For future issues we will be seeking the **hidden treasures** of Physics. So if you know of some or have an anecdote or two to share, please send me an email (jay.jay@uwa.edu.au).

Jay Jay

EQuS and the Chamber of Ice!

The Australian Research Council's Centre of Excellence for Engineered Quantum Systems, known in short as EQuS, opened on the 1st of January 2011. Winthrop Professor Michael ("Mike") Tobar leads the University of Western Australia node of the Centre. The centre believes that the ability to engineer materials using quantum mechanics will lead to technology that will make present day technology seem primitive.

Mike is a chief investigator for EQuS and leads the School of Physics' Precision Microwave Metrology Lab. The \$22 million EQuS grant, of which the lab receives a significant portion, is the biggest grant that the lab has received since it was established in 1999. Competition for Centre of Excellence funding is fierce, and EQuS was one of only a few new Centres funded. The consortium involved in EQuS was ecstatic when they found out in August 2010 that their 453 page application – which had taken two years to prepare – was accepted for the highly sought after honour.

The School of Physics now houses a BlueFors cryogenic fridge worth around \$400,000. This cool chamber contains 20 Litres of helium-3, itself worth around \$65,000 and can cool to milliKelvin temperatures. The dry dilution fridge is stunning to view and is necessary for quantum measurement



Mike Tobar hard at work

experiments with matter cooled to its ground state.

One of the first goals of the School's contribution to the centre is to study sapphire at milliKelvin temperatures. They want to do this because the thermal noise in sapphire, which is an astonishingly good microwave resonator rather than simply an expensive jewel, is reduced at lower temperatures (see "Ten Treasures from Physics" article for the importance of sapphire to physics researchers). The reduction in thermal noise, which acts as a fog that prevents researchers' clear observation of quantum effects, has the potential to open new windows on our understanding of macroscopic quantum systems. One potential application is quantum computing, in which "qubits" will be coded into quantum degrees of freedom such

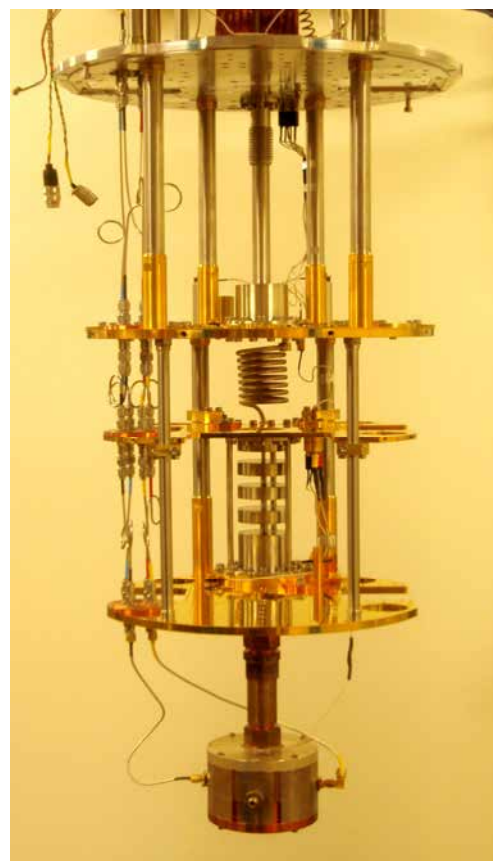
as electron spin.

Cryogenic amplifiers are used for quantum read out-systems. Mike is working to design an amplifier which will have the lowest noise ever achieved. Metaphorically, if it becomes possible for scientists to hear noises as far off and tiny as the sound of a butterfly's feet as it lands on a leaf in Myanmar, the easier it will be for modern research to be advanced. The School of Physics has already made the world's first measurements of sapphire at milliKelvin temperatures.

The curiosity driven research conducted by the Centre will give an opportunity for Australia to lead a new global tide of technological innovation. The Centre has already created invaluable opportunities for many researchers and engineers, such as Dr Jean-Michel le Floch and Romain Bara (see articles on pages 4-5). Daniel Creedon who began his physics career here has become an expert on the running and maintenance of the School's BlueFors cryogenics fridge. It is evident that the Centre will open up a multitude of opportunities for researchers in the School.



BlueFors cryogenics fridge



**Inside the belly of the beast
(lowermost chamber contains the gas)**

Make Your Parents Proud

Education is a lifelong journey and for some the desire to extend their knowledge results in a variety of unforgettable experiences. Romain Bara is one of those people. He was awarded a prestigious International Postgraduate Research Scholarship to do a PhD at UWA. His research is on millimeter waves in the Frequency Standards and Metrology Group under the supervision of Laureate Professor Mike Tobar, and is linked to a joint research project with his home institution, the University of Limoges in France. Romain holds a Bachelor of Electronic Communications and a Masters in microwave techniques specialising in electronics and optics.

Last year Romain recorded some excellent results, and produced a paper which he titled "Generation of 100 GHz with parts in 10^{16} Frequency Stability Using Cryogenic Sapphire Oscillators." Romain submitted his project abstract to the Institute of Electrical and Electronics Engineers (IEEE). His abstract earned him a place on the short list of this January's IEEE International

Frequency Conference, held in San Francisco. Upon notification of his selection, Romain conducted more research, wrote the report, and flew over. His work represents an important contribution to the international physics community. Completing the project was a goal which required Romain to delve into an area of physics with which he was unfamiliar. For most people, working on a project in an area in which they are not expert can be daunting. Nevertheless, Romain's positive attitude, dedication, and enthusiasm for knowledge resulted in his success. Asked about his first trip to America, he smiled and said that he found San Francisco "very spacious and didn't feel nearly as crowded" as he had felt in France. He was excited to see the state's infamous Alcatraz prison and admired the city's urban architecture. "The people were so open and friendly," he reminisces.

Romain's poster made it to the finals of the poster competition at the conference. Yet another success for someone who knows that hard work is the only path to success. "I was really happy when I was selected to go to the

finals in San Francisco. All my hard work had been rewarded. It was a great experience".

Romain is a greatly determined and persevering researcher who works extremely hard (sometimes going home at 3am) to get his results. More importantly, he recognises that he would not have "achieved these results without the help or support of many other researchers and my family. Help and support are very important when studying physics," he says.

Romain's primary motivation was providing his parents with the assurance that it was worth funding his education. He beams when describing his parent's joy at his success. "Mum and dad were very proud and were telling all their friends and the whole family. Just as any parent would be proud of anything their son or daughter achieves." Physics researcher Roman Bara is therefore an perfect example of why making your parents proud is undeniably worth the effort.



"All my hard work has been rewarded. It was a great experience." - Romain with San Francisco Bay and Alcatraz in the background.

Physics' French Connection

The University of Western Australia (UWA) has been at the forefront of international relations with France for over 15 years as an institution participating in the French-Australian Cotutelle program, an agreement between French institutions and select Australian universities that allows doctoral students to complete a jointly supervised project and receive a “double-badged” PhD degree from both institutions. Cotutelle began at UWA in 1997 and the School of Physics is proud to be involved.

In 2003 our very own Dr Jean-Michel Le Floch became the first student from Limoges University, France, to receive the benefits of a Cotutelle at UWA. As the first double-badged PhD student jointly supervised, he spent half his PhD at Limoges University and the other half at UWA studying dielectric resonators for filtering applications and materials characterization, graduating with Distinction in 2007 and becoming a member of staff in 2008.

Jean-Michel is very appreciative of the resources available at our University. “It’s much better in Perth,” he admits. “We have better supervision and better means of research.” His consistently and commendably posi-

tive and uplifting attitude, his *joie de vivre*, suggests that he is loving it here.

When Jean-Michel first arrived the University assisted him with adjusting to life in Australia, perhaps the most far off continent from France bar Antarctica. Jean-Michel undertook a six-month training course after arriving in Perth to help him become proficient with the use of the challenging English language (let us not forget that many of us flounder in confusion when faced with the choice of it’s and its’ or the difficulty someone might have differentiating between words like ‘there’, ‘they’re’, and ‘their’ especially in conversation). “At the beginning I was only speaking ‘froglish,’” he laughs. “So at the start it was quite hard for me to understand and speak English at the level required. It’s much easier now,” he smiles.

Jean-Michel no longer speaks ‘froglish’ but—and we are glad for this—he has not lost his irresistibly charming French accent and lively French humor. He and his wife Angelique have also brought to the School the game of Petanque, and they run a lively in-house competi-



“It’s never too early to start!”

tion for staff and postgraduates.

Jean Michel’s original passion was microwave technology. However, since being in Perth, his research has extended into the field of thin film materials and their use in linking microwave and optical frequency domains. Potential applications include better frequency standards, medical imaging, and radio astronomy. Jean-Michel is conducting his research as a member of the UWA node of the ARC Centre of Excellence for Engineered Quantum Systems (EQuS).

Jean-Michel hopes to stay in Perth for many years. He enjoys living here with Angelique and their five month old daughter, who already shows a keen interest in the School of Physics. As Jean-Michel says, “It’s never too early to start!”



Dr Jean-Michel Le Floch and his daughter Clemence

“At the beginning I was only speaking ‘froglish’. So at the start it was quite hard for me to understand and speak English at the level required. It’s much easier now,”

UWA's Own Dr House



Dr Michael House

There is growing need to educate and develop physical scientists in medical physics, as medical technology is increasingly being used to diagnose and treat a variety of medical conditions such as cancer. The Western Australian and Commonwealth Governments are trying to increase the number of medical physicists being educated and trained in WA, partly by funding a new Masters of Science (Medical Physics) course at The University of Western Australia (UWA).

Currently there is a shortage of medical physicists in the field of radiation oncology. One of the jobs that radiation oncology medical physicists perform is looking after equipment that gives radiation doses to cancer patients. They also monitor the amount of radiation going into a person. Medical physicists also work in areas such as diagnostic radiology and nuclear medicine.

“For the students who are doing the masters degree, we need the medical physicists in the hospitals to help supervise these students and their research projects.” - Michael House

Dr Michael House is the course co-ordinator of this new course at UWA. The course will bring the health sector and the School of Physics closer as the Master's involves close collaboration between students and working medical physicists. There are two aspects to the involvement of hospital-based medical physicists in the course. One of them is through teaching. As part of the course, people are needed to give tutorials for the course work and because UWA doesn't necessarily have all the expertise, they need the help of the medical physicists from hospitals to provide those teaching services. “I regularly get a range of medical physicists from the hospitals to give tutorials to the students as part of their course work. That is one aspect of how we interact with industry.”



Human Brain Tissue

“I regularly get a range of medical physicists from the hospitals to give tutorials to the students as part of their course work. That is one aspect of how we interact with the industry.” - Michael House

The other aspect involves the research component of the course. Each student in the Master's Degree does a research project over eighteen months and generally those research projects require a supervisor who can provide the relevant knowledge and expertise for the topic or project the students are working on.

Mike believes that “for the students who are doing the masters degree, we need the medical physicists in the hospitals to help supervise these students and their research projects.” So having the support of the medical physics community is vital to the success of the course.

The course will provide a pathway into a range of careers for students that include medical physics in public hospitals or private healthcare providers, radiation physics in industries like mining, research in tertiary education institutions or private scientific companies, and radiation safety in education or the public sector.



Relaxometres are like simplified MRIs

The Ten Treasures of Physics

2. Niobium Bar

The Department of Physics entered into the search for gravity waves in the late 1970's when the construction of a resonant bar gravity wave detector was commenced. This detector included a number of revolutionary features, including the use of a superconducting niobium bar. The Department purchased a 1.6 tonne niobium bar for the price of US\$180,000. It was considered an asset to the Department as the metal was in high demand because of the cold war and its price was predicted to increase. Niobium's price decreased in the late 1980s but recovered in the new millennium as it became used for alloys and tools.

The bar is a super-conductor at liquid helium temperatures and, because of this, was originally housed in a large vacuum dewar. It now resides in the Cosmology Gallery at the Professor David Blair inspired Gingin Research and Outreach Complex.

The high Q of the niobium bar made the UWA detector one of the most precise in the world. "It's not very exciting to look at, it's just a piece of metal," declares Dr Frank van Kann, one of the many to work on the project, "but its

history and its uses make it highly valuable."

It is clear that our niobium bar remains an asset to the School.

3. Rooftop Symposiums

Every Friday on the roof of the School of Physics building staff and Honours and PhD students gather together for the Rooftop Symposium (or as some would call it 'Beers on the Roof'). It has become a tradition which helps people relax, fosters fond memories of the School, and establishes a friendly atmosphere in which science-related and non-work related topics can be discussed. With a spectacular view of the Swan River as well as the whole of UWA, the symposium is organised each year by an enlightened PhD student. "My supervisor used to do that. He's like a thousand years old," says the current organiser.

Head of School, Winthrop Professor Ian McArthur says that the symposiums are a "very good way to wind-down at the week's end." It "promotes interaction between staff, postgrads, and honours students which is incredibly important because people have less and

less time these days to have a chat." This time-honoured ritual has been going on since the late 1970s, and is also used to celebrate special events such as awards, birthdays, arrivals and departures, and completion of PhD theses. In this case, it is the tradition that the beers are on the house (as well as on the roof)!



GDC Main Building, Cosmology Gallery and Leaning Tower of Gingin

4. Gingin Research and Outreach Complex

This is one of the biggest scientific research and educational centres in Western Australia. This facility has been championed by Professor David Blair and the Australian International Gravitational Research Centre since the late 1990s. It is home to The Leaning Tower of Gingin, the tallest leaning tower in the southern hemisphere (13 storeys high), and is modelled after the Leaning Tower of Pisa where Galileo conducted experiments using gravity, a process the Gingin tower allows visiting students to replicate.

More than 100,000 visitors have walked through its Gravity Discovery Centre (GDC), marvelled at its neighbour the Gingin Observatory (a space observatory, with a fully retractable roof, housing 5 large telescopes, including the largest in Australia for public access, and 6 pairs of high magnification binoculars). Situated next door is the Zadko Telescope, committed to Gamma Ray Burst research, in its own dedicated dome. Visitors to the complex have also been fascinated by its award-winning multicultural Cosmology Gallery (in the shape of a buckyball) which ex-



Rooftop symposiums bring many people together

The Ten Treasures of Physics

plores the possibilities of a union between art and science. The complex's one kilometre Solar Walk, which allows participants to walk a to-scale length of the solar system, is a popular family activity.

David, who believes that modern physics and astronomy are the greatest cultural achievements of humanity in the last 100 years, along with biology, declares that the facility "allows the general public to experience the wonders of the universe." It is useful to physics students and, according to David "It's a fantastic research facility."

The facility also connects UWA and Curtin University through the operation of the Science Education Enrichment Project (SEEP). SEEP targets high-school students from years six to twelve and promotes teaching and research in the sciences.

5. John Robin's History of The Department of Physics

History is an account of events, a narrative, which creates a platform for the understanding of the present. In 2005 Professor John Robins realised that no definitive history of UWA's Physics Department (now known as the School of Physics) had been written. On the 17th of August 2005 he began publishing periodic short accounts of its history. One can now access sixteen of these micro histories at www.physics.uwa.edu.au/alumni/history. They represent a tantalising peek into what will eventuate into a book that takes us through the 100 years of the history of Physics at UWA.

The book will contain three sections. The first will elucidate the growth and evolution of the Department, including buildings, facilities, and staff and will illustrate the Department's involvement in major scientific events such as the 1922 observation of a solar eclipse to test Einstein's theory of relativity and the establishment of the Watheroo Magnetic Observatory. The second part of the book will contain contributions supplied by former students about the research that has been done in the Department. The final section will contain reminiscences from alumni about events and life in the Department from its beginning to its

centenary next year.

The inclusion of previously unpublished photographs, reports, and personal accounts from alumni, as well as other historical sources such as newspaper reports from the time will make Professor Robins' history of the School a fascinating history of the people who made and continue to make the School what it is today.

Physics alumni are invited to contact John Robins via email (john.robins@uwa.edu.au) with information, photographs, or stories that they would like to contribute.



Plaque featuring Archimedes

6. Historic Plaques in the Ross and Clews Theatres

Sixteen plaques depicting distinguished scientists throughout the ages decorate the Clews and Ross lecture theatres. Professor C. J. B. Clews commissioned the plaques for the lecture theatres in the new Physics building, and was possibly inspired by the stone bas-reliefs on the original Physics building.

The physicists depicted on the plaques are: Archimedes, Newton, Faraday, Galileo, Rutherford, W. H. and W. L. Bragg with von Laue, Cockcroft, Fermi, Michelson, Bohr, J. J. Thomson, and Einstein. The first four are represented in both theatres for balance. The plaques are highly detailed and feature the physicists' faces surrounded by images that represent the contributions they made to science.



Wonders of the Tesla Coil

7. Interactive Outreach Activities

There are many "hands on" activities that make UWA's School of Physics outreach programme memorable to those school students and members of the public who are fortunate enough to participate in them. Of all the University's outreach activities, the Physics "performance" is consistently rated as amongst the most popular. Outreach activities are conducted both "in-house" and at external venues such as schools and science fairs. Participants have included school groups visiting from places as remote as Christmas Island or the National University of Singapore (NUS) High School.

The outreach activities have been championed by Senior Teaching Technician Lance Maschmedt, with the assistance of Joe Coletti in recent years. A crucial element is the involvement of enthusiastic undergraduates and post-graduates as demonstrators and ambassadors for physics. They aim to inform and to intrigue. The magic of the activities is that they are really "hands-on", in that the audience participate – be it in making a balloon shrink by immersing it in liquid nitrogen, or trying to understand why the stool they are sitting on rotates when they tilt a spinning wheel.

Senior Teaching Technician Lance Maschmedt believes that all physics demonstrations that the School sets up for outreach must be fun because the enjoyment of science is what encourages students to study it. "You must not make physics too serious; it frightens students away," he asserts.

Even more so, a passion for science is vital, according to Lance: "You must believe in what you're doing. You must

The Ten Treasures of Physics



Smoke on the water: learning about liquid nitrogen

enjoy what you're doing – you can't just do a job for the money." According to Lance, who sets up and organises the outreach activities, the most popular experiments are those using liquid nitrogen to demonstrate the properties of matter.

Experiments are chosen for their portability and their repeatability. However, safety is the chief priority. "We pay strict attention to safety because we can't afford to have any accidents," he declares. High levels of oversight are necessary and demonstrators are required to adhere strictly to a set routine - improvisation brings risk.

Other engaging demonstrations are the "can crusher" capacitor discharge and the spectacular sound and light show from the Tesla coil. "The whole room bursts into laughter, screeches, and whistles when it is on," Lance beams. It is easy to see why the School puts a high priority on these outreach activities in its efforts to show students why they should study at UWA's School of Physics.



Physics Heads of State

8. Physics' Heads of Department/School

The roles of a Head of Department/School are multiple and have changed over the years. Ensuring academic leadership and integrity in the core activities of teaching and research is the most enduring role. This occurs directly via the Head, and indirectly via collegiality and consensus. One measure of the health of a Department/School is the degree to which the latter is dominant. Accountability to Government for the outcomes of the activities of Universities, and therefore Departments/Schools, has increased over the years. Shielding those at the coal-face of teaching and research from burdensome administrative and reporting requirements has traditionally been an important role for the Head of Department/School of Physics, particularly given the small size of Physics relative to other disciplines at UWA.

Recently, Schools have been required to operate on "one-line budgets", whereby they have total freedom (and responsibility) for expenditure of income allocated by a formula based on the number of undergraduate students taught, the number of postgraduate completions, the number of refereed journal publications, and the dollar value of competitive and industry research funding. This has significantly increased the managerial requirements of Heads of School, conducted in partner-

ship with School Managers. The success of a Department/School resides ultimately in the quality of its staff and students. These can only be moderated by the Head. The Department/School of Physics at UWA has been blessed with a remarkable crop of staff and students during its existence.

The names of the people who have served in this important role as Head of the Department/School of Physics are listed below with the approximate dates of service. In Physics, before 1990 the Professor of Physics held the Chair of Physics and was also the Head of Department. Such joint appointments are designated by an * in the list below and those named between these were appointed to fill the inevitable gaps between the professorial appointments. Since 1990, the Heads designated by a # in the list, have been appointed in their own right. Dates are approximate as appointments are made at varying times throughout the year. It was in 2001 that the Department of Physics was renamed the School of Physics.

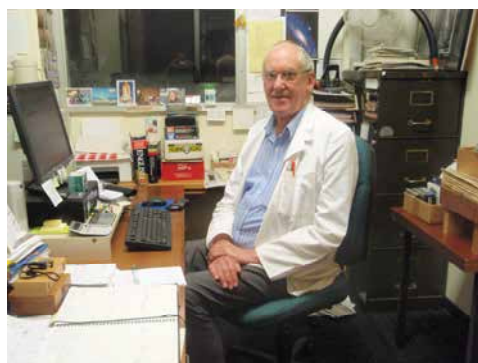
A.D. Ross (1913 – 1952) *
C.J.B. Clews (1952 – 1961) *
J. Shearer (1962)
A.J.F. Boyle (1963 – 1972) *
J.B. Swan (1972 – 1973)
R.E. Rand (1974 – 1977) *
W.C. Macklin (1978 – 1979))
J.F. Williams (1980 – 1990) *
R.S. Crisp (1991 – 1993) #
E.N. Maslen (1994 – 1997) #
C. Edwards (1997 – 1999) #
I. McArthur (2000 – Present) #

9. Physics 'Fishbowl' and Valued Contents

If there is one thing that students remember about their first year lectures in physics at UWA, it is Senior Teaching Technician Lance Maschmedt, the longest serving member of staff in the School of Physics. Noticeably tall and always keen to help both students and staff, Lance is an unforgettable person and one of the University's real characters.

And the fishbowl? The name students have given to his glassed-in office in the atrium.

Ten Treasures of Physics



“Nothing is too much if it’s for a student.” - Lance Maschmedt

Lance is committed to supporting students. “Nothing is too much if it’s for a student. If someone, whether they’re from primary school, high-school, or university - or even a parent, anybody - asks a question about science, my belief is that we should do our best to answer their question, or guide them in how to gain an answer.”

Extremely knowledgeable and meticulous when it comes to setting up experiments for lecturers, Lance has been employed by the School since 15 February 1965, having started when he was just 17. He has a strong concern for the welfare of students and staff. Lance speaks passionately and with emphatic hand gestures that suggest he is a man of firm beliefs and convictions. He is dedicated to the University and its values: “I very much enjoy working with and for people.”

New lecturers dealing with a theatre full of engineering students who do not necessarily want to be there have been major beneficiaries of Lance’s unique skills in crowd control – helped somewhat by his imposing physical presence! But he also believes passionately in linking physics to the real world. “We need to get away from the true definitions of physics and stimulate people to think laterally and relate physics to the beauty of nature.”

In 2010 Lance’s dedication was recognised by the University when he was awarded a Chancellor’s medal for “sustained contributions” to the University through his commitment and dedication. Three years earlier he received a Citation from the Australian Teaching and Learning Council’s Carrick Institute for his outstanding con-

tribution to student learning via teaching support has lead to “significantly enhanced learning outcomes.” The School of Physics is lucky to have had one such as Lance in these many decades past.

10. The Physics Workshop

The School of Physics’ Workshop consists of highly skilled technicians who work closely with academic and research staff and postgraduate students to create the apparatus necessary for research and teaching. Specialising in precision machining and ultra-high vacuum technology, the workshop staff are an integral part of the research effort of the School of Physics.



The Physics Workshop

Workshop Manager Gary Light has worked here for 34 years. He says that the workshop staff pride themselves on “making something right the first time” because this is essential in creating accurate experimental results. Providing services beyond those of a standard workshop, technical staff not only machine apparatus; they are also involved in design, installation, troubleshooting and ongoing maintenance. The process is a partnership between the workshop and researchers. A unique feature of the workshop is the repository of knowledge that has been built up in the machining of exotic materials. A number of workshop staff have been included as authors on scientific papers for their innovative solutions to challenging technical problems.

Head of School Ian McArthur believes “if you can buy your apparatus



Precision is the KEY for Steve!

off the shelf, you are most likely doing engineering research; fundamental research in physics requires unique one-off hand built apparatus.” Asking why the School of Physics required such an expensive workshop, a new Dean of Science received the response: “You try buying a gravity wave detector at Dick Smith’s!”

Equipment in the workshop is a combination of traditional and modern technologies. One of the highest precision lathes is more than 40 years old but is still as good as the day it was bought due to the priority the workshop staff place on care and maintenance of equipment. In recent years, modern digital metrology equipment, state-of-the-art computer-aided design packages, an Electric Discharge Machine (EDM) facility, and a multi-axis computer controlled milling machine have been added to increase the capabilities of the workshop.

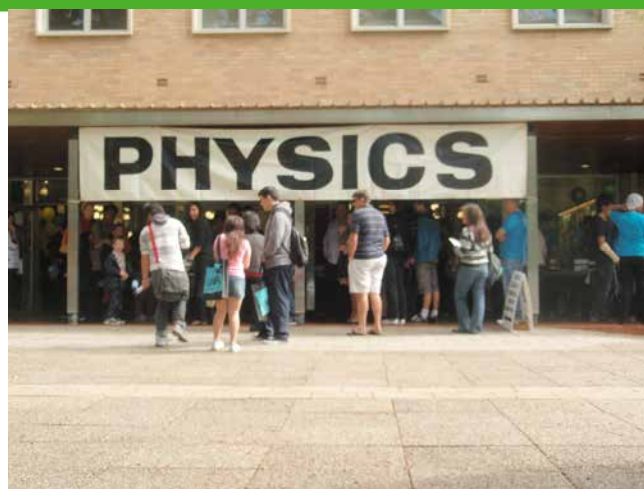
The Workshop aims to continue providing world-class research capability to the School of Physics and will continue pushing the boundaries of technology, whilst also providing training to the next generation of world class research tech-



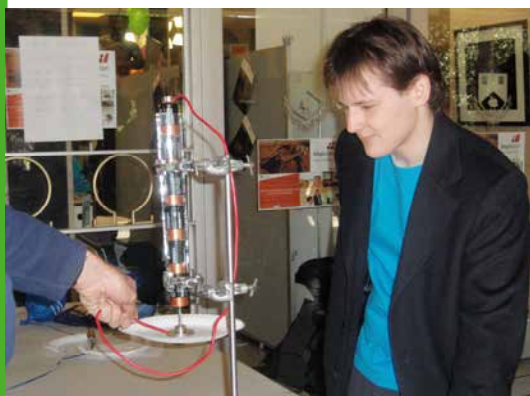
Dave Turner works his magic

Physics Open Day 14 August 2011

The School of Physics display at the University's Open Day this year was a resounding success. Greeted by our friendly volunteers who beamed in their blue shirts and offered pink, orange, and green helium balloons, our visitors were treated to experiments with liquid nitrogen and magnets, and were even invited to participate in an interactive demonstration of the laws of angular momentum. Only at the School of Physics exhibit could you leave having demonstrated your physical prowess by turning a wheel rapidly to generate a high frequency chopping of a laser beam. In fact, one of our School's researchers, Daniel Creedon, managed to get the highest score (see photo on the opposite page). A popular attraction was the Phantastic Physics 2011 Open Day Quiz (included here) which received more than 100 entries, including 14 with perfect scores! Do you know the answers?



Turn, turn, turn!



The power of magnets compels you



Gay Hollister and Mark Bolton working together to offer visitors balloons

THE PHANTASTIC PHYSICS 2011 OPEN DAY QUIZ

EGG OF COLUMBUS

Q1. Who created the electricity based demonstration of the Egg of Columbus?

- A. Christopher Columbus
- B. Nicola Anelka
- C. Nikola Tesla
- D. Albert Einstein

ELIHU THOMPSON'S JUMPING RING

Q2. What is the law that this demo is showing?

- A. Lenz's Law
- B. L.A. Law
- C. Newton's Law
- D. Law of Thermodynamics

Q3. What is one of the physics principles demonstrated by this?

- A. Jumping
- B. Thermodynamics
- C. Symmetry
- D. Induction

LIQUID NITROGEN

Q4. At what temperature does liquid nitrogen 'boil'?

- A. Minus 196 degrees Celsius
- B. Zero degrees Celsius
- C. 100 degrees Celsius
- D. Zero degrees Kelvin

Q5. What temperature is normally accepted to be the coldest possible?

- A. Minus 196 degrees Celsius
- B. Minus 273 degrees Kelvin
- C. Minus 273 degrees Celsius
- D. Zero degrees Celsius

TESLA COIL

Q6. What did the great Serbian-American scientist Nikola Tesla create that you use every day at home?

- A. The Sony Playstation
- B. AC current
- C. The telephone
- D. Electricity

GRAVITY WAVE RESEARCH

Q7. Which of the following astrophysical phenomena gives the strongest gravity wave signals?

- A. Comet
- B. Supernova
- C. Galaxy expansion
- D. Twinkling of stars

BIOPHYSICS RESEARCH

Q8. What does ECG stand for?

- A. Electroencephalograph
- B. Electronic Computerised Gravitation
- C. Electrogravitics
- D. Electrocardiogram

Q9. What is an EEG? What does it measure?

- A. Electroencephalogram, measures voltages from the brain
- B. Electroencephalograph, measures voltages from the heart
- C. Electroencephalophone, measures voltages from musical instruments
- D. Electrocardiograph, measures voltages from the heart

ASTRONOMY

Q10. What does SKA stand for?

- A. Super Kilometer Array
- B. Square Kilometer Antenna
- C. Square Kilometer Array
- D. Super Kool Astronomy

Q11. Which country apart from Australia is in the running to host the SKA?

- A. Bhutan
- B. USA
- C. China
- D. South Africa

MAGNETICS

Q12. Scrap yards pick up wrecked cars using a principle of physics. What principle is this?

- A. Electromagnetism
- B. Electrophoresis
- C. Nuclear Magnetic Resonance
- D. Magneto Hydrodynamics

14 August 2011: A Day To Remember



Daniel Creedon shows kids the magic of dry ice



Bam! And the dirt is gone!



Physics' Atrium packed to the rafters



We're spinning around, watch out!



The power of three: Ron Burman, John Brookes, and Ian McArthur



Jacinta Delhaize hosts the School of Physics/ICRAR galaxy exhibit

Reminiscences from the Early 1970s

There has always been a great spirit of camaraderie amongst the post-graduate students of our Department (now School) of Physics. Camaraderie was particularly strong in the early years when the staff and student numbers were relatively small. I was reminded of this while reading some of the reminiscences sent to me by Peter Price (PhD 1976).

I put together a collection of those which related to group activities to form an article for this newsletter but the article became too long for inclusion. As a result, I give an abbreviated account below and refer you to the full article, which is available on the web as Special Issue No.2: 'Reminiscences of Past Graduates – Early 1970s'. You will find it in Section C of my History of the Physics Department at: www.physics.uwa.edu.au/alumni/history

Many students identify themselves in terms of their Honours year as it is here that many enduring friendships are established. The accompanying photo exists of Peter Price's 1970 Honours year. The group con-



sisted of (left to right starting with the front row of desks) Pam Gunn, Peter Price, George Kirczenow, Jon Silic, Peter Rye, Barry Cross, Graham Yates, Greg Metaxas and Larry Tilbury (with Charles Willock, Lewis Carter, Ray Hobbs and Roger Clifton not attending this particular lecture). The photo (supplied by Peter Rye) was taken in the small honours room, located at what was then the western end of the 4th floor corridor before the building was extended in 1972. Graduates from that era may recall the poor quality

'roller' blackboard and the selection of 'pull-down' maps at the back of the room, which itself was only separated from the staff tea room by a fan-fold fabric wall.

I urge you to read Peter's own accounts of these activities and particularly his recollections of the 'Wednesday night seminar' group and its most unusual format.

In May 1969 Peter, still an undergraduate, together with Frank van Kann and Jon Silic, drove Frank's Datsun 1600 in four hour shifts non-stop to Brisbane to attend the 1969 National Science Faculties Association Conference. Travel support for undergraduates was virtually nonexistent in those days.

Numerous activities took place during 1973. On one occasion over Easter six students went on a four-day bushwalk along the lower Blackwood River and a great photo recording the event ap-

“I urge you to read Peter's own accounts of these activities and particularly his recollections of the 'Wednesday night seminar' group and its most unusual format.”- John Robins

pears in the longer article. There was also a caving expedition lead by Norm Poulter to explore the 'Easter Extension of Christmas Cave' near Margaret River. Two of the Department's secretaries joined in on that trip.

Later in the year a different group, including a colleague from the Chemistry Department, went on a three-day walking trip in the Stirling Ranges, which had a dramatic moment when one member fell (but survived) whilst descending one side of a canyon. A final trip in October occurred to follow-up on a report that stromatolites had been discovered in the Sharks Bay area. This was long before the seashell beach and the dolphins at Denham had made the region a tourist attraction.

Peter's reminiscences conclude with a lengthy account of running in King's Park with Ted Maslen. A very large



Ted's Runners in King's Park

number of ex-students will remember this, as it was a regular event held every Friday at 5pm and continued until Ted's untimely death in 1997. Those shown in the accompanying photograph, left to right, are): Don Philp (a seriously fast runner from Chemistry wearing black shorts), Terry Edwards (brown sweater), Frank van Kann (yellow shorts), John Carras, Bob Stuart (visiting Ted from Carnegie-Mellon), Ted Maslen, Cyril Edwards, Jose Varghese, Roger Price and Peter

Rye. Peter Price took the photo.

Today, many companies spend large sums of money employing professional groups to organise 'team-building retreats' for their employees. Throughout the years our students have clearly been achieving exactly the same, if not richer, results through many forms of self-initiated collaborative activities such as these.

Please read the full article and remember that if you would like to contribute some reminiscences of your own I would be delighted to hear from you.

John Robins, PhD 1962.
robins@physics.uwa.edu.au

Physics Honour Roll 2010-2011

2011

| Month | Name | Current Status | Award |
|-------|------------------------------------|---------------------|--|
| Nov | School of Physics | Staff & Students | Safety Committee Group Safety Award |
| Oct | John Moore | Staff | Safety Leadership Award |
| Oct | Lance Maschmedt | Staff | Safety Recognition Award |
| Sept | Eric May | Physics Alumni | WA Young Scientist of the Year |
| Sept | Michael Tobar | Staff | WA Scientist of the Year |
| Sept | Christopher Murphy and Jingbo Wang | Student/Staff | iVEC internship award for Entanglement Dynamics in Multi-Quantum Walkers |
| Sept | Jonathon Goodwin and Paul Bourke | Student/ iVEC Staff | iVEC internship award for Visualisation of Entangled Quantum Walkers |
| Sept | Karim Benmessai | Staff | Research Developments Award for Tuneable Whispering Gallery in a Ma-ser Oscillator |
| Sept | Alan Duffy | Staff | Research Developments Award for Visualising the Dark Universe for Next Generation Radio Telescopes |
| Sept | Rebecca Fuller | Staff | Research Developments Award for Quantitative Molecular Imaging (QMI): The Future of Medical Diagnostics |
| Sept | Peter Metaxas | Staff | Research Developments Award for Nano-scale: Traps for Magnetic Do-main Walls |
| Sept | Jake Dennis | Staff | Now and then: Literature Prize Open Category Poetry, Peppermint Grove Library Young Writer in Residence for the Katherine Susannah Prichard Writers Centre |
| Sept | Sascha Schediwy | Staff | Research Developments Award for A Single-Photon Detector at Micro-wave Frequencies |
| Aug | Francis Torres | Student (PhD) | 1 st Runner-Up – UWA Three Minute Thesis Competition |
| Aug | Ben Hug | Student (PhD) | EPSM – ABEC Student Scholarship to attend a conference in Darwin |
| July | Paul Abbott | Staff | Grand Prize Winner - Rocket Einstein Day Apps |
| July | Florian Beutler | Student (PhD) | First Place – Best Student Poster at ASA (Astronomical Society of Australia) Annual Meeting |
| July | Morag Scrimgeour | Student (PhD) | Second Place – Best Student Talk at ASA (Astronomical Society of Australia) Annual Meeting |
| July | Jacinta Delhaize | Student (PhD) | Honourable Mention – Talk & Poster at ASA (Astronomical Society of Australia) Annual Meeting |
| July | Peter Metaxas | Staff | American-Australian Association Pratt Fellowship |
| May | Kaela Slavik | Student | Ted Maslen Scholarship |
| May | Scott Berry | Student | Maslen Prize in Physics |
| May | Blake Segler | Student | Lady James Prize in Physics, Lady James Prize in Chemistry Ronald ad Iren Searcy Prize in Calculus, Statistics and Probability UWA Graduates Association Prize in Physics, Geology and Chemistry Level 1 Weatherburn Medal |
| May | Joshua Izaac | Student | Digby Fitzhardinge Memorial Prize UWA Graduates Association Prize in Mathematics and Computer Science Level 2 |
| May | Jeremy Bourhill | Student | Muriel and Colin Ramm Medal in Experimental Physics |
| May | Callum Shakespeare | Student | Blakers Prize in Mathematics Physics Level 3 Prize Tesla Prize Medal in Experimental Physics |
| May | School of Physics | Staff & Students | Team Prize for Clean Up Australia Day |

Physics Honour Roll 2010-2011

| | | | |
|-----|--------------------|---------------|--|
| May | Pete Wheeler | Staff | Australia Day Achievement Award |
| May | Jim Williams | Staff | Excellence in Teaching Award (first year teaching) |
| May | Felix McKenzie-Ray | Student | UNKNOWN |
| May | Monique Hollick | Student | John Patricia Farrant Honours Scholarship |
| May | Ian McArthur | Staff | Excellence in Teaching Award (coursework) |
| May | John Wojdylo | Staff | Excellence in Teaching Award (coursework) |
| May | Shaun Hooper | Student (PhD) | UWA GRST Award |
| Apr | Haixing Miao | Student (PhD) | The Gravitational Wave International Committee (GWIC) Thesis Prize |
| Apr | Pete Wheeler | Staff | Australia Day Achievement Award |
| Apr | Ben Hug | Student (PhD) | Cancer Council Grant |
| Apr | School of Physics | Staff | Distinguished Teaching and Learning Award |
| Mar | Gar-Wing Truong | Student (PhD) | Winner of 2011 Fulbright Postgraduate Scholarship in Technology and Communications Awarded Highest Rank Scholar |
| Feb | Shaun Hooper | Student (PhD) | Honourable Mention – Best Student Posters for Low-Latency and Efficient Gravitational Wave Detection @ International Gravitational Wave Conference |
| Jan | David Coward | | ARC ARF ARC Future Fellow Australian Academy of Science travel award ISL France Australia Science & Technology collaboration award |

2010

| | | | |
|------|---|-------------------------------|--|
| Dec | Jacinta Delhaize | Student (PhD) | UWA GRST Award |
| Dec | Eugene Ivanov | Staff | Joseph F. Keithley Award for the Advances in Measurement Science Recipient |
| Dec | Monique Hollick | Student | Tesla Prize Medal in Experimental Physics |
| Dec | Eric Howell | Staff | UWA re-entry Postdoctoral Fellowship |
| Dec | Gar-Wing Truong | Student (PhD) | Canon CISRA Student Prize |
| Dec | Gary Allwood, Paul Bourke and Jingbo Wang | Student/ iVEC Staff/ Staff | iVEC internship award for Quantum Computer Simulation |
| Dec | Scott Berry, Paul Bourke and Jingbo Wang | Student/ iVEC staff/ Staff | iVEC internship award for Quantum Walk Visualisation |
| Dec | Jake Dennis | Staff | Outstanding Student Prize (Creative Writing) Vice Chancellor's List |
| Dec | John Moore | Staff | Endeavour Executive Award |
| Nov | Stephen Karl | Student (PhD) | Winner of the Western Australian AusBiotech-Glaxo Smith Kline Student Excellence Award |
| Nov | Vincent Ung | Student (PhD) | Robert Standford Award |
| Nov | Mikhail Kostylev | Staff | Best poster presentation at Magnetism and Magnetic Materials Conference (Atlanta, USA) Invited Professorship from National University of Singapore |
| Oct | Mounir Ibrahim | Student (PhD) | Australasian College of Physical Scientists and Engineers in Medicine (WA Branch) John Black Student Award for best student paper Award for the Best Scientific Presentation |
| Sept | Stephen Karl | Student (PhD) | UWA Convocation Travel Award |



THE UNIVERSITY OF
WESTERN AUSTRALIA
Achieve International Excellence

Physics Honour Roll

2010-2011

~Continued~

| | | | |
|--|---------------------|---------------|--|
| Sept | Michael Tobar | Staff | ALTC Award Citation for outstanding contributions to student learning |
| Sept | Paul Abbott | Staff | Faculty Award for Excellence in Teaching |
| June | Tim St Pierre | Staff | Clunies Ross Award from the Australian Academy of Technological Sciences and Engineering |
| June | Jay Jay Jegathesan | Staff | Top 10 – 2010 Linden Prize |
| June | John Hartnett | Staff | IEEE UFFC W.G. Cady Award |
| May | Stephan Karl | Student (PhD) | UWA GRST Award |
| Mar | Stephen Karl | Student (PhD) | Travel Award |
| Feb | John-Michel LeFloch | Staff | Young Radio Scientist Keynote Award (WARS) |
| Jan | Jeremy Bourhill | Student | 2010 Colin and Muriel Ramm Scholarship for Honours Students |
| Congratulations to all the staff, students, and alumni at the School of Physics! | | | |

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Contributions to the Physics Alumni Newsletter are most welcome.
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