

# Particles

The Physics Work Experience Newsletter

Issue 9 | December 2016 |



THE UNIVERSITY OF  
**WESTERN  
AUSTRALIA**

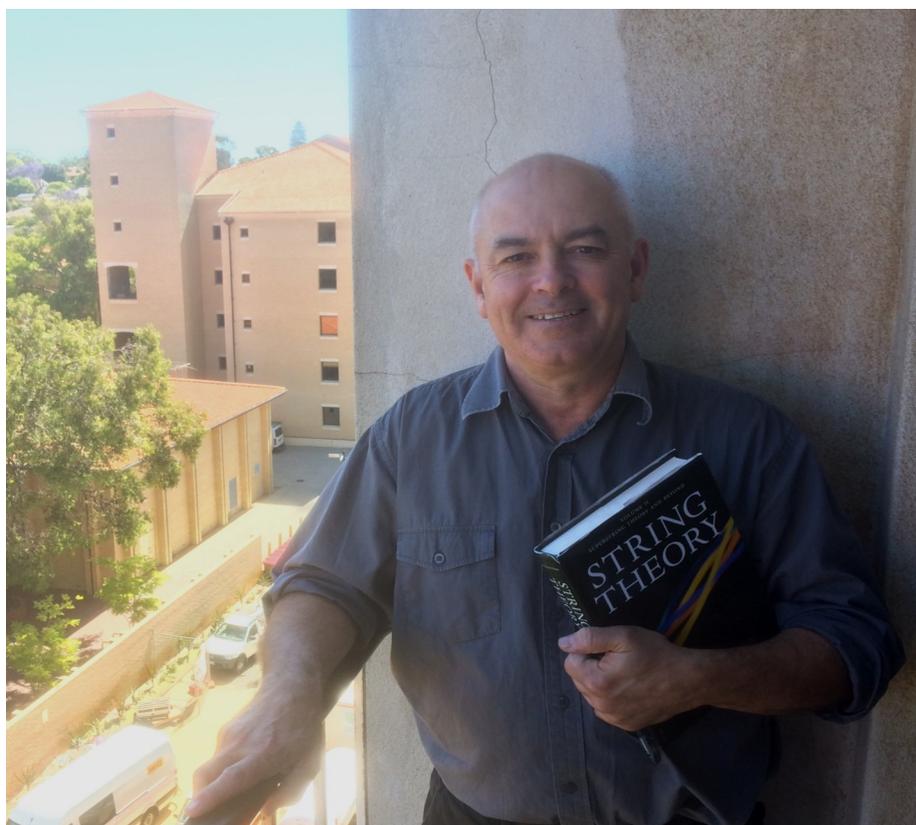
*Particles is a 'mini-newsletter' which is produced as part of the **School of Physics Science Journalism Work Experience Programme**. This edition was created as part of the work experience by Year 10 students: Seamus Pandit and Junho Park, Perth Modern School.*

## The One and Only Constant in Physics?

Stable. Never changing. Coherent. These are all characteristics of constants. Constants shape mathematical equations and influence them being the only factor of an equation that isn't variable. Whilst all the other numbers and operations may change, the constant will stay the same. Constants are used throughout physics such as in Einstein's very own cosmological constant as well as Newton's gravitational constant. The School of Physics came into being on the 1st of January 2001, evolving from *The Department of Physics* during the previous major restructure at UWA. Since then, it has had 16 successful and fruitful years and come the 31st of December 2016 it will undergo another drastic change. Although the school has experienced major alterations, and been through highs and lows, facing several challenges and developments across the years, the constant that has held everything together since the start has remained unchanged. Throughout the time the School of Physics has existed, there has been one constant, and that constant has been Professor Ian McArthur.

Ian was appointed as the Head of Department in the year 2000, one year before the birth of the *School of Physics* in 2001. In fact, he has been and always will be the "one and only" Head in the history of the *School of Physics* at UWA.

After being appointed to the position, he successfully navigated the school through the major university-wide restructure. The changes included allowing more flexibility for lecturers and researchers to pursue their strengths, and building strong



Professor Ian McArthur at UWA, his home away from home

research groups, thus turning Physics into a more research intensive entity, with a focus across Astronomy and Astrophysics, Biomagnetics and Medical Physics, Precision & Quantum Measurement, and Theoretical & Computational Physics.

A new budget model was also introduced at UWA which provided funding to schools based on both research and teaching inputs and outputs, meaning the school had to earn every last dollar it received for day to day operations. The way Ian modelled the school maximized the

return on the budget model, with particular reference to research input and output, making Physics one of the few schools where research income outstripped teaching income.

Ian's devotion and passion to the school and teaching has been a driving force throughout the years. This passion for physics took shape in Ian's early high school years and has taken him on an educational and life journey filled with illustrious achievements and a long list of accolades.

# The One and Only Constant in Physics?



Ian in his natural habitat

It was at Hollywood High School (now merged with Swanbourne to become Shenton College) where Ian's interest in physics was piqued. In his time there, he pursued physics and other closely related disciplines such as chemistry and mathematics. After the completion of high school, the next phase of his educational journey took him to the University of Western Australia.

Here, he completed an undergraduate degree in maths and physics which inspired him to pursue a PhD. He earned an academic scholarship to the world renowned Harvard University, where he would undertake his PhD in theoretical physics and super symmetric quantum field theories under the supervision of Professor Howard Georgi III.

Supersymmetric quantum field theories incorporate a symmetry relating two types of particle that are observed in nature, fermions and bosons. The former are the constituents of ordinary matter, the latter mediate the interactions that holds matter together in bound

states including nuclei and atoms. One of the major science goals of the Large Hadron Collider at CERN is to look for evidence of supersymmetry.

Following his time at Harvard, he took up a Postdoctoral Fellowship in the Department of Applied Mathematics and Theoretical Physics at Cambridge University in England, lecturing in the same theatres where such luminaries as Professor Stephen Hawking cut their teeth. Thereafter Ian went onto a second Postdoctoral Fellowship in Germany at the University of Karlsruhe where he worked alongside Professor Julius Wess. After 9 years of dedication and hard work in research and teaching, Ian was promoted to Assistant Professor at Hamburg University.

Despite Ian's prestigious position and educational endeavours, he found the environment a mismatch to his long term visions and ambitions, with particular reference to family. He had his four beautiful children to consider and hence wanted an ideal

environment for his family to grow up in. After much thought, his love and connection with his birthplace won through, coming to the conclusion that Perth was the ideal place. After all, Europe didn't have the pristine beaches and crystal clear blue skies, in which he now pilots an open cockpit bi-plane (but that's a story for another day).

On his return to UWA in 1993, he found himself back in the Department of Physics. He continued lecturing and teaching as well as carrying on with his research. Ian's passion and enthusiasm was recognised by Professor Cyril Edwards, the then Head. He saw potential in Ian to take the baton after him, and in the year 2000, he was appointed to the position.

Ian's passion for teaching and research saw him win multiple teaching excellence and research awards. His teaching awards stretch back to the *Excellence in Undergraduate Teaching Award* he won in 1995 to the 2011 award for *Excellence in Teaching and Learning - Coursework Teaching*. He also

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won an *Alexander von Humboldt Research Fellowship (1996)*, which he took up at Munich University.

He is also a member of panels such as The National Committee for Physics (NCP) of the Australian Academy of Science and the Executive of the Australian Institute of Physics (AIP). The NCP aims to promote links at both the national and international level amongst physicists while the AIP promotes the role of Physics in research, education, industry and the community.

Despite Ian's individual achievements, his selflessness has led him to always put greater emphasis on the improvement of the school and guiding it to reaching new frontiers. These include various partnerships with organizations such as mining giant *Rio Tinto* and the innovative medical physics organisation, *Resonance Health*. The partnership with Resonance focuses on technology which aids in medical practices such as biopsies and medical imaging technology. Rio Tinto are linked to the school through the innovation surrounding the concept of developing a commercially viable gravity gradiometer which is an instrument that could transform geophysical and mining exploration.

Under Ian's watch, the school has also achieved feats such as receiving a perfect score in the *Excellence in Research Australia (ERA)* assessment of research in universities across Australia in 2012, conducted by the Australian Research Council. Physics was one of only two disciplines at UWA that had accomplished this. The top assessment of '5' indicates achieving a standard of research which is considered to be "well above world average". The top score was received again in 2015, with Physics being the only discipline to achieve this mark across 2 assessment periods.

Ian has always emphasised that all these achievements are only possible with the collective effort and unity of the entire school. As he has stated himself, "It isn't the building or the classrooms, it is the people and those who are present in the classrooms and the



Ian & Jay Jay: The Longest Head of School-School Manager Partnership at UWA

buildings that make up the school."

Ian had built the school on the strength of relationships between staff in the school, be they academic or professional and this extended to postgrad and undergraduate students. While the strength of these relationships will no doubt endure, one of these will come to an end due to the nature of the current restructure.

*"...it is the people and those who are present in the classrooms and the buildings that make up the school"*

The 31st of December 2016, brings the curtain down on the longest Head of School-School Manager partnership at UWA between Ian and Jay Jay Jegathesan, which has been in place since 2007. This partnership saw the establishment of numerous unique and innovative programmes in the school such as the International Research Outreach Programmes with schools and universities in Japan, China and Singapore as well as the Science Journalism Work

Experience Programme and the establishment of UWA in Virtual Worlds.

"I consider it an honour and a privilege to have served at the School of Physics under Ian. From the first day I met him, he always put the needs and wants of others above his own, and he seemed to act as an umbrella for the school, protecting staff from additional administrative work, by doing it all himself and carrying a very significant teaching load as well. He brings out the best in those around him. He is certainly someone to admire and the world would be a better place if there were more people like him", Jay Jay explained.

New times are coming. Regardless of the changes, nothing can take away the exceptional and progressive years the School of Physics has had under the guidance of Professor Ian McArthur. The philosophy that the 'constant' has ingrained in the school will allow Physics to overcome anything, even obstacles that seem insurmountable in the years ahead.

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## Cyril Speaks!



**Professor Cyril Edwards**  
Head of Department (1997-1999)

I was recently asked why I had recommended that Ian McArthur should take over as Head of Physics when I retired in 2000. At that time it seemed such an obvious choice that it needed little explanation, but even now, sixteen years later, the essentials remain clear.

I'd met him first as a second year undergraduate student in my Many Particle Systems course. He was quietly self-assured and it was soon clear that he understood where I was trying to take the class and we shared an unspoken joy as the development unfolded. The realisation that so much understanding could be traced back to the dimensionality and geometry of a classical phase space was a Eureka moment that I loved to share. And the fact that quantum physics fitted so

naturally into this picture was just icing on the cake.

Like most of the high flyers, Ian seemed to take similar pleasure in his concurrent mathematics units. So much so that I wondered, as Course Coordinator, whether he might do a double major. He didn't. Although in later years, as a fully mature scientist, he confirmed his love of maths, he explained that it truly flourished only when it was applied to something: for him, physics and maths meant a marriage made in heaven. His research on quantum super gravity, string theory and super spaces shows how well that marriage has been consummated.

When searching for a replacement Head of Physics, it occurred to me that someone with a passion so thoroughly embracing both physics and mathematics would present as an ideal candidate. Moreover, Ian's research interests would be unlikely to challenge material resources. This could not be said for other potential candidates who, as experimentalists, inevitably placed often large and competing demands on increasingly scarce funding. Added to this, his excellent teaching record suggested a passion for teaching that would safeguard its fundamental importance into the future.

Although the decision to appoint Ian was not mine, I made these points to the Dean when discussing my replacement. Perhaps he listened ... perhaps not. No matter, Ian has been the longest serving Head of Physics since Professor Ross, appointed as Professor of Mathematics and Physics in 1913. Sixteen years later the disciplines separated and C E Weatherburn became the first Professor of Mathematics. The marriage remained comfortable however, and will hopefully strengthen when Physics takes up the challenge of life in a rebalanced Faculty of Engineering and Mathematical Sciences.

Ian's leadership has been entirely in this millennium and, although second in terms of length of service, it must be recognized that the University was a very different place a hundred years ago. The importance of the disciplines was then paramount but a curtain has since fallen. Ian's calm efficiency and wisdom would be a valuable asset in its new home for above all it would nourish and preserve the difference between the cultures ... the "how" of engineering and the "why" of science.

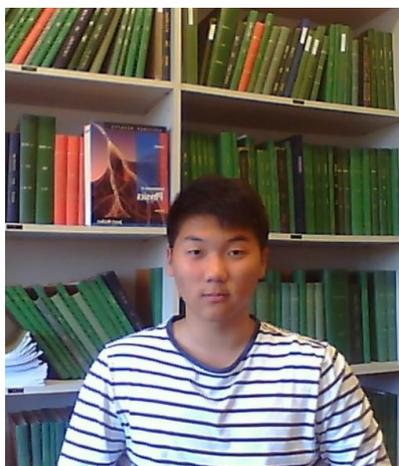
We should all thank him for a first rate performance in a very difficult job as the current chapter of the 'School of Physics' ends, heralding a new dawn.

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