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Editorial

Volume 146–1 of the *Journal and Proceedings* goes to press just after the Society has held its annual Forum, this year at Sydney's Powerhouse Museum. With education reforms very much a part of the current political agenda the subject matter chosen was certainly topical: "Maths and science education in Australia – is there a crisis?" While there is no doubt there are many issues of consequence around questions of levels of scientific literacy in Australia – such as how society responds to the issue of climate change – whether that is the result of a crisis in our education system, or perhaps reflects a cultural divide in the community, is a matter of debate. What is clear, however, is that there is a crisis in our ability to teach science in our schools – in particular maths and physics – with large numbers of school teachers qualified in these areas fast approaching retirement age, and without a similarly qualified cohort of younger teachers ready to take their place.

As a university teacher of physics who sees the output from the school science system – over 10,000 students have now passed through my own classes – the consequences of limited preparation for the demands of problem solving that undergraduate physics students are subjected to are clear to me. At UNSW, while around 2,000 students pass through the doors of our first year physics program, by the time honours level is reached we rarely have more than 10 remaining. Now, while of course many are instead studying challenging courses in other fields such as engineering, this is a mere 0.5% uptake from those who were sufficiently qualified to start a university-level physics course in the first place. While the best students are brilliant, too many find themselves ill-equipped to develop their skills in critical analysis and quantitative reasoning which are among the essentials of a science education.

Ask any person who excels in a scientific field of endeavour why they got started in that field and invariably the response is because of an inspirational teacher at school. The multiplier effect to society of one great teacher is immeasurable. One such teacher might be able to inspire tens to hundreds through the span of their own career to take up and tackle the challenges of university-level science. This is a mighty contribution towards equipping the next generation for dealing with the ever increasingly technologically-dependent world that we all inhabit.

So how do we inspire a new generation of science teachers into our schools? This is one of the big challenges we face as a society and there appear to be no easy solutions. There are impediments we might consider removing, however. The best science teachers will invariably come from the cohort who have taken science the furthest at university, yet there are real barriers to their employment in the school system. The lack of a formal teaching qualification should one decide to turn ones endeavours to teaching from another field while in mid-career is one such barrier. Might there be means of providing teacher training while on the job, so as to avoid the need to completely stop one career to re-train for another? This is essentially the way teaching is learnt at university – on the job experience. While it might result in some rough edges along the way, there is nothing like jumping in at the deep end to learn how

to swim. The first essential to teach a subject is to know that subject. This cannot be learnt on the run. Unfortunately the lack of maths and physics teachers at many schools has the consequence that these subjects are often taught by life science teachers who found it an effort to get through their first year university physics course and went no further with it. No matter how motivated and dedicated they are, such a teacher is always going to struggle to instill the fundamentals of physics in a student.

Anyone knowledgeable in physics is also literate in mathematics, and vice-versa. The key concept of problem solving in each field is the same. If you can teach in one of these fields you can also teach in the other. I know, as that was my own career path, having trained in mathematics and yet now earning my living by teaching physics, without having received a formal training in it (or in teaching, for that matter). Yet there are barriers within many schools against such cross-discipline teaching.

Another matter of contention is whether to incentivise the teaching profession through differential salary scales. In the university system there now may be a factor three between the highest and lowest paid academics, the result of a clear career progression path together with performance-based incentive schemes. While a meritocracy in salary might be an ideal we should aspire too, one can question whether it is also presenting a barrier to bringing in the best science teachers to the school system. While the research-based metrics used in universities as part of their performance appraisal systems might not be applicable in the school system, perhaps a simpler criteria of qualifications and years of experience in the requisite fields of need might be used instead when determining remuneration levels? For instance, a relevant doctorate could attract a higher starting salary?

This issue of the *Journal* brings in three research papers, two invited discourses and two thesis abstracts. The subject matter covered is broad, from the causes of the Global Financial Crisis, to the medical cyclotron at Sydney University, to the career of the new Director of the Australian Astronomical Observatory (Warrick Couch). In a new direction for the *Journal* the GFC article contains a timeline as online-only material, a feature we hope to be able to expand on in the future to allow the presentation of additional material, too extensive for the print edition of the *Journal*. Of the two invited discourses, we hear from John Dickenson on the invention of the pendulum weight shift hang glider, a fascinating story that emerges from the sport of water skiing. Finally, Society President Donald Hector discusses the humanist paradox, elements of which are strong in the discussion of scientific literacy, education and cultural divides in society, as espoused in the Society's recent Forum.

Michael Burton
Hon. Secretary (Editorial)
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