



Professor Penny D. Sackett
Chief Scientist for Australia

Why Physics is Important to Australia (and vice versa)

Thoughts from the Chief Scientist on the
importance of physics to Australia, its people, and
its future - and the role of scientists in an
increasingly global society

Presentation to the 18th Biennial Congress of the
Australian Institute of Physics

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Venue: Napier G03, University of Adelaide North
Terrace

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Thank you Roger for that kind introduction.

It is a delight to be in Adelaide today, and in particular here at the 18th Biennial Congress of the Australian Institute of Physics.

Fortunately, I will be able to enjoy the Women in Physics session this afternoon; unfortunately, I've missed a number of sessions on topics ranging from solar power to the Large Hadron Collider, climate change and the art of physics making music.

Today I would like to speak a bit about why physics is important to Australia, and why Australia is important physics.

But as I imagine that this audience is largely convinced of those points, I'd like to focus more on how this importance can grow.

Australia has a rich tradition in physics of which any nation of its age would be immensely proud.

Sir William Lawrence Bragg, who was borne in North Adelaide, received the Nobel Prize when he was only 25 years of age for us work on the

structure of crystals as deduced from the diffraction of X-rays, work that eventually led to our understanding of DNA.

London-borne Rachel Makinson began her studies in Cambridge, and finished them at the University of Sydney.

During an age when Australia was said to “Ride on the sheep’s back” because of the importance of wool as the major export, Makinson became a world expert in the structure and characteristics of wool, pioneering new techniques to increase its usefulness and durability.

Howard Florey, also a native of Adelaide, has forever changed the world as a physicist who discovered penicillin. It is difficult for us to now imagine a world without antibiotics.

Physics has been important for Australia. Physics that is driven by curiosity and leads, sometimes decades later to unanticipated benefits, as it did with the work of Bragg, and physics focussed on providing solutions to immediate problems, as in the case of Makinson.

Never has Australia and the world needed more what physics can provide.

Think no further than:

the exhaustion fossil fuels, our primary
source of energy

the realities of climate change

and the promise of nanotechnology.

And yet, a recent audit by the Australian government is predicting a shortfall of 19,000 scientists in the country in just three years time.

While the population grows, the numbers of Australians with degrees in physics has declined, on average, about 1.5% per year.

Against such a backdrop, it seems odd that physicists --- and scientists in general --- find themselves explaining to some in positions of influence that physics is a vital piece of any modern society.

My attention was drawn to a piece in the 22 November edition of *The Economist* quoting an academic from the Columbia Business School that what the world needed, or at least that part of the world occupied by America needed was not more PhDs but better MBAs.

Now few would dispute that better MBAs would be a benefit, but can we do with fewer citizens that understand in detail the mechanics of the world in which we live?

I think not. If you agree with me, then we need to ask why that message is not being heard. Perhaps we need to do better in getting the message out.

I am a physicist by training. An inspirational teacher in secondary school made me appreciate that physics is a way to seek understanding about anything --- everything --- in the world.

But as I progressed through graduate school, the definition of physics seemed to narrow, rather than widen. There was a sense that some science was just not “real physics, not fundamental physics,” which led, in some, to an introverted and linear discipline that is more easily segregated from society.

But this meeting is an indication that physics is moving away from that narrow view and returning to its earlier roots, when physics encompassed or at least interfaced with all questions of how the universe works and why.

If physics is a volume, then the interactions occur at its surface, and the larger that surface, the more convoluted that surface, the more fractal that surface, if you like, the more interaction will take place.

More interaction means more ways for physicists to influence the world and more ways for the world in which we live to provide input and enrich our work.

That's my take home message.

Remember that as a physicist you can make a strong contribution to science policy, but to get action, you need to interact.

Last night I hosted the Science Outside the Square session called Physics to Blow your Mind, a fantastic opportunity for physicists to talk about their work with people from all walks of life.

Professor Steven Carlip from the University of California and CERN's Professor John Ellis interacted with the crowds through a free exchange of questions and answers, challenging and expanding understanding on topics ranging from dark matter and energy, and black holes and The Big Bang.

One program set up by my predecessor, Jim Peacock, allows to form one-on-one partnerships with teachers in Australia.

Scientists in Schools is a wonderful and very successful initiative, based on an earlier initiative born here in South Australia.

I encourage you to consider participating in it, which is as simple as registering your name on a web interface.

Based on a visit I made yesterday, I assure you that the teachers and pupils of schools like Cowandilla Primary are waiting and depending on you.

We need, as scientists to interact with schools, with policy makers, and with the public to share our excitement of science, to explain its focus on questions as well as answers, and to fully integrate into the society that supports us and depends upon us.

Physics is not just a training, it is a life-long continuing education. We are learners as well as teachers.

As Chief Scientist for Australia, I need to wear many hats, as a:

facilitator for innovation,

bellwether for the nation's most important scientific issues,

as communicator of and an ambassador for science and

a continuous advocate of evidence-based decision making.

But these aren't just my roles, they are yours as well. I need your help. Australia needs your help. You can and will help shape the future.

And so I look forward to working with you to increase the surface area of interaction between physics and the world in which it is so inextricably linked.

Thank you