Science and Conservation

A talk to the Perth Modernian Society on 27 April 2016

When Barrie asked me to talk about science and conservation I had a very difficult decision to make. I could talk for hours on this topic and it is difficult to compress a lifetime of experience into 30 minutes, so I will just focus on a few important aspects of my work and provide some personal anecdotes to illustrate my points. I will start by explaining how I came to be involved in this field and then look at the work that I have done on wetlands and biodiversity. I will conclude by explaining how it related to my work as an academic physicist at Murdoch University.

I chose a career in science, mainly because I enjoyed it so much at PMS and I did well at it. In those days boys were only allowed to study two aspects of science, physics and chemistry, but I loved both of them and I had some outstanding teachers.

I did well in the Leaving and could have taken any course at UWA but I never really considered anything but science and that for me meant physics, chemistry and mathematics.

UWA was a bit of a culture shock after PMS. I found that physics was poorly taught while the maths and chemistry lecturers were much more inspiring, so I decided to do a double major in physical chemistry and mathematics. I did my honours year in 1962 with another Old Modernian, Doug McLean, as my supervisor. My project was on quantum chemistry and the applications of the exciting new digital computers to solving problems of chemical structure and bonding. Doug left UWA half way through my honours year and went to work for IBM in San Jose, but he continued to supervise me by correspondence. When I graduated I decided to go to the USA to do a PhD in theoretical chemistry and Doug arranged for me to study at Harvard University where I completed a PhD in chemical physics in 1967. My supervisor at Harvard was the famous theoretical chemist and molecular spectroscopist, Prof EB Wilson, who had himself been a student of Linus Pauling. After finishing at Harvard I spent 18 months as a postdoctoral fellow at Bell Telephone Laboratories in New Jersey, where I worked on the theory of low energy electron diffraction from metal surfaces.

During my time in the USA I became increasingly concerned about the misuse of science and technology. The Vietnam war was raging at that time and US forces were dropping napalm and agent orange on the jungles to flush out the Vietcong. The cold war was also at its peak and the USA and USSR were both testing weapons of mass destruction, including atmospheric nuclear tests. Linus Pauling and Bertrand Russell led a worldwide movement that eventually produced the Atmospheric Test Ban Treaty. The civil rights movement was also in full swing and I had the privilege of hearing Martin Luther King speak at Harvard. I met many inspiring people at Harvard and I read widely outside my area of study, especially on the topic of science, technology and society.

I recall that in the spring of 1964 I was concerned to see a plague of caterpillars devouring the ivy on the walls of the building at Harvard where I worked. I called the campus garden staff to report the problem and the gardener politely informed me that he was unable to spray the ivy because he was concerned that DDT would kill the birds that fed on the caterpillars. He suggested that I read Rachel Carson's book "Silent Spring" that had been published in 1963. That chance conversation changed my life. I bought the book and read it and it reinforced my growing concern about the careless application of technology to solve human problems. It pointed out how the use of pesticides like DDT was killing off a wide range of animals, including the American national symbol, the bald eagle. I began to realize that science and technology are powerful tools which can improve our quality of life but equally they can cause great harm if not used wisely.

I returned to Australia as a Queen Elizabeth Fellow at Flinders University in 1969 - 70 and then I got my first teaching job as a lecturer in physics at the University of NSW, where I worked on surface physics between 1971 and 1974. When the opportunity arose to return to WA in 1975 to work at the new Murdoch University, I took it and I have remained there for the past 41 years.

Murdoch appealed to me because it set out to be a different kind of University. One that was more flexible than the older Universities, more engaged with the community and one which addressed interdisciplinary and contemporary issues. The Foundation Professors called this the Murdoch ethos.

At Murdoch I met many interesting colleagues, including Keith Roby, who was a theoretical chemist with a strong interest in the interactions of science, technology and society. He had attended the United Nations Conference on the Human Environment in Stockholm in 1972 where the vision of a just, participatory and sustainable society was first adopted. He was committed to this goal and to the Murdoch ethos and I had the good fortune to work with him on several interdisciplinary projects while I helped to build up the physics program at Murdoch University. He put forward the idea that science should be seen as a servant of the community and that scientists had a duty to consider the implications of their work and inform the public about their concerns. We had many discussions about how to do this and we realized that education was a powerful agent of social change. We began to introduce Science, Technology and Society issues into our science curriculum to make our students more aware of the responsibilities of scientists.

During the early years of Murdoch University the first world energy crisis erupted when the OPEC cartel cut oil production and forced up crude oil prices. This led to considerable interest on campus in energy policy and alternative energy sources and several of us began to do research in this area. Keith Roby and I were also concerned about the nuclear arms race and the link to the nuclear fuel cycle. Following the Three Mile Island nuclear accident in 1979 I became increasingly concerned about nuclear power and we began seriously looking at alternatives. We didn't know about global warming at that stage but air pollution and acid rain, caused by the burning of coal, were major issues, so we started looking seriously at wind and solar energy as realistic alternatives and we began to include them in our teaching and research.

Murdoch University was the first University in Australia to introduce the teaching of environmental science and this was a subject of great interest to me. Because of its commitment to interdisciplinary studies I had the opportunity to interact with the environmental scientists and contribute to their teaching and research. One area that I was particularly interested in was biodiversity. On my return to Perth after 12 years away I was struck by the amazing biodiversity of the Swan Coastal Plain landscape. I read George Seddon's wonderful book, "A Sense of Place" and understood then why I loved this environment.

I recalled many happy days as a child, roaming through the banksia woodlands and wetlands and spending time at the beach or by the river. However, I was saddened to see how much destruction had occurred in the 12 years that I was away. So much of the beautiful banksia woodlands had been cleared and all that remained were a few precious fragments of one of the world's biodiversity treasures.

The state of our wetlands was another major concern to me**.** Wetlands are havens for wildlife and they support much of the biodiversity of the Swan Coastal Plain.

My second cousin, who was a State politician, alerted me to the EPA's System Six Study as an opportunity to protect the remaining fragments of bushland and wetlands on the Swan Coastal Plain and I engaged with that process. Together with another Murdoch colleague, Peter Newman, we put

forward a case to protect the Cockburn wetlands and woodland and create a new national park. Eventually the EPA accepted this proposal and recommended a system of Regional Parks to protect the wetlands, woodlands, estuaries, beaches and the escarpment that give the Swan Coastal Plain its unique character. I spent many years lobbying politicians and public servants to get this plan implemented and eventually, in 1997, they did it and we now have a system of 8 Regional Parks in the metropolitan area.

I was asked to chair the Beeliar Regional Park Community Advisory Committee and I have done so now for the past 19 years. All of this conservation work I did in my own time, working with my family and community groups and other Murdoch colleagues who held similar convictions.

I should point out that this process was not plain sailing. In September 1984 the Main Roads Department decided to put a road through the Beeliar Wetlands, despite a recent EPA recommendation against it. We knew nothing about their plans until three bulldozers arrived at North Lake on 10 September 1984 and started clearing the vegetation. We were shocked to see this destruction occurring despite all the careful scientific arguments that we had put forward to the EPA. We protested to our MPs and local councillors and contacted the EPA but the destruction went on. Finally, in frustration some local residents and students stood in front of the bulldozers and tried to obstruct them, but they were removed by the police and we failed to stop the road going through. It appeared to us that once the funds had been approved and the contracts were signed the Government was unwilling to stop the project. However, this incident – the Farrington Road Blockade – taught the Government and Main Roads an important lesson that sustainability and openness were key issues for the community. For me it underlined the need for ongoing public education and constant vigilance.

As a result of this experience I have come to realize that true conservation is a complex process involving careful research and public education, which lead to awareness and eventually to government action.

This however is not the end of the story as the public has a vital ongoing role to play in ensuring that well designed policies are applied to achieve sustainable outcomes. Government policies alone are not enough unless people are constantly watching and reminding them of their duty.

During the Farrington Road Dispute I met many people who were concerned about biodiversity conservation and wetlands and together we formed the Wetlands Conservation Society in 1985 to advocate for wetland conservation. In 1993 I helped to establish the Cockburn Wetlands Education Centre which conducts wildlife research and education and is involved in landcare activities. **S15, S16**

There is much more that I could say on the topic of wetland conservation. I am still very involved with it and there are many important current issues such as the effects of climate change and the Government's Green Growth Plan for Perth and Peel.

I would also like to mention at this stage that I have enjoyed the strong support of my family, especially my wife and daughters, who assisted me with many of these issues and encouraged me to speak out about them. I also met and worked with many wonderful people from all walks of life who were also doing voluntary community service. When you are doing community work it is important to have a strong supportive network as the workload can build up suddenly and it can be very stressful to have the public spotlight on you.

I would now like to shift my focus to the sustainability debate that has been an important part of my academic work. It is closely related to my work on wetlands and biodiversity as I will shortly explain.

In 1987 the World Commission on Environment and Development released its landmark report on sustainability called “Our Common Future” (often referred to as the Brundtland Report) and it defined sustainable development as “Development which meets the needs of the present without compromising the ability of future generations to meet their own needs”. In 1991 the International Union for the Conservation of Nature defined sustainability as “Improving the quality of life while living within the carrying capacity of supporting ecosystems”. The IUCN put forward a set of principles of sustainability and applied them to all sectors of industry. These principles related directly to some of the professional and community work that I had been doing and the associated action plans were particularly relevant.

In 1992 the Rio Conference of the UN Commission on Environment and Development was held and this endorsed the Agenda 21 and the Earth Charter and the debate about sustainability suddenly became mainstream. Many Governments released sustainability policies and many firms and institutions developed their own sustainability strategies.

One of the spin offs from my community work was the way it enriched my teaching and research. Through my community work on sustainability issues I was made aware of the international debate about these issues and this knowledge enabled me to develop a new program of study in sustainable energy at Murdoch University. Although there were some existing courses on various aspects of renewable energy, there was nothing available anywhere in the world in 1990 that taught energy technology in the context of sustainability. I worked with another colleague to develop an entirely new curriculum and all of the learning materials for the students. Because of its uniqueness and relevance to contemporary issues we attracted some brilliant students from all over the world and this continued through the nineties and into the new century, until the rest of the world gradually caught up.

I also had the opportunity at Murdoch University to develop two foundation units which are general studies options for first year students to introduce them to University study. In these units I was able to make them aware of the ethical issues involved in the practice of science and the strengths and limitations of technology. Through my community experience I was able to draw on numerous examples of successful and unsuccessful developments and warn students about the need for careful design and thorough assessment of all major new technological developments.

In research, I had the opportunity to help develop a strong program in solar energy at Murdoch University and we were chosen to host the Australian Cooperative Research Centre for Renewable Energy from 1996 to 2004. We still have a very strong presence in this field.

From my experience, I have learnt that science and technology are powerful tools with which to understand and transform our society. They can help to address many of the pressing issues of the world but they can never provide complete solutions to social problems. They can also be damaging and dangerous if used inappropriately. The challenge for scientists and society in general is to learn how to use science and technology to address key issues like sustainability without causing further harm to society and the environment. Science educators have a vital role to play in this process and this was stated clearly in Agenda 21, where it says “Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. It is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making”.

HG Wells put is rather more colourfully when he said in 1920 that “Human history becomes more and more a race between education and catastrophe.”

I believe that scientists and science educators must accept this responsibility to use their knowledge and skills wisely to address the serious global issues like climate change and sustainability that confront us today. This is what I have tried to do throughout my career.

Thank you for listening.
Philip Jennings
April 2016