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**Science and Parliament:
Engaging in a Changing Climate**

Comments from the Chief Scientist to Participants
of the 2009 Science meets Parliament

Speech at the Parliament House Great Hall

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- Good evening everyone and thank you for that warm introduction Natasha [Natasha Mitchell from ABC Radio National].
- Ministers, Senators, Members of Parliament, colleagues, friends, ladies and gentlemen:
- Tonight I would like to acknowledge all the talented and engaged scientists around the room that have come to Canberra to participate in Science meets Parliament, as well as the talented and engaged parliamentarians that have agreed to meet them.
- I thank our hosts from FASTS, an organization that represents the interests of 60,000 Australian scientists and technologists.
- And I'm sure we'd all like to indicate our appreciation to Senator Carr, Minister for Innovation, Industry, Science and Research for his portfolio's ongoing support, along with the support of all the other sponsors of this wonderful initiative, which includes over 150 meetings held over today and tomorrow.
- You, the over 250 participants of Science Meets Parliament have a very important role to play in ensuring that scientific knowledge is turned into action for the advancement of Australia, and for the future health and prosperity of its citizens.
- As well as being Australian leaders, you have the opportunity to lead the world by participating in rational and compassionate governance based on sound evidence.
- The intersection of good science, good governance and a healthy society has three prongs, I believe:

1. First, science, in the broadest sense of that word, provides evidence on which decisions can be based and predictions against which policies can be considered.
 2. Second, the new ideas that flow from science can act as one of the engines for innovation from which commercial and public good benefits flow.
 3. Third, through the exchange of knowledge with the wider public, science can increase the understanding and appreciation of society for the world in which it lives, and enhance the skills required for a competitive modern workforce.
- Regardless of the science or technical area in which you were trained, the portfolio of government you help to manage, or the constituency you represent, you have a unique role to play by talking across boundaries to forge good policy, deliver economic and social benefits, and increase understanding and preparedness in today's increasingly technical and global world.
 - I'd like to illustrate what I mean by focussing on what I believe to be the single largest challenge of our generation, namely:
 - The opportunity and the necessity to transform the world in a way as profound as that witnessed at the dawn of the Industrial Age.
 - I've just returned from Copenhagen, from a major congress of over 2000 international climate change scientists --- nearly 100 of them Australian.
 - The 2007 report of the Intergovernmental Panel on Climate Change (or IPCC), a world authority on global climate change, is based on data that is three to four years out-of-date.

- The newest science is crucial because some elements of the global climate are now changing at a rate considerably faster than previously thought.
- When world political leaders, including those from Australia, meet in Copenhagen in December --- in the very same hall in which the scientific experts convened last week --- they will be representing their national constituents to hammer out a global protocol to meaningfully reduce the greenhouse gas emissions that are responsible for climate change.
- If they do not act, if we do not act, and act quickly and decisively, the effects will be devastating.
- The newest science, based on more, better and a larger spectrum of data, illustrates clearly that the earth is reacting more quickly to greenhouse gases, tracking along the worst case scenario of the IPCC report.
- As the earth experiences CO₂ levels not seen for hundreds of thousands of years, its ability to counteract our actions and maintain a stable climate is weakening.
- The ability of the oceans to absorb carbon is diminishing, ice sheets which act as mirrors to reflect heat back into space are shrinking, and the remaining natural carbon sinks of the earth's forests are showing measurable stress.
- Sea level, which can now be measured even more accurately from space, shows that the effects of dynamically melting ice sheets is causing the sea level to rise about 50% faster than the IPCC prediction, which did not include the effects of this melting.
- The new estimates indicate that without intervention, sea levels could rise a metre or more during the lifetime of a baby born today, resulting in much more frequent and severe cyclones and flooding, coastal erosion, and aquifer contamination.

- Tens of millions of people living on Asian and African mega deltas will be in continual flooding danger, prompting massive human suffering and a huge flux of environmental refugees.
- Without intervention, children born today are likely to experience an Australia that is about 4 degrees C warmer on average, a world in which previously once-in-a-century bushfires are common, water is even more scarce, and heat deaths much more commonplace.
- The types and magnitude of vulnerability to climate change vary dramatically on rather small spatial scales. I encourage every parliamentarian in the room to learn more about the efforts of Australian scientists to scope the vulnerability in your jurisdiction: they need your support.
- The Copenhagen science conference concluded that there is a significant risk that many of the trends we are already measuring will accelerate, leading to an increasing risk of abrupt or irreversible climatic shifts.
- In order to mitigate against this scenario, and meet the target of a stabilisation point that is no more than 2 degrees C warmer than in 1990, we must set very ambitious goals for greenhouse gas reductions.
- The weaker the targets we set in the near term, the more difficulty we will have to meet the 2 degree emission targets later. And the more risk we take of pushing the earth beyond a tipping point that forces the warming much higher.
- Perhaps most importantly, to meet the 2 degree C warming goal, global CO₂ emissions must not grow after 2015.
- That gives us 6 years to go from increasing global emissions every year, to decreasing them every year.
- Six years. That's about the time to train two successive PhD students or complete two terms as a member of Parliament.

- So am I despondent ? Of course not.
- Tonight I am look out at some of Australia's brightest and most influential --- determined individuals that have chosen to serve the public good through science or democratic governance.
- The solutions to our dilemma lie within your grasp at the intersection of science, governance and society.
- Beginning with the firm evidence that scientists have gathered and successfully submitted to the scrutiny of their peers, we must now act now to deliver socio-economic benefits for ourselves and for future generations.
- Thanks to investment made over the last many, many decades in basic and applied research, nearly every area of science and technology can contribute.
- Mathematicians will continue to refine the algorithms that solve the complex set of equations that describe the Earth system.
- Marine scientists will collect more data on the impact of climate change on the oceans, in particular the role of our southern oceans in the great circulatory system of the planet that differentially distributes heat to coastlines around the world.
- Biologists and ecologists will monitor the effect on plant and animal life, and propose ways for reducing the negative impacts where possible.
- Astronomers and space scientists will study the natural greenhouse effect on other planets and monitor changes in the earth with remote sensing.
- Physicists and electrical engineers will improve solar energy solutions already in massive use in the United States, Europe and elsewhere, and no doubt invent some of their own.

- Mechanical engineers, aerodynamicists and material scientists will refine the windmills that already provide 20% of Denmark's power.
- In some countries, the production of nuclear energy will increase.
- Microbiologists and geneticists will work to develop crop varieties that are more adaptable to the changing climate.
- Architects and building engineers, together with individual citizens and businesses, will work on efficiency measures that will decrease the end use of energy, thereby reducing costs, saving CO₂ emissions, and increasing comfort.
- Forestry scientists and agriculturalists will improve land management techniques to increase the ability of the land to absorb carbon.
- Chemists and industrial scientists will refine techniques for coal and gas-fired electricity generation to reduce emissions.
- More efficient and portable fuel cells will be developed and put into routine use.
- Engineers and technologists will work feverishly to test whether carbon geosequestration can be effectively applied at the massive industrial scales required.
- More high voltage DC power lines will be installed to transport large amounts of energy over long distances more efficiently.
- All of these things can happen and need to happen immediately.
- For the medium term, soil scientists and agronomists will be examining how carbon can be stored in soils, including the possible use of biochar to act as a carbon sink and improve land productivity.

- Electrical engineers and software scientists will be developing smart power grids that can put power where it is needed when it is needed.
- Second- and third-generation biofuels will be investigated as an alternate fuel source by biochemical engineers.
- And in the longer term still, geologists and geoengineers will study deep geothermal “hot rock” energy while theoretical and experimental physicists continue to work on nuclear fusion as alternate source of energy.
- Can this all be done?
- In fact, much of it is already being done around the world in regions that have realised the social and economic advantages of leading the transition to the new low-carbon world.
- Australia has made a start with its Renewable Energy and Energy Innovation Funds, and the National Clean Coal Initiative.
- Over the past thirty years, Denmark has gone from being fully dependent on external energy to becoming a net energy exporter. Its GDP has grown by 70% over this period without almost NO increase in its total energy use, and its CO₂ emissions have dropped by 18%.
- Renewables now account for 27% of the energy use in Denmark, a fraction that is expected to rise to 50% by 2030.
- China is on track to surpass by a factor of two its target for wind power by 2010, and is expected to become the world’s largest producer of wind turbines by the end of this year.
- California has increased its solar and wind energy capacity by a factor of near five between 2007 and 2008, and is on track to increase this by yet another factor of five by the end of 2009.

- Interestingly, Kenya is said to have the highest penetration rates of photovoltaic technology in the world, using small 18 Watt, low-efficiency, but very inexpensive, solar cells that are now installed at the rate of 30,000 new systems per year.
- But won't this cost too much?
- Studies presented by the Director of the Global Energy Assessment indicate that the cost to maintain the global temperature rise to 2 degrees C above 1990 levels is nearly the same as that to maintain the rise to 4 degrees C, because much of the reduction in CO₂ can be achieved through increased efficiency, which saves energy and thus money.
- So what are we waiting for?
- Or, as one of the six summary points from the Copenhagen Climate Change conference phrased it: "There is no excuse for inaction."
- If Australia acts strongly now to join other leaders around the world who are de-carbonising their economies at the same time they are stimulating their economies, a raft of benefits will follow.
- These include:
 1. the immediate generation of new green jobs,
 2. better preparedness for climate change, which will reduce health and economic costs,
 3. the restoration of ecosystems, and the industries and human well-being that depends upon them, and
 4. the ability to lay the foundation for international competitiveness and leadership in the low-carbon economy of our future, the only real future a baby born today has.
- We will not be alone.

- Individuals, business and industries all around the world are discovering clever ways to reduce their energy consumption.
- We should learn from their examples, and provide new ones of our own.
- We should increase dialogue not only between scientists and politicians, as is exemplified by this event, but also between scientists and our fellow citizens in the wider community.
- We should listen to their concerns about living in a world with a changing climate, and one that is also presently challenged by an economic downturn, to draft solutions together that work for their communities and their children.
- We should increase support to the scientists who are working directly on climate change issues, as well as those who are working in basic, enabling and emerging areas that will provide the innovation of tomorrow.
- We should strengthen and better resource the scientific advising capability of Australia
- We should support our political leaders of all persuasions to work together to recognise climate change policy as a centrepiece of a socially and economically healthy Australia by:
 - quickly and forcefully implementing a plan to prepare for the emerging carbon-free economy, and
 - emerging from Copenhagen in December as signatories to a meaningful international protocol to limit global warming to 2 degrees.
- In our lifetimes, science revealed that our solar system is not the only collection of planets in the Universe orbiting stars like our own Sun.

- At least several percent of the billions of such stars in our own Milky Way are orbited by other worlds.
- Ours is the first generation to know this with certainty.
- Ours is also the first generation to know with certainty that our own activities are altering this planet, our home, in a manner that may deny the next generation the prosperity we have enjoyed and endanger the lives of millions, particularly the world's poor.
- We enjoy more privilege and responsibility than any generation of humankind.
- Parliamentarians must not now shoot the scientific messengers, but rather listen to them, asking probing questions with an open mind.
- As scientists, we must not act like so many lobbyists, who already fill the lives and offices of politicians, but rather answer their questions, and not shrink from engagement.
- Because each of us can empower ourselves, our communities, our regions, and our nation to make a positive difference that is far beyond our numerical footprint on this Earth.
- How could we possibly pass up this opportunity?
- I trust that those of you in this room tonight will not.
- Thank you.