OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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Keynote address at the Auckland War Memorial Museum's 2012 research & scholarship medals ceremony

Sir Peter Gluckman

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Tēnā koutou, tēnā koutou, tēnā koutou katoa

First let me start by congratulating the Museum on the award of the 2011 Museum Medals to some most deserving individuals. I only regret that Judith is not here with us – what a tremendous loss. We have too few true intellectuals in New Zealand and Judith was one of those.

Whenever I come to this museum I cannot help but be reminded of the dreams of those in whose memory this building was first established – they would have been dreaming of a healthy, wealthy, proud and safe New Zealand and I cannot help but be reminded of the memories and values and taonga of the many cultures, particularly those of the Māori and many other Pacific cultures protected within these walls.

But museums should not just be places for collections of interesting objects – both natural and cultural. The modern museum is a critical institution in an advanced society –advanced societies are societies that generate knowledge and use that knowledge to create wealth, protect the environment and improve the social fabric. Essential to all that is scholarship, research and intellectual advance and I will expand on this momentarily.

Almost every challenge we face as a society requires research and scholarship, science and technology as a core part of its solution. Paradoxically, of course, many of these challenges arise because of the capacity of our species to change the world we live in through science and technology.

Just 72 hours ago I was in Ottawa as a guest of the Prime Minister of Canada. I gave a speech to a selection of senior officials in the Canadian Museum of Nature, one of Canada's federal museums. I spoke in the rotunda while upstairs in the fourth floor technicians from Te Papa were installing their fabulous whale exhibition which has been touring North America to great crowds over the last few years. To see on show the skeleton of an adult male sperm whale which beached on Karekare about a decade ago is, even to me, an experienced biologist, something that inspires awe in the power of nature.

I was speaking there about the nexus between science and values, because this is at the heart of the balance that we have to strive to achieve in thinking about how we deal with the conflicting issues of leaving a future for our great grandchildren and needing economic growth to fuel our and their expectations.

Defining scientific knowledge is the role of scientists and scholars. Values are properly the realm of the community, the policy maker and politician and in this world of increasing complexity, science literacy is a necessary skill for every citizen. I do not have time to discuss

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it in detail but I do want to make several points. For those who are interested, the text of my Toronto speech is on the website of my Office.

We do not live in a technocratic world, and the nature of policy formation is based on many inputs, including fiscal and diplomatic considerations, societal values, prevailing public views, and the ideology and ambition of the government of the day. While democratic governments want to make good decisions, some tension between short-term electoral ambitions and desirable long term outcomes is inevitable.

So where does science fit into this process? I would argue that the use of high quality information and evidence should be at the core of good decision making. Science is not simply knowledge; science the only process we have to develop reliable knowledge about the universe. Decisions made in the absence of such knowledge can only be made on the basis of either belief and dogma or anecdotal experience which must be more limited in its applicability and validity.

But we also have to consider how science has changed in the last 300 years.

Initially the dominant sciences were physical and fueled a mechanical view of the world and a belief that reductionist accuracy was possible. The goal was precision. Science became authoritative and definitive and was largely accepted by a rather submissive population. Much science still continues in this way – indeed this is effectively how most empirical science is still conducted by cutting complex systems up into small bits and looking at each bit in a reductionist manner.

But we now recognise the limits of such reductionist linearity. Systems cannot be understood simply by looking at their components and science now deals with complex non-linear processes where certainty cannot be possible and answers are defined in terms of probabilities – climate studies are an obvious example but so are most of the problems we face as societies from food security to an aging population.

But here is a major problem: probability may be defined mathematically by a scientist but that has little relationship to how the public understands and perceive risk. This creates uncertainty – that is not what scientists want to be the outcome of their work, and it is certainly not what policy-makers want to hear.

But there is another stage in the evolution of the nature of science. For much complex science has another dimension: it involves a strong values dimension. Typical examples include the use of genetic modification, and of course climate change. These are issues of high public concern and political complexity and indeed the very matters on which governments turn to science advisors.

Such science has been 'post-normal science' which has been defined as the application of science to public issues where facts are uncertain, values in dispute, stakes high and decisions urgent.

Values have always played a role in what and how scientists choose to study and in research ethics and in funding decisions. But the requirement that the process of obtaining the results and interpreting any set of observations must be value-free is core to the processes of modern science.

But now an additional values-laden factor arises and this is how much uncertainty is acceptable when using knowledge as the basis of an action or policy. This decision is a value judgement. Values determine the importance of the inevitable inductive gaps left by the evidence. The values question becomes: When is a particular body of scientific work adequately 'sound' to serve as the basis of policy? This requires judgement about how much evidence is sufficient, how reliable are the studies underpinning the evidence and how much uncertainty is acceptable? And what are the risks associated with an erroneous conclusion in either direction?

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By way of an example let us look at climate change through this lens.

Climate science is not an experimental science; rather it is almost entirely observational. Geology, palaeontology, and taxonomy fit in that category. In those sciences, progress occurs from looking at past data, formulating new hypotheses and thereafter seeking further data to test those hypotheses. But climate change science has one important difference – the hypotheses and models being developed are being used to predict the future, not to look backwards. It is this unique positioning of a predictive science that has created some discomfort for a number of non-climate scientists.

It is not my intention here to detail climate science; indeed, I am not competent do so. Rather, I want to explore why there is a debate and its implications. But suffice to say that the scientific community has agreed that the weight of evidence is that anthropogenic climate change is highly probable and that at some time in the not too distant future it will have significant impact on the planet's biota. True, there remain uncertainties as to how fast warming will occur and to what degree and there also remain many technical questions.

But this view has been widely debated, and the question has to be why has this debate been so vociferous.

There is little doubt on the sufficiency of evidence: the IPCC and many national academies conclude with remarkable unanimity that although there are inductive gaps, the estimates of probability are such that action is justified. They have reached the conclusion that the risks of inaction are far greater than those of action. Remember we will not have certainty over planetary conditions in say 2050 until we look back retrospectively in 2051.

So what is going on? Science here is being used as a proxy for an embedded values debate. What is really being debated is intergenerational equity, which is not really a scientific matter but a values debate for the public, politician and policy maker. Does this generation have to make some economic sacrifices to change the trajectory of greenhouse gas emissions so as to benefit later generations, or can we leave it to a later generation to deal with whatever happens, however best they can; perhaps a technological solution will become possible. Human nature is such that unless the issues are well explained it is inevitable that some segments of the community will favour the former – all said and done, economic growth drives the immediacy of how we live our lives. By confusing science and values in one debate, democracy is not served – the public becomes confused.

These concepts have defined how I undertake my role. I see my role as to explain what we know as scientists and what we do not know and what does this lead us to infer about probability and risk. This cannot be done without explaining the scientific process and its limits. But most importantly I must explain where science and values intersect and be clear that it is for the public and politician to opine on the latter. By being careful not to stray into that values domain I can engender trust in science and can argue for its privileged place in the process of policy formation.

No science advisor is expert in everything they must advise on; indeed that is not their role. They must act as a broker between the science community and the policy framework. It is how that brokerage is conducted that is key. At all times the advisor must be conscious of where values and biases can enter into consideration and when they do not. In the end I provide the scientific basis for options and provide the basis for the policy process to proceed. It is how this is done that determines whether the advisor has the trust of the public and the policy maker. It requires skill from the advisor and a good understanding and integrity of bureaucrat and politician as well. But it must be achieved, for at the end policy formed in the absence of knowledge or without considering relevant knowledge is simply dogma and cannot serve the public well.

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Museums are uniquely placed to assist society through these challenges. They are both places of scientific knowledge and they are places of culture – primarily material culture but it is in part through material culture we can come to understand our societal values.

So now let me turn to the biggest challenge we face. How do we become an society that values knowledge and turn that to advantage? This is often called innovation and it is clear that economic growth requires us to be much more innovative and entrepreneurial. My own view is that we have a fundamental problem – that we have been lucky! Until recently, we have become rich by international standards selling food and selling tourism. But in the 21st century that will not be enough. We have to build a more entrepreneurial society capable of selling ideas to the world.

That requires not just money – although it does require money. Even more importantly it requires cultural change in our society. It requires us to respect knowledge, to enhance its development, to admire intellectual risk taking and thinking differently and to be global in our perspective. It requires real collegial partnership between government, local bodies, intellectual institutions such as museums and universities and the private sector. That requires a true sense of partnership. Auckland has yet to properly achieve it and I am delighted to see the museum recognising its potential and indeed essential role.

But it requires one more thing – something I already implied earlier. It requires a science literate public – one which is capable of engaging in the issues of the interface between knowledge and values, and considering the meaning of risk. Where that has not been understood, fear and illogical conclusions can be reached. We have big issues ahead from geo-engineering to synthetic biology to regenerative medicine to achieving the balance between resource extraction and resource conservation. The public must be engaged and museums are proper and important places for those conversations to occur in neutral territory.

I started by reflecting on museums as repositories of the past. I would argue that they are equally repositories of the future. For while we want to protect the treasures of the past, they are the raw material for science and scholarship that assist us with understanding and addressing the future. A museum must be a place of life not a mausoleum.

Auckland is at a pivotal turning point. We are starting to redefine ourselves; the word innovation is starting to be more than mantra. It is starting to crystallise into combined action by many players, perhaps most obviously in the proposed developments at Wynyard Quarter. To know that the Auckland Museum sees itself as an important part of that future is a tribute to all those involved – it can help put us on a new path.

Thank you.

ENDS

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