OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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Sir Peter Gluckman speech to Transit of Venus Forum: an overview and introduction

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This forum was the creation of Sir Paul Callaghan, a man with a real vision for New Zealand and one of our too few public intellectuals. He asked me to take the realm when he realised that sadly he would not be able to do so. He saw resonance between the scientific origins of Cook's first visit to the South Pacific and using this year's transit to promote a dialogue on the role of science and scholarship in New Zealand's future.

But the focus was not to be a debate about what kind of New Zealand we wanted - after all we can all roughly agree on that. We all want a high standard of living, we want it for everyone, we want greater societal cohesion and we want to achieve the necessary economic growth without significant harm to our environment. And we recognize that we cannot live in isolation but are part of a world where the capacities of a nation state to control its destiny depend in an ever-increasing part on how it manages its relationships across the globe.

Those of various political persuasions have different views on what one needs to do to get there and the relative weightings to give to each of these goals. That is highly appropriate and the delight of a democracy.

But the simple reality is that everything we do involves tradeoffs. Sustaining 40% more people on the planet, many of whom rightly demand far better standards of living, will involve more energy consumption, more food, more resource use – there is no way around that. How do we do that while protecting a planet we have increasingly come to value and see at risk?

Too much of discussion has been trite in imagining that these trade-offs can be avoided – a much more sophisticated discussion is needed and science and technology will be essential in finding the appropriate solutions.

Rather than debating the goals, what Sir Paul and I decided upon was dialogue between scientists and the community on how we can use science and scholarship to better to advance New Zealand faster towards these goals. Our fundamental thesis is that we have underestimated the critical role that science will play in achieving these goals.

There is no challenge that we will face over coming decades that does not depend on science. It will be critical to our economic, our environmental, our social and cultural development. And this does not just mean science in the laboratory or field setting, science has a critical role to play in the public dialogue as we develop a national consensus on how best to manage these trade-offs. It also can have a far better role to play in dealing many

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complex policy issues in areas such as health, education and social welfare. All of this must require a much more scientifically aware, literate and engaged population.

This will be essential if a participatory democracy such as ours is to navigate through the opportunities and threats associated with these challenges and the rapid changes that technology brings. There are also important issues emerging as the very substrate of society moves from the physical to virtual. The cyber-world has created the problem of how to discern reliable from less reliable information in a world smothered with information and polemic, leading to increasing confusion and indeed a loss of confidence in science as the key source of knowledge. I shall return to this issue of trust later.

So what is science – Science is not just a collection of facts – rather it is a particular way of observing the natural and built world so as to gain a better understanding of it. It is wrong to assume science is about certainty, for in most of science certainty is not possible; it is largely about reducing uncertainty. As the Nobel laureate, the late Sir Peter Medawar once put it: "Science is a means by which we analyse the many things that might be true about the universe and pare them down to the few that are probably true."

But science, both formal and informal, remains the only process we have to gather reliable information about our world on any scale and from any perspective. To reject this is to reject the very basis of logical assessment of the challenges we face. The one dimension of science that needs to be protected at all costs is the need for the collection and interpretation of data to be value free. Such freedom from bias is not easy. But while this formal face of science is often presented as a western tradition that gained impetus after the enlightenment, observation and experiment have their presence in every culture. But is where the boundaries between what is observed and what is believed become blurred that confusion appears and better understandings are needed.

We are in danger of underestimating how much the nature of science has changed; it used to be focused on linear questions, those aimed for reductionist precision. But much science has undergone radical change particularly as the biological, environmental and human sciences have come to dominate. Science now deals with complex non-linear phenomena where certainty is not possible, there remain many unknowns, and answers are defined in terms of probabilities and levels of uncertainty. Much of biology and medicine is such complex science – what will be the impact of introducing an exotic into a new ecological niche, what will be the impact of a new medicine. While these complex areas and are the subject of interdisciplinary science, we are developing the tools to deal with them.

But much complex science has another dimension. It involves the values dimension. Typical examples include food security, the use of genetic modification, dealing with adolescence or the aging population and climate change. These are issues of high public concern and political complexity. Such science has been termed post normal science and can be defined as the application of science to public issues where facts are uncertain, values in dispute, stakes high and decisions urgent. So by the very nature of these characteristics such science is now intimately linked to and intertwined with the values and concerns of the public and body politic.

I have spent time on this issue because it is important that in this forum we do not put science on a lofty pedestal that it does not deserve to be on. Sir Paul clearly saw that science was part of, not distinct from, society. Science provides some forms of knowledge but societal decisions are made on many other grounds with strong value domains: community values, public opinion, fiscal and diplomatic considerations are critical to policy making: similarly business must take many other domains into account in making its decisions.

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Because of this intertwining of values with knowledge a further complexity arises. Science can become the proxy for a values or political debate which is essentially independent of the science. A current example is the pseudo-debate about anthropogenic climate change. While there are real knowledge gaps, most of that debate is not really about the existence of climate change – rather it being used as a proxy for a values debate about economics and intergenerational equity. As scientists get drawn into such debates, they can turn into advocates and risk loss of public trust.

New Zealand is increasingly using science better as a part of policy development. Good information and evidence provides the essential base for a rational assessment of options which must then be weighed up against those other criteria that politicians and their supporting policy advisors must consider. Policy decisions are all too often dealing with complex systems with incomplete knowledge – here scientific approaches including modelling, pilot studies and evaluation can play a much greater role than is generally accepted, especially as science has developed new tools to deal with such complex systems.

Ultimately the primary discussion at any level, from global to local, will be about the balance between resource conservation and resource exploitation, using these terms in the broadest sense. A mature conversation will depend on a solid evidential base which only unbiased science can provide whereas the weighting of paths and priorities is based on values that the whole community must own.

But at the interface is a complex interaction which is reflected in the concept of risk. Risk means different things to different people – scientist may talk in mathematical probabilities, politicians think of risk in an electoral sense, the public generally see risk through system one thinking, to use the decision theorist's term – that is instinctively and emotionally. This can lead to some misunderstandings – for example the precautionary principle was not meant as a way to avoid action, rather it is a tool for managing risk in an active way that should be revised as the risks are better understood.

Technologies are developing faster all of the time and they having far greater impact as they project so much more quickly. The challenge is for society to understand and accommodate these technologies at pace commensurate with their development. Otherwise some important technologies may wrongly rejected or their harm overstated and yet others may be misused or their potential harm understated – in New Zealand, we have given insufficient focus to technology assessment and forecasting.

The conflict between the pace of development and understanding can be reflected in the rejection of science – an illogical but understandable response to the pace of change. These issues are real and technological advances must be accompanied by greater scientific literacy for all and a true dialogue between the scientific community and the wider community if a participatory democracy is to use science well.

So let us turn back to the question Sir Paul posed for us – how can science take us to where we want to go? We can see science as having the following purposes:

- To create a society that values knowledge and to support the development of our people, capabilities and capacities
- To enhance our understandings of who we are of our national identity be it to understand our peoples and their history, or our indigenous flora and fauna, and our environment
- At the same time we need research to understand and best manage our natural resources for both economic and conservatory reasons

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- To defend our economy, environment and society through research such as biosecurity environmental and public health research
- To improve the effectiveness of our policy and public expenditure through areas such as health research, social science and economic research for example
- To support our trading and diplomatic interests – for example thorough Antarctic research, science to support foreign aid, or to support trade agreements for example through phytosanitary research.

A notable feature of this list is that as important as these objectives are, I have not yet talked about the most commonly advanced argument for investment in research, namely economic benefit. Increasingly research is undertaken for its critical role in driving innovation of direct economic benefit but that is the topic of the next session and I shall leave its expansion until then.

In essence then this meeting is designed to create a dialogue on how we can use science and scholarship to advance our economic, social, environmental, policy and cultural ambitions. Sir Paul and I both agreed we have not used the tools of the intellect and science to our optimal advantage. He wanted this meeting to address this deficiency – to make this country into a clever country – we both agreed we need to be more ambitious in the goals we set ourselves and less inward looking. Indeed Sir Paul was never afraid of expansive thinking but he generally had his feet on the ground – let us not let him down.

Thank you.

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