OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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Opening speech at the Rotary National Science & Technology Forum dinner

Sir Peter Gluckman

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You are here because of your interest in being the scientists of the next generation. But what I want to talk to you about tonight is what science is in the twenty-first century.

Many people think science is about facts; it is not. Science is defined by the process by which we make our best efforts to understand what is going on in the universe, in the natural and social world and ourselves. The process of ideas generation, observation and testing and revision of ideas by more testing, validation and scepticism are the core components of the tools of empirical science. But science is more than observation and experiment – there is much more to the process of science than that.

To think scientifically one needs many tools – ideas about cause and effect, respect for evidence and logical coherence, curiosity and intellectual honesty, the willingness to create hypotheses which can be tested, the willingness to refine one's ideas in the face of evidence: these are the core skills of science and scientists. But even more important is to consider how the nature of science has changed because this change will determine how your lives in science will be spent. Science used to be focused on linear questions, those aimed for reductionist precision. For example how much weight will this bridge take, are birds descended from dinosaurs, how old is the earth? As a result science was authoritative, definitive and largely accepted by a very different public.

But much science has undergone radical change particularly as the biological, environmental and human sciences in their broadest definition have come to dominate. Science now increasingly deals with complex non-linear phenomena. In such complex systems certainty is not possible; there remain many unknowns, and answers are defined in terms of probabilities and levels of uncertainty. This is a shift that many scientists caught in the detail of one particular element of a system have failed to recognise.

More importantly, many of the public policy makers have also failed to recognise it. And the problem this creates is obvious: uncertainty. That is not what scientists want to be the outcome of their work, and it is certainly not what people want to hear. But that is the honest outcome – we are not in the business of creating certainty, just probability.

A good example is that of earthquakes and earthquake prediction. We still have enormous gaps in our knowledge of plate boundary earthquakes even though they have been the subject of intense study. But the Christchurch earthquake was even more complex in that it is not on a plate boundary, and represents a much less studied form of earthquake. Yet the scientist wants to be able to assist the public and policy maker in knowing how the future will unfold.

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Much of biology and medicine is complex science – what will be the impact of introducing an exotic species to a new ecological niche, why are sea lions dying, how will dairy intensification affect the environment, is GM food safe, is a new drug safe, and so on. One dimension of this is the idea of traditional scientific disciplines becoming less important – most of this science will involve teams of scientists of different experience working on a common problem.

Many of you will change areas and skills during your careers. But, much complex science has another dimension. It involves a strong values dimension. Typical examples include food security, the use of genetic modification, dealing with the aging population and of course many environmental issues such as 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.

The good scientist will be one who can understand that his or her role is to reproduce the knowledge, allowing the public to understand it and properly incorporate their values into the way we address these issues. It is when we conflate these separate domains that confusion reigns and we stall in moving ahead. There is no doubt that science and technology are central to the way ahead for our society, our economy and our planet. Paradoxically, they are at the root of many of the challenges we face as our technologies consume more resources and our population expands due to better health and nutrition.

A healthy New Zealand will need economic growth on the back of knowledge-based economy; a healthy environment based on evidence-based approaches to marrying economic growth with sustainability; and social cohesion based on better use of science in understanding our communities. Hopefully some of you will rise to the challenge. We need you to do so.

Thank you.

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