



Knowledge, beliefs and values

**Graduation address, University of Otago
Sir Peter Gluckman, December 2013**

Chancellor;
Vice Chancellor;
Members of the University of Otago;
Fellow graduands;
Ladies and gentlemen

Today you graduate from New Zealand's oldest university, one that is truly world-ranked – for example more than 10% of all its research publications are in the highest cited 10% of all papers in their particular fields worldwide and this percentage is continuing to increase - a remarkable attestation to the quality of this university.

There are all sorts of pressures that your University will face as the world and society continues to change and the expectations on universities change. Good universities will thrive and survive in no small part because its graduates stay connected and assist in protecting their special nature. Universities are more than just a place of teaching; they are indeed the essential intellectual heart of our Society. As you celebrate your own successes and your families celebrate your emerging fiscal independence, also understand in that accepting your diploma you are also undertaking an obligation and opportunity to support your university into the future.

I want to thank the Council of the University of Otago; the greatest honour any academic can receive is indeed recognition from your peers. I first graduated from this University in 1971, having spent four years in Dunedin. I fooled myself that I worked hard; I embedded myself in student politics; but most of all I learned to think for myself and to communicate. It was during one clinical seminar in Dunedin Hospital, a bell rang in my head, and at last I understood how physiology and medicine came together and with that I realized that I would focus my career on pathophysiology. Little did I know how that career would emerge and change – from clinician to physiologist from physiologist to evolutionary theorist to molecular biologist and back again; and from scientist to the role I now have.

Whatever career you start on now, the chances are you will be doing something different within a decade and something very different in another decade. Knowledge in the life sciences changes fast and most of what you have painstakingly learnt will soon be superseded. Many of the drugs you will use do not yet exist; you will face a world where genomics, epigenomics, metabolomics, metagenomics, proteomics, exposomics and other 'omics' not yet invented will create novel diagnostics that will give you an almost infinite amount of information about a patient or population - and complex informatics will become a central part of your work whatever discipline you

enter. You will face information overload and many new technologies and with these burdens you will have the obligation to keep on learning.

The former Chief Science Advisor in the United Kingdom, Sir John Beddington, used the term “the perfect storm” to describe the combined global challenges of climate change and food water and energy security. I extended this concept to what I call an impending “demographic storm”. There will be rapidly changing social and family structures, greater expectations of healthy and longer lives, an ageing population with its increased health and social sector demands and an associated increased burden of non-communicable disease. On top of this will be the ongoing impacts of greater urbanization and the changed ways of interacting as we move into a world of digital rather than personal communication.

Medicine and medical technology are, and certainly will be, central to addressing these challenges. For new technologies will be needed to support a growing global population with justifiable expectations to have satisfied and enriched lives with a fair access to the planet’s resources while at the same time finding ways to do so sustainably. But many technologies create their own deep societal and political dilemmas. They challenge values and beliefs. What will be the perception of bio-implants in the brain or the use of synthetic biology or gene therapies or advanced therapeutic foods based on novel genetic technologies?

Decisions will have to be made in situations where knowledge is inevitably incomplete and objectivity can be easily replaced by bias and opinion. Addressing many matters in medicine and technology will involve balancing the claims of objective and rational knowledge with those of prior belief, biases and culture. It will also influence how you impart so-called objective knowledge to others. This interplay will underpin much of what you do and so it is very important that you continually reflect on the factors influencing your decision-making.

Science is defined by its processes: these are designed to develop relatively reliable knowledge about the natural, built and social worlds. The only other sources of knowledge are ultimately those of belief or dogma and it is this differentiation that provides the particular authority of science. But science alone cannot create decisions be it in policy or in medicine or public health. Further science is never complete. The objective test may give you the diagnosis, but it does not deal with many aspects of the relative benefits and risks of different approaches, it does not deal with the beliefs, bias and context of a patient or yourself. There will be many situations where we do not yet have compelling knowledge and we must be honest about what we know and do not know.

While many scientists deny it, values have always played a role in science. Beyond the obvious issues such as what scientists choose to study and of research ethics, there is an additional values-laden factor: how much uncertainty is acceptable when using knowledge as the basis of an action? Here values determine the importance of inevitable inductive gaps left by the evidence. You will soon be no strangers to this dilemma – is one more test necessary – too few and you have a high risk of misdiagnosis, too many and health costs soar as defensive medicine becomes excessive.

As medical science has progressed, paradoxically the burdens of increased knowledge have created greater complexity in your interactions with the patient. What therapeutic modality, what technology: a lumpectomy, a mastectomy, radiotherapy, traditional chemotherapy, experimental chemotherapy, gene targeted immunotherapy? At the same time there has been greater public access to information of varying quality and reliability that has resulted in greater expectation by the public to be engaged in decisions involving science and technology. Effectively this is a shift from an authoritative position of science and scientists to one in which other voices are also heard. And both patients and doctors have their views biased by beliefs, values and their sources of knowledge: the internet, Twitter, Facebook, other patients, mentors, journals, evidence based medicine.

It is not simple; every day you will be addressing this equation of empirical knowledge, knowledge gaps and uncertainties, your values and biases and those of the patient. Every patient is also addressing the same equation albeit with a different balance of knowledge and values. Reaching agreement is the art of good medicine – what are the trade-offs in any therapeutic choice, what are the risks associated with that choice. You need to be honest about what components are based on knowledge, how you deal between the inferential gap between science and your conclusions, and what components are values based.

What I have been talking about is the somewhat clichéd marriage between the “art and science” of medicine – but the duality is real, and it applies equally to what I do in assisting government in the better use of evidence in making policy choices. The nuances in understanding risks and trade-offs will be important, the need to understand how to make decisions in an uncertain world and to use objective evidence better in policy making, in medicine and public health should be self-evident. But above all we must avoid scientific and professional hubris. Both as a health professional and as a graduate of this university you have obligations to assist society as well as healing the sick.

Thank you