

# Preface

The global grand challenges of the twenty-first century are profound and wide-ranging. Health and well-being, water, energy and food will be the foci as the population approaches 9 billion. The primary mission of the twentieth century scientists and engineers requires redefining, embracing creativity and enterprise for sustainable development. This will require new approaches to science and engineering education to meet the demand for talent and leadership for generating next generation technologies and solutions.

Scientific and engineering professions have traditionally focused on scientific and technical knowledge and skills and contributed to a step change in wealth creation and improved quality of life across the world. These improvements have been primarily achieved through harnessing the powers of nature for the benefit of mankind. Yet the challenges of sustainability, climate change and resource depletion are better articulated and the non-technical factors, social, environmental and ethical, are increasingly recognised to be integral to the science and engineering professions. Thus, science and engineering education can no longer continue to be limited to science, measurement, modelling and synthesis of these. In today's globalised marketplace, the career success of engineering graduates and their employers demands that the graduates are creative and innovative.

Charles Vest, former president of MIT, speaking to the National Academy of Engineering conference in 2005 said, "I envy the next generation of engineering students because this is the most exciting period in human history for science and engineering". He went on to say that the engineering educators must tap into students' passion, curiosity, engagement and dreams. There has been a growing interest in innovating science and engineering education over the last 10 years.

The discipline context of education and practice offered professional opportunities for scientists and engineers over the last century, but only a few progress to be the leaders of the industry. Based on the work which I carried out initially at Massey University in New Zealand in late 1990s and then at Napier University in Scotland from 2004 to 2007, I proposed the development of a dedicated institute to promote entrepreneurship in engineering education. Professor Nathu Puri CBE,

an alumnus of London South Bank University and highly successful industrialist and entrepreneur, agreed to support this development with a substantive donation. Thus, the Nathu Puri Institute for Engineering and Enterprise was born in 2013 with the primary objective of facilitating innovation of engineering education and practice. This is to be achieved through research and scholarship in partnership with industry, other higher education institutions and learned societies in the UK and overseas.

This volume consists of contributions from industry, professional institutions and universities on innovating science and engineering education. The topics considered range from educating scientists and engineers to give a business edge and embedding entrepreneurship to work integrated education and curriculum innovation.

I believe this volume forms an important contribution to the development of enterprise focused science and engineering education into the future.

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