



FOREWORD

Everyone's life is enhanced by the beneficial application of science. The creative engineer is central to this activity and in many societies engineering is the career that is most sought after by the cleverest young people. This is not always the case in the UK. While I am glad to say that many of the brightest do opt for engineering, others see engineering at best as the implementation of advances made by scientists, and at worst as maintenance. It is the fixing of railway tracks or – a little better – the routine implementation of established methods of design.

The creative excitement of the activity is not widely understood. For decades, this has been the despair of engineers and others interested in the advancement of the UK but, despite endless discussion, little progress has been made. So why do I bring it up again? It is because I believe that we should change our approach. We have been trying to define the engineer in a way that improves the way he or she is perceived. I believe that in striving for an adequate definition we may even be perpetuating the problem. Engineering is an activity pursued by more people who do *not* carry the label 'engineer' than by those that do. The Malpas report presents this very well. It

describes engineering as a universe of activities rather than a single activity and avoids the need to define the engineer.

The universe of engineering is best described through examples as it is in Sir David Davies' letter of 7 February 2000 to Lord Sainsbury. This letter is attached to the Malpas report. The list contains items that range from aerospace to health and food and excellently illustrates the extraordinary breadth of the engineering universe. The Malpas report infers that the engineer is anyone who works within the universe. I wish to emphasise an additional point, however, and this is that most effective practitioners within the engineering universe also operate outside that universe.

Successful 'engineers' divide their lives between many activities. Sometimes they are advancing science and can clearly be defined as scientists, at other times they are advancing mathematics when they become mathematicians, or they are spending time on financial matters when they come close to being economists, or they are social scientists as they decide what it is that people want from technology. If you examine citation data for mathematics, for example, you will find (amongst the most highly cited) those who are nominally engineers, but in that context they are mathematicians, particularly as they frequently pursue mathematics for its own sake.

Another example is the development of the silicon chip which, in effect, has been a succession of exciting scientific experiments, perhaps the most exciting ever. It has involved scientists,

mathematicians, chemists, engineers, and materials scientists, all of whom have been working, at least for a part of their time, on what falls within the engineering universe. They could certainly be defined as engineers while they were working on the chip even if they were at other times pursuing the fundamental aspects of their subjects.

For this reason, if we feel it is necessary to describe people, then we should do so according to the application they are working on. Those working on the chip can accurately be described as semiconductor technologists. This is the way I like to define myself although I have spent considerable time working on the fundamentals of electron optics and electron–solid interactions, and on the electron microscopy of biological samples, and I pursued these interests during the same period that I was working on chip fabrication.

Instead of striving after what will inevitably be a simplistic definition of an engineer, I suggest that we devote more effort to explaining how new technology is created and allowing the excitement of this to attract the brightest and most creative to the universe of engineering. Not just because this will improve the economy and standard of living within the UK but because these new 'engineers' will lead more interesting and fulfilling lives than they will in almost any other field of endeavour. ■

The Malpas report The Universe of Engineering: A UK Perspective is available as a pdf file on The Academy's web site: www.raeng.org.uk