

Response by John Ball on behalf of the honorary graduates

Rector,

President of the University Pierre et Marie Curie,

Colleagues and friends.

It is a great pleasure and privilege for me to respond on behalf of all the recipients of honorary degrees this afternoon, and to express the deep appreciation of us all for the great honour that has been bestowed upon us by the University in this magnificent ceremony and setting. Ours ears are ringing with an excess of compliments, and we thank warmly our colleagues at the University who composed and delivered them.

As scientists we do research because we enjoy it, and for the deep satisfaction it brings. We are so lucky to work in a multi-cultural profession whose panorama is constantly changing and which offers the opportunity, if things go well, to make a contribution that will still be remembered by future generations. To receive a degree *honoris causa* is a recognition of hard work, perhaps, and success, but working in science is its own reward, providing the thrill of discovery together with membership in a worldwide community dedicated to understanding. Thus I would prefer to think of today's ceremony as a celebration of the scientific enterprise, and not just of the work of individuals. Indeed it is impossible to separate the work of one person from that of the rest of the scientific community, so dependent are we on the research of our contemporaries and those who have gone before, and on our interactions with collaborators, colleagues and students.

Today science is more important to the world than it has ever been, a result of its own success in broadening the range of phenomena it can effectively analyze, of its creation of the tools of modern life (computers, mobile phones, medical scanners and so on), but also of the negative consequences of its own creations – weapons, pollution and global warming. It is

consequently not surprising that it faces multiple challenges in its relations with the rest of society, every member of which is affected by it, and whose governments pay for it. I would like to mention three of these.

The first is a lack of trust in science and scientists. Of course a healthy scepticism, questioning scientists to give rational justification for their opinions, is greatly to be welcomed. But nowadays many scientific questions are extremely complex, and only understandable by experts. For example, the investment of time required to grasp the issues behind identifying the causes of global warming is very considerable, and well beyond most people, including scientists working in unrelated areas. In the end, when complex science is involved, respecting a consensus among a large majority of scientists who have spent many years studying the issues must represent the most rational way forward for society. There are never absolute guarantees, of course, and the consensus can be, and in the past has been, wrong, but it is much better to trust in science's own correction mechanisms than to give undue weight to vocal minority views.

One reason why public trust in science is at a low ebb is, I think, a general lack of appreciation of science and the scientific method by those working in the media, who perhaps have this attitude because of their lack of comfort with science at school. Of course there are notable exceptions, journalists who do tremendous work in the communication of science, but they often experience difficulty in getting editors to print their stories. All journalists need the active help of scientists, so that important and interesting stories about science displace those about celebrities (unless, of course, they are scientists!).

This leads me to a second challenge, the teaching of science in schools. This raises many issues regarding the curriculum, including the proportion of it spent on mathematics and science, and who is involved in determining its contents. But whatever one's view on these matters, it seems to be the case

that the teaching profession is not attracting enough good scientists who can inspire the young, leading to a vicious circle in which the quality of teachers in the next generation may be further diminished. This is a particularly serious problem in developing countries, whose children are often deprived of any real chance to develop a career in science. This requires action both by governments and those in universities, to make the teaching of mathematics and science in schools throughout the world a more respected and rewarding career option.

The third challenge concerns how science is directed and evaluated by governments. Here there are two worrying trends. One is the belief that in order to bring maximum benefit to society and taxpayers, science should be increasingly funded by programmes directed towards specific issues identified as important by those holding the purse-strings. While directed programmes form a sensible part of a balanced research strategy, to overfund such programmes by taking money away from fundamental research is likely to be counter-productive. The key advances come more often from curiosity-driven fundamental research, inconveniently on time-scales greater than the typical election cycle.

The other worrying trend is the increasing use of metrics – citation indices, impact factors and the like – to evaluate research, driven by an apparent global obsession to rate everything by single numbers. Metrics are statistics, and should be treated as such. If intelligently used, they may be useful as one element in the evaluation of large institutions or departments, but their application to the assessment of individuals is dangerous and a true threat to academic excellence and freedom. Further, if research is judged by a particular metric, then researchers will change their behaviour so as to maximize their rating with respect to this metric. We already see such undesirable effects, for example, in the unethical manipulation of journal impact factors, resulting in journals with insignificant real impact having very high impact

factors, with those who publish in them being correspondingly overrated.

In celebrating today science and scientists, let us also celebrate the great scientific tradition of France, its current pre-eminence as a scientific nation, and the exceptionally high regard in which its researchers and institutions are held internationally. To be honoured by the University Pierre et Marie Curie, an institution with a remarkable record of achievement, and with such a distinguished faculty, is an honour indeed. But it is more than an honour. It is an affirmation of the scientific relations that we have each had with this university over many years, of our friendship with individuals too numerous to mention, of our fondness for Paris and France, and of our belief in the importance of great academic institutions for the world and its citizens. We are deeply grateful to be able to formally join the community that is this university, its researchers and those who make their research possible. We thank again this community for this honour, and wish all who work in it renewed success for the future.