THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

DINNER/DISCUSSION SUMMARY

Creativity, Science, Engineering and Technology

Held at The Royal Society, 6-9 Carlton House Terrace, London SW1Y 5AG
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Council for the Central Laboratory of the Research Councils
The National Endowment for Science, Technology and Arts

In the Chair: **The Rt Hon the Lord Jenkin of Roding**

Speakers:
The Lord Puttnam CBE
House of Lords
Mr David Hughes FREng
Director General, Innovation, Department of Trade and Industry
Dr Robert Hawley CBE DSc FRSE FREng
Chairman, Taylor Woodrow and Advisory Director, Corporate Finance and Advisory, HSBC
Mr Julian Anderson
Composer in Residence, City of Birmingham Symphony Orchestra and Head of Composition, Royal College of Music

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LORD PUTTNAM said that NESTA was based on the assumption that science /technology and the arts were not two separate cultures but could interplay and cross-fertilise. Much artistic innovation had stemmed from technological discovery – e.g. oil painting from new pigments. The most notable example was cinema whose development had been fuelled by successive technologies, starting with Edison, through sound and colour. But it was artists who seized upon the visceral power of the image to turn it from a scientific curiosity into a major art form. Scientific discovery comes about from similar insights to those which drive artistic innovation e.g. the sideways leap from work on astronaut survival to new methods of intensive medical care. Artistic demands can cause technological innovation – e.g. the engineering innovations needed to build the architectural triumphs of Gehry. Science, technology and the arts must work together to create an economy based on knowledge transfer and innovation which the UK needs. To remedy our poor record on innovation, application, and marketing we need to promote creativity at all stages of the cultural and business cycle. NESTA spent £12m p.a. on its fellowship, innovation and education programmes which had the underlying theme of supporting projects and people which had a higher degree of risk attached to them. Creativity meant taking risks.

MR. DAVID HUGHES gave a brisk summary of the conclusions and options for action in the future, which were emerging in the DTI Innovation Review. The Review looked at what drove innovation, - "the successful implementation of new ideas" - and what effect innovation had on GDP. The UK cannot compete on low cost so its economy must focus on increasing added value. The UK had high rates of labour participation, but they were skewed to low added value parts of the economy. UK companies were underrepresented in the middle band of the value added "scoreboard"– i.e. between £70,000 and £30,000 added value per employee - which covered manufacturing, software, and construction. There was much the government could do to improve skills and training; to improve the business environment through regulation etc.; through intelligent use of government procurement, and through better delivery of services. It was crucial to bring academia and business (particularly SMEs) together so that they spoke the same language; and ensure that IPR did not impede knowledge transfer. Most important was to develop a national technology strategy – cf. France and California. Government could focus science and technology exploitation on particular fields – e.g. nanotechnology – improve co-ordination between DTI and DfES, and look to ways of helping companies to raise finance and pay for necessary skills.

DR. HAWLEY said team working was the core of successful project delivery; and engineers were an essential component of such teams – it was the engineering process that turned science into the product. Creativity was crucial to the engineers work: they could not solve the innumerable problems that arose in design and construction without it – but it was "steady state" creativity, not a single burst. He illustrated the enormous scale and complexity of engineering projects by reference to Sizewell B; the Rihand Power Station in India, and the Millennium village in Greenwich. All were very different – Sizewell was very complex, but could employ high tech equipment (12 tower cranes) in a country with a good infrastructure. At Rihand there was no infrastructure; the climate and conditions were ghastly; all equipment had to be brought in and it generated

75 tons of correspondence. The Millennium Village had to deal with very demanding planning and environmental standards and difficult social aims. All were delivered on time and budget through the ability of engineers to solve problems by e.g. using bamboo instead of steel for scaffolding, and thwarting thieving by misleading notices. Engineering always involved compromise and an understanding of how any particular solution fitted in with the overall environment. He was concerned that engineering graduates lacked the wider picture; their education needed to give them some feeling for the context within which they would be working.

Mr. ANDERSON spoke about the use of technology in musical composition. He demonstrated how natural or social sounds (the sea or an Ethiopian Jewish chant) could be analysed by computer so that the frequencies involved could then be used as the basis for original composition. It was, to his mind, essential that composers should be able to understand the analytical technique and use such technology and processes, if they wished to write pieces that reflected the aural world of nature or community. It was not a question of imitation, but taking the essence of the original sounds and sculpting them into pieces for particular audiences. Music was about considering not only the original sounds, but also the musical culture, habits, social situation of the players and audiences who would eventually hear the piece. Sadly, the equipment he used was not made in the UK.

A principal theme of the following discussion was the role of education in promoting creativity and innovation. The problems started in schools themselves, where too great emphasis on fact-finding inhibited the development of problem-solving skills. But it was no use trying to get children interested in problems for which the solution would not be known for a long time. You had to build on children's competitive desires and incentivise them by using techniques which enable them to see results (which, of course, should be better than those of their competitors) quickly - Lego had some ideas. Then there was the problem of the narrowing study for A levels. Was there a need for a Foundation year at University where budding engineers and scientists could study with, say, architects to widen their horizon? But it was pointed out that the problem was not only one way. Such a year would be equally valuable – indeed possibly more so – for arts and humanity students. Another suggestion was that such a year should come between graduation and starting professional work, in order to deal with the problem of those neophytes who thought that all you needed to do to design a bridge was to press a computer button. But all such suggestions met with the serious objection that the whole of education, and government policy towards it, was determined by utilitarian objectives – getting core skills which would enable the student to make a focussed contribution to the economy through employment as a lawyer, accountant, scientist and engineer. And it was the sad truth that if one wished to excel in one particular skill, everything had to be sacrificed to learning and using it – you could not, as one member mournfully said, be both a painter and a scientist. Burdened with debt, what student would want to spend more time learning something that would not gain him/her professional accreditation? And, to judge from the Secretary of State's recent remarks, the Government would be reluctant to pay for it unless it could be demonstrated that there was real added value. But there must be, if the right balance could be found in education for engineers to understand about accounting and law and lawyers and accountants learn about engineering principles and practices. Perhaps it was a question of risk taking to bring it about?

Doubts were expressed about the view that relations between academia and business were as difficult as had been suggested. The CBI statistics, on which such a view was based, were open to challenge and the position had got much better in recent years. But it was clear that better liaison was needed, particularly with SMEs. The Lambert review (www.lambertreview.org.uk) should give some helpful ideas. Certainly, one problem was whether the Universities' position on IPRs was beneficial to innovation. A major difficulty was that Universities sometimes put a much higher value on their product than did the commercial world. The academic tended to see the world-beating potential of his discovery, while the company looked at what would be the sales in the short term. The government's attitudes did not help. On the one hand they said all the right things about academia making a priority of knowledge transfer, on the other hand you Mrs. Hewitt is praising universities for being hard about keeping IPR.

The difficulties companies found in financing innovative developments were acknowledged by a number of speakers. Venture capitalists were not interested in taking risks; the NESTA schemes might help. But there was strong criticism of the numerous small DTI schemes: they were too complex, too small and of little use to SMEs. The 1970 scheme was better: fewer, bigger, simpler schemes were needed if they were to be of any use. It was important that EU funds from Framework 6 went more to industry (as with our competitors) than to universities. The DTI must take care, if a national technology strategy were developed, to tread the narrow path between choosing priorities and attempting to pick winners.

Creativity was a matter of culture; a belief that it was worth taking risks and that one could learn from other people in apparently unrelated works of life. The Bloomberg offices, which encouraged open communication, net-working, sharing and "fun" were described as being conducive to creativity. But would the UK personnel like working in such conditions? If we were serious about creativity, efforts would have to be made to encourage a culture of much more open and interactive working.

Music came up frequently in the discussion; many members being fascinated by Mr. Anderson's analysis of sounds. But, alas, no member had suggestions for developing musical creativity. But the importance of understanding sound as a component of design and marketing was noted; and the effect of music in helping people in understanding emotional and mental states was observed.

Finally, as one speaker with special knowledge observed: to err was human, to forgive divine; to check engineering.

Sir Geoffrey Chipperfield KCB