THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

WORKSHOP AND DINNER/DISCUSSION SUMMARY

Horizon Scanning

Workshop held at the Irish Embassy and Dinner/Discussion at The Royal Society
on Tuesday 3rd June 2003

Sponsored by
QinetiQ and The Institution of Electrical Engineers

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

Speakers: **Professor Sir David King KB ScD FRS,** Chief Scientific Adviser to HM Government and Head, Office of Science and Technology
Dr Geoff Mulgan, Head, Strategy Unit, Cabinet Office
Dr William Harris, Director General, Science Foundation Ireland

Workshop at the Irish Embassy

Members of the workshop were welcomed by H E Daithi O'Ceallaigh, the Ambassador to London, who stressed the benefits of UK-Ireland cooperation.

DR. WILLIAM HARRIS explained that Ireland had been transformed from an agricultural economy to a modern manufacturing economy through education (and it had the added advantage of being English-speaking). Companies had successfully risked investing in Ireland, and the ITC and biotechnology sectors contained many world-class companies. In 1998, the Irish Government began a year-long technology foresight exercise, which concluded that those two sectors should be the focus for investment in education and research, the aim being to make Ireland a very friendly place for scientists working in these fields. Science Foundation Ireland was established in 2000. Funding of €650m would allow transformation of the science base from a mainly poorly-funded set of institutions focused on teaching to the major research base needed for a knowledge-based economy.

Dr Harris said that Western economies were facing severe competition, from India and China in particular. To succeed, Ireland would need to improve the interface between academia and industry, use all its intellectual potential, and retain speed of action.

In discussion, the Irish foresight programme was contrasted with the first UK foresight exercise. The former had been focused on directing research expenditure into key technologies, while the latter had tried to achieve a much wider range of goals (though later horizon scanning exercises in the UK had been much more focused). Was the Irish approach 'picking winners', which had not been well thought of in the UK? The answer was that the Irish government had picked priorities for underlying training, leaving it to industry to pick winners (or not). It was, however, pointed out that past forecasts had often been wrong, or even if right in some ways had been falsified by unpredicted developments elsewhere. On the other hand there were examples of amazingly accurate pieces of foresight – which however had been ignored by the policy makers. It was important to embed the results of foresight exercises into the culture of the organisation.

The Irish experience on difficulties in the interface between universities and industry was familiar to people in the UK. Conventionally, the relationship had been seen as customer-supplier, but now it was thought that a knowledge-sharing partnership of peers would be better. Each side had things to learn from the other. Trust had to be built, against the difficulty that people in the two sectors spoke somewhat different languages, and academics were competitive, passionate about academic freedom, and often keener on perfection than on timely delivery. A current UK review of the links between industry and universities was using social scientists, because of the cultural aspects of technology transfer. There was also the problem that industry favoured multidisciplinary team working, whereas university structures and funding mechanisms tended to militate against that. There were also barriers within companies themselves. Achieving the required changes required leadership and appropriate financial incentives. This might be easier at times of radical change.

Intellectual property was often a problem between academics and industry. Much time could be wasted in worrying about IP rather than just getting into the market before further developments reduced the value of the IP. Perhaps academics should just accept that they would lose control.

On the State's role in funding research, UK industrialists felt that apart from education it should be restricted to pump-priming, facilitating partnerships, crossing boundaries, and looking at areas a long way from market. A similar approach held in the USA, where current key research areas were nuclear fusion (where the value of international cooperation had been recognised), supercomputing, and the hydrogen economy. In Ireland, funds for close-to-market research were being increased.

It was suggested that the EU might do more to promote research funded by the member states. There was also a plea for more funds to be diverted to the NATO 'Science for Peace' budget.

In the West, science and technology were popularly seen as causing problems rather than providing solutions. The plateauing or decline of the number of students choosing science was a problem affected much of the Western world. A particular issue in the UK was the shortage of technician-level skills.

Key messages from the workshop were:

- To compete successfully, countries need to invest in science education, react rapidly to developments, and be highly cooperative;

- Foresight exercises must contain mechanisms to ensure that the results are embedded in the culture of the organisation;
- Relationships between universities and industry should be knowledge-sharing partnerships which take account of cultural differences.

Evening dinner/discussion at the Royal Society

PROFESSOR SIR DAVID KING KB ScD FRS outlined the role of the Office of Science and Technology in horizon scanning. Proactive foresight (examining current science and technology developments to address key future challenges for society) was likely to produce better results than just reacting to events when they occurred. Foresight in the UK had begun in 1994, and until 2002 had been a very comprehensive, panel-based process. It had succeeded in spreading the idea of foresight, especially to industry. Initiatives from it were continuing outside OST. From 2002, foresight had become more focused, with no more than four projects to run at any one time. There were two types of project: wealth creation opportunities, and emerging challenges. In each case there was a stakeholder Department and Minister.

For the first current project, on flood and coastal defences, analysis of the impacts was complete. The final phase would be to decide Government's responses. Analysis of the value of the Thames Barrier showed how successful the foresight which led to it had been, with annual closures – preventing floods – having greatly increased in frequency in recent years. The second project, on cognitive systems, had involved careful work to allow the differing approaches of IT experts and neuroscientists to inform each other. 150 scientists had been involved in developing grand challenges, such as a theory of forgetting and building an artificial animal. The other two projects, on cyber trust and crime prevention, and exploiting the electromagnetic spectrum, were in earlier stages.

DR. GEOFF MULGAN said that problems with foresight exercises included a lack of reliable methods, too many variables, and visions of the future influencing that future. Many businessmen preferred to concentrate on short-term issues, and pressures on Ministers led to governments also not being naturally concerned with the long term, though small countries appeared to find strategy easier. There had, however, been some improvement in the UK government's approach and internal structures in the current decade. Strategy was better integrated into everyday work, and methods for understanding the future were being more widely and systematically deployed. These included trends analysis (e.g. life expectancy), benchmarking against other countries (which showed that the UK is currently outside the largely Nordic cluster of high performers), simulations (whose results may be ignored when politically unpalatable!), and scenario building.

In looking to the future, it was vital to challenge conventional opinion, which was often wrong. One needed to go to marginal sources, eg gossip, and then apply formal processes of distillation and judgement. The best methods used teams integrating analysts and practitioners and covering different sectors. Successful horizon scanning would allow governments and other bodies to be better prepared for low probability, high impact events, and to be less driven by events and more driven by goals.

DR. BILL HARRIS said that the best way to be prepared for the future is through education, but in most Western democracies many youngsters were choosing not to study science and maths. Hitherto the USA had solved this problem by importing talent, but that was unsustainable. The development of human capital was key, and the most effective technology transfer was when people moved from universities into industry. This required trust between the two sectors; barriers had to be lowered. Governments also needed to ensure the correct provision of science advice in government departments, and not just in the obvious areas.

He outlined the process followed by Ireland in establishing Science Foundation Ireland (as reported in the workshop). Centres for Science and Technology were being established: they would be clusters of industrial and academic researchers, interdisciplinary, internationally competitive, and working on large-scale problems. Amongst the challenges facing Ireland were to attract and retain international stars of science, and to ensure predictable and sustained investment in university research. Ireland also had to make choices – it could not be good at everything.

In discussion on the shortages of people choosing to study science, it was pointed out that the market normally solves scarcity problems by increasing price (in this case the remuneration of scientists). The choice of the right individual to head research organisations was vital. Private US universities do pay to get star performers. But perhaps the huge influx of 'cheap' scientists into the US had distorted the system. OST were planning to examine this issue.

University research should be informed by industrial priorities but not be aimed at solving short-term problems. Its first product should be 'stars of science', and only then should spin-outs and industrially useful products be used to gauge success.

The early UK foresight exercise had been more important for the interaction of the people than for its product. There was now a problem in convincing people in big companies that they were not already all-knowing about issues likely to affect their businesses, while smaller companies often did not have the scientific capacity and manpower to take the process on board. It was important that the English regions became more involved in foresight, though it was early days. Devolution had led to progress in Scotland and Wales. Traditionally, horizon scanning had been more used for defence and overseas policy purposes than by civil departments, but it was now recognised that there were equivalent challenges on the civil side of government. One was the demographic changes facing many Western countries. New foresight projects could be selected by panels, within government, or by allowing groups of visionaries to brainstorm.

There was scepticism about forecasting, because of people's inability to foresee disruptive technologies. For example no scientist would forecast that his discipline would disappear. People would miss spotting future trends which were against their interests, and might emphasise possibilities which led to more research funds (global warming might fall into this category). One way of dealing with these problems was to use scenarios, which could at least help identify what gaps needed addressing. Evaluating the success of foresight exercises was difficult, but could sometimes be achieved, as with the Thames Barrier.

Dr Elliot Finer