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Fish stocks

John Selborne: A policy for Europe

Elliott Morley: Listen to the science

John Gummer: The case for urgency

John Williams: The broad view

Governments and innovation

Leslie Morrison: The dash for innovation and growth

Gerry McKenna: A role for the universities

Noel Treacy: The Republic as pathfinder

Dietary salt

Is dietary salt a factor in hypertension?



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FOR SCIENCE AND
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contents



THE COUNCIL OF THE FOUNDATION . . . inside front cover

DIARY

Fischler throws down gauntlet on fisheries. 2

FISH STOCKS

What fisheries policy for Europe? 3

John Selborne

Listening to the science 4

Elliot Morley MP

The case for urgency and passion 6

John Gummer MP

Fisheries in a broader context 7

John Williams

GOVERNMENTS AND INNOVATION

Ulster: dash for innovation and growth 9

Leslie Morrison

Universities: vanguards of change 10

Professor Gerry McKenna

The Republic as pathfinder? 12

Noel Treacy TD

DIETARY SALT

Salt and diet — too much or too little? 14

Professor Morris Brown; Professor Paul Elliott;

Professor Rob Pickard

EVENTS 16

Fischler throws down gauntlet on fisheries

Six weeks at least behind schedule, the European Commission published its plan for the reform of the Common Fisheries Policy on 28th May, amid accusations that the Government of Spain (which holds the EU presidency until the end of July) had exerted improper influence in the preparation of the new policy.

A week earlier, on 23rd May, Dr Franz Fischler, the Commissioner for Agriculture, Rural Development and Fisheries, found it expedient to make a detailed defence of his independence and of the circumstance that the Director-General of his directorate, Danish Steffen Smidt, had been precipitously re-assigned to another directorate just a few days earlier and without adequate warning.

Fischler concluded by saying that he hoped he had made it plain that “any claim that Mr Smidt was removed at the request of Spain is utterly erroneous” and that the reforms now published “are in my handwriting and I will answer for them”. But the muttering in the European Parliament is unlikely to be stilled.

The proposed reforms, which have still to be accepted by the European Council, go a long way to meet suggestions made by the Earl of Selborne at the Foundation’s talk/dinner meeting (see page 3). The chief of them is that EU funds will no longer be used to subsidise the construction of new fishing vessels and that Member States will henceforth have to ensure that their own funds are not used to increase the catching-capacity of their fishing fleets.

The Commission says that current scientific advice suggests that it is necessary to cut present fishing effort by between 30 and 60 per cent (depending on the stocks concerned), which translates into the scrapping of some 8,200 fishing vessels (and 18 per cent of its total tonnage) in the coming four years. The funds the Commission at present has allocated to subsidies for new vessels, together with €272 million of new money, will be used to support scrapping them.

Recognising that many fishermen will lose their jobs as a consequence of these plans, the Commission reckons that it will have €460.6 million to spend, in partnership with national governments, in helping fishermen to retrain or diversify and to assist with “social measures” needed to relieve hardship when their fishing is halted on a temporary basis.

In addition, the Commission proposes a switch from the present arrangements under which national quotas for the allowable catch for particular species are set annually to a regime (beginning in 2003) under which there will be multi-annual quotas. One objective is to avoid the “political horse-trading” between fishing

nations that accompanies the annual setting of quotas. Another is to give the governments concerned a greater sense of responsibility for the resource on which the livelihoods of their fishermen depend.

The Commission proposes that the setting of long-term quotas should be decided not by the European Council (meaning fisheries ministers in member states) but by itself, aided by a Management Committee whose task would be to coordinate and interpret scientific advice. On past form, it seems unlikely that the Council of Ministers will accept this change of practice before the reform becomes EU law.

The reform proposals also include a special regime for the Mediterranean, where EU and non-EU fleets of fishing vessels chase the same stocks. The EU says that it will try to negotiate with non-EU governments a common management scheme for the fish stocks of the Mediterranean.

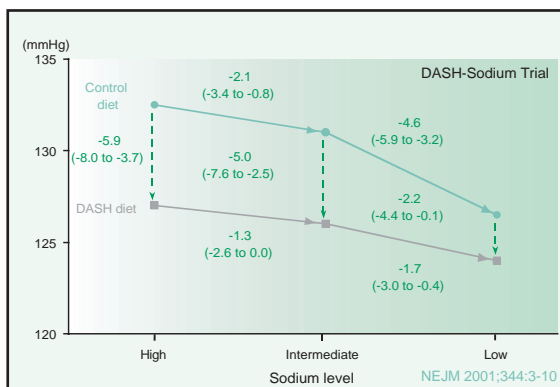
On the contentious issue of the enforcement of the EU fisheries regime, the Commission seems ready to retain the present arrangements under which national governments are responsible for identifying violations, but plans to create a “Joint Inspection Structure” under which multinational teams would carry out inspections and national governments deemed insufficiently vigilant in their inspections would be fined — by a reduction of their national quotas.

It also advocates the use of satellite navigational devices to keep a log of fishing voyages as well as electronic logs of catches, with all records open to inspection by rivals and competitors.

Other proposals include the improvement of knowledge of fish-stocks outside EU waters that are accessible to EU fishermen. The EU is also keen to “strengthen and complete” present understanding of the legal status of fishing boats in the hope of “eliminating” vessels sailing under flags of convenience as well as the practice of landing catches at ports “without proper controls”. There is to be a renewed effort to help developing countries put in place systems for the sustainable management of their own fish stocks.

The Commission also wishes to set up a network of regional advisory councils involving all “stakeholders” in the fishing industry. The intention is that these should be able to make suggestions on fishing policy directly to the EU and would have a right to be consulted whenever national governments plan changes of the fisheries regime within the 12-mile limit of national waters. □

Link: http://europa.eu.int/comm/fisheries/policy_en.htm



Dietary salt and hypertension

On the left, data from a recent study that compared blood pressure effects of the “usual American” diet with those of the DASH (Dietary Approaches to Stop Hypertension) diet at various levels of sodium. The results are discussed by Professor Paul Elliott in this issue. The role — or otherwise — of dietary salt in hypertension is a subject of continued controversy as reflected in the summary of a recent Foundation dinner/discussion, on pages 14–16.

What fisheries policy for Europe?

John Selborne, The Earl of Selborne KBE FRS

The decline of world fish stocks: will our great-grandchildren be able to eat food from the sea?

At a discussion meeting held at the Royal Society on 13 November 2001 on the decline of world fish stocks, there was unanimous agreement that more effective policies need introducing worldwide in order to salvage fish stocks.

The discussion that followed is summarised by Jeff Gill.

will come straight to the point about the Common European Fisheries Policy (CFP). It has failed lamentably.

The basic objective of the policy, pursued for 20 years, is to ensure a rough balance between stocks of fish and the catch. What it has actually achieved is an increase of fishing capacity, chiefly by its subsidy of the fleet when that was totally inappropriate. We have all been anxious about our fisheries for some time, but have never taken the wake-up call seriously. Yet when we realised, ten years ago, that the Grand Banks fishery off Newfoundland, once the most prolific fishery anywhere, was to close, we should have realised the same could happen to our home fisheries.

The Common Fisheries Policy is a basket of four policies, two of which date from the early 1970s. I suspect that one of those, the structural policy, embodies the roots of current problems. As well as allowing the decommissioning of ships, which is sensible, at least if the decommissioned ships are not simply moved elsewhere (which, alas, has happened), it also allows member states to subsidise the building of new vessels. It is not surprising that if you replace a ship that is out of date with one (albeit smaller) with improved technology, you fail to reduce fishing capacity. That is what has happened.

The market policy, the other early innovation, aims to ensure reasonable prices for consumers and incomes for workers. The external policy regulates fishing in international and community waters; again, we have clearly over-exploited fish in third country waters. The fourth policy concerns conservation and management. In my judgement, the roots of our present difficulties lie in the failure to reconcile the first and fourth of these policies.

These different strands were brought together as the Common Fisheries Policy (CFP) in 1983, but they were not consolidated as one; they remain separate strands. In 1992 I chaired a House of Lords sub-committee to review the working of the CFP; that was a dispiriting exercise. We realised that there was not much political will in some member states to implement measures that the Commission was advancing and many of their proposals were watered down. Now, in March this year, we published a Green Paper on the future of the CFP. It reads as a catalogue of failure. It demonstrates repeatedly the poor state of certain stocks – North Sea cod most obviously. The most urgent need is for regulations that will protect and con-

serve marine resources and provide for rational and responsible exploitation on a sustainable basis.

To be fair, there have been some modest improvements since the review of 1992. The precautionary approach has gained influence in the management of fish stocks. The Irish Sea cod recovery programme has demonstrated that when fisheries managers, fishermen and scientists are given a sense of ownership of a programme, they can deliver results that have previously eluded us. The phasing out of tuna driftnets and other conservation measures have been successes, although progress has been slow.

My involvement with these two reviews of the CFP – in 1992 and then 2001 – persuades me that the most striking difference between the two occasions is the readiness of all parties now to accept that what the scientists had been saying all along may well have been correct. Part of the difficulty is that the scientific advice given to the Council of Ministers is not always robust or specific enough, so that it can be (and is) evaded.

The fundamental problems persist: over-capacity of the fleet, declining stocks, the practice of discarding under-sized fish, inconsistent enforcement and failure to meet our obligations to foster sustainable development. Our European neighbours complain that we fail to manage our fisheries to the their disadvantage. If ever there was a need for a common European policy, fishing must be the prime candidate. Fish, after all, do not remain within territorial waters.

The fact that we have failed does not mean that the task is impossible. We must begin by recognising that we are attempting to reconcile ecological processes with the social and economic consequences of matching capacity and effort with a declining resource. That is the nub of the problem. Restrictions on fishing practice, days at sea and so on, are part of a solution, but they have so far failed to match effort and resource.

On capacity reduction, we have done the opposite and actually increased the catching capacity of the European fleet. That has been done under the aegis of four successive instalments of the multi-annual guidance programmes specifically designed to reduce capacity. It is an astonishing aberration to have spent most of that money on capital investment in vessels when clearly what was needed was socio-economic support for communities



John Selborne, the Earl of Selborne KBE FRS is a vice-president of the FST. He has had a distinguished career as a leading scientist and farmer and sits as a Conservative peer in the House of Lords where he has chaired the Select Committee on the European Union and the Select Committee on Science and Technology. He became a Fellow of The Royal Society in 1991.

and for conservation measures — closed fishing areas, for example.

As to effort control, we have relied too heavily on total allowable catches and quotas. They still have a role to play, because you cannot bring effort and resource back into balance by reducing capacity overnight. The hope must be that the International Council for the Exploration of the Sea (ICES), the scientific committee which has been in business for a very long time, will recommend fishery closures where that is appropriate. But the long-term objective in European waters, must be to move eventually to a licensing system where there is a sense of ownership of the stock among those who are catching it, as has been done in the South Atlantic.

There is great support nowadays for the zonal management of stocks guided by zonal advisory committees. We should go further and arrange that, within the framework of a renewed Common Fisheries Policy, zonal committees could take immediate action when that is required. Greenland, Iceland and other countries can act immediately when necessary. The same countries complained that the European Union is quite incapable of responding quickly to changing needs — altering the gear management regime or closing an area, for example. The new policy must therefore cater for a degree of delegated responsibility.

I return to the financial issues. The Green Paper assesses the annual injection of public money (Community and National) into the fisheries sector at €1.1 billion each year. This compares to a total value of the Community production of about €7 billion for fishing landings and €2 billion for aquaculture. The Community, through its Financial Instrument for Fisheries Guidance, finances investment in fishing vessels and onshore installations for processing and aquaculture.

Resurgence of demand. The talks were mainly concerned with supply questions: the management of fish stocks and fishing capacity. In discussion, attention was drawn to factors tending to increase demand. There were problems with red meat, eating fish was promoted commercially and recommended on health grounds and new outlets such as sushi bars are popular.

discussion

Many looked to farming as a way to meet rising demand. A difficulty was that farmed fish eat fish. Feeding them on the output of industrial fishing was a possibility, but that could be only a temporary solution. Another might be to feed grain to farmed fish, but novel diets for farmed animals could carry unforeseen risks, as BSE had shown.

It was asked how trawling could be reconciled with conservation of the sea bed, given current knowledge of its effects. In response it was said that the Barents Sea had been trawled throughout the last century without destroying fish stocks. Other fishing methods had disadvantages: fishing off the bottom could harm small fish, and line fishing was relatively unproductive and caught seabirds.

Research on the effects of trawling on the seabed, using closed areas for comparison, had not produced evidence of real damage. Nevertheless more research was needed, and should take account of the effects of bottom fishing on marine organisms other than fish. It was observed that the Scottish pelagic fishing industry presented a paradox, with considerable overcapacity yet very healthy supplies of mackerel and herring.

In future the Community's contribution should be directed to socio-economic support. I fear we shall eventually see large scale industrial closure in the fisheries sector unless we succeed in matching catching capacity with the resource.

Enforcement is another issue that needs attention. Every country believes it does the job well, but that everybody else does it badly. It really is unrealistic to have only 25 Community Fisheries inspectors. Clearly more money is needed for enforcement. Otherwise, this will remain an area of grievance and an excuse for ministers not to sup-

port what will clearly be a draconian package.

In summary, the CFP has been a failure, always too little too late. The failure is damaging because, like other European states, we have signed up to the Convention on Biological Diversity; we shall be represented at the forthcoming conference in Johannesburg. But what credence will be put in Europe's views on sustainable development if it cannot get its fisheries policy right? But I still ask whether we will ever summon up the political will to make the decisions we all recognise have to be made. □

Listening to the science

Elliot Morley MP



Elliot Morley MP is Parliamentary Under Secretary at the Department of Environment, Food and Rural Affairs (DEFRA). He is also a vice-president of Wildlife and Countryside Link.

I disagree with very little in what Lord Selborne has said. Moreover, the timing of this discussion is apt: the Commission's Green Paper on the CFP is an opportunity to reconsider the strengths and weaknesses of the CFP. Nobody disputes that there are weaknesses: the CFP is inflexible, slow to respond and very bureaucratic. But the CFP has strengths as well: above all, it allows for pan-European fisheries management. If the CFP did not exist, we would have to invent something very similar.

You will have noticed that I represent a newly created government department (DEFRA) which is also an opportunity to

re-focus, perhaps to adopt a more holistic approach, putting sustainability at the heart of the policies we pursue. But we also recognise, of course, that in making policy on fisheries management, many groups of people must be involved. Obviously, the fishermen are key players as are the scientists, but there are many other groups as well — processors, the food industry, environmental groups and some consumers groups.

The Government's response to the Green Paper echoes what Lord Selborne has been saying: any common fisheries policy must be economically and environmentally sustainable and must involve

stakeholders closely in management decisions that affect them. That is the only way we shall have an effective CFP. We have begun by encouraging the fishing industry to meet our scientists and to have more of an input. We have invited fishermen's representatives to sail on our research vessels in the belief that mutual understanding will result.

I also strongly support what Lord Selborne said about subsidies, which have indeed distorted the fishing industry. It makes no sense, when there is over-capacity in the European fleet, to build new vessels that are inevitably more effective catching machines than those they replace. The revised CFP must grasp this nettle. We cannot conserve stocks effectively unless the catching capability of our fleets matches the availability of stocks.

But there are elements of the CFP that we want to retain. One is the doctrine of relative stability, which ensures that national catches of particular stocks are varied in roughly constant ratios. This is one of the cornerstones of the CFP. If relative stability were to be negotiated afresh, there would be a free-for-all with no guarantee that any member state would be better off than now.

There is also the issue of the six and twelve mile coastal limits. We believe that these will continue; there seems to be a majority within the Council of Ministers. The limits do not automatically roll over, but have to be agreed by a majority vote every few years. I would prefer the limits to be permanent; they have become important to conservation.

On the total catch, while there are various ways of managing quotas, it will be very hard to get away from a total allowable catch (TAC) for each species of fish. These numbers are tangible measures of what we believe to be sustainable. We shall need to retain these arrangements in the coming review of the CFP which will be starting very soon. We have already responded to the Green Paper. I pay tribute to our fishing organisations for the case they have put forward on matters such as regional management, more involvement with the industry and for breaking up areas into smaller zones or regions.

When the European Union is enlarged, there will be many more countries with rights to fish in common waters, all wanting annual quotas. As things are, the December Fish Council meeting routinely lasts all day and night. Logically, there should be subcommittees dealing with the North Sea, the Irish Sea, the Baltic and so on, with the power to make decisions that are ratified by the Council of Ministers. I fear we have some way to go before such an idea is accepted. We, as the UK

Stakeholders and consensus. One participant described fishing on the high seas as the last hunter-gatherer activity. It remained unclear what forms of control might succeed. Countries often saw fishing as part of their heritage, but fishing grounds were shared and control had to be multinational. One model might be that of the Intergovernmental Panel on Climate Change (IPCC), which had achieved a measure of agreement over climate change.

There was reasonable agreement over the state of the major world fisheries and it was realistic to aim for a scientific consensus within which local decisions could be made on management. In the North Atlantic there were a number of different management structures, some working better than others. The Icelandic regime was not perfect but was a lot better than the EU system.

There had been a so-called stakeholder dialogue on European fishing policy, but one speaker wondered who the stakeholders were and whether consultations from the bottom up would have a real effect on decisions. One response was that special pleading was inevitable but did not remove the need for inclusive and transparent debate.

Fisheries management must be underpinned by good science.

Government, argue that it is a much better, more responsive and more flexible management system for the CFP.

Environmental issues also arise under the CFP. You have heard about the ban on high seas driftnets, which had an unsustainable cetacean catch. We have also agreed, with the co-operation of Denmark, a three-year closure of the industrial fishery for sand eels off the north-east British coast. Our joint study will assess the impact of these activities on feed stock for commercial fisheries and also the potential by-catch. I confess that I have serious doubts about industrial fishing and believe that human consumption fisheries should always take precedence over industrial fisheries. When we have a measure of seabed productivity, we may have to take tough decisions on industrial fishing.

I want to say clearly that fisheries management must be underpinned by good science. There is a view, especially among my ministerial colleagues, that when fish-

eries ministers go to the Council of Ministers, the Commission artificially inflates the cuts they are proposing so that we can negotiate higher quotas and claim success for our negotiating skills. Certainly some ministers are under great pressure from their fishing industries. But for some years I have made it very clear that I will be guided by the science and that when the science argues for conserving fish-stocks, I will not talk up the quotas.

In reality, there are many scientific questions not yet answered. If we are to move to ecosystem management, for example, we need a better understanding of multi-species impacts. Our priority now is to focus on the scientific work, expanding on what we know. My belief is that you have to take a stand on the science and on sustainability. If there are tough decisions to take, they should be taken now and not put off for future years. But we also have to recognise the socio-economic impacts that Lord Selborne mentioned.

Since I first became fisheries minister in 1997, I have detected a significant change in attitude from all involved. There is more thought about conservation, more acceptance of the science, more recognition of the need for sustainability and much more engagement by the industry. And not all is doom and gloom. Although catches have been cut quite drastically in the past two years, prices have often risen quite well; and the returns have been quite good in many sections of the industry. I also believe there is now fruitful common ground between environmental organisations and the fishing industry. These are the objective we should be aiming at. We are slowly beginning to achieve them—even if one or two countries are still not convinced. □

The case for urgency and passion

The Rt Hon John Gummer MP



John Gummer MP represents the Suffolk Coastal constituency. During the Conservative administration he held a wide range of ministerial appointments, including Secretary of State for Social Services and the Environment. He is Chairman of the Marine Stewardship Council.

I share many of the views of the previous two speakers, but I want to inject a sense of urgency into the discussion. We are in a very, very serious position.

To begin with, think about your own childhood. We were all taught about the great harvest of the sea. We would talk about the Grand Banks and about the Dogger Bank in the North Sea; it seemed as if these were an inexhaustible resource. We learned about trawlers and driftnets and how all these things were contributing to what was a remarkably robust industry. Fish was cheap and regarded as a food which would be always available.

Now, on the Dogger Bank and particularly in the Grand Banks, the fish have disappeared. We are talking about a different world and yet the pressures against doing anything are enormous. The fishing industry has a romantic feel about it, making it able to call out the troops all over Europe. To people with a romantic view about the history of Britain, it is the fishermen of England who have hearts of oak. It is like that everywhere in Europe.

In Britain, we have a Fisheries Minister for the UK, one in Scotland, another in Wales and yet another in Northern Ireland — all these fisheries ministers for an industry that is smaller than the British lawnmower industry. Yet we do not have a single Lawnmower Minister, let alone four. The arrangement is not sensible, but is a measure of the political importance of the fishing industry, which is concentrated in particular areas such that the socio-economic impact of change is conspicuous.

There is no point in trying to explain away the CFP as the wrong policy. So long as the main interest of the people who decide about fisheries is the fishermen and not the fish, then the decisions will always be wrong. Of course, the CFP has to be common. Anybody who suggests that we should repatriate fishing has no idea about fish; they do not wear flags on their fins. Those in my party who put this forward have not understood about fisheries.

The truth is that we need a European system and that we cannot rely entirely on governments because of the nature of fisheries ministers, whose constituents are fishermen. I should say about Elliot Morley that he has stood up to some pretty tough times in telling the whole of the industry that if there is to be a tomorrow, there must be change today. We have to take some tough measures, which I shall briefly list.

First, we must stop the subsidy of the fishing industry all over the world except

for socio-economic measures to soften the effect of the changes the end of subsidies will bring.

Second, we must recognise that industrial fishing in present circumstances is quite unacceptable. It is not just that it is better to use the fish for human beings, but that in most cases, industrial fishing harms the fish stock itself. Scooping up tiny fish from the bottom of the ocean, must damage the food chains on which commercial fish depend.

Third, I believe we have to take a serious view of fishing techniques that may damage fish stocks other than those of the target species. We now know a lot more about the disturbance of the ocean bottom caused by certain kinds of fishing with which people persist. We need direct and comprehensive measures to regulate such practices.

Next we have to recognise that the common belief that there are good countries and bad countries is a fable. Elliot Morley is right to insist that the UK is not among the angels; we are a bit better than some, but not much. Morality is very strong on shore, but once you are beyond that harbour light, it is surprising how the interpretation of the rules can change. The British mackerel fishery depends to a large degree on creative reinterpretation of the rules. We must also recognise that even Iceland, after lecturing the rest of the world for a decade, has now found that its fishermen were not always doing what they said they were doing. Iceland is a much better example than almost any other country, but it is not as good as we had hoped.

We also need much more effective enforcement. It is not just a matter of more enforcement vessels, but of allowing European enforcement vessels to enter docks without prior notice. This is an issue on which the British Government must lead. So far, we have been among the countries least willing to allow people to come into our ports without notice. But we, more than others, need enforcement on a European level. There is no way in which you can deal with, say, Spanish enforcement unless you are prepared to start with yourself.

Next, it is disgraceful that we in Europe export our problems to the rest of the world without apparent care for the consequences. I am passionately opposed to this indifference. If we reach an agreement with Namibia that gets some Spanish boats off our back, off they go down the coast of

Africa without policing of any kind. We must insist that in every future agreement, the European Union polices its ships to ensure that there is no over-fishing anywhere. Ships that break the rules must be sent back.

We must take this obligation seriously. The reason is stark and simple. Fish provide protein for some of the poorest people on Earth; often there is no alternative. But you do not have to be much of an economist to know what happens when a product is in short supply. The rich get it and the poor do not. Yet whenever we fish out stocks or fish out an area, we seek new

places, new sources and new species. Every time we do that, we impinge upon people who cannot respond.

I find it frankly sickening that the Irish are now building a huge new boat to go out along the coast of Africa to continue this depredation. We, like the Spanish and the Portuguese, have boats that do the same. We are making the poorest pay for our shortcomings. I care about biodiversity, of course, but I also care about human diversity and about choice for all our children. Taking the food literally out of the mouths of those who have no alternative is the greediest

action there could be.

I conclude with a brief remark about what we are trying to do with the Marine Stewardship Council. We are trying to say which fish are being produced sustainably. When you see the happy fish logo on a package, you will know that there are no more fish caught in one year than the fishery can bear. You will see more and more of this. It is the only way to protect the fish for the future and, frankly, only an independent body could achieve this end; governments are too indebted to their fishermen to be trusted to police their product. □

Fisheries in a broader context

John Williams



John Williams is General Manager of Boyd Line Ltd, a family owned company that operates the UK's only filleter trawlers producing, at sea, frozen cod and haddock from the North Atlantic. He is a Master Mariner, a RFU referee and Chairman of the management committee for the Ocean Youth Trust in the Northeast of England.

The challenge we face is that the supply of ground fish from the major stocks is declining while the demand for seafood is growing. If we continue as we are, there will be no fish in the sea for our grandchildren to eat. The future is bleak for various reasons: illegal fishing, short-term and ineffectual government policies, insufficient scientific research, poor media management and an indifference to the consumer. All these are symptoms of an industry in trouble, suffering from inefficiency, ignorance and greed.

I cannot speak for the industry at large; I will tell you what my company is doing. Despite my gloomy beginning, there is a future and the culture change we desperately need will come about.

We fish in the Barents Sea, which produces some 50 per cent of North Atlantic Cod. To put that in perspective, the total cod catch is almost 900,000 tonnes, of which 200,000 tonnes is landed in Iceland and less than 90,000 tonnes comes from the North Sea. Norway is following Iceland in developing a fisheries management system for the future. It is not perfect and is not universally popular among fishermen, but conservation of the stocks is critical to the way of life of fishing communities.

The Norwegian sector of the Barents Sea is policed vigorously by the coastguard. Ships are boarded frequently, with the protection of juvenile fish regarded as the critical factor in conservation policy. There is regular on-board sampling; ships with more than 15 per cent by number of undersized fish are moved to another area. If the incidence of small fish is too high then the coastguard has the authority to close large areas of sea; an instant decision-making process that we should take note of. These methods are so effective that

skippers now check the numbers of small fish in their catches carefully, moving their ships to avoid the attention of the coastguard if necessary.

Discards are banned. Some doubt the effectiveness of this rule, but my experience of the Barents Sea and the Norwegian sector of the North Sea is that there are regular inspections and warnings for offenders. A long steam back to port, detention and a probable fine; a strong deterrent.

Compare this to EU waters, where discards are allowed. We are told the discard rate is 17 per cent, but I believe the real figure is double that. With stocks declining, this is an obscenity for which there is no excuse. It is known to be more difficult for smaller vessels in mixed fisheries to comply; a problem to solve, not to ignore.

When a former Boyd Line skipper wrote a paper entitled "Baby fish don't spawn" some years ago, we acted on that message and unilaterally increased the mesh sizes on our trawls from the Northeast Arctic minimum of 135 mm to 150 mm. (North Sea cod ends are 100mm, rising to 120 mm next year.) Although the value of small fish is often greater than that of larger ones, we feel it is a price worth paying. We also fish with sorting grids to allow juvenile fish to escape. This measure is imperfect and is not popular with crews, but is a contribution to conservation. Had similar measures been taken in the North Sea 20 years ago, we would have avoided the present crisis.

The Barents Sea and Icelandic cod fisheries are also fully exploited and some scientists have recommended a reduction in effort. Fishermen say that this view is pessimistic as fishing has rarely been better. The capelin stock, food for cod, is healthy

and the number of juvenile fish in the water is increasing. This divergence of opinion highlights a problem that all fishermen and many scientists recognise. The scientists do not have the resources to collect and analyse these anecdotal data that may point to emerging patterns.

We need also to focus on longer-term issues; for example, age/weight ratios, how changes in the food chain affect the growth and reproductive capacity of fish and how climate change will affect stocks. We have heard that the North Sea is warmer and that the poor fishing at Greenland may be attributable to global warming.

More research is also needed on the real impact of industrial fishing. How, for example, does the capture of 1 million tonnes of North Sea sand eels affect catches for human consumption? The Food and Agriculture Organisation (of the UN) (FAO) has recently encouraged states to incorporate ecosystem considerations into fisheries management. I hope governments will acknowledge the FAO declaration and ensure adequate long-term funding for this research.

We also need to give priority to target species and the resources on which they depend. The bilateral fisheries agreement between the EU and Norway has recently been put into jeopardy because one of the trading stocks, blue whiting, has been heavily over-fished and faces closure. An estimated 1.2 million tonnes of fish has been caught and turned to fishmeal, against a total allowable catch of 600,000 tonnes. Substantial amounts have been caught in international waters, but the quota has also been abused inside the EU fisheries zone.

The deliberate plundering of blue whiting for fish meal, some of which is mackerel mis-recorded, may seriously damage the distant water fleets of Germany, France and Britain. These ships provide high quality white fish to European markets and support many jobs ashore and afloat. That is an excellent example of a problem caused by fishermen but made worse by government inactivity.

I often hear attempts to justify the landings of over-quota fish. But it is not acceptable and affects not only fish stocks but also markets. Sadly, even with the current parlous state of stocks, these landings continue. Enforcement of landings by vessels needs to be supported by prosecutions for those who handle over-quota fish, a measure successive governments have avoided.

The future of fishing also requires a change of culture. It demands the development of best practice in managing stocks, strict policing and investment in fleet reduction, not just to take out clapped-out tonnage, but to encourage a modern industry that can expand.

Economics and enforcement. Any control system needed to be enforced, and there were too few EU fisheries inspectors to do the job. It was suggested that the Royal Navy and its counterparts in other member states might play a part. Fishery protection work could promote wider co-operation between national navies. Modern technology made it easier to track boats, but a presence was still needed in fishing areas, as well as arrangements for dealing with miscreants when they returned to port.

One speaker criticised the tendency to rely on regulation and the criminal law to change the way fishermen acted. They were in business, and the way to influence them was through incentives, using economics and psychology. Another speaker sympathised with this argument, but had found in practice that everyone was in favour of conservation measures until they actually conserved. Devastatingly strong measures were needed, because a decline could suddenly become a rout. When the Newfoundland Grand Banks closed the fishermen were still claiming that the fish were back.

Economic measures would not necessarily be gentle. Capacity needed to be cut by something like 60 per cent, on one view. Another speaker observed that if governments had been stupid enough to pay for excess capacity, they must now take people out of the industry. The measures required would be painful and terminal for those concerned, not transitional. No new money was needed: the vast EU resources spent on subsidising the fleet should be spent more intelligently on short-term help to support the communities affected, and the resolve must then be never again to subsidise anyone to catch fish.

In the long term, it was argued, market forces had to be put to work. Consumers should be encouraged to choose fish from sustainable sources. A labelling scheme had been started, and the hope was that in a few years' time the big supermarkets would only sell fish from properly managed stocks. Another speaker thought that consumers would ultimately avoid fish from countries that adopted unpopular practices. The Icelanders were talking about going back to whaling, but to do so would blight sales of Icelandic cod.

⇒ A detailed summary of the discussion is available on www.foundation.org.uk

We need to give fishermen real responsibility to look after the resource. This could be the ownership of quota, as in Iceland, New Zealand and elsewhere. There is a fear in Britain that that would this will encourage corporate money and destroy communities. But we need corporate money and the discipline it brings. There can be safeguards to protect those who are vulnerable. Vertical integration and market awareness are vital. The fishing industry is in the Dark Ages compared to other food industries in the developed world.

For too long the UK fishing industry, ashore and afloat, has regarded itself as an independent industry. It is not; it is part of the international food industry and as such must spend much more effort looking after the consumer if it is to remain competitive or even in existence. My company has invested heavily in improving its product and meeting changing consumer demands.

A growing number of owners are thinking in the same way. Accurately weighed boxes, added value products and above all fish that scores highly on the Torry freshness scale, are the products of the future. Those who continue to produce a second-grade product will eventually suffer.

In the long term, we need to satisfy the public that our fish comes from a sustainable source. One major fishery, the New Zealand hoki, has achieved Marine Stewardship Commission approval, which will bring great benefits. We now need one of the major cod fisheries to apply for MSC accreditation. In such a regime, traceability of all fish is essential. The techniques exist. What we need is the will. We do have a future. The patient is critically ill, but due to the remarkable resilience of nature, is not terminally ill. We all share a responsibility to nurse the industry back to health. □

Ulster: dash for innovation and growth

Leslie Morrison

How should governments support science and innovation in a growing economy?

Governments provide support for scientific innovation in many different ways. How this should develop was discussed at a meeting on 19 March 2002 at the Odyssey Centre and the Parliament Building in Belfast. The first speaker, Mr Leslie Morrison, recently joined Invest Northern Ireland. In his most recent role he was a Managing Director at Head Office in New York where he had responsibility for marketing, project execution and relationship management for JP Morgan's global mining clients, for the Canadian oil and gas industry and for certain US industrials. The other speakers were Professor Gerry McKenna and Noel Treacy, Minister for Science, Technology & Commerce in Dublin. The discussion that followed is summarised by Sir Kenneth Bloomfield.



Mr Leslie Morrison is Chief Executive of Invest Northern Ireland. He recently joined Invest Northern Ireland after a long career with JP Morgan.

The question for debate is "How should governments support science and innovation in a growing economy?" Note the modifier, "in a growing economy". I doubt that the question implies that government should withdraw support when an economy stops growing. Germany and Japan would agree that wisdom lies elsewhere.

But a reasonably advanced economy is unlikely to grow adequately unless governments act in partnership with universities and business. US companies have been amazingly innovative and US universities are a treasury of scientific discovery, but government-funded initiatives such as the Manhattan Project, the Pentagon's nurturing of the internet and the development of anti-ballistic missile technology have also had an enormous impact. The motivations may have been political or military, but these programmes demonstrate that high-level scientific research can be a trigger of technological leaps forward. Commercial spin-offs multiply and new applications abound — witness telecomm, the digital revolution, materials technology, automation, medical advances, biotech and all kinds of consumer electronic devices. The resulting growth generates capital that is then re-deployed in a virtuous circle of discovery.

It is largely for business to spend capital to develop new products, and largely for government and well-endowed foundations to fund the high-risk programmes from which radical innovation springs. That does not require central control, but fiscal, financial and structural incentives. A coherent strategy is not mechanistic planning, but an alignment of policy to facilitate desired ends. Broadly agreed goals and the provision of some risk capital should stimulate the market for ideas, not stifle it.

The Northern Ireland Executive is conscious of the central role now played by science, technology and innovation in economic development. It seems to be understood that competitive economies in the 21st century will be founded on top-class R&D, driven by entrepreneurship, creativity and innovation. Northern Ireland is well equipped to thrive in this new knowledge-based economy.

What exactly is a knowledge-based economy? The innovation process in this century is already very different from that in the last decade of the 20th century. The process is more radical, disruptive, complex, dynamic — and uncertain — than that

of the mid-1990s. That reflects two hard realities: innovation includes more than R&D and innovation alone does not guarantee economic performance. The challenge requires a response different in kind, not merely in degree, from that of previous strategies. We need the concerted commitment of industry, government, academia and — crucially — the financial sector.

All countries and regions face the same challenge. Most are responding fast with business-centred, science-driven, knowledge-based and capability-funded strategies. But even that may be insufficient. Economies such as that of China, marrying high knowledge and low wages, where the cost of a skilled engineer is about one thirtieth of that in Japan, can set the pace.

Recently, Northern Ireland has enjoyed unprecedented economic success. Unemployment has reached a 30-year low. The regional economy has been one of the fastest growing in the United Kingdom. Exports from Northern Ireland have increased dramatically and there has been a marked upturn in GDP.

There has also been a 60 per cent increase in private sector R&D funding in the past 6 years; more than 60 companies are involved in pre-competitive R&D and more than 600 in near-market R&D; 18 new Centres of Excellence have been established (and funding is in place for a further five, with more to follow); four research-linked incubation units — two each in software and bioscience — have been created and there are now 19 companies in Northern Ireland spending over £1 million a year on R&D.

A Northern Ireland Science Park initiative, based in Belfast, Londonderry and Coleraine, is under way and a series of new-economy clusters in key sectors such as aerospace, software and biotechnology is being established. In the past three years, 3,500 new indigenous companies have been established, creating 5,800 jobs. The fastest growing areas of the economy are services in ICT; these new-economy companies are growing four times faster than the average for comparable companies in the UK as a whole.

Moreover, 46 university spin-out companies have been established, creating 835 high quality jobs. Both Queen's University and the University of Ulster have developed commercially focused research and development strategies and have significantly increased their ratings in the 2001 Research Assessment Exercise, recording 21 units with either 5 or 5* status in a

range of key disciplines.

So, thanks to the two universities, Northern Ireland has a powerful base for science research and development. Government is committed to harnessing the commercially focused R&D in the universities. In the past six years, government and industry have invested significantly in new research Centres of Excellence. Areas such as biotechnology, sensors, nanotechnology, communications engineering and polymer processing have become academic and industrial flagships for Northern Ireland.

Nor has fundamental research been neglected: we have invested in buildings and equipment and encouraged international collaboration. Our improved infrastructure has begun to attract inward investment. There is clear evidence of external financial support in areas such as medical devices, communications, drug delivery, sensors and data storage. Our expertise is attracting the attention of major international companies.

All in all, great things have been done here over a short period of time. Economic prospects and the conditions for investment-led growth are better than Northern Ireland has known for decades. There is every reason to believe that Northern Ireland can become a world-class regional economy.

But we are not nearly there yet and things can go wrong. Northern Ireland has had a world-beating economy before. A century and a half ago, in dozens of towns and villages across this tiny region, the application of state-of-the-art technology revolutionised the mass production of textiles, changed the agricultural sector forever and created one of the most successful regional economies of the age. Less than 100 years ago, the City of Belfast was synonymous with maritime engineering excellence; the most advanced ships the world had ever known were built here, in this city.

It is not for me to tell you what went wrong. A self-confident and undivided society can reinvent itself to meet changing needs: one at odds with itself cannot. Devolved government and shared powers have given us the chance to pool our talents and energies. We are far too small to make an impact without partnership with others, but overseas partners will not engage fully with us if we are not working with and for each other. For the first time in my life, this may now be happening.

Invest Northern Ireland will place innovation at the heart of its mission to foster economic development. Although private-sector innovation generates wealth whose effects spread rapidly in an open economy, the beneficial role of pub-

lic-sector institutions is more important than generally appreciated.

For all its recent success, Northern Ireland's economy is not in great shape. Our systemic weaknesses could yet stifle entrepreneurship and innovation. We have an SME economy with too few knowledge-based clusters; poor productivity; a lack of SME involvement in supply-chain and customer-relations and in associated e-business technology; minimal venture-capital activity; too little investment in R&D; limited business spending on innovation; and, with a few exceptions, on university research, too few international patents per capita and a much lower business birth-rate than the UK average.

To restore our ability to compete in the global marketplace, the Northern Ireland Executive has committed itself to bring forward a comprehensive strategy for R&D and Innovation. Invest Northern Ireland will be an enthusiastic agent for government's part in this endeavour. The US entrepreneur and innovator, Professor John Kao, said here in Belfast some weeks back that innovation is the means by which we get the future we want, not the future that is forced upon us. We must not let our recent past become our future, but must turn our people's considerable talents to our own benefit. □

Universities: vanguards of change

Professor Gerry McKenna



Professor Gerry McKenna is Vice-Chancellor and President of the University of Ulster. He has served on a very wide range of external bodies including chairing the Northern Ireland Technology Foresight Health and Life Technologies Panel.

We are all grateful to the Foundation for coming back to Northern Ireland this evening. The Foundation should know that the discussion it organised at Coleraine three years ago influenced both the development of the Universities and the government's assessment of the importance of the science base. This evening, I want to encourage you in the belief that the Government should continue to support research in Northern Ireland and that both our universities are playing an important part in our economic development. At no previous time has there been such unanimity that the research base is vital for the development of the Northern Ireland economy and for the social and cultural development that will follow.

In the world today, where there is a high technology, vibrant economy, there is invariably a strong research base. North Carolina and Georgia in the United States are good examples; both are flush with new company start-ups and inward investment and both are supported by

very strong research universities. If you compare North Carolina with South Carolina and Georgia with Alabama, you will see my point. Yet 30 or 40 years ago, North Carolina and Georgia had strong research universities but little inward investment. The best graduates left the states, which also had civil strife and were over-reliant on agriculture and textiles.

According to the Northern Ireland Economic Council, 34 per cent of all R&D in Northern Ireland is carried out by universities. That is a much higher proportion than in any other major region of the UK. There are two partial explanations: the absence of major government research facilities in Northern Ireland and the nature of the economy — based largely on small businesses with limited capability to invest in R&D.

How has the research strategy for the Northern Ireland universities evolved? There has been an enormous change in the past few years, supported by the Department of Further and Higher Education, Training and Employment for

Challenge for NI Assembly. Several of those present focussed upon the ability of the Republic of Ireland to adopt radical fiscal, funding and policy measures. The Northern Ireland Assembly would face a real challenge in creating a business-friendly environment, and if necessary should bring pressure to bear upon the Chancellor of the Exchequer to obtain the necessary room to manoeuvre.

A participant from continental Europe, drawing on relevant experience in his home country, underlined the message that a commitment to innovation had to be a sustained, long-term affair. The whole of society would need to appreciate that “knowledge is the future”.

There was a strong plea that Northern Ireland should be sure it was developing its best human potential, regardless of gender. Professor McKenna said that in his institution a majority of students in the biomedical sciences were female as were 36 per cent of undergraduates in computer science. Nevertheless there remained fields such as engineering which were still predominantly male.

discussion

Northern Ireland, now the Department of Employment and Learning, with the encouragement of the Northern Ireland Higher Education Council. We now have an ordered and selective approach to university research. The strategy is highly selective because we cannot do everything. It is based on the potential for national and international strength – second rate research is of no value to anyone. We seek to identify and support key wealth-creating sectors, which is where the Foresight Exercise activity plays its part, but our global outreach also helps us to spot future developments.

We also have a major commitment to exploiting intellectual property for the development of the region. This is distinctive, at least in UK terms: as universities, we are anxious that the research we carry out should benefit the region rather more directly than would standard licensing arrangements with companies in the US or other countries. This aim also drives our approach to the formation of start-up companies. We have also, as universities, developed facilities for innovation and growth; the innovation centres at Coleraine, Magee and Belfast have been mentioned already.

The universities support the Northern Ireland economy more broadly. A strong research base produces well-qualified graduates and top academics at the leading edge of research. The graduates feed into all areas of activity in Northern Ireland, professions such as engineering, business, healthcare etc. But we must recognise that Northern Ireland is part of the global economy and that we must create conditions that allow us to retain our best graduates and university researchers; indeed, we must also aim to attract the best from elsewhere.

In our economy, there are many small and medium sized enterprises lacking the

resources to undertake their own research. Both universities have embraced this challenge; they work with small companies through, for example, teaching-company schemes that place graduates in industry. We also allow small companies access to our facilities.

The 2001 Research Assessment Exercise has shown clearly where our university strengths lie. We have two 5* areas, in biomedical sciences and mechanical, aeronautical and manufacturing engineering both important for our economy. We also won high ratings in several other important areas — art and design, built environment, civil engineering, music, electrical and electronic engineering, computer science, physics. I include music because music and the arts are important ingredients of the creative industries that will have important roles in the future. In short, there are several important research areas where the two universities have established themselves nationally, and in many cases, internationally. This position has been difficult to achieve; our goal must be to maintain it and to exploit it for the benefit of Northern Ireland.

University R&D also directly supports the programme the Government is taking forward in Northern Ireland. The key themes of that are: working for healthier people, investing in educational skills, securing a better economy and developing North/South, East/West and international relations. In the health sector, for example, there is much world class research in Northern Ireland, including work in cancer and diabetes, new treatments for AIDS-related diseases, multiple sclerosis, medical devices and so on.

Both universities are also key players in developing educational skills, having scored well in the assessments of the national Quality Assurance Agency's in the past two or three years. In many cases,

students spend a year on placement in industry, which helps equip them for the workplace. Both universities are committed to ensuring that all sections of the community have access to excellence in both teaching and research.

On the theme of “securing a better economy”, both universities have made very significant contributions to the Northern Ireland economy, particularly by technology transfer. There has been a sea-change in the attitudes of the two universities and in their readiness to cooperate fully and effectively for the benefit of Northern Ireland.

That is borne out by the performance of the two technology transfer companies formed by the universities. QUBIS at Queen's University, founded in 1984, now has 32 companies with a combined turnover that will exceed £31 million this year; the companies employ more than 600 people and more than 95 per cent of their output is exported. The University of Ulster's technology and knowledge transfer company, UUTECH was established in 1988; since 1999, in just two years, it has set up 18 new companies resulting in 235 new jobs on our campuses at Coleraine and Magee.

In terms of North-South relations, the universities have many research partners in the Republic; we are working very closely with Intertrade Ireland to encourage research and shared research facilities. One example is the Irish University Research Alliance, where the University of Ulster, Trinity College Dublin and University College, Cork, have come together to make a world-class research alliance. But the universities also have major links internationally: they are, for example, major players in the EU's Framework programmes and there are major collaborations with the United States and the Far East.

So far, I have been positive about our prospects, but I am less sanguine about university funding in Northern Ireland. The reality is that the block grant to the universities for research support has been cut by 20 per cent in real terms over the past 9 years, while it has increased by 23 per cent in the rest of the UK. I do not attribute blame in any particular direction, but we have to address this problem if we are to maintain the world class research I have been describing.

Much the same conclusion emerges from the figures for science-based funding per head of population in the various regions of the UK in 2001. Science-based funding is the total of the block grant for university research support and the money that comes from research councils. Scotland is top of the list, followed by England, followed by Wales and followed in an abysmal fourth place by Northern Ireland.

However you look at it, Northern Ireland is not spending as much on research as will be necessary to remain competitive. It is encouraging that the Welsh Assembly's Budget, produced last week, foresees research funding at the same level as Scotland. I would also pay tribute to the Department of Employment and Learning and other relevant ministries for their support for increasing the funding for the research base. Somehow, we must begin to rectify

this shortfall. We have a long way to go.

Mr Treacy will no doubt tell us what the Republic's Government is doing; it has taken significant initiatives to support the science base. I have a worry: while we cooperate effectively and fully with our neighbours in the Republic, if we are not able to match their level of funding and infrastructure, we could see a significant drain of our best people from Northern Ireland to the Republic. They not only want to be paid appropriately but they

want the best facilities in order to carry out world class research. We need to face up to that challenge.

The prospects in Northern Ireland are potentially bright. We are well placed to play a full part in the key economic sectors of the 21st century -- in biotechnology, ICT and nanotechnology, for example. But we shall need sustained investment in research and development from government and, of course, from industry if we are to maximise our potential. □

The Republic as pathfinder?

Noel Treacy TD



Mr Noel Treacy TD is the Republic of Ireland's Minister for Science, Technology and Commerce at the Departments of Enterprise, Trade and Employment and at Education and Science. He was first elected to the Dáil Éireann in a by-election, in July 1982.

Ireland's performance in recent years has been outstanding by any standard. We are doing well and, with the positive and creative attitude of our people, we will continue to be successful in the years ahead.

Many factors underlie our success. While Ireland's economic growth has been driven by the private sector, the contribution of the public sector has also been critical. I cite the successful evolution of the management of our economic affairs; the certainty in wage-setting and industrial relations that the social partnership process has brought and the broadening of intellectual resources now deployed in policy formulation and decision-making at the national level; the quality of our educational system at all levels; and our membership of the European Union since 1973.

This audience well understands the benefits of sound fiscal and monetary policies, which are prerequisites of investor confidence and subsequent economic growth. The control over public expenditure in line with revenue potential and the reduction in taxation made possible the exceptional economic performance of recent years. Tax reform has also contributed. The 10 per cent rate of corporation tax introduced in the early 1980s was a major attraction of international investment. A single 12.5 per cent rate of corporation tax for all trading income in all sectors of our economy is being phased in over the period to 2003.

Ireland's current prosperity and growth has been underpinned by the development of the knowledge base of our work force by our education system. The availability, quality and potential productivity of the Irish labour force has been a major factor in attracting interna-

tional investment in the traded goods and services sector, especially in electronics, pharmaceuticals, computer software and financial services. It also underlies the transformation of Irish-owned industry in recent years.

The quality of our labour force reflects the high value attached to education and to the acquisition of skills and qualifications in Irish society. As Ireland develops as a knowledge-based economy, the acquisition of knowledge and the accumulation of knowledge capital are essential elements and the formal education system, industry-education links, basic and applied research, all contribute to accelerated economic growth.

A framework within which to develop policy is essential. In 1997, the Government established the Business, Education and Training Partnership to assist in the development of national strategies to meet skill needs, the estimation of manpower needs and education and training for business.

There are three elements to the partnership, the most visible of which is the Expert Group on Future Skill Needs. The Group's First Report on the Information Technology sector in November 1998 prompted significant investment by Government. Overall, the Expert Group has made a significant contribution to growth by developing supply-side solutions to skills needs.

Europe, of course, has had a major influence on Irish science and technology. Access to EU Structural Funds since the late 1980s has provided substantial (though now declining) resources for new ventures in science and technology. We have, for example, upgraded the science and technology infrastructure and encouraged innovation by companies.

discussion

Evaluation has shown that these targeted strategic programmes have helped to strengthen key areas such as biotechnology, software and information and communications technology.

The EU research programmes — the Framework Programmes — have been a crucial source of funds. The benefits of participation extend beyond the EU's contributions to research costs; participants from the business sector find that collaborative projects give them access to sources of research and innovation.

New technology is now being introduced into our lives at an ever-increasing pace. Such technologies are the primary source of industrial competitiveness and economic growth. The new companies being formed to develop and exploit them are the key weapon in our battle against unemployment. They lead in product innovation, are major sources of technological advance, are capable of high growth and are prime targets for investors, especially in the United States. The companies (and countries), investing most in research have also created most jobs in the past two decades.

Competitiveness now requires the manufacturing and service sectors to meet fast-changing market needs quickly and efficiently by means of new technology. The National Development Plan 2000-2006 identifies "insufficient investment in research, technology development and innovation as a constraint to the sustainable growth of indigenous industry, which must move from low value-added, low productivity sectors towards sectors characterised by high levels of innovation, quality, productivity and value-added". Thus, the relatively low level of industry R&D in Ireland continues to be a major challenge for industrial policy-makers.

Our Government is investing substantially in the country's R&D base. The National Development Plan allots €2.5 billion to Research, Technological Development and Innovation (RTDI) over its seven years, a sign of the high priority this Government gives to R&D in our future economic growth. Of the total, €1.5 billion is intended for activities related to industrial development.

Support is available to firms to help them develop innovative products, services and processes and to encourage them to access and exploit R&D and technology from overseas. The outcome will be enhanced innovation and competitiveness — and so increased output and employment.

We cannot plan the future — but we can plan for the future. By preparing for a future that is uncertain and constantly changing, it is possible to build a society able to face this future with confidence. Foresight is about preparing for the

Fine-tuning research efforts. In discussion, it was emphasised that R&D is not an end in itself and that economic success had to begin and end in the marketplace. Moreover, R&D spanned a wide spectrum; care and selectivity were necessary in deciding how and when to sponsor it. While there was a need for a sound research infrastructure in the universities, the focus should be on the quality rather than the quantity of research. Moreover, the long-term character of investment in R&D should be recognised; it offered no immediate or guaranteed pay-off, yet governments commonly looked for immediate benefits.

It was argued that the processes by which innovations rooted in R&D were converted into marketable business propositions were still poorly understood. Leslie Morrison emphasised that the role of Invest Northern Ireland would not be either to invest in pure or basic research or to become an entrepreneur in its own right, but rather to encourage and advise in developing propositions that would be carried forward by venture capital or otherwise.

Concern was expressed about the absence of substantial venture capital firms. Of course, projects attracting venture capital involve the risk of failure, but the community would have to learn that the acceptance of risk was a corollary of enterprise.

Several speakers were concerned about the implications of Northern Ireland's low per capita investment in R&D, and the relatively low level of core funding for university research. It was strongly argued that only true centres of excellence could hope to attract the best people in an increasingly competitive world; foot-loose talent would look for the best available in terms of buildings and equipment.

⇒ A detailed summary of the discussion is available on www.foundation.org.uk

future. It is about deploying resources in the best way possible.

We have had a particular experience of foresight — Technology Foresight. It was a good experience. We used the process to generate our National Development Plan. To be frank, the process was a bit of an adventure. We were not sure what the destination would be. Nevertheless, we knew from the enthusiasm and advice gleaned from countries such as the UK, the Netherlands, Austria and New Zealand that important benefits lay ahead. It is important to learn from and, where possible, to use the experiences of others.

Arising from our Technology Foresight process between 1998 and 1999, the Government decided to strengthen the public research system significantly over the period 2000-2006 and agreed an extra public investment of €635 million in world-class basic research in biotechnology and information and communication technologies (ICTs). The underlying rationale was the need radically to upgrade the Irish research system to achieve world levels of excellence. To implement this new research fund, in 2001 we established Science Foundation Ireland (SFI) with a remit to establish world-class Irish research programmes in science and engineering fields that underpin biotechnology and ICTs. SFI will pursue three main goals:

- To help tertiary institutions recruit

and retain scholars capable of building internationally significant research programmes;

- To foster related programmes at all levels of Irish education so that students can learn the excitement of these fields (and consider careers in them); and
- To encourage and join governmental, educational and industrial efforts that strengthen Ireland's scientific, engineering and entrepreneurial cultures and promote the resulting technological innovations throughout the world.

The Irish government does not underestimate the challenge facing SFI in developing significant clusters of world class teams able to make a major impact. But we have already faced such challenges, as when we first began to attract high-technology investment. The intention now is to develop a research environment that will compete with the best in the world in chosen areas. It is an ambitious project that will lead to a sustained effort to transform Irish scientific and engineering research.

Constant change marks all our lives. Innovation is about anticipating and shaping that change to achieve our social and economic objectives. It is a challenge that faces all of us. I am confident that, by collaborating, we can enhance the quality of life for all of the people on the island of Ireland, in the exciting years ahead. □

Salt and diet — too much or too little?

Held at the Royal Society on Tuesday, 24 April, 2001

The three speakers reviewed the evidence linking high blood pressure with the risk of coronary heart disease and strokes, and sodium intake with high blood pressure. Their remarks are summarised here and landmark publications in the field are listed opposite.

Professor Morris Brown FMedSci

Professor of Clinical Pharmacology, Addenbrooke's Hospital and University of Cambridge

There are two ways for high blood pressure to develop. The first is for increased resistance to blood created by excessive vasoconstriction of the arteries, and the second is for there to be too much blood or fluid circulating, either because the heart pumps too much or because there is simply more salt and water in the system. The problem for the 'salt lobby' pushing to reduce salt intake, is that most of the fluid is in the low-pressure venous side of the circulation. An acute salt load causes little increase in blood pressure because its immediate home is in the veins until the excess leaks out through the kidneys.

The development of hypertension usually takes many years, and, in most patients it is the result of the interaction of multiple factors, inherited and environmental, of which salt intake is only one. The evidence that I shall review says that under some circumstances, salt *can* be a key factor in hypertension but these circumstances appear to be exceptions that prove the rule.

In a classic study in 1972, Dahl *et al.* demonstrated a link between salt intake and blood pressure, supporting the data with clinical, ecological studies. And a meta-analysis (or overview) of 27 epidemiological studies suggested a direct linear relationship between salt and blood pressure (L. Gleibermann; 1973). The weight of pharmacological evidence, however, is consistent with the model of hypertension in which initial stages in Caucasian patients are driven by excess vasoconstriction not by salt, with retention of salt, if it occurs, a later secondary event. When increased sensitivity to salt is known to be the cause of hypertension, as in a few rare inherited syndromes, patients have a very low level of the kidney hormone, renin, in their blood, and their blood pressure is unresponsive to drugs which work by suppressing renin. A similar, low-renin picture is seen in young Afrocaribbean patients with hypertension; but this is the opposite of the picture seen in the early stages of hypertension in Caucasians.

Most patients with hypertension succumb to myocardial infarction rather than stroke, although the main risk due to hypertension itself is stroke and this is primarily what we seek to prevent. In consid-

ering how much blood pressure needs to be reduced to lower stroke risk, small differences in blood pressure are less likely to reduce risk in normal than hypertensive subjects. It is also much harder to demonstrate even short term reductions in blood pressure within the normal range, and there is no evidence of long-term reductions in blood pressure by salt restriction, far less prevention of stroke. So one wants to take the extrapolations of epidemiologists with, dare I say it, a pinch of salt.

Drugs are not the only approach to controlling blood pressure. The most comprehensive study so far on the effect of diet is the DASH (Dietary Approaches to Stop Hypertension) Study. This took over 400 subjects on a control diet low in fruits, vegetables, and dairy products, and with a fat content typical for Americans. For 8 weeks participants were put onto either the control diet, a diet rich in fruits and vegetables, or a combination diet (the 'DASH diet') that emphasized fruits, vegetables, and low-fat dairy products. The study showed that about the same average effect that was obtained using drugs could be achieved by increasing the fruit and reducing the fat content of diet.

Later Appel *et al.* (1997) looked at subjects in the DASH diet or a normal diet, on normal, medium and low salt diets, 8, 6 and 4 grams a day. Both the 'pro' and 'anti' salt camps claim support from the support from the data. The clear message that I draw is the study's confirmation of the first DASH study of a substantial fall in blood pressure when we increase fruit and reduce fat intake. The benefit of reducing salt intake alone seems to be small, especially when one considers that most of the benefit is achieved at very low levels of salt intake — extremes that many subjects will be unwilling to go to for the many years that it is necessary to prevent stroke.

So, in conclusion, salt can cause hypertension but only for certain when there is a pre-existing abnormality of salt handling, or perhaps in populations where salt intake is higher than the 10–15 grams a day typical of the UK diet. Because the evidence for benefit from drugs is overwhelming our immediate task is to make sure that all hypertensive patients receive the right drugs. But if we are to avoid a hefty hike in the drug bills, as new expensive drugs are tested in ever lower levels of blood pressure, we have two options. Either we can

make diuretics (which rival aspirin for safety, effectiveness and cheapness) available over the counter, which sounds unlikely; or we can explore where hard evidence exists to back dietary re-education, especially at the age when the seeds of hypertension are being sown.

At older ages, I think the horse has already bolted and I like this quote, attributed to George Burns: "Personally I stay away from natural foods. At my age I need all the preservatives I can get." □

Professor Paul Elliott FMedSci

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I will be looking at the same data as Professor Brown — but will come to rather different conclusions.

Twelve year follow up of the 360,000 men screened for entry into the Multiple Risk Factor Intervention Trial (MRFIT) in the United States makes it clear that there is no divide between hypertensive levels and lower blood pressure levels in terms of risk. Rather there is a continuous increase in risk with higher blood pressure right across the blood pressure range. The majority of the population have blood pressure levels within the 'normal' or 'high normal' range, but nonetheless are at excess risk compared with men with the lowest blood pressures (systolic blood pressure <110 mm Hg). The statistics show that about half of the excess mortality related to high blood pressure occurs at levels that we do not treat with drugs — so non-pharmacological approaches are required if the public health burden of blood pressure associated morbidity and mortality is to be tackled.

The Health Survey for England shows that as the population ages, the proportion of people in the hypertensive ranges of blood pressure increases. Though the highest risk of death associated with blood pressure is stroke, in terms of overall population burden there are many more deaths associated with coronary heart disease, as this is commoner. The challenge is to prevent the age-dependent rise in blood pressure that we see in Western populations. We know that there are populations around the world where this rise in blood pressure does not hap-

Chronology of the major studies

Dahl, L. K. *et al.* Influence of dietary potassium and sodium-potassium molar ratio on the development of salt hypertension. *J. Exp. Med.* 136, 318–320 (1972).

Clinical, ecological, and rat studies support a link between salt and high blood pressure.

Gleibermann, L. Blood pressure and dietary salt in human populations. *Ecol. Food Nutr. Res.* 2, 143–156 (1973).

Reviews 27 ecologic studies and suggests a direct relationship between salt and blood pressure.

INTERSALT Cooperative Research Group. INTERSALT: an international study of electrolyte excretion and blood pressure. Results for 24-hour urinary sodium and potassium excretion. *Br. Med. J.* 297, 319–28 (1988).

Study of 52 populations shows significant relationships between salt and blood pressure and between salt and the rise in blood pressure with age.

INTERSALT Cooperative Research Group. Intersalt revisited: further analysis of 24 hour sodium excretion and blood pressure within and across populations. *Br. Med. J.* 312, 1249–1253 (1996)

Statistical reanalysis of the original Intersalt data finds consistent positive association between salt and blood pressure.

Law, M. R., Frost, C. D. & Wald, N. J. By how much does dietary salt reduction lower blood pressure? I: Analysis of observational data among populations. *Br. Med. J.* 302, 811–815 (1991).

A major review concludes that the salt-blood pressure link is “substantially larger” than generally appreciated.

Denton D. *et al.* The effect of increased salt intake on blood pressure in chimpanzees. *Nature Med.* 1, 1009–1016 (1995).

Midgley, J. P, Matthew, A. G, Greenwood, C. M. T. & Logan, A. G. Effect of reduced dietary sodium on blood pressure. *J. Am. Med. Ass.* 275,1590–1597 (1996).

Meta-analysis of 56 trials finds that benefit from salt reduction is small and does not support current dietary recommendations.

Cutler, J. A., Follmann, D. & Allender, P, S. Randomized trials of sodium reduction: an overview. *Am. J. Clin. Nutr.* 65(suppl), 643s–651s (1997).

Meta-analysis of 32 trials concludes that there is considerable benefit from salt reduction. This study supports current dietary recommendations.

TOHP II. Sodium Reduction Main Effects. *Arch. Intern. Med.* 157, 657–667 (1997).

The Hypertension Prevention Collaborative Research Group’s clinical trial in 2,400 subjects indicates that long-term reductions in salt intake are hard to maintain, resulting in little or no reduction in blood pressure.

Graudal, N. A., Galloe, A. M., Garred, P. “Effects of sodium restriction on blood pressure, renin, aldosterone, catecholamines, cholesterol and triglyceride.” *J. Am. Med. Ass.* 279, 1383–1391 (1998).

Meta-analysis of 114 clinical trials does not support a general recommendation to reduce salt intake.

Chobanian A. V., Hill, M. National Heart, Lung and Blood Institute Workshop on sodium and blood pressure. A critical review of current scientific evidence. *Hypertension* 35: 858–863 (2000).

Sacks, F. M. *et al.* for the DASH-Sodium Collaborative Research Group. Effects on blood pressure of reduced dietary sodium and the DASH diet. *N. Engl. J. Med.* 344: 3–10 (2001).

pen, and we know that when those populations migrate to Western or urban populations, their blood pressures go up. So there is no genetic protection against the rise in blood pressure with age; it must be caused by environmental factors.

That brings us on to salt and blood pressure. Salt is one of the most studied of the potential environmental causes. Recent overviews of randomised clinical trials of sodium reduction (for example Midgley *et al.* (1996), Cutler *et al.* (1997), Graudal *et al.* (1998)) gave average reductions in blood pressure that ranged from 3.9 to 5.9 mm Hg systolic and 1.9 to 3.8 mm Hg diastolic blood pressure among hypertensive individuals, and 1.2 to 1.9/0.3 to 1.1 mm Hg systolic/diastolic respectively among normotensive individuals, for average sodium reductions ranging from 75 to 160 mmol. The overviews include trials of varying quality, with varying degrees of compliance, while the range of estimates reflect different trial inclusion criteria.

More recently, results of the DASH-sodium feeding study have been published (Sacks *et al.*, 2001), in which participants were randomised either to a control “usual American” diet, or the DASH diet, at three levels of sodium : high , intermediate and low (141, 106 and 64 mmol/day). The DASH diet itself is high in fruit and vegetables and low-fat dairy products, with reduced saturated and total fat content, in comparison with the “usual American” diet. The study found that both the DASH diet and the reduced sodium diets independently lowered blood pressure; though the effects were not strictly additive, the largest blood pressure reductions were found in the low sodium/DASH diet group (8.9/4.5 mm Hg lower systolic/diastolic pressure compared with high sodium control diet). A greater fall in blood pressure occurred from intermediate to low

sodium than high sodium to intermediate; for participants taking the control diet with low compared with high sodium intake (ie 77 mmol lower sodium), systolic blood pressure was reduced by around 8 mm Hg among hypertensive individuals and 5.5 mm Hg among normotensive individuals. For all DASH participants combined, low versus high sodium reduced blood pressure by 6.7/3.5 mm Hg systolic/diastolic.

Seminal among the animal work is the controlled trial among chimpanzees reported by Denton *et al.* (1995). With stepwise addition of up to 15 g salt/day (255 mmol/day sodium) to their usual low-sodium diets, systolic/diastolic pressure rose 33/10 mm Hg over a 20 month period, with rapid reversal to baseline once the added salt was removed.

Moving on to the epidemiological data, the Intersalt study was carried out in 52 different population samples from 32 countries involving over 10,000 men and women in the age range 20–59 years. Sodium intake was estimated from 24-hour urine collections. Four isolated population groups stood out from the rest in terms of their sodium excretion: the Yanamamo and Xingu Indians of Brazil, highlanders in Papua New Guinea and the Luo in Kenya. The Yanamamo excrete virtually no sodium in their urine; in these populations, there is virtually no increase of blood pressure with age.

Intersalt found a highly significant association of average sodium excretion of the populations and their upward slope of blood pressure with age. These data were challenged by the salt industry in the United States through an organisation called ‘The Salt Institute’ which represents the manufacturers and producers of salt and, through their lawyers, they requested that the study re-analyse the data with a different method for looking at the rise of

blood pressure with age. The reanalysis was done (Elliott *et al.*,1996)) giving similar findings to the originally reported results (Intersalt, 1988), but, to my knowledge, the Salt Institute has not quoted the results of the reanalysis that they requested.

Intersalt also looked at the association of dietary sodium with blood pressure between individuals within the populations. In the sample of 10,000 people there was a 3–6 mm Hg difference in systolic blood pressure per 100 mmol difference in daily sodium excretion. This range of estimates reflects the uncertainty in correcting for the various confounders in the study (particularly body weight) and made allowance for the fact that a single 24-hour measure of sodium excretion is imprecise, as we vary greatly day-to-day in the amount of sodium we eat. Across the populations, there was a 4.5 mm Hg difference in systolic pressure per 100 mmol sodium. Again these results are consistent with the trial data, including the new DASH-sodium study, and with overviews of the other observational studies.

Although apparently small clinically, a 2 or 3 mm Hg difference in mean blood pressure at population level translates into around 4 or 5% lower coronary heart disease mortality and 6 to 8% lower stroke mortality. In England and Wales, at younger ages, 45 to 64 years, that would translate into about 3,000–4,000 fewer deaths a year. For 5 mm Hg, the estimate is 9% lower coronary heart disease mortality, 14% lower stroke mortality, and some 7,000 fewer deaths in that lower age range.

Potentially, these differences could have big effects on public health. Malcolm Law and colleagues, reviewing the evidence from the trials and the epidemiological data in 1991, said of salt reduction and blood pressure “few measures in preventive medicine are as simple and economical and yet can achieve so much”. The evidence on salt

and blood pressure has been looked at by various expert bodies around the world, including the Cardiovascular Review Group of the Committee on Medical Aspects of Food Policy (COMA); they recommended a reduction in the average intake of salt in the adult population from the current level of about 9 grams a day (150 mmol sodium), down to about 6 grams a day (100 mmol).

So given the evidence, and the recommendation, why not act upon it? One problem is that about 75% of the salt in our diet is added by the food manufacturer in food processing, only about 10% of our salt intake is 'natural' salt content of foods, while the remaining 15% is added in cooking or at the table. So if we really do want to reduce our sodium intake, we have to tackle this 75%, and that means changing the food that we buy in the supermarkets. There has been considerable opposition to the idea of tackling the salt 'at source', and the adoption of the COMA recommendations has been strongly resisted — as recounted in a 1996 editorial in the *British Medical Journal*, "Food Industry Fights for Salt",

On a more positive note, the White Paper "Saving Lives — A Healthier Nation" has led to meetings with the food industry to explore ways of reducing the salt content of processed food, while a number of major retailers have taken action themselves to reduce the salt content of their products. There are also constructive moves towards better labelling allowing consumers to make their own choices.

To sum up, the evidence is compelling, from animal models, clinical trials and epidemiology, that dietary sodium is a key factor in high blood pressure and the rise of blood pressure with age. If we could reduce sodium in the diet, we may help to stem that rise of blood pressure and reduce the blood pressure burden in the community. □

Professor Rob Pickard,

Director-General, British Nutrition Foundation

The great interest in the role of salt in the diet in relation to hypertension highlights the danger of focussing too much on a single factor and neglecting other factors such as lifestyle. For instance, a study of nuns in a closed order over a 20-year period showed no rise in blood pressure with age, compared with local controls. The mean difference was 30 millimetres of mercury — a very significant difference in blood pressure — and in this and other similar instances the differences in blood pressure have been attributed to lifestyle rather than diet.

The major studies such as DASH and Intersalt clearly show that dietary advice is important, and is best when tailored to the

needs of the individual rather than applied doctrinally to a heterogeneous population. At the moment, we don't know enough about how to 'personalize' dietary advice but this will change as we begin to make full use of the information revealed by the sequencing of the human genome.

In all this talk of diet, blood pressure and food technology, it is too easy to forget that we eat food for pleasure as well as just 'to live'. The difficulties of influencing public taste have been touched on by the other speakers. Humans place a high sensory value on salt, and an appreciation of this is critical to understanding some of the problems that we have today in food addiction. We evolved in the sea and land animals are basically bags of sea water in an alien environment. Not surprisingly, the nervous system evolved to place a high value on the detection of salt through the sensory system and taste receptors. Now we have an abundance of salt in our diet, it is no longer appropriate for us to have a nervous system so highly tuned to gathering — and enjoying — salt. But, of course, we haven't changed the way our brains work.

It is unfair to say that industry has not been sensitive to the argument that there is too much salt in our food. Alternatives are being used increasingly in processing and as bulking agents, and companies are taking steps to limit salt used as a flavouring or taste enhancer. There are lessons to be learned — Heinz, for example, originally reduced the salt in one of their product and quickly had the products sent back to them because consumers complained. But when they reduced the salt level very slowly and gradually, they managed to retrain the palates of their consumers.

Taste is a relative sense and that is why it is difficult for one company to act unilaterally to reduce salt level and thereby affect taste. That is why it is key to identify groups of companies that produce similar products and work with them. If the public's taste is to be 'trained' to less salt, not only the food manufacturers but chefs in catering establishments and restaurants would need to adjust their salt levels.

I conclude with the view of the British Nutrition Foundation on dietary salt intake. For hypertensives, we should certainly reduce salt intake if it is high. But for 'normotensive' individuals, after a lot of soul-searching and assessment of the literature, we do not find that health benefits would definitely result from a reduction in dietary salt with no change in lifestyle or other contributory factors. However, a gradual reduction of high salt intake is a reasonable precautionary measure and when it comes to children, we have a duty of care which is critical and it would be prudent not to encourage the early establishment of a high salt intake habit in children. □

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Dr Robert Coleman, Chief Scientific Officer, Pharmagene Laboratories Ltd
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