MEDICAL PRACTICE

All change for research

RICHARD SMITH

It is clear that the methodology of evaluation [of research and development] is less scientific than the science and technology it is designed to assess.¹

HOUSE OF LORDS SELECT COMMITTEE ON
SCIENCE AND TECHNOLOGY, 1986

Our project has only one goal: to demonstrate that objective, scientific techniques—instead of the present anecdotal approach—can be used to design and justify a national biomedical research policy.²

JULIUS COMROE, ROBERT DRIPPS, 1976

Now is a good time to be writing about Britain's policy on biomedical research because the whole research enterprise is in flux. The next 10 years will see a transformation of the research community in Britain. It may emerge a much more innovative creature that is adept not just at creating but also at exploiting new knowledge, or it may be castrated—for a research culture is much more difficult to create than to destroy. At the moment we have the paradox—albeit familiar to those who watch the National Health Service—of eminent scientists queuing up to make statements on crisis and low morale (see first box), while the government and its advisers keep announcing proposals designed to galvanise British science.

What cannot be disputed is that Britain is falling behind in expenditure on science compared with its competitors and is also experiencing a decline in its share of world scientific publications and the amount that they are cited.^{3,7} Japan, meanwhile, is moving up very fast: it increased its overall expenditure on research in natural science from 2.9 trillion yen in 1976 (£5417m at the 1976 exchange rate) to 8.1 trillion yen in 1985 (£26376m at the 1985 exchange rate),⁸ and the Minister for Education, Science, and Culture has just asked for a 20% increase in government expenditure on science for 1988.⁹ Such expenditure may well relate to Dr Susumu Tonegawa, aged 46, winning this year's Nobel prize for medicine for his work on the genetics of antibody production. He was the first Japanese to do so.

As well as sharing the problems of the whole British research community medical research has its own particular pressures that are forcing change, and the House of Lords Select Committee on

"The morale of the scientific community has fallen to its lowest point this century. . . ."

SIR GEORGE PORTER, president of the Royal Society, 1986³²

"[We feel] increasing alarm at the speed at which our country's medical research prestige and achievements have been run down . . . it takes years to build up effective medical research teams and units, but they can be destroyed or dispersed almost overnight."

ASSOCIATION OF CLINICAL PROFESSORS OF MEDICINE, 1987³³

"I have never known such low morale in our universities and institutes."

PROFESSOR T W B RIBBLE, FRS, professor of physics at the Imperial College of Science and Technology, 1987³⁴

"Science must be supported because it is at the root of our future prosperity, and it has to be supported by a clever mix of calculation and faith that has eluded our present masters."

PROFESSOR ROGER NEEDHAM, FRS, professor of computing systems in Cambridge, 1987³⁴

"I find it incredible that again and again Mrs Thatcher emphasises how sound the economy is and yet she is starving the long term future of the country."

DR MAURICE WILKINS, FRS, winner of the Nobel prize for medicine, 1987³⁴

The previous 12 months have seen "the passing of Britain as a leading member of the world of science."

Leading article in *New Scientist*, 1985³⁵

Science and Technology has a subcommittee currently considering medical research. Its report, expected early next year, will be the first ever parliamentary report on all of biomedical research, and it has received evidence from over 160 organisations and individuals. Many of those giving evidence to the committee have told it that medical research is in crisis: government funds for medical research are declining in real terms and the dual support system is on the point of collapse; many top graded projects cannot be supported by the Medical Research Council (and the council announced a fortnight ago that it was being forced to spend 20% less on its short

term grants in 1987-8); young scientists and doctors are reluctant to enter a career in research because the prospects are so poor; and some of Britain's most gifted researchers are draining away to America or into industry or commerce. Some of these factors presumably contribute to the decline in citations of biomedical research papers produced from Britain, although the total number of papers published has remained roughly constant (figs 1 and 2). Paradoxically, however, while government funds for medical research have undoubtedly declined in real terms, total funds available for biomedical research have increased in real terms because of the rapidly growing contributions of the medical charities and the drug industry (fig 3).¹⁰

A new secretary, Dr Dai Rees, has just taken over at the Medical Research Council. He will have to respond to these problems, and

FIG 1—Number of biomedical research papers published by five countries during 1976-82. (Advisory Board for the Research Councils, Royal Society, Economic and Social Research Council.⁵)

FIG 2—Citations received by all biomedical research papers published that year and in the preceding three years by five countries 1976-82. (Advisory Board for the Research Councils, Royal Society, Economic and Social Research Council.⁵)

FIG 3—Estimated total expenditure on biomedical research in Britain at 1981-2 prices (a detailed explanation of how the figures are reached will be given in a future article).

he will have to see through merging the Royal Postgraduate Medical School and the Clinical Research Centre. He will also have to prove the competence of Britain's biomedical research community by producing value for the £14m that the government has set aside specifically for research into the acquired immune deficiency syndrome (AIDS), although it is minute compared with the \$1 billion set aside by the United States government.

A series to come

This series of articles will consider the problems of the whole research community but concentrate on those facing biomedical research. I will discuss the crisis in funding and describe the structure of government research and the proposed changes, but will not be transfixed by these much publicised issues. I want to go much deeper into detailed questions such as how research funding bodies decide whom they will support and how they evaluate their results and I have spent many hours at the MRC. I will consider, too, the difficulties facing individual researchers. To take a wider view I have been to the United States and looked at the elaborate systems of the National Institutes of Health. Finally, I have been reading about science policy research and talking to its practitioners in an attempt to understand this emerging discipline. The process of researching into research is building up steam but is not yet having much influence on those who manage biomedical research.¹¹

Galvanising the research community

The fast pace of change in the organisation of research has been set by the government, which seems as enthusiastic about transforming the research community as it does about cleaning up the trade union movement. The government's main weapon has been money, and progressive squeezing of university and research council budgets has caused hard thinking on priorities and methods. Now the government and its satellite committees are proposing substantial structural changes, including the creation of a cabinet committee chaired by the Prime Minister that will decide national priorities in research.¹² She is said to be willing to tackle even seemingly impossible questions such as, for example, "How much should we spend on research into transport compared with research into health." Biomedical researchers might do well out of such comparisons if they can present their case well—because the public

is likely to be more enthusiastic about medical research than almost any other sort of research.

Selectivity is an important part of the new culture that the government is trying to introduce, and in 1986 the University Grants Committee began awarding funds selectively based on assessments of university departments' performance in research. The exercise raised a storm of protest, particularly because it was not made clear how the judgments were made and because there was no appeal.^{13 14} While conducting that exercise the University Grants Committee has itself been examined and found wanting¹⁵ and is to be transformed into a leaner, hungrier University Funding Council that will have more industrialists and fewer academics and may eventually contract out teaching rather than simply hand out grants.^{16 17} It may also have the funds that it distributes for research taken away; they would be distributed instead through the research councils, which may themselves be amalgamated into one large research council.¹⁵

Three grades of research in universities?

Meanwhile, the Advisory Board for the Research Councils, the body that stands between the five research councils and the government and advises on how the government distributes funding between the councils, has proposed taking the process begun by the UGC much further and creating three sorts of institutions of higher education: those that maintain substantial research activity across the range; those that do what will inevitably be second class (although the board does not use that term) research simply to support and develop teaching; and those that do first class research but in only a few subjects.¹⁸ The board also wants to see the research councils develop in association with higher education institutions interdisciplinary research centres and to support research in higher education through "higher value, longer term, programme grants." These proposals, which have been long expected and are in many ways simply the speeding up of a process already under way, have grown out of the Oxburgh report on concentrating resources in earth sciences.¹⁹ Published in only May 1987 that report's proposals are already being put into action, and university earth science departments are being invited to apply to be in a particular tier by January 1988. The government asked for responses to the proposals of the Advisory Board for the Research Councils by October 1987 and the Committee of Vice-Chancellors and Principals last week announced its "outright rejection" of the "autocratically imposed stratification." But the proposals will probably be adopted without much modification because the board is singing the tune that the government wants to hear. The only snag may be the extra money that the board says is necessary for restructuring.²⁰

But while making these proposals—which some of the board's members did not support—the board itself may have had its influence reduced. The government is to create an Advisory Council on Science and Technology (ACOST), which will advise ministers on all aspects of science.¹⁴ The new council will have a considerable input from academic science but will be chaired by an industrialist—Sir Francis Tombs, the chairman of Rolls-Royce. The government is also to set up—on the advice of the Advisory Council for Applied Research and Development (which is also chaired by Sir Francis Tombs and which is being replaced by ACOST)—a Centre for Exploitable Areas of Science and Technology. The centre is to get £1m from government and £3m from industry. The new "independent" organisation will monitor developments in science and changes in world markets and spot exploitable possibilities.

All these changes mean that Britain's research effort is to be managed to a much greater extent, and its primary aim will be less the generation of knowledge for its own sake and more the production of innovations that will increase "economic and social returns from science and technology."¹² And who can doubt—particularly with the ascent of industrialists in advising on research—that the emphasis will be on the economic rather than the social? The government is keen, too, that much more of the support for research should come from private sources rather than from central government. In biomedical research this trend has been happening

"The end of our Foundation [of natural philosophers] is the knowledge of Causes, and secret motions of things; and the enlarging of the bounds of Human Empire, to the effecting of all things possible . . . upon every invention of value, we erect a statua to the inventor, and give him a liberal and honourable reward."

SIR FRANCIS BACON, Lord Chancellor of England, 1627³⁶

"It is for the association of savants [natural philosophers] to judge independently what it believes should be undertaken to speed up the progress of science. It is for the public authorities to judge with the same independence which of its projects merit support or even munificence. Let us not despair of seeing the time when this division can be effected through reason alone."

ANTOINE DE CONDORCET, French aristocrat and revolutionary, 1804³⁷

"It cannot have escaped the attention of those . . . who have had opportunities to judge science in other countries, that here in England we are much below other nations, not merely of equal rank, but below several even of inferior rank. That a country 'eminently distinguished for its manufacturing ingenuity' should be indifferent to the process of inquiries which form the highest department of that knowledge on whose elementary truths its wealth and rank depend is a fact which is well deserving the attention of those who shall inquire into the causes that influence the progress of nations. . . . Unless there exist peculiar institutions for the support of such [abstract] inquirers, or unless the government interfere, the contriver of a Thaumoscope may derive profit from his ingenuity, whilst he who unravels the laws of light and vision on which multitudes of phenomena depend, shall descend unrewarded to the tomb."

CHARLES BABPAGE, professor of mathematics in Cambridge, 1830³⁸

" . . . we must proceed with caution in carrying over the methods [of coordinating and supporting research] in wartime to the very different conditions of peace. We must remove the rigid controls which we have had to impose and recover scientific freedom of inquiry and that healthy competitive scientific spirit so necessary for expansion of the frontiers of scientific knowledge. . . . Basic research leads to new knowledge. It provides scientific capital. It creates the fund from which the practical applications of knowledge must be drawn. New products and new processes are founded on new principles and new conceptions which, in turn, are painstakingly developed by research in the purest realms of science."

VANNEVAR BUSH, dean of engineering, Massachusetts Institute of Technology, and director, Office of Scientific Research and Development, which organised the building of the American atom bomb, 1945³⁹

fast, and the medical charities and the pharmaceutical industry now have more money to spend on research than the Medical Research Council (fig 3). The MRC has been much slower than some other research councils—for instance, the Natural Environment Research Council²¹ and the Agricultural and Food Research Council²²—to seek funds from sources other than the government.

Although the cutting of government funds for research and the proposed restructuring are causing anguish and despair, in some ways they are another skirmish in a long running battle between governments and scientists everywhere over how much scientists should be allowed to set their own objectives and pursue them and how much they should do what the government wants them to do (see pictures and quotes). Ronayne traces the conflicts back to Francis Bacon,²³ and as recently as 1971 Lord Rothschild attempted to tip the pendulum the government's way with his customer-contractor principle.²⁴ At least in medical research the principle proved a flop,²⁵ but the most recent proposals for change are in many ways another form of Rothschild.

Russian novels and soap operas

The previous paragraphs must have read to many doctors like the introduction to a particularly complex Russian novel or to the 500th episode of a television soap opera. Who are all these committees, boards, and councils, what do they do, and how do they fit together? And how do their grand proposals translate into what research is going on in the local university department of surgery? These are some of the questions that I want to consider in this series, but the heart of the problem is whether grand designs from above can be translated into excellent research below.

Changing medical research

Biomedical research must proceed within this large and rapidly changing world but it also has its own particular challenges to face. Although the secretary of the MRC does not have anything like the power that he once had, Dr Rees still has the potential to change directions in medical research. His power has been reduced not only by the ascent of other sources of funding but also by the increasing size and complexity of the MRC itself. At one time the secretary could have a large say in most of the decisions on which research projects to fund, but now many of the decisions are taken without his participation. Still, however, the secretary of the MRC can be seen as the natural leader of the medical research community, and from this point of view what goes on at the MRC matters greatly.

One thing Dr Rees will have to do is to change the image and the workings of the MRC. The government and its advisers see the MRC, I think, as an organisation that is reluctant to change with the times and engage more in management, evaluation, priority setting, and economic exploitation. In contrast with the MRC, the Agricultural and Food Research Council has produced four corporate plans (the latest of which includes a cost benefit analysis of many of the projects it supports²²), has increased its income from industry to over 10% of its overall income (for the MRC it is well under 1%), has appointed an officer who is looking at objective performance indicators, and even has outsiders evaluating its corporate plan. The Agricultural and Food Research Council also has above it a priorities board that sets priorities for all agriculture and food research.²⁶ The Prime Minister herself participated in setting up this priorities board, and it may well prove to be a model for other research subjects, including medicine. In resisting these management pressures the MRC has, however, been doing what many scientists want; they see the pressures as passing fashions.

But the MRC's image generally is little better with scientists and particularly doctors than it is with the government. By many doctors it is seen as remote, elitist, and arrogant, rarely explaining or publicising what it is doing, overconcerned with science and underconcerned with improving the health of the people, and insufficiently accountable. A vitriolic correspondence in the *BMJ* over whether the MRC was biased against medical schools in the

north²⁷ featured a professor of surgery saying: "It is a national disgrace that an organisation of this kind [the MRC]—however successful it might be—can proceed in the way it does without scientific accountability, without a policy, and encased in its own arrogance. Nothing short of a formal inquiry will convince me that the MRC really serves the public interest in relation to solving the problems of disease now, as distinct from those of science for the future."²⁸ More than 50 years earlier another surgeon, Lord Moynihan, said "the Medical Research Council, which might exert so magisterial and incisive an influence upon the progress of medicine, the very purpose for which it was founded, seems too busy with little things, too aloof from the day to day practice of medicine."²⁹

My contacts with the MRC have convinced me that many of these perceptions are unfair, but active steps will still need to be taken to change the image. The MRC will have to raise its profile not just with doctors and researchers but also with the public and with politicians. In the new world being forged by Mrs Thatcher the MRC will have to beat its drum loudly to guarantee its funding. This is what the National Institutes of Health has to do in the United States, and it will happen here. Political lobbying and "manipulation" of the media—the job of public relations people—will become more important to the MRC. Will the stuffy MRC be able to cope with this change? It has at least appointed a public relations person, and its annual reports and newsletters are now much more attractive.

Dr Rees will also have to see through the recently announced decision to merge the Clinical Research Centre and the Royal Postgraduate Medical School on the Hammersmith site. This long running problem can be seen both as a test of the council's commitment to clinical research and as a test of its ability to come through a bureaucratic nightmare featuring London University, health authorities, local authorities, and government departments.

Dr Rees will have to struggle as well with the general problems of clinical research. How can medically qualified doctors be attracted into internationally competitive research when the career prospects are so poor and the gap is growing so fast between the financial rewards of NHS work (generously supplemented by the expanding possibilities of private practice) and academic research work? How can the handful of doctors who are keen to do such research best be trained? And how can they be given the large amounts of time needed to do it? The plans for reorganising medical manpower, announced last week,³⁰ are likely to make it even more difficult to attract medically qualified doctors into research.

The MRC will also have to become more forthcoming in its relations with the medical charities and with industry. It must recognise that these groups are now financially just as important as it is, and it must work with them more creatively. Coordination and exploitation are two of the buzz words in the government's plans for reforming research. One of the reasons that Dr Rees got the job of secretary of the MRC was probably his experience of industry. Can he now capitalise on that experience?

Two other buzz words—selectivity and evaluation—will also give Dr Rees headaches. The MRC is already very selective in whom it supports, but it may have to become much more so. In particular it may have to be more brutal in closing units that are not producing the goods, despite the fact that any attempt to close a unit produces a clamour both in parliament and in the press. The MRC's record on evaluation, and particularly on studying its own processes, is not so good. The pressure for evaluation comes not just from politicians but also from academics.^{1-5 13 14 31} The box on the next page gives some questions that the MRC might address. Dr Eugene Garfield, president of the Institute of Scientific Information, last week addressed a meeting of the Biological Council in London and pointed out how absurd it was that universities were willing to invest what amounted to about £1m in giving tenure to an academic and yet were unwilling to invest even 1% of that amount in numerically evaluating his work.

Finally, and perhaps most importantly, both Dr Rees and the whole biomedical research community in Britain will be tested by how they respond to the acquired immune deficiency syndrome. The £14m set aside by the government for research into AIDS may

"I appreciate the generous sentiments which actuate the aspiration of guiding the progress of science into socially beneficial channels, but I hold its aim to be impossible and nonsensical. . . . Any authority which would undertake to direct the work of the scientist centrally would bring the progress of science to a standstill."

MICHAEL POLANYI, professor of chemistry and then of sociology, University of Manchester, 1962⁴⁰

"I had lunch with Sir Denning Pearson, the deputy chairman of Rolls-Royce, and discussed with him the general problem of our research operations. He said that the worst people in the world to decide their own programme were research scientists and that we ought to latch businessmen on to each of our research stations. This is in line with my current thinking."

TONY BENN, former British Minister of Technology, 1966⁴¹

be a paltry amount compared with the amounts being spent by the Americans and the French, but the government will want to see results.

A challenge to us all

The problems that face biomedical research are not, of course, problems just for Dr Rees and other scientists. The future of medicine depends heavily on its research effort, and the whole medical community needs to pay more attention to how that effort is organised. That is the idea behind these articles.

**Questions that might be researched (rather than just considered) by the
Medical Research Council and other bodies funding research**

- Are resources better concentrated in fewer bigger units or spread through more smaller units?
- Does the presence of first class research in a medical school mean that its teaching is better?
- Are bigger MRC units more productive proportionately than smaller ones?
- Within a unit is strong managerial direction better than a laissez faire attitude?
- What is the comparative productivity of the different research councils? What are the factors that seem to improve productivity?
- Can the excellent be easily recognised?
- Is the best policy for research to give excellent people lots of funds and freedom?
- What is the best ratio of basic to applied clinical research?
- How can topics that are poorly researched be spotted? And what can be done to encourage them?
- How can we predict which will be the most productive projects?
- What is the best training for a medical researcher?
- Is the peer review mechanism the best way to select research applications that will be supported?

"It is also sometimes said in justification of basic research that chance observations made during such work, and their subsequent study, may be just as important as those made during applied R and D. While there is some truth in this contention, the country's needs are not so trivial as to be left to the mercies of a form of scientific roulette, with many more than the conventional 37 numbers on which the ball may land."

LORD ROTHSCHILD, head of the central policy review staff of the British government, 1971²⁴

"The government agree that it should be a major national priority to focus the effort of the scientific community and industry on increasing the economic effectiveness of our national investment in science and technology."

KENNETH BAKER, Secretary of State for Education and Science; quotation from government response to House of Lords Select Committee on Science and Technology.¹²

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