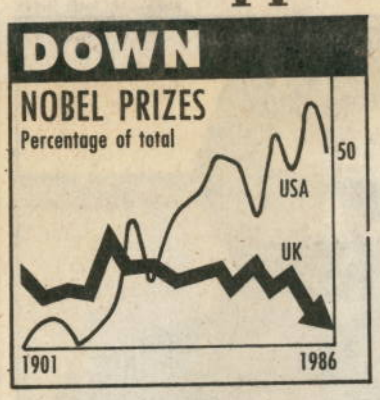
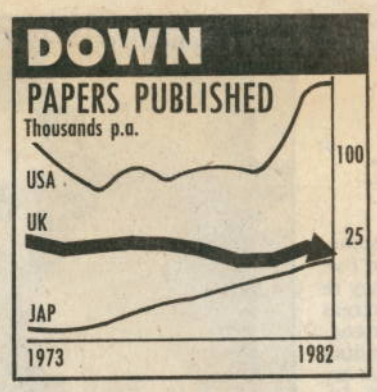
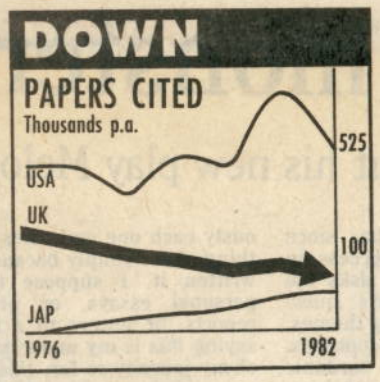
'We could find ourselves stripped naked of scientific expertise in ten y

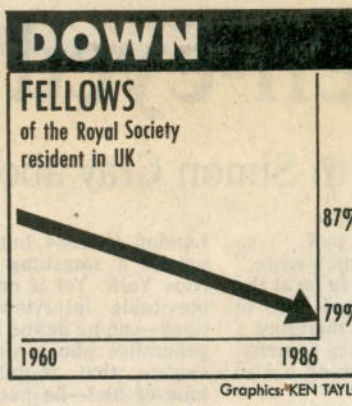
SPECIALISTS

This month the Royal Society issues a long-awaited report on Britain's accelerating brain drain. Technology correspondent ROGER HIGHFIELD finds that the future is far blacker than many had thought . . .









Graphics: KEN TAYL

Swansong for British science

"THE BRITISH are coming" read the headline in a major American university newspaper earlier this year. And it reported: "Some US adminstrators foresee the greatest sustained academic immigration since Jewish scholars fled Europe before World War II".

Every year the crisis in British research drives thousands of our best scientists abroad. Every year Britain slips further into the second division of the science league. Our reputation is no longer for first-rate science but for training excellent scientists and then driving them abroad because of low funding, dwindling morale and lack of opportunity in university laboratories.

"The situation is critical and very near irreversible," said Professor Sir George Porter, the president of the Royal Society, which will report on the brain drain in two weeks' time.

Each year 1,000 of our scientists go to the United States alone. They may be only two per cent of our total annual output of 50,000 scientists, but they represent the cream of Britain's brains, including many young scientists and whole teams who have been working in commercially sensitive areas. According to Sir George, they will probably not return.

Britons excel in vital fields such as genetics, biochemistry, medicine and artificial intelligence yet they are driven abroad by the mood of despair in the British scientific community caused by low pay and dismal prospects, exacerbated above all by poor funding for their work and uncertainty over how long the meagre funds that are available will last.

The seriousness of this drain of talent reveals itself in the exodus by Fellows of the Royal Society, the nation's most distinguished scientists. In every field of endeavour, more of them choose to work abroad today.

A report by the Advisory Board for the Research Councils (ABRC) showed that in 1960, 13 per cent of the 603 fellows lived abroad. By 1986 this proportion had risen to 21 per cent of the current fellowship of 1022.

There are now 90 Royal Society Fellows living in the United States. We could rejoice, Sir George says, if there were the same number of members of the American equivalent, the National Academy of Sciences, here. There are, however, two.

"It cannot be only because of the weather," he said. In the States a professor can, in addition to a lavish laboratory, enjoy a basic salary of up to £100,000 or more, compared with around £30,000 here. "Many will tell you the incentive is not the salary but the opportunities for apparatus, research and facilities," he added.

The overseas brain drain, bad though it is, is not as serious as the internal brain drain according to Professor Denis Noble of Oxford University, a founder member of the pressure group Save British Science which represents leading societies and thousands of scientists including 100 Fellows of the Royal Society and 11 Nobel Prize winners.

Disaffection has two roots. First, scientists and engineers

> *A British scientist can hardly travel anywhere without being subjected to pity by others*
>
> **Prof Sir David Phillips, FRS**

have to spend so much time scratching around for funds that it is difficult to pursue the research itself. Second, young graduates perceive the prospects in science as so poor that they are moving into other careers, notably banking, accountancy and management.

Prof Noble said: "It is this form of the brain drain that is most worrying of all. If not corrected, it will have very serious implications for the quality of our science in 10 to 20 years' time."

Of the international brain drain, "We have not see anything yet," said Professor Sir David Phillips FRS, chairman of the ABRC. In the long-term the demand for scientists here and in America will increase dramatically both for demographic reasons (we are at the peak of a birthrate bulge and from now the number of young people will start to decline) and because large numbers of academics taken on during the expansion of the university system in the 1960s are coming up for retirement.

Just as the phenomenally wealthy Getty Museum has cornered the international art market, the US National Science Foundation has already made it clear it will make up the deficiency by importing more talent from countries such as Britain.

"They will be recruiting like mad in industry and universities in the States just at a time when the number of graduates will be at a minimum here and over there," Sir David said. "At the moment the Americans buy the best. In 10 years' time they will be buying our average scientists."

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THE REASONS for the decline in British science are numerous. The most obvious is funding: this has been cut on two fronts. The University Grants Committee, which funds our basic science effort, has had its support for science cut by at least 11 per cent since 1981, according to an ABRC estimate. Even those departments classified as outstanding in the UGC assessment of performance have suffered. One, the Oxford physics department, has suffered a 20 per cent cut in UGC funds, including the loss of seven posts.

Treasury forecasts also show that funding for the research councils will be cut further — in spite of "technological inflation" as ever more sophisticated equipment is needed to keep Britain at the frontiers of science (estimated to be around 20 per cent by the Royal Society); fluctuations in the value of the pound (which can make a major difference in funding international "big" science); and the cost of redundancy payments and closure of research establishments.

> *We were able to respond to the Aids challenge only because of the excellent groundwork laid in the UK. But the erosion of our science base is so bad that the next virus along will beat us*
>
> **Prof Robin Weiss, director of the Institute of Cancer research**

Of Britain's £4.5 billion science budget, more than half goes on defence (compared with the Nato average of one quarter), and of this military expenditure, much goes on development, not research.

Between 1985-6 and 1989-90, it is estimated that the contribution to civil research and development will shrink by some three per cent, continuing a decline which started in 1972 (one year after Shirley Williams, the former Secretary of State for Education and Science wrote an article which warned, "For the scientists, the party is over").

The Science Policy Research Unit at Sussex University reports that, as a percentage of GDP, government spending on academic and academically related research is lower here than in Germany and France, our closest competitors.

A further problem begins with scientific education in our schools. Sir George stresses that not only is there a desperate shortage of science teachers, but our system also produces "a country of half-educated people. Britain is, on the whole, a non-scientific nation.

□ □ □

THE RESULTS of this growing inadequacy of science funding and education are clear. The ABRC reports that overall UK performances across all fields of research, declined significantly in the decade up to 1982, based on a survey of British publications and citations. Fewer British scientists are publishing papers today and fewer are being cited elsewhere — in other words they carry less influence within the international scientific community, notably in fields such as solid-state physics.

No wonder, then, that Nature, the British science magazine widely regarded as the most prestigious in the world, has rapidly increased the size of its Washington office, reflecting the dominance of American science and the slump in British output.

> *The morale of the scientific community has fallen to its lowest point this century*
>
> **Sir George Porter, President of the Royal Society**

Its editor, John Maddox, admits that he has thought privately of moving the nerve centre of the magazine from London to Washington, though he says this has not been discussed formally with the journal's proprietors.

Britain's traditional excellence in basic science has been accompanied by an impressive record of throwing up valuable new ideas. Sadly we have an equally impressive record of failing to take these ideas from the laboratory into the market-

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Land of the £100,000 professor

PROFESSOR Bob Crabtree's nuclear magnetic resonance spectrometer at Yale University in the States helped him discover a new catalyst, the first of its type with commercial applications.

Prof. Crabtree, 39, started out in research at the University of Sussex. "I looked around for the liveliest place for science in the world and it turned out to be the United States. Salaries are massive here—half as much again—before you add the extras such as consulting."

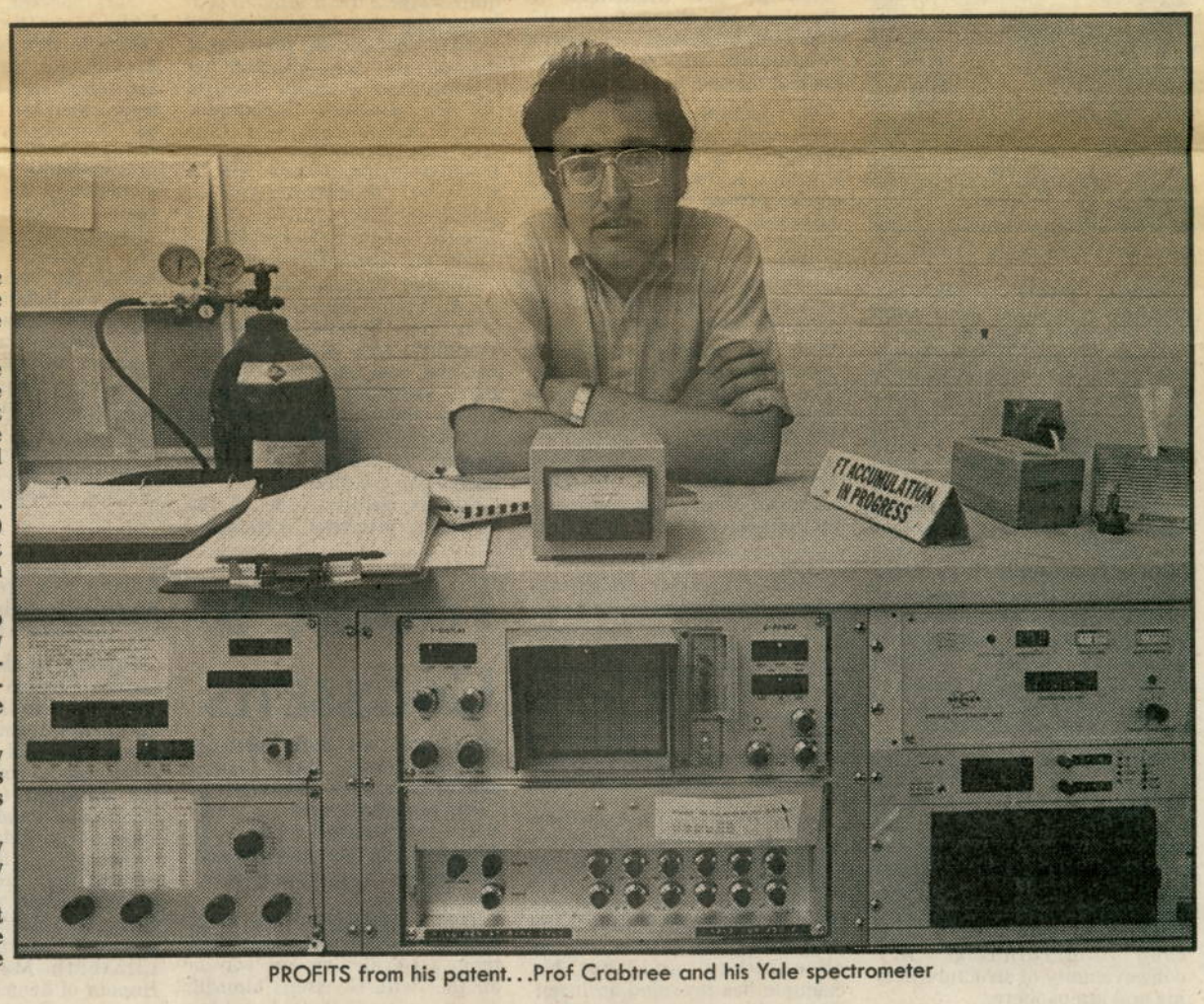
Indeed, whereas a British lecturer, senior lecturer and professor earn at most £18,000, £23,000 and £30,000 respectively, the American equivalent (assistant and associate profs, and professor) can earn up to £35,000, £50,000 and £100,000.

Now Crabtree and his graduates look set to boost their earnings, having patented the new catalyst which turns relatively unreactive molecules, called hydrocarbons, into industrially useful compounds. The catalyst is being tested by the company Exxon.

He said: "The American system is particularly advantageous for young people because it gives them scientific and financial independence as early as 24 or 25."

Ironically, he was recently awarded a Corday Morgan medal by the Royal Society of Chemistry for outstanding young researchers.

"Reading about the latest cuts and the latest problems does not encourage me to return. The present government seems unconcerned about the fate of the universities."



PROFITS from his patent. . .Prof Crabtree and his Yale spectrometer

THOSE WHO HAVE BEEN TEMPTED. . .AND ONE WHO WILL SIMPLY QUIT

THIS YEAR, Professor Alan Fersht, 44, of Imperial College, London, has had on average an offer a month from universities in Switzerland, institutes in Germany and several prestigious US universities.

One of the 18 Royal Society professors and recent winner of the Royal Society of Chemistry's Charmian Medal for outstanding research, he is one of the world's authorities in the area of protein engineering.

Temptation does not stop at money. "One will be offered a fully equipped laboratory worth

Fersht: "Crunch coming"

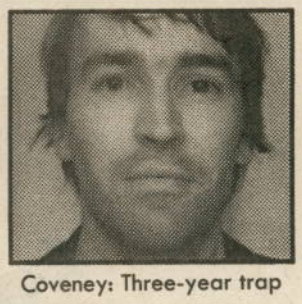
researcher can expect between three and five thousand pounds a year for three years of productive research, not study. "By

■ DR ANDREW MILLER, 33, is now at the world-renowned AT&T's Bell Laboratories in the United States. He has no intention of going home. At Heriot Watt University in Scotland he was unable to research the basic physics behind a new generation of computers the way he wanted to. He is pursuing fundamental research on the optical transistor.

He said: "There is a whole area of research in Britain which is missing, namely applied research, which is

DR PETER COVENEY, 28, a theoretical chemist who is coming to the end of his three-year term as a Junior Research Fellow at Keble College, Oxford, has offers of research positions abroad, however he most wants to remain in Britain to stay with Samia, a Cambridge University scientist he is marrying later this month.

But in spite of gaining one of the top Oxford firsts, being privileged to work with a Nobel Laureate, and having won scholarships to Oxford and Princeton, Dr Coveney will probably join the internal brain



Coveney: Three-year trap

contract work, the salary that goes with it is derisory."

For instance, a position he has been offered at the Center

■ DR JULIAN HEATH, 37, has been investigating the structure of cells and after only two years in the United States is about to take up a professorial chair at a medical school in Houston.

His research into fundamental processes that underpin research into cancer started at King's College in London. There the system was to go through a probationary period before becoming a tenured member of staff but he was turned down.

He said: "Everyone there seemed to think my science

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