

Frank

PRIME MINISTER

c. Mr. Butler

Science & Technology Seminar

I attach Robin Nicholson's first draft of your speech for this occasion which is on Monday week. The speech will be between 15 and 20 minutes long.

I imagine that you will want to work on the speech during the course of next week and with this in mind I have asked the Policy Unit to look at it with a view to developing some more ideas. Is there anything which at this stage you would like us to produce?

Perhaps we could have a word on your return from Balmoral about drafting sessions next week.

T. FLESHER

2 September 1983



Science & Technology

W.0565

1 September 1983

MR FLESHER

DRAFT SPEECH FOR THE PRIME MINISTER

- Attached are three copies of a draft speech I have prepared for the Prime Minister to deliver at her Seminar on 12 September.

The speech is designed to take the offensive at the Seminar by stating the Government's track record in support of science and technology for industry and posing questions for industry, the city and academia as to their performance. In this way I hope to avoid the Seminar developing into bleating from the audience for more help from Government.

I have also limited the number of examples of success quoted in the speech since the subsequent speakers have been briefed to do this from their first-hand experience.

I am copying this minute and the attachment to Sir Robert Armstrong.

RBN.

ROBIN B NICHOLSON  
Chief Scientific Adviser.

(The Prime Minister is expected to speak at 10.00am)

OPENING ADDRESS BY THE  
PRIME MINISTER, THE RT HON MARGARET THATCHER FRS, MP.  
AT THE ONE-DAY SEMINAR ON  
'SCIENCE, TECHNOLOGY AND INDUSTRY'  
AT  
LANCASTER HOUSE, LONDON.  
ON  
MONDAY, SEPTEMBER 12, 1983.

Press Office  
10 Downing Street  
LONDON SW1  
Tel 01-930 4433

MAY I EXTEND A WARM WELCOME TO EVERYONE HERE TODAY,

- TO THE 100 FROM INDUSTRY
- 60 FROM THE UNIVERSITIES
- 40 FROM THE CITY
- AND THE 50 FROM GOVERNMENT AND CIVIL SERVICE.

MAY I ALSO THANK THOSE WHO HAVE AGREED TO PRESENT PAPERS

TO THIS OUR FIRST SEMINAR ON SCIENCE,  
TECHNOLOGY AND INDUSTRY.

/ EVERYONE

EVERYONE WHO WAS ASKED TO SPEAK AGREED,

AND MANY MORE THAN WE COULD ACCOMMODATE  
ASKED TO COME.

THIS DEMONSTRATES THE IMPORTANCE OF THE  
SUBJECT, AND THE ENTHUSIASM TO GET TOGETHER  
TO DISCUSS IT.

THE PURPOSE? - TO USE OUR SEVERAL ABILITIES TO

INCREASE THE WEALTH AND WELL-BEING OF THE  
SOCIETY OF WHICH WE ARE ALL A PART.

/ WE SHALL

WE SHALL ONLY OVERCOME OUR DIFFICULTIES IN POSITIVE  
WAYS.

IF WE ARE ABLE TO CREATE NEW AND SUCCESS-  
FUL BUSINESS ON A SUFFICIENT SCALE, WE  
SHALL BE WELL ON THE WAY TO SOLVING MANY  
OF THE MATERIAL PROBLEMS WHICH ASSAIL OUR  
COUNTRY, AND ~~SOME~~, BUT NOT ALL, OF THE  
OTHER PROBLEMS TOO.

/ WE ARE CONCERNED

WE ARE CONCERNED NOT ONLY WITH THE GREAT NEW SCIENCE-  
BASED INDUSTRIES, BUT WITH MOST TRADITIONAL  
BUSINESS AND COMMERCE AS WELL.

THE APPLICATION OF NEW TECHNIQUES TO THEIR  
PROCESSES, DESIGNS AND ADMINISTRATION IS  
VITAL TO SURVIVAL AND EXPANSION.

IF THEY DON'T EMBRACE THE LATEST  
TECHNOLOGY THEIR COMPETITORS WILL.

/ WE TAKE GREAT PRIDE

WE TAKE GREAT PRIDE IN THE BRILLIANCE OF OUR RESEARCH,

BUT WE HAVE A FEELING THAT OTHER COUNTRIES

SOMETIMES MAKE MORE PROFITS OUT OF THE

DISCOVERIES OF OUR SCIENTISTS THAN WE DO.

WE APPLAUD THE EFFORTS OF MANY OF OUR COMPANIES,

LARGE AND SMALL.

UPON THEIR SUCCESS DEPENDS OUR FUTURE.

/ I BELIEVE THAT

I BELIEVE THAT THERE IS MORE CO-OPERATION THAN EVER

BEFORE BETWEEN THOSE IN UNIVERSITY AND

INDUSTRY.

BUT IT IS NOT ENOUGH.

AND TODAY WE WANT TO SEE HOW WE CAN DO

BETTER.

OF COURSE YOU WILL ASK ME,

"WHAT IS GOVERNMENT DOING?"

/ ROLE OF GOVERNMENT

ROLE OF GOVERNMENT

OVER THE PAST FOUR YEARS, THE GOVERNMENT HAS SPENT

£12.7 BILLION OF TAXPAYERS' MONEY ON

RESEARCH AND DEVELOPMENT - AN INCREASE

IN REAL TERMS OF NEARLY 8 PER CENT OVER

THE PREVIOUS FOUR YEARS.

FIRST, MOST OF THIS MONEY GOES ON THE KIND OF RESEARCH

WHICH ENSURES THAT GOVERNMENT BUYS THE BEST

PRODUCTS AND SERVICES -

/ FOR EXAMPLE

FOR EXAMPLE, THE BEST ROADS, THE BEST

MEDICAL, DEFENCE AND OFFICE EQUIPMENT.

AND THE GREATER PART IS SPENT IN

INDUSTRY: TWO-THIRDS OF OUR DEFENCE

RESEARCH AND DEVELOPMENT BUDGET IS PLACED

WITH INDUSTRY.

SECOND, WE SPEND MONEY TO STIMULATE THE DEVELOPMENT OF

NEW SCIENCE-BASED PRODUCTS, AND TO HELP

BRING THEM TO THE MARKET-PLACE.

/ SPENDING ON

SPENDING ON THIS HAS INCREASED BY NEARLY  
20 PER CENT IN REAL TERMS OVER THE PAST  
FOUR YEARS.

AND, THIRD, OF COURSE WE SPEND A HUGE AMOUNT TO  
SUPPORT FUNDAMENTAL RESEARCH.  
THIS YEAR, ABOUT £500 MILLION THROUGH  
RESEARCH COUNCILS AND ABOUT THE SAME AMOUNT  
FOR UNIVERSITY RESEARCH THROUGH THE U.G.C.

/ NOW YOU ALL KNOW

NOW YOU ALL KNOW THAT GOVERNMENTS CAN MAKE MISTAKES.

ONE MISTAKE WAS TO GIVE THE BRITISH  
TECHNOLOGY GROUP A MONOPOLY POWER OVER THE  
APPLICATION OF GOVERNMENT-FUNDED RESEARCH.  
THIS MONOPOLY WAS VERY RESTRICTIVE AND  
WIDELY CRITICISED, NOT LEAST BY  
SCIENTISTS WANTING TO EXPLOIT THEIR WORK.  
WE HAVE DECIDED TO ABOLISH THAT MONOPOLY.  
I AM SURE THAT MANY OF YOU WILL WELCOME  
THIS STEP AND THE NEW OPPORTUNITIES WHICH  
CAN NOW BE PURSUED.

/ THESE ARE SOME



THESE ARE SOME OF THE SPECIFIC THINGS THAT

GOVERNMENT IS DOING, AGAINST THE BACKGROUND

OF ITS GENERAL POLICY TO CREATE THE

CONDITIONS IN WHICH ENTERPRISE AND

INNOVATION CAN FLOURISH.

BUT GOVERNMENT CAN NEVER SUBSTITUTE FOR

THE INSPIRATION OF THE SCIENTIST, THE

GENIUS OF THE INVENTOR, THE ACUMEN OF

THE INDUSTRIALIST, OR THE JUDGEMENT OF

THE FINANCIER.

FOR THESE, WE LOOK TO YOU.

/ SCIENCE IN THE UNIVERSITIES

SCIENCE IN THE UNIVERSITIES

THIS COUNTRY HAS A LONG AND BRILLIANT RECORD IN SCIENCE

AND ENGINEERING.

NEWTON, FARADAY, DARWIN AND FLEMING:

STEPHENSON, BRUNEL, ROYCE AND BARNES WALLIS.

MANY OF THEIR MODERN COUNTERPARTS ARE

SITTING IN THIS HALL TODAY.

WE MUST BE AS SUCCESSFUL AS OUR FORE-

FATHERS IN SUSTAINING YOUR GENIUS AND

TURNING IT TO THE BENEFIT OF THE NATION AS

A WHOLE.

/ MANY OF YOU

MANY OF YOU CARRY OUT YOUR RESEARCH IN UNIVERSITIES  
AND RESEARCH COUNCILS.  
FUNDAMENTAL RESEARCH IS VITAL, ALTHOUGH  
WE DON'T KNOW WHAT ITS COMMERCIAL RESULTS  
WILL BE OR IF OR WHEN THEY WILL COME.

/ IN MY DAY,

IN MY DAY, AS A SCIENCE UNDERGRADUATE;  
NEW WORLDS WERE OPENING UP IN PLASTICS,  
PENICILLINS AND ISOTOPES BECAUSE OF  
EARLIER RESEARCH IN CHEMISTRY,  
BACTERIOLOGY AND NUCLEAR PHYSICS;  
TODAY, ASTONISHING DEVELOPMENTS IN  
BIOTECHNOLOGY AND MICRO-ELECTRONICS HAVE  
COME UNEXPECTEDLY FROM FUNDAMENTAL  
RESEARCH IN MOLECULAR BIOLOGY AND SOLID-  
STATE PHYSICS.

/ BUT I HOPE

BUT I HOPE THAT THOSE DOING FUNDAMENTAL RESEARCH WILL  
THEMSELVES BE ALERT TO ITS POSSIBLE  
APPLICATIONS.  
IF NOT, WHOLE INDUSTRIES MAY BE STILL-BORN.

TO MAKE FULL USE OF OUR DISCOVERIES, WE MUST STRENGTHEN  
THE LINKS BETWEEN THOSE WHO WORK IN  
UNIVERSITIES AND THOSE WHO WORK IN INDUSTRY.

/ ATTITUDES

ATTITUDES ARE MUCH HEALTHIER NOW THAN  
EVEN FIVE YEARS AGO.  
WITNESS THE GROWTH IN SCIENCE PARKS.

BUT I AM NOT ONLY TALKING ABOUT ATTITUDES WITHIN  
UNIVERSITIES.  
I AM ALSO TALKING ABOUT INDUSTRY'S  
ATTITUDE TOWARDS UNIVERSITIES.

/ MANY FOREIGN FIRMS

MANY FOREIGN FIRMS MAKE THE EFFORT TO  
"NOSE AROUND" OUR CENTRES OF SCIENCE AND  
ENGINEERING.  
I KNOW THAT SOME OF OUR OWN COMPANIES  
ARE RIGHT ON THE BALL.  
I HOPE THAT MANY OTHERS WILL FOLLOW THEIR  
EXAMPLE.

/ PRIVATE SECTOR INDUSTRY

PRIVATE SECTOR INDUSTRY

WE ARE OFTEN ASKED WHETHER WE HAVE GOT THE BALANCE  
RIGHT BETWEEN RESEARCH FUNDED THROUGH THE  
GOVERNMENT, AND RESEARCH FUNDED BY PRIVATE  
SECTOR INDUSTRY.

TO PUT IT ANOTHER WAY,

- IS OUR INDUSTRY, AS A WHOLE, SPENDING  
ENOUGH ON RESEARCH AND DEVELOPMENT?

/ COMPARISONS

COMPARISONS WITH OUR MAJOR INDUSTRIAL  
COMPETITORS SUGGEST NOT: PRIVATE INDUSTRY'S  
OWN SPENDING ON RESEARCH AND DEVELOPMENT FORMS  
A SMALLER PROPORTION OF NATIONAL INCOME  
IN BRITAIN THAN IN JAPAN OR GERMANY: AND  
OF COURSE, IN ABSOLUTE TERMS, WE ARE SPENDING  
CONSIDERABLY LESS THAN EITHER COUNTRY.

WE IN GOVERNMENT NEED CONSTANTLY TO REMIND OURSELVES  
THAT THE PRIVATE SECTOR FUNDS ITS ALL-IMPORTANT  
RESEARCH OUT OF ITS PROFITS.  
THE MORE INROADS MADE BY THE GOVERNMENT INTO  
THOSE PROFITS THE SMALLER THE FUNDS / AVAILABLE

AVAILABLE FOR PRIVATE SECTOR RESEARCH AND  
DEVELOPMENT.

THAT IS WHY IT IS VITALLY IMPORTANT THAT THIS  
GOVERNMENT SHOULD MAKE EVERY EFFORT TO REDUCE  
THE BURDEN OF TAXATION AND CONSEQUENTLY TO LIMIT  
OUR EXPENDITURE COMMITMENTS.

INTELLECTUAL PROPERTY

FURTHER, FEW COMPANIES COULD AFFORD TO EMBARK ON  
EXPENSIVE PROGRAMMES OF RESEARCH AND DEVELOPMENT  
WITHOUT THE ASSURANCE THAT OWNERSHIP OF THE  
/ FRUITS

FRUITS OF THIS RESEARCH AND DEVELOPMENT WILL  
BE SAFEGUARDED.

THAT MEANS TAKING VERY SERIOUSLY INDEED THE  
PROTECTION OF THESE IDEAS - OF INTELLECTUAL  
PROPERTY, AS IT IS CALLED - THROUGH PATENTS,  
COPYRIGHT AND REGISTERED DESIGN.

FINANCIAL SECTOR

HOW CAN PRIVATE INDUSTRY MAKE THE OPTIMUM USE OF SCIENCE

AND ENGINEERING WITHOUT A SUPPORTIVE AND  
INTELLIGENT FINANCIAL SECTOR.

OUR BANKS AND INSTITUTIONS NEED

- TO SPOT

- TO SPOT THE OPPORTUNITIES FOR PROFITABLE  
INVESTMENT IN NEW TECHNOLOGY;
- AND TO PLACE THEIR FINANCIAL SKILLS,  
DEVELOPED OVER CENTURIES OF SUCCESSFUL  
FINANCING OF MANUFACTURING AND TRADE,  
AT THE DISPOSAL OF THE YOUNG SCIENTISTS  
AND ENGINEERS WHO HAVE A NEW PRODUCT  
AND SERVICE TO DEVELOP.

ACHIEVEMENTS

BUT LET US LOOK AT WHAT HAS BEEN ACCOMPLISHED BY SCIENCE  
AND INDUSTRY TOGETHER.

/ IT IS

IT IS NOT THE BIONIC MAN OR EVEN WONDER WOMAN ON THE

TELEVISION THAT ARE THE MARVELS OF OUR AGE.

IT IS THE POWER THAT WE HAVE ADDED TO

ORDINARY HUMAN FACULTIES.

THINK OF THE MIRACLE OF THE SCANNER AND OF THE DEVELOPMENT

OF NUCLEAR MAGNETIC RESONANCE; THE DOCTOR WHO

USED TO LISTEN TO HIS PATIENT TRYING TO

DESCRIBE HIS SYMPTOMS CAN NOW SEE THROUGH SKIN

AND BONE TO DIAGNOSE AND TREAT.

/ THE OLD

THE OLD VISION OF X-RAY EYES IS NOW REALITY.

REMEMBER WHAT SWIFT SAID:

"WHOEVER COULD MAKE TWO EARS OF CORN OR

TWO BLADES OF GRASS TO GROW UPON A SPOT

OF GROUND WHERE ONLY ONE GREW BEFORE WOULD

DESERVE BETTER OF MANKIND THAN THE WHOLE

RACE OF POLITICIANS PUT TOGETHER."

TODAY MODERN TECHNOLOGY ENABLES THE FARMER TO GROW NOT

TWO EARS OF CORN, BUT TEN OR TWENTY EARS.

/ ONE OF THE

ONE OF THE MOST EXCITING THINGS ABOUT OUR TIMES IS THE

SPEED WITH WHICH SCIENCE CAN TURN INTO  
TECHNOLOGY, AND TECHNOLOGY CAN TURN INTO  
VALUABLE AND FASCINATING PRODUCTS.

ELECTRON BEAM TECHNOLOGY MAKES MORE POWERFUL  
SILICON CHIPS AND A FURTHER STARTLING ADVANCE  
IN AUTOMATION IS UPON US.

THE COMPUTER FLOODS IN EVERYWHERE - FROM THE  
CONTROL OF THE STOCK IN THE WAREHOUSE TO  
PATTERN RECOGNITION FOR EARLY DIAGNOSIS OF CANCER.

THE TECHNOLOGICAL MIND IS EVER MORE RESTLESS  
AND FERTILE IN APPLYING THE GREAT GIFTS OF PURE  
SCIENCE.

/ OURS

OURS IS NOT ONLY AN AGE OF DISCOVERY.

IT IS AN AGE OF APPLICATION - DEVASTATING IN  
ITS SWIFTHNESS; ENTHRALLING IN ITS SURPRISES;  
REMORSELESS IN ITS COMPETITIVENESS.

OUR BUSINESS IS TO BE THE LEADERS OF THAT AGE - TO

APPLY OUR SCIENCE AND APPLY OURSELVES TO BUILDING  
THE INDUSTRIES OF THE FUTURE.

OVER TO YOU, LADIES AND GENTLEMEN.



Return to  
C/F.

CONCLUDING REMARKS  
OF THE  
PRIME MINISTER, THE RT HON MARGARET THATCHER FRS, MP.  
AT THE ONE-DAY SEMINAR ON  
'SCIENCE, TECHNOLOGY AND INDUSTRY'  
AT  
LANCASTER HOUSE, LONDON.  
ON  
MONDAY, SEPTEMBER 12, 1983.

Press Office  
10 Downing Street  
LONDON SW1  
Tel 01-930 4433

MRS. THATCHER: THAT BRINGS US TO THE END OF OUR FIRST SEMINAR ON SCIENCE TECHNOLOGY AND INDUSTRY: MAY I, ON YOUR BEHALF, THANK ONCE AGAIN ALL OF THOSE WHO LED OUR DISCUSSIONS WITH PREPARED PAPERS, I DON'T THINK WE'VE EVER HAD A MORE DISTINGUISHED GROUP OF PEOPLE IN ONE DAY ON THIS SUBJECT OR INDEED ON ANY OTHER SUBJECT. WE'RE VERY GRATEFUL TO THEM FOR COMING AND FOR GIVING THEIR TIME IN PREPARING THOSE PAPERS TO LEAD OUR DISCUSSIONS. CAN I ALSO THANK THOSE WHO'VE CONTRIBUTED FROM THE FLOOR AND APOLOGISE TO THOSE WHO ARE GOING AWAY WITH BRILLIANT SPEECHES IN THEIR POCKETS - BETTER LUCK NEXT TIME! MAY I ALSO THANK DR. NICHOLSON, FOR ORGANISING THIS WHOLE OCCASION. HE HAS DONE IT MAGNIFICENTLY WITH A VERY SMALL STAFF. (APPLAUSE)

I THINK THE GENERAL FEELING PERHAPS WITH ONE OR TWO EXCEPTIONS BUT THE GENERAL FEELING HAS BEEN ONE OF OPTIMISM BUT NOT COMPLACENCY AND I THINK THAT'S RIGHT, THE GOVERNMENT WHICH I LEAD HAS TRIED VERY HARD TO REMOVE THE OBSTACLES TO SUCCESS AND TO RESTORE SOME OF THE INCENTIVES. OF COURSE WE COULDN'T DO IT ALL IN ONE TERM AND OF COURSE IT TAKES TIME FOR THOSE THINGS TO SHOW IN RESULTS BUT WE'VE MADE A START AND I BELIEVE WE'RE BEGINNING TO SEE A RISING OPTIMISM BECAUSE THE THINGS WE HAVE DONE ARE ENABLING PEOPLE OF GREAT TALENT AND ABILITY THE BETTER TO DEVELOP THE RESOURCES THAT WE HAVE IN THIS COUNTRY. I HOPE YOU'LL AGREE WITH ME THAT THE DAY HAS BEEN A GREAT SUCCESS, AS WELL AS BEING ENJOYABLE AND REWARDING. I HOPE YOU WILL AGREE THAT WE SHOULD FOLLOW IT UP, I BELIEVE WE HAVE THE RIGHT INSTITUTIONS AND ORGANISATIONS BUT OF COURSE THEY WON'T WORK UNLESS INDIVIDUALS TAKE ADVANTAGE OF ALL THE MANY OPPORTUNITIES THEY REPRESENT. I THINK THIS VERY SEMINAR ITSELF HAS BEEN JUST SUCH AN OPPORTUNITY AND THAT MANY PEOPLE MAY HAVE MET HERE TODAY WHO HAVE NOT MET BEFORE. WE WILL THEREFORE TRY TO GET TOGETHER AT MY LEVEL AND WITH DR. NICHOLSON, TO SEE HOW WE CAN HAVE, IF NOT ANOTHER ONE OF THESE QUICKLY, HAVE PERHAPS SMALLER GROUPS TO FOLLOW UP THE MANY POINTS WHICH YOU'VE GIVEN US. I STRESS THE POINT OF THE SEMINAR IS POSITIVE FROM THE BEGINNING TO ENABLE US ALL TO DO TWO THINGS, TO CREATE NEW BUSINESS AND INDUSTRY AND TO EXPAND EXISTING BUSINESS AND INDUSTRY AND AS PROFESSOR KINGMAN SAID, ALWAYS, BECAUSE MANY OF US ARE SCIENTISTS, TO REACH OUT TO THE UNKNOWN, TO TRY TO UNLOCK THE SECRETS OF NATURE WHICH WE HAVE NOT YET SOLVED AND TO TRY ALWAYS TO MEET THE CHALLENGE OF OUR TIMES WHICH IS THE CREATION OF NEW WEALTH AND NEW BUSINESS.

THANK YOU VERY MUCH ALL FOR COMING AND A SAFE JOURNEY HOME.

*M. Balcer*

THE STIMULATION OF INNOVATION BY GOVERNMENT

The subject this afternoon is "The Stimulation and Financing of Innovation". And that title is important because the role of Government in stimulating innovation doesn't just mean the Government providing financial assistance - cash. Indeed financial assistance is only part of what Government needs to do to encourage a vigorous and innovative industry.

The first, and most important job for Government, is to provide the right <sup>economic</sup> climate. The Prime Minister has spoken of the excitement of technology, and we need a climate in which that excitement can flourish. It must be a climate in which industry can grow and prosper, and be profitable. A glance at the first graph will show that the country spends about £5 billion per

year on R&D and at least half of that money must come from the profits of industry. Government pays for the other half, and half of the Government's money is necessary for defence research. My Department's expenditure is the white sector at the bottom of the diagram.

British industry has not found it easy to spend on R&D because of its low profitability. Our competitors have had better record here and as a result they have been capturing our markets. We must have the conditions, and the economic climate, that will enable us to match them - and catch them.

*Tax Fiscal. Incentives.*

The second thing which Government can do is to change the climate of regulation. We have given a great boost to innovation in the telecommunications area by our policy of ending the

monopoly and increasing liberalisation. It has stimulated research and development in large companies like GEC and Plessey, and in BT itself, and in a mass of much smaller companies. Innovation in telecommunications and cable TV should not need Government financing. It flourishes through Government withdrawal.

We have eased the burden of legislation and taxation for the innovative small firm by over 100 Government measures. We have made investment in these companies easier. We can offer them advice and counselling.

The third job for Government is to provide some direct financial support for research and development. I shall, of course, speak mainly of my own Department although many other Departments have significant R&D programmes - MAFF, Department

of Energy, Department of Environment, DHSS and of course the MOD.

My Department's science and technology expenditure has increased steadily since 1979. Now you will know that we run a very tight ship on public spending, and quite rightly so. Nevertheless, the Prime Minister agreed that this was such an important area that there should be a steady increase in cash expenditure. It is a record of which we are proud. We have not only been increasing the total spend but we have been spending much less in our laboratories and much more in industry.

In 1982/3 we spent £268 million. £60 million of that aerospace expenditure was in the space industry, where a vigorous industry is developing. We are making nine satellites in Britain. We are

second only to America in satellite manufacture.

We have projects for communication satellites, navigational and meteorological satellites and for remote sensing.

Information technology covers our support for the microchip, and for the application of the microchip.

Chemicals, materials and standards includes expenditure on biotechnology, on composite materials, on engineering ceramics and on the measurements and standards programmes in industry and in our own laboratories.

Mechanical and electrical engineering covers robotics, computer assisted design and manufacture, flexible manufacturing systems and industrial automation.

And we spend on textiles, on paper, on printing research and on a whole range of unglamorous but vitally important technologies.

How do we spend this money?

We recognise that there are three steps. First, by improving the technological base. We provide funds for research into the basic and enabling technologies. Into microelectronics, into computers and communications technology, into materials technology and many others. Much of the work is done in industry.

Second, we need to make companies aware of the possibilities of these technologies. It is no good just getting the message over to the large companies. They understand it already. But the small engineering company, in a town like



Wolverhampton, also needs to know. Because if it is not aware of how it can use these technologies in its business it will be out of business. The choice for British industry is to automate or liquidate. We can help them with our awareness and consultancy programmes. Over 5,000 companies have benefitted from our microprocessor consultancy scheme and 3,500 small companies from our manufacturing advisory service.

And third - and most important is project support. The support we give to companies for research and development. It is under the general heading of "Support for Innovation". And we have a variety of schemes - some may even say too many - but each is targetted on a specific technological area. Biotechnology where we are spending £15 million, Software Products Schemes for companies devising new and innovative applications for software, for

robotics, for computer aided manufacture, for many areas vital for the future of a modern British industry.

And let me give you some examples of what industry has achieved with our help:

- The development by Ferranti of the uncommitted logic array microchip. Ferranti are the leaders in this type of chip. They have 25% of the world's market. But to put them in perspective they are still only number 33 in the list of companies making chips in the world.

- You can see its application in a camera, where it is controlling the exposure.

- We have supported Unimation to set up a plant in Telford. It created 250 new jobs. We must keep abreast of this technology.
  
- This is the application of microprocessors to a precision grinding machine tool. The project cost us £.35.000 The company is small employing only 260 people.
  
- Fibre-optics. A technology which Britain invented. We are still in the lead. Our programme supports large companies and small ones. We will have the most extensive fibre-optics network in the world by 1986.
  
- On a much smaller scale this is a machine that monitors blood sugar for diabetics. We put in £.14.000 The company employs 27.

- A microprocessor controlling the weaving of Cashes name tapes. We put in £11,000 and the company employs about 200 people (5-6 on the process control application).
- At the other end of the scale we have supported a flexible manufacturing system for the 600 Group.

You can see the nature and range of products which we support.

When we provide financial assistance we follow two important principles. First we ask the firm to provide most of the money - at least two thirds and perhaps three quarters. We provide the balance. It is catalytic money. Second the projects are not initiated by Civil Servants or Ministers. There is no Civil Servant or Minister in this room today who has the technical knowledge or the ability to pick this sort of research. It

has to be done by industry. And we rely very heavily on the help and advice that we get from industry through our Requirements Boards and other consultative bodies.

It is essential that industry and Government work together and we have been doing that in many ways.

For example in project Universe a group of companies with BT and Research Council laboratories and universities are working together to develop and demonstrate advanced data transmission technology. This technology heralds a future in which the electronic office becomes international. Britain has a lead in Europe in the technology and the work is as advanced as any in the world.

The Prime Minister has already spoken of the Alvey programme. It is the most important

collaborative project ever undertaken in this way.

Companies which are strong competitors in the market have combined to work on a joint project costing over £350 million. <sup>£150</sup>~~£200~~ million will

come from industry. <sup>£200</sup>~~£150~~ million from

Government. My Department provides the project management, with most of the team brought in from industry.

More recently I announced a materials applications initiative aimed at achieving similar Government/industry collaboration in the field of advanced materials technology. The Group will be under the direction of John Collyear, Chairman of one of our Requirements Boards and Chairman of AE. The first job of the new Group will be to find the areas of opportunity for research, development and application.

There is important work done in our own laboratories to support industrial innovation. We have four. There were six and have we have privatised two. They provide important measurements standards without which a modern industrial and trading economy would be impossible. They provide essential technical support to our initiatives - in robotics, in automated manufacture, in microelectronics, for example,. We encourage them to work closely with industry and a very successful method has been to set up co-operative programmes, or clubs, with industry helping to meet the cost and steer the programme.

Here are some examples. At NPL, this last one - the Tokens and Transactions Control Consortium. It sounds a mouthful, but it is very important work on credit card and signature verification.

We are opening up our laboratories so that their skills and expertise are available to industry.

Transferring technology between laboratory and industry is never easy. The recent ACARD/<sup>ABRC</sup>report emphasises the need for close links between universities and industry. As the Prime Minister said we are considering this report and will be coming forward, together with Keith Joseph, with proposals for improving the liaison between universities and industry.

Hitherto the BTG has been responsible for exploiting the publicly funded research done in universities. We have been reviewing the role of BTG and its old function as a hospital for sick companies is being rundown and the portfolio disposed of. But the technology transfer role of the old NRDC continues. BTG has had a monopoly



on many university discoveries but I do not think it right that all the eggs should go into the same basket and as the Prime Minister announced we are removing this monopoly. Inventors in universities will be free - subject to certain safeguards to the public interest - to develop their own inventions by whatever route they wish.

BTG has had successes. Celltech, for example, which exploits the outstanding work of the Medical Research Council in biotechnology. At the time the private sector was not ready to take on these developments alone but private sector interest is now increasing and BTG has been able to reduce its holding. Recently a company has been set up with a majority of private sector funding to exploit the work of the Agricultural Research Council in a similar way.

I have talked principally of the DTI, but other Government Departments have R&D programmes too. DHSS for example has supported some outstanding achievements in the vitally important medical electronics area.

The Prime Minister spoke of nuclear magnetic resonance, and here it is. A British invention, and we have a world lead in this equipment. We are supporting companies to make it and develop it. It is important that the technology gets established and that the equipment is available in British hospitals. We are using some public purchasing funds to do that and are helping to equip a factory to manufacture.

We have given support - at the other end of the scale - to a chap in a garage in Swansea to apply

a microcomputer to the frame of this gymnast - Jan Burgess - who broke her neck in an accident. She is able to stand and walk and go back to her job again.

This is the compassionate face of technology and more than 60 products have reached the market as a result of DHSS support, and we work closely with them.

Innovation is a complex process. It is easy for Government to stifle it by legislation, by bureaucracy, by taxation or by trying to protect the old technologies from the inevitable march of the new. But Government can stimulate it if it works closely with industry and its customers. All the elements of Government must work together, as I hope I have shown this afternoon that they do. We must be particularly certain to get the

maximum value from the areas of big expenditure  
such as defence research and basic science.  
Perhaps above all Government must also be  
innovative, not just in its laboratories, but also  
in its policies.

Seminar on "Science, Technology and Industry"

12th September, 1983

TECHNOLOGY TRANSFER

by D. Downs

Chairman & Managing Director, Ricardo Consulting Engineers plc

My subject is 'technology transfer', or, more properly, perhaps, 'the marketing of technology', because one of my themes is that technology is a product, no less so than manufactured goods, and one for which the customer should expect to pay the appropriate market price. You buy technology if you get good value for money, not otherwise. Of course, before you can market something, you must make it or create it, and so I shall also be dealing with the subject of innovation and the creation of a marketable technology package.

My Company's ability to provide just such a technology package sprang from an exceptional man, Sir Harry Ricardo, growing up with an important new engineering product, the internal combustion engine. Sir Harry came from a comparatively well-to-do professional family with connections in engineering, in industry, in banking and in the City, and so his interest in the internal combustion engine having been aroused when he was at Cambridge, he seems to have had comparatively little difficulty in raising the finance required to set up his own design and research establishment. Other men of similar background at that time, such as Sir Charles Parsons, did likewise. There was a climate which encouraged bright young men of good family

to follow their own innovative instincts in engineering. This contrasts with the present cultural climate, particularly amongst the young at school and at university, which is anti-industry, even when it is not anti-technology. It contrasts also with the situation even in this Country in the immediate post-War period, with the Wartime developments in aircraft and in radar fresh in our minds, and with the manifest need to rebuild our Country, everyone could see the importance of developing our industry, and the rewards of our endeavours were immediately obvious in the form of improved living standards. While Britain seems largely to have lost this urge to improve material standards, it can be observed most strongly in the Socialist countries of Eastern Europe, in China and, of course, in Japan, where there is an excitement about technology and the improvement in living standards it can bring. The first necessity to my mind, therefore, is to increase our stock of innovation by creating a climate wherein more of our bright young boys and girls will be encouraged to take up applied science, technology or engineering as their career. I believe that exceptional men, such as Parsons, Ricardo and, to mention one in this room, Sinclair, have the potential to emerge. We must do our best to provide a climate within which they can prosper. Unless we do our Country will never regain its place in the front rank of industry and technology.

It is, of course, not sufficient to produce innovative ideas. The ideas must be within a field which is ripe for development and exploitation. Sir Harry Ricardo found just such a field in the internal combustion engine, as Parsons did in the steam turbine. Engineering products such as these, important at the turn of the century, have continued

to find a market, while others have declined and new ones have emerged. This is natural evolution and, while we hope that the UK will play a leading part in a respectable number of new developments, it is unrealistic in the modern world to expect any one country to lead in every field. We must concentrate on those technological fields where we perform best and be prepared, if necessary, to import technology from abroad in other cases. The Japanese are an object lesson here, for their open-mindedness to new ideas from no matter what source; the British, maybe because of what we take to have been our earlier technical leadership, still display a certain arrogance towards others' ideas.

In the same way that no one country can now lead in every technical field, so no industrial Company, however large, can generate all the technical expertise it requires in-house, and it would be uneconomic for it to attempt so to do. They should and do make use of specialist consultant and R & D organisations, thus effectively spreading the cost to them of the technology they buy. It can also be argued that innovation is easier for the smaller Companies. Larger Companies should recognise this, should encourage it, and be prepared to pay realistically for it, instead of (as they sometimes do) attempt to make use of their greater economic power to browbeat their smaller collaborator. It is, of course, very costly for R & D organisations such as ours to keep up to date with a growing technology, let alone provide the technical lead their customers rightly expect. The Government, which has shown its willingness to help manufacturing industry to fund its research, must, I believe, exhibit an equal willingness to help the independent R & D organisation whose efforts

not only benefit British manufacturing industry, but also contribute substantially to our invisible exports: Farseeing governments overseas, particularly it would seem in countries where our technological rivals are situated, provide just such help and, unless the UK Government is prepared to do likewise, our technology transfer companies will be operating at a substantial disadvantage.

I spoke at the beginning of marketing technology, and I believe that our attitude to the sale of technology should be no different in principle to our approach to the sale of any other product or service. In fact, the operations in an organisation like Ricardo in many respects parallel those in manufacturing industry. First, you must have a product to sell, ie. you require a strong engineering/research department to produce new and improved products, and Ricardo ploughs back some 12% of its turnover into internally-funded research. Then you must produce the goods which the customer requires efficiently, which means examining your methods of design (including the use of CAD), your prototype production and your conduct of experimental work, to ensure that they are the most effective for their purpose. Then you must sell. At one time Consultants and Contract Research Organisations were inclined to adopt what was seen to be the gentlemanly way of selling, to sit back and wait for the work to come to them. This is no longer possible in the modern world where potential customers need to be constantly reminded of your existence and of the services you have to offer. The final and one of the most important elements in the total operation is finance and accounting. Accurate estimating and cost and performance monitoring, together with well-designed legal agreements, are as essential to technology transfer as to manufacturing industry, and it is particularly important



that a high technology Company, most of whose principals will be engineers and scientists, has a financial man with a strong accounting background as an equal partner in the team.

I think there needs to be a greater recognition in this Country of what While most of Ricardo's work is done for industrial Companies a valuable export we could have in technology. Britain has a thriving of the developed world, of Western Europe (including, of course, group of contract R & D organisations covering a wide range of the United Kingdom), the United States and Japan, we also work in technologies. We are better served in this respect than most of our the Socialist economy countries of Eastern Europe and The People's Republic of China, as well as with developing countries. Some six years ago, we were, I believe, the first British Company to sign an agreement with China purely for technology transfer, unassociated with the supply of goods. They recognised that the employment of an organisation such as ours enabled them to improve the level of capital equipment and quality goods. In their great emphasis on their technology with the least expenditure of foreign currency. While we have been similarly successful in selling our services in Yugoslavia, Poland and Czechoslovakia, we have not so far been so successful in Russia. Countries having Socialist economies, and this applies particularly to Russia itself, are unused to the idea of paying for advice or for technology transfer. Such activities in their own country are normally carried out in State Institutions, and when they sign a trade agreement with a Western Country, say on diesel engines, there often seems to be an expectation that technology exchange will take place between State Institutions as part of the agreement. It comes as a nasty shock to the Soviets to learn that most Institutions of that nature in the UK are in private hands, and that they expect to be paid for any advice they offer. I think that it is important that State Corporations in the UK offering consulting services overseas, such as BR, BSC, CEGB, and others, should not do so without proper recompense. Otherwise, apart from losing

that Britain derives no real advantage from this situation and potential revenue for the Country, they are merely confirming some overseas government in their bad habits.

I think there needs to be a greater recognition in this Country of what a valuable export we could have in technology. Britain has a thriving group of contract R & D organisations covering a wide range of technologies. We are better served in this respect than most of our industrial rivals. Historically, the export of manufactured goods has been followed by the export of capital equipment to enable the overseas countries themselves to manufacture consumable goods. We are now entering a third phase in which, increasingly, it is the technology itself which we shall be exporting, together, of course, with specialised capital equipment and quality goods. In their great emphasis on UK manufacture, there was a tendency at one time for government to minimize the importance of technology export. This situation has changed, but still within UK manufacturing industry there is sometimes a view expressed that this technology should be used only at home and not exported. I believe that this is short-sighted. Where our Country is strong in a particular technology, we should not hesitate to export it and, of course, to ensure that we are paid for it as part of our total effort/reward package. In addition, the activities of a Company like Ricardo in the export field serve to keep UK industry up to date through the feedback of information from overseas and, where necessary, can serve as a channel for the importation of technology. In any case, there is now one world of technology; the UK cannot expect to excel in every field; there must be 'give and take', export and import, as I have mentioned earlier. Technology transfer Companies, operating internationally, can ensure

that Britain derives maximum advantage from this situation and, in that way, play a part in securing the future prosperity of our Country.

TECHNOLOGY TRANSFER

by D. Downs

Chief Executive, Managing Director, Alderpa Consulting Engineers Ltd

Technology is a product of the human mind, and it is the responsibility of the inventor to ensure that it is marketed in the most profitable way possible. You buy technology if you get good value for money, and otherwise. Of course, before you can market something, you must first create it, and in this case it is dealing with the subject of marketing and the creation of a marketable technology package.

The company's ability to provide just such a technology package is exceptional. Sir Harry Ricardo, regarded as one of the greatest mechanical engineers of the 20th century, was an inventor of the internal combustion engine. His work was done in the early 20th century, and it was at Cambridge that he was at Cambridge. He seems to have had a very high level of technical ability, and it was his work on the internal combustion engine that led to the development of the modern internal combustion engine. The company's ability to provide just such a technology package is exceptional.

4a. Other opportunities arise from the use of new technologies. In the world of commerce: modern computing and communications technology allow the exploitation of our skills in the provision of information - financial reports, text books and reference works, technical specifications - as a valuable commercial product attractively and conveniently packaged. Recently I handed over the millionth teletext set - up from 100,000 sets only 2 years ago and the highest market penetration in the world. The demand for these and other services will be further stimulated by the arrival of multi-channel cable systems.

No one understands how valuable

World Standard

13a. Of course Government must fund some research in support of its regulatory functions, some research in support of its procurement programmes (although not to the extent that suppliers neglect their R & D responsibilities), and some basic science and engineering research at our Universities and Research Councils (but not to the exclusion of funding from industry and private foundations).

22. Many of these people work in our Universities which is one of the reasons why I want to encourage closer collaboration between Universities and industry. Attitudes are much healthier than even five years ago, as the growth in science parks shows. We were not slow starters; the Heriot Watt Riccarton campus was the first of its kind in Europe and the Cambridge Science Park has drawn major companies as well as providing a home for new ones. However only recently have parks been begun elsewhere in any numbers. The need to speed up this improvement in attitudes is why I asked ACARD together with ABRC to look at collaboration between Universities and industry and we are now actively studying Sir Alan Muir Wood's recommendations.

23a. Too often those developing new ideas believe that starting the exploitation process is someone else's task. This attitude is found in universities, Government research establishments and even in some large industrial laboratories. As a result some major British inventions have been exposed, without protection, and have in effect become a free gift to our competitors.

23b. A vital step in securing a return on our ideas is the ability to claim ownership. That means taking seriously the protection of intellectual property through patents, copyrights, registered designs etc. The system is there to be used; the Government can encourage awareness, but the first responsibility lies with the individual research workers.

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23c. I want to encourage scientists in industry to take an interest and responsibility in their exploitation of their ideas. They should leave their laboratory benches, develop new products from their ideas, and champion them through their companies and into the market place. We need more scientists and engineers in production, in marketing and in senior management in industry generally. Their places at the laboratory bench can be filled by the fresh generation of young people coming out of the science and engineering Departments of our Universities and Polytechnics.