

Government response to the second report of the Science and Technology Committee (Session 1999-2000) on Engineering and physical sciences based innovation : first special report / Science and Technology Committee.

Contributors

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SCIENCE AND TECHNOLOGY COMMITTEE**First Special Report****GOVERNMENT RESPONSE TO THE
SECOND REPORT OF THE SCIENCE AND
TECHNOLOGY COMMITTEE
(SESSION 1999–2000) ON ENGINEERING
AND PHYSICAL SCIENCES BASED
INNOVATION**

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The Science and Technology Committee

The Science and Technology Committee is appointed to examine on behalf of the House of Commons the expenditure, administration and policy of the Office of Science and Technology (and any associated public bodies). Its constitution and powers are set out in House of Commons Standing Order No. 152.

The Committee has a maximum of eleven members, of whom the quorum for any formal proceedings is three. The members of the Committee are appointed by the House and unless discharged remain on the Committee until the next dissolution of Parliament. The present membership of the Committee is as follows:¹

Dr Michael Clark MP (*Conservative, Rayleigh*)²
Mrs Claire Curtis-Thomas MP (*Labour, Crosby*)²
Dr Ian Gibson MP (*Labour, Norwich North*)²
Dr Brian Iddon MP (*Labour, Bolton South East*)⁵
Mr Robert Jackson MP (*Conservative, Wantage*)³
Dr Lynne Jones MP (*Labour, Birmingham Selly Oak*)²
Mr Nigel Jones MP (*Liberal Democrat, Cheltenham*)²
Dr Ashok Kumar MP (*Labour, Middlesbrough South and East Cleveland*)²
Mr Ian Taylor MP (*Conservative, Esher and Walton*)⁴
Dr Desmond Turner MP (*Labour, Brighton Kemptown*)²
Dr Alan W Williams MP (*Labour, Carmarthen East and Dinefwr*)²

On 30 July 1997, the Committee elected Dr Michael Clark as its Chairman.

The Committee has the power to require the submission of written evidence and documents, to examine witnesses, and to make Reports to the House. In the footnotes to this Report, references to oral evidence are indicated by 'Q' followed by the question number, references to the written evidence are indicated by 'Ev' followed by a page number.

The Committee may meet at any time (except when Parliament is prorogued or dissolved) and at any place within the United Kingdom. The Committee may meet concurrently with other committees or sub-committees established under Standing Order No. 152 for the purposes of deliberating, taking evidence or considering draft reports. The Committee may meet concurrently with the House's European Scrutiny Committee (or any of its sub-committees) or the Environmental Audit Committee for the purposes of deliberating or taking evidence. The Committee may exchange documents and evidence with any of these committees, as well as with the House's Public Accounts and Deregulation Committees.

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at www.parliament.uk/commons/selcom/s&thome.htm. A list of Reports of the Committee in the present Parliament is at the end of this volume.

All correspondence should be addressed to The Clerk of the Science and Technology Committee, Committee Office, 7 Millbank, London SW1P 3JA. The telephone number for general inquiries is: 020 7219 2794; the Committee's e-mail address is: scitechcom@parliament.uk.

¹ Mrs Caroline Spelman MP (*Conservative, Meriden*) was appointed on 14 July 1997 and discharged on 22 June 1998. Mr David Atkinson MP (*Conservative, Bournemouth*) was appointed on 14 July 1997 and discharged on 30 November 1998.

Mrs Jacqui Lait MP (*Conservative, Beckenham*) was appointed on 22 June 1998 and discharged on 5 July 1999.

Mr Nigel Beard MP (*Labour, Bexleyheath and Crayford*) was appointed on 14 July 1997 and discharged on 20 March 2000.

² Appointed on 14 July 1997.

³ Appointed on 5 July 1999.

⁴ Appointed on 30 November 1998.

⁵ Appointed on 20 March 2000.

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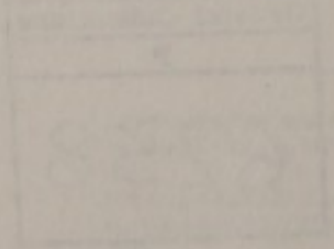
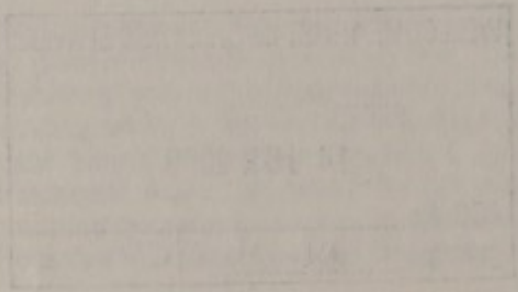
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FIRST SPECIAL REPORT

The Science and Technology Committee has agreed to the following Special Report:—

GOVERNMENT RESPONSE TO THE SECOND REPORT OF THE SCIENCE AND TECHNOLOGY COMMITTEE (SESSION 1999-2000) ON ENGINEERING AND PHYSICAL SCIENCES BASED INNOVATION

1. On 9 February 2000 the Committee published its Second Report of the 1999-2000 Session on Engineering and Physical Sciences Based Innovation. The Government's Response, in the form of a Memorandum to the Committee from Lord Sainsbury of Turville, the Parliamentary Under-Secretary of State for Science, was received on 17 April 2000.
2. The Government's Response, and a letter to the Chairman of the Committee from Lord Sainsbury, are published as Appendices to this Report.
3. We intend to make a considered reply to the Government Response in due course.

APPENDICES

APPENDIX 1

Letter to Dr Michael Clark, MP, Chairman of the Committee, from Lord Sainsbury of Turville, Parliamentary Under Secretary of State for Science

HOUSE OF COMMONS SCIENCE AND TECHNOLOGY COMMITTEE REPORT: ENGINEERING AND PHYSICAL SCIENCE BASED INNOVATION

I am writing in response to the Committee's recent report on Engineering and Physical Sciences based Innovation.

I attach a memorandum setting out the Government's response to the Committee's recommendations. I would like to thank the Committee for their useful and timely report which is a helpful contribution to the work which we have been carrying out on science and innovation. As you will know, I announced on Monday that, following the Spending Review 2000, the Government will be publishing a White Paper on Science and Innovation to help British science create the high-skill, high-wage jobs of the future. The White Paper will be about how we maintain and enhance our outstanding record of scientific discovery, and how we enable and incentivise our scientists, engineers and business men to take advantage of it to create wealth and improve the quality of our lives. The White Paper will promote university-industry collaboration, help scientists develop business skills, and encourage small companies to undertake more research and development. I intend it to take forward many of the Committee's recommendations.

APPENDIX 2

GOVERNMENT RESPONSE

Introduction

1. The Government warmly welcomes the Committee's timely and useful report on engineering and physical sciences based innovation. The Government has noted the Committee's observations and recommendations which have made a very helpful contribution to the Government's current work on developing its Science and Innovation strategy. Over the past six months, the Government has been consulting key stakeholders on how best to maximise the contribution made by science, technology and innovation to our economic performance and quality of life. Later this year, the strategy emerging from this work will be published in a White Paper on Science and Innovation.

2. The Government is firmly committed to maintaining and building on the excellence of our science base and to deriving maximum value from it through increasing knowledge interaction between the science base and business and between businesses. It re-affirms its belief that "innovation is vital to business and wider economic growth" and that "our success depends on how well we exploit our most valuable assets: our knowledge, skills and creativity".

3. The Government has achieved much in the last three years and the forthcoming White Paper will set the framework for a continuing programme of action designed to reinforce the quality of the UK science base and ensure that the UK thrives in the global knowledge-driven economy. The Government's achievements in this area to date include:

- a substantial increase in the Science Budget representing a 15% increase in real terms by 2001-02;

- introduction of an R&D tax credit for SMEs;
- further development of the UK venture capital industry, already the largest in Europe;
- the launch of the Small Business Service;
- an increase in the DTI's budget for helping businesses use new technology and encourage innovation;
- strengthening of the links between universities and business;
- raising awareness and take up of information and communication technologies;
- reviews on the reform of insolvency and bankruptcy law to re-assess our approach to risk.

4. The Committee found that there were many definitions of innovation in common use. The Government defines innovation as "the transformation of knowledge into new products, processes and services". The Government's view is that innovation is not just about discovery. Innovation in business can be seen in new ways of using old materials, new marketing and distribution methods, new processes and organisational methods in long established businesses and services as well as in high-tech products using new technology. Any new idea, product or process that is successfully adopted and brings benefits to an organisation, can be said to be innovative, even if those benefits are not of direct commercial value. Successful innovation in the development of a new business process can be just as beneficial as in the development of a new product.

Responses to the Committee's recommendations¹

- (a) Successful innovation does not depend on a uniform process or a set approach; it is inherently dynamic and evolutionary. The success of Government policies designed to foster innovation in industry is dependent on a clear understanding of these issues. We commend efforts to further the understanding of innovation and recommend that they continue to attract Government support (paragraph 10).*

5. The Government is grateful for the Committee's acknowledgement of the Government's efforts to understand the process of innovation and agrees entirely with the Committee that innovation does not depend on a uniform process or set approach. In order to innovate successfully, companies and individuals must not only generate new ideas, but consider all the technological, financial, marketing, design, business, human and other factors which could influence success. The DTI's Innovation Unit works on all of these issues. The Committee's report cites "Research Partnerships", which was a joint publication issued by the CBI, Association for University Research and Industry Links and the Innovation Unit, and which is currently being revised and updated. Other ventures by the Unit include work on the innovation processes which lie behind successful Millennium Products, in collaboration with the Design Council; a project on the characteristics of successful university-industry interactions; and continuing work on the management of intangible assets by innovating companies. The Unit has twenty-five secondees from companies of all sizes, financial institutions and academia, who bring a wide range of external experience both to its external work and to Government policy-making. The DTI and OST also work closely with bodies such as the ESRC and EPSRC and others who are carrying out research into innovation processes, and seek to incorporate their findings in development of policies and schemes.

- (b) There is a failure in the UK to appreciate what at Massachusetts Institute of Technology is termed the "dignity of applied knowledge" (paragraph 12).*

¹ The Select Committee's recommendations are shown in bold and italic. In some cases, two recommendations have been taken together.

- (c) *Not a single witness disputed the maxim that for engineering and physical sciences based industries innovation required a greater focus on the application and development of scientific advances than in the biosciences and that this was the root of the differences between the two in terms of innovatory performance and approach (paragraph 13).*

6. The Government agrees that the innovation process in engineering and physical sciences is very different to that in biosciences. The former is more focused on the application and development of scientific advances to specific products and processes, whereas in the latter the links between the UK's world class bioscience base, which includes universities, Research Councils, charities and Government laboratories, and the industry are more well established at all points on the fundamental to applied research spectrum. The Government also agrees that in the UK, whilst it is important to maintain and develop the newer, cross boundary fields of R&D, it is important also not to neglect the more traditional, but essential, fields such as engineering.

7. The Government recognises the fundamental contribution which the engineering community makes to the UK in terms of wealth creation and improvements to the quality of life. It has also consistently supported co-ordinated action by the engineering community to correct misperceptions about the status of engineering as a profession and has sought to encourage more young people to consider taking up engineering as a career. This has included initiatives such as Action for Engineering and the current Campaign to Promote Engineering (CPE). A key outcome of Action for Engineering was the establishment of SETNET (the Science Engineering Technology Mathematics Network) whose objective is to bring coherence and co-ordination to the myriad of schemes and resources aimed at fostering the teaching and learning of engineering related subjects in schools.

8. The most recent development in this area has been the Hawley Review of the Engineering Council that was launched by Lord Sainsbury last autumn. Lord Sainsbury asked Dr Robert Hawley to undertake a review to look at the contribution the Engineering Council should make to add value to the wider engineering community by improving the effectiveness of existing activities in such areas as the promotion and standards of engineering, building on existing synergies with other organisations. The key strategic objectives developed by the Hawley Group are contained in the Stage I Report published in February 2000 (available at www.engc.org.uk/hawleygroup) and include: 'Promoting the understanding of engineering and its contribution to the knowledge-based economy'; and 'Establishing the competencies engineers will need in the knowledge-based economy'.

- (d) *Since 1993 the UK has seen a greater drop in expenditure on R&D as a percentage of gross domestic product than any other G7 nation as growth in gross domestic product has outpaced R&D investment (Paragraph 17).*

9. The Government acknowledges that UK expenditure on R&D is not as high as some of its international competitors and could be better. The UK's current gross domestic expenditure on R&D (GERD) as a percentage of GDP is the fifth highest amongst the G7 countries (ahead of Italy and Canada) but still almost a full percentage point behind countries such as Japan and the USA. However, recent figures, just published, show an arrest of the 1993-1997 decline in the UK's GERD/GDP proportion. In 1998 UK GERD increased to £15.5 billion. This represents an increase of 2% in real terms on the 1997 expenditure figure. This 1998 UK GERD figure equates to 1.81% of GDP – the same proportion as in 1997.

10. A continued improvement in GERD into the future would indicate an increasing focus on innovation and R&D as key drivers in the knowledge-based economy. The Government's commitment to R&D is demonstrated by the increase in spending on the science and engineering base of £1 billion over the three years from 1999/00 to 2001/02.

- (e) *We, in common with the majority of our witnesses, conclude that the UK's relatively poor record in innovation in engineering and the physical sciences is not the result of a weakness in the science base. There is plenty of good research being produced in the UK and there are more innovative ideas than are taken up and commercialised*

by industry. The UK is strong in terms of scientific production but weaker in terms of its application and exploitation (paragraph 22).

11. The Government agrees with the Committee's conclusion that there is plenty of good research being produced in the UK, but our weakness lies in applying and exploiting that research. However, the Government does not agree that the responsibility for exploiting the results of research lies solely outside the science base. Whilst industry has the main role in exploiting R&D, the science base can help the innovation process by being more aware of the end application of its research and the commercial opportunities available. The Government is trying to encourage this through schemes such as University Challenge, the Science Enterprise Challenge and the Higher Education Reach-out into Business and the Community fund.

(f) We recommend that the Government assumes a greater role in supporting development and technology demonstration where the risks are high but the rewards good if the project is successful. We recommend that the Government supports the development of large scale demonstration facilities to allow UK companies better means of carving out proof of concept research (paragraph 33).

12. The Government agrees that technology demonstration can help to minimise the risks associated with the launch of new large scale, expensive products by ensuring that advanced technologies are fully mature before being committed for products. The Committee cites Government support for the development of Rolls-Royce's Trent engine as a precedent for supporting demonstration work. This is not the case, as Launch Investment is not used to support research or demonstration. This repayable support is only given to the aerospace industry to help develop a specific product for which there is a clear case for Government intervention. This would involve showing that the private sector could not fund the product to the necessary scale and in the appropriate timescale, and that there would be a significant strategic benefit to the UK that would not otherwise be available.

13. Although the Government believes that technology demonstration is properly the responsibility of industry, government can most readily make a difference when the technology requires development, or where its demonstration in a collaborative programme between users can help accelerate take-up. For example, the CARAD programme supports long-term research into inter-dependent aeronautics technologies, generating technology (or know-how) for industrial application, and thus underpins the strong competitive position of UK aeronautics companies in world markets. 15% of the CARAD budget supports technology demonstration, which is essential in order to minimise the even greater expenditure that would be involved in resolving technical problems (on components and systems) during product development or after entry into service. Additionally, the Ministry of Defence funds demonstration for defence purposes. In another example, through DTI's Smart scheme, the Government has already supported many development projects in small and medium sized enterprises (SMEs). In the energy sector, the renewables programme has achieved considerable success via systematic progress through R&D, followed by demonstration and then market stimulation. A new programme was announced in February incorporating a budget expanding to £18 million in 2001/2002. The DETR, working with the construction sector through Movement for Innovation, has promoted the concept of demonstration projects to show how innovations can be implemented in practice and the business benefits identified.

(g) We recommend that the Government scrutinises closely management and marketing strengths in companies seeking investment grants (such as SMART) and, where necessary, considers providing additional support (paragraph 34).

14. The Government agrees with the Committee's comments on the importance of good management and a good marketing strategy to the success of a new product launch. In appraising applications for support under the research and development elements of DTI's Smart scheme, the Government does scrutinise the management strengths, including marketing, of applicants and takes this into account in judging which projects should be supported. All Smart applicants are encouraged to make use of the wide range of business support offered by Business Links and further enhance their management skills. However, the Government believes that whilst it has

a role to play in encouraging best practice, Government should not directly support marketing and market launch since these are the responsibility of industry.

- (h) *We welcome the Secretary of State's recognition both of the importance of larger corporations in creating an economy characterised by innovation and of the role of Government in stimulating them to innovate (paragraph 41).*
- (i) *For scientific and technological advances to be successfully exploited, each one of the components of innovation - research, development, market investigation, manufacturing and commercial launch and the entrepreneurial spirit to bring them together - must be present. The UK's comparatively poor record in innovation in engineering and physical sciences based industries is not the result of weakness in the research base. The failure results from poor translation of research ideas into viable products - weaknesses closer to the market where industry has primary responsibility such as in development, demonstration of a product integrating various technologies, marketing and launch (paragraph 42).*

15. The Government notes and agrees with the Committee's comments.

- (j) *We recommend that the Government seeks harmonisation of trading patterns and systems across the European Union and gives support to a primary market for growth and technology-based companies (paragraph 48).*

16. Stock exchanges across Europe are private bodies and it would not be appropriate for the Government to attempt to force the exchanges to harmonise their trading patterns and systems. However, the Government welcomed the proposed European Alliance of stock exchanges when this was announced. The exchanges themselves clearly see the benefits of integration on a pan-European basis and some have taken greater steps towards full integration.

17. The Government is also fully behind the European Commission's Risk Capital Action Plan. This contains measures specifically aimed at growth and technology based companies, such as the relaxation of pension fund rules to allow greater investment in venture capital. Also, the "single passport" for issuers will facilitate the widest possible access to investment capital on an EU-wide basis. The UK Government has been in the lead in seeking an EU-wide primary market for issuers. Competition between the exchanges should then lead to the most efficient promotion of these companies in the secondary market.

- (k) *We recommend that the Enterprise Fund should do more than provide capital; it should be prepared to support enterprises with functions such as recruiting, management and business development. We shall monitor the implementation and development of this scheme to assess its effectiveness (paragraph 55).*

18. Announced in the Competitiveness White Paper in December 1998, the Enterprise Fund was created to ensure that our entrepreneurs have access to appropriate forms of finance. Initial support for the Enterprise Fund was announced as a £150 million fund over three years but following the Budget in March 1999, this was increased to £180 million.

19. The Government does recognise that the investments made by Fund Managers supported by the Enterprise Fund are more likely to succeed if the investee businesses have access also to additional business support. The Government will, therefore, require that all proposals seeking Enterprise Fund support show how their Fund will work with the local business support organisations. They will be asked to demonstrate how they will actively work with the private and public sector networks, to ensure that small companies with growth potential are able to link into relevant and appropriate business and management support.

20. The Government has always stressed the commercial nature of the Enterprise Fund venture capital schemes. The responsibility for investment decisions will rest with the FSA authorised Fund Managers alone, who have a legal responsibility to make investment decisions in the best interests of their investors.

- (l) *If the funds invested generate adequate returns, University Challenge will demonstrate to the venture capital community the benefits of investing in technology-based companies and thus draw in further investment. This should be one of its long-term objectives however, the success of the initiative should be measured by the number of new science and technology-based ventures established by universities as a result of the fund (paragraph 56).*

21. The Government welcomes the Committee's positive comments on the University Challenge scheme which supports the early stages of commercialisation of academic research. As the Committee points out, it would not be appropriate for Government to provide *all* the seed corn funds required to commercialise public sector research, but it is certainly the long term aim for the scheme to encourage further investment by the venture capital community in technology based companies. Each Fund has to report to DTI on an annual basis for the next ten years. Their success will be judged against their business plan and DTI will monitor a number of performance indicators related to their activities including the number of new science and technology based ventures established by universities as a result of the scheme.

- (m) *We recommend that the Business Link network should be charged with assisting small technology-based firms in preparing for venture capital investment (paragraph 57).*

22. Local outlets of the Small Business Service (SBS) will replace Business Links from 1 April 2001. The SBS will aim to improve the quality and coherence of support for small businesses, including small technology-based businesses. They will offer advice and guidance on the most appropriate type of finance for individual businesses and will be able to refer businesses to the sources of such finance. They will also work closely with private sector business support organisations to ensure that small businesses with growth potential are able to access appropriate support they may need in preparing for investment.

- (n) *We recommend that the Regional Development Agencies should assume responsibility for working with local and regional business angel networks and business introduction agencies (paragraph 58).*

23. Regional Development Agencies have responsibility for developing regional networks and clusters which support innovation. These networks will include Universities and other HEIs as well as the local franchises of the Small Business Service (SBS). The Government wishes the SBS to become the natural local port of call for the delivery of services to SMEs - thus eliminating the scope for confusion on the ground. As the Committee points out, business angels fill a vital gap in the venture capital market by providing small scale investment. The Government is pleased that the Committee welcomes the DTI's efforts in this area. A number of Business Links already operate their own matching service for business angels and businesses seeking equity and many others work closely with existing local Business Angels Networks (BANS). At a national level, the Government has recently agreed to provide pump-priming funding for the National Business Angels Network (NBAN) and the Business Angels Network Association (BANA). The former aims to become a national conduit through which any company seeking investment can be put in touch with investors, whilst the latter will represent the industry and act to spread and develop good practice throughout the industry. The aim is for NBAN and BANA to bring the informal investment market to full operation in order that business angels can become a mainstream source of finance for SMEs.

- (o) *We welcome the introduction of R&D tax credits to support small companies. It will not, however, affect the behaviour of larger companies whose commitment to innovation is just as important. We recommend that the Government should look again at extending this type of tax credit to large companies (paragraph 60).*

24. The Government is pleased to learn that the Committee welcomes the introduction of R&D tax credits to support small companies. The new R&D tax credit was announced by the Chancellor in the 2000 Budget and has been supported by DTI's publication of proposed new Guidelines on R&D which will be of help to large companies as well as SMEs seeking to qualify for the tax credit.

25. The introduction of the R&D tax credit has followed an extensive period of consultation, commencing with a consultation on innovation in early 1998 and the publication of two subsequent discussion documents in early 1999 on the definition of R&D and the appeals process and the proposed R&D tax credit. Following these consultations it was finally concluded by the Government that a volume based R&D tax credit for small and medium sized companies (SMEs) would be most cost effective and would focus the benefit on those companies most likely to grow and increase their R&D, but which face the greater barriers to R&D from risk and access to funding. Targeting assistance to corporate SMEs was considered the most cost effective approach. To provide *all* firms with a volume tax credit based on a firm's total R&D expenditure would be very expensive, involve considerable dead-weight and would not offer good value for money. Thus, the Government does not believe that it would be appropriate to extend this type of volume tax credit for SMEs to large companies.

26. An economic case for an alternative incremental tax credit for larger UK companies has not been properly determined. It would be useful to properly consider the affects on R&D of the recently introduced volume tax credit for SMEs. It should be noted that an alternative incremental R&D tax credit for larger companies—that is one which is paid on the increase in a firm's R&D expenditure over a base level—would fit very poorly with the existing UK tax system and would be complicated.

27. Although larger companies are not eligible for the R&D tax credit they do have full use of Research and Development Allowances (RDA). RDA provides for 100 percent expensing of all capital expenditure on R&D. Proposed Guidelines on R&D published by the Secretary of State for Trade and Industry will also be of help to larger firms and should positively affect their behaviour towards R&D. The Guidelines will clarify the scope of activities for which they are able to obtain R&D tax relief.

(p) It is important that any system of fiscal incentives is stable from year to year; is focused on the cost of development, market research, demonstrators and product launch, and that its value is monitored in the long term (paragraph 61).

28. Unlike the US R&D tax credit which has never been made permanent, the UK R&D tax credit for SMEs is permanent. This will enable SMEs to plan ahead from within a stable fiscal framework. Furthermore, to clarify what constitutes R&D for tax purposes, and thus increase the certainty of companies' understanding of what will be considered eligible R&D expenditure for tax purposes, the Secretary of State for Trade and Industry has published proposed Guidelines on R&D. These build on the provisions within SSAP 13 (accountancy treatment of R&D) and take into account Frascati and thus put the UK in the advantageous position of having a clear and consistent link between the accounting and tax treatment of R&D. What's more, the new Guidelines on R&D will be universally applicable by companies of all sizes in relation to what has since 1945 been called Scientific Research Allowance but which (in recognition of the emphasis now being given to R&D) was renamed in Budget 2000 as Research and Development Allowances.

29. It is recognised that it may be some years before the full effect of the R&D tax credit (and the Research and Development Allowances and Guidelines on R&D) is evident. The Government will be keen to evaluate the effect of the R&D tax credit in the medium term, but accepts the Committee's recommendation that its value should be monitored in the long term. Even so, it should be noted now that market research and product launch costs are not considered to be eligible R&D costs for tax purposes.

(q) We welcome the changes in the 1998 and 1999 budgets which some witnesses argued would substantially alter the operation of Capital Gains Tax in the favour of entrepreneurs and management teams. We recommend that the Government monitors closely the impact of these changes to ensure their effectiveness in facilitating innovation. It should also monitor closely approaches to taxation and Capital Gains Tax in other member countries of the European Union (paragraph 62).

30. The changes to Capital Gains Tax in recent Budgets aim to create the right incentives for investments in assets which generate sustained growth. In particular the changes aim to support

entrepreneurial investment. Alongside the changes to Capital Gains Tax, the Government has introduced Enterprise Management Incentives to allow small higher risk companies to offer tax-advantaged share options to key employees. Being able to offer options over shares valued up to £100,000 to each of up to fifteen employees provides a real incentive for people to take jobs in smaller companies with the potential to grow. The new All Employees Share Plan, which is the most tax-advantaged all-employee share scheme ever introduced in the UK, allows all employees to share in the success of their company. Together, these tax measures encourage and reward entrepreneurial endeavour.

31. For all UK tax measures, the effect of new and existing incentives is kept under review. When comparing the UK tax regime with other EU tax regimes, individual tax measures have to be viewed in the context of the broader tax regime of the country in question. This makes direct comparisons difficult. Nevertheless, it is helpful to be aware of the approach taken by other countries – both others in the EU and elsewhere, particularly in the US.

(r) We welcome the Institutes for Enterprise; they are a step in the right direction and we look forward to them playing a more significant role in the future (paragraph 63).

32. The Government is pleased that the Committee feels that the recent award of £25m funding under Science Enterprise Challenge, to eight universities to establish world class entrepreneurship centres, is a significant step in helping to stimulate scientific entrepreneurialism in the UK. A range of new activities is planned by the Centres, including teaching and training to support innovation and entrepreneurship and development of managerial capacity to enable more business start-ups to grow successfully. There will be support to increase the capacity of academia to commercialise innovations arising from science and engineering research, and there will be projects to increase the capacity of business to exploit and acquire such knowledge assets. There will be a regional focus, with the Centres forming strong links with local business, as well as a national impact through the dissemination of best practice in scientific entrepreneurship education.

33. Progress of the centres will be monitored over a five year period, and there will be monitoring and evaluation of the scheme as a whole. It is also planned to facilitate networking and sharing of best practice between the centres and other universities actively involved in entrepreneurship teaching, for example, through organisation of an annual conference and distribution of case studies.

(s) We recommend that changes in the reward structure for serial entrepreneurs be coupled with widespread publicity regarding successful role models and active Government support in marrying together entrepreneurs with the right technology and access to finance (paragraph 64).

34. The DTI is supporting the business-led National Enterprise Campaign, to be launched in May 2000, which aims to create a more entrepreneurial culture across the UK. A key part of the Campaign will be the creation of a network of entrepreneurs and business people to help promote and encourage the values of enterprise. These 'ambassadors' will speak honestly and from the heart about the excitement, challenges and satisfaction of being an entrepreneur. The DTI also supports initiatives designed to enable access to technologies both from within the UK and from overseas, for example TCS (Teaching Company Scheme), Smart and the International Technology Service.

35. The Small Business Service (SBS) will not, in itself, provide finance for individual businesses as this would put it in competition with existing finance providers. It will, however, work with these providers to ensure that the market is effective in providing finance which meets the needs of small businesses. Local SBS outlets will offer advice and guidance on the right kind of finance and will work closely with local finance providers. The SBS Gateway site will include pages on types and sources of finance.

(t) We welcome the Secretary of State's undertaking to review the legislation on bankruptcy and insolvency to introduce a distinction between responsible

entrepreneurs whose businesses have failed and those whose reckless activities have resulted in business failure (paragraph 65).

36. The Government agrees with the Committee's view that the stigma associated with business failure in the UK discourages entrepreneurship.

On 7 April 2000, the Government published a consultation document entitled "Bankruptcy – A Fresh Start". The document recognises that there is a very real stigma attached to financial failure in the UK which discourages enterprise. Entrepreneurial activity is a major determinant of growth but UK cultural attitudes are among the least supportive of entrepreneurs. Only a relatively small minority of bankrupts are either dishonest or reckless. Present bankruptcy law adopts a "one size fits all" approach with no distinction made between the honest and dishonest. The document proposes that a distinction can and should be made in order to remove the stigma for the honest bankrupt. It recommends a much earlier discharge from bankruptcy for the large majority whose failure is honest, it proposes a relaxation of the rules on exemption of personal property, where appropriate, and suggests financial counselling for those who would benefit from it. The small minority of dishonest bankrupts would be subject to the full rigour of a new, tougher and more restrictive regime.

(u) The 1998 Competitiveness White Paper stated that it is not for Government to determine how companies are managed nor to anticipate boardroom decisions. We agree. Government should, however, encourage firms to adopt a long-term approach to market and technological opportunities by spreading best practice in innovation management and drawing attention to the financial and commercial benefits which can derive from technological innovation. Likewise business schools should ensure that the management of science-based innovation is properly covered in their curricula (paragraph 67).

37. Since publication of the Government's Competitiveness White Paper², important steps have been taken to encourage firms to take a long-term approach to market and technological opportunities by spreading best practice in innovation management. For example,

- Foresight helps provide a vision of the markets and technologies that will transform traditional industries and create new ones over the next ten to fifteen years;
- The Design Council's Millennium Product Awards have recognised one thousand innovative products and services that are successful in their markets. From these examples the DTI, working with the Design Council, has undertaken in-depth research into innovation management practices and the key factors that differentiates between success and failure. A key finding - how companies create and sustain an innovation culture for the long-term - will be launched as part of the Celebration of Innovation in May 2000.

38. In implementing the Competitiveness White Paper targets, the Department has supported actions targeted at encouraging the use of innovation and best practice. The CBI/DTI *Fit for the Future* National Best Practice Campaign is providing a growing network to encourage "business learning from business". British Aerospace is an active campaign partner, helping its suppliers to focus on innovation and best practice. The Institution of Mechanical Engineers is also a campaign partner, and through the Manufacturing Excellence 2000 Awards is seeking to recognise companies that have successfully integrated the Foresight process within their business strategy.

39. The Government recognises the important role of Business Schools in developing people with skills needed for the new knowledge based companies. The Council for Excellence in Management and Leadership (CEML) has been established to make recommendations to the Secretaries of State for Trade and Industry and Education and Employment on policy changes and

²"Our Competitive Future—Building the Knowledge Driven Economy", Cm 4176 December 1998.

actions. Sir Anthony Cleaver has been appointed to chair the Council and in its first year of operations the Council has the clearly defined aim:

"To ensure that the UK is able to develop the managers and leaders of the future to match the best in the world, in both the public and private sectors, to sustain the UK's competitive performance."

40. The CEML members have agreed to work with the Councils in Scotland, Wales and Northern Ireland and give a particular focus to, amongst other things, the role of the Business Schools.

- (v) *Universities must protect their intellectual property appropriately. Methods of protection will, however, vary depending on a range of factors including the nature of the invention. Consideration of intellectual property rights and patenting should not be allowed to act as impediments to the flow of knowledge and expertise which is the fuel for innovation (paragraph 72).*

41. The Government strongly agrees that the protection of intellectual property is an important part of the process of innovation and that universities, as well as companies, must take steps to protect their intellectual property appropriately. The UK Patent Office has reduced Patent and Trade Mark fees by 20% and has abolished the cost of patent application fees altogether, in order to encourage more patent filing.

42. The intellectual property system operates to protect invention and encourage innovation, and offers sufficient flexibility to give protection to different types of intellectual property under a wide range of circumstances, provided those making use of it have enough understanding of the benefits available. Use of the patent system is not an impediment to the flow of knowledge and expertise, since all patent applications (other than those withdrawn prematurely) are published eighteen months after filing. Published patent specifications (some 40 million world-wide) constitute an invaluable source of technological information.

- (w) *The Government placed strong emphasis on addressing weaknesses in the EU and UK patent systems in Our Competitive Future. Its 'IPR Action Plan' includes working towards an EU patenting system which is both affordable and easily enforceable. We welcome these commitments but note that the German Government said that it favoured a move to the US system. These European and international differences need to be reconciled (paragraph 73).*

43. The Presidency conclusions from the Lisbon European Council emphasise the importance of establishing a Community patent system whereby rights would be accorded simultaneously across all EU Member States. The Presidency calls for urgency and specifies the end of 2001 as the date for making this new system available. This reflects in full the Government's objective in the "IPR Action Plan".

44. The United States is alone in the world in according patent rights to the first to invent the apparatus, chemical compound or process for which patent protection is sought. All other countries, including the United Kingdom and Germany, accord rights to the first to file an application for patent protection. We are not aware that the German Government is seeking to change to the US system.

45. Although a "first to invent" system appears attractive, compliance costs in keeping fully notarised laboratory records, and resolving disputes between competing companies have persuaded other countries to opt for the legally clearer system of "first to file". We are not aware that this is causing difficulties for inventors or innovators. However, we understand that Germany may favour introducing what is known as a "grace period" into European patent law. This would mean that an invention could be published during a short period (3, 6 or 12 months) prior to filing a patent application, without prejudicing the grant of rights. No such period exists in European patent law at present and its absence is criticised by some as being disadvantageous to academics and SME's.

46. An ambitious programme for reform of the existing European Patent Organisation (not a Community institution) is underway, and the Government intends to hold a Ministerial conference this autumn to consolidate progress. Many aspects of the European patenting system are being reviewed, including grace periods. We continue to press, bilaterally and through multilateral fora such as the World International Patent Organisation (WIPO) for change in the US system. This is also included in the "IPR Action Plan".

- (x) *Government policy should be focused upon achieving two equally important goals. First, Government must ensure that there is a strong public sector research and education base, at all levels, to provide industry with leading-edge research and the highly trained staff "which is the life-blood of technology based industry". Second, Government must provide an economic and fiscal environment that supports those who innovate, and encourages others to improve their innovative performance (paragraph 74).*
- (y) *The greatest contribution that Government can make to industrial innovation is by providing a stable economy over the long term which is conducive to innovation, informed risk-taking and change (paragraph 76).*

47. The Government agrees with the Committee on the importance of maintaining a strong public sector research base, and in particular the research capability of the universities and the Research Council establishments. In the Comprehensive Spending Review £1 billion additional funds were made available for the science budget, and in a unique public private partnership the Wellcome Trust agreed to contribute a further £400 million. Over half of this £1.4 billion was set aside to upgrade the capital infrastructure for university research.

48. The Government agrees that its main role is that of facilitator and enabler rather than instigator of innovation and that its greatest contribution to innovation is to provide a stable macro-economic environment which supports innovation over the long term. The Government's macro-economic framework, built around explicit objectives for low and stable inflation and sound public finances, combined with the structural reforms designed to raise the productivity of the economy, together, do indeed create the very best environment for industrial innovation.

- (z) *We recommend that Government funding for the Teaching Company Scheme should continue to increase gradually up to the time when the level of return starts to fall significantly (paragraph 79).*

49. The Government is pleased that the Committee found that many of its schemes aimed at linking university know-how to industrial application, such as TCS and LINK, have been generally effective. Following the commitment by DTI, announced in the White Paper *Our Competitive Future*, to double its funding of TCS, the total annual Government expenditure on TCS is scheduled to rise to at least £28m by 2003, as against just less than £18m in 1999/2000. As the Committee acknowledges, whether there can be further growth beyond 1000 'live' TCS Programmes at any one time will depend on a number of factors, not only Government funding. In addition to there needing to be a sufficient supply of high calibre graduates wanting to participate in the scheme as TCS Associates, there also needs to be a sufficient number of academics in the relevant departments willing to be involved in TCS. The potential for future growth of TCS will be kept under review.

- (aa) *We acknowledge LINK's effectiveness in strengthening long-term links between industry, and the science base but recommend that steps are taken to reduce the bureaucracy of the scheme and to make it more accessible (paragraph 80).*

50. The Government is pleased to note the broadly positive response to LINK reported by the Committee, which mirrors the feedback OST has received from participating companies. LINK is overseen by an independent advisory body, the LINK/TCS Board, which was set up to advise on the strategic development of both LINK and TCS. Over the last few years, the LINK/TCS Board (and, before it, the LINK Board) has played an important role in encouraging the Government Departments and Research Councils which sponsor LINK to improve the scheme's efficiency and accessibility. This has resulted in significant improvements in case processing

times, which have on average more than halved over the last 5 years, and in the spread of best practice among programme administrators. Other initiatives for streamlining LINK's administration and making the scheme more accessible are currently being considered, including the introduction of common, electronic application forms and additional guidance for participants.

(bb) If LINK is to reach its maximum potential, it must be effectively, marketed and easily accessible not only to those companies which are already aware of the benefits of collaboration with the research base but more importantly also to those which have no experience of interaction with academia (paragraph 81)

51. The Government agrees with the Committee that LINK must be effectively marketed and easily accessible to companies which have no experience of interaction with academia and that, traditionally, only a minority of participants have accessed LINK through the national Business Link network. Over the last two years, however, information about LINK and LINK programmes has routinely been sent to Innovation and Technology Counsellors, who are best placed within Business Links to identify appropriate companies. LINK is also marketed in a number of other ways to companies new to collaboration with academia. LINK programmes are generally established after consultation with the relevant industries and their trade associations and are advertised through appropriate trade magazines. Increasingly, LINK programmes have a Web site or regular newsletters giving information about the projects being supported, details of which are widely disseminated to the relevant industries. DTI LINK programmes, in particular, encourage the involvement of SMEs in project consortia, for example based on a supply chain. The Government proposes to continue with these efforts and to ensure that other bodies, such as the new Small Business Service, Faraday Centres and University Challenge winners are well placed to promote LINK to their business communities.

(cc) We welcome the Department of Trade and Industry's commitment to the Faraday concept as a means of transferring technology and instituting market orientated development and its announcement of additional funding (paragraph 82).

52. The Government welcomes the Committee's support for the Faraday Partnerships concept. It believes that Faraday Partnerships have the potential to correct many of the problems that have frequently been identified with the UK innovation system, including the need to build commonality of purpose between research organisations, intermediaries, user firms and providers of capital; the confusion over the many Government-funded schemes; and, the lack of continuity between research, development and exploitation. Taking note of Foresight priorities, Faraday Partnerships are intended to be the "partner of choice" in the sectors where they are established.

(dd) We have previously called for greater clarification in existing schemes designed to promote interaction between industry and the research base and recommended that consideration be given to the greater use of the successful LINK scheme as an umbrella to reduce confusion. We do so again (paragraph 83).

53. The Government has noted the Committee's recommendation. As part of the work for the White Paper on Science and Innovation, the Government is considering how best to ensure the coherence and clarity of its package of measures to support innovation. The new Small Business Service will act as a focal point for the delivery of support to small and medium sized businesses, and is being closely involved in consideration of how best to market innovation support.

54. Steps have been taken to use LINK as an umbrella for other schemes promoting research collaboration between industry and the research base. For example, the LINK marque and procedures have been franchised to three Research Councils, most recently to EPSRC's Innovative Manufacturing Initiative, which was brought within the LINK fold in April 1998. Opportunities for further rationalisation of such schemes under the LINK umbrella will continue to be sought while respecting the integrity of the brand.

(ee) There is no intrinsic reason why greater interaction with industry, should compromise the ability of the research base to meet its own goals. It is, nevertheless, critical that Government policy, in seeking to increase the industrial relevance and take up of the research it performs, should not overlook the science base's diverse roles. We are

adamant that the primary measure of quality in the science, engineering and technology base should be scientific excellence rather than the potential for commercial exploitation (paragraph 84).

55. The Government agrees entirely with the Committee that there is no intrinsic reason why greater interaction with industry should compromise the ability of the research base to meet its own goals. The Government also agrees that the primary measure of quality in the science and engineering base should be scientific excellence rather than the potential for commercial exploitation. Indeed, the Science Budget has been increased to ensure that the UK science base remains the most respected in the world and the Science Budget is still administered within DTI as a separate Vote and therefore unaffected by expenditure on other areas of S&T activity.

56. However, the Government believes that more should be done to encourage industrially relevant research within the SET base, without compromising excellence, and, as the Committee has noted, recently launched the Higher Education Reach-out to Business and the Community fund to enhance the capability of universities in England and Northern Ireland to interact with business for knowledge transfer, strengthen higher skills development and improve student employability.

(ff) The public interest clearly lies in the easiest possible exchange of knowledge between academics and industry. Funding mechanisms such as the Research Assessment Exercise must encourage universities to exploit their intellectual property and foster a collaborative culture in the university sector (paragraph 85).

(gg) HEROBC is, in terms of its funding, too limited to be effective. The creation of HEROBC, although a welcome sign of intent, will not be able to effect the culture change that both we and the Higher Education Funding Council for England are seeking if the research assessment exercise itself continues to undervalue research undertaken in collaboration with industry or research of industrial relevance (paragraph 86).

57. The Government notes the Committee's view of the level at which the HEROBC fund was introduced. As the Committee have suggested, the institutional and cultural change that HEROBC seeks to instil will not happen overnight. HEFCE has announced the intention to initiate in due course a third stream of core funding for universities to further enhance their knowledge transfer activities with business, alongside funding for research and teaching. Future funding in this area will need to be considered as part of the Government's current Spending Review.

58. The Government agrees with the Committee that there should be no disincentives to knowledge transfer. If we are going to provide universities with a realistic opportunity to diversify and increase their level of university-business interaction, it is important that we have a mutually supportive funding framework. The challenge for Government is to stimulate and facilitate increased knowledge interaction between the science base and business and society, across all sectors of the economy whilst maintaining, and indeed, improving the quality of both teaching and the research base.

59. The Government recognises that the perception exists in parts of the business and academic communities that the RAE gives more weight to published academic papers than to other forms of research outputs. The definition of research that applies in the RAE includes "work of direct relevance to the needs of commerce and industry" and acceptance of this type of research has developed over the lifetime of the RAE.

60. To further strengthen this approach for RAE 2001, the funding bodies are taking the greatest possible care to ensure that all forms of research activity are being equally regarded and valued—this includes patents, designs, new products and devices, and commercial and technical reports. The RAE panels have developed their criteria and working methods with the aim of ensuring that the assessment process will be applied uniformly across all forms of research activity. Representatives of the RAE panels recently attended a joint CBI/DTI/Funding Bodies'

seminar to discuss, with representatives of business and HEIs, the application of their criteria and working methods to the assessment of industrial and commercial work.

61. It is important that the panels are able to incorporate within the assessment process the additional perspectives and expertise provided by the users of research. After the last round of RAE, the funding bodies made a commitment to increase the level of user representation on the panels. In RAE 2001, users of research will be included on 75% of the RAE panels and will make up 13% of the total panel membership.

62. If collaborative research is to be encouraged then all businesses and all HEIs must be aware of the value that the RAE places on applied research. The funding bodies have recently issued a joint HEFCE/DTI leaflet, "Industry Commerce and the RAE2001". This leaflet builds on previous efforts by the Funding Bodies to raise the level of awareness and, as well as being available on the internet, it will be sent out to all HEIs and distributed widely throughout the business community.

(hh) The conflict of opinion between the Chief Scientific Adviser and industrialists over the availability and suitability of science, engineering and technology graduates needs to be reconciled (paragraph 88).

(ii) The Government must recognise the need to increase the quality and levels of competence of science, engineering and technology graduates. The onus must then be on industry to seek ways of attracting the highest quality UK graduates in sufficient number into industrial careers (paragraph 89).

63. The Committee suggests that the number of personnel in R&D in the UK declined substantially in the decade 1986-96. However, the number engaged in research, as distinct from technical support and administration, has remained broadly stable over the period, and in the case of researchers in higher education it has increased strongly, levelling off only in recent years.³ More people are graduating with science, engineering and technology qualifications than ever before, and the flows into manufacturing and professional occupations remain strong. The Government believes it is healthy that the skills of science and engineering graduates also percolate more widely through the economy into posts not directly related to their degree subject.

64. The Government accepts the thrust of the Committee's recommendations on the quality and levels of competence of science, engineering and technology graduates and that industry should seek ways of attracting the highest quality UK graduates into industrial careers. The Government is determined to facilitate high-quality, flexible provision which meets the diverse needs of students and prospective employers. Proposals for Foundation Degrees will have a major impact on intermediate skills shortages, for example in IT, electronics and across engineering. It is vital that employers signal clearly the career opportunities and rewards open to science and engineering graduates, and work directly with institutions and professional bodies to ensure attractive, quality courses which equip students with the technical, personal and business skills to succeed.

(jj) The Government should ensure that Regional Development Agencies, in partnership with Local Authorities, are adequately resourced to provide the infrastructure for economic development and the establishment of clusters around local universities (paragraph 90).

65. Business incubation and the development of clusters feature prominently in the Regional Development Agencies economic strategies. The Chancellor announced in the budget the allocation of £50 million to assist the eight English Regional Development Agencies (and the London Development Agency, when it is established in the Summer), to work with partners such as Local Authorities, Universities and other HEIs in promoting the development of clusters and business incubation in their respective regions.

(kk) We welcome the Government's recognition of the importance of clusters and the

³ Tables 5.14 and 8.3, SET Statistics 1999, Cm 4409, and Business Enterprise R&D 1998, ONS (98) 325 November 1999

changes that have been made to the planning system to promote their development (paragraph 93).

- (II) We recommend that one of the objectives of the Ministerial Group should be to understand better the ways in which technology clusters promote innovation (paragraph 94).*

66. The Government welcomes the Committee's comments about the importance of technology clusters and the work which the Government has already done to promote clusters, particularly in biotechnology and IT. The Government recognises that it cannot create clusters. However, it has a clear role to provide the environment in which new and existing clusters can develop and grow. One relevant factor is undoubtedly the planning system and, building on the recent changes made, Lord Sainsbury's Clusters Policy Steering Group will consider whether any further changes are appropriate. The terms of reference for Lord Sainsbury's Group are currently being drafted. However, the Group will have a broad remit covering all aspects of Government policy which impinge on clusters. The Government accepts the Committee's recommendation that for the Group to fulfil that role comprehensively, it will need to understand the ways in which technology clusters promote innovation.

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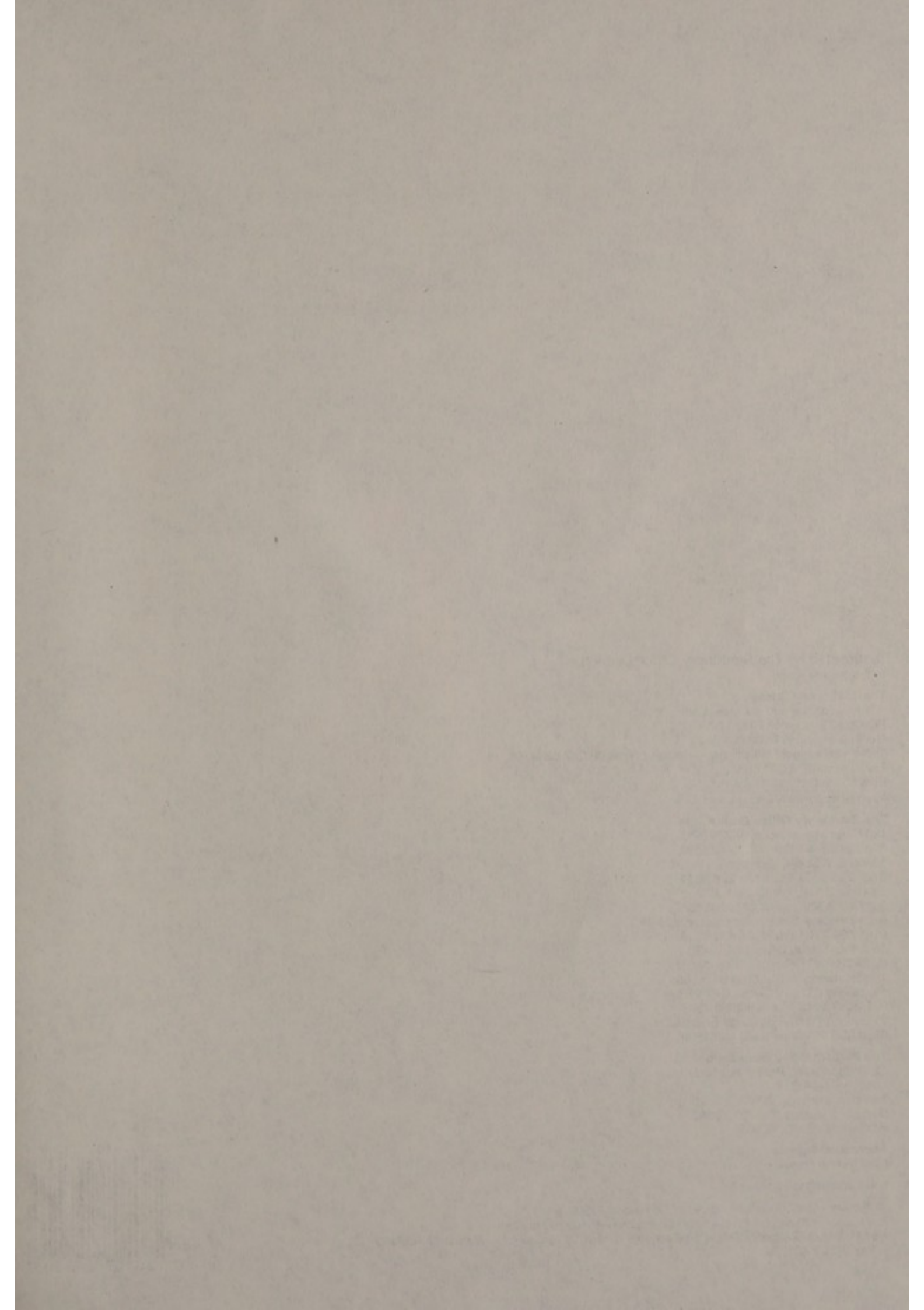
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