



# SCIENCE AND TECHNOLOGY STATEMENT 1982-83

by  
The Minister for Science and Technology  
The Honourable Barry O. Jones, M.P.

MAY 1983



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1982-83

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A statement on the Commonwealth Government sector  
prepared by the Department of Science and Technology  
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agencies of the Commonwealth Government  
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PREFACE

BY THE

MINISTER FOR SCIENCE AND TECHNOLOGY

THE HON. BARRY O JONES MP

26 MAY 1983

Introduction

*The Science and Technology Statement, as in previous years, is a tabulation of Commonwealth expenditure on research and development, or R&D, classified according to agency. Ministry, and socio-economic objective. I have arranged for the information provided in the Statement to be tabulated on the basis of the Ministry structure of this Government; as the figures presented are for the current financial year, however, they reflect the priorities and programs of our predecessors in government.*

*The Statement contains statistical information on Commonwealth funding of R&D over the past five financial years, and on more general science and technology activities for the past two financial years. From 1978-79 to 1982-83 there has been a total real growth in R&D supported by the Commonwealth of about 16%. Measured as a percentage of gross domestic product, or GDP, funding increased from 0.49% in 1978-79 to 0.52% in 1981-82, to an estimated 0.54% in the current year. The growth rate of R&D funding is slightly greater than that of the economy as a whole but it is also true that the costs of R&D tend to increase at far higher rates than the CPI. The Statement confirms that R&D expenditure is by no means confined to the Department of Science and Technology. Of projected total government expenditure of \$1552 million for 1982-83 on science and technology (including R&D), the Department of Science and Technology accounted for only 32.1%, followed by Defence and Defence Support 11.7%, Education 7.6%, Resources and Energy 6.3%, Treasury 6.2% and Communications 5.9%. Total expenditure for the Department of Science and Technology, including CSIRO, was less than the annual expenditure on R&D by Eastman Kodak in the U.S. and about a third of IBM's.*

*Funding of R&D*

*The really significant question about the level of Commonwealth funding of R&D is: 'is it enough?': and the other important question it raises is: 'what contribution are the other R&D - performing sectors of the economy making?'. These questions in turn raise fundamental issues about the significance of R&D, and of science and technology generally, for Australia, its people, and its economy.*

*The term 'R&D' covers a wide range of activities, from basic or pure scientific research with no commercial application in mind, to development of commercial marketable products.*

*Basic research is mostly funded by governments; the risks are too great and the returns too uncertain to expect business to invest substantially in such activities. An example which is sometimes quoted is that of Crick, Watson and Wilkins, who published their discovery of the structure*

of DNA in 1953. It is only now, thirty years later, that that discovery is finding commercial application in the promising and growing field of biotechnology. Few business enterprises could contemplate a twenty-five year wait for a return on investment, and that is why governments must support most long-term research.

On the other hand, as we move along the R&D spectrum towards the development end, the contribution of the private sector increases. In Australia, experimental development is funded mostly by private business, although there is still substantial government activity, for example, through the Industrial Research and Development Incentives Scheme. Yet the total of investment by the private sector in R&D is extremely low; when measured as a percentage of GDP, we have one of the lowest rates of private sector R&D funding among OECD countries. The introduction to the Statement points out just how poorly our business sector is performing.

It is distressing to me that private industry's commitment to R&D is so meagre. It is understandable, I suppose, that when things are tough managers see R&D budgets as an area where they can cut costs. But I would argue that R&D should be one of the last areas to be touched, because it represents the future - it provides a way for an enterprise to lift itself more quickly out of a slump, it supplies a pool of knowledge, ideas and skills on which the enterprise can draw. R&D is an investment in the future in something of the same way that education is.

#### Trade in Technical Know-how

The poor performance of the Australian private sector in R&D finds its reflection in Australia's comparative standing as a technologically-advanced country.

The Australian Bureau of Statistics collects information relating to receipts and payments, by business, for technical know-how. The recently released preliminary figures for 1981-82 show that uncorrected for inflation, both payments and receipts decreased in the period from 1978-79 to 1981-83, payments by 8% and receipts by 7%. By comparison with other OECD countries, Australia's level of both import and export is very low. It may come as no surprise that the Netherlands had receipts for technical know-how of the order of twenty times as great as ours, in 1978; but payments also, were much higher - three times our level.

On an expenditure basis, Australia performs about 0.9% of the world's applied research and experimental development other than that performed by the U.S., and over the period 1963-1979 obtained 0.9% of the foreign patents awarded in the U.S. Nevertheless, on a per capita basis Australia was strongly outperformed in U.S. patents by the small developed European nations, specifically Switzerland, Sweden, Netherlands, Belgium, Austria and Denmark.

Figure 5 on page 155 presents the results of a collation of statistics relating to the import and export of goods with a high research component. This collation shows that in 1980 Australia exported U.S. \$81 per capita of such goods, which makes for a startling comparison with Switzerland, for which the figure is \$2 584, Netherlands (1 378), Belgium (1 352), Sweden (1 087), Denmark (882), Austria (720), Ireland (589), Finland (509) and Norway (507). The figure taken over all OECD countries is U.S. \$468 per capita, and in the OECD only Portugal, Greece, Iceland and Turkey have a lower figure than Australia.

In 1980-81 Australia ran a trade deficit of some \$A6 billion in goods with a high research component. The deficit for all manufactures was about \$10 billion; overall there was a trade balance, with imports and exports each totalling about \$19 billion. A deficit in goods having a significant research component has been a normal part of Australia's trade pattern, but in the last decade it appears to have increased rapidly.

#### *Economic Change*

The statistics I have just listed present a sorry picture of Australia's technological performance. It is appropriate to ask why this state of affairs has come about. One reason is the degree of foreign ownership in Australia, under which parent companies prefer to carry out their R&D at home rather than in their Australian subsidiary; a second reason is doubtless the persistent conservatism of Australian business; and a third is the inaction of governments. And the resources with which Australia is so richly endowed have encouraged the development of an economy which is highly dependent on the agricultural and mining sectors.

There are some who argue that this woeful picture is not a cause for concern, but the natural order of things. These are doctrinaire free marketeers who insist that Australia's natural advantages lie in the agricultural and mining industries, and that we should allow our economic fate to be decided by this comparative advantage. The 16.5% of Australians who at present are employed in manufacturing are, according to this school, to be abandoned to the winds of change. But an economy so dependent on resource-based industries is highly vulnerable. Commodity markets tend to be unstable and the current and past economic difficulties of many of Australia's resource industries illustrate the drastic effects of market volatility. Secondly, while there might be something 'natural' about our bounteous resources, there is nothing natural about our disadvantage in manufacturing: that disadvantage is the result of action by other governments and inaction by our own. There is little that is genuinely free about the international market; governments of other countries have been establishing their own industries on an advantageous footing by the judicious use of various kinds of assistance measures and trade barriers for years. Meanwhile in Australia there is bleating about non-interference in the market. It's a bit like sticking to Marquess of Queensberry Rules in the middle of a Saturday night free-for-all; it's no wonder that we've been getting the worst of it.

The conclusion is inescapable - the natural order of things does not in itself deny us a healthy and competitive manufacturing sector. Unfortunately the manufacturing sector is in considerable difficulties at present: employment has dropped, profitability is down, as is investment, and competitiveness is impaired. These problems constituted one of the principal reasons for the economic summit held in April. A set of resolutions was incorporated in the final communique of the summit, and I believe that we all hope that the earnest application of those resolutions will help the economy to emerge from the current crisis.

#### *Transition to a Post-industrial Phase*

I have a wider concern, however, which is that regardless of the short term rises and falls in the fortune of manufacturing, there is a longer term trend which we must be aware of. I have spoken on other occasions of my conviction that western economies are in transition to a

post-industrial phase. This is shown by a gradual drop in employment in manufacturing over the past twenty years, as technological improvement causes productivity to increase faster than demand. The transition in Australia has occurred more rapidly than elsewhere, and has had severe effects in some areas because of the regional concentration of manufacturing.

As employment in manufacturing declines, there is a movement of labour to the service sector. The history in Australia has been, however, that the service sector does not expand at the rate necessary to take up the surplus labour; partly this is because new technologies are improving productivity in the service sector itself, so that service sector employment may not be a replacement for the loss of jobs elsewhere. The adoption of new technologies in this sector, can be seen at its most marked and radical in the 'information industries'; indeed the significance of information in the modern economy has led to the identification of a distinct 'information sector'.

If employment is falling in manufacturing and the slack is not being made up in services, what are the prospects for the Australian economy? One answer, at least until about the end of the century, is that it is possible to rejuvenate manufacturing through the application and generation of new technologies. We can engineer comparative advantage for Australia as other countries have; what is needed are conditions which will allow new industries to be established, and encourage the revitalisation of old industries. This means, among other things, creating an environment which encourages innovation, R&D, the adoption of new technologies, and the opening of new markets.

#### *New Technologies*

New technologies can contribute in more than one way. First, process innovation can enable the manufacture of an existing product more cheaply, so that unit costs are reduced and international competitiveness is enhanced - for example through use of industrial robots. Second, technology can generate totally new products which can create their own markets - as did the pocket calculator. New industries based on technological innovation act as wealth generators providing a stimulus to the economy as a whole.

Through the adoption and development of new technologies, enterprises can obtain a market advantage - and, provided they keep producing new ideas, they will retain that advantage. Australians are as creative and inventive a people as any other; if we could harness that inventiveness we could build ourselves a stronger and more resilient economy.

It may be argued that Australia does not need to generate its own innovations and new technologies, that imported technology is just as good as the home-grown variety. There is a grain of truth in this; certainly we cannot hope to be self-sufficient in technology. It is noteworthy that the small technologically successful countries tend to import large amounts of technical know-how, and the successes of the Japanese economy since the Second World War were based in large measure on technology borrowed from elsewhere. But Australia cannot follow the Japanese model, which relied on low wage rates in post-war Japan; now that wage rates have risen, Japan has shifted to an intensive R&D effort as the basis of its future growth.



We do need to import more technology and technical know-how; but we cannot allow ourselves to become technologically dependent. That way we would always be behind overseas developments instead of in the vanguard; and we must foster our own technological capabilities and inventiveness if we are to be able to make best use of overseas knowledge. A truly fertile environment for innovation and invention would involve a balanced mix of original and borrowed ideas.

#### Government Goals

The goals I have identified are not easy to achieve; but the economy will benefit from measures which encourage greater flexibility and diversity, and a more innovative and technology-intensive manufacturing sector. There has been discussion about the need for structural adjustment for some years, but precious little has been done to help it take place. The present Government hopes to create conditions under which structural change can occur smoothly, with a minimum of dislocation. Many of the elements of the Science and Technology Platform and Policy we put forward in the last election were designed with this in mind. Thus the documents provide for:

- . increased expenditure on R&D, especially by the business sector; the target is a 100% increase over five years, virtually all of that coming from industry; incentives would be devised in collaboration with industry to encourage this increased investment; there should also be an increase in funds made available through the Australian Research Grants Committee; and plans are underway to amend the Industrial Research and Development Incentives Act so as to broaden its scope and application.
- . the introduction of measures to enable the establishment of new industries; our policy lists sixteen areas as examples of new industries which could be established, as well as putting forward proposals for the provision of venture capital.
- . technology transfer: we propose a series of measures designed to encourage local control of technology and the rapid adoption of useful technology.

A further area where science and technology policy has something at stake is in education and skills. Current retention rates for Australian students in secondary and tertiary education are comparatively low, and they will need to increase markedly if we are to revitalise and supplement the traditional industries with new technologies. At some stage we must make the shift to being a 'skill-based' or 'knowledge-based' society. The mention of the need for higher retention rates in education, in the summit communique (paragraph 44), is a first step in the right direction.

#### Technological Sovereignty

One aspect of technology which I have not yet mentioned is the threat it sometimes poses to people's employment, personal freedoms and quality of life. Paradoxically, perhaps, if Australian industry were to embrace technology enthusiastically there could be a beneficial effect in the impact of technologies on peoples lives, because this would lead to

greater indigenous control over technology. As it is, we are losing in both directions, having no guaranteed access to technologies we want, and having those we may wish to avoid foisted upon us.

Technological sovereignty then, is the first step in minimising unfortunate side effects of technologies. Our platform set out others, notably public information and the establishment of two assessment and information bodies - an Office of Technology Assessment and a Commission for the Future. Information, open discussion and control of technological destiny are the essential elements in ensuring a future in which technological change occurs in a way which is both acceptable to the individual and beneficial to the community as a whole.

I have mentioned the significance of information in the modern world. That position of importance stems from the new information technologies, which have allowed the collection, storage, manipulation, transmission, and retrieval of large amounts of information at minimal cost. Consideration of the central position of information in so much of modern life has led to the formulation of a National Information Policy. This sets out principles and ways of ensuring that Australians have access to the information they need to retain control of their lives, and that no segment of society is discriminated against with respect to the information to which it needs or desires access.

#### Conclusion

Implementation of the measures of which I have spoken will be influenced by budgetary and other constraints; nevertheless I expect that over the next few years many of our policies and proposals will be given effect, and the results will begin to be visible. I cannot say that I am excited about the contents of this Science and Technology Statement; it is my hope and expectation that in future years it will be my privilege to table Science and Technology Statements which give far greater grounds for optimism about the future of science, technology and the economy in Australia.

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## ACCURACY AND ROUNDING CONVENTION

All entries in the Ministry tables have been rounded to the nearest \$0.001m, except where a lesser accuracy was quoted by the respondent. It should be recognised, however, that the data are often less accurate than implied. For greater clarity in presenting broad aggregates some tables show figures rounded to the nearest \$0.01m, except in cases where the aggregate included items specified only to \$0.1m, where only this accuracy is given. Some discrepancies between quoted totals and actual sums of components listed in tables may be noted: these are due to rounding.





## INTRODUCTION

This is the fourth annual Statement providing detailed information about expenditure by the Commonwealth Government in support of science and technology (S&T).

The information provided in the Statement is an important aid in the development of policy in matters relating to science, technology and associated economic development, and in the coordination of the Commonwealth's S&T activities.

The figures presented in the Statement each year constitute a reflection of Commonwealth Government policy on science and technology so far as that is expressed in expenditure commitments. For the present Statement, of course, the expenditure data reflect the policies of the previous Government. In particular, the 1982-83 expenditure estimates are those associated with the Budget brought down in August 1982. Significant changes in direction in science and technology policy have been foreshadowed by the present Government which took office in March 1983. These changes are presented in the Minister's tabling speech, and their effects will be reflected in future Statements.

The Science and Technology Statement is only one among a number of sources of information on Commonwealth Government involvement in scientific and technological matters. The Department is continuing to explore the development of other elements of a larger package of source material for policy makers, policy analysts and advisers, and others concerned with science and technology.

In addition to further updated editions of the directory outlining functions and interactions of Commonwealth bodies in relation to science and technology <sup>(1)</sup>, the Department is working towards publishing a biennial Australian science and technology indicators report. As a step in this direction, consultants have been engaged to complete the Australian Science and Technology Indicators Feasibility Study, in which indicators under consideration include: measures derived from research and development expenditure and manpower statistics; bibliometric indicators based on characteristics of scientific publications, authorships and citations; technological intensity; innovation characteristics; measures derived from patent statistics; and trade in technical know-how and technology intensive products. The aim is to provide a further valuable quantitative contribution to understanding the structure of the national science and technology effort, its inputs, its outputs, and its impact on the economy and society at the macro level.

This Statement largely follows the format developed in previous years. The main change has been to expand the text where possible to refer to each line item in the Ministry tables, and to include more specific examples of the kinds of work being undertaken under each of these items. While some progress in this direction has been achieved, it is clear that the present relationship between text and tables in many cases could still be improved. It is hoped that the more satisfactory examples will serve as models for further progress in subsequent Statements.

As in previous Statements, there has been a consistent effort to maintain compatibility with international practice, particularly in relation to the terminology and definitions adopted by UNESCO and OECD. One persistent point of confusion to some has been the common usage of "science and technology" as being synonymous with the natural sciences and engineering (NSE), whereas in international usage it extends to the social sciences and humanities (SSH). This was one of the factors which led to the separate presentation of NSE and SSH in the tables of this Statement. The SSH figures and their relationship to the NSE figures are becoming more significant as the economic and social importance of information technology and of the use of information increases.

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(1) Directory of Science and Technology in the Commonwealth Sector, Department of Science and Technology, September 1981

In Australia, funds for science and technology are provided through a number of different avenues to a wide range of bodies which carry out activities in this field. Funds disbursed by the Commonwealth proceed via different Ministries to Commonwealth, State, higher education and private bodies; there is no centralised co-ordinating or funding body.

Commonwealth Government expenditure on R&D in Australia in 1982-83 is estimated to be higher in real terms than in the previous year. Figures for R&D by business enterprises are not available for 1982-83, but the Australian Bureau of Statistics has recently released preliminary figures for 1981-82. They show that expenditure by the business sector on R&D over the period 1978-79 to 1981-82 decreased by 2% in real terms (about 3% if public sector enterprises are excluded) and there was a 6% decrease in manpower devoted to R&D. Over the same period the level of R&D activity funded by the Commonwealth Government actually increased at an average rate of about 3% per annum.

When R&D contributions by business and government in Australia are placed side by side, it is seen that in 1978-79, for example, business contribution represented 0.2% of gross domestic product(GDP) whereas government contributions were 0.8%. While, as a proportion of GDP, government funding of R&D in Australia was comparable with that of other OECD countries for that year (it was larger as a percentage than that for Japan, for example), the level of funding by business is very much below that of other countries whose gross expenditure on R&D (GERD) is similar to Australia's. In Switzerland business funding of R&D was 1.9% of GDP, in Sweden 1.9%, in Netherlands 1.1%, in Belgium 0.9%. The further decline in R&D expenditure by Australian business since 1978-79 will in all probability worsen our comparative position.

It is clear that stimulation of basic research, applied research and experimental development, and adoption by industry of technologies which give a competitive edge or which open new markets, are vital factors in economic growth. This Statement summarises in broad terms the support provided by the Commonwealth towards those objectives, as well as to the science and technology aspects of a wide range of other socio-economic objectives. It is intended to be a factual rather than an interpretive document.

The Department of Science and Technology wishes to acknowledge the assistance of other departments and agencies in providing information; the supportive role played by ASTEC; and the advice provided by the Australian Bureau of Statistics on the planning of the information collections.

**Page 2, Paragraph 3, line 8 should read:**

**... funding of R&D was 1.8% of GDP, in Sweden 1.1%,  
in Netherlands 0.9%, in Belgium 0.9%. The ...**

## RECENT DEVELOPMENTS

### Agriculture

As an outcome of CSIRO's first major strategic planning review, the following are to be given the highest priority in the Organization's agricultural research:

- . Plant production
  - new methods for breeding established crop species of high economic importance;
  - biological control of weeds;
  - biological control of insect pests, including genetic techniques;
  - mechanisms of disease, pest and herbicide resistance and the breeding of resistant plants;
  - management of soil-borne plant diseases;
  - enhancing biological nitrogen fixation;
  - improving the efficiency of root function; and
  - soil engineering studies for increased fertility;
- . Animal Production
  - identifying characteristics for breeding easy-care productive and well-adapted genotypes of sheep and cattle;
  - biological defleecing;
  - immunology of animal diseases for the development of more efficient vaccines and the breeding of resistant animals;
  - mechanisms and genetics of the acquisition of resistance by parasites of livestock to pesticides and anthelmintics;
  - epidemiology, diagnosis and control of exotic animal diseases and pests which present a threat to Australia; and
  - biological control of insect parasites such as sheep blowfly and screw-fly worm, including genetic techniques.

A CSIRO Laboratory for Rural Research (Perth) was established to provide a focus for scientific expertise available in all parts of CSIRO to tackle rural problems peculiar to Western Australia.

During 1982-83 a statutory cotton research scheme was established similar to the other rural industry research schemes administered by the Department of Primary Industry. Levy collections have commenced and research programs will be funded from the scheme from 1984-85.

## Manufacturing

A new CSIRO Division of Chemical and Wood Technology was formed from existing resources to work on:

- wood and lignocellulose research;
- biotechnology;
- industrial microbiology;
- water and wastewater purification;
- agro-industry systems; and
- agricultural engineering.

## Construction

The Government, through the Department of Industry and Commerce, established in 1982, a joint industry/government Working Group to report on the current systems of undertaking, co-ordinating and funding construction research and development in Australia; the manner in which results of such research are disseminated; and options available for changed arrangements. The report of the Working Group has been completed but has not yet been considered by the Government.

## Economic Services

### . Water

CSIRO is to increase its work on the hydrology of catchment areas, salinity and the effects of land use on groundwater. Divisional rearrangements include the formation of Divisions of Groundwater Research (in Perth) and Water and Land Resources (in Canberra).

## Environment

A new CSIRO Division of Wildlife and Rangelands Research was formed from existing resources to study the plants and animals of semi-arid and arid rangelands ecosystems.

## Health

The Commonwealth has agreed to share equally with the Victorian Government the approved cost of a new building for the Walter and Eliza Hall Institute of Medical Research. The estimated Commonwealth contribution in 1982-83 is \$4.4m

A total of \$1.7m is to be provided to the Commonwealth Institute of Health in 1982-83 for a special ongoing epidemiological study into the effect of herbicides and other chemicals on Australian Vietnam veterans.

## Education

From the beginning of 1983, the living allowance for Commonwealth Postgraduate Research awards was increased 48% from \$4 620 to \$6 850 per annum, but will still be subject to taxation. The limit on supplementary income from other awards was eased and the number of new awards to be offered in 1983 was increased by 100 to 900.

## Advancement of Knowledge

### . Marine sciences

Provision of \$3.5m has been made in the CSIRO 1982-83 budget for the commencement of a laboratory complex for marine research. The new complex, expected to cost a total of \$10.75m, will be built for the CSIRO Divisions of Fisheries Research and Oceanography at Hobart, Tasmania and will be known as the CSIRO Marine Laboratories.

A contract has been let (finalised in 1982-83) for the construction of a 50 metre oceanographic research vessel for CSIRO, to cost \$13m of which \$4m has been allocated to CSIRO for this purpose in 1982-83.

### . Atmospheric sciences

The CSIRO Divisions of Atmospheric Physics and Cloud Physics were amalgamated into a Division of Atmospheric Science.

### . Earth Sciences

Reorganisation of the BMR has resulted in the formation of four new research divisions : Continental Geology, Geophysics, Petrology and Geochemistry, and Marine Geosciences and Petroleum Geology. A Resource Assessment Division has also been created.

Australia and China signed a memorandum of understanding in April 1983 to promote cooperation in geoscientific research. The coordinating agencies are the BMR for Australia and the Chinese Department of Geology and Mineral Resources.

### . Space sciences

A new radio-telescope is to be built by CSIRO and operated as a national facility. It is to be known as the Australia Telescope and is expected to be completed in time for the bicentennial. It will cost \$25m, of which at least \$20m will be spent in Australia acquiring high technology and other services. It will consist of new antennae at Culgoora and Siding Spring linked to the existing CSIRO radio-telescope at Parkes. These will combine to simulate a dish 300 km across. A sum of \$0.820m is provided in CSIRO's budget for 1982-83 for the project.

During the current phase of Starlab, a joint project with the USA and Canada aimed at putting a wide-field optical and ultra-violet telescope into orbit, a number of Australian companies will be involved in preparation of essential data for the final design of the instrument package for which Australia is responsible. Funding in 1982-83 for this phase to the level of \$1.337m is through the public interest provisions of the Industrial Research and Development Incentives Act.

## Research coordination

A committee has been established to provide inputs from the Northern Territory to the national CSIRO advisory body, the CSIRO Advisory Council. The committee is representative of Territory government, industry and community interests.

## RECENT TRENDS IN COMMONWEALTH FUNDED S&T

### Summary

Table 1 presents a broad summary of the information presented in this section, with references to tables presenting further dissections. The Table refers to the total of the Budget sector (net expenditure) and the Non-Budget sector and thus represents Commonwealth "own funds". Budget sector figures are net of recoveries and comprise expenditures from appropriations specifically identified for R&D, estimated expenditures on R&D from other appropriations, and, in the case of Research Trust Funds, the R&D expenditures from the Trust funds which can be attributed on a pro-rata basis to an appropriation. Commonwealth Non-Budget sector figures represent the R&D funded by Commonwealth bodies from their own funds (other than direct appropriations). These consist mainly of trading revenues of government enterprises, disposals of plant, sales of publications, and residuals of appropriations retained from previous years.

Projected Commonwealth Budget sector expenditure of \$815m on R&D for 1982-83 shows an increase of nearly 15% relative to the estimated 1981-82 total of \$709m. Part of this apparently large rise is explained by the fact that in early 1982 the previous Government exercised expenditure restraint which severely curtailed activities under the Australian Industrial Research and Development incentives scheme by about \$21m. This is the largest component of the \$22m by which the 1981-82 Budget sector R&D expenditure is less than the \$731m projected for 1981-82 in the previous Statement.

To discuss trends in expenditure in terms of the levels of activity being supported, the expenditures should ideally be expressed at constant price levels, and adjustments should be made to remove the effects of any expenditure changes which did not influence the level of real activity. This is discussed further in Appendix 5 under the heading "Estimation of trends in real terms". Several relevant price indexes and deflators are presented in that section of the Appendix, but with few exceptions accurate deflators are not available for the individual expenditure items in this Statement. For this reason, and to ensure that the data are useful for financial policy purposes, the expenditures shown in the tables are, unless otherwise stated, unadjusted figures at current prices. Subsequent references to trends in "real" terms should be interpreted as having been estimated using the implicit gross non-farm product deflator series <sup>(1)</sup>. Where relevant, it has been assumed that the projected 1982-83 expenditures will actually be realised .

Over the period 1978-79 to 1982-83 the average real growth rate in R&D expenditure funded through the Budget sector is 4% per annum. However if the level of activity being supported is the point of interest rather than the level of expenditure from the public purse, then allowance should be made for a change in the way superannuation for employees of statutory authorities has been funded from 1981-82 onwards. From that year, as a result of changes made to the Superannuation Act in 1976, statutory bodies have paid an employer contribution to the Commonwealth Superannuation Fund and have received increased appropriations for this purpose. When allowance is made for the \$28m identified in the 1982-83 Budget for CSIRO and AAEC for the employer contributions to superannuation then the average real growth rate in R&D activity supported through the Budget is estimated to be 3%.

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(1) See the implicit gross non-farm product deflator series from Appendix 5, p 179, together with the estimated rise of 11% quoted in 1982-83 Budget Paper No. 1, p 62.

Table 1: Summary of trends in Commonwealth Government support for S&T, 1978-79 to projected 1982-83.

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	Projected		79-80	80-81	Projected	
				81-82	82-83			81-82	82-83
<b>A. Identifiable* S&amp;T Expenditure by sector (Table 2)</b>									
Budget sector*	467	526	627	709	815	910	1075	1247	1398
Non-Budget sector									
-Cwlth Bus. Enterprise (BE)	29	30	41	45	49	98	114	142	56
-Other	4	6	7	10	27	6	8	11	29
<hr/>									
Total* (direct Commonwealth funding, excluding BE)	470	532	634	720	842	916	1083	1258	1428
Total* (including BE)	500	563	675	764	891	1014	1197	1400	1583
<hr/>									
<b>B. Type of Identifiable* S&amp;T Expenditure</b>									
Intramural (Table 7**)									
Capital expenditure	50	74	89	98	118	126	144	149	184
Current expenditure	284	305	361	433	474	602	707	869	908
Sub total	334	378	449	532	593	728	851	1018	1091
<hr/>									
Extramural* (Table 8#)	166	184	225	232	298	285	346	382	492
<hr/>									
Total* (direct Commonwealth Funding)	500	563	675	764	891	1014	1197	1400	1583
<hr/>									
<b>C. Identifiable* S&amp;T Expenditure by Broad Field of Science</b>									
Expenditure on Natural Sciences and Engineering									
Intramural (Table 9)	323	366	434	514	575	630	723	857	948
Extramural* (Table 10)	133	150	186	246		234	292	304	395
Sub-total*	455	516	620	702	821	873	1015	1161	1343

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	Projected		79-80	80-81	Projected	
				81-82	82-83			81-82	82-83
Expenditure on Social Sciences and Humanities									
Intramural (Table 11)	11	13	16	17	18	98	128	161	142
Extramural* (Table 12)	33	34	39	44	52	52	54	78	97
Sub-total*	45	47	55	62	70	151	182	239	240
Total* (direct Commonwealth Funding)	500	563	675	764	891	1014	1197	1400	1583

D. Identifiable\* R&D Expenditure by Major Socio-Economic Objective Group, R&D only  
(Table 3)

Expenditure on National Security									
Intramural (Tables 13 & 15)	86	92	106	112	118				
Extramural (Tables 14 & 16)	0.4	0.4	0.4	0.7	1.0				
Expenditure on Economic Development									
Intramural (Tables 13 & 15)	186	215	257	319	349				
Extramural (Tables 14 & 16)	49	61	81	60	90				
Expenditure on Community Welfare									
Intramural (Tables 13 & 15)	43	45	52	62	75				
Extramural (Tables 14 & 16)	30	32	40	57	71				
Expenditure on Advancement of Knowledge									
Intramural (Tables 13 & 15)	86	92	103	115	136				
Extramural (Tables 14 & 16)	86	92	103	115	136				
Total* (direct Commonwealth Funding)	500	563	675	764	891				



(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	Projected		79-80	80-81	Projected	
				81-82	82-83			81-82	82-83
E. Commonwealth Identifiable* S&T Expenditure Estimates Compared to Outlays and GDP (FINANCIAL PERSPECTIVE ##)									
Identifiable* Commonwealth Government Budget sector funds expended on S&T (\$m)	467	526	627	709	815	910	1075	1247	1398
% Total Commonwealth Outlays (%)	1.61	1.66	1.73	1.72	1.73	2.87	2.96	3.02	2.97
Identifiable* Commonwealth Government funds expended On S&T (including Non-Budget sector) (\$m)									
	500	563	675	764	891	1014	1197	1400	1583
% GDP (%)	0.49	0.49	0.52	0.52	0.54	0.89	0.92	0.95	0.97
Total Commonwealth Outlays (\$m) 29014 31660 36291 41339 47067 GDP (\$m) 102225 114487 130563 147576 164000###									
F. Commonwealth S&T Expenditure Estimates (adjusted) Compared to Outlays and GDP (S&T ACTIVITY PERSPECTIVE ##)									
Identifiable* Commonwealth Government Budget sector funds expended on S&T (\$m)	467	526	627	683	787	910	1075	1218	1368
% Total Commonwealth Outlays (%)	1.61	1.66	1.73	1.65	1.67	2.87	2.96	2.95	2.91
Identifiable* Commonwealth Government funds expended On S&T (including Non- Budget sector)									
- including Cwlth-owned BE (\$m)	500	563	675	737	863	1014	1197	1371	1552
% GDP (%)	0.49	0.49	0.52	0.50	0.53	0.89	0.92	0.93	0.95
- excluding Cwlth-owned BE (\$m)	470	532	634	692	814	916	1083	1229	1397
% GDP (%)	0.46	0.46	0.49	0.47	0.50	0.80	0.83	0.83	0.85

BE Wholly Commonwealth-owned business enterprises.

\* The data shown do not contain estimates for the research components of higher education sector teaching-and-research expenditures - see page 44. If these estimates were added in, totals for Commonwealth-funded R&D in the last line of Table F would be approximately \$690m (78-79), \$770m (79-80), \$900m (80-81), \$980m (81-82) and \$1120m (82-83).

- \*\* Tables 7 to 18 are located in Appendix 1.
- # Table 8 presents a breakdown of extramural payments by ministry and major granting program. Detail on contracts and grants is provided in Appendix 3.
- ## The principal perspective of the Science and Technology Statement is on trends in Commonwealth support for S&T activity. Thus, an adjustment is made in Table F for changed superannuation arrangements involving increased expenditure by some major agencies, without any corresponding change in function or level of activity. Those whose major concern is expenditure per se will find Table E more appropriate for most purposes.
- ### DST estimate, April 1983.

### S&T Expenditure by Ministry

Table 2 is a presentation of aggregate Commonwealth funds expended on S&T by ministry. The division between Budget and Non-budget sectors mainly serves to indicate where S&T activities are supported by Parliamentary appropriation and where they are supported by the trading revenues of government business enterprises. Figure 1, which is confined to the years 1981-82 and (projected) 1982-83, is a visual presentation of the same information but with Budget and Non-budget sectors combined and expenditure by broad field of science indicated. Further dissections of S&T expenditure by ministry are provided in Part A of Appendix 1.

The main trends evident in data presented by ministry in Table 2 may be compared with trends in aggregate expenditures directed towards particular socio-economic objective categories as used in the Project SCORE R&D survey. The distribution of Budget sector funds by Budget function is also of interest in this context. Although a number of category titles in the socio-economic objective classification are the same as category titles in the Budget function classification, entries in these categories will in general differ because the R&D activities of some organisations contribute to socio-economic objectives other than the Budget function to which they are classified. Further explanation is given in Appendix 5.

**Fig. 1 Estimated Commonwealth Government Funds Expended on S&T by Ministry**

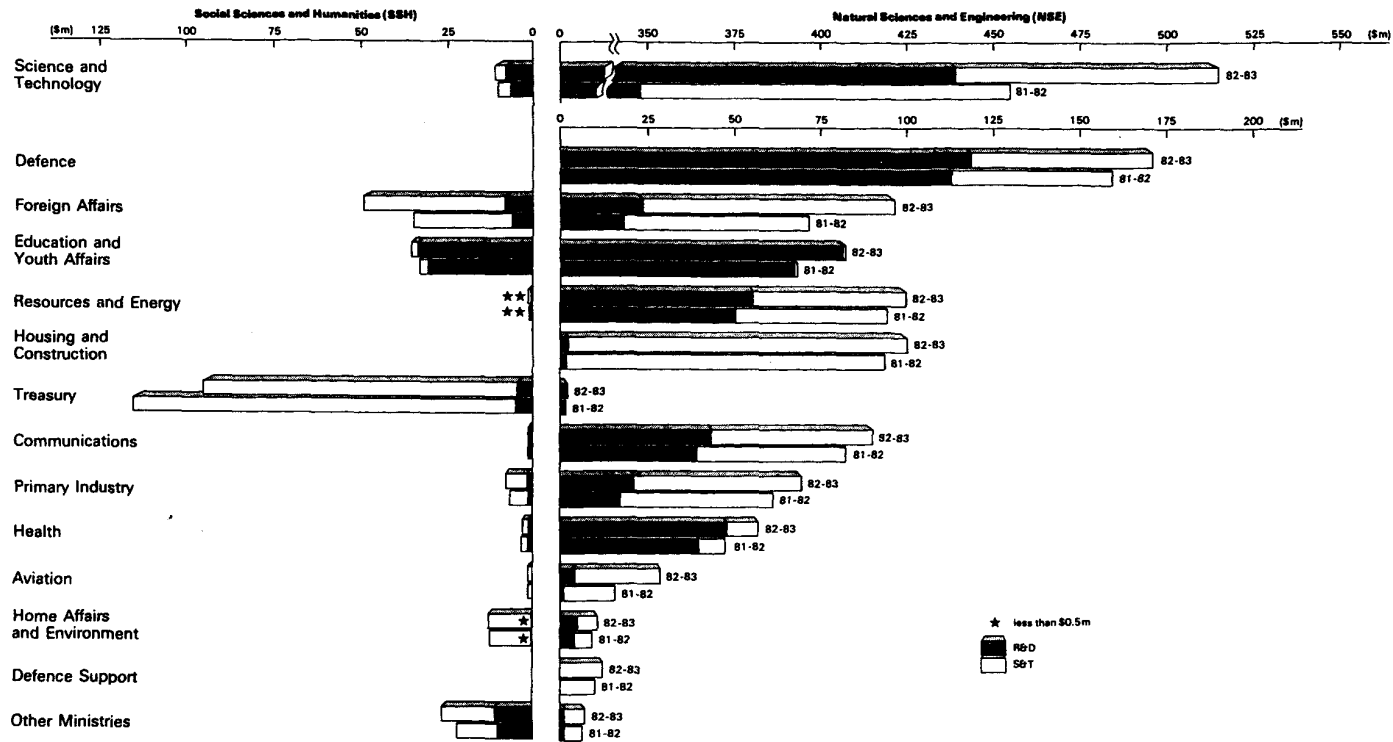


Table 2: Estimated Commonwealth Government funds expended on S&T by ministry with prime responsibility for planning the expenditure\*

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	Projected		79-80	80-81	81-82	Projected
				81-82	82-83				
A. Commonwealth Budget sector net expenditure									
Aboriginal Affairs	1.33	1.19	0.92	0.62	0.66	3.09	3.00	2.75	3.05
Admin. Services	0.01	-	-	0.01	-	-	-	0.01	0.07
Attorney -General's	1.33	1.52	2.18	2.82	3.25	2.34	3.12	3.85	4.25
Aviation	1.14	1.27	1.30	1.35	4.07	11.60	16.37	17.79	28.61
Communications	0.22	0.33	0.30	0.52	0.37	0.45	0.50	1.04	1.30
Defence	85.86	92.33	105.89	112.91	119.23	130.34	142.64	160.05	169.94
Defence Support	-	0.03	0.03	-	-	6.09	7.39	10.40	12.05
Education & Y.A.	75.7	79.5	88.3	96.9	114.6	82.0	91.5	99.5	116.8
Employment and Ind. Relations	0.15	0.42	0.82	1.71	1.34	1.78	1.80	2.43	2.08
Foreign Affairs**	13.11	13.05	16.52	23.48	32.15	59.47	74.26	106.41	145.05
Health	21.92	24.29	29.22	38.40	46.70	31.00	37.12	47.04	57.03
Home Affairs & Environment	1.54	2.54	3.93	4.61	5.08	17.15	20.52	21.36	23.27
Housing & Construction	2.72	3.08	2.66	1.97	2.13	34.40	37.39	38.95	42.31
Immigration & Ethnic Affairs	0.30	0.45	0.53	0.39	0.43	1.06	2.42	3.14	5.06
Industry & Commerce	0.81	0.94	1.29	1.83	1.95	1.01	1.37	1.90	2.00
Primary Industry	14.09	15.44	18.46	18.66	22.39	50.82	60.02	67.76	76.87
P.M. & Cabinet	0.05	0.04	0.06	0.05	0.04	0.91	1.16	1.38	1.47
Resources & Energy	29.13	31.27	37.77	50.77	44.49	65.27	74.06	95.07	89.42
Science & Technology	211.79	252.50	309.92	345.00	407.72	332.37	397.23	438.59	509.47
Social Security	0.12	0.15	0.15	0.24	0.19	0.68	1.12	1.79	1.62
Special Ministry	0.03	0.12	0.19	0.22	0.48	0.16	0.25	0.44	1.20
Territories & L.G.	0.28	0.28	0.31	0.35	0.33	3.79	3.96	4.07	4.08
Transport	3.27	3.35	3.14	2.00	2.70	9.43	9.65	5.54	6.94
Treasury	1.59	1.86	2.64	3.99	4.00	64.13	87.95	115.11	93.94
Veterans' Affairs	0.36	0.40	0.40	0.47	0.48	0.40	0.40	0.46	0.48
<b>Total (Budget sector)</b>	<b>466.8</b>	<b>526.4</b>	<b>627.0</b>	<b>709.2</b>	<b>814.8</b>	<b>909.7</b>	<b>1075.2</b>	<b>1246.8</b>	<b>1398.0</b>
<b>Adjusted Budget Total*</b>	<b>466.8</b>	<b>526.4</b>	<b>627.0</b>	<b>682.7</b>	<b>787.7</b>	<b>909.7</b>	<b>1075.2</b>	<b>1217.8</b>	<b>1367.6</b>
B. Commonwealth Non-Budget sector, BE excluded									
Aboriginal Affairs	0.05	0.03	0.21	-	-	0.11	0.29	0.21	0.22
Attorney General's	0.02	0.02	0.01	0.03	0.10	0.02	0.04	0.06	0.11
Education & Y.A.	0.12	0.11	0.28	0.17	0.25	0.26	0.65	0.39	0.80
Housing & Construction	-	0.04	0.07	0.04	0.12	0.04	0.07	0.04	0.12
Immigration & Ethnic Affairs	-	-	-	-	-	-	0.03	0.01	0.01
Industry & Commerce	0.12	0.13	0.05	0.05	0.08	0.15	0.05	0.06	0.10
Resources & Energy	-	-	-	-	11.17	-	-	-	12.50
Science & Technology	3.24	5.33	5.97	9.92	15.07	5.81	6.55	10.58	15.49

(\$ million)	R&D					S&T (including R&D)				
	78-79	79-80	80-81	Projected		79-80	80-81	81-82	Projected	
				81-82	82-83				81-82	82-83
Total (Non-Budget, ex-BE)	3.54	5.66	6.58	10.20	26.79	6.39	7.69	11.34	29.25	
Adjusted Total#	3.54	5.66	6.58	9.77	26.39	6.39	7.69	10.88	28.85	
Total (Direct Commonwealth funding, ex-BE)	470.4	532.0	633.6	719.5	841.6	916.0	1082.9	1258.2	1497.3	
Adjusted Total#, non-BE	470.4	532.0	633.6	692.5	813.6	916.0	1082.9	1228.7	1396.6	
C. Commonwealth Non-Budget sector, BE only										
Communications	27.4	28.1	37.3	39.7	44.0	51.7	64.8	82.4	90.6	
Health	0.97	1.25	2.08	2.43	2.46	1.25	2.36	2.69	2.80	
Housing & Construction	0.07	0.04	0.01	-	-	43.17	44.97	54.20	59.30	
Treasury (Financial Enterprise sector)	1.24	1.37	1.62	2.45	2.53	1.37	1.77	2.58	2.68	
Total (BE only)	29.6	30.08	41.0	44.6	49.0	97.5	113.9	141.9	155.4	
Total (All Non-Budget)	33.2	36.5	47.6	54.8	75.8	103.9	121.6	153.2	184.8	
Adjusted Non-Budget Total#	33.2	36.5	47.6	54.3	75.4	103.9	121.6	152.7	184.4	
Total (All direct Commonwealth funding)	500.0	562.8	674.5	764.0	890.6	1013.6	1196.8	1400.0	1582.8	
ADJUSTED TOTAL#	500.0	562.8	674.5	737.1	862.6	1013.6	1196.8	1370.5	1552.0	

\* See part A of Appendix 1 for more detailed dissections of expenditure by ministry.

\*\* This Statement incorporates estimates for the S&T component of Australia's development assistance program (see pages 53 to 55).

# An adjustment is made for changed superannuation arrangements involving increased expenditure by some major agencies, without any corresponding change in functions or level of activity. Those whose major concern is expenditure per se, rather than trends in Commonwealth support for S&T activity, should use the non-adjusted totals.

## R&D Expenditure by Socio-economic Objective

Table 3, which combines the Budget and Non-budget sectors, shows that Commonwealth R&D expenditures directed towards all the given socio-economic objective categories except "education" have increased at current prices over the four years between 1978-79 and 1982-83.

The gross non-farm product implicit price deflator is estimated to have grown at an average annual compound rate of about 10.6% over the four years. Socio-economic objective categories for which Commonwealth funded R&D expenditure at current prices increased at less than this average rate, and the corresponding average rates, were: defence, 9%; transport, 7%; construction, 5%; and education, -4%. The most recent decline in education R&D was due to reduced funding for the Education R&D Committee and for curriculum development activities (2). The decline in real terms in construction R&D expenditure mainly is due to a reduction in the percentage of CSIRO resources devoted to construction (3), and reduction in funding for the Experimental Building Station (4).

Socio-economic objective categories for which Commonwealth funded R&D expenditure at current prices increased at an average compound rate greater than 10.6% per annum, and the corresponding average rates, were: welfare, 77%; energy, 25%; community services n.e.i., 23%; health, 18%; other primary industries, 18%; environment, 18%; manufacturing, 18%; agriculture, 17%; mining, 16%; general advancement of knowledge, 15%; economic services n.e.i., 15%; and communications, 13%.

While these figures are generally indicative of the way Commonwealth support for these R&D objectives has changed between 1978-79 and 1982-83, it would be unwise to draw firm conclusions without considering the size and phasing of large capital works programs, and taking account where relevant of the superannuation payments discussed earlier. The effect of removing the latter would be to reduce the figures quoted above by approximately two percentage points for those socio-economic objectives where CSIRO, or CSIRO and AAEC, together are dominant. These are agriculture, other primary industries, mining, manufacturing, construction, energy, economic services n.e.i., and environment. The average growth rates in levels of R&D activity supported by the Commonwealth, estimated by excluding both intramural capital expenditures and superannuation payments, would then be approximately as follows: welfare, 37%; community services n.e.i., 23%; energy, 21%; health, 20%; manufacturing, 16%; other primary industry, 15%; economic services n.e.i., 15%; general advancement of knowledge, 14%; mining, 14%; agriculture, 13%; environment, 12%; communications, 12%; defence, 8%; construction, 6%; transport, -2%; and education, -5%.

The estimated average annual compound growth rate of gross domestic product at current prices over the four year period was 12.5%. The four socio-economic objectives for which total Commonwealth Government R&D funding has not at least kept pace with GDP are: defence, transport, construction, and education. If the level of R&D activity being supported is considered, then environment and communications must be added to the list.

Agencies and programs contributing strongly to the levels of R&D activity and/or the growth rates in each socio-economic objective are as follows:

- 
- (2) See Department of Education and Youth Affairs, p 46.
  - (3) See CSIRO, p 104.
  - (4) See Department of Housing and Construction, p 69.

. Welfare

More than half of the R&D reported under this category is not related to social security or welfare in the Budget sense, but is concerned with labour market research. The two largest programs, which also show the highest growth rates over the period, are Bureau of Labour Market Research (p 49) and Development of Australian Standard Classification of Occupations (p 50).

. Energy

The four major contributions towards this objective are from CSIRO (p 104), AAEC (p 91), the National Energy Research Development and Demonstration Program (p 89), and the BMR (p 90). The AAEC energy program grew less rapidly than the others, but at a higher rate than inflation.

. Community Services, n.e.i.

The dominant program in this category is the R&D component of the overseas development assistance program administered by ADAB (p 53).

. Health

All R&D funded by the Health ministry (p 56) is included in this category. The only significant contributor from outside the Ministry is CSIRO (\$3.0m in 1982-83, p 104). The high growth rate is due primarily to NH & MRC (p 59) and the capital grant to the Walter and Eliza Hall Institute of Medical Research (p 58).

. Other Primary Industries

CSIRO is the dominant contributor to R&D in this category. Growth is primarily due to CSIRO (p 104) and the Reserve Bank of Australia Grant Schemes (p 128).

. Environment

CSIRO (p 104), the Office of the Supervising Scientist for the Alligator Rivers Region (p 66), and AAEC (p 91) contribute nearly all the R&D in this category, and all three have shown high growth over the period.

. Manufacturing

CSIRO (p 104), and the Industrial R&D Grants (p 99) under the Australian Industrial R&D Incentives Scheme are the major components and the major sources of growth over the period.

. Agriculture

CSIRO (p 104) and the Rural Industry Research Trust Funds (p 82) are the main contributors. While growth in activity in CSIRO towards this objective was small there was a strong growth in capital expenditure in real terms. Other significant contributors to growth were Research Trust Funds for wheat and wool, and the Reserve Bank of Australia Grant Schemes (p 128).

. Mining

CSIRO (p 104) and BMR (p 90) contribute almost all the R&D effort in this category. Growth is due to CSIRO, as BMR expenditure towards this objective declined at current prices over the period.

. General Advancement of Knowledge

The dominant contribution to R&D in this category is from Grants to Universities, including Commonwealth Special Research Centres (p 48). Other significant contributors are: Antarctic Division (p 97); Research Grants and Fellowships, including ARGC Grants (p 101); Commonwealth Post-graduate Awards (p 47); CSIRO (p 104); AIMS (p 104); BMR (p 90); AAEC (p 91); and AATB (p 103). For the bulk of the expenditure represented by these programs the average annual growth rate over the period at current prices was in the region of 12%. The higher average rate for the category as a whole (15%) is due to a high rate of growth for the Antarctic Division in both capital and current expenditure. CSIRO expenditure towards this objective grew at about 15%.

. Economic Services, n.e.i.

CSIRO (p 104), ABS (p 128), and BIE (p 74) are the main contributors. Growth in real terms is primarily due to the BIE.

. Communications

Telecom (p 35) is the main contributor.

Figure 2 is a visual presentation, for the years 1980-81 and 1981-82 (projected), of the information on R&D contained in Table 3. It also indicates expenditure by type and by broad field of science. Further dissections of R&D expenditure by socio-economic objective are provided in Part B of Appendix 1.

S&T Expenditure by Budget Function (Budget Sector only)

Table 4 shows the trends in R&D and S&T percentages of Commonwealth Government outlays directed towards each Budget function, while Table 5 shows for reference the values of these total outlays.

Nil percentages are shown for R&D in the Budget functions "social security and welfare", "housing", "water supply and electricity", and "legislative services". In the last three cases this is due to the nature of the Budget function classification rather than absence of Commonwealth-supported R&D, but in the case of "social security and welfare" the identifiable Commonwealth-supported R&D is in fact less than 0.05% of the relevant total outlay.



**Fig. 2 Estimated Commonwealth Government Funds Expended on R&D by Socio-Economic Objective**

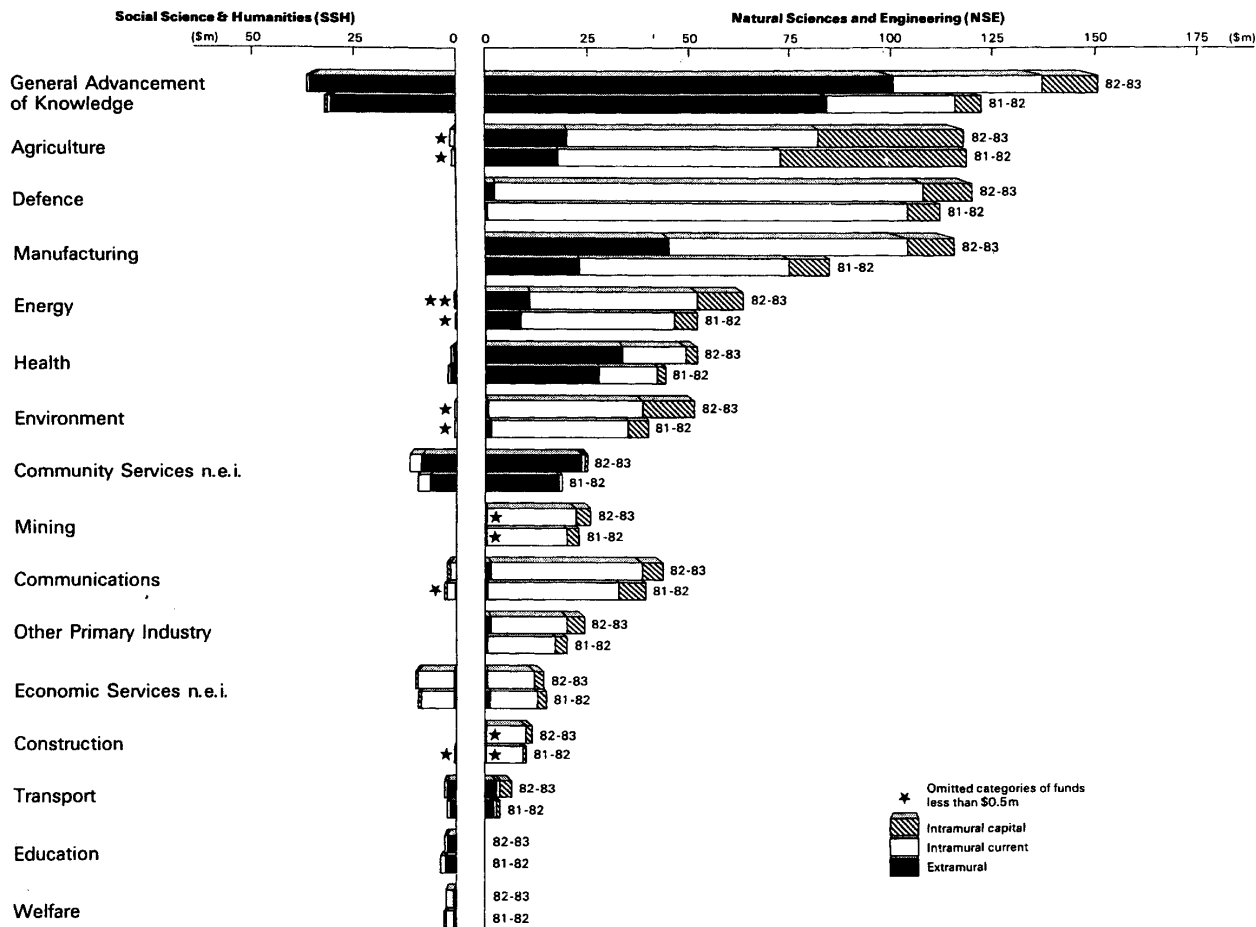


Table 3: Total Commonwealth Government expenditure on R&amp;D by socio-economic objective\*

Objective Category	1978-79	1979-80	\$m 1980-81	1981-82	1982-83
National security					
. Defence					
Economic development					
. Agriculture	64.39	86.53	103.27	120.28	120.23
. Other primary industries	12.22	14.48	14.95	20.39	23.84
. Mining	14.38	12.39	16.08	23.12	25.89
. Manufacturing	60.21	69.41	93.11	84.83	116.67
. Construction	8.55	8.49	8.16	9.32	10.30
. Energy	26.56	31.16	38.97	52.41	64.39
. Transport	7.08	8.74	7.38	5.73	9.35
. Communications	27.7	28.6	37.6	40.3	44.5
. Economic services n.e.i.	13.31	15.68	18.33	22.97	23.22
Sub-total	234.4	275.4	337.9	379.3	438.4
Community welfare					
. Environment**	26.41	27.06	31.77	39.82	51.53
. Health	27.04	30.14	35.55	45.18	53.27
. Education#	3.57	3.10	3.94	3.70	2.97
. Welfare	0.63	1.04	1.56	2.26	2.20
. Community services n.e.i.##	15.50	15.69	19.76	27.25	35.92
Sub-total	73.15	77.03	92.57	118.20	145.89
Advancement of knowledge					
. General advancement of knowledge	106.6	118.0	138.2	153.5	187.1
Total	500.0	562.8	674.5	764.0	890.6

\* See Part B of Appendix 1 for more detailed dissections of expenditure by socio-economic objective. See Table 20, Appendix 2 for international comparisons of civil R&D expenditure by OECD objective category.

\*\* Includes both "Environment" and "Urban and regional planning" objectives.

# R&D funded by the Minister for Education for the purpose of producing qualified researchers or for supporting normal academic activities has been included in "General advancement of knowledge". Only research mainly directed towards education processes or education administration has been included in the "Education" objective.

## Includes overseas development assistance R&D.

Table 4: Percentage of Commonwealth Government Outlays in the Budget sector expended on S&T by Budget function

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	Projected		79-80	80-81	Projected	
				81-82	82-83			81-82	82-83
Defence	3.3	3.1	3.0	2.7	2.6	4.5	4.2	4.1	3.9
Education	3.0	3.1	3.0	2.9	3.0	3.2	3.1	3.0	3.1
Health	0.8	0.8	0.8	1.3	1.4	1.0	1.0	1.6	1.7
Social Security and Welfare	::	::	::	::		0.1	0.1	0.1	0.1
Housing	::	::	::	::		0.1	0.1	0.1	0.1
Urban and Regional Development n.e.c. and the Environment	0.8	1.9	3.2	5.5	4.3	7.5	10.3	11.7	9.3
Culture and Recreation	0.2	0.2	0.1	0.2	0.1	3.2	3.2	3.3	3.7
<hr/>									
Economic Services									
. Transport and Communications	0.7	0.6	0.5	0.3	0.5	2.7	2.7	2.0	2.4
. Water Supply and Electricity	-	-	-	-	-	-	-	-	-
. Industry Assistance and Development	11.3	10.7	10.3	7.5	8.6	20.1	18.3	15.0	16.1
. Labour and Employment	0.1	0.2	0.2	0.4	0.3	0.7	0.5	0.6	0.5
. Other Economic Services	0.7	0.5	0.6	0.8	0.7	45.2	49.7	51.6	61.4
Total Economic Services	3.6	3.8	3.8	2.7	3.0	10.5	10.1	8.5	8.6
<hr/>									
General Public Services									
. Legislative Services	-	-	-	-		::	::	::	::
. Law, Order and Public Safety	0.8	0.8	0.9	0.9	1.0	1.3	1.3	1.3	1.4
. Foreign Affairs and Overseas Aid	2.2.	2.0	2.2	2.7	3.4	9.0	9.9	12.4	15.3
General and Scientific Research n.e.c.	88.3	87.1	89.8	88.1	91.1	100.0	100.0	100.0	100.0
Administrative Services	0.5	0.5	0.5	0.5	0.5	12.9	13.7	14.3	11.5
Total General Public Services	11.6	11.9	12.3	13.1	13.5	21.2	21.7	23.5	23.3
<hr/>									
Not allocated to function	-	-	-	-		-	-	-	
<hr/>									
Total (Budget sector)	1.6	1.7	1.7	1.7	1.7	2.9	3.0	3.1	3.0

Table 5: Commonwealth Government Outlays\* In the Budget sector, by Budget function

(\$ million)	1978-79	1979-80	1980-81	1981-82	1982-83
Defence	2 614	3 017	3 550	4 135	4 662
Education	2 529	2 611	2 930	3 341	3 792
Health	2 901	3 169	3 650	2 912	3 379
Social Security and Welfare	8 095	8 783	9 917	11 498	13 272
Housing	382	343	341	458	571
Urban and Regional Development n.e.c. and the Environment	126	116	111	77	113
Culture and Recreation	281	321	400	483	501
<b>Economic Services</b>					
. Transport and Communications	723	807	989	1 180	1 475
. Water Supply and Electricity	6	25	54	67	97
. Industry Assistance & Development	473	593	821	917	1 016
. Labour and Employment	332	302	387	460	510
. Other Economic Services	96	112	123	134	123
<b>Total Economic Services</b>	<b>1 630</b>	<b>1 839</b>	<b>2 374</b>	<b>2 757</b>	<b>3 221</b>
<b>General Public Services</b>					
. Legislative Services	70	79	112	132	161
. Law, Order & Public Safety	173	200	221	258	293
. Foreign Affairs and Overseas Aid	608	664	748	860	947
General and Scientific Research n.e.c.	229	271	314	394	426
Administrative Services	832	927	1 089	1 243	1 363
<b>Total General Public Services</b>	<b>1 912</b>	<b>2 140</b>	<b>2 484</b>	<b>2 887</b>	<b>3 189</b>
Not allocated to function	8 544	9 323	10 532	12 789	14 406
<b>Total (Budget sector)</b>	<b>29 014</b>	<b>31 660</b>	<b>36 291</b>	<b>41 339</b>	<b>47 067</b>

\* 1982-83 Budget paper No. 1, Budget Statements 1982-83, Statement No. 6.

### Commonwealth Contribution to Gross Domestic Expenditure on R&D

Surveys of R&D performers have shown that Commonwealth Government funding of R&D rose substantially between 1968-69 and 1973-74, approximately kept pace with inflation as measured by some of the broad aggregate price indexes(1) until 1978-79, and subsequently increased in real terms at about 7% per annum to 1981-82. Private enterprise funding of R&D fell sharply between 1973-74 and 1976-77.

This reduced the Private enterprise share of funding of the gross domestic expenditure on R&D (GERD) from 28% to 11%, and correspondingly increased the Commonwealth Government share from 58% to 66%. These shares have remained stable since that time, although there is some evidence to suggest that private enterprise R&D may have declined further in 1982.

Table 6 shows the contributions of each sector to funding the GERD.

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(1) See Appendix 5, pp177-180.

Table 6: Commonwealth Government and other sector funding contributions to Australia's gross domestic expenditure on R&D (GERD): 1968-69 to 1981-82

	1968-69	1973-74	1976-77	1978-79	1981-82
	(\$m)				
Commonwealth Government #					
- General Government	n.a.	n.a.	541	666	958*
- Public Enterprise	n.a.	n.a.	38	29	40*
Sub- total	173	333**	579	695	998*
State Government					
- General Government	n.a.	n.a.	111	140	189*
- Public Enterprise	n.a.	n.a.	6	8	11*
Sub- total	61	67	117	148	200*
Private Enterprise	116	186	152	180	257
Other Australian	9	7	10	18	24*
Overseas	10	11	14	13	17*
Total (GERD)	368	655	873	1054	1496*
Commonwealth Government funding as % GERD	(%) 47	58	66	66	67
State Government funding as % GERD	(%) 17	10	13	14	13
Private Enterprise funding as % GERD	(%) 32	28	17	17	17

# The Government funding data include university overheads not included in similar tables in previous Statements.

\* These estimates are DST projections. Firm data is expected to be issued by ABS late in 1983. Note that Table 6 is based on Project SCORE and includes the imputed research component of higher education teaching-and-research expenditures. All other tables exclude this imputed component - see page 44.

\*\* Much of the large rise between 1968-69 and 1973-74 is due to changed funding arrangements for universities.

Sources: Figures are DST estimates based on:

- . Project SCORE 1968-69, 1973-74, 1976-77, 1978-79
  - . Science and Technology Statement 1981-82
  - . Research and Experimental Development - Business Enterprises - 1978-79, ABS Catalogue No. 8104.0
  - . Research and Experimental Development - Business Enterprises - 1981-82 (preliminary), ABS Catalogue No. 8105.0
  - . Quarterly Estimates of National Income and Expenditure, Australia - December Quarter, 1982, ABS Catalogue No. 5206.0.
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## MINISTRY ACTIVITIES

The following is a presentation of Commonwealth R&D and S&T expenditures by ministry. Readers are reminded that the S&T figures include the R&D expenditures, and that the purpose of the S&T figures is to identify programs and agency units primarily devoted to S&T activities. In general, the total S&T figures are not comparable between agencies or between ministries. (See Appendix 5 for further detail).

The tables for the ministries are presented in three categories (not all the categories apply for particular ministries), Commonwealth Budget sector net expenditure, Commonwealth Non-Budget sector, and expenditure from other sources. Figures listed under Commonwealth Budget sector net expenditure correspond to expenditure on S&T from amounts appropriated by Parliament under the Appropriation Acts, less any relevant recoveries or income received by the Commonwealth in respect of particular activities. Commonwealth Non-Budget sector figures represent the S&T funded by Commonwealth bodies from their own funds (other than direct appropriations). These consist mainly of trading revenues of government enterprises, disposals of plant, sales of publications. They also include residuals of appropriations retained from previous years. The sum of the Budget and Non-Budget sectors constitutes all direct funding by the Commonwealth Government. Expenditure from other sources covers S&T activities funded by recoveries (and hence excluded from the Budget sector) plus amounts received by the Commonwealth from sources such as industry and State or foreign governments in respect of particular activities of a non-commercial nature.

As in previous Statements, the aim has been to list expenditures of each agency or program for all years under the Ministry which holds responsibility for that agency or program at the time the Statement is finally drafted. The present Statement thus reflects the administrative arrangements as at April 1983. As there were two separate sets of changes in arrangements during the period August 1982 to April 1983, considerable effort has been expended in modifying the data base, tables, and text to accommodate all shifts in responsibility. To the best knowledge of the Department of Science and Technology, with one exception, all necessary changes of this kind have been effected. However, the very recent nature of the last administrative changes means that minor errors in the allocation of responsibility in this Statement cannot be completely ruled out.

The exception referred to concerns the creation of the Department of Defence Support and subsequent changes in the allocation of functions between that Department and the Department of Defence. This posed particular problems in the preparation of their respective entries. For the present Statement, expenditure by the Department of Defence on behalf of the Industry Development Branch of the Department of Defence Support has been included in the figures for the Department of Defence. In subsequent Statements it is expected that this expenditure will be shown as a line item under the Department of Defence Support, in accord with our convention that expenditures are attributed to the agencies which decide how the money is to be spent, rather than the agencies to which the money is appropriated.

Unless stated otherwise, sources for the information presented in the tables are the agencies listed.



ABORIGINAL AFFAIRS

(\$ million)	R&D					S&T (including R&D)		
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
<b>A. Commonwealth Budget sector net expenditure</b>								
Department of								
Aboriginal Affairs	S(b)	-	-	-	-	-	0.058	0.063
	S(c)	0.182	0.152	0.073	0.088	0.094	0.088	0.094
	N(c)	-	-	-	0.006	0.006	0.006	0.006
Applied Ecology Pty Ltd	N(a)	0.100	0.140	0.142	-	-	-	-
	N(b)	0.548	0.425	0.220	-	-	-	-
Australian Institute of								
Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.080	0.103
	S(b)	-	-	-	-	-	1.708	1.922
	<sup>n</sup> S(c)	0.497	0.471	0.489	0.530	0.559	0.813	0.856
<b>Total (Budget sector)</b>		<b>1.327</b>	<b>1.188</b>	<b>0.924</b>	<b>0.623</b>	<b>0.659</b>	<b>2.752</b>	<b>3.045</b>
<b>B. Commonwealth Non-Budget sector</b>								
Applied Ecology Pty Ltd	N(a)	0.008	0.008	0.083	-	-	-	-
	N(b)	0.042	0.026	0.127	-	-	-	-
Australian Institute of								
Aboriginal Studies	S(a)	-	-	-	-	-	0.009	0.011
	S(b)	-	-	-	-	-	0.203	0.208
<b>Total (Non-Budget sector)</b>		<b>0.050</b>	<b>0.034</b>	<b>0.210</b>	<b>-</b>	<b>-</b>	<b>0.212</b>	<b>0.219</b>
<b>Total (Direct Commonwealth funding)</b>		<b>1.377</b>	<b>1.222</b>	<b>1.134</b>	<b>0.623</b>	<b>0.659</b>	<b>2.965</b>	<b>3.264</b>
<b>C. Expenditure from other sources</b>								
Department of Aboriginal Affairs								
. Payment to Central Land Council (anthropological investigations)	S(c)	-	-	-	-	-	0.208	0.260
Australian Institute of								
Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.004	0.004
	S(b)	-	-	-	-	-	0.093	0.076
<b>Total (Other sources)</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.305</b>	<b>0.340</b>
<b>Total (A+B+C)</b>		<b>1.377</b>	<b>1.222</b>	<b>1.134</b>	<b>0.623</b>	<b>0.659</b>	<b>3.270</b>	<b>3.604</b>

- |                |  |     |                                |
|----------------|--|-----|--------------------------------|
| N              | Natural sciences and engineering               | S   | Social sciences and humanities |
| <sup>n</sup> S | Includes some natural sciences and engineering |     |                                |
| (a)            | Intramural capital expenditure                 | (b) | Intramural current expenditure |
| (c)            | Extramural expenditure                         |     |                                |

### Department of Aboriginal Affairs

The Department's research program is undertaken by outside agencies and is primarily directed to the collection and analysis of data needed by the Government for policy definition and determination. Specific examples include; research into operation of community stores, employment policies and practices of major mining companies towards Aborigines, decision-making by Aboriginal communities in relation to mining royalties, and impacts of training and educational programs.

On a biennial basis the Department collects data which is used to provide a general measure of the well being of Aboriginal communities. The data is aggregated by type of community, and cross-classified across major areas of concern - population, employment, schooling, community facilities, etc. Material is coded and placed on computer tape: a wide variety and number of tables and publications result from the collections.

The Central Land Council carries out anthropological investigations to form the basis of land claims and development negotiations on or for Aboriginal land under the Aboriginal Land Rights (Northern Territory) Act 1976. The investigations are funded by payments to the Council from the Aborigines Benefit Trust Account established under the Act and financed by royalties.

### Australian Institute of Aboriginal Studies

The Institute promotes Aboriginal studies and assists relevant cooperation among universities, museums and other institutions. This entails the collection, processing and storage of data on all aspects of Aboriginal culture and the facilitation of studies by its own staff and others. Work being undertaken by the Institute includes the preservation of Aboriginal languages, compilation of dictionaries of the main languages, recording of music and dances, taping of oral history and studies of food sources and herbs used by Aborigines. The Institute disseminates information about Aboriginal culture, both by publishing its own findings and making available material from other sources.

### Applied Ecology Pty Ltd

Applied Ecology was established by the Commonwealth Government to conduct research associated with natural resources on behalf of Aboriginal and Torres Strait Islander communities. As a result of a government decision in April 1981 to withdraw funds, operations are being wound down. Major research projects included an emu farm at Wiluna, W.A. and a crocodile farm at Edward River, QLD. Research activities ceased in late 1981 with the projects being placed on a 'care-and-maintenance' basis.

ADMINISTRATIVE SERVICES

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Administrative Services								
. Aust. Survey Office	N(b)	-	-	-	0.006	-	0.06	0.073
Total (Direct Commonwealth funding)	-	-	-	0.006	-	0.006	0.073	

N Natural sciences and engineering

(a) Intramural capital expenditure

(c) Extramural expenditure

(b) Intramural current expenditure

Department of Administrative Services

. Australian Survey Office

The Australian Survey Office provides land, engineering and topographic surveys throughout Australia and its external Territories for departments and authorities. Past achievements have been the determination of the predictive accuracy for rectified Landsat imagery, determination of the accuracy of water depth penetration and the production of depth zone images. The Office is now engaged in the transfer of these technologies to a production system.

ATTORNEY-GENERAL'S

(\$ million)		R&D					S&T (including R&D)	
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure								
Australian Institute of Criminology	S(a)	0.006	0.002	0.016	0.001	0.001	0.017	0.004
	S(b)	0.348	0.400	0.390	0.470	0.450	1.218	1.197
Criminology Research Council*	S(b)	-	-	-	-	-	0.001	0.001
	S(c)	0.030	0.030	0.034	0.030	0.045	0.030	0.045
Commonwealth Legal Aid Council**	S(a)	-	-	0.004	-	-	-	-
	S(b)	0.110	0.148	0.165	0.177	0.205	0.177	0.205
	S(c)	0.012	0.021	0.045	0.041	0.060	0.041	0.060
Institute of Family Studies	S(a)	-	-	-	-	0.025	-	0.038
	S(b)	-	0.018	0.243	0.418	0.513	0.587	0.707
	S(c)	-	-	0.230	0.250	0.170	0.250	0.170
Law Reform Commission Legislative Drafting Institute	S(b)	0.822	0.900	1.055	1.163	1.288	1.163	1.288
Human Rights Commission	S(b)	-	-	-	0.263	0.426	0.293	0.461
	S(c)	-	-	-	0.004	0.070	0.004	0.076
Total (Budget sector)		1.329	1.519	2.184	2.816	3.254	3.850	4.253
B. Commonwealth Non-Budget sector								
Australian Institute of Criminology	S(a)	-	-	-	-	-	0.001	-
	S(b)	-	-	-	-	-	0.025	0.016
Criminology Research Council* . Attributable to past Commonwealth contributions	S(c)	0.020	0.020	0.007	0.012	0.025	0.012	0.025
Law Reform Commission	S(b)	-	-	-	0.019	0.073	0.019	0.073
Total (Non-Budget sector)		0.020	0.020	0.007	0.031	0.098	0.057	0.114
Total (Direct Commonwealth funding)		1.349	1.539	2.191	2.847	3.352	3.907	4.367

	(\$ million)	R&D					S&T (including R&D)	
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
C. Expenditure from other sources								
Criminology Research Council*								
Attributable to State								
contributions	S(b)	-	-	-	-	-	0.001	0.001
	S(c)	0.050	0.050	0.042	0.042	0.070	0.042	0.070
Total (Other sources)		0.050	0.050	0.042	0.042	0.070	0.043	0.071
Total (A+B+C)		1.398	1.589	2.233	2.889	3.422	3.950	4.438

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

\* In each year the Commonwealth and States make matching contributions to the Criminology Research Trust Fund. Moneys may be carried over from year to year and the expenditure in any year may derive from accumulated contributions and interest. See Appendix 6.

\*\* Figures for 1978-79, 1979-80 and 1980-81 are for the Commonwealth Legal Aid Council.

#### Australian Institute of Criminology

Since its establishment the Institute has undertaken a wide range of research in cooperation with Commonwealth and State authorities on such subjects as crime trends, drug offences, prison labour, suicide, juvenile justice, domestic violence, police administration, terrorism, corporate crime, the costs of crime, sentencing and crime prevention planning. The publication of the results of such research and of the Institute's training activities is evidence of the close day to day relationship that has been established and developed with criminal justice administrations and the judiciaries since 1973.

Crime remains a serious problem in Australia and the cost to the community, in identifiable terms, is well in excess of \$2 000m per annum and continues to increase. The Institute sees a growing need at government policy levels for large-scale imaginative efforts to deal with the causes. Research is aimed at containing the costs of crime not only in economic terms but also in social damage and personal tragedy.

In this regard the Institute has established and continues to develop its relations with international agencies in the sphere of crime prevention and correction and has been instrumental in the promotion of conferences overseas held under United Nations auspices and hosted by overseas governments, the most recent example of the latter being a second regional conference of correctional administrators held in Bangkok in July 1981.

During 1981-82 the Institute's research program included a project on Youth and Crime in Australia. This project is a three part study being undertaken by a senior criminologist plus support staff and will provide, inter alia, comparative data from the United Kingdom and the USA and the eight Australian jurisdictions. Part one, Age and Crime, has been substantially completed and it is expected that the remaining parts, Internal Differences in Offensivity with Emphasis on Juvenile Dominated Offences and Age and Sanction will be completed by June 1983. Other projects include studies on white collar crime, juvenile justice, the Victorian remand system, political terrorism, the role of defence forces on law enforcement and public order, police unionism and Aborigines and criminal justice.

#### Criminology Research Council

The Criminology Research Council was established in 1972 to control and administer a Criminology Research Fund and to determine the manner in which the moneys from the Fund are allocated. The State governments match the Commonwealth Government's annual contributions to the Fund on a dollar for dollar basis with individual State government contributions being determined on a pro rata population basis.

The Council invites applications for research grants from individuals and organisations wishing to undertake research in connection with the causes, correction and prevention of criminal behaviour and any related matter. During 1981-82 the Council awarded fifteen grants for research projects, including as typical examples a study on the disposition of mentally retarded offenders, analysis of Victoria Police documentation relating to detected young offenders in 1981, and analysis of juvenile vandalism in selected areas of Adelaide.

The Australian Institute of Criminology provides secretarial and administrative services for the Council.

#### Commonwealth Legal Aid Council

The Commonwealth Legal Aid Council was appointed on 17 September 1981. The Council takes over many of the functions of the Commonwealth Legal Aid Commission which was abolished on 30 June 1981. The functions of the Council are to advise and make recommendations to the Attorney General and to undertake research to ascertain the most efficient and economic method of providing and funding legal aid in Australia. Research is conducted by Attorney-General's Department staff and externally contracted consultants.

Research projects underway at present include studies of the legal needs of social security claimants and of institutionalised people.

#### Institute of Family Studies

The Institute of Family Studies was established to conduct, encourage and coordinate research into the factors affecting marital and family stability in Australia. It also collects, analyses and disseminates information on the impact of government policies and social change on families.

The current research program includes studies on the impact on families of government policies in the areas of income transfers, housing, children's services and family services; family formation; family dissolution/reformation; family support networks and children in families. These studies, together with others planned for coming years, contribute individually and collectively to the aim of building a comprehensive, detailed and theoretical picture of Australian families.

The Institute advises and assists the Attorney-General on the making of grants for purposes related to its functions and supervises the employment of such grants.

### The Law Reform Commission

The Commission has been established as a result of the Government concern to modernise, simplify, eliminate defects in, and adopt more effective methods for administering the law and dispensing justice.

The Commission works pursuant to References from the Commonwealth Attorney General. At present the Commission has before it eight such References - Privacy, Consumers in Debt, Insurance Contracts, Access to the Courts, Aboriginal Customary Laws, Sentencing, Evidence and Foreign State Immunity.

The final product of the research undertaken in the Commission is a Report to the Commonwealth Parliament. Reports contain a full discussion of an area of law which needs to be developed, changed or modernised as well as draft legislation. Several References relate to areas not covered by any existing Commonwealth or Territory Laws or only partly covered. Privacy and Aboriginal Customary Laws are examples of these.

The Commission's proposals for protection deal with general administrative matters; power of entry; surveillance; and information privacy, including information stored on computers in the public and private sectors.

The Reference on Aboriginal Customary Laws is difficult and interesting. It requires the Commission to enquire whether it would be desirable to recognise either in whole or in part, Aboriginal customary law to Aborigines, either generally or in particular areas, or only to those living in tribal conditions.

### Legislative Drafting Institute

The Legislative Drafting Institute was abolished in December 1981 as a result of the Review of Commonwealth Functions.

The Institute conducted courses of training and instruction for legislative draftsmen, especially from developing countries.

### Human Rights Commission

The Human Rights Commission was established in December 1981. Its mandate is to ensure that the laws of the Commonwealth and acts and practices under those laws conform with the provisions of the International Covenant on Civil and Political Rights, the Declaration of the Rights of the Child, the Declaration on the Rights of Mentally Retarded Persons and the Declaration on the Rights of Disabled Persons. The Commission is also responsible for the administration of the Racial Discrimination Act 1975.

The Commission's Research program involves three main strands - research stemming from formal complaints to the Commission, research following a reference of existing or draft legislation by the Attorney-General, and research which the Commission considers to be of priority concern for the promotion of human rights in Australia.

The Commission has an extensive in-house research program but also contracts out research to tertiary institutions, non-governmental organisations and individual researchers. Research projects for 1982-83 include reviews of the Australian Citizenship Act, the proposed Mental Health Ordinance for the A.C.T., and Commonwealth crimes legislation; studies of conciliation activities under the Racial Discrimination Act, on human rights in country towns and on incitement to racial hatred; a survey of human rights literature and preparation of an associated bibliography; and a project on the teaching of human rights in primary schools.

AVIATION

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Aviation								
. Provision, Operation & Maintenance of Airways Facilities	N(a)	0.600	0.700	0.800	0.700	3.300	2.100	9.900
	N(b)	0.200	0.220	0.240	0.270	0.300	0.810	0.900
	N(c)	0.125	0.110	0.100	0.235	0.215	0.235	0.215
. Regulation of Air Transport								
- Environment and security	S(b)	0.123	0.129	-	-	-	0.060	0.070
	S(c)	-	-	0.027	0.014	-	0.014	-
- Aviation medicine	N(c)	0.029	0.035	0.043	0.044	0.079	0.044	0.079
- Airworthiness	N(b)	0.020	0.020	0.020	-	-	-	-
	N(c)	0.045	0.060	0.069	0.071	0.055	0.071	0.055
. Major Projects	N(b)	-	-	-	0.014	0.020	0.414	0.428
	N(c)	-	-	-	-	0.100	0.235	0.265
. Provision of Meteorological Services	N(c)	-	-	-	-	-	12.912	15.736
. Evaluation and Planning	S(b)	-	-	-	-	-	0.168	0.146
. Transport forecasting and statistics	S(b)	-	-	-	-	-	0.706	0.815
	S(c)	-	-	-	-	-	0.020	-
<b>Total (Direct Commonwealth funding)</b>		<b>1.142</b>	<b>1.274</b>	<b>1.299</b>	<b>1.347</b>	<b>4.069</b>	<b>17.788</b>	<b>28.609</b>

N Natural sciences and engineering

S Social sciences and humanities

(a) Intramural capital expenditure

(b) Intramural current expenditure

(c) Extramural expenditure

Department of Aviation

. Airways - Provision, Operation and Maintenance of Airways Facilities

The Department has obligations under the Air Navigation Act and Regulations and commitments arising from Australia's membership of the International Civil Aviation Organisation (ICAO) which require the establishment, provision, maintenance and operation of air route and airway facilities and associated services.

The objective is to ensure the continued safe, efficient and economic performance of the national network of airways facilities and services and to ensure that the network expands or changes as necessary to meet Australia's future transport needs.



. Regulation of Air Transport

- Environment and security

The Department is responsible for policy, standards and procedures on aircraft noise and other environmental matters associated with aircraft operations as well as aviation security policy and procedures. It also coordinates protective security and intelligence arrangements. Funding was provided last year to the National Acoustics Laboratories, Department of Health for an Aircraft Noise Social Survey Project. An investigation into air pollution near airports was also funded.

- Aviation medicine

The Department has a continuing commitment to discharge statutory obligations and responsibilities by establishing and enforcing medical standards for flight crew and air traffic controllers to ensure the maintenance of safe flying operations. Activities include an ongoing 'crash protection' project (Aeronautical Research Laboratory), a study on oxygen starvation in patients with head injuries, research on risk factors in aircrews with specific regard to epilepsy, post cardiac infarction, psychosis and pacemakers and the programming of a data bank concerning aircraft accident reports and associated injury reports.

- Airworthiness

The Department has responsibilities under the Air Navigation Act and Regulations which necessitate the development and implementation of standards for aircraft airworthiness. Most research projects are carried out at the Aeronautical Research Laboratories and other institutions. Such research makes an important contribution to aircraft safety, mainly in the fields of aircraft structure, corrosion, engine failure and pilot fatigue. The Royal Melbourne Institute of Technology has been selected to carry out a full scale fatigue test on a composite glider wing to determine the viable life of the aircraft.

. Major Projects (Airport/Airways Development)

A number of master planning studies associated with the development of major airports around Australia are continuing. The financial and economic assessment of airports/airways infrastructure investment proposals is an ongoing task.

. Provision of Meteorological Services

The Department is obliged to obtain meteorological services from the Bureau of Meteorology as part of the statutory responsibilities for the safety of aircraft operations.

COMMUNICATIONS

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Communications	N(a)	0.005	0.015	0.011	-	-	0.220	0.452
	N(b)	0.032	0.072	0.027	-	-	0.108	0.228
	N(c)	0.013	0.013	0.013	-	-	-	-
	S(b)	-	-	-	0.012	-	0.012	-
	S(c)	-	-	-	0.043	-	0.043	-
Aust. Broadcasting Comm.	N(a)	0.020	0.020	0.051	0.030	0.045	0.060	0.090
	N(b)	0.076	0.087	0.094	0.093	0.113	0.186	0.225
Aust. Broadcasting Tribunal	nS(b)	0.073	0.090	0.102	0.195	0.215	0.242	0.265
	nS(c)	-	0.029	-	0.144	0.002	0.173	0.036
Total (Direct Commonwealth funding, excluding BE)		0.219	0.326	0.297	0.518	0.374	1.044	1.296
B. Commonwealth Non-Budget sector								
Australia Post BE	N(a)	0.040	0.070	0.130	0.085	0.070	0.205	0.230
	N(b)	0.544	0.565	0.605	0.459	0.611	1.329	1.825
	N(c)	0.040	0.060	0.060	0.085	0.102	0.235	0.307
Overseas Telecommunications Commission, Australia (OTC) BE	N(b)	-	-	-	-	-	0.034	0.255
	N(c)	0.180	0.181	0.195	0.345	0.534	0.367	0.923
Telecom Australia BE	sN(a)	1.9	2.1	7.9	6.3	4.7	10.1	9.1
	sN(b)	24.4	24.9	27.7	31.8	36.9	64.5	71.9
	sN(c)	0.254	0.269	0.671	0.717	1.094	5.717	6.094
Total (Non-Budget sector)		27.4	28.1	37.3	39.7	44.0	82.4	90.6
Total (Direct Commonwealth funding, including BE)		27.6	28.5	37.6	40.2	44.4	83.4	91.9
C. Expenditure from other sources								
Telecom Australia	N(a)	-	-	0.022	0.050	0.057	0.050	0.057
	N(b)	-	-	0.078	0.250	0.443	0.250	0.443
Total (Other sources)		-	-	0.100	0.300	0.500	0.300	0.500
Total (A+B+C)		27.6	28.5	37.7	40.5	44.9	83.7	92.4

- N Natural sciences and engineering      S Social sciences and humanities  
 nS Includes some natural sciences and engineering  
 sN Includes small proportion of social sciences and humanities  
 (a) Intramural capital expenditure      (b) Intramural current expenditure  
 (c) Extramural expenditure  
 BE Wholly Commonwealth-owned business enterprise

Department of Communications

The Department of Communications' responsibilities include the policy and technical aspects involved in developing and maintaining broadcasting services and the management and use of the radio frequency spectrum. The Department has been allocated \$550 000 for an intensive program of field and laboratory investigations to be undertaken to determine systems standards and performance specifications for small earth stations to be used in the reception of the Homestead and Community Broadcast Satellite Service (HACBSS). The Communications Development Division, as well as conducting these HACBSS investigations, is also involved in a survey to assess adjacent channel interference in the UHF band.

Australian Telecommunications Commission ('Telecom Australia')

New telecommunications services and facilities and fundamental changes in the technology of the telecommunications network infrastructure are continually becoming economically and technically feasible with the increasingly rapid advances in telecommunications science and technology stemming largely from developments in semiconductor and optical materials and devices, particularly microelectronic devices. Community demand, economic pressures and network development considerations require Telecom Australia to adopt new technology in a timely manner to provide new or improved customer services, to contain costs and provide flexibility for future change in the development of its network, or to improve its operational efficiency and service standards.

To develop an independent competence to manage the technology which is fundamental to the performance of its statutory obligations, Telecom performs intramural R&D on projects selected for their relevance to the Australian telecommunications environment. The output of this R&D provides an input to other scientific and technological activities performed within Telecom as an integral part of its planning and implementation of innovations in customer services, network systems or operational practices.

The R&D activities of Telecom Australia cover the whole spectrum of telecommunications engineering and science. Projects range from long-term research related to possible but distant innovations in customer services or network systems, to investigatory evaluations and development projects with more definite and shorter-term application. Other projects seek to use new or existing science and technology to solve technical problems relating to the systems, equipment, components or materials used in the existing network, or through the development of new engineering practices and procedures, to improve the productivity or efficiency of network operations and maintenance. The Telecom Research Laboratories Review of Activities published annually describes a selection of projects which give an overall picture of the type and breadth of work undertaken, and of the degree to which the Laboratories are keeping abreast of world developments in communications science. A more comprehensive list of current projects is issued in Telecom's "Research Quarterly". Among the many research investigations being pursued in 1981-82 were:

- optical signal processing techniques;
- multi-mode and single mode optical fibre transmission systems;

- digital microwave radio transmission systems;
- teleconferencing;
- packet switched data networks;
- software architectures and specification and description techniques for real time control of telecommunications systems;
- common channel signalling techniques in stored program controlled exchange networks;
- verification of communication protocols;
- formulation of polymer materials for reliable application in telecommunications plant;
- analytical techniques for the assessment of hazardous chemicals arising in telecommunication operations; and
- development of electro-magnetic hearing aid/telephone couplers to assist hard-of-hearing telephone users.

#### Australian Postal Commission ('Australia Post')

The Postal Services Act requires that the Commission perform its functions in such a manner as will best meet the social, industrial and commercial needs of the Australian people. In providing these services, the commission is required to have regard to the need to operate its services as efficiently and economically as practicable. It must have regard also to the special needs for postal services of Australian people who reside or carry on business outside the cities and the desirability of improving and extending its postal services.

The Commission, which trades as "Australia Post", carries out research and development aimed at providing new and improved products, services, management systems, procedures and techniques which have been identified as important for the achievement of its broad objectives. Current research is directed towards developing automated lettermail processing and mail containerisation.

#### Overseas Telecommunications Commission (Australia) (OTC)

The Overseas Telecommunications Commission (Australia) is responsible for the establishment, maintenance, operation and development of all public telecommunications services between Australia and other countries, between Australia and its external territories and with ships at sea. Its R&D activities and supported projects, which encompass radio, submarine cable and satellite technologies, are funded from trading revenues.

The substantial increase in S&T expenditure for 1982-83 relates to the letting of contracts for policy related studies and procurement of knowhow in relation to telecommunications services and facilities. There is also a large increase in intramural expenditure for administrative and other support for activities directed towards the development and operation of these services and facilities.

### Australian Broadcasting Commission (ABC)

The ABC has the responsibility to provide adequate and comprehensive television and radio programs throughout Australia. To further this aim, its R&D activities cover the design, using innovative techniques where appropriate, of specialized equipment which is not otherwise available. Technical support is also given to facilitate the introduction of technological changes into the ABC's operations and to allow effective liaison with overseas and Australian organisations.

### Australian Broadcasting Tribunal

The Australian Broadcasting Tribunal is responsible for matters relating to licensing and supervision of public and commercial broadcasting and commercial television stations.

The Research Branch of the Tribunal provides the Tribunal with original field research, background papers and statistical analyses. Projects undertaken during 1982-83 included two studies relating to the Tribunal's inquiry into the possible introduction of cable and subscription television, viz a survey of public usage of video cassette recorders and attitudes to cable television, and a study of public attitudes to new television services. Two other projects were conducted concerning censorship classification. These were a survey of the attitudes of cinema goers to censorship and a study of public attitudes to the classification of television programs.

DEFENCE

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Defence	N(a)	6.803	9.252	7.796	8.182	11.067	12.510	13.883
	N(b)	78.662	82.705	97.697	103.989	107.125	130.194	135.335
	N(c)	0.397	0.370	0.399	0.742	1.041	17.349	20.720
Total (Budget sector)		85.862	92.327	105.892	112.913	119.238	160.053	169.938
B. Expenditure from other sources								
Department of Defence	N(a)	0.068	0.142	0.135	0.083	-	0.088	-
	N(c)	0.791	1.268	1.697	1.051	-	1.081	-
Total (Other sources)		0.859	1.410	1.832	1.134	-	1.169	-
Total (A+B)		86.721	93.737	107.724	114.047	119.233	161.222	169.938

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

Note

The costs shown in the table are estimates of expenditure or actual expenditure incurred against appropriations to the Department of Defence. Costs classified as R&D expenditure include:

- all capital and most current expenditure on the Defence Science and Technology Organisation (DSTO), including salaries of some service personnel; and
- payments to CSIRO for assistance to Defence on environmental matters relevant to land management.

Costs classified as expenditure on S&T (other than R&D) include:

- other salaries for Service personnel and costs borne by the Service in support of DSTO establishments;
- production development expenditure classified as "engineering for innovative production" for project funds administered by the DSTO and the Defence Industry Development (ID) Branch;
- a portion of DSTO expenditure not considered as R&D; and

- broad estimates for identifiable elements of the Service conducting work classifiable as S&T.

The S&T expenditures include capital expenditures by the Department of Defence on behalf of the Industry Development Branch of the Department of Defence Support. Under the convention followed in this Statement the latter expenditure should be attributed to the Department of Defence Support.

#### Department of Defence

##### . Defence Science and Technology Organisation (DSTO)

On 7 May 1982 the functional responsibilities of DSTO were split between the Departments of Defence and Defence Support, with Defence retaining the administrative functions associated with policy and programming. All functions were restored to the Department of Defence by the incoming Government in March 1983.

DSTO's functions are to:

- provide scientific and technical advice on defence policy matters;
- provide scientific and technical support:
  - (1) to the Australian Defence Force in its task of maintaining effective forces in being and for the development of the Force;
  - (2) for the acquisition of defence material; and
  - (3) for such other matters as specified by the Minister for Defence;
- maintain a technology base to support the Australian Defence Force, the Department of Defence and defence industry; and
- carry out the initial development of selected prototype equipment, to meet approved Defence requirements.

DSTO may also undertake departmentally agreed work for others where it has special expertise or equipment not available elsewhere in Australia.

DSTO has a staff of 4 800 including about 1 100 professional scientists and engineers, deployed in twelve establishments located in the ACT, the eastern states and South Australia.

Current projects of significance include the JINDALEE over the horizon radar, the WRELADS laser depth sounding system for marine charting and a one year UK/Australia cooperative research program on the Ikara antisubmarine missile.

DSTO participates in international cooperative programs in science and technology, notably the Technical Cooperation Program (UK, USA, Canada, Australia). In the latter, it plays a leading role in a number of areas of interest.

The work of DSTO is matched to the needs and trends of Australian defence (present and future). While DSTO's work mostly involves its principal customers - the defence force and defence industry - there is considerable interaction with other science and technology bodies in the private and public sectors, as well as tertiary institutions both in Australia and overseas.

DSTO is cooperating in staff exchanges with industry and academic institutions, in addition to arrangements for study leave at DSTO laboratories and staff secondments.

DSTO has had a policy of contracting to industry, wherever possible, development work on projects likely to lead to volume production. DSTO tries to involve industry as early in the project as is practicable but needs to have sufficient competence initially to provide "R&D authority" supervision. Some large tasks have been placed in Australian industry, e.g. contracts worth \$25m for development of the BARRA sonobuoy.

DSTO's modest program of research contracts with tertiary educational institutions has been growing in recent years. Recent research agreements have been arranged in areas of signal processing, strength degradation of brittle ceramics, magnetic materials and aircraft gust loading statistics. DSTO is represented on the Radio Research Board, and will be participating with modest funding in the operation of the Computer Research Board.



DEFENCE SUPPORT\*

(\$ million)	R&D					S&T (including R&D)	
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure							
. Aircraft Guided Weapons and Electronics Supply	N(b)	-	-	-	-	1.935	2.900
. Industry Development Branch	N(c)	-	-	-	-	n.a.	n.a.
. Munitions Supply	N(a)	-	-	-	-	1.642	1.383
	N(b)	-	0.027	0.032	-	6.799	7.764
	N(c)	-	-	-	-	0.026	-
<b>Total (Budget sector)</b>		-	0.27	0.032	-	10.403	12.047
B. Expenditure from other sources							
Department of Defence Support							
. Munitions Supply	N(a)	-	-	-	-	0.930	0.879
	N(b)	-	-	-	-	3.863	5.041
<b>Total (Other sources)</b>		-	-	-	-	4.793	5.938
<b>Total (A+B)</b>		-	0.027	0.032	-	15.196	17.985

N Natural sciences and engineering

S Social sciences and humanities

(a) Intramural capital expenditure

(b) Intramural current expenditure

(c) Extramural expenditure

\* The data in the above table are DST estimates based on information supplied by the Department of Defence Support. The short deadlines necessarily imposed have not allowed the Department of Defence Support sufficient time to confirm the entries. In particular, the distribution of Munitions Supply Division funds between sources may require adjustment.

\*\* Capital extramural expenditures on behalf of this Branch are paid by the Department of Defence, and in this Statement have been included in the figures for that Department. Under the convention followed in this Statement these expenditures should be attributed to the Department of Defence Support.

## Department of Defence Support

- . Aircraft, Guided Weapons and Electronics Supply Division
  - Provides policy advice to the Minister on the capacity, efficiency, and technological capability of the Australian aerospace industry.
  - Formulates proposals and implements programs for improving the structure and efficiency of the industry, for the development and acquisition of new technologies and equipment, and for the economic utilisation of defence production capacity.
  - Manages government aerospace production facilities concerned with the design, development, manufacture, maintenance, and export of aircraft and guided missiles.
  - Plans and oversees defence aircraft activities in the private sector.
- . Industry Development Branch
  - Provides technical advice and expertise to assist in industry productivity initiatives and actively seeks to transfer to industry modern techniques and technologies developed or acquired for aerospace production purposes.
  - Develops proposals for, and/or provides advice on, the involvement of Australian industry in specific defence procurement.
  - Monitors, and, where necessary, manages Australian industry programs forming part of specific defence procurements.
  - Implements and manages production engineering and production phases of major Australian defence equipment projects.
- . Munitions Supply Division
  - Formulates detailed proposals for planning, allocation and control of, production capacity in government munitions factories to meet the requirements of the defence services.
  - Oversees and co-ordinates the management of the government's munitions factories and the design projects and planning of capital projects and new equipment programs.
  - Develops production practices embracing quality control and the safe handling of munitions material in government establishments.

EDUCATION AND YOUTH AFFAIRS

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Education and Youth Affairs								
. Australian Council for Educational Research	S(c)	0.275	0.295	0.319	0.370	0.392	0.370	0.392
. Curriculum Development*	S(b)	0.798	0.605	0.602	0.469	0.072	1.524	0.401
	S(c)	0.591	0.438	0.445	0.408	0.076	0.512	0.076
. CERI participation	S(b)	-	-	-	-	-	0.012	0.005
. Education Planning Group	S(b)	0.052	0.068	0.067	0.066	0.040	0.102	0.071
. Education Research and Development Committee	S(b)	-	-	-	-	-	0.083	-
	S(c)	1.002	0.963	0.992	0.679	0.137	0.679	0.137
. Education Review and Evaluation Studies	S(c)	0.110	0.139	0.140	0.070	0.124	0.070	0.124
. Educational use of Communications Technology	S(c)	-	-	-	-	0.100	-	0.100
. Office of Youth Affairs	S(c)	-	-	-	0.028	0.036	0.028	0.036
. Postgraduate Awards	S <sup>N</sup> (c)	8.002	7.583	7.756	8.537	11.300	9.583	12.705
. TAFE National R&D Centre	S(c)	-	-	0.020	0.212	0.282	0.212	0.282
. Transition Program	S(c)	-	-	0.250	0.236	0.394	0.233	0.394
. Tertiary Education Commission								
. Evaluations and Investigations	s(b)	0.179	0.094	0.078	0.035	-	0.035	-
	S(c)	0.196	0.122	0.186	0.095	0.095	0.378	0.429
Schools Commission	S(c)	0.100	0.114	0.369	0.495	0.485	0.517	0.514
A.C.T. Schools Authority	S(a)	0.001	-	-	-	-	-	-
	s(b)	0.086	0.101	0.118	0.152	0.203	0.152	0.203
Grants to universities**								
. Commonwealth Special Research Centres	S <sup>N</sup> (c)	-	-	-	1.5	5.9	1.5	5.9
. Other	S <sup>N</sup> (c)	64.3	69.0	77.0	83.5	95.0	83.5	95.0
<hr/>								
Total (Budget sector)		75.7	79.5	88.3	96.8	114.6	99.5	116.8
<hr/>								
B. Commonwealth Non-Budget sector								
Curriculum Development*	S(b)	0.068	0.066	0.158	0.089	0.120	0.289	0.671
	S(c)	0.050	0.048	0.117	0.077	0.127	0.097	0.127
<hr/>								
Total (Non-Budget sector)		0.118	0.113	0.275	0.166	0.247	0.386	0.798
<hr/>								
Total (Direct Commonwealth funding)		75.8	79.6	88.6	97.0	114.9	99.9	117.6

- N Natural sciences and engineering                      S Social sciences and humanities  
 SN Includes significant proportion of social sciences and humanities  
 (a) Intramural capital expenditure                      (b) Intramural current expenditure  
 (c) Extramural expenditure

\* DST estimates.

\*\* See discussion below. The amounts which universities spend on research from their general recurrent grants and equipment grants are a matter for each institution to determine. There is, therefore, no reliable basis for projecting expenditure in advance. The amounts included for 1980-81 and 1981-82 are based on the assumption that the proportion of general recurrent grants and equipment grants expended on research in 1980 is maintained for 1981 and 1982, and take into account the level of the special research grant approved for these years.

#### Notes on R&D expenditure in tertiary Institutions

Total expenditure on R&D in tertiary institutions, principally universities, falls into three categories. These are:

1. Expenditure specifically earmarked for research in universities in the States Grants legislation (known as the Special Research Grant), together with other funds earmarked for research by the universities themselves from grants provided under this legislation, or, in the case of the Australian National University, from its direct appropriation. Only expenditure in Category 1 has been included in the R&D part of the line 'Grants to universities' in the above table.
2. Expenditure specifically allocated to research activities which is funded from sources other than those in Category 1 (e.g. ARGS grants to universities). It is assumed that the Commonwealth components of such funding have been included as extramural expenditure by the departments and authorities concerned.
3. Expenditure on research activities which is part of expenditure of the university or college but which is not specifically identified. This activity is funded from grants provided under the legislation referred to above. While the value of this research cannot be separately identified, an imputed value of \$213m for universities was estimated for 1978 in the 1978 Project SCORE survey. If the 1978 proportion of imputed to total expenditure from all sources is applied to total expenditure from all sources in subsequent years, the imputed value of R&D in this category performed by universities would be approximately \$220m in 1979, \$250m in 1980, \$280m in 1981 and \$300m in 1982.

For colleges of advanced education the R&D reported to Project SCORE for 1978 was \$7m which represented 1.4% of total Commonwealth grants to these bodies.

The imputed figures for R&D in Category 3 have not been included in the above table because they are large amounts based on subjective assessments, and are thus subject to some degree of uncertainty.

The Government will provide \$16m over the 1982-84 triennium to establish Commonwealth Special Research Centres; included in the grants to universities are amounts of \$1.5m for 1981-82 and \$5.9m for 1982-83.

Because accounting in universities is on a calendar year basis, 'Grants to universities' in the above table are estimates based on the following actual expenditures:

	(\$ million)			
	1978	1979	1980	1981
Identifiable research expenditure by universities from Category 1				
. from general funds	50.1	52.2	57.9	65.3
. from special research grants	4.5	5.6	6.2	7.1
. from equipment grants	8.4	7.7	8.3	8.7
Total	63.0	65.5	72.4	81.1

Research expenditure from general funds and equipment grants is not yet available for 1981 and 1982. However, for these years the special research grants available have been approved at \$7.2m for 1981 and \$8.0m for 1982 in estimated average prices for each year.

#### Department of Education and Youth Affairs

##### . Australian Council for Educational Research (ACER)

The annual research program and level of funding of ACER is agreed to by the Australian Education Council (AEC) which provides Commonwealth/State coordination at Ministerial level. As well as receiving the Commonwealth grants shown in the table, ACER also receives matching grants from the States.

The grant to ACER assists it:

- to promote research and development in education in Australia;
- to conduct research and undertake development in any matters affecting education through its own staff and in cooperation with other bodies in Australia and overseas; and
- to disseminate publications and results of research and development.

In 1981-82 the direct Commonwealth contribution represented just over 50% of the total core grant received by ACER, and 23% of total ACER R&D expenditure for that year.

Broad research programs cover teaching and learning; the social context of education; and measurement and evaluation. These are supported by programs covering library and information services; survey and psychometric services; advising services; and publishing. The research program overall contains many diverse projects. Examples of substantial projects current in 1981-82 and continuing (unless otherwise stated) in 1982-83 include:

- the Second IEA Science Study, which aims to measure the current state of science education across the world, and to investigate curricular and other factors which explain differences in the outcomes of science programs;
- the IEA Classroom Environment: Teaching for Learning Study, which is investigating the relationships between specific teaching practices and student outcomes, both cognitive and affective;

- the Staffing and Resources Study (completed in 1981-82) examined issues relating to resource allocation in the government school systems of the six Australian States, the Australian Capital Territory and New Zealand;
- Youth in Transition (formerly known as the Survey of School Leavers) addresses questions relating to the transition from school to work;
- the ACER Early School Series of ten diagnostic and screening tests for auditory conceptual, and language skills, which was published in 1982.

. Curriculum Development

The Curriculum Development Centre was a national body that worked on school curricula in cooperation with educational authorities and agencies throughout Australia and overseas. Its activities included research into curricula and publishing and marketing of curriculum and teaching materials. In conjunction with the RCF decision to wind down the Centre and set up a Curriculum Development Unit within the then Department of Education, the then Government decided to continue activities in two areas of national significance, namely Aboriginal education and multicultural education. Some bilateral projects were also maintained in international education, and commitments outstanding for Phase 2 of the Language Development Project were to be met.

The expenditures shown are DST estimates based on publicly available documents.

. Educational Use of Communications Technology

A Commonwealth/State Advisory Committee was established in 1982 to recommend a balanced program of trials or other projects in the educational use of communications technology. The program is for a three year period commencing in the 1982-83 financial year. In 1982-83 the Commonwealth is providing \$100 000 to match on a dollar-for-dollar basis expenditure by the States on approved trials and evaluation under the program. It is expected that further funding will be available in the following two years.

. Education Planning Group

The Education Planning Group (EPG) is concerned broadly with education at the national level, and with coordination of the Commonwealth Governments' activities in education.

Included amongst the EPG functions are:

- provision of research and analysis resources and statistical services for the portfolio;
- reporting on, reviewing and evaluating existing policies and programs; and
- conducting analytical projects in relation to major dimensions of, or issues in, Australian education with particular reference to coordinated projects involving other parts of the portfolio and other Departments.

The EPG conducts in-house studies for these purposes, and manages contracts under the Education Review and Evaluation Studies program and the Transition Program.

. Education Review and Evaluation Studies

The studies aim to provide a process within ongoing departmental management to determine the extent to which the departmental programs have achieved their planned goals and to provide feedback information to facilitate program improvements and modifications.

. Transition Program

In 1982 a maximum of \$320 000 was allocated centrally for National Projects and Evaluation within the Transition Program. The funds were to be spent mainly in the areas of evaluation, research, dissemination and conference activities. For 1983 the figure allocated for these purposes will be \$360 000.

The National Projects and Evaluation allocation was established to provide a modest capacity at the national level to take initiatives within a State grants program where the initiative for program development lies mainly with the State authorities.

The projects are policy orientated and developmental in nature, with a view of extending the concept of and policies for transition education. Areas covered by projects current in 1982-83 include studies of transition courses and programs in schools and TAFE; evaluation of projects which focus on changing girls' perceptions of career opportunities; examination of job acquisition and adjustment processes from the perspectives of employers young worker's and school leavers; and case studies of innovative and traditional career counselling and guidance programs.

. Education Research and Development Committee (ERDC)

The Committee advised the Minister on educational research priorities and made education research grants and annual awards as well as arranging dissemination of reports.

The ERDC has been abolished and its programs are being terminated following the Review of Commonwealth Functions. Over forty diverse projects were funded in 1982, all scheduled for completion before the end of March 1983.

. The Office of Youth Affairs

The Office of Youth Affairs was set up by the Commonwealth Government in 1977 with the aim of improving coordination and consultation between Commonwealth Government departments, State and Local government and non-government organisations in relation to Commonwealth programs and policies which affect young people.

Activities for 1982-83 include a national study on youth in remote areas, and two programs on migrant youth relating to employment experience and health problems and needs.

. Postgraduate Awards

There are three categories of postgraduate awards. Research awards are for PhD and Masters research courses in universities. Course awards are for coursework Masters programs in universities. Advanced Education Institution awards are for Masters programs in Colleges of Advanced Education. The living allowance under the awards was increased for 1983 from \$4 620 to \$6 850. In addition, a further 100 new awards were provided.

. TAFE National Research and Development Centre Ltd

The TAFE National Centre for Research and Development Ltd was established in September 1981 by the Commonwealth and the State Governments as a company. Its functions are to carry out or stimulate research aimed at analysing skills required for various occupations and to review and evaluate technical and further education curricula and programs, particularly those with national significance.

### Tertiary Education Commission

The prime function of the Commission under its Act is to inquire into and advise the Minister on the necessity for, and the conditions and allocation of, financial assistance in respect of universities, colleges of advanced education and technical and further education institutions.

#### . Evaluations and Investigations Program

For the years 1978-79 to 1981-82 the expenditure shown under this heading is the sum of expenditures under two former programs, namely the Evaluative Studies Program and the Research and Investigations Program. The latter program was phased down as the TAFE National R&D Centre Ltd was established and the work was transferred to that Centre. The Evaluations and Investigations Program is (as was the Evaluative Studies Program) primarily concerned with evaluation of various aspects of the education system. In some cases research is required as part of the evaluation process. Projects involving research in 1982-83 were mainly concerned with nurse education and transition from school to higher education or employment. These projects are: evaluation of college-based and hospital-based basic nurse education in Victoria; evaluation of general basic nursing education programs in NSW; ACER longitudinal study - youth in transition; study of the effects of early student experience in colleges of advanced education; and study on developing measures of quality and efficiency in Australian higher education.

### Schools Commission

The Commission advises the Minister for Education and Youth Affairs on the needs of schools in Australia. In addition to its general funding programs the Commission has specific purpose programs designed to assist special target groups such as children in disadvantaged schools or areas, migrants and the handicapped. Other programs address particular educational issues, for example, the needs of school communities, students in a particular age group, and girls.

### A.C.T. Schools Authority

The research program of the ACT Schools Authority is aimed at improving the operation of schools and education in the ACT. Major areas of research and development are assessment of students, evaluation of schools, transition programs (school-to-work), and multicultural education.

### Grants to universities

#### . Commonwealth Special Research Centres

These Centres were referred to in the previous Statement (1981-82, p32) as Research Centres of Excellence.

#### . Other

The nature of "Grants to universities" included in this Statement is outlined in footnote \*\* to the above table.



EMPLOYMENT AND INDUSTRIAL RELATIONS

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Employment and Industrial Relations								
. Bureau of Labour Market Research								
Research	S(a)	-	-	-	0.009	-	0.009	-
	S(b)	-	-	0.089	0.626	0.777	0.877	1.053
	S(c)	-	-	0.006	0.067	0.097	0.127	0.184
. Development of Australian Standard Classification of Occupations								
	S(b)	0.057	0.307	0.501	0.619	0.419	0.619	0.419
	S(c)	-	-	-	0.018	0.020	0.018	0.020
. Employee Relations Program								
	S(b)	-	-	-	-	-	0.080	0.130
	S(c)	-	-	0.021	0.025	0.025	0.025	0.025
. Physical environment standards								
	N(b)	0.090	0.110	0.193	0.343	-	0.512	0.089
	N(c)	-	-	0.007	-	-	0.160	0.160
Total (Direct Commonwealth funding)		0.147	0.417	0.818	1.706	1.337	2.426	2.078
N Natural sciences and engineering		S Social sciences and humanities						
(a) Intramural capital expenditure		(b) Intramural current expenditure						
(c) Extramural expenditure								

Department of Employment and Industrial Relations

. Bureau of Labour Market Research

The Bureau of Labour Market Research (BLMR) is the research arm of the Department of Employment and Industrial Relations.

The Bureau undertakes research and analysis, sponsors research by other bodies and acts as a "clearing house" for labour market research to ensure that advances in understanding are widely known and used. Senior staff are responsible for the design, implementation and dissemination of research. An Advisory Council oversees the work of the Bureau and advises the Minister for Employment and Industrial Relations on the Bureau's research program and priorities.

The BLMR is independent and publishes the results of research. The major emphases in the 1982-83 program are the youth labour market and programs, the further development of understanding of the labour supply (labour force participation), the technological work force, i.e. tradesmen and engineers and public sector operations, especially employment services and programs.

. Australian Standard Classification of Occupations (ASCO)

The Department of Employment and Industrial Relations and the Australian Bureau of Statistics jointly are developing a new comprehensive ASCO which will be used by the ABS, State government departments and authorities, the Commonwealth Employment Service, universities, schools, and private industry for various purposes. ASCO will provide a systematic classification and description of occupations in the Australian labour market to provide:

- . better labour market analysis;
- . better training programs;
- . better manpower forecasting;
- . accessibility to occupational information; and
- . more efficient matching of job seekers to vacancies.

. Working Environment Branch

The Working Environment Branch aims to stimulate the development of a working environment in which people contribute to optimal productivity performance through deriving job satisfaction in occupations for which they are effectively trained, and in surroundings that are attractive, healthy and safe. Through policy development, research, publication, dissemination, training programs and advisory activities, the Branch seeks to raise awareness and stimulate positive action designed to improve both productivity and quality of work life and to encourage organisational effectiveness and adaptability.

- The Employee Relations Program covers research, documentation and advisory activities in the fields of personnel practices, advanced management systems and employee participation. Projects funded by the program in 1981-82 dealt with participative approaches to introduction of new technology, organisational decision making and a case study of one company's approach.

The projects were:

- . employee participation and the design and start-up of major technological projects;
  - . examination of employee participation in an assembly line factory;
  - . technological change and employee participation; and
  - . organisation decision-making structure as it relates to employee participation.
- The Physical Working Environment Section's programs cover occupational safety and health, ergonomics, engineering and architectural aspect of the working environment. The work of the section also involves the development of uniform standards and uniform safety policies for the Commonwealth Public Service. In carrying out programs the section is involved in on-site consultancy with various Commonwealth Government departments on the application of occupational safety and health, the maintenance of Codes of Practice and liaison with outside agencies such as the Standards Association of Australia.

Work was curtailed as a result of the Review of Commonwealth Functions. Typical projects undertaken by the section include:

- . the production of occupational safety and health publications in the 'At Work' series;
- . the dissemination of occupational safety and health information throughout Australia; and
- . inspection and measurement of nominated working environments so as to maintain a safe and healthy workplace for Commonwealth employees.

FOREIGN AFFAIRS

(\$ million)	R&D					S&T (including R&D)	
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure							
Department of Foreign Affairs							
. Bilateral Agreements	N(c)	-	-	-	-	0.133	0.125
	S(c)	-	-	-	-	0.159	0.101
. Multilateral Grants	N(c)	0.013	0.012	0.012	0.011	0.030	0.030
	S(c)	0.040	0.037	0.037	0.030	0.080	0.080
. Economic Studies	S(c)	-	-	0.332	0.172	0.332	0.172
Australian Centre for International Agricultural Research (ACIAR)							
	N(b)	-	-	-	-	0.011	0.789
	N(c)	-	-	-	-	2.590	2.590
	S(b)	-	-	-	-	-	0.042
	S(c)	-	-	-	-	0.210	0.210
Australian Development Assistance Bureau (ADAB)*							
. Administration	N(b)	-	-	-	-	1.485	1.558
	S(b)	-	-	-	-	0.488	0.514
. International Science, Technology and Research Programs	N(c)	2.759	3.287	3.736	4.717	6.246	4.717
. Regional Training and Research Centres	N(c)	0.073	0.075	0.071	0.102	0.118	0.645
	S(c)	0.060	0.054	0.063	0.046	0.086	0.279
. Bilateral Aid - South East Asia and Pacific Region	N(c)	5.255	3.915	4.077	6.848	7.891	38.380
	S(c)	0.100	0.080	0.024	0.541	0.347	1.416
. Bilateral Aid - n.e.i.	N(c)	0.248	0.260	0.490	0.499	0.910	10.777
	S(c)	-	-	-	0.031	-	0.790
. Regional Programs	N(c)	-	-	-	0.069	0.029	0.913
	S(c)	-	-	0.009	0.009	0.016	0.473
. ASEAN Australian Economic Cooperation Program (AAECP)	N(c)	1.450	1.964	2.628	2.863	3.223	4.032
	S(c)	0.007	0.146	1.331	2.669	2.851	2.669
. Development Training	N(c)	1.498	1.538	1.857	2.078	2.840	9.678
	S(c)	1.017	1.048	1.268	1.314	1.985	10.485
. Multilateral support	N(c)	0.593	0.636	0.549	1.256	2.136	8.473
	S(c)	-	-	-	0.075	0.068	9.507
. Non Government Organisations	N(c)	-	-	0.010	0.075	0.078	0.085
	S(c)	-	-	0.030	0.075	0.083	0.075
Total (Direct Commonwealth funding)		13.111	13.053	16.524	23.479	32.147	106.406
							145.049

N Natural sciences and engineering

S Social sciences and humanities

(a) Intramural capital expenditure

(b) Intramural current expenditure

(c) Extramural expenditure

\* Data for ADAB are DST estimates compiled with ADAB cooperation. While DST consider these figures to be more accurate than those published in previous S&T statements, further refinement is possible.

#### Department of Foreign Affairs

##### . Bilateral Agreements

The Australia-China Council (ACC) grants on science and technology exchanges with China have been mainly concerned with projects that have emerged from the Academy of Sciences' exchange program, or which involved other government departments, universities, and private institutions. The Council acts as a focus for information dissemination, commissions research work and promotes Chinese Studies in Australia.

The USSR/Australia Agreement for Scientific and Technical Cooperation involved the exchange of visits by scientists from Australia and the USSR and joint research projects. All activities in respect of the Agreement have been suspended as a result of Soviet intervention in Afghanistan.

##### . Multilateral Grants

Australia contributes to the funding of certain international organisations which undertake S&T activities. The expenditure shown in the table above includes contributions to the Commonwealth Science Council and specific programs of the International Atomic Energy Agency, Food and Agriculture Organisation and the Organisation for Economic Cooperation and Development which can be identified as falling within the scope of this Statement. In addition to the amounts shown above, approximately \$9m (1981-82) was contributed to the core budgets of these organisations and the United Nations Education, Scientific and Cultural Organisation. However, it has not been possible to identify the proportion of this amount which was directed towards scientific and technological activities.

##### . Economic and Social Studies

The Australia/Japan and Western Pacific Economics Relations Project is funded by both Australia and Japan and coordinates research by Australian and Japanese economists on economic relations between the two countries. Support is also given to the Indonesia Project at the Australian National University to carry out research on Indonesian economic affairs. The grant to the Australian Studies Centre in London is also included here.

#### Australian Development Assistance Bureau

Australia's development assistance program is a major focus of our relations with many Third World countries. This program has given increasing priority to science and technology.

The Australian Science, Technology and Research Cooperation Program (AUSTREC) has been developed largely within the established framework of bilateral, multilateral and training aid activities. In addition, new avenues outside the scope of the traditional aid framework have been instituted to strengthen scientific and technical institutions in developing countries.

. International Science, Technology and Research Programs

Support is provided for the core budgets and special projects of international and regional research programs. Institutes supported include the International Agricultural Research Institutes of the Consultative Group on International Agricultural Research (CGIAR) and other agricultural research institutes.

. Regional Training and Research Centres

This program provides support for institutional and program support and fellowship grants to training institutes and research centres in the Asia Pacific regions. Institutes and centres receiving support include the Asia and Pacific Development Centre, Kuala Lumpur, the Statistical Institute for Asia and the Pacific, Tokyo and the Agricultural Development Council, New York and Bangkok.

. Bilateral Projects

Assistance to bilateral projects totalled \$126m in 1981-82 and is estimated at \$150m for 1982-83. These projects are undertaken in response to requests from developing countries and many of them have a substantial scientific component. It is Australia's aim to use these projects to build up the development capacity of developing countries so there is a strong emphasis on technology transfer through the provision of experts, equipment and training.

. Research for Development

This program has been established specifically to stimulate scientific research for developing countries. It has been used to support a number of scientific seminars, and the creation of networking arrangements to facilitate communication and research on microbiology, chemistry of natural products and fibrous agricultural residues. Support for regional scientific activities has included provision of seeds of Australian trees and pastures, a regional meteorology project and a regional animal diseases survey.

. ASEAN Australian Economic Co-Operation Program (AAECP)

The AAECP sponsors ASEAN regional co-operation by assisting projects of regional importance jointly conducted by member countries of ASEAN. This has stimulated research and development work, technology transfer and mutual assistance, and has laid the foundation for further co-operation among ASEAN countries. Projects being funded under this program include development of low cost protein rich foods, comprehensive studies into and the application of improved techniques for post-harvest handling of food, programs aimed at strengthening the research capacity of ASEAN countries in the field of population and the development of methods of management and utilisation of food waste materials.

. Development Training

Training assistance enables Australia to assist in the development of skilled manpower resources in developing countries. Developing country governments decide how they will use the training allocation provided under the aid program.

Training can be offered to meet special needs. For example, within Australia funds are spent to enable Australian educational institutions to run Australian Development Assistance Courses (ADACS). These courses may be intensive practical or formal postgraduate programs. In addition, governments may nominate candidates to attend regular courses at Australian tertiary institutions.

While the emphasis of the program is on training in Australia, awards are also made available for study at institutions in the Pacific and South East Asian regions.

In 1981-82 Australian sponsored approximately 3 300 students and trainees.

#### . Multilateral Programs

Assistance is provided to international aid organisations which undertake S&T activities. Organisations receiving funding include the United Nations Development Program which is the largest multilateral funding agency for technical assistance, the United Nations Fund for Population Activities which assists countries to be aware of the social, economic and environmental implications of population problems and the Commonwealth Fund for Technical Cooperation which provides technical assistance to the developing countries of the Commonwealth in fields such as finance, statistics, development planning, project evaluation and preparation, public administration and taxation.

#### . Non-Government Organisations

Non-government organisations, operating through channels outside the official aid program, effectively complement the Government's program. Government assistance is provided for the International Union for the Scientific Study of Population, the Population Council, the International Foundation for Science and the Association of Geoscientists for International Development.

#### Australian Centre for International Agriculture Research (ACIAR)

The ACIAR was established by an Act of the Australian Parliament which came into effect in June 1982. The Centre is designed to encourage research aimed at identifying agricultural problems in developing countries and at finding solutions to such problems.

From initial studies it is clear that Australia can assist in problems in crop and pasture legumes and areas such as biological nitrogen fixation, animal health and nutrition, plant protection, soil and water management, plant nutrition, agro-climatology, post-harvest technology and socio-economic analysis. ACIAR is developing an initial portfolio of projects covering some of these areas. The research will be contracted to Australian research institutions and other suitably qualified groups in collaboration with developing country scientists whenever possible.

HEALTH

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Health								
. Australian Radiation Laboratory	N(a)	1.260	0.550	0.190	0.190	0.430	0.290	0.520
	N(b)	1.040	1.325	1.590	1.915	2.155	2.870	3.235
. Building grants to W. & E. Hall Institute	N(c)	-	.100	0.294	2.170	4.455	2.170	4.455
. Commonwealth Institute of Health	N(a)	0.205	0.170	0.476	0.150	0.100	0.150	0.100
	N(b)	0.262	1.491	1.715	1.914	1.887	2.870	2.831
. National Acoustics Laboratories	N(a)	0.062	0.196	0.126	0.700	1.975	1.425	3.980
	N(b)	0.732	0.608	0.619	0.645	0.696	1.542	1.662
. National Biological Standards Laboratory	N(a)	0.050	0.059	0.171	0.046	0.100	0.177	0.320
	N(b)	1.633	1.807	2.116	2.220	2.486	4.723	5.290
	N(c)	-	-	-	-	-	0.006	0.006
. National Health and Medical Research Council	sN(c)	13.175	14.000	18.698	25.648	29.750	25.648	29.750
. Health Services R&D Grants Program	N(c)	-	-	-	0.218	0.220	1.775	1.580
. Ultrasonics Institute	N(a)	0.125	0.227	0.194	0.047	0.050	0.093	0.100
	N(b)	0.455	0.492	0.530	0.308	0.346	0.616	0.692
	N(c)	0.034	0.022	0.007	-	-	-	-
. Other*	N(a)	0.064	0.056	0.589	0.037	0.013	0.037	0.013
	N(b)	0.569	0.416	0.363	0.259	0.160	0.339	0.214
	sN(c)	0.370	0.516	0.306	0.264	0.072	0.264	0.082
Capital Territory Health Commission	N(c)	0.004	0.004	0.004	0.004	-	0.004	-
Commonwealth Serum Laboratories	N(a)	0.097	0.046	0.040	0.078	0.025	0.108	0.030
	N(b)	1.784	2.203	1.103	1.359	1.559	1.708	1.955
	N(c)	-	-	0.083	0.224	0.215	0.224	0.215
Total (Direct Commonwealth funding excluding BE)		21.921	24.288	29.215	38.395	46.695	47.040	57.030



(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
B. Commonwealth Non-Budget sector								
Commonwealth Serum Laboratories BE	N(a)	0.050	0.026	0.074	0.132	0.039	0.153	0.044
	N(b)	0.919	1.222	2.004	2.297	2.416	2.540	2.755
Total (Non-budget Sector)		0.969	1.248	2.078	2.429	2.455	2.693	2.799
Total (Direct Commonwealth funding, including BE)		22.890	25.536	31.292	40.824	49.150	49.733	59.828
C. Expenditure from other sources								
Department of Health								
. Commonwealth Institute of Health	N(a)	0.009						
	N(b)	0.012	-	-	-	-	-	-
. Other*	N(a)	0.004	0.005	0.002	0.001	-	0.001	-
	N(b)	0.044	0.033	0.057	0.032	-	0.032	-
Capital Territory Health Commission	N(b)	0.001	0.057	0.080	0.164	0.088	0.164	0.088
Total (Other sources)		0.069	0.095	0.139	0.196	0.088	0.196	0.088
Total (A+B+C)		22.960	25.631	31.431	41.021	49.238	49.929	59.916

N Natural sciences and engineering

S Social sciences and humanities

sN Includes small proportion of social  
sciences and humanities

(a) Intramural capital expenditure

(b) Intramural current expenditure

(c) Extramural expenditure

\* "Other" covers R&D expenditure by the Dental Health Branch, Institute of Child Health, Health Facilities Branch, Public Health Division, Therapeutics Division and the Plant Quarantine Branch.

#### Department of Health

##### . Australian Radiation Laboratory (ARL)

ARL undertakes research and development relating to the public and occupational health implications of the uses of ionising and non-ionising radiations. Findings are published as technical reports. Fields covered include radiation measurement and assessment (including national standards), environmental radiation (radiochemistry), occupational health in uranium mining, effects of non-ionising radiation, solid state dosimetry, and nuclear medicine (radiopharmaceutical).

. Walter and Eliza Hall Institute of Medical Research

The Commonwealth and Victorian State Governments are jointly funding the planning, design, construction and commissioning of a new building for the Walter and Eliza Hall Institute of Medical Research.

. Commonwealth Institute of Health

The work of the Institute comprises teaching, investigation and consultation in all fields relating to health and its maintenance and promotion. This includes resources devoted to the study of health problems of the tropics and the developing nations.

The Institute's academic and research functions are under the direction of the University of Sydney, while its various training, consultative and professional service roles are funded by the Commonwealth Department of Health.

The Institute has an important role as a resources and data collection centre for the nation. The Institute is endeavouring to promote health and a better understanding of health care and its delivery throughout Australia and neighbouring countries.

. National Acoustics Laboratories (NAL)

NAL undertakes research and development in respect of hearing aids and their application to the needs of individuals, and in respect of problems of noise as it affects individuals. Projects underway include the investigation of auditory processing problems in children, techniques for the selection, fitting, evaluation and development of hearing aids and methods of rehabilitation of deaf people, and studies of the physiological and sociological effects of noise.

The commencement of a new laboratory building has resulted in a substantial increase in capital expenditure.

. National Biological Standards Laboratory (NBSL)

The NBSL is the laboratory arm of a national system of therapeutic goods control jointly administered by Commonwealth and State authorities.

It has the responsibility for ensuring that the therapeutic goods for human and veterinary use available in Australia are of good quality, safe and effective. The activities utilised to this end are:

- (a) the testing of samples for compliance with standards;
- (b) the evaluating of protocols of the chemistry, microbiology, manufacturer's quality control, packaging and labelling of therapeutic goods;
- (c) the developing of new and revised standards;
- (d) inspecting manufacturing practices; and
- (e) providing advisory and consultative services within and without government.

The activities of the NBSL, which include applied research and experimental development activities, are directed towards preventing potentially dangerous products reaching the consumer and, when hazards occur, towards preventing their recurrence.

. National Health and Medical Research Council (NH&MRC)

The NH&MRC is an independent body which advises the Minister for Health on the application of funds from the Medical Research Endowment Fund. The Fund provides assistance to Commonwealth and State Governments engaged in medical research, to universities and other institutions for the purpose of medical research, and to persons engaged in medical research and in the training of persons in medical research. NH&MRC grants form the major proportion of the total Commonwealth funds spent on medical research in Australia.

. Health Services Research and Development Grants

Health Services R&D project grants are awarded to assist government, universities and other organisations and individual research workers to improve, by way of research and demonstration, the techniques and practice of administration, evaluation, planning and delivery of health care in Australia and to provide information which will assist development of health services policy. Recent grants for new projects include the investigation of Australian dietary supplementation, the evaluation of the welfare officer in community care of the aged, a comparative analysis of nursing home patient populations and a study of complications in continuous ambulatory peritoneal dialysis patients.

Block grants which were paid to the States on a dollar for dollar basis to assist their health planning and research activities ceased on 30 September 1982.

. Ultrasonic Institute

The Ultrasonics Institute carries out research on the development of instrumentation and techniques for the application of ultrasonic sound waves in medicine. Researchers from the institute engage in clinical research and development of instrumentation and techniques and work in close cooperation with a number of clinical collaborators. They have maintained a pre-eminent international position in ultrasonic imaging. Recent developments include a pulsed doppler blood flow measurement system which provides the first quantitative non-invasion measurement of blood flow in the deep lying abdominal and fetal vessels. The most recent new departure is the propagation of sound waves within the body which may be used to assess the mechanical properties of the tissues through which the sound passes and hence the pathological state of the tissues. The institute holds a total of 108 patents of twenty inventions in various countries .

. Plant Quarantine Research Program

This Program investigates problems peculiar to plant quarantine not covered by other research programs.

Types of research undertaken at the Plant Quarantine Research Station include the investigation of the penetration of fumigation gases into timber, logs and packing material, investigation of new techniques for the elimination of virus diseases from plant material, and work on aircraft disinfection.

. Family Planning Program

This Program aims to provide family planning information, education and training programs at professional and community levels and to undertake research into family planning and related activities.

. Insect Vector Control

This program provides grants to institutions for research into arbovirus infections and Australian encephalitis.

## . Nursing and Health Facilities Branch

The Nursing and Health Facilities Branch is developing a Facility Planning System (FPS) to provide a framework for the organisation and control of the planning process to reduce both construction and operating costs. Five manuals have been developed covering briefing, terminology, commissioning, the planning process and evaluation.

In conjunction with the FPS, the Branch has developed a computerised information system which provides for specific recall of health facility planning matters.

## Capital Territory Health Commission

The Capital Territory Health Commission (CTHC) is responsible for the provision of public health services in the ACT. This covers a wide range of hospital and laboratory services, and community services such as public health surveillance, child and maternal health, mental health, comprehensive geriatric and rehabilitation services, transport (including ambulance services), home nursing, health education etc. The three public hospitals in the ACT work co-operatively to provide a range of thirty-seven separate medical specialist services for residents of the ACT and its surrounds and visitors to the national capital.

Research and development is undertaken throughout the specialist areas. In some cases funding is provided through the NH&MRC and Health Services Research schemes. Projects include:

- . generation of specific immune responses by patients lymphocytes to their own tumor cells - some results of this work have been published;
- . study of whether prolactin comprises a hormonal determinant of 'nurturing' behaviour in women;
- . examination of diabetes central through trasplantation in experimental animals;
- . oxygen consumption and exercise tolerance after myocardial infarction;
- . effectiveness of smoking cessation programs and the characteristics of smokers who seek help;
- . asthma research;
- . study of disorders in cognitive function in epileptics with specific reference to the effect of anti-convulsant drugs;
- . neuropsychology of construction dyspraxia and drawing disabilities in particular;
- . investigation into cerebral evoked responses by stereoscopic visual stimulation; and
- . a study of sensitivity to alcohol following head injuries - this project is expected to be completed during 1983.

## The Commonwealth Serum Laboratories (CSL)

The Commonwealth Serum Laboratories undertake research and development of therapeutic and diagnostic products for human and animal use. Many of the products developed by CSL are designed for and are unique to Australia. Research activities at present include improvements to the methodology of vaccine production with accompanying clinical studies, isolation of human and interform genes and their cloning into micro-organisms, new in-vitro diagnostic tests for immune status, and purification of blue-tongued virus strains.

HOME AFFAIRS AND ENVIRONMENT

(\$ million)	R&D					S&T (including R&D)	
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure							
Department of Home Affairs and Environment							
. Bureau of Flora and Fauna	N(b)	0.004	0.008	0.022*	0.026*	0.187*	0.216*
	N(c)	0.032	0.133	0.152*	0.143*	0.839*	0.792*
. Environmental Activities	N(b)	-	-	-	-	2.574	2.840
	N(c)	-	-	-	-	0.249	0.693
Australian Film and Television School	S(a)	0.003	0.004	-	0.015	0.015	-
	S(b)	0.121	0.061	0.080	0.094	0.128	0.133
	S(c)	0.024	0.036	0.009	0.033	0.034	-
Australian National Parks and Wildlife Service (ANPWS)	N(c)	0.336	0.193	0.198	0.140	0.255	0.230
Great Barrier Reef Marine Park Authority	N(b)	0.034	0.056	-	-	0.015	0.029
	N(c)	0.052	0.057	0.066	0.097	0.138	0.212
	S(b)	-	-	-	-	0.009	-
	S(c)	-	-	0.008	-	0.032	0.027
National Library of Australia	N(a)	-	-	-	-	1.161	1.390
	N(b)	-	-	-	-	0.383	0.383
	S <sup>s</sup> N(c)	-	-	0.009	0.007	0.007	0.008
	S(a)	-	-	-	-	1.935	2.284
	S(b)	-	-	-	-	9.353	9.353
Office of the Supervising Scientist for the Alligator Rivers Region	N(a)	0.279	0.401	0.972	1.654	1.654	1.685
	N(b)	0.531	1.281	2.062	2.060	2.060	2.645
	N(c)	0.125	0.420	0.384	0.333	0.333	0.336
<hr/>							
Total (Direct Commonwealth funding)		1.539	2.535	3.929	4.607	5.076	21.361
<hr/>							
B Expenditure from other sources							
Australian Film and Television School	S(b)	0.011	-	0.001	-	-	-
National Library of Australia	S(c)	-	-	-	0.001	0.002	0.002
<hr/>							
Total (Other sources)		0.011	-	0.001	0.001	0.002	0.002
<hr/>							
Total (A+B)		1.550	2.535	3.931	4.608	5.078	21.362
<hr/>							

N Natural sciences and engineering                      S Social sciences and humanities

<sup>=</sup>N Includes a small component of social sciences and humanities for 1978-79 and 1979-80

<sup>S</sup>N Includes some social sciences and humanities

(a) Intramural capital expenditure (for the National Library includes monographs, serials, films and data bases)

(b) Intramural current expenditure                      (c) Extramural expenditure

\* DST estimates.

## Department of Home Affairs and Environment

### . Bureau of Flora and Fauna

The Bureau of Flora and Fauna is responsible for conducting the Australian Biological Resources Study (ABRS). Its main work is to develop and promote studies of the taxonomy and distribution of the Australian flora and fauna. Working in close collaboration with other Commonwealth and State agencies the Bureau plans, coordinates and directs the national effort to describe and document Australia's vast and largely unique biota.

The ABRS Participatory Program provides grants to support individual projects within the objectives of the Study. The staff of the Bureau are also involved in scientific work essential to national taxonomic documentation.

Current ABRS programs include the Flora of Australia, Australian Faunal Directory, Australian Plant Name Index, Australian Plant List, and the computer-based Australian Biotaxonomic Information System.

### . Environmental Activities

The Environment Division provides the focus for Commonwealth responsibilities in environmental matters and for communication with international environmental agencies, particularly the United Nations Environment Programme and the Environment Directorate of the OECD. In general, the Division is responsible for policy advice, developing proposals, administering legislation, implementing programs, carrying out studies and assessments and general coordination of Commonwealth environmental interests.

Major recent policy developments have included the launching of a National Tree Program which aims to raise public awareness and promote remedial action throughout Australia in conserving, regenerating and planting trees by demonstration projects and through information and education activities. The Wildlife Protection (Regulation of Exports and Imports) Act which will allow Australia to more effectively implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora, other international agreements and the long standing controls on export of Australian wildlife was passed by parliament and given royal assent on 31 December 1982. Following a period of public comment on a discussion paper circulated nationally, a draft National Conservation Strategy for Australia is being prepared in consultation with the States and Northern Territory and with a wide range of community and industry organisations.

Environmental assessments of proposals affecting the environment to a significant extent, and which involve the Commonwealth Government are carried out under the Environment Protection (Impact of Proposals) Act 197A. The assessment of uranium mining, mineral sands mining and woodchipping have been particularly important.

An interim notification scheme for industrial chemicals introduced in 1981 enables identification of new industrial chemicals and assessment of the potential hazards to health and the environment which may be associated with these chemicals before they are marketed in Australia. Action has also proceeded in implementing the national action plan on environmentally hazardous chemicals. Air quality activities have been directed towards the development of a long-term strategy for control of motor vehicle emissions.

Uniform national codes of practice for protecting the health and safety of people and the environment from possible harmful effects associated with nuclear activities are being developed. Codes of practice on radiation protection, transport of radioactive substances and radioactive waste management, and associated guidelines have been approved. Additional guidelines are being finalised.

Marine environment activities have included work on regulations to bring the Environment Protection (Sea Dumping) Act into force, further development of the computer-based model for predicting the spread of oil-spills at sea, and the administration of the marine quality assessment program which includes monitoring baseline pollution levels and bio-indicator studies.

Environment studies undertaken by the Division include measurement of the costs of environment protection measures, utilisation of environment statistics, and the evaluation of the environmental implications of present and proposed public policies that may be environmentally important.

The responsibilities of the Division also include the administration of grants to voluntary conservation bodies, and the provision of secretariat and other support services to the Australian Environment Council, the Australian Council of Nature Conservation Ministers and the Australian Ionising Radiation Advisory Council.

#### The Australian Film and Television School

The School's Research and Survey Unit conducts an on-going program of research into the radio, film, and television industries as an aid to the formulation of School training policy and to provide background material for students of media courses in all tertiary institutions and for the industry. The Unit also coordinates and disseminates research in these fields which has been undertaken elsewhere.

As an adjunct to these activities, the School has established a research program specifically designed to encourage cross-fertilisation between academic disciplines and the media. In each year, the opportunity is provided for a person, or body, to undertake original research on the media from the perspective of a particular discipline. The 1982 research program was awarded to Murdoch University, Western Australia, to study media education curriculum design and development.

#### Australian National Parks and Wildlife Service

The Australian National Parks and Wildlife Service is the principal adviser to the Commonwealth Government on national nature conservation and wildlife policies.

Science and technology aspects of the Service's role include developing research, survey, inventory and monitoring for nature conservation activities of national significance. It funds research projects under its Research, Investigations and Surveys Program. Projects for 1982-83 are:

- . study of Japanese Snipe in Tasmania and Victoria and the short-tailed Shearwater in Tasmania.

- . study of Waders in Australia;
- . ecology and interactions of exotic and endemic freshwater fishes in south-east Queensland streams;
- . Aboriginal history of Kakadu National Park; and
- . an integrated land classification system for nature conservation management in Kakadu National Park.

#### Great Barrier Reef Marine Park Authority

The Great Barrier Reef Marine Park Authority is responsible for the development and care of the Great Barrier Reef Marine Park within the Great Barrier Reef Region.

The Authority's research role is principally to secure information needed for marine park planning and management.

The Authority is concerned with three broad areas of research:

- studies of marine organisms and ecosystems, reef geomorphology, hydrology and other aspects of the biological and physical environment. A sound, basic understanding of what constitutes the Reef and how it has evolved is fundamental to the development and monitoring of the Authority's zoning and management plans;
- knowledge of the impact of human uses on the biological and physical environment, leading to identification of the levels of use at which critical damage begins to occur; and
- demographic, sociological and economic studies which will enable the Authority to anticipate changing patterns and intensities of use and adjust its planning accordingly.

As part of its task of identifying priorities, the Authority has developed a series of documents on the responsibilities, functions, needs, programs and objectives for research projects undertaken by and for the Authority. Ten research areas have been identified relating to the management of multiple uses consistent with conservation of the Great Barrier Reef. These are:

- oceanography of the Great Barrier Reef;
- marine geosciences and geomorphology;
- marine chemistry;
- bathymetry and survey;
- marine biology;
- analysis of use;
- management strategies;
- environmental design;
- Great Barrier Reef data bank; and
- mechanisms of information transfer.



In cooperation with AIMS and CSIRO, the Authority has developed a major paper detailing research needs for physical oceanography of the Great Barrier Reef.

#### National Library of Australia

- The National Library of Australia has a statutory responsibility to:
- maintain and develop a national collection of library materials in all areas of science and technology;
- make these materials available, through reference, current awareness and retrospective search services by traditional or computer based methods; and
- encourage the development of resource sharing networks among libraries and organisations with similar objectives in order to ensure that scientific and technological information is readily available to the nation.

These functions are carried out by:

- providing a reference enquiry service;
- publicising the Library's holdings of scientific and technological material and providing a rapid loan and photocopy service;
- developing expertise in using computer data bases in Australia and the USA in batch and on-line mode, providing services from these data bases and training others to use computer-based services;
- creating and helping to create computer based networks such as MEDLINE, AUSINET and ABN;
- developing and participating in user awareness projects;
- assisting other organisations to develop needed data bases, e.g. Australian Mineral Foundation, Department of Transport and Construction, Department of National Development and Energy;
- liaising with government departments, trade associations, professional societies and industry to ascertain needs for information sources and methods to meet these needs; and
- examining new technology (e.g. videotex and videodisc) potentially useful for information transfer.

#### Office of the Supervising Scientist for the Alligator Rivers Region

In recognition of the unique environment of the Alligator Rivers Region and the interests of the Aboriginal people of the area, the Ranger Environmental Inquiry recommended the establishment of a complex regime of environmental protection to guard against damage to the environment by uranium mining operations. Consistent with these recommendations, the Government's announcement in August 1977 that uranium mining would proceed in this region was accompanied by a number of measures, including:

- the appointment of a Supervising Scientist to oversee environmental protection measures;
- the establishment of a Research Institute managed by the Supervising Scientist; and
- the establishment of a coordinating committee of interested parties.

The Supervising Scientist manages the Alligator Rivers Region Research Institute, which has initiated a multi-disciplinary research program concentrating largely on hydrology and aquatic biology.

Primary responsibility for environmental protection and monitoring rests with the mining companies. Under agreed arrangements, the Northern Territory supervising authorities are responsible for day-to-day regulation, with the Supervising Scientist coordinating and supervising the activities of both the mining companies and the Northern Territory supervising authorities.

HOUSING AND CONSTRUCTION

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Housing and Construction								
. Central Investigation and Research Laboratories	N(a)	0.115	0.140	0.100	0.122	0.134	0.256	0.282
	N(b)	0.900	1.100	0.800	0.978	1.076	2.044	2.248
. Contributions to								
- Australian Housing Research Council	N(c)	0.017	0.046	0.067	0.058	0.083	0.058	0.083
- Australian Road Research Board	N(c)	0.259	0.259	0.259	-	-	-	-
- Australian Uniform Building Regulations Coordinating Council	N(c)	-	-	0.031	0.039	0.050	0.039	0.050
. Experimental Building Station	N(a)	0.189	0.197	0.221	0.094	0.091	0.098	0.092
	N(b)	1.238	1.339	1.183	0.681	0.700	1.308	1.359
. Technical Services	N(a)	-	-	-	-	-	0.990	1.060
	N(b)	-	-	-	-	-	31.820	34.070
	N(c)	-	-	-	-	-	2.340	3.070
<b>Total (Budget Sector)</b>		<b>2.718</b>	<b>3.081</b>	<b>2.661</b>	<b>1.972</b>	<b>2.134</b>	<b>38.953</b>	<b>42.314</b>
B. Commonwealth Non-Budget sector								
Department of Housing and Construction								
. Contribution to								
- Australian Housing Research Council	N(c)	-	0.038	0.067	0.038	0.059	0.038	0.059
- Australian Uniform Building Regulations Coordinating Council	N(c)	-	-	-	-	0.060	-	0.060
Snowy Mountains Engineering Corporation (SMEC) BE	N(a)	-	-	-	-	-	20.080	20.000
	N(b)	0.073	0.042	0.014	-	-	32.922	38.000
	N(c)	-	-	-	-	-	1.194	1.300
<b>Total (Non-Budget Sector)</b>		<b>0.073</b>	<b>0.080</b>	<b>0.081</b>	<b>0.038</b>	<b>0.119</b>	<b>54.234</b>	<b>59.419</b>
<b>Total (Direct Commonwealth funding, including BE)</b>		<b>2.791</b>	<b>3.161</b>	<b>2.742</b>	<b>2.010</b>	<b>2.253</b>	<b>93.187</b>	<b>101.733</b>
<b>Total (Direct Commonwealth funding, excluding BE)</b>		<b>2.718</b>	<b>3.119</b>	<b>2.728</b>	<b>2.010</b>	<b>2.253</b>	<b>38.991</b>	<b>42.373</b>

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
C. Expenditure from other sources								
Department of Housing and Construction								
. Experimental Building Station	N(a)	-	-	0.028	0.035	0.029	0.035	0.029
	N(b)	0.141	0.157	0.147	0.255	0.221	0.255	0.221
. Contribution to								
- Australian Housing Research Council	N(c)	0.005	0.048	0.121	0.092	0.140	0.092	0.140
- Australian Uniform Building Regulations Coordinating Council	N(c)	-	-	0.031	0.039	0.050	0.039	0.050
Total (Other sources)		0.146	0.205	0.327	0.421	0.440	0.421	0.440
Total (A+B+C)		2.937	3.366	3.069	2.431	2.693	93.608	102.173

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

BE wholly Commonwealth-owned business enterprise.

#### Department of Housing and Construction

The Department has responsibility for the planning, execution and maintenance of Commonwealth Government works. In support of these operations, the Department carries out applied research and laboratory testing and provides a comprehensive range of technical services. In many cases these services also directly or indirectly benefit the needs of industry, and the Department contributes to the development of national standards, building regulations and other public interest activities requiring research and other technical services.

#### . Central Investigation and Research Laboratory (CIRL)

CIRL conducts applied research directly concerned with design and construction of departmental projects. Topics include natural and processed materials, building products, processes and systems and operating and environmental conditions.

. Australian Uniform Building Regulations Coordinating Council (AUBRCC)

AUBRCC is responsible for the further development of the Australian Model Uniform Building Code. Several research activities are currently being funded by the Council. These are:

- . computerisation of the Code;
- . development of requirements for the provision of access to buildings by the disabled;
- . a review of the impact of regulations on energy conservation in buildings;
- . economic assessment of building regulation;
- . research into size of habitable rooms; and
- . information statement on accreditation.

. Australian Housing Research Council (AHRC)

The AHRC comprises Commonwealth, State and Territory Ministers with responsibility for public housing authorities. Its principle objectives are to provide for research into economic and social problems in housing, dissemination of research results, promotion of collaborative research and the coordination of research, and where necessary to complement research conducted elsewhere.

The 1982-83 research program includes continuing studies of the social and economic effects on increasing rents on public housing, the housing needs of single parents, who misses out on public housing and why, and the development of community estates with particular reference to single mothers. New projects commenced in 1982-83 include studies of mobile granny flats as supplementary housing modules, and housing alterations and additions.

. Experimental Building Station (EBS)

The EBS conducts applied research into the design and construction of buildings and related engineering works, including the effective and efficient use of building components and materials, structural features and behaviour of buildings, fire hazards in buildings and fire protection of buildings, functional efficiency of all buildings and codification of research information for use by the building industry through standards and building regulations.

The Government is reviewing the decision of the former Government relating to the disposal of the EBS.

. Central Office and Regional Offices

In addition to specific purpose establishments (EBS and CIRL), work is also conducted within Central Office and regional offices by specialist engineering and architectural branches on the development of design techniques and methods of analysis, the development of technical standards and the evaluation of components and systems. The work is more concerned with new and improved technology than with specific projects.

Snowy Mountains Engineering Corporation

The Snowy Mountains Engineering Corporation is a Commonwealth Government Authority providing specialist engineering consulting services on a commercial basis to government and private organisations both within Australia and overseas.

The fields of practice, stemming from the Corporation's origins in water and power engineering, cover many supportive activities which include civil, electrical and mechanical engineering, road engineering, hydrology and hydraulics, geology and soil mechanics, surveying, estimating, contract supervision, irrigation, agriculture, economics, training, equipment procurement and project management.

While continuing to undertake significant work in Australia, the Corporation has become increasingly committed to assisting with engineering development programs in developing countries and by far the larger part of the work is now performed overseas.

In support of the provision of the above types of consulting services, SMEC operates a large hydraulics laboratory at which design data are developed for dams, spillways, river systems, flood studies and other works involving hydrology and hydraulics.

IMMIGRATION AND ETHNIC AFFAIRS

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Immigration and Ethnic Affairs								
Studies and Research	S(b)	0.102	0.121	0.164	0.117	0.091	0.721	0.797
	S(c)	0.200	0.333	0.364	0.270	0.339	0.288	0.452
Australian Institute of Multicultural Affairs								
	S(a)	-	-	-	-	-	0.137	1.545
	S(b)	-	-	-	-	-	1.549	1.836
	S(c)	-	-	-	-	-	0.440	0.430
Total (Budget Sector)		0.303	0.453	0.527	0.387	0.430	3.135	5.060
B. Commonwealth Non-budget sector								
Australian Institute of Multicultural Affairs								
	S(a)	-	-	-	-	-	0.001	0.004
	S(b)	-	-	-	-	-	0.008	0.004
Total (Non-Budget Sector)							0.009	0.008
Total (Direct Commonwealth funding)		0.303	0.453	0.527	0.387	0.430	3.144	5.068
C. Expenditure from other sources								
Department of Immigration and Ethnic Affairs								
	S(b)	-	-	-	0.001	-	0.001	-
	S(c)	-	-	0.007	0.011	0.049	0.013	0.053
Total (Other sources)		-	-	0.008	0.011	0.049	0.013	0.053
Total (A+B+C)		0.303	0.453	0.534	0.398	0.479	3.157	5.121
N	Natural sciences and engineering			S	Social sciences and humanities			
(a)	Intramural capital expenditure			(b)	Intramural current expenditure			
(c)	Extramural expenditure							

### Department of Immigration and Ethnic Affairs

The Co-ordination and Research Division conducts policy research into immigration issues and investigatory research into migrant settlement. The Division's welfare area is involved in research projects dealing with particular groups of migrants. Examples of research in this area are studies of settlement experience of general eligibility migrants, recognition of Indochinese refugee qualifications, and the study of Greek and Arabic ethnic press in Sydney.

The Department has also entered into a joint project with the Committee on the Economic Development of Australia (CEDA) to study the economic impact of migration. The project is being undertaken over a four year period from 1981-82 to 1984-85. Recently a conference dealing with the 'economics of immigration' was held to gain a better understanding of the impact of immigration upon the economy and the housing market. A project is also currently underway to assess the effect of immigration on urban growth and housing.

Work is also in progress to establish the English language learning needs of migrants.

### Australian Institute of Multicultural Affairs

The Australian Institute of Multicultural Affairs is a statutory corporation, located in Melbourne, with its prime activities being advice to government, conducting and commissioning research into multiculturalism and related issues, community education in multiculturalism, and establishing a repository of literature and other material relating to the diverse cultures of members of the Australian community. Most of the Institute's current work has been geared to the conduct and commissioning of research.



INDUSTRY AND COMMERCE

(\$ million)		R&D				Projected 82-83	S&T (including R&D)		
		78-79	79-80	80-81	81-82		81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure									
Department of Industry and Commerce									
. Bureau of Industry									
	Economics	S(b)	0.561	0.722	1.047	1.454	1.612	1.454	1.612
		S(c)	-	-	0.013	0.093	0.120	0.107	0.120
. Grant-in-aid to									
	Australian Institute of Urban Studies	S(c)	-	-	-	-	-	0.035	0.035
. Ship Design									
		N(a)	0.002	0.001	-	-	-	-	-
		N(b)	0.044	0.015	-	-	-	-	-
Industries Assistance Commission									
. IMPACT Project									
		S(a)	-	-	0.001	-	-	-	-
		S(b)	0.180	0.156	0.209	0.257	0.109	0.257	0.109
		S(c)	-	-	-	-	0.082	-	0.082
Albury Wodonga									
	Development Corporation	N(a)	0.005	0.029	0.009	0.002	0.001	0.002	0.002
		N(b)	0.022	0.015	0.016	0.028	0.029	0.043	0.043
Total (Budget Sector)			0.813	0.938	1.294	1.833	1.953	1.898	2.003
B. Commonwealth Non-budget sector									
Albury Wodonga									
	Development Corporation	N(a)	0.005	0.030	0.010	0.002	0.001	0.003	0.002
		N(b)	0.021	0.015	0.018	0.030	0.035	0.043	0.051
		N(c)	0.094	0.081	0.017	0.015	0.042	0.015	0.042
Total (Non-Budget Sector)			0.120	0.126	0.045	0.047	0.078	0.061	0.095
Total (Direct Commonwealth funding)			0.932	1.064	1.339	1.880	2.031	1.959	2.098

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
C. Expenditure from other sources								
Albury Wodonga Development Corporation	N(a)	0.009	0.074	0.022	0.004	0.002	0.005	0.004
	N(b)	0.042	0.037	0.037	0.056	0.058	0.085	0.086
Total (Other sources)		0.051	0.111	0.059	0.060	0.060	0.090	0.090
Total (A+B+C)		0.984	1.175	1.398	1.940	2.091	2.049	2.188

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

#### Department of Industry and Commerce

##### . Bureau of Industry Economics (BIE)

The BIE is a major centre for research into the manufacturing and commerce sectors. The major objectives of the Bureau are to:

- carry out research work needed to assist the Government in the formation of industrial policy;
- assist the Industries Assistance Commission and other government bodies by making submissions on the results of its research;
- attract a high standard of professional staff and publish its research findings; and
- complement the work of other research agencies and cooperate with universities and colleges in developing research programs.

Areas for research are selected after consideration of the importance of the issues involved and consultation with BIE Council of Advice. Investigations into several areas are underway or have recently concluded. These include:

- structural adjustment of selected industries;
- regional consequences of industrial development;
- economic significance of tourism;
- corporate taxation;
- Australian direct investment abroad;

- economic effects of shorter working hours;
- investment behaviour in manufacturing;
- economic effect of technological developments in financial markets;
- economic analysis of the retail pharmacy industry;
- variation in productivity performance of industry; and
- evolving economic relations between Australia and North-east Asia.

. Ship Design Group

As a result of the Review of Commonwealth Functions, the Ship Design Group ceased operations during October 1981. This Group's role was to conduct scientific and technological programs in respect of the specialised areas of ship design and marine technology.

Industries Assistance Commission (IAC)

Inter alia, the IAC is the coordinating agency for the IMPACT Project. IMPACT is a research project to improve policy analysis of inter-related economic and social issues, particularly in the areas of trade, industry development and manpower. The Project is a cooperative effort involving a number of Commonwealth agencies (Industries Assistance Commission, Bureau of Agricultural Economics, Bureau of Industry Economics, Bureau of Labour Market Research, Department of Home Affairs and Environment and Department of Immigration and Ethnic Affairs) in association with the University of Melbourne and La Trobe University.

The Project involves the further development and enhancement of analytical frameworks, consisting of economic-demographic models and associated data bases and computing systems, which enable the implications of both policy-induced and naturally occurring changes to be studied systematically in an economy-wide perspective.

Albury-Wodonga Development Corporation

The development of Albury-Wodonga is a joint venture of the Commonwealth, New South Wales and Victorian Governments. In 1973 and 1974, legislation was enacted by the three Parliaments to establish the Albury-Wodonga Development Corporation (Commonwealth), the Albury-Wodonga (Victoria) Corporation, and the Albury-Wodonga (New South Wales) Corporation.

The major activities of the corporations have been land acquisition, development of residential, industrial and commercial land and provision of rental housing and factory accommodation. The Commonwealth has also undertaken a research program into the effects of the increased urbanisation of the Albury-Wodonga area on the flora, fauna and chemical quantity of the water in River Murray. A total of \$122 000 was spent on this research in 1981-82 and \$126 000 has been allocated for 1982-83.

PRIMARY INDUSTRY

(\$ million)	R&D					S&T (including R&D)	
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure							
Department of Primary Industry							
. Administrative support for S&T, not elsewhere included							
- Commonwealth Council for Rural Research and Extension	N(b)	-	-	-	-	0.003	-
- Library Services	N(b)	-	-	-	-	0.303	0.308
- Ministerial Councils	N(b)	-	-	-	-	0.080	0.089
- Statutory Research Funds and Special Research Grants	N(b)	-	-	-	-	0.527	0.580
. Australian Agricultural Council Sponsored Projects	N(c)	-	0.053	0.055	0.058	0.209	0.167
. Australian Wine Research Institute Grant	N(c)	0.100	0.099	0.148	0.165	0.255	0.255
. Barley Improvement Schemes (S.A., Vic., W.A.)	N(c)	0.142	0.145	0.148	-	-	-
. Bureau of Agricultural Economics	S(b)	0.879	0.843	0.853	1.056	1.104	6.600
. Bureau of Animal Health	N(a)	-	-	-	0.029	0.002	0.586
	N(b)	0.156	0.184	0.192	0.276	0.400	2.072
. Commonwealth Extension Services Grant	<sup>S</sup> N(c)	3.763	1.884	1.382	-	-	-
	<sup>S</sup> S(c)	.	.	0.303	-	-	-
. Commonwealth Special Research Grant	N(c)	0.217	0.237	0.248	0.279	0.238	0.279
. Export Inspection Service (Commonwealth funded component)	N(b)	-	-	-	-	-	36.216
	N(b)	-	-	-	-	-	1.140
. Fisheries Division	N(c)	-	-	-	-	-	0.674
	N(c)	-	-	-	-	-	1.000
. Fishery Management (Torres Strait)	N(c)	-	0.073	0.174	0.175	0.275	0.175

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure (continued)								
. Forestry Research Grants	N(c)	0.041	0.031	0.033	0.022	0.032	0.022	0.032
. Plague Locust Commission	N(a)	0.005	0.011	0.011	0.015	0.018	0.025	0.030
	N(b)	0.041	0.043	0.052	0.051	0.056	0.196	0.214
Sub-total		5.343	3.601	3.599	2.127	2.455	49.270	53.965
. Statutory Rural Industry Research Schemes *								
- Barley	N(c)	-	-	-	0.276	0.325	0.294	0.350
- Chicken Meat	N(c)	0.083	0.089	0.104	0.102	0.106	0.200	0.248
- Dairying	N(c)	0.278	0.236	0.305	0.272	0.263	0.507	0.569
- Dried Fruit	N(c)	0.033	0.054	0.066	0.049	0.113	0.055	0.120
	S(c)	.	.	0.007	0.005	0.013	0.005	0.013
- Fishing Industry Research **	N(c)	0.472	0.582	0.741	0.863	1.594	1.066	2.135
- Fishing Industry Development #	S(b)	-	-	-	-	-	0.237	0.100
	N(c)	-	-	-	-	-	-	0.200
- Honey	N(c)	-	-	-	0.005	0.011	0.022	0.050
- Meat	N(c)	2.676	2.916	3.196	3.405	4.091	3.653	4.389
	S(c)	.	.	0.278	0.290	0.348	0.301	0.361
- Oilseeds	N(c)	0.062	0.217	0.275	0.298	0.322	0.318	0.352
- Pig Industry	N(c)	0.141	0.146	0.128	0.152	0.186	0.325	0.441
	S(c)	.	.	0.010	0.007	-	0.007	-
- Poultry	N(c)	0.065	0.045	0.067	0.066	0.066	0.139	0.150
- Tobacco	N(c)	0.294	0.323	0.275	0.197	0.420	0.281	0.600
- Wheat	N(c)	1.490	2.143	2.708	2.845	3.201	3.095	3.600
- Wine	N(c)	0.054	0.082	0.088	0.088	0.088	0.088	0.088
- Wool	N(c)	3.100	5.000	6.611	7.616	8.785	7.896	9.140
Sub-total (Commonwealth derived expenditure on rural research schemes)		8.747	11.834	14.857	16.535	19.933	18.489	22.906
Total (Direct Commonwealth funding)		14.091	15.435	18.457	18.662	22.388	67.759	76.871

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
B. Expenditure from other sources								
Department of Primary Industry								
. Bureau of Agricultural								
Economics ##	S( <sup>a</sup> <sub>b</sub> )	0.111	0.094	0.094	0.096	0.112	0.602	0.698
. Bureau of Animal Health	N(c)	-	0.010	0.022	0.017	0.020	20.244	22.348
. Export Inspection Service (industry-contributed funds)	N(b)	-	-	-	-	-	20.436	23.907
. Plague Locust Commission (State-contributed funds)	N(a)	0.005	0.011	0.011	0.015	0.018	0.025	0.030
	N(b)	0.041	0.043	0.052	0.051	0.056	0.196	0.214
Sub-total		0.156	0.157	0.179	0.179	0.205	41.503	47.197
. Statutory Rural Industry								
Research Schemes *								
- Barley	N(c)	-	-	-	0.222	0.402	0.237	0.434
- Chicken Meat	N(c)	0.088	0.096	0.082	0.109	0.104	0.215	0.243
- Dairying	N(c)	0.278	0.318	0.274	0.309	0.329	0.575	0.712
- Dried Fruit	N(c)	0.045	0.053	0.059	0.049	0.101	0.055	0.110
	S(c)	.	.	0.007	0.005	0.011	0.005	0.011
- Fishing Industry Development	N(c)	-	-	-	-	-	0.188	0.250
- Honey	N(c)	-	-	-	0.007	0.012	0.032	0.052
- Meat	N(c)	2.446	2.815	2.870	3.740	5.115	4.012	5.487
	S(c)	.	.	0.250	0.318	0.435	0.330	0.452
- Oilseeds	N(c)	0.071	0.208	0.313	0.275	0.322	0.294	0.352
- Pig Industry	N(c)	0.135	0.129	0.169	0.154	0.169	0.329	0.400
	S(c)	.	.	0.014	0.007	-	0.007	-
- Poultry	N(c)	0.051	0.063	0.050	0.088	0.101	0.187	0.229
- Tobacco	N(c)	0.467	0.368	0.565	0.596	0.468	0.851	0.668

	(\$ million)	R&D					S&T (including R&D)	
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
- Wheat	N(c)	1.647	2.343	2.898	2.443	2.432	2.658	2.735
- Wool	N(c)	8.568	7.383	5.578	6.664	8.785	6.909	9.140
Sub-total (Industry-derived expenditure on rural research schemes)		13.796	13.777	13.129	14.988	18.786	16.886	21.274
Total (Other sources)		13.951	13.934	13.308	15.167	18.991	58.388	68.471
Total (A+B) ##		28.042	29.369	31.765	33.829	41.379	126.148	145.342
Less intra-Ministry transfers		(0.111)	(0.094)	(0.094)	(0.096)	(0.112)	(0.602)	(0.698)
Total		27.931	29.275	31.671	33.733	41.267	125.546	144.644

N Natural sciences and engineering      S Social sciences and humanities

<sup>SN</sup> Figures for 1978-79 and 1979-80 include a significant component of social sciences and humanities

<sup>SN</sup> Includes small component of social sciences and humanities for 1978-79 and 1979-80

(a) Intramural capital expenditure      (b) Intramural current expenditure

(<sup>a</sup><sub>b</sub>) Intramural expenditure (capital and current)      (c) Extramural expenditure

\* The convention adopted for the reporting of expenditure to and from Research Trust Funds is outlined in Appendix 5. See the table in the body of the text for industry contributions to the Trust Funds.

\*\* Amounts indicate payments for research made from the Trust Fund. Commonwealth contributions to the Trust Fund were \$746 000 (1978-79), \$850 000 (1979-80) and \$820 000 (1980-81).

# Amounts indicate payments for research made from the Trust Fund, Commonwealth contributions to the Trust Fund were \$400 000 in each year.

## The intramural expenditure of the Bureau of Agricultural Economics shown in B is funded by grants from the Meat and Wool Industry Research Schemes. The totals shown for expenditure from other sources are thus overstated. The Total (A+B) is adjusted to avoid double-counting for the Ministry as a whole.

#### Department of Primary Industry

A major role of the Department is to provide advice to the Minister for Primary Industry on rural industry policy issues and to implement and administer legislation and government programs for rural industries and their produce. These policy issues by necessity frequently involve a recognition and consideration of scientific and technical factors. The administration of research funds are important functions of the Department.

The Bureau of Agricultural Economics (BAE) and the Australian Bureau of Animal Health (ABAH), operate to a certain extent outside the mainstream of the Department's activities, but are responsible to the Secretary.

. Australian Agricultural Council-Sponsored Projects

The Department of Primary Industry provides funds for the Commonwealth contribution to Commonwealth/State projects recommended by the Australian Agricultural Council. Approved projects for 1982-83 include fresh fruit disinfection, Fruit Variety Foundation, Commonwealth Advisory Laboratory and pig carcass classification scheme.

. Australian Wine Research Institute

In 1979 the Commonwealth agreed in principle to move to a dollar for dollar matching arrangement with the then Australian Wine Board to finance the Australian Wine Research Institute. The move to 1:1 matching would be achieved over a five year period commencing in 1978-79. However this was achieved in 1979-80, bringing arrangements for financing wine industry research into line with those applying to other rural industries.

The proposed Budget of the AWRI for 1982-83 envisages an industry contribution of \$365 600. The matching Commonwealth contribution comprises \$22 600 from CSIRO, \$88 000 from interest earned from the Wine Research Trust Fund and \$255 000 from DPI appropriations. This represents an increase of \$90 125 in the level of DPI appropriation but is consistent with maintaining \$:\$ financing in 1982-83.

. Barley Improvement Schemes

These schemes were completed in 1980-81. The Commonwealth contributed to the Barley Improvement Plan to match industry contributions. The industry contributions were made by the Australian Barley Board on behalf of growers in South Australia, Victoria and Western Australia and by brewers and maltsters in all States. The Commonwealth now provides funds for the Barley industry through the Barley Research Trust Account.

. Bureau of Agricultural Economics (BAE)

The BAE undertakes a continuing program of investigation and reporting on the economic aspects of agriculture in the broadest sense. It also aims to meet the wider needs of the Australian community as a whole for economic research and reporting on agriculture and the inter-relationships between agriculture and the general economy. The BAE's responsibilities were enlarged in March 1982 by the addition to its charter of economic analysis and research on the fishing industries.

The BAE's program has four major components:

- monitoring and forecasting the economic situation on Australian farms and evaluating the farm-level consequences of current and prospective changes in economic conditions and policies;
- evaluating present and future market prices and prospects for rural commodities in domestic and world markets;
- conducting in-depth studies into the economics of agricultural production, marketing, prices and agricultural trade opportunities; and
- servicing departmental, ministerial, administrative and policy needs.



. Australian Bureau of Animal Health (ABAH)

The ABAH is responsible for the coordination of national animal health programs for endemic and exotic animal disease. The BAH undertakes research and investigation into the epidemiology of animal disease. A major task at present is the Brucellosis and Tuberculosis Eradication Campaign. The ABAH also provides the secretariat for national committees dealing with animal health and production and international liaison on technical animal health and production issues.

. Commonwealth Extension Services Grant

The objectives of the grant were to encourage and facilitate continuing increase in the efficiency of Australian agriculture and the adjustment of agriculture to change. The grant was discontinued from 1981-82 with the States being compensated for the amount involved through Federal/State tax sharing arrangements.

. Commonwealth Special Research Grant

The purpose of the Grant is to provide Commonwealth Government contributions to rural research outside the scope of other specific Commonwealth rural research funding arrangements. This includes support for research associated with industries not covered by specific statutory and non-statutory research schemes. In these instances grant funds are normally matched on a dollar for dollar basis by the industry concerned. Other areas which are eligible for grant support include research not specifically related to a single industry (multi-industry research) and development of new or infant industries.

Some of the larger allocations for the grant in 1982-83 are for the development of an integrated pest management program for seed lucerne, investigation of the toxicity of wild mushrooms in Australia and the development of harvest mechanisation and intensive production systems in citrus.

. Export Inspection Service

The Export Inspection Service was established within the Department on 16 March 1982. The Service is responsible for all Commonwealth export inspection activities.

. Fisheries Division

The functions of the Division include:

- management of Australian fisheries in cooperation with the States, including:
  - . interpretation of biological data on available species, sustainable catch rates and environmental aspects;
  - . application of the most efficient and effective fishing gear and technology;
  - . interpretation of economic research and analysis, involving costs and earnings (profitability) surveys and ad hoc investigations;
  - . interpretation of available economic data and the evaluation of the likely impact of fisheries management proposals; and
  - . procurement of accurate and timely catch, marketing and production statistics and information;
- develop legislation affecting the management of fisheries;

- participate in the education/training of Commonwealth and State fisheries' officers involved in activity under Commonwealth delegation. In recent years, the education function has been more widely interpreted to include the training of professional fishermen, for example in the use of sonar equipment;
- encourage development of the Australian fishing industry by the provision of grants from the Fishing Industry Research Trust Account and the Fisheries Development Trust Account. Both these trust accounts are administered by the Fisheries Division;
- provide secretariat facilities to committees of the Standing Committee on Fisheries;
- participate in negotiations within international organisations or with foreign governments on fisheries matters and in the formulation of agreements with foreign governments or corporations;
- disseminate information and advice to the industry by the production of monthly Australian Fisheries and other publications; and
- where possible and consistent with Australia's international aid program, provide assistance to developing countries in relation to fisheries matters.

. Management of Torres Strait Fisheries

The Torres Strait Treaty requires cooperative management of commercial fisheries in the Torres Strait Area and allocation between Australia and Papua New Guinea of catches taken in the Protected Zone.

. Commonwealth Forestry Post-Graduate Research Awards

Each year the Department of Primary Industry makes available awards for the degree of Master and/or Doctor of Philosophy at an Australian university. Fields of study are nominated by the Australian Forestry Council and cover topics of current interest, calling for urgent investigation, mainly for projects not being undertaken by the various State forest services.

. Australian Plague Locust Commission

The Commission is financed by the States of New South Wales, Victoria, South Australia and Queensland with a matching contribution from the Commonwealth. The Commission engages in operations to combat outbreaks or potential outbreaks of the Australian plague locust and performs research related to this role.

Operations include the collection and collation of data on locust populations, the forecasting of significant changes and developments in locust populations, control operations, the development of improved control measures, the monitoring of all actions and the effects of control operations and the provision of advice to individual States on locust problems.

. Rural Industry Research Trust Funds

The Rural Industry Research Trust Funds differ somewhat in regard to their purposes. The general objective of the Funds, however, is to provide money for research and dissemination of information, relating to production improvement, in a broad sense, within the industry. Commonwealth support is in most cases on a 1:1 matching of expenditure of money raised from producers in the form of a levy on their produce.

The Funds promote a degree of self-help through industry involvement in selecting and financing industry specific rural research. Their impact on research priorities is thought to be greater than the level of funding would suggest due to their 'pump-priming' or 'catalytic' effect.

Industry Contributions to Primary Industry Trust Accounts

(\$ million)	78-79	79-80	80-81	81-82	Projected 82-83
Barley	-	-	0.311	0.472	0.300
Chicken Meat	0.189	0.226	0.235	0.250	0.232
Dairying	0.435	0.459	0.422	0.416	0.515
Dried Fruit	0.089	0.090	0.119	0.082	0.099
Honey	-	-	0.018	0.050	0.050
Meat	3.198	3.178	3.297	3.073	4.035
Oilseeds	0.349	0.412	0.275	0.325	0.310
Pig Industry	0.290	0.288	0.389	0.420	0.468
Poultry*	0.138	0.096	0.142	0.146	0.150
Tobacco	0.393	0.389	0.378	0.348	0.600
Wheat	3.466	3.086	2.012	3.060	1.970
Wool	1.932	10.239	7.538	8.750	9.122
<b>Totals</b>	<b>10.479</b>	<b>18.463</b>	<b>15.136</b>	<b>17.392</b>	<b>17.851</b>

\* Estimated proportion of levy attributable to research purposes of Fund.

PRIME MINISTER AND CABINET

(\$ million)	R&D					S&T (including R&D)	
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure							
Auditor-General's Office	S(b)	-	-	-	-	0.137	0.168
Australian Science and Technology Council (ASTECC)	sN(b)	-	-	-	-	0.710	0.807
	sN(c)	-	-	-	-	0.022	0.040
Office of Public Service Board							
. Manpower planning	S(a)	-	-	-	-	-	0.007
	S(b)	-	-	-	-	0.345	0.345
. Postgraduate Awards	nS(c)	0.045	0.044	0.060	0.046	0.035	0.105
Total (Direct Commonwealth funding)		0.045	0.044	0.060	0.046	0.035	1.376
						1.376	1.472

N Natural sciences and engineering      S Social sciences and humanities

sN Includes small component of social sciences and humanities

nS Includes significant proportion of natural sciences and engineering. Most R&D expenditure is in the natural sciences and engineering.

(a) Intramural capital expenditure      (b) Intramural current expenditure

(c) Extramural expenditure

Auditor-General's Office

Audit research activity is conducted by full-time staff of the Office and is directed to:

- developing and implementing new audit methodologies and techniques including those related to ADP applications and efficiency/cost effectiveness audits; and
- reviewing developments in accounting and audit technology from all sources and where appropriate presenting these developments to other areas of the Office.

Australian Science and Technology Council (ASTECC)

Science and technology play an important part in Australia's development, and are basic to Australia's capacity to meet challenges in areas such as energy and resource availability, industrial productivity and competitiveness, and management of the environment.

The Government has recognised that high-level, high-quality independent science and technology advisory machinery is necessary if correct decisions are to be made in formulating objectives, establishing the most effective and appropriate institutional means for achieving them, and assigning priorities on a rational and considered basis. The Government established the Australian Science and Technology Council (ASTEC) in 1977 with these considerations in mind. ASTEC became a statutory body in 1978.

The functions of ASTEC are to advise the Government on science and technology, including:

- the advancement of scientific knowledge and the development and application of science and technology in relation to the national well being;
- the adequacy, effectiveness and overall balance of the national effort in science and technology in government, industry, education and other sectors of the community;
- the assessment of gaps and overlaps in science and technology in Australia;
- the identification and support of new ideas of science and technology likely to be of national importance;
- the practical development and application of research discoveries and the fostering of technological innovation in industry; and
- the means of improving efficiency in the use of resources related to science and technology.

The Council has a strategic role in assisting the Government to encourage Australian science and technology to meet the nation's needs and objectives. It has no executive responsibilities, but is able to advise on operational arrangements, and draws on existing departments and agencies for the expertise, knowledge and assistance necessary to enable its functions to be discharged effectively.

In 1981-82 consultants were employed to gather information on the attitudes of managers, employees and the general public towards robots as part of a study by the Technological Change Committee of ASTEC. In 1982-83 projects are directed towards evaluating the Bureau of Meteorology capital equipment program, assessing the effects of technological change on employment opportunities for migrants, and examining the likely growth of Videotex systems in Australia and their economic and social impacts.

#### Office of the Public Service Board

##### . Manpower Planning

Manpower planning is an important aid to personnel management in the Service, particularly in times of tight control such as the present.

The Planning, Research and Information Branch (PR&I) of the Public Service Board maintains records of Public Service staff. These records are largely kept on computer-based files, the major one being the Continuous Record of Personnel. Information from these records is made available to the Board and departments for planning purposes. This information is used to provide estimates of future recruitment and development requirements, using techniques such as computerised modelling and analysis.

In addition, the Branch promotes the development and implementation of appropriate planning systems within the Service through training activities and the provision of a consultancy service on methods and techniques.

The allocation for capital expenditure in the 1982-83 year is for the purchase of a graphics plotter to supplement other computer resources. The decline in current expenditure for 1982-83 reflects a decrease in training activities.

. Postgraduate Awards

Each year the Board makes awards for postgraduate study, usually involving research towards a PhD or Masters degree. There are two schemes: one for study in any appropriate field; and one specifically for management studies. In 1981-82 twenty-five awards were granted in the general category (sixteen being taken up at overseas institutions and nine in Australia) and three under the management studies scheme (one being taken up overseas and two in Australia).

RESOURCES AND ENERGY

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Resources and Energy								
. Energy Research, Development and Demonstration Program (Administration)	N(a)	-	-	-	-	-	0.006	-
	N(b)	-	-	-	-	-	1.464	1.266
. Energy Research Trust Account	N(c)	3.540	4.647	6.282	8.917	-*	10.035	-*
	S(c)	0.094	0.065	0.069	0.351	-*	0.372	-*
. Australia/FRG Coal Liquefaction Study	N(c)	-	0.109	0.323	0.008	-	0.008	-
. National Water Programs	N(b)	-	-	-	-	-	0.127	0.367
	N(c)	0.368	0.658	0.896	1.412	1.599	11.467	12.119
	S(c)	0.022	0.023	0.026	-	-	0.062	0.150
. Bureau of Mineral Resources, Geology and Geophysics	N(a)	0.303	0.325	0.453	0.573	1.850	0.877	2.026
	N(b)	9.407	7.845	9.089	13.056	14.275	18.712	19.225
	N(c)	0.200	0.200	0.010	0.010	0.010	0.010	0.010
. Division of National Mapping	<sup>S</sup> N(a)	-	-	-	-	-	0.509	0.759
	<sup>S</sup> N(b)	-	-	-	-	-	10.231	10.897
	<sup>S</sup> N(c)	-	-	-	-	-	0.329	0.488
. Australian Safeguards Office	N(a)	0.005	0.010	0.004	0.004	-	0.004	-
	N(b)	0.004	0.004	0.004	0.005	0.025	0.044	0.064
	N(c)	-	-	-	-	-	-	0.001
Australian Atomic Energy Commission	N(a)	0.917	1.012	0.878	1.632	3.143	2.504	4.642
	N(b)	13.687	15.720	19.113	24.021	23.289	38.324	36.709
	N(c)	0.582	0.649	0.625	0.808	0.757	0.958	1.905
Total (Budget sector)		29.129	31.269	37.771	50.766	44.486	95.073	89.416
Less AAEC Superannuation employer contribution**		-	-	-	(2.154)	(3.437)	(2.441)	(3.849)
Total (less Superannuation adjustment)		29.129	31.269	37.771	48.612	41.049	92.632	85.567

(\$ million)	R&D					S&T (including R&D)	
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
B. Commonwealth Non-Budget sector							
Department of Resources and Energy							
. Energy Research Trust							
Account	N(c)	-	-	-	10.780	-	12.480
	S(c)	-	-	-	0.390	-	0.420
<hr/>							
Total (Non-Budget sector)		-	-	-	11.170	-	12.900
<hr/>							
Total (Direct Commonwealth funding)**		29.129	31.269	37.771	48.612	52.219	92.632 98.467
<hr/>							
C. Expenditure from other sources							
Department of Resources and Energy							
. Australian Safeguards							
Office	N(c)	-	-	-	0.003	-	0.003
. CHOGRM Energy Projects	N(c)	-	-	-	-	0.298	0.280
. Coal Research Trust							
Account	N(c)	2.869	5.471	3.793	4.766	4.250	5.156 4.600
. Australia/FRG Coal							
Liquefaction Study	N(c)	0.007	0.725	0.625	0.026	-	0.026 -
. Bureau of Mineral							
Resources, Geology							
and Geophysics	N(a)	-	0.004	0.029	0.006	0.014	0.006 0.014
	N(b)	-	0.092	0.349	0.214	0.112	0.214 0.112
Australian Atomic Energy							
Commission	N(a)	-	-	0.024	0.060	0.109	0.060 0.109
	N(b)	0.003	0.291	0.522	0.821	0.794	0.821 0.794
<hr/>							
Total (Other sources)		2.879	6.583	5.339	5.893	5.280	6.581 5.910
<hr/>							
Total (A+B+C)**		32.009	37.852	43.111	56.659	60.939	99.213 104.377
Less intra- Ministry transfers*		(0.003)	(0.387)	(0.705)	(0.897)	(0.763)	(0.897) (0.763)
Total**		32.006	38.465	42.406	53.608	56.739	98.316 103.614

N Natural sciences and engineering      S Social sciences and humanities

<sup>SN</sup> Includes small component of social sciences and humanities



- (a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

- \* Because of a build-up of funds appropriated to the Trust Account in previous years it was not necessary to appropriate funds in 1982-83. Expenditure from the Fund in this year thus appears in the Non-Budget sector.
- \*\* A change in the method of funding employees' superannuation has led to an increase in expenditure without any corresponding change in activity or function. As the principal perspective of the Science and Technology Statement is on levels of support for S&T activity rather than expenditure per se, the totals are adjusted for these amounts.
- # Most intramural expenditure of the BMR and the AAEC shown in B is funded by grants under the National Energy Research Development and Demonstration Program, the Total (A+B) is adjusted to avoid double counting for the Ministry as a whole.

#### Department of Resources and Energy

##### . National Energy Research, Development and Demonstration Program

The National Energy Research, Development and Demonstration Council (NERDDC) was established in 1978 to advise the Minister for Resources and Energy on the development and coordination of a national energy R,D&D program and to recommend support for individual research, development and demonstration projects.

In developing its recommendations for support grants, NERDDC takes into account the existing level of research activity in Australia and identifies those areas where additional support is required to bring Australia's overall energy R,D&D effort into line with established priorities.

Applications for support grants are invited annually by NERDDC. The Council recommends the commissioning of projects where applications are not received in priority technology areas. Since 1978, grants totalling about \$97m have been approved on the advice of the Council.

The Energy Research and Development Division in the National Energy Office of the Department of Resources and Energy administers the Program and also provides advice to the Minister on energy R&D policy. The Division also provides secretariat and technical support for NERDDC and its seven technical standing committees.

##### . Australian/Federal Republic of Germany Joint Coal to Oil Study

A joint feasibility study on the conversion of Australian coals into liquid fuels was conducted by Australia and the Federal Republic of Germany. Arrangements for the conduct of the study were agreed to and the instrument was signed on the 10 October 1978. The study examined the feasibility of establishing 3 million tonnes a year liquid fuel plants at sites in New South Wales, Victoria and Queensland. The relevant State Governments contributed three quarters of the cost of Australia's share of the study.

Work on the study started on 1 April 1979 and the final report was presented to the Commonwealth and the three participating States in November 1981.

##### . National Water Programs

The Water and Development Division of the Department of Resources and Energy administers research grants and activities to support programs and policies concerned with the planning, development and management of Australia's water resources.

Activities include:

- National Water Resources Program
- National Water Resources Assessment Program
- National Water Research Program
- Perspective on Water Resources to the Year 2000 Study.

Under the National Water Resources Program approximately \$30m has been provided to the States each year over a five-year period to undertake works of high priority. Apart from major construction works, a number of studies have been undertaken as part of the program. These include studies into River Murray salinity and drainage control, dryland salinity control in Western Australia and floodplain management.

The National Water Resources Assessment Program was initiated in 1964 as a priority of the Australian Water Resources Council. Under the Program Commonwealth assistance has been provided to the States to accelerate the collection of basic water resources data. Additionally, a considerable body of data on Australia's water resources has been amassed over a period of almost twenty years.

The National Water Research Program is currently being established as a result of a government decision to establish a National Water Research Council to advise on all aspects of federal involvement in water research in Australia. This initiative was preceded by an earlier research program which still has two years to run to completion. This program was based on individual research projects recommended through the Australian Water Resources Council.

The Perspective on Water Resources to the Year 2000 Study was undertaken over a twelve month period completed early in 1983. It was undertaken to extend knowledge of Australia's water resources and was based on a series of consultant studies covering areas such as future demands for water, water use efficiency in irrigated agriculture, water quality and salinisation, erosion and sedimentation, flooding and droughts.

. Bureau of Mineral Resources, Geology and Geophysics (BMR)

BMR is a geoscience research organisation which undertakes scientific studies aimed at an integrated, comprehensive, scientific understanding of the geology of the Australian continent, the Australian off-shore area, and the Australia Antarctic Territory to support the fullest development of our mineral and energy resources. The activities of BMR include detailed field and laboratory research, fossil fuel and mineral resources assessments, and the development of national geoscience data storage and retrieval systems.

The Bass Basin Marine Geologophysical Project has been allocated \$900 000 in 1982-83 for the processing of results. The Project comprised studies of the evolution of the Australian continental margin and the associated sedimentary basins in the Bass Strait region.

. Grants to Australian Institute of Urban Studies

The Australian Institute of Urban Studies sponsors applied research into major problems in urban development and government. It disseminates research findings and provides administrative resources to stimulate and coordinate research activity.

. Division of National Mapping

The prime tasks of the Division of National Mapping (Natmap) are to provide coverage of Australia with topographic maps, to make bathymetric maps of Australia's continental shelf and to make thematic and special purpose maps. The topographical mapping of Australia is a cooperative enterprise shared between the Commonwealth and the States. The Department of Defence contributes to this activity.

. Australian Safeguards Office

The Australian Safeguards Office operates the national system of accounting for and control of nuclear material as required by the agreement between Australia and the International Atomic Energy Agency (IAEA) for the application of safeguards in connection with the treaty on the non-proliferation of nuclear weapons. It also implements safeguards requirements of Australia's bilateral safeguards agreements.

The practical implementation of safeguards in Australia is supported by a program of research and development into methods for the physical verification of nuclear materials together with a vigorous program on the evaluation of safeguards methodology. The Office is applying high resolution gamma spectrometry and microcomputer data analysis to the accurate and timely verification of fresh and irradiated fuel elements of research reactors.

Assistance is provided to the IAEA by the provision of expert advice and by the support of research and development programs.

Australian Atomic Energy Commission

The Australian Atomic Energy Commission is the principal agency for nuclear R&D in Australia. The Commission also provides technical advice to government on a range of nuclear related matters. Its main research programs cover:

- . nuclear technology, including fission and fusion;
- . nuclear science with emphasis on nuclear physics and materials science;
- . health and environmental science with special reference to uranium mining and processing, radiation biology and biophysics;
- . uranium fuel cycle enrichment and high level waste disposal; and
- . applications of radioisotopes and radiation to medicine, industry and research.

The commission operates two research reactors: the 10MW High Flux Australian reactor (HIFAR) and the 100KW MOATA reactor. These reactors are used for the commercial production of radioisotopes for use in medicine, industry and research, as well as providing research facilities for the AAEC, universities and other tertiary bodies.

Technical liaison is maintained with a wide range of bodies involved in atomic energy including the international atomic energy agency, the OECD's nuclear energy agency, national and international governmental authorities, Australian State government bodies and universities.

SCIENCE AND TECHNOLOGY

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Science and Technology (DST)								
. Administrative and other costs not elsewhere included	N(a)	-	-	-	-	-	-	-
	N(b)	-	-	-	-	-	15.063	12.763
	N(c)	-	-	0.007	-	-	-	-
. Antarctic Activities								
- Antarctic Division	N(a)	1.915	4.465	5.561	4.663	10.169	6.208	13.599
	N(b)	5.279	7.337	11.028	12.241	14.701	15.610	18.780
	N(c)	0.025	0.024	0.028	0.027	0.011	0.034	0.119
- Antarctic Air Transport Study	N(b)	-	-	-	-	-	0.061	0.114
	N(c)	-	-	-	-	-	0.023	0.053
- Antarctic Ship Design Study	N(b)	-	-	-	-	-	0.026	0.117
	N(c)	-	-	-	-	-	0.009	0.156
- CCAMLR Contrib.	N(c)	-	-	-	-	-	-	0.098
- Scott Polar Research Institute Grant	N(c)	-	-	-	-	-	0.010	0.010
. Australian Government Analytical Laboratories	N(a)	0.011	0.015	0.025	0.019	0.022	2.527	0.535
	N(b)	0.243	0.252	0.298	0.343	0.384	5.391	6.059
. Baseline Air Pollution Monitoring Station	N(a)	-	-	-	-	-	0.057	0.003
	N(b)	-	-	-	-	-	0.274	0.504
. Bureau of Meteorology	N(a)	0.003	-	-	0.003	0.033	1.340	4.752
	N(b)	0.287	0.256	0.377	0.513	0.575	35.332	36.501
- International Activities	N(b)	-	-	-	-	-	0.988	1.061
. Commercial Development of Technology								
- InterScan support	N(c)	2.200	3.702	2.450	2.068	2.154	2.068	2.154
- Public Interest Projects	N(c)	-	-	-	-	-	2.446	5.000
. Grants-in-Aid								
- Academies and ANZAAS	N(c)	-	-	-	-	-	0.403	0.426
	S(c)	-	-	-	-	-	0.109	0.141
- Industrial Design Council	N(c)	-	-	-	-	-	0.140	-
- National Association of Testing Authorities	N(c)	-	-	-	-	-	0.767	0.811
- Research Associations	N(c)	-	-	-	1.209	1.341	1.209	1.341
- Standards Association of Australia	N(c)	-	-	-	-	-	2.460	2.583

	(\$ million)	R&D					S&T (including R&D)	
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
. Industrial R&D Grants								
- Commencement Grants	N(c)	6.000	7.000	9.657	9.700	11.300	9.700	11.300
- Project Grants	N(c)	16.500	22.950	36.056	12.053	32.800	12.053	32.800
. International Cooperation								
- Academies' Scientific Exchanges with China	<sup>s</sup> N(c)	-	-	-	-	-	0.120	0.126
- Association for Science Cooperation in Asia	N(c)	-	-	-	-	-	0.025	0.025
- Bilateral Agreements (India, Japan, Mexico, U.S.A., West Germany)	<sup>s</sup> N(c)	0.072	0.071	0.072	0.117	0.150	0.252	0.300
- Commonwealth Science Council	N(c)	-	-	-	-	-	0.068	0.080
. Ionospheric Prediction Service								
	N(a)	0.009	0.005	0.076	0.006	0.009	0.038	0.041
	N(b)	0.089	0.100	0.015	0.085	0.093	1.132	1.232
. National NMR Centre								
	N(a)	0.013	-	-	-	-	-	-
	N(b)	0.084	0.108	0.114	0.093	0.085	0.093	0.085
. Patent Activities								
- Patent Office*								
	N(a)	-	-	-	-	-	0.116	0.201
	N(b)	-	-	-	-	-	11.429	12.174
	N(c)	-	-	-	-	-	0.099	0.250
- Contributions to international patent bodies	N(c)	-	-	-	-	-	0.223	0.529
. Productivity Promotion Council (admin support)								
	S(a)	-	0.005	0.009	-	-	-	-
	S(b)	0.023	0.023	0.026	0.012	0.012	1.812	1.812
	S(c)	0.008	0.008	0.008	0.016	-	0.016	-
. Research Grants and Fellowships								
- ARCS Grants	<sup>s</sup> N(c)	12.300	12.800	11.553	13.187	15.247	13.187	15.247
	S(c)	-	-	2.934	3.803	4.397	3.803	4.397
- Fellowships	N(c)	0.376	0.503	0.560	0.671	0.681	0.671	0.681
- Marine Science Grants	N(b)	-	-	-	-	-	0.029	0.060
	N(c)	-	0.394	2.000	1.899	2.121	1.899	2.121
- Marine Science Fellowships	N(c)	0.162	0.245	0.250	0.336	0.276	0.336	0.276
. Space and Upper Atmosphere Activities								
- LANDSAT Station								
	N(a)	-	-	-	-	-	0.458	0.650
	N(b)	-	-	-	-	-	0.327	0.641
	N(c)	-	-	-	-	-	1.193	1.140
- Space Projects	N(b)	-	-	-	-	-	0.140	0.140

(\$ million)		R&D				S&T (including R&D)		
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
. Technology Development								
- Assistance to inventors	N(b)	-	-	-	-	-	0.092	0.140
	N(c)	-	-	-	-	-	0.076	0.120
- Materials handling	N(a)	-	-	-	-	-	0.062	-
	N(b)	-	-	-	-	-	1.110	0.899
- Research activities	N(b)	0.035	-	-	-	-	-	-
- Technological innovation programs	N(b)	-	-	-	-	-	2.146	1.600
	N(c)	-	-	-	-	-	0.708	0.670
- Technology Transfer Network	N(b)	-	-	-	-	-	0.035	0.040
	N(c)	-	-	-	-	-	0.400	0.600
Anglo-Australian Telescope Board (AATB)	N(a)	0.326	0.188	0.679	0.554	0.597	0.554	0.597
	N(b)	0.714	0.824	0.851	1.058	1.145	1.058	1.145
	N(c)	-	-	-	0.126	0.142	0.126	0.142
Australian Institute of Marine Science (AIMS)	N(a)	0.687	0.476	0.593	0.527	0.586	0.527	0.586
	N(b)	2.115	3.100	4.631	5.195	5.656	5.195	5.656
Commonwealth Scientific and Industrial Research Organization (CSIRO) **	S <sub>N</sub> (a)	33.749	51.780	58.693	70.577	76.335	71.356	76.941
	S <sub>N</sub> (b)	126.655	134.037	157.879	200.976	223.457	214.812	238.630
	S <sub>N</sub> (c)	1.921	1.834	1.892	1.032	1.226	1.110	1.375
	S(a)	.	.	0.397	0.125	0.117	0.125	0.117
	S(b)	.	.	1.202	1.488	1.731	1.488	1.731
	S(c)	.	.	-	0.058	0.066	0.058	0.066
National Standards Commission	N(a)	-	-	-	-	-	0.016	0.017
	N(b)	-	-	-	-	-	0.685	0.797
Total		211.788	252.503	309.922	344.995	407.719	453.540	526.040
Less recoveries from patent-related charges*		-	-	-	-	-	(12.710)	(14.117)
Less other DST recoveries##		-	-	-	-	-	(2.245)	(2.457)
Total (Budget sector net expenditure)		211.788	252.503	309.922	344.995	407.718	438.585	509.466
Less CSIRO superannuation employer contribution #		-	-	-	(24.315)	(25.181)	(25.598)	(26.500)
Total (Less superannuation adjustment)		211.788	252.503	309.922	320.680	382.538	412.987	482.966

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
B. Commonwealth Non-budget sector								
Anglo-Australian Telescope Board (funds brought forward and other revenue)	N(a)	-	-	0.039	-	-	-	-
	N(b)	0.013	0.022	0.072	0.016	0.019	0.016	0.019
Australian Institute of Marine Science (AIMS)	N(a)	-	-	-	0.003	0.023	0.003	0.023
	N(b)	-	-	-	0.034	0.221	0.034	0.221
Commonwealth Scientific and Industrial Research Organization (CSIRO)	N(a)	0.471	0.793	0.937	0.582	1.176	0.601	1.183
	<sup>S</sup> N(b)	2.752	4.515	4.924	9.282	13.633	9.773	13.890
National Standards Commission	N( <sup>a</sup> <sub>b</sub> )	-	-	-	-	-	0.153	0.155
Total (Non-Budget sector)								
		3.236	5.330	5.972	9.917	15.072	10.580	15.491
Less CSIRO superannuation employer Contribution #		-	-	-	(0.434)	(0.393)	(0.455)	(0.400)
Total (less superannuation adjustment)		3.236	5.330	5.972	9.483	14.679	10.125	15.091
Total (Direct Commonwealth funding)*								
		212.641	253.926	313.402	330.163	397.217	423.112	498.057
C. Expenditure from other sources								
Department of Science and Technology (DST)								
. Bureau of Meteorology	N(a)	-	-	-	-	-	0.447	1.794
	N(b)	-	-	-	-	-	15.327	16.818
. National NMR Centre	N(b)	0.016	0.007	0.015	0.044	0.020	0.044	0.020
. Productivity Promotion - Productivity Promotion Council(admin, support - industry contribution)	S( <sup>a</sup> <sub>b</sub> )	0.008	0.009	0.012	0.010	0.010	0.578	0.710
	S(c)	0.012	0.012	0.011	0.010	-	0.010	-
. Space and Upper Atmosphere Activities								

	(\$ million)	R&D					S&T (including R&D)	
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
- Space Projects (U.S. contribution)	N(b)	-	-	-	-	-	2.596	2.281
	N(c)	-	-	-	-	-	9.664	10.044
Anglo-Australian Telescope Board (U.K. contribution and other revenue)	N(a)	0.326	0.188	0.718	0.554	0.597	0.554	0.597
	N(b)	0.727	0.846	0.923	1.074	1.164	1.074	1.164
	N(c)	-	-	-	0.126	0.142	0.126	0.142
Commonwealth Scientific and Industrial Research Organization**	<u>S</u> N(a)	1.320	2.022	1.878	1.837	2.777	1.844	2.786
	<u>S</u> N(b)	14.493	17.899	21.189	25.378	27.503	25.665	27.901
Total (Other sources)		16.901	20.983	24.766	29.032	32.213	57.928	64.257
Less CSIRO Superannuation employer contribution		-	-	-	-	(1.973)	-	(2.000)
Total (less Superannuation adjustment)		16.901	20.983	24.766	29.032	30.240	57.928	62.257
Total (A+B+C)#		231.925	278.816	340.659	359.195	427.457	481.040	560.314

N Natural sciences and engineering                      S Social sciences and humanities

SN Includes significant proportion of social science and humanities for 1978-79 and 1979-80

<sup>S</sup>N Includes some social sciences and humanities

<sub>S</sub>N Includes small component of social sciences and humanities

(a) Intramural capital expenditure                      (b) Intramural current expenditure

(c) Extramural expenditure

\* The activities of the Patent Office result in revenue to the Commonwealth. This amounted to \$9.221m in 1979-80, \$11.026m in 1980-81, \$12.710m in 1981-82 and \$14.117m (estimated) for 1982-83.

\*\* Most of the scientific and technological service activities undertaken by CSIRO are integral with the Organization's research programs and have been included under the heading R&D. The following activities have, however, been identified as S&T (other than R&D) for the purposes of these tables: information, library, editorial, patenting, science communications, overseas aid and the servicing of Australia's standards of physical measurement.

# A change in the method of funding employees' superannuation has led to an increase in expenditure without any corresponding change in activity or function. As the principal perspective of the Science and Technology Statement is on levels of support for S&T activity, rather than expenditure per se, the totals are adjusted for these amounts.



## For 1982-83, a major item of revenue is expected to be \$1.1m from the sale of LANDSAT imagery.

#### Department of Science and Technology

The Department was established in November 1980 by amalgamating the policy and operational divisions of the former Department of Science and the Environment with the Patent Office and the Productivity Development and Working Environment Divisions of the former Department of Productivity. The Department has a broad policy role in relation to science, technology, and the development of innovation and industry. It has administrative and operational responsibilities across a wide span of scientific, technological and industrial activities.

##### . Antarctic Activities

The importance of Antarctica to Australia lies in the data base it forms for meteorological and pollution studies, in the critical role the ice sheet plays in southern hemisphere and global atmospheric and oceanic circulations, in its marine life and potential mineral resources, and in the fact that Australia claims sovereignty over nearly one half of the continent's land mass.

The Antarctic Division of the Department of Science and Technology conducts research and administers, organises and provides logistic support for the Australian National Antarctic Research Expeditions (ANARE) which operate from three stations on the Antarctic continent and one on Macquarie Island. The stations support programs of scientific research in upper atmospheric physics, cosmic ray physics, glaciology, biology, medical science, geology and geophysics.

The R&D activity expenditure reflects the continuing commitment to rebuilding all three Australian Antarctic stations.

##### . Australian Government Analytical Laboratories (AGAL)

AGAL provides essential services in analytical chemistry and microbiology which enable client government departments and agencies to meet their responsibilities to protect public health, collect revenue on imported goods, enforce laws against importing illicit drugs of abuse and protect the good name of export foodstuffs. AGAL's operational laboratories are supported by a research and development group which is responsible for development of new methods, quality assurance programs, the issuing of reference chemicals and the provision of specialist technical services.

##### . Baseline Air Pollution Station (Cape Grim, Tasmania)

The station is part of a worldwide baseline monitoring network sponsored by the United Nations and guided and coordinated by the World Meteorological Organization. The object is to monitor changes in atmospheric constituents to determine whether man-made pollution is changing the atmosphere on a global scale and whether this in turn is changing the world's weather and climate.

##### . Bureau of Meteorology

The Bureau of Meteorology provides the national meteorological service. This covers a broad spectrum of activities including observing and forecasting the state of the atmosphere throughout Australia and adjacent territories; issuing warnings of hazardous weather events; and publishing and promoting use of meteorological information. It also undertakes the research needed to maintain it as a viable modern service. Research

undertaken by the Bureau is directed toward the following objectives;

- . to increase knowledge of those aspects of the meteorology and hydrology of the Australian region and the southern hemisphere which bear directly on the provision of services by the Bureau;
- . to solve practical scientific problems relating to the development, provision and improvement of Bureau services;
- . to develop new and improved techniques and systems for the provision of services and the overall operation of the Bureau; and,
- . to provide a core of expertise and achievement in the main specialist areas of meteorology.

. Commercial Development of Technology

Major programs developed under the former Department of Productivity are aimed at the commercial development of Australian technology.

- InterScan (Australian Microwave Landing System (MLS)). The program holds promise of considerable benefits in production orders if Australian industry can meet the challenge of providing competitively priced products with acceptable reliability and maintainability. The formation of InterScan Australia Pty Ltd and industry participation in the company are important innovations in the development of industry-government cooperation to exploit Australian technology commercially. Government assistance has been extended to 1983-84 to allow further development of the product to suit the MLS market.

- Public Interest Projects. Proposals for assistance under Section 39 of the Industrial Research and Development Incentives Act 1976 are considered in the light of the Government's desire that public interest projects should:

- . be of high priority in terms of Government policy objectives;
- . have substantial social and economic benefit to the community;
- . be of major importance and likely to command widespread public support;
- . normally involve the commercial development of the results of research done in the public sector or by non-profit research institutions; and
- . not be funded in place of other funding sources.

Only research and development proposals which are of outstanding merit and which meet the above criteria are provided with financial support by the Government.

. Grants-in-Aid

The Department disburses government grants-in-aid to a number of bodies. The grant to the Australian and New Zealand Association for the Advancement of Science (ANZAAS) assisted nineteen young Australian scientists to attend the 52nd Congress in Sydney in May 1982. The grants to the four learned academies contribute toward the costs of their affiliations with overseas and international organisations, and general administration, i.e. Academy of Humanities, Australian Academy of Sciences, Academy of Social Sciences and Academy of Technological Sciences. These grants have also assisted academies to participate in exchange programs with their Chinese counterparts.

The Department is the channel for government support to the Industrial Design Council of Australia, the Standards Association of Australia, the National Association of Testing Authorities and the National Safety Council. The grant to the Standards Association is a contribution towards its administrative costs. This Association's chartered objectives are to prepare and publish Australian Standards and to promote the general adoption of standards relating to structures, commodities, materials, practices and operations. The grant to the National Association of Testing Authorities is in recognition of the need for an independent registration system for laboratories.

Research associations were formerly supported by the Government through CSIRO, but from 1981-82 receive grants through the Department of Science and Technology. They are associations of persons or firms engaged in industrial research and development and associated activities and concerned with a particular industry sector or a common technology. Grants to recognised associations are made on an agreed basis related to other income raised for IR&D purposes. The Government announced a policy of increased support for research associations in its response to the CITCA report. The associations currently recognised are the Bread Research Institute of Australia, Australian Welding Research Association, Sugar Research Institute, the Brick Development Research Institute, and the Radiata Pine Research Institute (recognised from 1981-82). All the research associations operate in close co-operation with CSIRO.

. Industrial R&D Grants (Industrial Research and Development Incentives Act 1976)

- Commencement Grants are aimed at encouraging companies, whose IR&D activities have not yet developed to the stage where major projects are being undertaken, to establish or develop a basic capability in industrial research and development. The commencement grant scheme is to operate until 30 June 1986. Grants are set at 50% of the company's eligible expenditure, with an upper grant limit of \$40 000 (taxable) per company. A company's eligibility for commencement grant consideration depends on whether it or any related companies have received grant payments aggregating \$200 000 or more, or grant payments in respect of five or more grant years, or whether during the eight grant years prior to that covered by the first commencement grant application, the company incurred IR&D expenditure exceeding \$250 000.

- Project Grants are aimed at encouraging established companies to undertake IR&D projects to develop new or substantially improved processes and products. Project grants up to \$750 000 (taxable) per annum per company or group of related companies may be paid by the Australian Industrial Research and Development Incentives Board in support of specific projects submitted by companies. A project grant has definite objectives, a specified time scale and in general it is not intended to cover open ended or ongoing research and development tasks. Agreements between the Board and applicant companies may be concluded up to 30 June 1989 for projects which will commence not later than 1 July 1986.

- Successful applicants for grants are required to undertake to exploit the results of assisted IR&D for the benefit of the Australian economy.

. International cooperative arrangements in science and technology

Bilateral international agreements are an important source of support for the development of science and technology in Australia. There is considerable activity under the six agreements administered by the Department: the United States-Australia Agreement for Scientific and Technical Co-operation, the Federal Republic of Germany-Australia Science and Technology Agreement, the India-Australia Science and Technology Agreement, the Japan-Australia Science and Technology Agreement, the China-Australia Science and Technology Agreement and the Mexico-Australia Science and Technology Agreement. Activities supported under the agreements include short-term visits (usually up to six months) to plan or participate in cooperative research, seminars and workshops, and information exchange projects (see Appendix 5).

The Department is responsible for managing Australia's involvement in the Association for Science Cooperation in Asia (ASCA). Australia is presently involved in ASCA projects which include a study of improved sun drying of food, a study of marine resources throughout the Indo-Pacific region, and a Science and Technology Information Registry on policy and planning.

The Department administers special grants to the learned academies for exchange programs with institutions of the Peoples Republic of China.

. Ionospheric Prediction Service

The Ionospheric Prediction Service provides assistance and advice in support of planning and maintaining HF radio communications mainly through the distribution of long-term operational radio predictions and short-term forecasts of the state of the sun, the earth's upper atmosphere and magnetic field. Ten ionospheric stations and three solar observatories, radio and optical, record and analyse data from which future radio communications conditions can be forecast. The Service is responsible for exchanging solar-terrestrial data with international organisations and, in particular, exchanges data by agreement with the USA and the Peoples Republic of China. IPS is also joint manager of the US-Australia solar observatory at Learmonth, W.A. IPS conducts a research and development program in radio wave propagation and solar-terrestrial relations so as to improve ionospheric predictions and forecasting techniques.

. National Nuclear Magnetic Resonance Centre

The Centre was established in 1975 as an independent national research facility located within the grounds of the Australian National University. It helped Australian Research Grants Scheme grantees and other scientists to achieve results of national significance in the fields of chemistry, biochemistry, biology, geochemistry and medicine. Projects assisted include the manufacture of proteins, oil-from-coal research and development of new therapeutic drugs. The agreement between the Government and the A.N.U. terminated on 31 December 1982. Tenders were called for sale of the Centre's equipment and on 1 January 1983 ownership passed to A.N.U.

. Patent, Trade Marks and Designs Office

The Patent Office:

- oversights and administers Australian industrial property systems for the protection of inventions, trade marks and industrial designs;
- investigates all applications for Letters Patent of invention and for the registration of designs and trademarks;
- issues Deeds of Letters Patent and Certificates of Registration and publishes details of successful applications;
- acts as a Receiving Office, International Searching Authority and an International Preliminary Examining Authority under the Patent Co-operation Treaty;
- provides and further develops patent information services to facilitate diffusion of technology by enabling access by research, manufacturing and industrial concerns to information contained in patent specifications; and
- contributes advice and expertise to other areas of the Department concerned with encouraging invention and technological innovation.

The Office also contributes advice and expertise to other government departments and agencies concerned with invention and technological innovation. In addition it provides policy advice to the Minister in relation to the development and administration of industrial property laws, practices and procedures so that they may encourage innovation and creative activity for the national benefit. It is responsible for administering Australian participation in bilateral and multilateral international agreements in industrial property and ensuring that Australia's responsibilities under these agreements are discharged in a proper manner. The costs of operating the Office are balanced by revenue from fees charged for activities under the Patents, Trademarks and Designs Acts and International Property Agreements, the sale of publications and from fees for the provision of services to members of the public and industry.

. Productivity Promotion Council of Australia (PPCA)

The Department provides executive and program support services to PPCA in raising awareness in the community of the meaning and importance of productivity, the development and implementation of training programs and projects including extension and development of the Productivity Groups Networks, and the provision of information and advisory services. Following decisions of the Review of Commonwealth Functions, Departmental support services to the PPCA are to be progressively withdrawn and the future level of Commonwealth funding of the Council is currently under review.

. Research Grants and Fellowships

- Australian Research Grants Scheme (scientific research)

Total amounts of \$17.98m and \$19.25m were allocated to individual research scientists and research teams for the calendar years 1982 and 1983 respectively under the Australian Research Grants Scheme. The average grant for 1983 is \$16 136 an increase in real terms of approximately 10.7% over the average grant in 1982. This increase has been achieved partly by reducing the number of grants from 1 347 in 1982 to 1 193 in 1983. By making a smaller number of larger grants, greater emphasis has been given to those basic and applied research projects of the most exceptionally high quality.

- Queen Elizabeth II Fellowships (post doctoral fellowships)

Up to ten awards are made in each year to young scientists of exceptional promise and proven capacity for original research in the physical and biological sciences. The fellowships are for two years tenable at Australian Research Institutions.

- Queen's Fellowships in marine science

Each year about three or four Queen's Fellowships in marine science are awarded to young scientists of exceptional promise and proven capacity for original work, for two years' full-time post-doctoral research at an Australian marine research institution. The scheme also provides for the appointment of senior Queen's Fellows - eminent marine scientists from overseas who come to Australia for periods up to one year to give lectures and seminars and to conduct research.

- Marine Sciences and Technologies Research Grants Scheme (marine research)

Funds are provided for research projects in the marine sciences and technologies in those priority areas which are determined by the Minister for Science and Technology on the advice of the Australian Marine Sciences and Technologies Advisory Committee (AMSTAC).

. Space and Upper Atmosphere Activities

- Landsat station. The Australian Landsat Station consists of the Data Acquisition Facility (DAF) located at Alice Springs, which receives and records data from NASA's Landsat series of earth resources satellites, and the Data Processing Facility (DPF) at Canberra where this data is sent for processing into images and computer compatible tapes for clients. Because of the lower orbit of the Landsat 4 satellite the station has been modified at a cost of nearly \$600 000 to enable it to provide the existing range of services from the new satellite.
- Space Projects. The Department plays a central role in Australian space activities and provides vital communications support for the United States National Aeronautics and Space Administration (NASA) through the operation of deep space and earth satellite tracking stations in Australia. The Department is also the cooperating agency for a European Space Agency tracking station operated by the Overseas Telecommunications Commission (OTC), located at Carnarvon, Western Australia.

. Technology and Innovation Programs

The Technology Development Division (formerly Productivity Development Division) of the Department of Science and Technology undertakes a range of programs in productivity development, technology transfer, technological development, invention and innovation that form essential elements of the Government's industrial development policy. The Division encourages development of:

- programs in consultation and in agreement with industry, employee organisations and government to examine specific industry sector problems, develop solutions and disseminate results;
- technology transfer programs facilitating industries' access to new technology by practical programs which assist:
  - . development and extension of practical technology transfer mechanisms;
  - . development and adoption of more effective information handling systems; and
  - . use of a common inventory cataloguing and supply language (AUSLANG);
- co-operative technological development programs to develop, demonstrate and promote projects in industry based on industrial processes, techniques and applications to facilitate increased competitiveness of Australian industry; and
- new enterprises based on Australian innovation through:
  - . the Assistance to Inventors Scheme, which provides grants of up to \$10 000 where appropriate to assist private inventors in the development of pre-production prototypes;
  - . supporting innovation centres, to promote greater interaction between individual inventors, financial institutions and manufacturers;
  - . supporting adventure workshops in innovation and entrepreneurship, for graduates in commercial and technological disciplines, which provide practical experience in the commercial exploitation of Australian inventions; and

- . assisting in the formation of new technology-based firms, using guidance committees to develop corporate strategies and to bring together financial and complementary skills.

- programs that raise understanding of the impact of advanced information technologies and of the commercial opportunities generated through them.

- . National Materials Handling Bureau

The Bureau provides consulting services on packaging, materials handling and distribution. It also undertakes mechanical and materials testing services.

- . Technology Transfer Network

The Technology Transfer Council (TTC) has been established as a private non-profit making company, initially funded by the Government, to assist companies to select and apply technology which is up-to-date and appropriate to their needs. Operating initially in the metals manufacturing industry the TTC offers a range of services through its Technical Referral Network with eight operating centres located in the five mainland capitals. Services offered by the TTC in addition to its ad-hoc enquiry and referral service include:

- New business opportunities. Matching new processes to the skills and capabilities of individual manufacturers.
- Technical information sourcing and interpretation. Providing direct links to technical information including overseas experts and data bases.
- Product information. Disseminating information on new products, processes and new applications of existing technology.
- Technology at work. Advisors identify and solve problems affecting manufacturer's plants.
- Group/club projects. Coordinating cooperative introduction of new technology by participating companies.
- Courses/seminars/workshops. Conducts a range of practical workshops and courses including development of courses specifically aimed at providing technical information to top management in areas such as sheet metal forming, machining and modern aids to manufacture.

#### Anglo-Australian Telescope Board (AATB)

The Anglo-Australian Telescope Board, jointly funded by the U.K. and Australia, maintains the 3.9 metre Anglo-Australian Telescope at Siding Spring, N.S.W. and associated facilities in Sydney. The Telescope is regarded world-wide as one of the most technically advanced optical telescopes, particularly in respect of its tracking accuracy and electronic data acquisition and processing facilities. Refinements to the original installation, new instrumentation development, and scientific and technical support staff of the highest quality have maintained its place in the forefront of astronomical research. The Telescope is available to leading astronomers, principally from Australia and the United Kingdom, to carry out research relating to galactic and extra-galactic phenomena.

### Australian Institute of Marine Science (AIMS)

The Institute Headquarters, situated near Townsville, undertakes research towards a predictive understanding of the environment and living communities of the marine tropics with particular emphasis on mangrove dominated coastlines, the Great Barrier Reef and adjacent waters. Mangroves are an important natural resource influencing coastline stability and contributing a major potential food supply to near-shore fisheries. The heritage and general socio-economic significance of the Great Barrier Reef is widely recognised within Australia and internationally. Effective management of this highly complex system depends on scientific understanding. Australia's policy is directed towards high priority research on the overall dynamics of the reef system and the waters which influence it.

### Commonwealth Scientific and Industrial Research Organization (CSIRO)

CSIRO was established as a statutory corporation under the Science and Industry Research Act 1949, succeeding the Council for Scientific and Industrial Research which was formed in 1926. Major amendments to the Act were made in 1978, following consideration by the Government of a report based on a major independent public inquiry.

In summary, the functions of the Organization are:

- to carry out scientific research relevant to Australian industry, the community, national objectives, national or international responsibilities, or for any other purpose determined by the Minister responsible for CSIRO;
- to encourage and facilitate the application and utilisation of its research results;
- to liaise with other countries in matters of scientific research;
- to train research workers;
- to make grants and award fellowships and studentships relevant to the Organization's research;
- to recognise, cooperate with and make grants to industrial research associations;
- to establish, develop, maintain, and promote the use of, standards of measurement of physical quantities;
- to collect, interpret and disseminate scientific and technical information; and
- to publish scientific and technical reports, periodicals and papers.

#### . Main Role

The main role of CSIRO is to plan and execute a comprehensive program of general scientific research on behalf of the Commonwealth. By convention, CSIRO does not undertake defence research in peacetime and, since the creation of a separate Australian Atomic Energy Commission, it has not undertaken research in direct support of the possible establishment of a nuclear power industry in Australia. Further, the Organization's research aimed at promoting human health does not include work in clinical medicine. With these main exceptions, however, the research work of CSIRO includes all fields of the physical and biological sciences, and their applications.



The types of research undertaken range from fundamental studies through to experimental development, with the main concentration being in "strategic mission-oriented" research. This was the term used by the Independent Inquiry into CSIRO to describe research undertaken for a national purpose and involving work at the boundaries of scientific knowledge. It includes both fundamental work in areas of major importance to the Australian economy and to Australia's national and international obligations, and the application of advanced scientific knowledge and techniques to the solution of defined national problems. The transfer to potential users in Australia of results is seen as an essential component of each CSIRO research program.

#### . General Policies

The Commonwealth's role in scientific research tends to be concentrated towards work of broad application and hence towards the fundamental end of the research and development spectrum. It does not perform research and development in support of economic growth which could and should be undertaken by industry. Instead it has, through CSIRO, concentrated its efforts on infrastructure support for industry, such as research relating to physical standards, plant and animal biology, physical and chemical processes, and properties of materials. Research is aimed at benefiting wide sections of industry and, as such, tends not to be of a kind which could be undertaken profitably by individual companies.

#### . Consultative Mechanisms

An Independent Advisory Council, comprising senior representatives of industry, government, tertiary education, and community interests, advises the Executive of CSIRO.

The Advisory Council is assisted in this task by committees in each State and the Northern Territory which include representatives of State and Territory Governments.

ASTECC, the Australian Science and Technology Council, has a responsibility to provide advice which will assist the Government in encouraging Australian science and technology to meet the nation's needs and objectives, but it has no executive responsibilities. Advice from ASTEC is a valuable input to CSIRO's planning processes, and helps particularly in the identification of national needs and their relative priorities. ASTEC has observer status on the CSIRO Advisory Council.

CSIRO also has direct formal consultative links with Commonwealth ministries having major interests in science and technology, with industry bodies, and with the tertiary education sector.

#### . Organisation

The research work of the Organization is carried out in five institutes, each headed by a Director. Institutes are groupings of divisions and units with related research interests, headed respectively by chiefs and officers-in-charge. Divisions and units are each responsible for a coherent set of research programs, the units being responsible for narrower fields of research and having fewer staff.

The broad objectives, fields of research and composition of the five CSIRO research institutes are as follows:

##### - Institute of Animal and Food Sciences

The Institute conducts scientific and technological research aimed at improving the efficiency of livestock production, the management and productivity of Australia's fisheries resources, the conservation of its marine ecosystems and the quality and safety of human foods, and at obtaining a better understanding of the relationships between human health and diet.

The Institute's activities include research on:

- . control of animal diseases;
- . nutrition, reproduction, genetics and management of livestock;
- . marine ecosystems and the ecology and population dynamics of the ocean's harvestable resources;
- . methods of processing, handling and storing meat, fish, dairy foods, fruit, vegetables and grain;
- . identification of nutritive imbalances and deficiencies in the diets of Australians and investigation of their effects on human health; and
- . molecular and cellular biology and its application in the livestock and pharmaceutical industries.

The Institute comprises the following divisions and units:

Division of Animal Health  
Division of Animal Production  
Division of Fisheries Research  
Division of Food Research  
Division of Human Nutrition  
Division of Tropical Animal Science  
Molecular and Cellular Biology Unit  
Wheat Research Unit.

- Institute of Biological Resources

The Institute conducts scientific and technological research aimed at improving the management and productivity of Australia's land, soil, water, agricultural, pastoral and forestry resources and the management and conservation of Australian ecosystems. A new Division of Wildlife and Rangelands Research was formed to study the plants and animals of semi-arid and arid rangeland ecosystems.

The Institute's activities include research on:

- . application of the plant sciences to the management and utilization of crops, pastures, forests and native ecosystems;
- . introduction, selection and breeding of plant material as a basis for developing new and improved varieties of crop and pasture plants and forest trees;
- . control of insect pests of plants and animals, and of weeds and plant diseases, with particular emphasis on research aimed at reducing dependence on chemical control;
- . biology of native and introduced animals in the context of conservation and pest control; and
- . assessment and management of land, soil and water resources in agricultural, pastoral, forested and near-urban areas.

The Institute comprises the following divisions and groups:

- Division of Entomology
- Division of Forest Research
- Division of Horticultural Research
- Division of Plant Industry
- Division of Soils
- Division of Tropical Crops and Pastures
- Division of Water and Land Resources
- Division of Wildlife and Rangelands Research
- Centre for Irrigation Research
- Laboratory for Rural Research (Perth)

- The Institute of Energy and Earth Resources

The Institute conducts scientific and technological research relating to the more effective definition, utilisation and management of Australia's energy and earth resources.

The Institute's activities include research on:

- . locating, evaluating, defining and characterising Australia's energy and earth resources; and
- . planning their recovery, development and effective use consistent with the minimisation of environmental stresses.

The Institute comprises the following divisions and units:

- Division of Applied Geomechanics
- Division of Energy Chemistry
- Division of Energy Technology
- Division of Fossil Fuels
- Division of Groundwater Research
- Division of Mineral Chemistry
- Division of Mineral Engineering
- Division of Mineral Physics
- Division of Mineralogy
- Physical Technology Unit.

- Institute of Industrial Technology

The Institute conducts scientific and technological research and development aimed at increasing the efficiency, competitiveness and scope of Australian secondary and tertiary industries in relation to both national and international markets.

The Institute's activities include research on:

- . purification of water, waste-water and sewage;
- . substitute liquid fuels;
- . industrial microbiology;
- . specialty polymers and resins;
- . biologically-active chemicals;
- . building materials;
- . building and design of urban communities;
- . safety and comfort in domestic and industrial environments;
- . new and improved technology in metals fabrication;
- . automated production technology;

- . utilization of forest and other lignocellulose resources;
- . preservation and properties of wood;
- . properties, processing and use of wool and leather; and
- . agricultural engineering.

The Institute comprises the following divisions:

- Division of Applied Organic Chemistry
- Division of Building Research
- Division of Chemical and Wood Technology
- Division of Manufacturing Technology
- Division of Protein Chemistry
- Division of Textile Industry
- Division of Textile Physics.

- Institute of Physical Sciences

The Institute conducts scientific and technological research in the physical, chemical and mathematical sciences aimed at meeting the needs of Australian industry and increasing understanding of the physical environment.

The Institute's activities include research on:

- . application of the physical sciences to industrial problems;
- . maintenance of the national standards of measurement;
- . development of scientific and industrial instrument techniques;
- . properties of industrial materials and development of improved materials and chemical and physical processes;
- . climate, weather and atmospheric transport of pollutants and other entities;
- . physics of interactions between soil, water, plants and atmosphere;
- . radiophysics and its application to astronomy, navigation and communications;
- . the physical and chemical oceanography of the Australian marine environment, including air-sea interaction;
- . application of mathematics and statistics to problems in industry and science; and
- . development of advanced computer operating systems and the provision of a central computing service.

The Institute comprises the following divisions and units:

- Division of Applied Physics
- Division of Atmospheric Research
- Division of Chemical Physics
- Division of Computing Research
- Division of Environmental Mechanics
- Division of Materials Science
- Division of Mathematics and Statistics
- Division of Oceanography
- Division of Radiophysics
- Australian Numerical Meteorology Research Centre.

A Bureau of Scientific Services, headed by a Director, provides a range of services which include:

- providing scientific and technical information and publishing, library and data base services for CSIRO and the community;
- communicating information about CSIRO and its research to a variety of audiences, both technical and non-technical, and liaising with industry;
- encouraging the adoption of CSIRO technical know-how, inventions and technology in industry by the use of patents and licences, contracting out of Research and Development, making grants and arranging technical conferences;
- planning, coordinating and evaluating CSIRO's involvement in technical assistance programs in developing countries; and
- providing advice to the Executive, institutes and divisions on matters of policy related to the Bureau's areas of activity.

The Bureau comprises the following units:

- Central Information, Library and Editorial Section (CILES);
- Centre for International Research Co-operation (CIRC);
- Commercial Group; and
- Science Communication Unit.

. Finance

Following the Independent Inquiry into CSIRO, the Government decided in 1978 that CSIRO should continue to be financed, in the main, by a specific government vote, and that research of general interest to the Commonwealth Government should be funded, as far as possible, through the budgetary appropriation to CSIRO. It also decided that the Organization should not have as its principal aim the generation of revenue, either to support its research or as a direct return for results achieved in research. CSIRO should continue to compete for Rural Industry Research Funds, provided they did not become a major component of support for research relating to the particular rural industries concerned.

. Distribution of Research Effort

In the table which follows, CSIRO research is grouped under a number of socio-economic headings. The classification accords with the primary purpose for which the research was carried out and no attempt has been made to apportion programs which contribute to more than one objective. Against these socio-economic headings, the actual expenditure (or projected expenditure for 1982-83) is set out. These figures reflect all the funds which were spent by CSIRO, or on its behalf, by other agencies, in each financial year. Caution must be exercised in making comparisons between years because small changes to the activities within a program may lead to the entire program being classified under a different heading.

These total expenditure figures, which are made up of funds from a variety of sources, include:

- Budget appropriations to CSIRO for salaries, operating expenses and minor capital works.
- Funds received for research from Government departments and agencies (e.g. National Energy Research, Development and Demonstration Council).
- Funds raised by a levy on various primary producer groups and distributed by the Commonwealth Department of Primary Industry together with matching financial support (i.e. Rural Industry Research Funds).
- Other contributory funds for supporting particular research work in CSIRO.
- Capital and related expenditure on behalf of CSIRO by the Department of Housing and Construction and the Department of Administrative Services (including the \$150m Australian National Animal Health Laboratory).

. Comparisons of Annual Expenditure Figures

When comparing expenditures for various years account must be made for changes in the structure of funding which have occurred. In 1981-82 CSIRO became liable for the employer's share of superannuation (\$26m in 1981-82 and \$29m in 1982-83) and for salary expenditure for an additional payday which fell in that year. Some sections of the Australian Atomic Energy Research Establishment at Lucas Heights transferred to CSIRO during 1981-82 and CSIRO provided associated expenditure for four months of that year.

CSIRO Expenditure

(\$ million)	1978-79	1979-80	1980-81	1981-82	Projected 1982-83
<u>A. Rural Industries</u>					
<u>Agriculture</u>					
. Plant Improvement	3.605	4.089	5.360	6.228	8.401
. Plant Physiology & Biochemistry	4.195	4.547	4.171	7.393	7.925
. Soils & Plant Nutrition	4.169	4.939	5.987	6.812	7.471
. Crop & Pasture Pests & Diseases	5.645	6.222	6.529	12.609	13.535
. Livestock Production	11.661	16.586	17.138	15.524	16.930
. Livestock Health	19.842	31.055	45.537	54.945	43.910
. Agricultural Systems	7.670	8.210	6.727	8.197	10.483
. Agricultural Engineering	.586	.741	.675	-	-
<b>Total (Agriculture)</b>	<b>57.373</b>	<b>76.389</b>	<b>92.187</b>	<b>111.708</b>	<b>108.655</b>

(\$ million)	1978-79	1979-80	1980-81	1981-82	Projected 1982-83
<u>Forestry</u>					
. Forest Science	6.960	7.694	8.052	10.118	11.081
Total (Forestry)	6.960	7.694	8.052	10.118	11.081
<u>Fishing</u>					
. Resource Assessment	4.410	6.411	7.223	-	-
. Fisheries Biology	-	-	-	7.505	8.846
. Marine Biology	-	-	-	2.829	3.334
Total (Fishing)	4.410	6.411	7.223	10.334	12.180
Total - Rural Industries	68.743	90.494	107.462	132.160	131.916
<u>B. Mineral, Energy and Water Resources</u>					
<u>Mineral resources</u>					
. Exploration	4.095	4.290	6.130	7.712	8.785
. Mining and Beneficiation	5.611	5.986	6.313	8.359	9.971
. Environment	.753	.737	1.068	1.326	1.445
Total (Mineral resources)	10.459	11.013	13.511	17.397	20.201
<u>Energy resources</u>					
. Coal	3.813	4.018	5.344	8.109	10.282
. Petroleum, Gas and Oil Shale	.434	.651	.996	2.139	3.583
. Substitute Liquid & Gaseous Fuels	4.330	6.379	6.893	10.038	14.568
. Renewable Energy	1.424	1.911	3.604	3.021	3.831
. Energy Storage and Conservation	.797	1.057	2.121	-	-
. Energy Storage	-	-	-	.941	1.031
. Energy Conservation	-	-	-	3.007	3.920
TOTAL (Energy resources)	10.798	14.016	18.958	27.255	37.215

(\$ million)	1978-79	1979-80	1980-81	1981-82	Projected 1982-83
<u>Water resources</u>					
. Water Management	2.689	3.293	3.842	5.242	5.726
. Water Technology	1.027	.997	1.670	2.597	2.512
Total (Water resources)	3.716	4.290	5.512	7.839	8.238
Total - Mineral, Energy and Water Resources	24.973	29.319	37.981	52.491	65.654
<u>C. Manufacturing Industries</u>					
<u>Resource-based manufacturing industries</u>					
. Food Processing	10.322	11.078	11.875	14.677	16.318
. Textiles	10.232	10.189	11.087	14.023	15.361
. Hides and Leather	.447	.520	.889	1.201	1.313
. Cellulose & Forest Products	2.391	2.667	3.515	7.797	7.541
. Basic Metal Products	2.175	2.360	2.703	3.274	3.679
Total (Resource-based manufacturing industries)	25.567	26.814	30.069	40.972	44.212
<u>Technology-intensive industries</u>					
. Instruments & Electronic Equipment	2.870	3.157	3.524	7.923	8.766
. Advanced Materials	1.920	2.391	2.852	6.346	10.913
. Specialty Polymers	1.173	.910	.870	1.212	1.320
. Agricultural Chemicals, Pharmaceutical & Veterinary Products	3.454	4.394	4.833	6.169	6.129
. Materials Fabrication	2.266	2.207	2.940	7.642	8.268
Total (technology-intensive industries)	11.683	13.059	15.019	29.292	35.396
<u>Standards</u>					
. Standards of Measurement	9.346	9.945	10.805	7.712	8.413
Total (Standards)	9.346	9.945	10.805	7.712	8.413
Total - Manufacturing Industries	46.596	49.818	55.893	77.976	88.021



(\$ million)	1978-79	1979-80	1980-81	1981-82	Projected 1982-83
<u>D. Community Interests</u>					
<u>Knowledge and management of the natural environment</u>					
. Fauna	5.673	6.170	7.087	7.189	7.722
. Flora	1.471	1.621	1.656	2.189	2.671
. Land	8.676	9.239	11.478	13.257	14.708
. Oceans	3.089	2.406	2.613	4.737	12.058
. Atmosphere	4.298	4.488	5.024	5.414	6.684
. Environmental Protection	2.692	2.575	2.728	3.467	3.770
. Astronomy	4.973	5.480	5.986	7.301	8.908
Total (Knowledge and management of the natural environment)	30.872	31.979	36.572	43.554	56.521
<u>Tertiary industry</u>					
. Building and Construction	6.323	5.941	6.455	7.742	8.464
. Mathematics and Statistics	3.317	3.473	4.120	4.950	5.388
. Computing	3.947	5.547	5.825	4.085	4.409
. Information Services	.309	.341	.248	.357	.393
Total (Tertiary industry)	13.896	15.302	16.648	17.134	18.654
<u>Public health</u>					
. Human Nutrition	2.897	3.202	2.988	3.517	3.733
. Industrial Hygiene	.542	.694	.655	-	-
Total (Public health)	3.439	3.896	3.643	3.517	3.733
Total - Community Interests	48.207	51.177	56.863	64.205	78.908
<u>CSIRO Total</u>	<u>188.519</u>	<u>220.808</u>	<u>258.199</u>	<u>326.832</u>	<u>364.499</u>
<u>Type of Expenditure</u>					
Intramural Capital					
- indirect	19.931	33.804	44.938	57.546	50.936
- direct	12.905	16.994	17.369	16.380	30.167
Intramural Current					
- indirect	3.239	4.221	4.851	4.381	5.400
- direct (salaries)	110.896	118.697	138.289	191.128*	212.419*
- direct (other)	39.627	45.258	50.784	56.229	64.196
Extramural	1.921	1.834	1.968	1.168	1.381

\* Some \$26m in 1981-82 and \$29m in 1982-83 of the increased provision for salaries is due to a change in funding arrangements for the Commonwealth Superannuation Scheme.

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. High Priority Areas for Expansion and Other Initiatives by CSIRO

CSIRO is withdrawing resources selectively from areas of lower priority in order to undertake new initiatives; increasing its effort in areas designated as having high priority for expansion; and maintaining its activities in other areas. The rate at which this redeployment can proceed is determined by the rate at which resources can be freed from lower priority areas.

Priority areas for expansion are:

- oceanography;
- energy;
- manufacturing industry;
- water and soils;
- biotechnology;
- plant pathology; and
- information technology.

Short notes on each of these priority areas are set out below.

Oceanography

The CSIRO Divisions of Oceanography and Fisheries Research together form the largest research group working in marine science in Australia. Research into the physical oceanography of the four major ocean systems which front the Australian coastline is being significantly increased. These systems influence Australia's weather patterns, fish population dynamics, commercial shipping, leisure activities, waste disposal, and the cost of offshore gas, oil and mineral exploration and production. A marine laboratory complex is being established in Hobart at a cost of \$10.75m, and a 50 metre oceanographic vessel is to be built for operation by CSIRO as a national facility.

Energy

Significant expansion and re-orientation of CSIRO's energy research activities has taken place over the past two years as a consequence of internal redeployment, Divisional re-organisation (formation of Division of Energy Technology), transfer of AAEC resources to CSIRO (formation of Division of Energy Chemistry) and Institute restructuring (formation of Institute of Energy and Earth Resources). Additional expansion of the Organization's energy research is not planned for the immediate future. High priority continues to be accorded to research which will delay the predicted eventual fall in the supply of indigenous petroleum or alleviate its effect in the shorter term, and to research which will reduce in the longer term Australia's dependence on natural petroleum.

## Manufacturing Industry.

There have been significant shifts in the emphasis of research directed towards resource based industries. For example, research effort on food processing is now giving emphasis to engineering aspects of meat handling, food manufacturing technology and the properties and protection of processed foods. In research on textiles, priority has been given to work on early-stage processing of wool for improved quality and productivity in the manufacture of yarns and fabrics. There has been an increased research effort directed toward technology-intensive industries, e.g. new materials such as industrial ceramics and a range of composites, design of very large scale integrated (VLSI) circuits and research by the Division of Radiophysics into signal processing. Major growth in the area of materials fabrication has emphasised integration of engineering manufacture (including automation and robotics) and improved technology for the production of high precision engineering components.

## Water and Soils

Australia has a larger proportion of shallow, infertile soils than any other continent, as well as generally low and variable rainfall. CSIRO is conducting research on plant/soil/water relationships to develop principles for applications in both dry land and irrigated agriculture, forestry, hydrology, engineering and conservation. Within CSIRO there has recently been a redeployment of resources from research on coastal and subcoastal lands to water management. Salinity and other aspects of water quality, groundwater and catchment hydrology have been identified as areas for expanded research effort. Other work includes the measurement, prediction and interpretation in water catchments; including erosion and other problems typified by the River Murray; testing of specially-adapted plant species; the requirements for and effects on water of industrial development; and water and waste water treatment and purification processes.

## Biotechnology

Biotechnology covers the use of biological organisms in industrial processes and the genetic modification of organisms to produce new plants and animals. It is aimed at more effective production techniques and new products in areas as diverse as food, fuels, Pharmaceuticals, chemical feedstocks, waste recycling and pollution control. Recombinant DNA and cell manipulation techniques have provided the major impetus for the expansion of biotechnology. They are used in a number of CSIRO research programs and are applicable to others, particularly the genetic improvement of plants and animals. A variety of agricultural applications of biotechnology is being researched; for example, animal cell growth and development, gene technology, and the biological defleecing of sheep through the use of epidermal growth factor. Other areas in which biotechnology research is continuing include, animal breeding, the molecular basis of plant improvement, understanding the mechanisms involved in the production of cell mutations, the manufacture of vaccines, hormones and rare proteins, and the use of micro-organisms in industrial processes.

## Plant Pathology

CSIRO has decided to expand its research on disease control in plants and is at present examining how this expansion might most appropriately be effected. Current research approaches include novel disease identification methods, the introduction of new sources of disease resistance into breeding programs, disease management strategies and the study of disease organisms as components of complex ecological systems. Fields under investigation include plant viruses particularly in pastures and annual crops, soil-borne diseases, diseases of forest and woodland trees, breeding of disease, pest and herbicide resistant plants, and diseases in new crops including those suitable for tropical areas.

## Information Technology

Information technology is emerging, not only as the basis of entirely new major industries, but also as an essential future component of those existing industries likely to survive past the end of the decade. In divisions such as Computing Research, Applied Physics and Radiophysics, CSIRO has already developed a scientific base from which to launch a timely and coordinated effort on an appropriate scale. Research will be expanded within the following areas:

- . technologies for the manipulation, transmission, storage and retrieval of information;
- . computer architecture, particularly VLSI and its application in intelligent knowledge-based systems, artificial intelligence and other aspects of advanced processors and fifth generation computers;
- . software engineering for applications such as graphic and image processing, database management, expert systems and special-purpose languages; and
- . the application of these technologies and processes to the needs of Australian industry, including manufacturing, mining, medicine and commerce.

## Other Initiatives

- . The Australian National Insect Collection, which contains about a million insect specimens representing 65 000 different species was re-housed in a new laboratory built at a cost of \$800 000.
- . A controlled plant pollination unit, built at a cost of \$500 000, was opened. It will enable researchers to maintain pure lines of 20 000 forage and crop species and their variants. These will be used to conduct research into novel agricultural systems for the tropics.
- . SIROMINES, a joint venture between SIROMATH Pty Ltd, and ARMINES the (business arm of the French School of Mines in Paris) was launched. It will provide geostatistical services to industry, concentrating on the estimation of ore reserves and the planning of mines.
- . A Control Data Cyber 205 super-computer was acquired to provide computational support at the highest level in a wide range of scientific research programs. Its performance is some five to twenty times better than the Cyber 76 it replaces.
- . CSIRO's F27 aircraft, equipped with infra-red fire mapping instruments, played an important part in monitoring the spread of disastrous bushfires in Victoria to help fire-fighters and rescue operations. It is mainly engaged in monitoring the spread of fires in a large-scale experiment in Western Australia as part of CSIRO's evaluation of large aerial tankers for use in bushfire control.
- . Six new CSIRO/university collaborative research projects were started under a program to foster greater interaction. A sum of \$500 000 a year has been made available for this program.

- . A new radio-telescope costing \$25m is to be built by CSIRO and operated as a national facility. Linked with the Parkes telescope it will simulate a dish 300 km across.

#### National Standards Commission (NSC)

The National Standards Commission exists to establish the use of uniform units and standards of measurement of physical quantities. The Commission is responsible for the operation of the Pattern Examination Laboratory, which controls the quality of measuring instruments used for trading purposes in Australia.

SOCIAL SECURITY

(\$ million)	R&D				S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Social Security								
. Office of Child Care	S(c)	0.022*	0.053*	0.052	0.124	0.035	0.455	0.308
. Studies on Rehabilitation and Services for the Handicapped	S(c)	0.096	0.096	0.096	0.113	0.160	0.321	0.179
. Welfare Research	S(b)	-	-	-	-	-	0.438	0.529
	S(c)	-	-	-	-	-	0.577	0.600
Total (Direct Commonwealth funding)*		0.118	0.149	0.148	0.237	0.194	1.792	1.617

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure  
\* estimated

Department of Social Security

The Department conducts a wide range of research, evaluation and statistical activities in the context of its policy analyses relating to various aspects of the social welfare system, including income maintenance, child care, rehabilitation and services for the aged and handicapped.

. Office of Child Care

Projects current in 1981-82 included research related to the development of community support networks (e.g. early intervention programs, toy libraries) and investigation of the impact of government programs on traditional Aboriginal communities. No new projects were funded in 1982-83 because of financial constraint. Other S&T programs included the National Data Base Collection (an annual national census of pre-school and child care services undertaken jointly by Commonwealth, State and Territory authorities and the ABS), evaluation of the Pilot Youth Services Scheme and design of innovative aids for the disabled.

. Studies on Rehabilitation and Services for the Handicapped

A research team from the Unit for Rehabilitation Studies at Macquarie University assists with the development of programs, training materials and research for services provided to intellectually handicapped clients, particularly in work preparation centres. A computer-based casework recording and statistical information system was progressively introduced during 1981-82 by the Department of Social Security to provide an improved monitoring system as well as a base for evaluation and research throughout the Commonwealth rehabilitation service. Other research programs are related to training requirements in voluntary organisations under the Commonwealth rehabilitation service.

. Welfare Research

The intramural expenditure reported covers the WELSTAT project, the Australian Council of the Aging/Department of Social Security survey of aged persons at home, Aboriginal identification and data project, the language services project, the ethnic aids project, the welfare staff monitoring project, and the pilot of the NSW referral information system. WELSTAT is a joint State and Commonwealth project concerned with the standardisation and improvement of social welfare statistics. The project is managed by committees consisting of representatives from each State and Territory welfare department, the ABS and the Commonwealth Department of Social Security Social Welfare Policy Secretariat. It is serviced by a Secretariat which operates full time and which is located in the central office of the Department of Social Security. Expenditure on WELSTAT has risen from \$41 000 in 1978-79 to \$95 000 in 1981-82 and an estimated \$100 000 in 1982-83.

The extramural expenditure covers the Department's contribution to the Social Welfare Research Centre in the University of NSW and the Victorian Council of Social Service monitoring project. Social Welfare Research Centre research projects current at the end of 1981 included policies and programs in children's services, the cost of a child, unemployment and the family, the implications of welfare provisions in the workforce for public social welfare, wage structure, social wage and social policy, social implications of part-time, casual, and short-term contract work, family care of the elderly, and the home help service.

. Income Security Research

As part of its on-going research activities, the Department analyses the trends and developments in certain key economic and social indicators, prepares critiques of related research studies, analyses the validity and usefulness of concepts commonly used in discussions on income security issues and reviews developments in overseas social security systems for their relevance to Australia. The Department works in conjunction with the Social Welfare Policy Secretariat in some of its research and analyses of policy issues. No expenditure data are presented for these activities.

SPECIAL MINISTRY OF STATE

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of the Special Minister of State								
. Support for								
International Congresses and Other Grants-in-Aid	N(c)	-	-	-	-	-	0.064	0.086
	S(c)	-	-	-	-	-	0.059	0.044
. Inquiry into Commonwealth Laboratories	N(b)	-	-	-	-	-	0.056	0.549
. National Police Research Unit	sN(a)	-	-	-	-	0.023	-	0.023
	sN(b)	-	-	-	-	0.066	-	0.066
	sN(c)	-	-	-	-	0.007	-	0.007
Australian Federal Police								
. Forensic research	N(a)	-	-	-	0.018	0.130	0.018	0.130
	N(b)	-	-	-	0.011	0.045	0.050	0.088
	N(c)	0.026	0.124	0.194	0.194	0.204	0.194	0.204
<hr/>								
Total (Direct Commonwealth Funding)		0.026	0.124	0.194	0.223	0.475	0.440	1.196
<hr/>								
B. Expenditure from other sources								
Department of Administrative Services								
. National Police Research Unit (State funding)								
	N(a)	-	-	-	-	0.046	-	0.046
	N(b)	-	-	-	-	0.132	-	0.132
	N(c)	-	-	-	-	0.013	-	0.013
<hr/>								
Total (Other sources)		-	-	-	-	0.192	-	0.192
<hr/>								
Total (A+B)		0.026	0.124	0.194	0.223	0.667	0.440	1.388

N Natural sciences and engineering      S Social sciences and humanities  
sN Includes small proportion of social  
sciences and humanities  
(a) Intramural capital expenditure      (b) Intramural current expenditure  
(c) Extramural expenditure



## Department of the Special Minister of State

Through appropriations to the Department of the Special Minister of State, the Commonwealth makes contributions to major international conferences held in Australia, some of which are primarily of a scientific nature. During 1981-82 \$100 800 was granted for this purpose. Larger grants were to the 22nd International Hospital Federation Congress, International Botanical Congress and the 11th International Scientific Congress of the Cultivation of Edible Fungi. In 1982-83 \$116 700 has been appropriated to provide grants mainly in support of the 12th International Biochemistry Congress, the 19th International FISITA (Federation of Automotive Engineering Societies) Congress and the 1st Asian Regional Seminar on Humanitarian Law.

Other scientific and technological activities in the Department are maintenance of a standard for length measures in the ACT and tests by the Transport and Storage Division on products being fitted to the Commonwealth car fleet, e.g. the Division has road tested the Halda Odometer which is a device fitted into the fuel line and connected to the vehicle speedometer to accurately measure fuel consumed and distance travelled.

### . Inquiry into Commonwealth Laboratories

The Department also has servicing responsibilities to the Inquiry into Commonwealth Laboratories which was established in January 1982 and is due to report on 1 October 1983. S&T activities conducted by the Inquiry are directed towards rationalising Commonwealth laboratory facilities and services.

### . National Police Research Unit (NPRU)

An agreement to set up the NPRU was signed by members of the Australian Police Ministers' Council in May 1982. The agreement provides for the Commonwealth to pay one-third of the costs of the NPRU and the other two thirds to be paid by the participating States and Territories. When the unit is fully established it will coordinate and undertake research into methods, equipment and techniques of the police forces, and research aimed at alleviating adverse effects of sociological trends on police forces and members.

## Australian Federal Police (AFP)

### . Scientific Research Directorate

The AFP sponsors a program of forensic science research to ensure that recent technology is available to it in performance of its functions. The program includes such projects as arson research at the Norman McCallum Forensic Science Laboratories, Melbourne and a Sydney University study of the relationship between cannabis, alcohol and driving impairment. Methods developed in the research project on new techniques for the visualisation of fingerprints at the Australian National University have been used successfully in a number of major criminal cases.

TERRITORIES AND LOCAL GOVERNMENT

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of the Territories and Local Government								
. National Botanic Gardens	N(a)	0.003	0.004	0.005	0.002	0.006	0.380	0.229
	N(b)	0.166	0.166	0.184	0.194	0.202	1.674	1.819
. Other	N(a)	-	-	-	0.001	-	0.189	0.231
	N(b)	0.018	0.028	0.035	0.052	0.017	0.912	
	N(c)	-	-	-	-	-	0.133	0.992
	S(a)	-	-	-	-	-	0.004	0.010
	S(b)	0.060	0.064	0.072	0.092	0.103	0.211	0.232
National Capital Development Commission	N(a)	-	-	-	-	-	0.008	0.003
	N(b)	0.002	0.001	-	0.003	0.003	0.066	0.060
	N(c)	0.027	0.013	0.016	0.009	-	0.083	0.021
	S(b)	-	-	-	-	-	0.400	0.440
	S(c)	-	-	-	-	-	0.010	0.050
Total (Budget sector)		0.277	0.276	0.312	0.353	0.331	4.065	4.076
Total (Direct Commonwealth Funding)		0.277	0.276	0.312	0.353	0.331	4.065	4.076
B. Expenditure from other sources								
Department of Territories and Local Government								
. National Botanic Gardens	N(a)	-	-	-	-	0.001	-	0.001
	N(b)	-	0.012	0.002	0.007	0.018	0.007	0.018
Total (Other sources)		-	0.012	0.002	0.007	0.019	0.007	0.019
Total (A+B)		0.277	0.288	0.315	0.361	0.350	4.072	4.095

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

Department of Territories and Local Government

The Department of Territories and Local Government is responsible for the administration of the Australian Capital Territory and the Jervis Bay Territory. The Department's involvement in science and technology is mainly limited to management oriented activities such as the management of wildlife populations, forests, parks, nature reserves and rural land.

The Conservation and Agriculture Branch is responsible through the ACT Conservation Service for planning, development and management of nature reserves and rural land in the ACT and for conducting research into the wildlife population. Current programs include research on the thermal tolerance and general biology of native fish species in ACT waters and of the fish parasite *Lernea*. A total of \$186 000 has been allocated to the Branch for 1982-83 for science and technology-related activities.

Canberra probably has the largest range of urban tree species of any major city in the world. The Horticultural Services Unit handles a program of plant introduction, plant breeding, plant propagation, pest and disease control, turf collection and management, and aquatic weed growth and management. This program ensures a continuing high standard of horticultural practice. The Unit has allocated \$665 000 in 1982-83 for S&T.

The ACT forests are administered by the Forestry Branch of the Department. The Branch is researching environmental factors affecting plantation development. The 1982-83 projected expenditure is \$45 000.

A total of \$144 000 has been allocated to the Weight and Measures Office in 1982-83. The Office inspects and verifies all weighing and measuring instruments in use for trade purposes and checks the quantities of all pre-packaged articles sold or packed in the ACT.

The Department's Welfare Branch compiles statistics on various social welfare activities for management purposes, policy formulation, monitoring of activities, provision of information, research and investigation purposes, and also for inclusion in the WELSTAT project (standardisation of welfare statistics) conducted by the Department of Social Security, State and Territory Welfare Departments and ABS on an Australian-wide basis. A total of \$27 000 is projected expenditure during 1982-83.

The Housing Branch administers the Government's rental housing and housing finance assistance schemes in the ACT and carries out research to identify housing needs of the ACT population. A total of \$205 000 is projected for expenditure during 1982-83.

#### . National Botanic Gardens

The National Botanic Gardens has assembled, and continues to develop, a national collection of Australian and related floras for the purpose of education and display, scientific study, recreation and conservation.

The Gardens is a centre for research into the botany and horticulture of the Australian flora. Current projects include germination and cultivation of Australian terrestrial orchids with emphasis on endangered species, in-vitro micropropagation and the introduction and propagation of rare and endangered species.

#### National Capital Development Commission (NCDC)

The NCDC is responsible for the planning, design and construction of the city of Canberra as the National Capital of Australia.

Most of the Commission's studies are directed towards collecting basic data or seeking to find solutions to specific problems. Particular concerns include air quality, water quality, ecology, geology and economic evaluation. Activities planned for 1982-83 include monitoring and analysis of water and air quality, a survey of dieback and regeneration of trees in rural land of the ACT, preparation of a vegetation map of the ACT and economic evaluations of land and housing, retailing, industry and tourism developments.

TRANSPORT

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Transport and Construction								
. Marine Navigational								
Aids	N(a)	0.023	0.050	-	-	-	0.014	-
	N(b)	0.095	0.110	-	-	-	-	-
	N(c)	-	-	-	-	-	0.001	-
. Office of Road Safety:								
Road safety and emissions research	S(b)	0.173	0.150	0.297	0.208	0.457	0.208	0.457
	S(c)	0.350	0.300	0.268	0.149	0.390	0.149	0.390
. Transport Statistics and Related Information								
Grants for Transport Planning and Financial Assistance	S(b)						0.212	0.235
	N(c)	-	-	0.500	0.308	0.264	0.462	0.054
	S(c)	2.600	2.700	2.000	1.320	1.591	1.650	1.989
Bureau of Transport Economics								
	S(a)	0.001	-	-	-	-	0.050	0.075
	S(b)	0.008	0.010	0.019	-	-	2.642	3.105
	S(c)	-	-	-	-	-	0.141	0.098
	N(b)	0.021	0.027	0.052	-	-	-	-
	N(c)	0.002	0.002	0.006	0.010	-	0.010	-
Total (Direct Commonwealth Funding)		3.273	3.349	3.143	1.995	2.702	5.538	6.943

N Natural sciences and engineering      S Social sciences and humanities  
(a) Intramural capital expenditure      (b) Intramural current expenditure  
(c) Extramural expenditure

Department of Transport

. Marine Navigational Aids

The Department has an obligation to provide marine navigational aids in accordance with the requirements of enabling legislation, as described in a Forward Five-Year Plan endorsed by the Maritime Services Advisory Committee-Navigational Aids and in response to obligations under the Australian Heritage Commission Act 1975. Research and development functions are undertaken to ensure the provision, review and upkeep of the most effective visual, audio and electronic aids.

. Road Safety Division

The Road Safety Division conducts and sponsors research and disseminates research findings, literature and data. It develops road safety counter measures for consideration

by the Australian Transport Advisory Council (ATAC) and road safety organisations throughout Australia. The Division also operates and maintains a Vehicle Emission and Energy Laboratory and conducts testing and research programs to enable the development of emission and energy policy.

. Transport Statistics and Related Information

The Department collects and compiles various statistics and other information relating to sea transport activities and port labour usage and disputation. The aim of these collections is to provide an effective information base to assist the port, shipping and stevedoring industries, their customers and governments, in policy and management decision-making. Statistics relating to non-government railways are also collected.

. Grants to Transport Research Bodies

- Australian Rail Research and Development Organisation (ARRDO)

ARRDO is a national railway research organisation established in 1977 under the auspices of the Australian Transport Advisory Council, and is jointly supported by the Commonwealth and State Government-owned rail systems of Australia. ARRDO's work program concentrates on the financial, operational and managerial problems of Australian railways. The aim is to provide a basis on which a "national corporate plan" for railways can be developed.

- Australian Road Research Board (ARRB)

ARRB was established in 1960 by the National Association of Australian State Road Authorities as a national centre for road research. ARRB research covers "hardware" aspects of roads such as the suitability and economy of construction materials and methods, as well as the broader fields of road design, traffic engineering, transport planning and safety.

Bureau of Transport Economics (BTE)

- analysis of the nature, capacity, performance and financing of transport systems and their economic resource allocation implications;
- analyses of the effects of specific pricing and regulatory policies, including methods of rate and fare setting;
- evaluation of transport investment proposals and programs;
- collection, analysis and dissemination of information relating to transport activities;
- development of economic evaluation methods, transport planning procedures and operations research techniques; and
- application of inter-disciplinary approaches to analysis of transport problems.

The BTE has a secondary function of assisting State and local governments, Commonwealth and State instrumentalities and the private sector to identify and address transport problems.

TREASURY

(\$ million)	R&D					S&T (including R&D)		
		78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83
A. Commonwealth Budget sector net expenditure								
Department of the Treasury								
. Balance of Payments	S(a)	-	-	-	0.002	0.001	0.002	0.001
	S(b)	-	-	-	0.020	0.005	0.020	0.005
. Econometric Forecasting	S(b)	0.045	0.050	0.092	0.083	0.109	0.148	0.186
. Quantitative Studies	S(b)	-	-	-	-	-	0.017	0.019
Australian Bureau of								
Statistics	nS(a)	0.018	0.021	0.229	0.128	0.200	4.205	6.686
	nS(b)	1.532	1.784	2.316	3.758	3.684	110.714	86.744
Total (Direct Commonwealth funding, excluding FE)		1.594	1.855	3.991	4.066	3.998	115.106	93.640
B. Financial Enterprises sector								
Reserve Bank of Australia FE								
. Grant Schemes								
- Rural Credits	N(c)	0.951	1.080	1.260	1.990	2.080	1.990	2.080
- Economic and Financial Research	S(c)	0.114	0.119	0.124	0.155	0.120	0.155	0.120
. Studies of Australian financial system	S(b)	0.170	0.169	0.240	0.304	0.334	0.439	0.483
Total (Financial Enterprises sector)		1.235	1.368	1.624	2.449	2.534	2.584	2.683
Total (Direct Commonwealth funding including FE)		2.829	3.223	4.261	6.535	6.532	117.785	96.323
C. Expenditure from other sources								
Commonwealth Bank	S(c)	0.007	0.020	0.007	0.024	0.024	0.037	0.047
Total (Other sources)		0.007	0.020	0.007	0.024	0.024	0.037	0.047
Total (A+B+C)		2.836	3.243	4.268	6.464	6.556	117.726	96.370
N	Natural sciences and engineering			S	Social sciences and humanities			
(a)	Intramural capital expenditure			(b)	Intramural current expenditure			
(b)	Extramural expenditure							
FE	Commonwealth financial enterprise							

## Department of the Treasury

### . Quantitative Studies Section

The Section undertakes economic analysis of such issues as:

- the likely effects on the consumer price index of specified changes in industry prices, indirect taxes and tariffs;
- availability of skilled workers and other labour market matters;
- aspects of resource development;
- investment and profitability measures; and
- influences on wage and productivity growth.

### . Forecasting Unit

The Unit is developing the National Income Forecasting econometric (NIF) model which is intended for use in short-term forecasting and policy analysis within the Treasury. Treasury's interest in forecasting is directly related to its macroeconomic policy advising role and is thus concerned with all aspects of the aggregate economy.

### . Balance of Payments Section

The Section is currently undertaking research into ways of improving the monitoring and forecasting of Australian imports with the aid of a new data base.

## The Australian Bureau of Statistics (ABS).

The ABS is the central statistical authority for Australia. It provides statistical services for the Government and private sectors by collecting, compiling, analysing and disseminating social, demographic and economic statistics and related information. In addition, the ABS coordinates statistical operations of official bodies to ensure attainment of statistical compatibility and integration, avoidance of duplication, compliance with standards, and maximum utilisation of information. The Bureau also provides advice and assistance on statistical matters.

All ABS activities are regarded as S&T activities (predominantly data collection in the social sciences). In particular, the ABS has the responsibility for the conduct of triennial general R&D surveys in support of the Department of Science and Technology's Project SCORE and the triennial energy R&D survey.

In 1981-82 the R&D expenditure showed an increase as a result of greatly increased expenditure on a number of projects, including a Survey of Employers and the development of new classifications such as ASCO being included.

The movement in capital expenditure reported by the ABS is due to expenditure on new computer equipment (up from \$4m in 1981-82 to \$6m in 1982-83). The drop in current expenditure is due mainly to the heavy expenditure associated with the 1981 Census of Population and Housing conducted during 1981-82 e.g. \$11.4m in salaries and \$12.4m in payments to agents.

## Reserve Bank of Australia

The Reserve Bank of Australia is involved in the following scientific and technological activities:

- research into the Australian financial system using econometrics and other analytical methods;
- through its Economic and Financial Research Fund, the Bank assists post-graduate research outside the Bank into economic and financial topics relevant to Australia. During 1982-83 grants amounting to \$124 000 were approved. Two Fellowships in Economic Policy, which are usually tenable for one year were also awarded from the Fund; and
- grants are awarded from the Rural Credits Development Fund for research, development or extension projects directed towards the promotion of primary production. The main recipients of grants are universities, State departments of agriculture and the CSIRO. During 1982-83 sixty-three grants totalling about \$2m were allocated from the Rural Credits Development Fund (no major grants were made).



VETERANS' AFFAIRS

(\$ million)	R&D					S&T (including R&D)		
	78-79	79-80	80-81	81-82	Projected 82-83	81-82	Projected 82-83	
A. Commonwealth Budget sector net expenditure								
Department of Veterans' Affairs								
. Central Development Unit	N(b)	0.115	0.127	0.129	0.145	0.161	0.145	0.161
. Central Medical Research Advisory Committee	N(a)	0.038	0.029	0.042	0.040	0.040	0.040	0.040
	N(b)	0.205	0.244	0.232	0.280	0.280	0.280	0.280
Total (Direct Commonwealth funding)		0.358	0.400	0.402	0.465	0.481	0.465	0.481

N Natural sciences and engineering                      S Social sciences and humanities  
(a) Intramural capital expenditure                      (b) Intramural current expenditure  
(c) Extramural expenditure

Department of Veterans' Affairs

. Medical Research Grants

To encourage, facilitate, assess and coordinate medical research in the Department a Central Medical Research Advisory Committee (CMRAC) has been established. Based on the recommendations of this committee and subject to the required ethical safeguards being observed, the Department provides financial support to medical research proposals submitted by Departmental Officers. The objectives of the various research projects broadly cover three areas - establishment of techniques for medical investigative procedures, comparative studies of alternative treatment regimes and evaluation of rehabilitative methods.

. Central Development Unit

The Unit follows a continuous program of research into methods of improving artificial limbs and surgical appliances. The program includes assessment of materials and components use, testing of new materials and components, development of improved methods of fitting artificial limbs, evaluation and adoption of the results of overseas research, dissemination of information, education and treatment of problem cases.

## FURTHER DISSECTIONS OF AGGREGATE EXPENDITURES

## A. Expenditure by Ministry

Table 7: Intramural Commonwealth Government expenditure on S&amp;T by ministry, showing agencies with major R&amp;D performance

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Aboriginal Affairs	0.70	0.60	0.57	-	-	2.12	2.25	2.06	2.31
Admin. Services	-	-	-	0.01	-	-	-	0.01	0.07
Attorney-General's	1.29	1.47	1.87	2.50	2.98	2.29	2.84	3.57	3.99
Aviation	0.94	1.07	1.06	0.98	3.62	2.38	4.22	4.26	12.26
Communications									
. Telecom	26.3	27.0	35.6	38.0	41.6	49.9	62.2	74.5	81.0
. Other	0.79	0.92	1.02	0.78	1.05	1.70	1.99	2.39	3.57
Defence	85.47	91.96	105.49	112.17	118.19	124.29	135.78	142.70	149.22
Defence Support	-	0.03	0.03	-	-	6.06	7.37	10.38	12.05
Education & Y.A.	1.18	0.93	1.02	0.81	0.44	2.35	2.70	2.20	1.35
Employment & Ind. Relations	0.15	0.42	0.78	1.60	1.20	1.61	1.59	2.10	1.69
Foreign Affairs	-	-	-	-	-	1.10	1.50	1.98	2.90
Health									
. Aust. Radiation. Lab	2.30	1.88	1.78	2.11	2.59	2.57	2.67	3.16	3.76
. Inst. of Health	0.47	1.66	2.19	2.06	1.99	2.41	3.05	3.02	2.93
. Comm. Serum Lab.	2.85	3.50	3.22	3.87	4.04	3.50	3.87	4.51	4.78
. National Biol. Standards Lab.	1.68	1.87	2.29	2.27	2.59	3.82	5.06	4.90	5.61
. Other	2.01	1.99	2.42	1.99	3.23	3.48	3.53	4.05	6.66
Home Affairs & Environment									
. Supervising Scientist	0.81	1.68	3.03	3.71	4.33	1.68	3.03	3.71	4.33
. Other	0.16	0.13	0.09	0.14	0.13	10.92	12.70	15.76	16.63
Housing & Construction	2.52	2.82	2.32	1.88	2.00	74.96	79.36	89.52	97.11
Immigration & Ethnic Affairs	0.10	0.12	0.16	0.12	0.09	0.72	1.74	2.42	4.19
Industry and Commerce	0.84	0.98	1.31	1.77	1.79	1.03	1.33	1.80	1.82
Primary Industry	1.08	1.08	1.11	1.43	1.58	30.97	36.97	47.98	52.06
P.M. & Cabinet	-	-	-	-	-	0.75	0.95	1.19	1.33
Resources & Energy									
. AAEC	14.60	16.73	19.99	25.65	26.43	27.54	28.37	40.83	41.35
. BMR	9.71	8.17	9.54	13.63	16.13	13.71	15.62	19.59	21.25
. Other	0.01	0.02	..	0.02	0.02	7.45	11.15	12.28	13.04

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Science & Technology									
. AATB (Australian funds only)	1.04	1.01	1.62	1.61	1.74	1.01	1.62	1.61	1.74
. Antarctic Div.	7.19	11.80	16.59	16.90	24.87	20.28	22.64	22.91	32.61
. AIMS	2.80	3.58	5.22	5.76	6.49	3.58	5.22	5.76	6.61
. CSIRO	163.63	191.13	224.03	283.25	316.45	199.01	232.74	298.16	332.49
. Other	0.80	0.78	0.96	1.09	1.23	54.46	61.64	64.96	82.78
Social Security	-	-	-	-	-	0.05	0.14	0.44	0.53
Special Ministry	-	-	-	0.03	0.26	-	0.01	0.12	0.86
Territories & L.G.	0.25	0.26	0.30	0.34	0.33	3.31	3.32	3.84	4.01
Transport	0.32	0.35	0.37	0.21	0.46	2.58	3.06	3.13	3.87
Treasury									
. ABS	1.55	1.81	2.55	3.89	3.88	64.04	87.80	114.92	93.43
. Other	0.22	0.21	0.33	0.40	0.45	0.26	0.54	0.62	0.69
Veterans' Affairs	0.36	0.40	0.40	0.47	0.48	0.40	0.40	0.47	0.48
Total (Direct Commonwealth funding of intramural expenditure)	334.1	378.3	449.3	531.5	592.6	728.3	851.0	1017.8	1090.8

Table 8: Extramural Commonwealth Government expenditure on S&T by ministry, showing major R&D grants programs

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Aboriginal Affairs	0.68	0.62	0.56	0.62	0.66	1.08	1.04	0.91	0.96
Admin. Services	-	-	-	-	-	-	-	-	-
Attorney-General's	0.06	0.07	0.32	0.34	0.37	0.07	0.32	0.34	0.38
Aviation	0.20	0.21	0.24	0.36	0.45	9.22	12.15	13.53	16.35
Communications	0.49	0.55	0.94	1.33	1.73	0.58	1.08	6.54	7.36
Defence	0.40	0.37	0.40	0.74	1.04	6.05	6.86	17.35	20.72
Defence Support	-	-	-	-	-	0.03	0.02	0.03	-
Education & Y.A.									
. Post-grad, awards	8.00	7.58	7.76	8.54	11.30	8.48	8.81	9.58	12.71
. Special Research Grants	64.3	69.0	77.0	85.0	100.9	69.0	77.0	85.0	100.9
. Other	2.33	2.12	2.83	2.67	2.25	2.38	3.64	3.10	2.61
Employment & Ind. Relations	-	-	0.03	0.11	0.14	0.17	0.22	0.33	0.39
Foreign Affairs									
. ACIAR	-	-	-	-	2.80	-	-	-	2.80
. ADAB	13.06	13.00	16.14	23.27	28.91	57.83	71.53	103.92	138.68
. Other	0.05	0.05	0.38	0.21	0.44	0.54	1.23	0.51	0.67
Health									
. NH&MRC	13.18	14.00	18.70	25.65	29.75	14.00	18.70	25.65	29.75
. Other	0.40	0.64	0.69	2.87	4.96	2.46	2.60	4.44	6.34
Home Affairs & Environment	0.57	0.73	0.81	0.76	0.62	4.59	4.79	1.89	2.30
Housing & Construction	0.28	0.34	0.42	0.14	0.25	2.65	3.07	3.67	4.62
Immigration & Ethnic Affairs	0.20	0.33	0.36	0.27	0.34	0.35	0.71	0.73	0.88
Industry & Commerce	0.09	0.08	0.03	0.11	0.24	0.13	0.09	0.16	0.28
Primary Industry									
. Rural Research	8.75	11.83	14.86	16.54	19.93	13.54	16.29	18.25	22.81
. Other	4.26	2.52	2.49	0.70	0.88	6.32	6.77	1.52	2.01
P.M. & Cabinet	0.04	0.04	0.06	0.05	0.04	0.16	0.22	0.18	0.15
Resources & Energy									
. Energy R,D&D grants	3.63	4.71	6.35	9.27	11.17	5.19	7.00	10.41	12.50
. Other	1.18	1.64	1.88	2.21	1.91	11.32	11.92	11.96	13.77
Science & Technology									
. AIRDIB	22.50	29.95	45.71	21.75	44.10	29.95	45.71	21.75	44.10
. AMSTAC-FAP	-	0.39	2.00	1.90	2.12	0.39	2.00	1.90	2.12
. ARGC	12.30	12.80	14.49	16.99	19.64	12.80	14.49	16.99	19.64

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
. Research									
Association grants	0.87	0.78	0.88	1.21	1.34	0.78	0.88	1.21	1.34
Other	3.90	5.61	4.39	4.45	4.81	15.92	16.83	13.91	18.11
Social Security	0.12	0.15	0.15	0.24	0.19	0.63	0.98	1.35	1.09
Special Ministry	0.03	0.12	0.19	0.19	0.21	0.16	0.23	0.32	0.34
Territories & L.G.	0.03	0.01	0.02	0.01	-	0.48	0.64	0.27	0.07
Transport	2.95	3.0	2.77	1.79	2.25	6.86	6.59	2.41	3.24
Treasury									
Reserve Bank grants	1.07	1.20	1.38	2.15	2.20	1.20	1.38	2.15	2.20
Veterans' Affairs	-	-	-	-	-	-	-	-	-
Total (Direct Commonwealth funding of extramural expenditure)	165.9	184.5	225.2	232.4	297.9	285.3	345.8	382.2	492.0

Table 9: Intramural Commonwealth Government expenditure on S&T by ministry, natural sciences and engineering

	(\$ million)	R&D					S&T (including R&D)			
		78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Aboriginal Affairs	(a)	0.11	0.15	0.23	-	-	0.15	0.23	-	-
	(b)	0.59	0.45	0.35	-	-	0.45	0.35	-	-
Administrative Services	(b)	-	-	-	0.01	-	-	-	0.01	0.07
Attorney-General's		-	-	-	-	-	-	-	-	-
Aviation	(a)	0.60	0.70	0.80	0.70	3.30	0.70	2.40	2.10	9.90
	(b)	0.22	0.24	0.26	0.28	0.32	0.56	1.06	1.22	1.33
Communications	(a)	1.9	2.2	8.0	6.3	4.8	4.1	10.4	10.4	9.8
	(b)	24.4	25.0	27.7	31.5	36.7	46.7	52.9	65.3	73.5
Defence	(a)	6.80	9.25	7.80	8.18	11.07	23.22	14.54	12.51	13.88
	(b)	78.66	82.71	97.70	103.99	107.13	101.06	121.24	130.19	135.34
Defence Support	(a)	-	-	-	-	-	0.97	0.59	1.64	1.38
	(b)	-	0.03	0.03	-	-	5.09	6.78	8.74	10.66
Education & Y.A.		-	-	-	-	-	-	-	-	-
Employment & Ind Relations	(b)	0.05	0.07	0.12	0.21	-	0.24	0.26	0.29	0.04
Foreign Affairs	(b)	-	-	-	-	-	0.84	1.19	1.50	2.35
Health	(a)	1.91	1.33	1.86	1.38	2.73	1.93	2.84	2.43	5.11
	(b)	7.40	9.57	10.04	10.92	11.71	13.85	15.34	17.21	18.63
Home Affairs & Environment	(a)	0.28	0.40	0.97	1.65	1.69	1.26	2.11	2.82	3.08
	(b)	0.57	1.34	2.07	2.08	2.67	3.41	4.57	5.22	6.11
Housing & Construction	(a)	0.29	0.32	0.32	0.22	0.23	18.16	16.18	21.42	21.43
	(b)	2.23	2.50	2.00	1.66	1.78	56.80	63.18	68.09	75.68
Immigration and Ethnic Affairs		-	-	-	-	-	-	-	-	-
Industry & Commerce	(a)	0.01	0.06	0.02	..	..	0.09	0.02	0.01	..
	(b)	0.09	0.05	0.03	0.06	0.06	0.06	0.05	0.09	0.09
Primary Industry	(a)	0.01	0.01	0.01	0.04	0.02	0.03	0.04	0.61	0.07
	(b)	0.20	0.23	0.24	0.33	0.46	26.23	31.48	40.77	45.09

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Prime Minister and Cabinet	(b) -	-	-	-	-	0.38	0.55	0.60	0.69
Resources & Energy	(a) 1.23	1.35	1.34	2.21	4.99	2.27	2.65	3.89	7.41
	(b) 23.10	23.57	28.21	37.08	37.59	46.44	52.50	68.56	67.96
Science and Technology	(a) 36.35	56.63	65.81	77.05	88.87	69.60	77.20	83.82	99.05
	(b) 134.99	146.71	176.94	227.64	257.64	202.90	239.01	303.87	334.53
Social Security Special Ministry	(a) -	-	-	0.02	0.15	-	-	0.02	0.15
	(b) -	-	-	0.01	0.11	-	0.01	0.11	0.70
Territories & L.G.	(a) ..	..	0.01	..	0.01	0.59	0.35	0.58	0.46
	(b) 0.19	0.20	0.22	0.25	0.22	2.26	2.46	2.65	2.87
Transport	(a) 0.02	0.05	-	-	-	0.05	0.04	0.01	-
	(b) 0.12	0.14	0.05	-	-	0.14	0.05	-	-
Treasury	(a) -	-	-	..	0.01	-	-	..	0.01
	(b) -	-	-	0.13	0.14	-	-	0.13	0.14
Veterans' Affairs	(a) 0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.04
	(b) 0.32	0.37	0.36	0.43	0.44	0.37	0.36	0.43	0.44
Total (Direct Commonwealth funding)	322.7	365.6	433.5	514.4	574.8	629.9	722.9	857.3	948.0

(a) Intramural capital expenditure

(b) Intramural current expenditure

Table 10: Extramural Commonwealth Government expenditure on S&T by ministry, natural sciences and engineering

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Aboriginal Affairs	-	-	-	0.01	0.01	-	0.10	0.13	0.16
Administrative Services	-	-	-	-	-	-	-	-	-
Attorney-General's	-	-	-	-	-	-	-	-	-
Aviation	0.20	0.21	0.21	0.35	0.45	9.22	12.12	13.50	16.35
Communications	0.5	0.5	0.9	1.2	1.7	0.6	1.1	6.3	7.3
Defence	0.40	0.37	0.40	0.74	1.04	6.05	6.86	17.35	20.72
Defence Support	-	-	-	-	-	0.03	0.02	0.03	-
Education & Y.A.	50.7	53.8	60.8	67.2	81.2	54.3	61.4	67.5	81.6
Employment & Ind Relations	-	-	0.01	-	-	0.16	0.17	0.16	0.16
Foreign Affairs	11.30	11.05	12.88	17.26	23.95	42.08	59.63	69.90	93.90
Health	13.19	14.21	18.61	27.36	33.60	14.21	18.62	27.37	33.61
Home Affairs & Environment	0.55	0.69	0.79	0.73	0.62	4.51	4.69	1.82	2.27
Housing and Construction	0.28	0.34	0.42	0.14	0.25	2.65	3.07	3.67	4.62
Immigration & Ethnic Affairs	-	-	-	-	-	-	-	-	-
Industry and Commerce	0.09	0.08	0.02	0.02	0.04	0.08	0.02	0.02	0.04
Primary Industry	12.11	13.77	16.75	16.93	20.45	19.22	22.44	19.46	24.44
P.M. & Cabinet	0.03	0.03	0.05	0.03	0.03	0.04	0.05	0.04	0.04
Resources & Energy	4.69	6.26	8.14	11.11	12.65	16.43	18.82	21.98	25.82
Science & Technology	37.06	46.93	64.53	42.42	67.55	57.12	76.82	51.73	80.66
Social Security	-	-	-	-	-	-	-	-	-
Special Ministry	0.03	0.12	0.19	0.19	0.21	0.16	0.22	0.26	0.30
Territories & L.G.	0.03	0.01	0.02	0.01	-	0.43	0.41	0.22	0.02
Transport	0.52	0.54	0.51	0.32	0.26	4.74	4.26	0.47	0.59
Treasury	0.95	1.08	1.26	1.99	2.08	1.08	1.26	1.99	2.08
Veterans' Affairs	-	-	-	-	-	-	-	-	-
<b>Total (Direct Commonwealth funding)</b>	<b>132.6</b>	<b>150.0</b>	<b>186.5</b>	<b>188.0</b>	<b>246.2</b>	<b>234.1</b>	<b>292.1</b>	<b>303.9</b>	<b>394.7</b>



Table 11: Intramural Commonwealth Government expenditure on S&T by ministry, social sciences and humanities

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Aboriginal Affairs	(a) -	-	-	-	-	0.03	0.16	0.09	0.11
	(b) -	-	-	-	-	1.49	1.52	1.97	2.19
Administrative Services	-	-	-	-	-	-	-	-	-
Attorney-General's	(a) 0.01	..	0.02	..	0.03	0.02	0.03	0.02	0.04
	(b) 1.28	1.47	1.85	2.51	2.96	2.27	2.81	3.55	3.95
Aviation	(b) 0.12	0.13	-	-	-	1.12	0.76	0.93	1.03
Communications	(a) 0.05	0.06	0.07	0.10	0.10	0.06	0.07	0.10	0.10
	(b) 0.71	0.74	0.83	0.99	1.10	0.76	0.85	1.04	1.15
Defence	-	-	-	-	-	-	-	-	-
Defence Support	-	-	-	-	-	-	-	-	-
Education & Y.A.	(b) 1.18	0.93	1.02	0.81	0.44	2.35	2.70	2.20	1.35
Employment & Ind Relations	(a) -	-	-	0.01	-	-	..	0.01	-
	(b) 0.09	0.35	0.67	1.38	1.20	1.37	1.32	1.80	1.65
Foreign Affairs	(b) -	-	-	-	-	0.27	0.32	0.49	0.56
Health	-	-	-	-	-	-	-	-	-
Home Affairs & Environment	(a) ..	..	-	0.02	-	1.24	1.41	1.95	2.28
	(b) 0.12	0.06	0.08	0.09	0.10	6.69	7.65	9.49	9.49
Housing & Construction	-	-	-	-	-	-	-	-	-
Immigration & Ethnic Affairs	(a) -	-	-	-	-	-	0.22	0.14	1.55
	(b) 0.10	0.12	0.16	0.12	0.09	0.72	1.52	2.28	2.64
Industry & Commerce	(b) 0.74	0.88	1.26	1.71	1.72	0.88	1.26	1.71	1.72
Primary Industry	(a) -	-	-	-	-	0.04	0.03	-	-
	(b) 0.88	0.84	0.85	1.06	1.10	4.68	5.42	6.60	6.90

(\$ million)	R&D					S&T (including R&D)				
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83	
P.M. & Cabinet	(a) -	-	-	-	-	-	-	-	0.01	
	(b) -	-	-	-	-	0.36	0.40	0.59	0.63	
Resources & Energy	(a) -	-	-	-	-	-	-	0.01	0.02	
	(b) -	-	-	-	-	-	-	0.25	0.26	
Science & Technology	(a) 0.83	1.10	1.20	0.23	0.20	1.10	1.20	0.23	0.20	
	(b) 3.30	3.87	4.48	3.69	4.08	5.75	6.50	5.49	5.88	
Social Security Special Ministry Territories & L.G.	(b) -	-	-	-	-	0.05	0.14	0.44	0.53	
Transport	(b) 0.06	0.06	0.07	0.09	0.10	0.45	0.52	0.61	0.67	
	(a) -	-	-	-	-	0.04	0.01	0.05	0.08	
	(b) 0.18	0.16	0.32	0.21	0.46	2.35	2.96	3.06	3.80	
Treasury	(a) 0.02	0.02	0.23	0.13	0.19	0.54	11.14	4.21	6.68	
	(b) 1.75	2.00	2.65	4.03	3.99	63.77	77.20	111.21	87.29	
Veterans' Affairs	-	-	-	-	-	-	-	-	-	
Total (Direct Commonwealth funding)	11.42	12.80	15.75	17.17	17.84	98.38	128.10	160.49	142.75	
(a) Intramural capital expenditure						(b) Intramural current expenditure				

Table 12: Extramural Commonwealth Government expenditure on S&T by ministry, social sciences and humanities

(\$ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Aboriginal Affairs	0.68	0.62	0.56	0.62	0.65	1.08	0.95	0.77	0.80
Administrative Services	-	-	-	-	-	-	-	-	-
Attorney -General's	0.06	0.07	0.32	0.34	0.37	0.07	0.32	0.34	0.38
Aviation	-	-	0.03	0.01	-	-	0.03	0.03	-
Communications	-	0.03	-	0.18	-	0.03	-	0.21	-
Defence	-	-	-	-	-	-	-	-	-
Defence Support	-	-	-	-	-	-	-	-	-
Education & Youth Affairs	23.53	24.92	26.83	29.01	33.23	25.53	28.04	30.17	34.58
Employment & Industrial Relations	-	-	0.03	0.11	0.14	0.01	0.05	0.17	0.23
Foreign Affairs	1.82	2.00	3.64	6.22	8.19	16.29	13.14	34.53	48.25
Health	0.39	0.43	0.78	1.16	1.11	2.24	2.68	2.72	2.48
Home Affairs and Environment	0.02	0.04	0.02	0.03	-	0.04	0.10	0.07	0.03
Housing and Construction	-	-	-	-	-	-	-	-	-
Immigration & Ethnic Affairs	0.20	0.33	0.36	0.27	0.34	0.35	0.71	0.73	0.88
Industry and Commerce	-	-	0.01	0.09	0.20	0.05	0.08	0.14	0.24
Primary Industry	0.91	0.59	0.60	0.30	0.36	0.63	0.62	0.31	0.37
Prime Minister and Cabinet	0.01	0.01	0.02	0.01	0.01	0.12	0.17	0.14	0.11
Resources & Energy	0.12	0.09	0.10	0.36	0.43	0.09	0.10	0.39	0.46
Science and Technology	2.50	2.60	2.94	3.88	4.46	2.72	3.09	4.04	4.64
Social Security	0.12	0.15	0.15	0.24	0.19	0.63	0.98	1.35	1.09
Special Ministry	-	-	-	-	-	-	0.02	0.06	0.04
Territories & L.G.	-	-	-	-	-	0.05	0.23	0.01	0.05
Transport	2.43	2.46	2.27	1.47	1.98	2.56	2.33	1.94	2.48
Treasury	0.11	0.12	0.12	0.16	0.12	0.12	0.12	0.16	0.12
Veterans' Affairs	-	-	-	-	-	-	-	-	-
Total (Direct Commonwealth funding)	33.3	34.4	38.8	44.5	51.8	52.1	53.7	78.3	97.2

B. R&D Expenditure by Socio-economic Objective

Table 13: Intramural Commonwealth Government expenditure on R&D in the natural sciences and engineering by socio-economic objective

Objective Category		(\$m)				
		1978-79	1979-80	1980-81	1981-82	1982-83
<b>National security</b>						
. Defence	(a)	6.81	9.25	7.80	8.18	11.07
	(b)	78.71	82.75	97.73	103.99	107.13
<b>Economic development</b>						
. Agriculture	(a)	16.14	32.25	41.83	45.89	35.82
	(b)	33.88	38.60	42.87	54.94	62.03
. Other primary industries	(a)	1.35	1.71	0.86	2.54	3.53
	(b)	10.28	11.99	12.84	16.62	18.30
. Mining	(a)	1.94	1.55	2.20	2.90	3.57
	(b)	12.32	10.74	13.72	20.04	22.18
. Manufacturing	(a)	5.53	6.01	5.90	9.65	12.54
	(b)	31.04	32.38	40.39	51.86	58.21
. Construction	(a)	1.33	0.88	0.59	0.56	0.61
	(b)	7.03	7.29	7.13	8.60	9.42
. Energy	(a)	2.91	3.58	4.31	5.50	11.10
	(b)	19.60	22.32	27.75	37.36	41.73
. Transport	(a)	0.62	0.75	0.80	0.70	3.30
	(b)	0.34	0.38	0.31	0.29	0.32
. Communications	(a)	1.92	2.16	8.08	6.27	4.77
	(b)	24.51	25.08	27.74	31.60	36.79
. Economic services n.e.i.	(a)	0.98	1.26	1.16	1.86	1.61
	(b)	5.97	6.60	7.45	10.76	10.81
<b>Sub-total</b>						
	(a)	32.73	50.14	65.72	75.86	76.84
	(b)	144.96	155.35	180.20	232.08	259.78
<b>Community welfare</b>						
. Environment*	(a)	3.34	4.12	3.63	5.42	13.31
	(b)	22.28	22.02	27.17	33.52	37.47
. Health	(a)	2.98	2.67	2.44	1.67	2.95
	(b)	10.38	12.66	13.57	14.88	15.55
. Education		-	-	-	-	-
. Welfare		-	-	-	-	-
. Community services n.e.i.	(a)	0.01	0.01	..	0.02	0.15
	(b)	0.21	0.24	0.22	0.22	0.11
<b>Sub-total</b>						
	(a)	6.33	6.80	6.08	7.10	16.42
	(b)	32.86	34.92	40.95	48.62	53.13

Objective Category		(\$m)				
		1978-79	1979-80	1980-81	1981-82	1982/83
Advancement of knowledge						
. General advancement of knowledge						
	(a)	3.70	6.24	7.61	6.62	13.54
	(b)	16.61	20.11	27.46	31.91	36.92
Total	(a)	49.56	72.43	87.20	97.77	117.86
	(b)	273.13	293.12	346.34	416.59	456.95

\* Includes both "Environment" and "Urban and regional planning" objectives.

Table 14: Extramural Commonwealth Government expenditure on R&D in the natural sciences and engineering by socio-economic objective

Objective Category	(\$m)				
	1978-79	1979-80	1980-81	1981-82	1982-83
National security					
. Defence	0.40	0.37	0.40	0.74	1.04
Economic development					
. Agriculture	12.59	14.25	17.11	18.09	20.91
. Other primary industries	0.59	0.78	1.24	1.24	2.02
. Mining	0.12	0.11	0.16	0.18	0.14
. Manufacturing	23.62	30.99	46.78	23.29	45.91
. Construction	0.14	0.20	0.27	0.16	0.28
. Energy	3.94	5.20	6.81	9.16	11.06
. Transport	2.67	4.18	3.44	2.75	2.90
. Communications	0.49	0.52	0.94	1.15	1.73
. Economic services n.e.i.	0.60	0.84	1.03	1.47	1.24
Sub-total	44.76	57.06	77.78	57.49	86.18
Community welfare					
. Environment*	0.73	0.85	0.89	0.77	0.63
. Health	13.22	14.24	18.62	27.36	33.60
. Education**	-	-	-	-	-
. Welfare	-	-	-	-	-
. Community services n.e.i.#	11.34	11.20	13.12	17.48	24.17
Sub-total	25.29	26.29	32.63	45.61	58.40
Advancement of knowledge					
. General advancement of knowledge	61.6	65.8	75.7	84.1	100.5
Total	132.1	149.5	186.5	188.0	246.2

\* Includes both "Environment" and "Urban and regional planning" objectives.

\*\* R&D funded by the Minister for Education for the purpose of producing qualified researchers or for supporting normal academic activities has been included in "General advancement of knowledge". Only research mainly directed towards education processes or education administration has been included in the "Education" objective.

# Includes overseas development assistance R&D

Table 15: Intramural Commonwealth Government expenditure on R&D in the social sciences and humanities by socio-economic objective

Objective Category	(\$m)				
	1978-79	1979-80	1980-81	1981-82	1982-83
National security					
. Defence	-	-	-	-	-
Economic development					
. Agriculture	(a) -	-	-	-	-
	(b) 0.88	0.84	0.86	1.06	1.10
. Other primary industries	-	-	-	-	-
. Mining	-	-	-	-	-
. Manufacturing	(a) -	0.01	0.01	-	-
	(b) 0.02	0.02	0.03	0.01	0.01
. Construction	(a) -	..	0.01	-	-
	(b) 0.05	0.13	0.15	0.09	-
. Energy	(a) -	-	..	..	0.01
	(b) 0.01	-	0.04	0.04	0.11
. Transport	(a) ..	..	0.02	0.01	0.02
	(b) 0.49	0.43	0.51	0.50	0.83
. Communications	(a) 0.05	0.06	0.07	0.10	0.10
	(b) 0.71	0.74	0.83	0.99	1.10
. Economic services n.e.i.	(a) 0.83	1.10	1.27	0.30	0.31
	(b) 4.80	5.75	6.91	8.02	8.42
Sub-total	(a) 0.88	1.16	1.39	0.42	0.44
	(b) 6.97	7.91	9.31	10.62	11.57
Community welfare					
. Environment*	(a) -	-	-	..	..
	(b) 0.06	0.06	0.07	0.11	0.12
. Health	(a) -	..	0.01	..	..
	(b) 0.08	0.15	0.13	0.11	0.05
. Education	(a) ..	-	..	0.01	0.01
	(b) 1.21	0.95	1.06	1.02	0.67
. Welfare	(a) 0.01	0.01	0.03	0.02	0.02
	(b) 0.30	0.55	1.02	1.66	1.54
. Community services n.e.i.	(a) 0.01	0.01	0.08	0.03	0.04
	(b) 1.87	2.00	2.65	3.02	3.20
Sub-total	(a) 0.03	0.02	0.13	0.06	0.07
	(b) 3.52	3.71	4.92	5.91	5.58
Advancement of knowledge					
. General advancement of knowledge	(a) -	-	-	0.01	0.01
	(b) 0.04	-	-	0.17	0.17
Total	(a) 0.90	1.18	1.51	0.48	0.52
	(b) 10.52	11.62	14.24	16.70	17.32

\* Includes both "Environment" and "Urban and regional planning" objectives.

Table 16: Extramural Commonwealth Government expenditure on R&D in the social sciences and humanities by socio-economic objective

Objective Category	(\$m)				
	1978-79	1979-80	1980-81	1981-82	1982-83
National security					
. Defence	-	-	-	-	-
Economic development					
. Agriculture	0.91	0.59	0.60	0.30	0.36
. Other primary industries	-	-	-	-	-
. Mining	-	-	-	-	-
. Manufacturing	0.01	0.01	0.01	0.02	-
. Construction	-	-	-	-	-
. Energy	0.09	0.07	0.07	0.35	0.39
. Transport	2.95	3.00	2.30	1.48	1.98
. Communications	-	0.03	-	0.18	..
. Economic services n.e.i.	0.14	0.14	0.52	0.56	0.83
Sub-total	4.09	3.83	3.49	2.89	3.56
Community welfare					
. Environment*	-	-	0.01	-	-
. Health	0.39	0.43	0.78	1.16	1.11
. Education**	2.36	2.16	2.88	2.67	2.29
. Welfare	0.32	0.48	0.52	0.58	0.64
. Community services n.e.i.#	2.05	2.23	3.69	6.49	8.25
Sub-total	5.12	5.30	7.86	10.90	12.30
Advancement of knowledge					
. General advancement of knowledge	24.6	25.9	27.4	30.7	35.9
Total	33.8	35.0	38.8	44.5	51.8

\* Includes both "Environment" and "Urban and regional planning" objectives.

\*\* R&D funded by the Minister for Education for the purpose of producing qualified researchers or for supporting normal academic activities has been included in "General advancement of knowledge". Only research mainly directed towards education processes or education administration has been included in the "Education" objective.

# Includes overseas development assistance R&D



### C. Categories of S&T

Table 17: Commonwealth S&T approximate expenditure in the natural sciences and engineering, by category of S&T activity.

S&T Category		\$m			
		79-80	80-81	81-82	82-83
. Promotional S&T					
. Demonstration of both technical and commercial viability	(ab)	7	8	10	11
	(c)	4	5	4	7
. Design for innovative production	(ab)	24	26	36	39
	(c)	7	8	17	21
. Technology transfer, extension services, other active diffusion of S&T skills and know-how	(ab)	5	10	8	9
	(c)	20	32	28	37
Sub-totals	(ab)	36	44	54	59
	(c)	32	49	49	65
<b>S&amp;T Services</b>					
. Advanced scientific or engineering services	(ab)	78	81	80	88
	(c)	12	15	24	29
. Policy -related studies using advanced techniques	(ab)	0.5	2	2	3
	(c)	0.9	2	0.5	0.7
. Testing, standardisation, metrology and quality control	(ab)	54	60	72	85
	(c)	5	5	4	5
. Patenting and licensing	(ab)	6	6	8	8
	(c)	0.2	0.3	0.3	0.7
. Data collection in the natural sciences	(ab)	51	53	51	60
	(c)	23	27	26	33
. Scientific and technological information and documentation	(ab)	16	18	19	20
	(c)	0.6	1	1	1.4
. Services associated with scientific and technological collections	(ab)	2	2	2	2
	(c)	0.1	0.1	0.2	0.1
Sub-totals	(ab)	208	222	234	265
	(c)	42	41	56	70
Administration of S&T activities, policy, planning and other studies of S&T, n.e.c.	(ab)	24	25	32	31
	(c)	2	2	2	2
Scientific and technical education and training	(ab)	2	1	1	2
	(c)	9	11	17	16

(ab) Intramural expenditure (capital and current) (c) Extramural expenditure

Tables 17 and 18 present approximate information for individual categories of S&T (other than R&D). However, this aspect of the data must still be regarded as experimental and apparent trends for particular categories may not be significant. Two of the extramural expenditure categories in Table 17 (technology transfer, extension services, or the active diffusion of S&T skills and know-how; and advanced scientific or engineering services) are dominated by ADAB figures which mask a much smaller level of activity within Australia. See Appendix 5 for a more detailed description of the categories.

For S&T activities (other than R&D) respondents were asked to indicate the proportion of their expenditure which could be attributed to particular categories. In a few cases, where respondents had failed to do so, estimates were made by the Department of Science and Technology on the basis of whatever information was available. Some cautionary considerations are as follows:

- . There is a particular demarcation problem between the first two categories of Promotional S&T, so that the figures for these categories may be better considered in aggregation. Similarly, administration of S&T activities, etc. is overstated, as several respondents could have better distributed what are essentially overhead activities to particular categories.
- . In Table 18, the figures for policy-related studies and data collection in the social sciences are likely to be considerable understatements of the level of Commonwealth activity in these areas (particularly in relation to financial data collection) since the guidelines for inclusion of S&T activities (other than R&D) provided, in general, that such activities were only included where the total S&T activity accounted for the majority of costs of the organisational unit or program. (See Appendix 5 for further details.) Although the level may be understated, the peaking of expenditure in 1981-82 is nevertheless real, being a reflection of ABS peak activity associated with the quinquennial Australian census.

It is stressed that the data presented in Tables 17 and 18 remain approximate at this stage. The sub-totals are better indications of trends than most individual categories. It is expected that more firmly based estimates will be presented in the next Statement, following further refinement of the data base.

Table 18: Commonwealth S&T approximate expenditure in the social sciences and humanities, by category of S&T activity.

S&T Category		\$m			
		79-80	80-81	81-82	82-83
Promotional S&T					
. Demonstration of both technical and commercial viability		-	-	-	-
. Design for innovative production		-	-	-	-
. Technology transfer, extension services, other active diffusion of S&T skills and know-how	(ab)	2	2	2	2
	(c)	5	4	9	12
Sub-totals	(ab)	2	2	2	2
	(c)	5	4	9	12
S&T Services					
. Advanced services in the social sciences	(ab)	0.8	0.6	1	0.8
	(c)	0.4	0.5	0.5	0.2
. Policy -related studies using advanced techniques	(ab)	2	3	4	5
	(c)	1	1	1	1
. Testing, standardisation, metrology and quality control		-	-	-	-
. Patenting and licensing		-	-	-	-
. Data collection in the social sciences	(ab)	66	89	116	95
	(c)	1	2	2	2
. Scientific and technological information and documentation	(ab)	10	12	14	15
	(c)	0.5	0.8	0.7	2
. Services associated with scientific and technological collections		-	-	-	-
Sub-totals	(ab)	79	105	135	116
	(c)	3	8	4	5
Administration of S&T activities, policy, planning and other studies of S&T, n.e.c.	(ab)	2	3	3	4
	(c)	0.2	0.3	0.4	0.3
Scientific and technical education and training	(ab)	0.4	0.5	0.4	0.3
	(c)	8	3	13	18

(ab) Intramural expenditure (capital and current) (c) Extramural expenditure

## INTERNATIONAL COMPARISONS AND TRENDS (1)

Total resources devoted to R&D

Figure 3 and Table 19 (overpage) show the source of funds and sector of performance of R&D expenditure of OECD member countries for 1979 (or nearest year for which data are available), grouped according to gross expenditure on R&D (GERD). The figure shows that all the large R&D performing OECD countries are also highly R&D intensive and perform the greater part of their R&D in the business enterprise sector. Of those countries for which recent estimates are available only New Zealand, Portugal and Iceland had higher proportions of government performance and funding of R&D than Australia. Another feature of particular note is the very low proportion of funds provided for R&D by business enterprise in Australia. Figure 3 indicates that only in New Zealand, Portugal and Iceland does the business enterprise sector contribute a lower proportion of GERD as a percentage of GDP.

Figure 4 shows the variation over time of GERD as a percentage of GDP. It can be seen that in comparison with other OECD countries, Australia's position on this scale had been close to the median but that between 1973 and 1976 our position deteriorated. This was a result of a sharp decline in business enterprise sector R&D in Australia, a decline in strong contrast with the stabilisation or increase in privately funded business enterprise R&D which occurred over the years prior to 1976 in almost all other OECD countries. The latest survey information indicates that while the decline in Australian private business enterprise R&D had been arrested by 1978-79 (2) there has been no subsequent recovery. Private business enterprise R&D funding declined by 3% in real terms between 1978-79 and 1981-82. These trends are shown at the foot of Table 19.

Government funding for R&D socio-economic objectives

Table 20 shows for twelve countries the distribution of Government funds to R&D in selected OECD socio-economic objective categories. The funding levels are expressed as parts per 10 000 of GDP. By comparison with the median values for countries other than Australia for which data are available, it can be seen that Australian Government funding in 1978-79 was high for agriculture (4 times the median), and environment (3 times); close to the median for industrial growth, advancement of knowledge, and defence; and low for energy, health, and social development and services (all less than half of the respective median values).

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(1) International comparisons are subject to a number of caveats arising from differences in R&D survey practice in the various countries. The proposed standard OECD practice is set out in the "Frascati Manual": The Measurement of Scientific and Technical Activities, OECD Paris 1980, but most member countries differ from the proposed standard in some areas. Readers should refer to the publications of the OECD Science and Technology Indicators Unit for details. Source documents for this section were:

- . OECD Science and Technology Indicators I, DSTI/SPR/81.27, OECD, Paris September 1982
- . Science Resources Newsletter, No 6, Summer 1981, OECD/DSTI Science and Technology Indicators Unit, Paris.

(2) Research and Experimental Development - Business Enterprises, Australia - 1981-82 (Preliminary), Australian Bureau of Statistics Catalogue No 8105.0, April 1983.

**Fig. 3 R&D Expenditure by Country — 1979 or nearest year.**

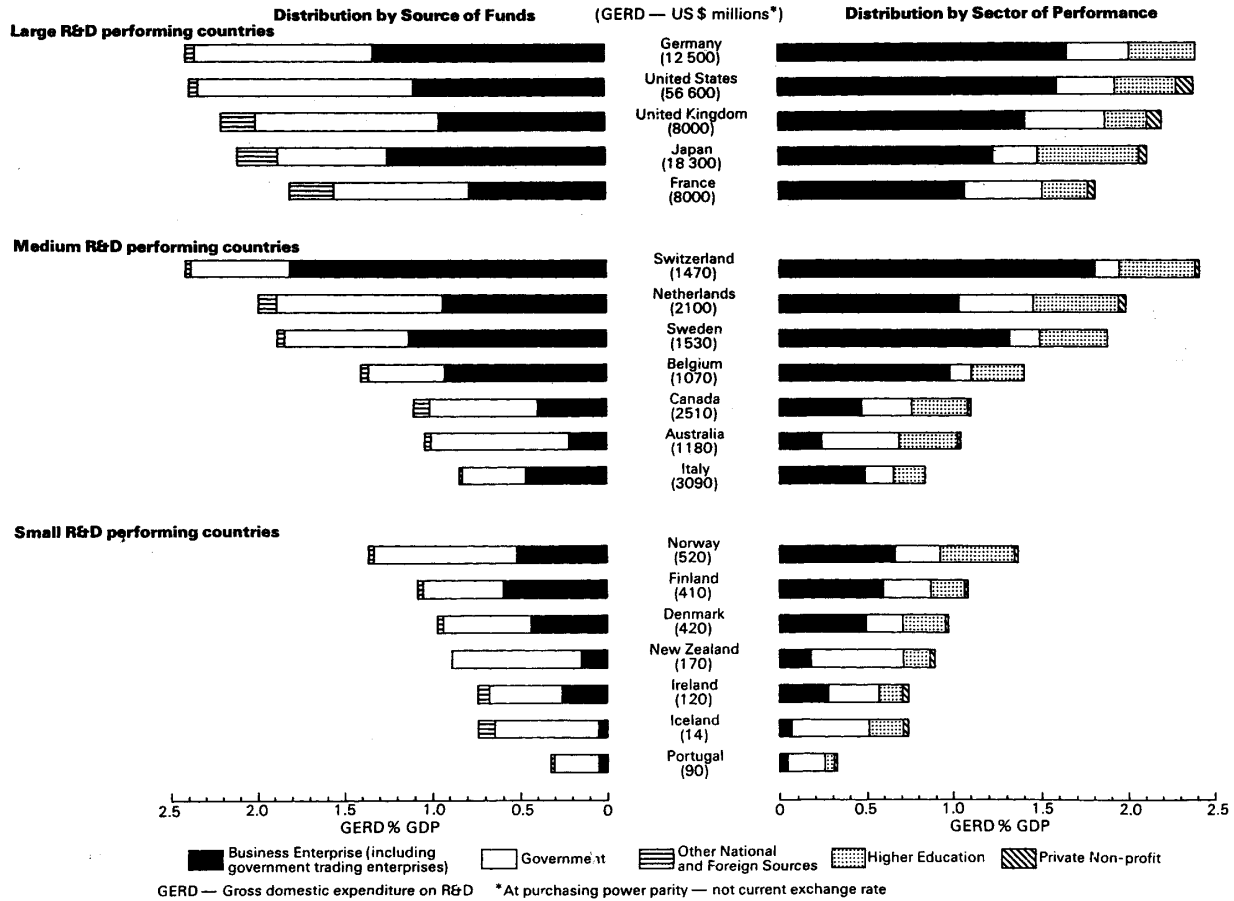


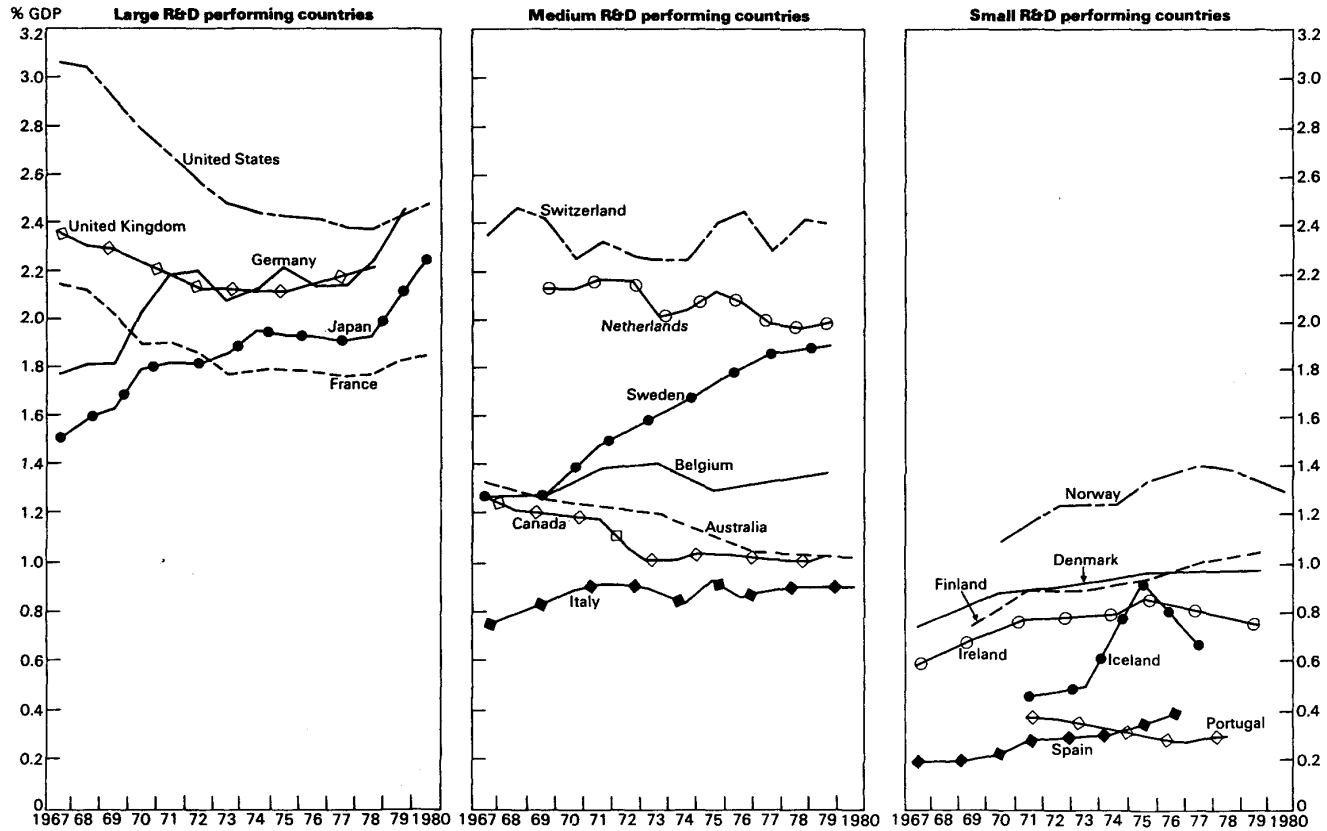
Table 19: R&D employment as % Total Workforce and across domestic expenditure on R&D (GERD) as % GDP (1979)#

Country	R&D Employment as % total workforce	% GERD/GDP	R&D in Sector* as % GDP				
			Source of Funds		Performance		
			Business Enterprise	Government	Business Enterprise	Government	Higher Education
<u>Large R&amp;D Performers</u>							
F.R. Germany	1.37	2.40	1.32	1.03	1.66	0.36	0.38
U.S.A.	1.27	2.38	1.09	1.24	1.59	0.33	0.36
(Group Median)	<u>1.17</u>	<u>2.20</u>	<u>1.09</u>	<u>1.03</u>	<u>1.41</u>	<u>0.36</u>	<u>0.36</u>
U.K.	1.17	2.20	0.95	1.06	1.41	0.46	0.24
Japan	1.08	2.11	1.24	0.63	1.22	0.25	0.59
France	1.00	1.81	0.78	0.78	1.07	0.43	0.27
<u>Medium R&amp;D Performers</u>							
Switzerland	1.23	2.41	1.81	0.58	1.81	0.14	0.43
Netherlands	1.09	1.99	0.94	0.96	1.03	0.42	0.50
Sweden	0.85	1.88	1.13	0.71	1.32	0.17	0.41
(Group Median, excluding Australia)	<u>0.78</u>	<u>1.40</u>	<u>0.92</u>	<u>0.62</u>	<u>0.98</u>	<u>0.20</u>	<u>0.33</u>
Belgium	0.78	1.40	0.92	0.43	0.98	0.13	0.29
Canada	0.52	1.10	0.40	0.62	0.46	0.30	0.33
AUSTRALIA	0.63	1.03	0.21	0.79	0.24	0.46	0.32
Italy	0.42	0.84	0.57	0.46	0.49	0.20	0.15
<u>Small R&amp;D Performers</u>							
Norway	0.77	1.36	0.52	0.82	0.67	0.26	0.42
Finland	0.69	1.08	0.59	0.46	0.59	0.28	0.19
Denmark	0.57	0.97	0.44	0.50	0.49	0.21	0.25
(Group Median)	<u>0.60</u>	<u>0.89</u>	<u>0.26</u>	<u>0.50</u>	<u>0.27</u>	<u>0.28</u>	<u>0.19</u>
New Zealand	0.61	0.89	0.14	0.75	0.18	0.53	0.15
Ireland	0.50	0.74	0.26	0.42	0.27	0.30	0.13
Iceland	0.60	0.74	0.04	0.60	0.07	0.44	0.20
Portugal	0.16	0.32	0.04	0.27	0.04	0.21	0.06
<u>Australian Trends</u>							
Australia (1968-69)	0.82	1.34	0.48	0.79	0.49	0.53	0.32
Australia (1973-74)	0.85	1.26	0.42	0.79	0.42	0.50	0.33
Australia (1976-77)	0.67	1.05	0.24	0.78	0.24	0.50	0.29
Australia (1978-79)	0.63	1.03	0.21	0.79	0.24	0.46	0.31
Australia (1981-82 est)	0.57	1.01	0.21	0.78	0.23	0.47	0.30

# With the exception of Table 20, the international comparisons in this chapter are based on OECD "Science and Technology Indicators I". The data differ slightly from those presented earlier in the OECD "Science Resources Newsletter".

\* In OECD data the Business Enterprise sector includes both private and public business enterprises. The General Government sector includes federal and provincial or State governments and their agencies excluding public business enterprises. "Government" as a source of funds includes the "Own funds" of public universities.

**Fig. 4 R&D Expenditure in OECD Member Countries as a Percentage of GDP — by year.**



Source: OECD Science and Technology Indicators Unit

These comparisons need to be taken with some reservation, as the data are only broadly comparable between countries. In particular all general university funds devoted to R&D have been included under advancement of knowledge. Thus, in Australia for example, a considerable amount of medical R&D is included in advancement of knowledge, thereby considerably understating the total Government support for the health objective. Moreover, each country has its own spectrum of needs which is reflected in differing funding priorities. The observed differences must therefore be interpreted in the context of additional information about the countries concerned.

Table 20: Government R&D funding by OECD socio-economic objectives\*, 1980  
(Cents expended per \$100 of gross domestic product)

Country	Agr.	Ind.	Energy	Env.	Health	Soc.	A. of K.	Def.	Other
F.R. Ger.	2.3	11.7	16.5	.	7.3	4.7	50.8	12.1	13.3
U.S.A.	2.8	0.4	14.8	1.3	14.9	2.8	n.a.	58.9	24.7
U.K.	4.5	6.7	7.2	0.9	1.7	1.1	22.1	58.5	5.1
France	4.3	10.1	8.5	1.2	5.0	1.4	24.9	40.9	13.5
Neth	7.5	5.7	4.2	.	5.0	6.0	53.7	3.1	11.8
Sweden	2.3	8.9	11.8	2.0	8.2	8.4	45.6	18.1	9.3
Belgium	2.9	9.1	5.3	1.7	7.9	6.7	19.3	0.2	7.7
Australia*	17.7	8.5	3.2	3.4	2.4	1.9	31.4	8.7	3.9
Italy	1.9	8.1	10.7	0.4	2.1	1.0	16.7	n.a.	5.8
Norway	7.2	11.7	3.9	2.4	4.6	5.8	33.6	3.6	6.5
Finland	6.7	11.0	3.4	0.5	0.4	4.2	22.7	1.1	4.9
Denmark	4.0	6.2	3.5	0.9	5.0	3.6	17.7	0.1	4.4
Median (excl. Aust.)	<u>4.0</u>	<u>8.9</u>	<u>7.2</u>	<u>1.2</u>	<u>5.0</u>	<u>4.2</u>	<u>23.8</u>	<u>7.9</u>	<u>7.1</u>

\* OECD socio-economic objectives  
Agr.: Agriculture  
Ind.: Industrial Growth  
Energy: Production of Energy  
Env.: Environment Protection  
Other: Includes  
Transport and Telecommunications  
Urban and Rural Planning  
Not Specified  
Health: Health  
Soc.: Social Development Services  
A. of K.: Advancement of Knowledge  
Def: Defence  
Earth and Atmosphere  
Civil Space

# Data for Australia refer to 1978-79

Note:

These data are subject to a number of qualifications for which the original source should be consulted. In addition, some categories for a number of countries contain S&T (other than R&D) categories as well as R&D, as they are based on "science budgets" or similar analyses for the countries concerned. Some R&D outside the science budgets may be omitted.

Another important point is that all general funding of universities (other than special purpose granting schemes) is allocated to "Advancement of knowledge". Thus, for example, A. of K. for Australia contains a large component directed towards the "Health objective. For federal systems such as Australia, the table includes both State and federal funds.

Source: OECD Science Resources Newsletter, No. 6 Summer 1981



## Social sciences and humanities

Table 21 ranks Australia relative to other OECD member countries in terms of total R&D expenditure in the social sciences and humanities expressed as a percentage of GDP.

Table 21 R&D expenditure in the social sciences and humanities (% GDP) 1979

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Japan	0.22	Finland	0.10	Switzerland	0.06
Netherlands	0.20	Australia (76-77)	0.10	Iceland	0.05
Norway	0.17	Ireland	0.07	Italy	0.04
Canada	0.11	Belgium	0.07	France (1977)	0.04
F.R. Germany	0.11	United Kingdom	0.07	Sweden	0.04
Denmark	0.10	New Zealand (77-78)	0.06	Portugal	0.04

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## Technology-based export performance

Figure 5 gives an indication in broad terms of Australia's low position among OECD countries in relation to exports of technology-based products. The data are drawn from OECD publications (D, in the Standard International Trade Classification groups 51 (organic chemicals), 52 (dyeing, tanning and colour materials), 54 (medicinal and pharmaceutical products), 58 (artificial resins and plastic materials and cellulose esters and ethers), 59 (chemical materials and products n.e.i.), 71 (power generating machinery and equipment), 72 (machinery specialised for particular industries), 74 (general industrial machinery and equipment n.e.i. and machine parts n.e.i.), 76 (telecommunications and sound recording and reproducing equipment), 77 (electrical machinery, apparatus and appliances n.e.i. and electrical parts thereof), 87 professional scientific and controlling instruments and apparatus n.e.i.) and 88 (photographic apparatus, equipment and supplies, and optical goods n.e.i., watches and clocks).

Some of the products in these product groups would not be regarded as technology-intensive on the usually accepted basis of above average R&D intensity in the associated industry class, but taken overall it is thought that exports in these thirteen product groups may be regarded as a reasonably satisfactory measure of a country's capability in producing technology-based products.

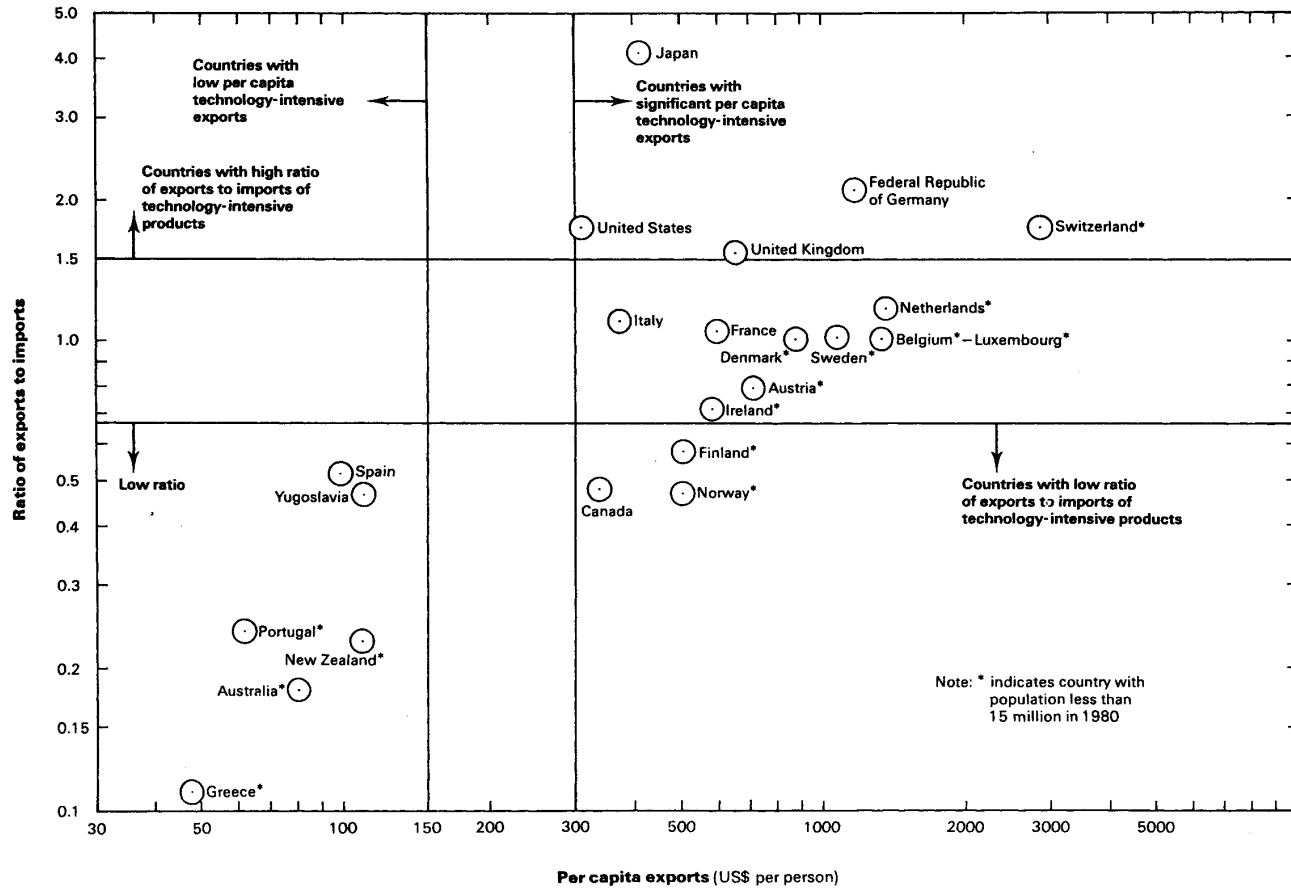
Interpretation of this indicator may differ according to the economic philosophy adopted. The indigenous levels of installed technology and technical skills of the workforce are among the economic determinants of the national product mix and competitiveness on the export market. In looking at trade in the technology-based product groups we are looking at the outcome of many economic factors and influences, but this paper adopts the viewpoint that trade in these product groups represents demonstrated technological capability. It may well be that countries such as Australia which are low on the scale of technology-based exports have either consciously elected or through market forces come to rely on trade in other commodities in which they have comparative advantage and/or traditional involvement, but if they are not involved in producing a technology-based product competitive on the export market it is fair to assume that in most cases they will not be current in the state-of-the-art for that product.

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- (1) (i) OECD Trade by Commodities Market Summary: Exports 1978-80  
(ii) OECD Trade by Commodities Market Summary: Imports 1978-80

The following discussion is based on the Figure 5, but includes some additional information:

- . In 1980 the top eight countries contributed 85% of the total exports by OECD countries in technology-based products. They were: FRG (19.6%), US (18.8%), Japan (13.0%), UK (9.8%), France (8.6%), Italy (5.7%), Netherlands (5.2%), and Switzerland (4.4%).
- . Australia, with 0.3% of the OECD total exports of technology-based products ranked 19th on this indicator. By way of comparison, Australia in 1980 contained 1.8% of the total OECD population (including Yugoslavia), generated 1.8% of the GDP, and on an expenditure basis performed about 1.1% of the R&D in the OECD area.
- . On a per capita basis, the eight top countries in 1980 were: Switzerland (32 times the Australian level), Netherlands (17 times), Belgium-Luxembourg (17 times), FRG (15 times), Sweden (13 times), Denmark (11 times), Austria (9 times), and the UK (8 times). Six of these eight countries have populations smaller than that of Australia indicating that small population size does not preclude a country from developing relatively substantial technology-based exports.
- . In general the countries exporting large volumes of technology-based products are also large importers. The average relationship (excluding Japan, which is atypical compared with the other large exporting countries, and the countries with low total technology-based exports, namely Australia, Portugal, Greece, New Zealand, Turkey and Iceland) suggests that imports are roughly proportional to the two-thirds power of the exports. Japan has a much higher than average ratio of exports to imports in these product groups, because its imports are only about 40% of the average level corresponding to its export figure. This is probably due to a high level of self sufficiency combined with import barriers.

**Fig. 5 Trade per head of population in broad product groups with high average research intensity.**



## COMMONWEALTH CONTRACTS AND GRANTS IN SUPPORT OF S&amp;T

In 1979 the Australian Science and Technology Council (ASTEC) sought information on scientifically and technologically-oriented R&D contracted out by nineteen government departments and agencies to determine amounts, areas of placement, purposes, motivations and procedures used(1). A summary of the results was included in Appendix 3 of Science Statement 1979-80. For the period reported (mainly 1978-79) Commonwealth R&D to the value of \$32.dm was reported as having been contracted out. Of this, \$19.lm was placed with manufacturing and other industries, with the remainder going to academics, consulting firms, the State governments and non-profit research organisations.

In collecting information for Science Statement 1980-81 provision was made for reporting total contracting of R&D and S&T, and also the component contracted to industry. The results were reported in Tables 9 and 10 (Appendix 3) of the 1980-81 Statement. Revised data were presented in the Science and Technology Statement 1981-82.

The results for the 1982-83 survey are presented at Tables 22 and 23. Table 24 summarises these data which now include information on contracting to the higher education sector and other Commonwealth bodies. Some information has been amended since publication of the Science and Technology Statement 1981-82. Information on grants is presented in Tables 25 and 26.

In this Appendix contracting refers to "contracts and commissions" and grants to "grants and donations" which form the remainder of extramural expenditure. These categories are defined in Appendix 5.

In addition to the normal difficulties for respondents associated with R&D/S&T surveys, there are particular problems associated with collecting good quality information on contracting. For example, there is sometimes confusion between intramural "other current" expenditure and extramural contracting. Some respondents are also unclear on the classification of the organisations to which contracts are let and, occasionally, contracts are classed as grants and vice versa. For all these reasons, data presented in successive Science and Technology Statements have been subject to progressive revision and refinement. This process is likely to continue in future Statements.

The data presented in Tables 22 to 26, which represent the best estimates available at present, should be utilised with due regard to the above cautionary statement. As in other parts of the Statement care has been exercised to ensure consistent reporting from year to year within organisations. Thus Table 24 should be indicative of trends within the sectors shown. It is expected that it is the levels shown, rather than the trends, which are most likely to be revised in the future.

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(1) Industrial Research and Development: Proposals for Additional Incentives; A Report to the Prime Minister by the Australian Science and Technology Council.

Table 22: Commonwealth contracting in the natural sciences and engineering (NSE)

(\$ million)		R&D			S&T (including R&D)		
		80-81	81-82	Projected 82-83	80-81	81-82	Projected 82-83
		Aviation	CW	0.05	0.07	0.03	11.94
	PE	0.02	0.01	-	0.03	0.01	-
	HE	0.10	0.27	0.27	0.10	0.51	0.27
Communications	CW	0.02	0.04	0.04	0.04	0.08	0.47
	PE	0.53	0.72	1.06	0.66	2.85	6.23
	HE	0.23	0.17	0.26	0.23	0.17	0.26
Defence	CW	0.40	0.43	0.05	0.40	0.98	1.10
	PE	-	-	-	6.46	11.06	19.13
Defence Support	PE	-	-	-	0.02	0.03	-
Foreign Affairs	CW	2.69	2.33	2.29	5.23	6.12	9.47
	PE	0.11	1.81	1.32	16.52	20.31	29.25
Health	PE	0.01	-	-	0.01	0.01	0.01
	HE	0.08	0.22	0.22	0.08	0.22	0.22
Home Affairs and Environment	CW	0.03	0.04	0.06	0.27	0.21	0.28
	PE	0.01	0.05	0.02	0.09	0.11	0.24
	HE	0.42	0.35	0.27	0.53	0.37	0.30
Housing and Construction	PE	0.03	0.03	0.09	2.68	3.56	4.46
	HE	0.08	0.09	0.12	0.08	0.09	0.12
Industry and Commerce	PE	0.01	0.01	0.01	0.01	0.01	0.01
Primary Industry	CW	0.17	0.18	0.28	0.18	0.18	0.28
Prime Minister and Cabinet	PE	-	-	-	-	0.01	0.01
	HE	-	-	-	0.01	-	-
Resources and Energy	CW	0.14	0.02	0.06	0.14	0.02	0.07
	PE	0.06	0.11	0.10	0.51	0.57	1.70
	HE	0.36	0.35	0.35	0.40	0.36	0.36
Science and Technology	CW	0.25	0.25	0.25	0.61	0.26	0.41
	PE	2.61	2.23	2.69	8.48	5.50	8.40
	HE	0.03	0.09	0.12	0.96	1.11	1.45
Special Ministry	PE	0.05	-	..	0.05	-	..
	HE	0.10	0.17	0.18	0.10	0.17	0.18
Territories and Local Government	CW	-	0.01	-	0.13	0.16	0.01
	PE	-	-	-	0.24	0.05	0.01
	HE	0.02	-	-	0.05	0.01	-
Transport	PE	..	0.01	-	..	0.01	-
Contracts to Others		0.32	0.02	0.02	4.48	2.94	0.02
Total (Direct Commonwealth funding, all NSE contracts)		8.96	10.34	11.19	61.74	71.30	101.00

CW Contracts to other Commonwealth agencies

PE Contracts to private bus. enterprise

HE Contracts to institutions of higher education

Table 23: Commonwealth contracting in the social sciences and humanities (SSH)

(\$ million)		R&D			S&T (including R&D)		
		80-81	81-82	Projected 82-83	80-81	81-82	Projected 82-83
Attorney -General 's	PE	0.15	0.07	0.06	0.15	0.07	0.06
	HE	0.09	0.06	0.10	0.09	0.06	0.10
Aviation	CW	0.03	0.01	-	0.03	0.01	-
	PE	-	..	-	-	0.02	-
Communications	PE	-	0.17	-	-	0.20	0.04
	HE	-	0.01	-	-	0.01	-
Education and Youth	CW	-	0.12	0.01	-	0.02	0.01
Affairs	HE	0.45	0.34	0.46	0.70	0.60	0.76
	PE	-	0.02	0.02	-	0.02	0.02
Employment and Industrial							
Relations	PE	0.01	0.07	0.02	0.02	0.13	0.11
Foreign Affairs	CW	-	0.50	0.29	-	0.51	0.34
	PE	0.02	0.04	0.01	0.48	0.75	1.15
Health	HE	-	-	-	0.03	-	0.01
Home Affairs and	PE	0.01	0.01	-	0.02	0.01	-
Environment	HE	-	0.03	-	0.05	0.05	0.02
Immigration and Ethnic	CW	-	-	-	0.02	0.13	0.15
Affairs	PE	0.06	0.13	0.15	0.37	0.47	0.51
	HE	0.25	0.11	0.11	0.27	0.12	0.13
Industry and Commerce	CW	-	-	-	0.01	-	-
	PE	0.01	0.08	0.09	0.01	0.09	0.09
	HE	0.01	-	-	0.01	-	-
Prime Minister and							
Cabinet	PE	-	-	-	0.01	0.02	0.03
Resources and Energy	HE	0.03	0.01	0.04	0.03	0.01	0.04
Science and Technology	PE	0.01	0.01	-	0.01	0.01	-
	HE	-	0.01	0.03	-	0.01	-
Social Security	CW	-	-	-	-	0.05	0.05
	PE	-	0.05	0.04	-	0.22	0.05
	HE	0.15	0.11	0.14	0.26	0.15	0.15
Territories and Local	CW	-	-	-	0.06	-	-
Government	PE	-	-	-	0.17	-	-
Transport	CW	0.01	..	0.01	0.01	0.06	0.05
	PE	0.11	0.10	0.24	0.17	0.18	0.29
	HE	0.10	0.03	0.08	0.11	0.04	0.09
Contracts to Others		0.33	0.01	-	0.45	0.01	-
Total (Direct Commonwealth funding, all SSH contracts)		1.82	1.97	1.88	3.50	4.02	4.24

CW Contracts to other Commonwealth agencies  
HE Contracts to institutions of higher  
education

PE Contracts to private bus. enterprise

Table 24: Summary of Commonwealth S&amp;T contracting 1978-79 to 1982-83

(\$ million)		R&D					S&T (including R&D)			
		78-79	79-80	80-81	81-82	Projected 82-83	79-80	80-81	81-82	Projected 82-83
Private Enterprise	N	2.93	4.47	3.44	4.96	5.28	28.97	35.75	44.06	69.44
	S	0.30	0.27	0.38	0.75	0.66	0.78	1.39	2.19	2.35
	N+S	3.23	4.74	3.82	5.70	5.94	29.75	37.15	59.25	71.84
Commonwealth agencies	N	4.88	3.94	3.76	3.37	3.64	19.31	18.95	20.99	27.91
	S	0.10	0.07	0.04	0.53	0.30	0.10	0.12	0.78	0.60
	N+S	4.99	4.01	3.79	3.90	3.94	19.41	19.07	21.77	28.51
Higher Education	N	0.55	0.91	1.44	2.01	2.28	1.24	2.56	3.31	3.65
	S	0.57	0.68	1.07	0.70	0.92	1.11	1.54	1.05	1.30
	N+S	1.11	1.59	2.51	2.71	3.19	2.34	4.09	4.36	4.95
Other Bodies	N	0.30	0.36	0.32	0.02	0.02	4.12	4.48	2.94	0.02
	S	0.20	0.03	0.33	0.01	-	0.27	0.45	0.01	-
	N+S	0.50	0.39	0.65	0.03	0.02	4.39	4.93	2.95	0.02
Total (Direct Commonwealth funding all contracts)		9.83	10.72	10.78	12.31	13.06	55.90	65.24	75.32	105.24

N National sciences and engineering

S Social sciences and humanities

N+S Total natural sciences and engineering, social sciences and humanities

Table 25: Commonwealth grants in the natural sciences and engineering (NSE)

(\$ million)		R&D			S&T (including R&D)		
		80-81	81-82	Projected 82-83	80-81	81-82	Projected 82-83
Aboriginal Affairs	HE	-	-	0.01	-	-	0.01
Communications	HE	0.03	0.04	0.16	0.03	0.04	0.16
Education and Youth Affairs	HE	60.8	67.2	81.2	61.4	67.5	81.6
Foreign Affairs	HE	1.86	2.08	2.84	8.91	9.68	13.74
Health	HE	9.33	12.72	14.76	9.33	12.72	14.76
Home Affairs and Environment	HE	0.11	0.12	0.09	0.21	0.29	0.27
Housing and Construction	HE	0.01	-	-	0.01	-	-
Industry & Commerce	HE	..	..	..	..	..	..
Primary Industry	HE	3.49	4.00	4.15	3.73	4.27	4.60
	PE	0.14	0.14	0.19	0.14	0.29	0.54
Prime Minister and Cabinet	HE	0.03	0.01	0.02	0.03	0.02	0.02
Resources and Energy	HE	1.99	2.72	3.18	2.05	3.02	3.53
	PE	2.40	3.31	4.01	2.72	3.77	4.55
Science and Technology	HE	13.81	15.72	17.76	13.93	15.77	17.82
	PE	46.60	22.96	45.44	50.75	26.97	49.87
Total grants to higher educ.		92.2	105.3	124.9	100.37	114.02	137.28
Total grants to private enterprise		49.13	26.48	49.70	53.63	31.17	55.08
Total grants to others		36.22	45.81	60.48	76.94	87.43	101.53
Total (Direct Commonwealth funding, all NSE grants)		177.5	177.6	235.1	230.9	232.6	293.9

HE Grants to institutions of higher education

PE Grants to private enterprise or in support of industry



Table 26: Commonwealth grants In the social sciences and humanities (SSH)

(\$ million)		R&D			S&T (including R&D)		
		80-81	81-82	Projected 82-83	80-81	81-82	Projected 82-83
		Aboriginal Affairs	HE	0.06	0.07	0.08	0.06
Attorney -General 's	HE	0.03	0.03	0.04	0.03	0.03	0.04
Education and Youth Affairs	HE	25.1	27.2	31.2	25.7	27.9	32.2
Employment and Industrial Relations	HE	0.01	..	-	0.03	..	-
Foreign Affairs	HE	0.17	0.17	0.17	0.17	0.17	0.17
	PE	-	-	-	0.05	0.59	-
Health	HE	0.30	0.58	0.63	0.99	1.38	1.44
Home Affairs and Environment	HE	0.01	-	-	0.01	..	..
Industry & Commerce	HE	-	-	0.08	-	-	0.08
Primary Industry	HE	0.10	0.06	0.07	0.10	0.06	0.08
Prime Minister and Cabinet	HE	0.01	0.01	0.01	0.14	0.11	0.03
Resources and Energy	HE	0.02	0.15	0.16	0.02	0.15	0.16
	PE	0.05	-	-	0.05	-	-
Science and Technology	HE	2.90	3.76	4.35	2.93	3.80	4.38
Social Security	HE	-	-	-	0.41	0.55	0.58
Treasury	HE	0.12	0.16	0.12	0.12	0.16	0.12
Total grants to higher educ.		28.8	32.1	36.9	30.7	34.4	39.4
Total grants to private enterprise		0.07	0.02	0.02	0.12	0.62	0.02
Total grants to other bodies		8.04	10.33	13.00	19.46	39.29	53.60
Total (Direct Commonwealth funding, all SSH grants)		37.0	42.5	49.9	50.2	74.3	93.0

HE Grants to institutions of higher education

PE Grants to private enterprise or in support of industry

## REVIEW OF BILATERAL SCIENCE AND TECHNOLOGY COOPERATION AGREEMENTS

The Department of Science and Technology operates bilateral science and technology agreements with the USA (1968), India (1975), the Federal Republic of Germany (FRG) (1976), Japan (1980), China (1980) and Mexico (1981). Exchanges under the science and technology agreement with the Soviet Union were suspended in 1980 following Soviet intervention in Afghanistan. Activities under the agreements have included short term research visits not exceeding six months, seminars, workshops, exchanges of policy delegations and postdoctoral awards in photosynthesis and plant productivity (Japan Agreement).

Applications under each of the agreements are sought from the research community. Additionally proposals in specific fields are developed following identification of priority areas by ad hoc committees or senior scientific delegations under the Japan, Mexico and China Agreements. All proposals are reviewed by senior scientists external to the Department. Program selection is on the basis of scientific or technological merit together with the likely contribution of proposals to the development of Australian and the other country concerned. Generally the agreements are not intended as a primary source of research funds. It is expected that the collaborating institutions provide the bulk of the necessary funding while the agreements provide support for airfares, living allowances and the running of seminars and workshops.

The following tables provide a breakdown of expenditure under each agreement by subject area.

The following table shows funds outlayed under the Agreements for the 1978-79 to 1981-82 fiscal years disaggregated by subject area.

<u>US/Australia Agreement for Scientific and Technical Cooperation</u>	1979-80 \$	1980-81 \$	1981-82 \$	1982-83 \$
Physical and Chemical Sciences	15 254	16 194	22 793	21 107
Engineering and Applied Sciences	9 794	11 269	5 200	11 836
Biological and Agricultural Sciences	41 276	43 200	28 400	13 885
Earth Sciences	14 506	-	9 474	30 297
Social Sciences	9 428	4 331	11 050	2 875
Sub-total	90 258	74 994	76 917	80 000
<u>India/Australia Science and Technology Agreement</u>				
Physical and Chemical Sciences	-	-	10 856	3 803
Engineering and Applied Sciences	1 584	2 105	1 200	6 000
Biological and Agricultural Sciences	25 239	12 775	2 790	800
Earth Sciences	3 395	18 082	23 160	9 397
Social Sciences	-	-	-	-
Sub-total	30 218	32 962	38 006	20 000



<u>FRG/Australia Science and Technology Agreement</u>	1979-80 \$	1980-81 \$	1981-82 \$	1982-83 \$
Physical and Chemical Sciences	9 526	4 324	2 700	3 930
Engineering and Applied Sciences	-	-	1 300	-
Biological and Agricultural Sciences	4 278	4 775	7 975	8 635
Earth Sciences	11 428	15 900	9 000	8 600
Social Sciences	-	-	-	-
Other	-	-	-	28 835
Sub-total	25 282	24 999	20 975	50 000

Japan/Australia Science and Technology Agreement

Physical and Chemical Sciences	-	-	-	6 467
Engineering and Applied Sciences	-	28 140	7 483	35 076
Biological and Agricultural Sciences	-	27 400	21 700	52 500
Earth Sciences	-	-	-	2 300
Social Sciences	-	-	-	-
Other	-	-	6 035	3 657
Sub-total	-	55 540	35 318	100 000

Mexico/Australia Science and Technology Agreement

Physical and Chemical Sciences	-	-	-	3 000
Engineering and Applied Sciences	-	-	2 854	-
Biological and Agricultural Sciences	-	-	-	16 200
Earth Sciences	-	-	-	-
Social Sciences	-	-	-	-
Other (Senior Scientific Delegations)	-	-	22 030	800
Sub-total	-	-	24 884	20 000

China/Australia Science and Technology Agreement

Physical and Chemical Sciences	-	-	-	8 800
Engineering and Applied Sciences	-	-	-	8 800
Biological and Agricultural Sciences	-	-	-	-
Earth Sciences	-	-	-	-
Social Sciences	-	-	-	-
Other (Senior Scientific Delegations)	-	-	19 000	12 400
Sub-total	-	-	19 000	30 000

Grand total	145 758	188 225	215 000	300 000
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## TECHNICAL NOTES

Background

The concepts and methodology employed in this Statement are based on or developed from international standard practices developed for science and technology statistics. The first Statement in this series, Science Statement 1978-79 was modelled on similar publications issued regularly by several other countries, including Canada, the Netherlands, and the United States. Appendix 6 of Science and Technology Statement 1981-82 outlines the development of the Statement prior to 1982-83. The remainder of the present Appendix describes the 1982-83 concepts and methodology. Tables for the statement are prepared by the Indicators and Resource Analysis Section (IRAS) of the Department of Science and Technology. Further information is available from IRAS.

Definitions and concepts

## . Research and development (R&amp;D)

The definition adopted by the Organization for Economic Co-operation and Development (OECD)(1) was used in the information collection:

Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications.

To clarify this definition the information collection guidelines included the following:

Any activity classified as R&D should contain an appreciable amount of novelty, it should have investigation as a primary objective, and should have a potential to produce results that are sufficiently general for mankind's stock of knowledge (theoretical and/or practical) to be recognisably increased. The concept of novelty is not associated with the actual creation of something which, although new, is made by artistry or by application of techniques that have already been established for that class of object. For example, devising and validating a new econometric model is R&D, whereas the econometric modelling of economic systems for policy purposes, using established techniques, is not R&D.

R&D ceases when work is no longer experimental. Once its primary objective is no longer investigation, an activity can no longer be considered as R&D even though it could be regarded as an important part of the total innovative process.

Note that R&D extends to substantial modifications to existing processes, systems, services and products.

The above definition and guidelines are also used in the Project SCORE R&D survey(2).

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(1) The Measurement of Scientific and Technical Activities: Proposed Standard Practice for Surveys of Research and Experimental Development, "Frascati Manual" 1980 OECD Paris June 1980.

(2) Research and Experimental Development, All Sector Summary, Australia, 1978-79, Australian Bureau of Statistics Cat. No. 8112.0, February 1982, Appendix A, ppl-2.

## Science and technology (S&T)

The activities to be included, in addition to R&D, as science and technology were presented in the guidelines in the form of a descriptive list as follows:

### Interpretation of S&T Activities (other than R&D)

- Demonstration of both technical and commercial viability: Demonstration projects and production and operation of pilot plant or equipment aimed at demonstrating both the technical and commercial viability of specific innovatory products or processes.
- Design for innovative production or service: Design engineering and 'tooling-up', often following either an experimental development or a successful demonstration phase, and aimed at establishing innovatory products or processes on a routine production basis or at providing an innovatory service. Includes products, processes or services new to Australia, regardless of whether or not these are well developed elsewhere.
- Technology transfer, extension services, other active diffusion of scientific and technological skills and know-how: Regular routine work on advising clients, including other sections of an organisation and independent users, to promote use of scientific, technological and management information. This activity includes extension and advisory services organised for farmers and for industry. It involves the transfer of skills, capabilities and 'know-how' to clients.
- Advanced scientific or engineering services: Consulting services to provide clients, including other sections of an organisation and independent users, with technologically advanced designs, products or processes, or with reports based on advanced scientific or technological analysis. Engineering feasibility studies are included in this category, except where they involve econometric techniques and/or operations research. The provision of products relying on advanced technology (e.g. isotopes) is also included.
- Policy-related studies using advanced techniques: Policy-related studies using operations research and/or econometric techniques. This category includes feasibility studies involving such techniques.
- Testing, standardisation, metrology and quality control: Regular routine work on the analysis, checking and testing, by recognised methods, of materials, products, devices and processes, together with the setting up and maintenance of standards, including standards of measurement.
- Patenting and licensing: Activities relating to patents and licenses: systematic work of a scientific, legal and administrative nature on patents and licences.
- Data collection in the natural sciences: Topographical, geological and hydrological surveying (including prospecting and related activities designed to locate and identify oil and mineral resources); routine astronomical, meteorological and seismological observations; surveying of soils and of plants, fish and wildlife resources; routine soil, atmosphere and water monitoring and the routine monitoring of radioactivity levels.
- Data collection in the social sciences: The gathering of information on human, social, economic and cultural phenomena, usually for the purpose of compiling routine statistics, e.g. population censuses, production, distribution and consumption statistics, market studies, social and cultural statistics etc.

- Scientific and technological information and documentation: S&T services provided by libraries, archives, information and documentation centres, reference departments, scientific congress centres, data banks and information-processing departments. Such services include S&T bibliographic searches, provision of S&T documents, provision of access to organised S&T information systems and the management of any associated data bases. Support for S&T conferences is included in this category. Systematic work on the translation and editing of S&T books and periodicals (except for textbooks used in school and university courses) is also included.
- Services associated with scientific and technological collections: S&T services provided by museums of science and/or technology, botanical and zoological gardens and other S&T collections.
- Scientific and technical education and training: Specialised non-university higher education and training, higher education and training leading to a university degree (except research training of (post) graduate students which is regarded as part of R&D), and organised lifelong training for scientists and engineers.
- Administration of S&T activities, policy, planning and other studies of S&T, n.e.i.: Administrative, policy, planning and related activities concerned with S&T which are not an integral part of one of the other defined S&T activities. The Australian Science and Technology Council (ASTEC) and the Policy Division of the Department of Science and Technology are examples falling in this category.

This list was compiled as an amalgamation of the following classes of activities:

- . Promotion of science and technology.  
This class encompasses the first three of the activities on the above list i.e. demonstration of both technical and commercial viability; design for innovative production or service; technology transfer, extension services, and other active diffusion of scientific and technological skills and 'know-how'. The first two of these activities, which are of strong interest to the Department of Science and Technology and to ASTEC, are not included in the UNESCO Recommendation concerning the International Standardization of Statistics on Science and Technology(3). The titles and descriptions of these activities were formulated by the Department in consultation with ASTEC. The third category is included in the UNESCO recommendation as a "scientific and technological service". (See below).
- . Scientific and technological services (STS).  
This class is defined in the UNESCO Recommendation as "activities concerned with research and experimental development and contributing to the generation, dissemination and application of scientific and technical knowledge".  
Examination of the activities listed in the Recommendation in this class

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(3) United Nations Educational, Scientific and Cultural Organisation (UNESCO) Recommendation concerning the International Standardization of Statistics on Science and Technology, adopted by the General Conference at its twentieth session, Paris, 27 November 1978.

(essentially those listed above from "advanced scientific or engineering consulting services" to "services associated with scientific and technological collections", inclusive) shows that the phrase "concerned with research and experimental development" in the UNESCO definition may be misleading. The relationship of these activities to R&D is that they often (but not necessarily) occur in organisations which also perform R&D, giving rise to difficulty in measuring R&D. For this reason the OECD Frascati Manual<sup>(4)</sup> refers to them as "Related Activities" to be excluded from R&D measurements. Two categories ("advanced scientific or engineering consulting services" and "policy-related studies using advanced techniques") taken with minor modification from the Frascati Manual's list of related activities are used to augment the list proposed by UNESCO. One category placed by UNESCO in this class has been included here under "promotion of science and technology". (See above).

- . Scientific and technical education and training (STET).  
This class is defined in the UNESCO Recommendation as "all activities comprising specialised non-university higher education and training, higher education and training leading to a university degree, post-graduate and further training, and organised lifelong training for scientists and engineers. These activities correspond broadly to ISCED<sup>(5)</sup> levels 5, 6 and 7". It is not clear from this definition whether UNESCO intends this class to apply to all higher education or only to the higher education of scientists and engineers. It was agreed between the Tertiary Education Commission and the Department of Science and Technology that the Statement would exclude expenditures on these activities where these were part of the formal education system. It is clear in any case that to include the total expenditure for the higher education sector would not be useful for the purposes of the Science and Technology Statement. Training activities in the field of science and technology sponsored by other Government agencies have value for the Statement, and have accordingly been included.
- . Administration of S&T activities, policy, planning and other studies of S&T n.e.i..  
This class is not contained in the UNESCO Recommendation. It may be argued that in some areas there are significant overheads relating to administration or policy work concerning S&T which our guidelines would otherwise exclude. Inclusion of this category has the advantage that the total expenditures of the Department of Science and Technology and of ASTEC appear in a Statement concerned with Commonwealth S&T activities.

Some respondents to the information collection for the 1980-81 Statement were concerned that the guidelines did not provide a definition of S&T analogous to that given for R&D. The explanation of this apparent anomaly is that the Department is not aware of any definition of S&T that is operationally useful for statistical purposes. The definition given in the UNESCO Recommendation, and quoted with attribution to UNESCO in the most recent version of the OECD Frascati Manual, is:

Scientific and technological activities (STA): systematic activities which are closely concerned with the generation, advancement, dissemination, and application of scientific and technical knowledge in all fields of science and technology. These include such activities as R&D, scientific education and training (STET), and the scientific and technological services (STS), defined (as above).

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(4) Op cit.

(5) International Standard Classification of Education, UNESCO, Paris, 1976 (COM. 75/WS/27)



The interpretation of this definition hinges on what is considered to be "scientific and technical knowledge" and "all fields of science and technology". The UNESCO Recommendation lists the following broad fields under the heading "fields of science and technology": natural sciences; engineering and technology; medical sciences; agricultural sciences; social sciences and humanities; and other fields. This list of fields accords with the dictionary definition of science(6) as "systematic and organised knowledge".

Although some grants for humanities research are provided through the Australian Research Grants Scheme administered by the Minister for Science and Technology, the main thrust of the ministry responsibilities and activities lies in a narrower spectrum, and hence in a narrower interpretation of the boundaries of science. Thus, the activities listed in the information collection guidelines for this Statement as S&T constitute an implicit, though somewhat fuzzy, operationally useful definition for the purposes of the collection. Although a few countries, and in particular Canada, have collected data for some time on a range of S&T activities, the collection of such data in Australia, and in most other OECD countries, must be regarded as experimental. The Science and Technology Statement 1980-81 Workshop (see Appendix 5 of Science and Technology Statement 1981-82) discussed this question. While agreeing that further work is required, the Workshop itself did not produce clearer guidelines.

#### The nature of S&T data Included in Science and Technology Statement 1982-83

In previous Statements, S&T (other than R&D) was collected for all or most agencies on a different basis from R&D (7). In collecting data for the present Statement this difference was removed. S&T data shown in this Statement should therefore in principle embody estimates of the S&T components of programs, rather than simply include or exclude total programs on the basis of whether there is or is not a preponderance of S&T activity.

While this change should make comparisons between Ministries more meaningful, caution must still be exercised in view of the lack of a statistically satisfactory definition of S&T and the corresponding wide discretion as to whether particular activities should be included. Reporting of these activities (other than R&D) for the present Statement remains uneven, particularly in the social sciences, where agencies often see their activities as having little or no relevance to a Statement on science and technology.

#### Broad field of science

Some users of the first two Statements, including ASTEC, highlighted a need to distinguish between activities in the natural sciences and engineering (NSE) and those in the social sciences and humanities (SSH). This is common practice in R&D statistics, where the data are collected from R&D performers, but is more difficult when data are collected from R&D funding agencies. Nevertheless, it proved possible to make reasonable estimates of the expenditures on NSE and SSH for nearly all agencies and programs. The guidelines used were as follows:

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(6) See for example The Concise Oxford Dictionary.

(7) Research and Experimental Development, All Sector Summary, Australia, 1978-79, Australian Bureau of Statistics Cat. No. 8112.0, February 1982, Appendix A, p5.

(a) for R&D

R&D reported should be classified as either natural sciences and engineering (NSE) or social sciences and humanities (SSH) according to the field of science in which the R&D is performed, as follows:

Natural Sciences and Engineering (NSE) includes:

- Agricultural sciences and forestry, biological sciences, chemical sciences, engineering and applied sciences, mathematical sciences, medical sciences, and physical sciences.

Social Sciences and Humanities (SSH) includes:

- Accounting; anthropology (social and cultural) and ethnology; demography; economics; education and training; geography (human, economic and social); information science; law; linguistics; management; political sciences; psychology; sociology; organisation and methods; miscellaneous social sciences and interdisciplinary, methodological and historical activities relating to subjects in this group. (Note that physical anthropology, physical geography and psycho-physiology should normally be classified with the natural sciences and engineering.)
- Arts (history of the arts and art criticism, but excluding artistic activity itself); languages (ancient and modern languages and literature); philosophy (including the history of science and technology); prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeology, etc.; music; religion; other fields and subjects pertaining to the humanities and interdisciplinary, methodological, historical and other activities relating to the subjects in this group.

(b) for S&T (other than R&D)

Each of these S&T activities (other than R&D) may also be further classified, according to the purpose of the activity, as NSE-supporting and SSH-supporting. For activities concerned with the promotion of innovation or knowledge, such classification is determined by the field of the innovation or knowledge. For service activities it depends on the field of the major professional group relying on the service.

In many cases the NSE and SSH activities falling within a given S&T category are reasonably clear by analogy. To help clarify cases which are less clear the following examples were given:

- "Trialing" of a new educational curriculum is an example of SSH in the category "demonstration of both technical and commercial viability";
- A study using operations research and/or econometric techniques specifically related to the siting of a chemical plant is an example of NSE in the category "policy - related studies using advanced techniques";
- Services for anthropological and archeological collections are normally to be classified as SSH.

The division of S&T activities (other than R&D) into NSE-supporting and SSH-supporting categories is, as far as the Department is aware, an innovation in international practice. It is considered to be a useful distinction for policy purposes and in practice there was little difficulty for respondents in this aspect of the survey.

#### Expenditure definitions and guidelines

Definitions and guidelines used in the collection of financial data for this Statement are in harmony with those used in the Project SCORE R&D survey<sup>(7)</sup>. Some key items are presented in this section.

- . Intramural expenditure is expenditure for R&D or other S&T activities undertaken by the respondent organisation. Intramural expenditure is separated into the two categories, capital and current:

Capital expenditure includes expenditure for:

- Land, buildings and other structures (including major alterations but excluding repairs and maintenance, which are reported as "Other current expenditure"); includes relevant capital expenditures by the Departments of Housing and Construction and Administrative Services on behalf of each agency;
- Vehicles, plant, machinery and equipment (expenditure incurred in the financial year on the acquisition (less disposal) of fixed tangible assets, either new or second-hand, with an expected life greater than one year. A proportion of expenditure on assets used partly for R&D should be included, but no such allowance should be included for other S&T).

Current expenditure includes expenditure for:

- Wages, salaries and other labour costs (these refer to gross earnings before taxation and other deductions. Overtime earnings, shift allowances, penalty rates, bonuses and commission payments to employees, holiday pay, payments to employees absent on long service leave, sick pay and similar payments, and employer contributions to superannuation and pension schemes are included. The employer contributions to superannuation and pension schemes where the contributions are paid by another organisation are excluded).
- Other current expenditure (includes expenditure on items such as materials, fuels, rent and leasing, repairs and maintenance, data processing, reference materials and special services in support of the R&D, e.g. payments to outside organisations for use of specialised testing facilities); includes relevant expenditure by the Department of Housing and Construction and Administrative Services on behalf of each agency.

- . Extramural expenditure is expenditure for R&D or other S&T activities funded by the respondent organisation but undertaken (i.e. performed) by other organisations. Extramural expenditure was classified by type of payment into the two categories, "contracts and commissions" and "grants and donations":

Contracts and commissions refer to funds disbursed specifically under contract or Commission arrangements to other organisations to perform specified tasks. Totals for "contracts and commissions" to other Commonwealth agencies, private enterprise, and tertiary education institutions were separately reported.

Grants and donations refer to funds disbursed without contractual obligation on the part of the receiving organisation to perform specified tasks on behalf of the funding organisation (other than provision of a report describing the work performed). Totals for "grants and donations" to private enterprise and tertiary education institutions were separately reported.

For both intramural and extramural expenditure, respondents were asked to report the sources of funds to enable expenditures to be allocated to the "Commonwealth Budget sector", the "Commonwealth Non-budget sector", and "Other sources of expenditure". The reporting categories were as follows:

Own funds refers to funds available for use by the respondent Department or Authority, and may be received:

- via the Budget sector (consisting of all transactions relating to the Public Account i.e. the Consolidated Revenue Fund, Trust Fund and Loan Fund, as reported in the Budget Statements(8). All transactions of departments are recorded in the Public Account and are accordingly part of the Budget sector); and
- via the Non-Budget sector (consisting of all transactions of authorities which do not pass through the Public Account).

Other sources relate to funds other than "Own funds" which are only available for the specified activity, and include, for example, any levy component from Research Trust funds, and funding provided by other Commonwealth departments and authorities, State government departments and authorities, and private enterprises.

#### Sources of expenditure from Research Trust Funds

There are a number of possible ways of presenting information on support for S&T resulting from the operation of research trust funds. There are four figures for expenditure which should be considered:

R, the total R&D (or S&T) expenditure from the trust fund account in the particular year;

C, the Commonwealth contributions to the trust fund account in that year in respect of the Commonwealth's support for research;

A, any Commonwealth appropriation to the trust fund account in respect of industry (or other) contributions to the Consolidated Revenue Fund for the purposes of the particular trust fund; and

I, the industry (or other) contribution in that year (usually a levy or tax).

In presenting information on trust fund support for S&T in the Science and Technology Statement, it has been our aim to seek a reporting method which, at least over a period of years, will tend to represent accurately the total of those components of expenditure from the fund which are attributable to Commonwealth contributions. A corollary of this is that we seek a similarly accurate representation with respect to industry (or other non-Commonwealth) contributions. The major classes of trust funds dealt with in the Statement were treated as follows.

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(8) See for example 1981-82 Budget Paper No. 1, Appendix, p303.

1. Funds where Commonwealth support is matched to the level of expenditure from the trust account.
  - (i) Commonwealth Budget sector net expenditure.  
C only is shown. (N.B. A is omitted since Commonwealth net expenditure only is sought).
  - (ii) Commonwealth Non-budget sector.  
There is no expenditure shown in this sector.
  - (iii) Other.  
R-C is shown since this expenditure can be attributed to industry (or other) contributions.
2. Funds where Commonwealth contributions are not matched to the level of expenditure from the trust account.
  - (i) Commonwealth Budget sector net expenditure.  
C only is shown, unless the Commonwealth component of R is less than C - in this case only that component is shown (e.g., where the Commonwealth contribution to the fund matches other contributions \$:\$, R/2 is shown).
  - (ii) Commonwealth Non-budget sector.  
Expenditure is shown (if any) which is attributable to Commonwealth contributions in previous years (e.g., where the Commonwealth contribution to the fund matches other contributions \$:\$, 1/2 (R-C-I) is shown).
  - (iii) Other.  
The amount shown here is the remainder after subtracting any amounts shown under (i) and (ii) from R.

Where the details of trust fund expenditure have been published in the annual Report of the Auditor-General upon Financial Statements prepared by the Minister for Finance, we have drawn on the Report to derive the figures for R, C, and I.

#### Allocation of expenditures by Budget function

The Budget functional classification<sup>^</sup>) brings together outlays directed towards like objectives or purposes. The basic aim of the classification is the same as that of the classification by socio-economic objective, namely to reveal the allocation of Government outlays to the broad purposes for which they are undertaken. However, the Budget functional classification is designed for general financial overview purposes, and to meet constraints imposed by the need to monitor and report monthly on actual outlays and receipts on a basis consistent with the annual estimates. As such, it does not provide an adequate functional statement for S&T policy purposes, but it is included in this Statement to show the location of the identified R&D and S&T expenditures in the Budget classification, to enable their relationship to broader economic aggregates to be evaluated.

The data presented in Table 4 were classified by the Department of Science and Technology using information provided in the 1982-83 Budget Papers<sup>(9)</sup>.

#### Allocation of expenditure by socio-economic objective

The socio-economic objective classes used in the Statement represent an amalgamation of those used in the Project SCORE R&D survey, as follows:

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(9) See 1982-83 Budget Paper No. 1, Appendix, pp 350-356 for detailed description of the classification, and Statement No. 3, pp 64-231 for treatment of individual items.

<u>Science and Technology Statement</u>	<u>Project SCORE</u>
Defence	Defence
Agriculture	Agriculture - Animal - Plant - Other agriculture
Other primary industries	Forestry Fisheries
Mining	Prospecting & resource assessment techniques - metallic minerals (other than uranium)  Prospecting & resource assessment techniques - non-metallic minerals (other than coal, oil, gas)  Extraction techniques - metallic minerals (other than uranium)  Extraction techniques - non-metallic minerals (other than coal, oil, gas)
Manufacturing <sup>(10)</sup>	Food Beverages and malt Tobacco Textiles and textile products Clothing and footwear Wood, wood products and furniture Paper and paper products Printing and allied industries Chemical fertilisers Industrial gases Synthetic resins and rubber Organic industrial chemicals n.e.c. Inorganic industrial chemicals n.e.c. Paints Pharmaceuticals Veterinary products Pesticides Other chemicals, petroleum and coal products Glass and glass products Clay products and refractories Cement and concrete products Other non-metallic mineral products Basic iron and steel Basic non-ferrous metals and products Structural and sheet metal products Other fabricated metal products Motor vehicles and parts Ships and boats Railway rolling stock and locomotives Aircraft

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(10) Promotion of industry aspects only e.g. funding of development of transport equipment for Australia's transport system is included under "Transport".

Transport equipment n.e.c.  
Photographic, professional and scientific  
equipment  
Radio and T.V. receivers; audio equipment  
Computers and electronic calculating machines  
Other electronic equipment n.e.c.  
Refrigerators and household appliances  
Other electrical machinery and equipment  
n.e.c.  
Agricultural machinery  
Construction machinery  
Materials handling equipment  
Other industrial machinery and equipment  
Leather and leather products  
Rubber products  
Plastic and related products  
Other manufacturing

Construction

Construction

Energy

Prospecting & resource assessment techniques  
- uranium

Prospecting & resource assessment techniques  
- coal

Prospecting & resource assessment techniques  
- oil and gas

Extraction techniques - uranium

Extraction techniques - coal

Extraction techniques - oil and gas

Production and utilisation of energy from

- Oil and gas
- Coal
- Solar
- Nuclear
- Other primary sources

Production and utilisation of synthetic fuels  
from

- Coal
- Biomass

Conservation of energy

Other energy R&D (including supporting  
technologies such as electricity  
transmission and distribution, energy  
storage, energy systems analysis etc.)

Transport	Road accidents & safety Other road Railway Water transport Air transport Multimodal transport Intermodal materials handling Other transport
Communications	Telecommunications & broadcasting Postal Other communications
Economic Services n.e.i.	Wholesale & retail trade Banking, finance & insurance Economy n.e.i. Overseas trade Productivity n.e.i. Industrial relations Water supply Sewage Other waste ADP systems n.e.i. Other information media n.e.i. Information indexing and retrieval systems Information reproduction n.e.i. General statistical methodology Other information technology Fire protection
Environment	Protection and rehabilitation of natural environment Protection of man-made environment Urban & regional planning Housing
Health	Health - Medical - Public
Education	Education
Welfare	Unemployment/unemployed Aboriginal welfare Migrant welfare Aged persons Youth/child welfare Social services n.e.i.
Community services n.e.i.	Consumer affairs Public administration Law reform Law enforcement Corrective services Sport Culture



	Parks
	Other recreation
	International relationships
	R&D primarily for the benefit of other countries
General advancement of knowledge	Geology
	Geophysics
	Geochemistry
	Cartography
	Geomechanics
	Hydrology
	Other earth
	Coastal & ocean engineering
	Biological marine science n.e.i.
	Other ocean
	Meteorology
	Other atmosphere
	Remote sensing
	General advancement of knowledge

Some particular cases requiring special note are:

. All grants by the Department of Education, and those recommended by the Tertiary Education Commission, for research in the higher education sector have been allocated to the socio-economic objective "General advancement of knowledge". This accords with international practice as embodied in the biennial International Survey of the Resources Devoted to Research and Experimental Development by OECD Member Countries, where the guidelines for the 1979 survey include the following:

"Please include in General Advancement of Knowledge all R&D financed by general public university grants from the Ministry of Education although, in certain Member countries, some of these programs may be relevant to other objectives. This is a convention dictated by the difficulty of distributing these funds by objective in many Member countries."

Should a distribution of these grants over other socio-economic objectives be required, the Project SCORE data may be used as a rough guide. Percentages of Commonwealth funded higher education sector R&D expenditures by broad socio-economic objective category reported for 1978 were Advancement of knowledge, 52%; Community welfare, 26%; and Economic development 21%.

- . In Science Statement 1979-80, the Project SCORE mining objectives relating to energy minerals were included in the category "Mining". In subsequent Statements, as noted above, they are included in the category "Energy".
- . In Science Statement 1979-80, expenditures of Commonwealth Serum Laboratories (CSL) were classified to the objective "Manufacturing" in accordance with the location of "Pharmaceuticals" in the classification scheme. In subsequent Statements, taking account of the objectives of CSL, these expenditures have been classified in the category "Health".

### Distinction between "advancement of knowledge" and basic research

Some readers of the Science Statement 1979-80 assumed a correspondence between the socio-economic objective category "advancement of knowledge" and the type of activity "basic research". A broad summary of General Government sector (i.e. Commonwealth plus State) intramural R&D expenditure data from the 1978-79 SCORE survey illustrates the difference.

Objective category	Type of activity			
	Basic research	Applied research	Experimental development	Total
National security	8.1	53.9	27.2	89.2
Economic development	57.2	204.0	30.4	291.6
Community welfare	24.1	28.2	5.4	57.7
Advancement of knowledge	21.6	5.8	4.0	31.4
Total	111.1	291.8	67.0	469.9

The basic research performed in objective categories other than "advancement of knowledge" is classified as basic because it has no "particular application or use in view" but satisfies the SCORE definition of strategic basic research, namely "research directed into specified broad areas in the expectation of useful discoveries. It provides the broad base of knowledge necessary for the solution of recognised practical problems."

Valid entries in the type of activity classes "applied research" and "experimental development" in the objectives category "advancement of knowledge" would be associated with developments which could ultimately contribute to several specific objectives in ways that do not allow one such objective to be selected as predominant".

On theoretical grounds, the figure for "basic research" in the objectives category "advancement of knowledge" should be an estimate of expenditure on "pure basic research", defined in Project SCORE as "research which is carried out without looking for long term economic or social benefits other than advancement of knowledge". In fact, two thirds of the \$21.6m in this category was reported as "pure basic research", and \$5.2m of "pure basic research" was reported outside the category.

The Statement does not attempt to distinguish between basic research, applied research, and experimental development.

### Estimation of trends in real terms

Expenditures throughout this Statement are presented in current prices i.e. in actual money terms. It is of course desirable to examine trends in real terms, taking account of changes in prices. The most acceptable presentation is to provide estimates of

all expenditures at constant prices(11). In the absence of known price variations for all goods and services purchased, it is usual for such estimates to be constructed using price indices for various broad categories of expenditure and quantity weights representing the relative contributions of these categories to the total expenditure.

Implicit price deflators are obtained by dividing aggregate flows of goods and services measured at current prices by the corresponding estimates at constant prices. Thus they are derived measures (hence the term 'implicit') and are not direct measures of price changes by which current price estimates are converted to estimates at constant prices. When calculated from the major national accounting aggregates, such as expenditure on gross domestic product (giving the GDP implicit price deflator), implicit price deflators relate to a generally broader scope of goods and services in the economy than that represented by any of the individual retail and wholesale price indexes that are published by the Australian Bureau of Statistics. The usefulness of implicit price deflators as indicators of price change is greatly limited by a number of factors(11). Nevertheless, because of the difficulty of constructing accurate R&D deflators, the GDP implicit price deflator is the deflator most commonly used for this purpose.

There is an extensive literature on this subject and readers are cautioned that while studies have shown that at the national and broad sector levels the GDP implicit price deflator has often given acceptable estimates of constant price R&D expenditures, there are many examples where it has not. In these cases the estimated R&D price deflators have usually increased more rapidly than the GDP implicit price deflator. Several price indices and deflators of some relevance are given below, for interest, but no attempt has been made to deflate the expenditures presented in the Statement. At the individual program and ministry levels, there can be marked variations from the price rises indicated by one or more of the broad aggregate deflators, due both to phasing of expenditures and the phasing and magnitudes of individual price changes of the goods and services actually purchased.

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(11) Australian National Accounts, National Income and Expenditure 1976-77, Australian Bureau of Statistics, Catalogue No. 5204.0, pp 109-112.

Price index or deflator	Index values for year (1979-80=100)						
	1973-74	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
GDP implicit price deflator	51.2	77.2	83.6	90.1	100.0	109.9	121.2
Gross non-farm product implicit price deflator	50.0	78.3	84.9	91.2	100.0	110.0	122.8
Government final consumption expenditure implicit price deflator	50.3	79.8	86.1	91.5	100.0	112.2	125.2
Consumer price index (CPI)#	51.1	76.6	83.9	90.8	100.0	109.4	120.8
University research cost index <sup>+</sup>	51.8	80.5	87.5	94.1	100.0	109.2	119.1
Private enterprise intramural R&D expenditure implicit price deflator*	45.3*	72.5*	80.2*	88.6*	100.0*	112.9*	127.4*
Research scientists and engineers salaries index**	61.0	86.7	92.7	97.0	100.0	113.4	121.8
Private other non-dwelling construction implicit price deflator	47.1	78.0	84.7	90.5	100.0	112.2	126.1
Private equipment implicit price deflator	45.5	72.7	82.4	90.9	100.0	109.8	118.7
Industrial machinery and equipment including photographic professional and scientific equipment - price index##	n.a.	74.1	81.9	88.6	100.0	112.3	127.4

Sources: Australian Bureau of Statistics:

- . Catalogue No. 5206.0, Quarterly Estimates of National Income and Expenditure, Australia, June Quarter 1982, pp13

- . Catalogue No. 6412.0, Price indexes of Articles Produced by Manufacturing Industry, Australia, January 1983 (p5);
- . Catalogue No. 6401.0, Consumer Price Index - December Quarter 1982 (p3);
- . Catalogue No. 8105.0, Research and Experimental Development - Business Enterprises, Australia - 1981-82 (Preliminary);

Salary data from Public Service Board and CSIRO.

n.a. not available

# Figures derived by DST from original series having a 1980-81 base

## Figures derived by DST from original series having a 1968-69 base

+ Estimated by DST.

\* Estimated by DST using the current and constant 1979-80 price figures for the years 1973-74, 1976-77, 1978-79 and 1981-82 (preliminary) published in ABS Cat. No. 8105.0, with interpolation of the deflator for missing years on the basis of constant annual percentage changes between the given years. In addition to noting the uncertainty introduced by using an interpolated figure for the base year, 1979-80, users should be aware that the ABS sees the constant price estimates in Cat. No. 8105.0 as less reliable than most published ABS constant price data. This series should therefore be treated as indicative rather than precise.

\*\* Computed by DST using salaries at 31 December each year for the Research Scientist Group and Engineer Grade 3. Arbitrary weights were used as follows: Senior Principal Research Scientist, 1; Principal Research Scientist, 2; Senior Research Scientist, 6; Research Scientist, 12; Scientific Officer, 12; Engineer Grade 3, 12.

#### Treatment of taxation concessions associated with R&D

Revenue forgone by the Commonwealth as a result of taxation concessions relating to R&D expenditure may be regarded as a form of Commonwealth funding of R&D. Estimates of costs borne by the revenue in respect of R&D performed by business enterprises can vary widely according to the viewpoint adopted and the timescale considered, because in the longer term industrial R&D is a profitable investment at the sector level, and may therefore be expected to increase taxation revenue in the future. Because of the difficulty of estimating appropriate amounts, no allowances for taxation concessions have been included in the tables presented in this Statement.

## ACRONYMS, ABBREVIATIONS AND SYMBOLS

(a)	Intramural Capital Expenditure
AAEC	Australian Atomic Energy Commission
AAECP	Asean Australian Economic Co-Operation Program
AATB	Anglo-Australian Telescope Board
ABC	Australian Broadcasting Commission
ABAH	Australian Bureau of Animal Health
ABN	Australian Bibliographic Network
ABRS	Australian Biological Resources Study
ABS	Australian Bureau of Statistics
ABT	Australian Broadcasting Tribunal
ACC	Australia-China Council
ACER	Australian Council for Educational Research
ACIAR	Australian Centre for International Agricultural Research
ACT	Australian Capital Territory
ADAB	Australian Development Assistance Bureau
ADACS	Australian Development Assistance Courses
ADP	Automatic Data Processing
AGAL	Australian Government Analytical Laboratories
AHRC	Australian Housing Research Council
AIAS	Australian Institute of Aboriginal Studies
AIMS	Australian Institute of Marine Science
AMSTAC	Australian Marine Sciences and Technologies Advisory Committee
ANAHL	Australian National Animal Health Laboratory
ANARE	Australian National Antarctic Research Expeditions
ANMRC	Australian Numerical Meteorology Research Centre
ANPWS	Australian National Parks and Wildlife Service
ANZAAS	Australian New Zealand Association for the Advancement of Science
ARGC	Australian Research Grants Committee
ARCS	Australian Research Grants Scheme

ARL Australian Radiation Laboratory  
 ARRB Australian Road Research Board  
 ARRDO Australian Railway Research and Development Organisation  
 ASCA Association for Science Cooperation in Asia  
 ASCO Australian Standard Classification of Occupations  
 ASEAN Association of South-East Asian Nations  
 ASTEC Australian Science and Technology Council  
 ATAC Australian Transport Advisory Council  
 AUBRCC Australian Uniform Building Regulations Consultative Committee  
 AUSINET Australian Information Network (Data Base Network)  
 AUSTRE Australian Scientific and Technological Reports (data base)  
 AUSTREC Australian Science, Technology and Research Co-operation (ADAB)  
 (b) Intramural Current Expenditure  
 BAE Bureau of Agricultural Economics  
 BE In this Statement Refers to Wholly Owned Commonwealth Business Enterprises  
 BERD Total Intramural R&D Expenditure in the Business Enterprise Sector  
 BIE Bureau of Industry Economics  
 BLMR Bureau of Labour Market Research  
 BMR Bureau of Mineral Resources, Geology and Geophysics  
 BTE Bureau of Transport Economics  
 (c) Extramural Expenditure  
 CCAMLR Convention on the Conservation of Antarctic and Marine Living Resources  
 CCRD Consultative Committee on R&D (ADAB)  
 CEDA Committee on the Economic Development of Australia  
 CHOGRM Commonwealth Heads of Government Regional Meeting  
 CILES Central Information, Library and Editorial Section (CSIRO)  
 CIRC Centre for International Research Cooperation (CSIRO)  
 CIRL Central Investigation and Research Laboratory  
 CITCA Committee of Inquiry into Technological Change in Australia  
 CGIAR Consultative Group on International Agricultural Research

CMRAC Department of Veterans' Affairs Central Medical Research Advisory Committee  
 CPI Consumer Price Index  
 CSIRO Commonwealth Scientific and Industrial Research Organization  
 CSL Commonwealth Serum Laboratories  
 CTHC Capital Territory Health Commission  
 CWLTH Commonwealth Government (i.e., Australian Federal Government)  
 DAF Data Acquisition Facility  
 DNA Deoxyribonucleic Acid  
 DPF Data Processing Facility  
 DST Department of Science and Technology  
 DSTO Defence Science and Technology Organisation  
 EBS Experimental Building Station  
 EPG Education Planning Group  
 ERDC Education Research and Development Committee  
 FPS Facility Planning System  
 FRG Federal Republic of Germany  
 GATT General Agreement of Trade and Tariffs  
 GBRMPA Great Barrier Reef Marine Park Authority  
 GDP Gross Domestic Product  
 GERD Gross Domestic Expenditure on Research and Development  
 HACBSS Homestead and Community Broadcast Satellite Service  
 HIF Health Facilities Information File  
 IAC Industries Assistance Commission  
 IAEA International Atomic Energy Agency  
 ICAO International Civil Aviation Organisation  
 ID Defence Industry Development Branch  
 IEA International Association for the Evaluation of Educational Achievement  
 IOC International Oceanographic Commission  
 IPS Ionospheric Prediction Service  
 IRAS Indicators and Resource Analysis Section. (Department of Science and Technology)



IR&D Industrial Research and Development  
 ISCED International Standard Classification of Education  
 MATPAK Materials Handling Program  
 MCB Metric Conversion Board  
 MEDLINE U.S. National Library of Medicine (Database Network)  
 MLS Microwave Landing System (INTERSCAN)  
 N Natural Sciences and Engineering  
 n.a. not available  
 NAL National Acoustic Laboratory  
 NASA United States National Aeronautics and Space Administration  
 NMR Nuclear Magnetic Resonance  
 NATmap Division of National Mapping (Department of Resources and Energy)  
 NBSL National Biological Standards Laboratory  
 NCDC National Capital Development Commission  
 n.e.c. not elsewhere classified  
 n.e.i. not elsewhere included  
 NERDDC National Energy Research, Development and Demonstration Council  
 NH&MRC National Health and Medical Research Council  
 NIF National Income Forecasting Model  
 sN Includes a small component of social sciences fee 1978-79 and 1979-80  
 NPRU National Police Research Unit  
 NSC National Standards Commission  
 NSE Natural Sciences and Engineering  
 OECD Organization for Economic Co-operation and Development  
 OTC Overseas Telecommunications Commission (Australia)  
 PPCA Productivity Promotion Council of Australia  
 PR&I Planning Research and Information Branch (Public Service Board)  
 RCF Review of Commonwealth Functions  
 R&D Research and Development  
 R,D&D Research, Development and Demonstration

S	Social Sciences and Humanities
NS	Includes some Natural Science and Engineering
S&T	Science and Technology
SCORE	Survey and Comparison of Research Expenditure
SMEC	Snowy Mountains Engineering Corporation
SSH	Social Sciences and Humanities
STA	Scientific and Technological Activities
STET	Scientific and Technical Education and Training
STS	Scientific and Technological Services
TAFE	Technical and Further Education
TTC	Technology Transfer Council
UHF	Ultra High Frequency
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VLSI	Very Large Scale Integrated Circuits
..	Figure non-zero, but insignificant for purposes of presentation.
.	Figure non-zero but not separately available is included elsewhere.









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