SCIENCE AND TECHNOLOGY STATEMENT 1983-84

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

MAY 1984

SCIENCE AND TECHNOLOGY STATEMENT
1983-84

The Minister for Science and Technology
The Honourable Barry 0. Jones, M.P.

A statement on the Commonwealth Government sector
prepared by the Department of Science and Technology
on the basis of information provided by
agencies of the Commonwealth Government
30 April 1984

Australian Government Publishing Service
Canberra 1984

ISSN 0726-2027

Printed by Canberra Publishing and Printing Co.

PREFACE

BY THE MINISTER FOR SCIENCE AND TECHNOLOGY

THE HON. BARRY O JONES MP

14 JUNE 1984

Introduction

As in previous years, the Statement is a tabulation of Commonwealth expenditure on science and technology, classified according to agency. Ministry and function. It also shows Commonwealth research and development (R&D) expenditure classified by socio-economic objective. The information presented covers Commonwealth funding on R&D over the past five financial years, and on more general science and technology activities for the past two financial years.

The term 'R&D' covers a wide range of activities, from basic scientific research with no commercial motivation to development of commercially marketable products. Basic research is funded mainly by government, as the time scales are too great and returns too uncertain to expect substantial business investment. The private sector contribution is greater in relation to experimental development (although the Commonwealth does have an involvement; for example through the Industrial Research and Development incentives Scheme, and CSIRO where development activity is necessary for effective research and technology transfer).

The Statement shows that in real terms total direct R&D funding provided by the Commonwealth Government and its agencies and enterprises for the current financial year is about 15 per cent greater than the level of five years ago. Thus the average real compound growth rate in Commonwealth support for R&D has been close to 3 per cent per annum, just slightly above the growth in real gross domestic product over the same period.

In real terms, total Commonwealth R&D funding for 1983-84 is approximately the same as for the previous financial year, but excluding land and buildings, (funding for which decreased due to completion of the Australian National Animal Health Laboratories), the real increase in the first Budget of the present Government is almost 5 per cent. Commonwealth support for R&D under this Government is higher than at any time in the past. R&D socio-economic objective areas which received particularly strong support under our 1983-84 Budget are: primary industry other than agriculture (up 23 per cent in real terms); health (up 22 per cent); education (up 13 per cent); community services, primarily development assistance (up 10 per cent); general advancement of knowledge, primarily in the tertiary education sector and CSIRO (up 8 per cent); and manufacturing (up 7 per cent).

The Statement gives us cause to reflect on some all too familiar and disturbing facts. We continue to be a middle ranking OECD country in terms of Government support for R&D. But due to the alarmingly small contribution by industry to R&D spending, we are near the bottom of the R&D table in terms of the percentage of GDP devoted to financing industrial R&D. Private enterprise funding of R&D fell sharply between 1973-74 and 1976-77 from 0.4% to 0.2% of GDP. This proportion has remained at about this level since then, indicating, I believe, a low propensity to innovate on the part of Australian industry.

In Switzerland, West Germany, Japan, USA, Sweden, UK, Netherlands, Belgium and France, private enterprise R&D funding ranges between 0.8% and 1.8% of GDP.

Figure 8 on page 171 of the Statement shows that Australia's per capita export performance in the range of manufactured goods which includes most technology-intensive products has deteriorated markedly since 1978. Based on this indicator we now rank 22nd on the list of 24 OECD countries. Switzerland, Netherlands, Belgium, Sweden, Ireland and Denmark are all small countries with per capita exports of these goods at least 10 times as large as Australia's - in Switzerland's case, 30 times as large! Compared with the small OECD countries which enjoy high GDP per capita, Australia purchases considerably less technical know-how, and sells a negligible amount of technical know-how to other countries.

You will understand why, in my speech tabling the draft National Technology Strategy recently, I identified amongst our national priorities the need to:

- *achieve a major increase in private sector R&D;*

- *move the economy toward high value-added goods and services.*

Science and Technology are major elements in the Government 's plan for the revitalisation of industry. The Science and Technology Statement outlines some significant recent developments in my portfolio and others, including Defence Support, Environment and Health. I now want to draw your attention to some of the developments in relation to my own portfolio responsibilities, and major initiatives the Government has taken since coming into office.

National Technology Strategy

My Department is developing a National Technology Strategy, a discussion draft of which I tabled on 8 May. The draft is being circulated widely throughout the community. It is at an early stage and a great deal of consultation will be necessary before the Strategy is finalised. Technological development is a complex process, involving a range of policy areas and affecting all parts of society. Governments can only do so much. The effort required of Australia is nothing less than a national response - industry, employees, unions, scientists, education and training institutions and community groups all have important parts to play.

Management and Investment Companies Act 1983

Legislation to promote the establishment and development of a private sector venture capital market in Australia was proclaimed on 1 February 1984. The Management and Investment Companies Act aims to encourage the formation and development of innovative, export-oriented Australian businesses which have the potential for rapid growth. This is to be achieved through the licensing of Management and Investment Companies (MICs) to raise venture capital in, and provide management guidance to such companies. There is a tax deduction of 100% for equity investment in MICs.

Australian Industrial Research and Development Incentives Scheme (AIRDIS)

Total funds available under the Australian Industrial Research and Development incentives Scheme (AIRDIS) were increased markedly in 1983-84. Project Grants were increased from $34m to $45m, and Commencement Grants from $13m to $16m. At the same time the scope for support of computer software development projects has been extended to encompass computer systems development and 'information sector ' services. Additional emphasis has also been given to support of biotechnology projects.

Evaluation of AIRDIS

A major evaluation of AIRDIS is to be undertaken in 1984-85. The project will assess the effectiveness of AIRDIS in meeting its objectives, and the appropriateness of those objectives in relation to Government industry and technology policy. A pilot study commissioned by my Department has recently been completed.

Biotechnology Research Grants Scheme

The Biotechnology Research Grants Scheme was funded for the first time in 1983-84. It is to provide financial support for selected strategic R&D programs holding the greatest promise for commercial development of biotechnology in Australia. Priority areas have been identified as genetic manipulation, cell manipulation and culture, and enzyme applications and fermentation technology. Eight programs, to cost $4.51m over 1984 to 1986, have been approved. Of the sunrise industries I have often talked about, biotechnology holds the greatest promise. It is sparing in its use of resources, and has almost unbounded applications in many areas. We have researchers who are world leaders in many areas of biotechnology. The Scheme is aimed at strengthening the link between academic researchers and industry.

National Technology Conference

My Department organised the National Technology Conference in September 1983 involving participants from private enterprise, trade unions, academia, research organisations, professional associations and Commonwealth and State governments. The primary aim of the Conference was to achieve the 'shock of recognition' of where Australia was placed in the dramatic sweep of technological change. Other aims were to seek community and industrial consensus concerning technology, to promote dialogue and to draw media attention to technology issues. The

Conference was successful in achieving the last two of these, and I hope we will move toward consensus as we develop a technology strategy in the months ahead. But the Conference was not so successful in achieving the shock of recognition of the extent and implications of technological change.

CSIRO Developments

For 1983-84 CSIRO identified seven areas for expansion by the allocation of new resources and by selective re-allocation of existing resources. These priority areas were biotechnology, advanced materials, generic manufacturing technologies, information technologies, water and soils, plant pathology and oceanography.

Additional resources for a number of these were made available by the Government in the 1983-84 Budget and further resources were allocated by re-deployments within CSIRO itself.

Some significant developments include:

- *R&D on zirconia-based ceramics such as the tough engineering ceramic PSZ (partially stabilised zirconia), and the formation of the KILCRA consortium by CISRO's licensee, Nilsen Sintered Products Ltd and CRA.*

- *Processes have been developed and are being commercialised to increase the yield of cheddar and similar cheeses through the application of ultrafiltration to milk.*

- *SIROTECH: the formation of the company SIROTECH to address industry use of CSIRO's research results was announced at the National Technology Conference in September. SIROTECH will negotiate licence agreements and arrange the development of research results to the stage where decisions on commercialisation can be made by industry. It will also assist CSIRO Divisions to identify and undertake research of more immediate relevance to particular firms by advising CSIRO on commercial matters and helping arrange contracts for CSIRO to undertake research for firms.*

- *An innovative new program in Applied Physics to foster high technology in industry and technology transfer to industry.*

- *A similar project-based program in information technology involving CSIRO-industry collaboration in research, development and commercialisation.*

- *Isolation in maize of the 'jumping gene' which could well lead to the genetic engineering of higher yield and drought and disease resistant crops.*

- *Introduction of a scheme of Overseas Fellowships under which up to 50 Fellowships can be awarded for work directly related to CSIRO's present or developing research needs.*

Commonwealth/State Cooperation

Special steps have been taken to establish links between Commonwealth and State technology policies. The Industry Minister's meeting has been expanded to include Technology Ministers. A supporting Working Party of Commonwealth and State Industry and Technology Officials was then established to consider specific technology issues.

OECD Review

The Government has invited the OECD to undertake a Review, commencing in 1984 of Australia's S&T policies. This will be the second such Review. The first led to a number of policy changes from the mid 1970s.

National Research Fellowships Scheme

The National Research Fellowships Scheme will initially provide 50 three year post-doctoral fellowships commencing in 1984. The fellowships are to be allocated to priority areas of national interest and will be tenable both in industry and for basic research.

Other Areas of Government Policy

Technology consideration are having an increasing influence on other Government policies. I give three examples.

- *The Government has reviewed its purchasing preference policy, which encourages industrial innovation in providing an endorsement and market for local products. The new policy has, inter alia, a revised local content definition which includes R&D and design.*

- *Revised industry consultative arrangements have been initiated. One of the aims has been to promote debate on the development and application of new technology. The new arrangements involve the establishment of 10 advisory councils and an expanded role for the Australian Manufacturing Council. CSIRO scientists are members of nine of these councils. Such involvement facilitates increased awareness by industry of new technology developments and awareness by CSIRO of trends and problems in industry.*

- *The Government's review of Foreign Investment Policy resulted in the revision of the criteria against which proposals are examined. A proposal now must indicate the contribution it would make to improving the utilisation of resources, or expanding productive capacity as a result of the introduction and diffusion of new technology and other skills.*

Conclusion

Considering the development and initiatives J have outlined, 1983-84 has been a significant year for science and technology. But we have no grounds for complacency. The Government recognises the need to introduce urgent and rapid change in Australia to achieve the transition to the growth areas of the 1980s and beyond. The recent Government initiatives have made a start, but it will take nothing less than a national effort to meet the challenge facing Australia.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

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 suns of components listed in tables may be noted: these are due to rounding.

INTRODUCTION

This is the fifth annual Statement providing detailed information about expenditure by the Commonwealth Government in support of science and technology (S&T). Beginning in the late 1960s, at least a decade after the more advanced OECD countries, Australia began to grope towards coherent policies for science and technology. In the debates on the need for such policies, what they might achieve, what they should encompass, and how they might be implemented, there was a wide diversity of views. In opposite camps were some in business and in the bureaucracy who saw Government intervention generally as both unnecessary and counter-productive, and those who saw that such intervention by Governments in other countries was generating strong technological and industrial advantages for those countries.

By the late 1970s Australia had in place science and technology policy machinery capable of giving sound advice to Government. A number of useful reports were produced and initiatives taken to develop our scientific and technological infrastructure. The annual Science and Technology Statement was established in 1980 as a source of data. Nevertheless, compared with the commitments of other Governments in both advanced countries and some newly industrialising countries, the Australian Government performance in promoting national technological capability and industrial vitality through innovation can be seen as little more than tokenism.

The public at large became aware of our serious technological disadvantage when the media for the first time recognised the importance of the issue in the campaign before the March 1983 election.

We are in a technological race where all the front runners will receive substantial benefits, while those who trail the field will inevitably suffer substantial declines in their relative standards of living. History tells us that in the long term a nation which does not maintain technical competence near the state-of-the-art becomes poor.

The Labor Government came to office in March 1983 with a comprehensive plan for national recovery and reconstruction. As part of that plan, the Government recognised that science and technology has a central role to play in Australia's economy by revitalising existing industries and encouraging the growth of new ones and emphasis was placed on the development of sixteen 'sunrise industries', including biotechnology, microelectronics applications, and industrial ceramics.

Following the National Economic Summit Conference in April 1983, the first National Technology Conference was held in September 1983. As an outcome of that Conference the Minister for Science and Technology has released a discussion draft of a National Technology Strategy. This recognises that a national effort is required to use technology in achieving Australia's social and economic goals. The process of development is complex, involving social and political issues as well as technological factors, and affecting all parts of society. Accordingly the draft strategy is being circulated widely throughout the community. Success of an overall strategy will depend on constructive approaches to the major issues facing Australia by all parties involved: government, unions, industry, academia and the community in general.

The draft National Technology Strategy is part of the process of developing Government policy. The present Statement presents figures which are a reflection of previous and existing Government policies on science and technology, so far as these are expressed in expenditure commitments. In this Statement only projected figures for 1983-84 have been influenced by the present Government. As there are limits to the changes in direction practicable in any one year it will be several years before the full effects of present Government policies become apparent. Nevertheless, some significant changes can be seen in this first year, and these are presented in the chapter "Recent Trends in Commonwealth Funded S&T". The Statement also presents a summary of recent developments in S&T supported by the Commonwealth, and a set of international comparisons which highlight the context, discussed above, in which Government policy is being made.

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 develop 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 (1), the Department is working towards publishing a biennial Australian science and technology indicators report, which will 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 in response to requests from ASTEC and others to include constant price estimates for various aggregated data.

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 OECD and UNESCO. 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.

In Australia, funds for science and technology are provided through a number of different avenues to a wide range of bodies. 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.

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 a factual rather than an interpretative 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.

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

RECENT DEVELOPMENTS

Policy and Co-ordination

. OECD Review of Australian Science and Technology Policy

The Australian Government has invited the Organisation for Economic Co-operation and Development (OECD) to undertake a Review of Australia's Science and Technology Policies during 1984. This will be the second such Review.

Since the first OECD examination of its S&T policies in 1974, Australia, like other nations, has experienced a new and challenging economic environment, coupled with a heightened perception of the need to integrate science and technology policies with other government policies. The second examination will help Commonwealth and State Governments develop and implement their policies in the context of an overall strategy.

The OECD is regularly requested to examine the science and technology policies of Member nations. These assessments serve dual purposes:

- enabling better national appraisal of the effectiveness of R&D effort and its supporting infrastructure in the achievement of national goals; and

- adding to international knowledge on the operation of science and technology policy as an instrument of government.

The first OECD Review led to a number of changes in Australia's S&T policies from the mid-1970s. The final Report of the OECD examiners, expected by the end of 1985, will also foster change.

. National Technology Conference

A National Technology Conference, held in Canberra from 26-28 September 1983, was organised by the Department of Science and Technology with a major goal of moving towards the development of a national technology strategy. The Conference had the following objectives:

- to consider the role of technology in economic development;

- to encourage innovation, including increased research and development, in industry;

- to examine means of encouraging technological development;

- to explore the need for and availability of selective assistance to encourage the development and/or revitalisation of industries based on new technological opportunities;

- to ensure consultation between all interested and affected sectors of the community on technology-related issues;

- to identify education, training and skill requirements of the community in the new technological environment;

- to examine the role of research in government and tertiary institutions and the mechanisms for increased interaction with all sectors of the economy; and

- to consider the roles of Federal and State Governments as part of a national technology strategy.

Participants at the Conference included representatives from private enterprise, the trade union movement, industry organisations, academia, research organisations, professional asociations and government, including Commonwealth and State Ministers.

. National Technology Strategy

A discussion draft of a national technology strategy based on the deliberations of the National Technology Conference was released by the Minister for Science and Technology in April 1984. The draft is being widely circulated as a step towards development of community and industrial consensus concerning technology. Comments and public discussion of the draft constitute a necessary step before proposals for a national technology strategy are brought before the Government.

. National Research Fellowship Scheme

A new scheme of National Research Fellowships will provide 50 three year post-doctoral fellowships commencing in 1984. The fellowships are to be allocated to priority areas of national interest, industry-based research and fundamental research.

. Inquiry into Commonwealth Laboratories

The Report of the Committee of Inquiry into Commonwealth Laboratories (Ross Committee) on the operations of Commonwealth Laboratory facilities and services was tabled in Parliament in March 1984. The Committee's findings have been published in a three volume report and its recommendations are currently under consideration.

Defence

In 1983 a new avionics test facility was opened at the Government Aircraft Factories (GAF). This facility is part of an upgrading of a number of facilities at GAF as part of the McDonnell Douglas F/A-18 project. Within this workshop highly skilled technicians and tradesmen will be able to carry out the complete range of tests on the avionics equipment associated with or to be fitted to the F/A-18 and other aircraft.

Agriculture

. Animal Production

Significant developments by CSIRO in this area include the following:

- An entirely new application for the technique of immunization has been developed by the Division of Animal Production. Ewes are immunized against one of their own hormones causing higher levels of twinning. This discovery was recently commercialised and will allow farmers to increase lamb production rapidly when season and markets are favourable.

- The Division of Tropical Animal Science has demonstrated that injection into cattle of extracts from adult female ticks confers a high degree of protection against tick infestation in the laboratory. Fractions concentrated from the crude extract have shown similar activity and the possibility of producing a tick vaccine through genetic engineering techniques is being pursued.

- A controlled release capsule that will give livestock continuous protection against parasites has been developed by the Division of Animal Production. The capsule is swallowed and lodges in the paunch of cattle or sheep. It will be used for controlled release dosing of livestock and offers potential for the administration of trace elements and chemical defleecing.

. Plant production

CSIRO has signed a research agreement with the US-based Agrigenetics Corporation. Under the four-year agreement, CSIRO and Agrigenetics will conduct further research into a promising new system being developed by CSIRO for introducing new genes into maize, using transposable DNA elements or "jumping genes". Agrigenetics will acquire rights to applications overseas of the system to maize. CSIRO will retain the right to use the system for maize breeding in Australia, and will have the right to commercialise the system worldwide for all crops except maize.

A computer-based system to assist irrigation farmers to improve crop management is being developed collaboratively by CSIRO and the New South Wales State Department of Agriculture. The project (SIRAGCROP) involves scientists from CSIRO's Centre for Irrigation Research, the Divisions of Plant Industry and Soils, and agronomists from the Department of Agriculture. The system is being applied initially to wheat and other summer crops at Griffith, NSW.

In a move to help in the diversification of non-irrigated agriculture in Australia, a new laboratory for the CSIRO Division of Plant Industry was opened in March for work on the introduction of new crops, and the improvement of existing crops. The laboratory has refrigerated storage facilities for germ plasm from wild Australian relatives of crop species such as soybeans, cotton, sorghum and rice, and has been designated as the national and international gene bank for these species.

Other primary industries

. Fisheries

A systematic oceanographic survey is being carried out by CSIRO to provide more reliable information about the distribution and abundance of crustacean species in Australian waters. Significant quantities of lobster-like crustacean (scampi) and new prawn types have already been found while conducting experimental trawls off the continental shelf about 150 km northwest of Port Hedland.

Mining

New smelting technology developed by CSIRO is now being adopted by Australian mining companies under licence agreements. The SIROSMELT technique is more efficient and uses less energy than conventional metal smelting methods. The most recent licensees are Eastern Copper NIL, which will be using SIROSMELT to recover copper, silver and gold from the Laloki deposit in Papua New Guinea, and Mount Isa Mines Ltd, which is investing several million dollars in pilot scale development of a process to smelt lead directly from its ore.

Manufacturing

. Venture Capital Legislation

Legislation to promote the establishment and development of a private sector venture capital market in Australia was enacted. The Management and Investment Companies Act 1983 is to encourage the formation and development of Australian businesses which utilise innovative technology, have the potential for rapid growth, are skill intensive, export oriented, internationally competitive and are significant generators of employment in Australia. These objects are to be achieved through the licensing of Management and Investment Companies (MICs) to raise venture capital for investment in, and to provide management guidance to such businesses. There is a tax deduction of 100 per cent for equity investment in licensed MICs. Main elements of the Act and associated amendments to taxation legislation are based on the principal recommendations of the High Technology Financing Committee of the Australian Academy of Technological Sciences (Espie Committee).

. IR&D Incentives Changes

The scope and effectiveness of the Industrial Research and Development Incentives Scheme were increased by a number of amendments to the legislation under which the Scheme is administered and by a marked increase in the Commonwealth Government's commitment to fund IR&D undertaken within the private sector. In particular, the scope for support of computer software development projects has been extended to encompass the important growth areas of computer systems development and 'information sector' services. Additional emphasis has also been given to support of biotechnology projects.

New criteria are to be employed in assessing IR&D project applications for Commonwealth funding support under the Incentives Scheme. Compliance with these new criteria will place a greater obligation on applicants to demonstrate that they have a sound business plan to see their project through from conception to commercial reality. To this end prior legislative restrictions have been removed to allow the Incentives Board to liaise with venture capitalists and other funding institutions if such consultation is considered likely to help recipients of grants carry through their projects to a profitable commercial outcome. In addition, collaboration between industry and specialist research organisations, including tertiary education institutions, will be encouraged by new provisions allowing research companies to obtain funding support for IR&D projects undertaken on behalf of two or more unrelated corporate clients. The cash flow problems sometimes associated with IR&D have been alleviated by amendments to the IR&D Incentives Act to allow limited grant payments to be made in advance of IR&D performance.

. Biotechnology Grants Scheme

A Biotechnology Research Grants Scheme has been established to provide financial support for selected strategic R&D programs holding the greatest promise for commercial development of biotechnology in Australia. The program commenced in 1984 and eight programs, to cost $4.5m over the first three years, have been approved. Priority areas are to be genetic manipulation, cell manipulation and culture, enzyme applications and fermentation technology.

. CSIRO Developments

The formation of a company (SIROTECH) to encourage industry's use of CSIRO's research results was announced at the National Technology Conference in Canberra in September 1983. SIROTECH will facilitate the transfer of CSIRO research results to industry by negotiating licence agreements and by arranging the development of research results to the stage where decisions on commercialisation can be made by industry. It will also assist CSIRO Divisions to identify and undertake research of more immediate relevance to particular firms by advising CSIRO on market and other commercial matters and by playing a part in arranging contracts for CSIRO to undertake research for firms. A special provision of $600 000 was made available to CSIRO by the Government to assist in the establishment and operation of SIROTECH, to complement a similar amount being provided by CSIRO through internal redeployment.

Other significant developments involving CSIRO's activities directed to manufacturing objectives include:

- Increased support in 1983-84 for research and development on zirconia based ceramics such as the tough engineering ceramic PSZ (partially stabilized zirconia) including the formation of the NILCRA consortium by CSIRO[1]s licensee, Nilsen Sintered Products Ltd and CRA.

- Ways have been developed to increase the yield of cheddar and similar cheese's through the application of ultrafiltration to milk. This retains in the curd soluble proteins that are removed in the whey in conventional cheesemaking. The yield of 'cheesebase' used in processed cheese has been increased by about 16%, and the yield of cheddar by about 9%. The processes, developed by the Division of Food Research, are being commercialised.

Energy

An analytical tool which will assist the Australian minerals and energy industries has been commissioned at CSIRO's Division of Mineral Physics. The Heavy Ion Analytical Facility (HIAF) will enable rapid, highly accurate analysis of mineral samples using a high-energy particle accelerator.

Economic Services

. Information technology

CSIRO has been allocated $0.7m to begin a new initiative in information technology. A study group has examined in detail appropriate areas for CSIRO involvement in collaboration with Australian industry. The Organization will establish an information technology program of joint CSIRO-industry projects nominated by industry, and a new Division of Information Technology to conduct advanced research. Continuing CSIRO-industry cooperation has resulted in the development of a micronode for computer communication networks which is being produced commercially.

Australia's first multi-project silicon wafer chip (MFC) has been produced by CSIRO's VLSI group in Adelaide in joint projects with industry, universities and other research institutes. The MFC has incorporated such chips as a processor for the bionic ear, an insulin diffuser, a mineral deposits assessor and an eye-movement detector to enable quadriplegics to operate various devices.

In 1984 CSIRO expects to take delivery of Australia's first 'super computer', the Advanced CYBER 205 System, to be added to the computing power available through the national network, CSIRONET. Users of CSIRONET are also being offered an electronic printing facility as an addition to its basic service. The facility, which includes technology that will be available for the first time in Australia, follows a collaborative agreement, between CSIRO and an Australian-owned micrographics company, Microsystems Pty Ltd. Three laser printers will be available, one each in Canberra, Sydney and Melbourne.

Environment

. Control of Hazardous Chemicals

The Commonwealth, State and Territory environment ministers have agreed to develop a new national scheme to assist in the control of hazardous chemicals in Australia. The scheme is expected to commence in January 1985 and will form part of joint Commonwealth-State measures aimed at providing controls on all chemicals which could harm people or the environment.

An inventory of existing chemical substances is being constructed as part of the new national scheme. The inventory will provide a reference point for identifying new chemicals being introduced in Australia. The inventory should be completed in late 1984.

Health

. Grant for Gene Synthesis Laboratory

The Commonwealth *is* providing a grant of $400 000 in 1983-84 to the Howard Florey Institute in support of its Gene Synthesis Laboratory. The grant is to provide funds to allow the high quality of the gene synthesis work to continue.

. Moves on Occupational Safety and Health

The Government has established a research grants scheme to be awarded annually for occupational safety and health research projects. $200 000 has been allocated for the scheme in 1983-84. Projects submitted for funding will be selected on the basis of their emphasis on occupational safety or direct relevance to improving the physical working environment.

The Government is to establish a national institute of environmental and occupational health. The institute is part of the Government's national strategy to improve the quality of the working environment and to combat industrial accidents and occupational disease.

. Assessment of Chemical Hazards

High priority is being given to the establishment of a chemical hazard assessment unit involving Commonwealth-State regulations and responsibilities. The unit will evaluate toxicological data on chemicals used in Australia and assess their health implications.

Community Services

. Overseas Development Assistance

Substantial progress has been made in controlling a huge infestation of salvinia, the world's worst water weed, in Papua-New Guinea. A weevil imported from Brazil by CSIRO's Division of Entomology has already cleared salvinia from the first lake in a large system of lakes on the Sepik River, and is attacking the weed on more than a dozen other lakes.

Earth, Ocean and Atmosphere

. Earth Sciences

BMR is commencing a new program of marine geological and geophysical research which will focus on the petroleum potential of the sedimentary basins occurring on Australia's continental margins. In 1983-84, $2.95m is being provided to charter a marine geoscience research vessel, purchase new marine survey equipment, and develop a seismic data processing facility.

A Minerals (Exploration) Research Liaison Committee (MERLCO) was established in December 1982 to facilitate co-ordination and rationalisation of the" geoscience research program's carried out by BMR and CSIRO.

Administrative responsibility for the Australian Landsat Station (ALS) is being passed from the Department of Science and Technology to the National Mapping Division of the Department of Resources and Energy.

. Water Resources

The Government has decided to consider establishment of an Institute of Freshwater Studies as the next step in Commonwealth involvement in water research and has established an Interim Council to advise on the need for the Institute.

. Marine sciences

The new CSIRO Marine Laboratories complex in Hobart will be ready for occupation later this year. The CSIRO Oceanographic Research Vessel, currently under construction in Cairns, will begin operating as a national facility in early 1985.

. Atmospheric Sciences

The Bureau of Meteorology is substantially upgrading its national meteorological research role with the establishment of the Bureau of Meteorology Research Centre (BMRC) as an essentially self-contained research institute within the Bureau's Head Office. The purpose of the BMRC will be the advancement of meteorological science with emphasis on improved understanding of Australian weather and climate, and development and improvement of the Bureau's operations and services.

General Advancement of Knowledge

. Antarctic Activities

A Joint Management Review team established to assess the present and future activities of the Department of Science and Technology's Antarctic Division in its report considered:

- the objectives and functions of the Antarctic Division, both now and in the context of likely developments in the future;
- the efficiency and effectiveness with which current functions and objectives are being met; and
- the changes which would be necessary to ensure the Division is able to meet future objectives.

Factors taken into account were:

- Australia's obligations under international treaties and agreements;
- existing legislation;
- likely international developments in the Antarctic;
- the probable introduction of regular air services between Australia and the Antarctic;
- difficulties in managing Antarctic shipping; and
- the multi-organisational composition of the Australian National Antarctic Research Expedition (ANARE).

At present the report's recommendations are under consideration.

. Astronomy

In November 1983, the Government accepted a recommendation by the Parliamentary Public Works Committee that construction of the Australia Telescope should proceed. Six antennae at Culgoora and at Siding Spring will be constructed and linked to the existing CSIRO radiotelescope at Parkes, simulating a disk 300km across. The total cost is $30.7m at March 1983 prices, and $4.4m has been allocated to CSIRO in 1983-84 for the project. The Australian content is expected to exceed 80!K. Work is proceeding on designing a VLSI correlator chip to process the large amount of observational data which will be produced.

. Space

The first Australian National Space Symposium, jointly sponsored by the Department of Science and Technology and AUSPACE Pty Ltd was held in Sydney in March 1984. The Symposium provided the first opportunity for representatives from government, industry, research establishments and academia to consider Australia's present activities and capabilities and discuss the direction its future space effort should take. The objectives were:

- to identify the nature and extent of local industrial and scientific capability and interest in space;

- to ascertain the nature and extent of Australia's likely or desirable involvement in space science and space-related manufacturing activities;

- to identify possible arrangements by which Australian industry and research institutions can participate in and profit from this involvement; and

- to discuss policy options for government in implementing any arrangements.

RECENT TRENDS IN COMMONWEALTH FUNDED S&T

Summary

Figure 1 and Table 1 present broad summaries 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 finds". 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 $921m on R&D for 1983-84 shows an increase of nearly 9% relative to the estimated 1982-83 total of $846m. (Part D of Table 1.)

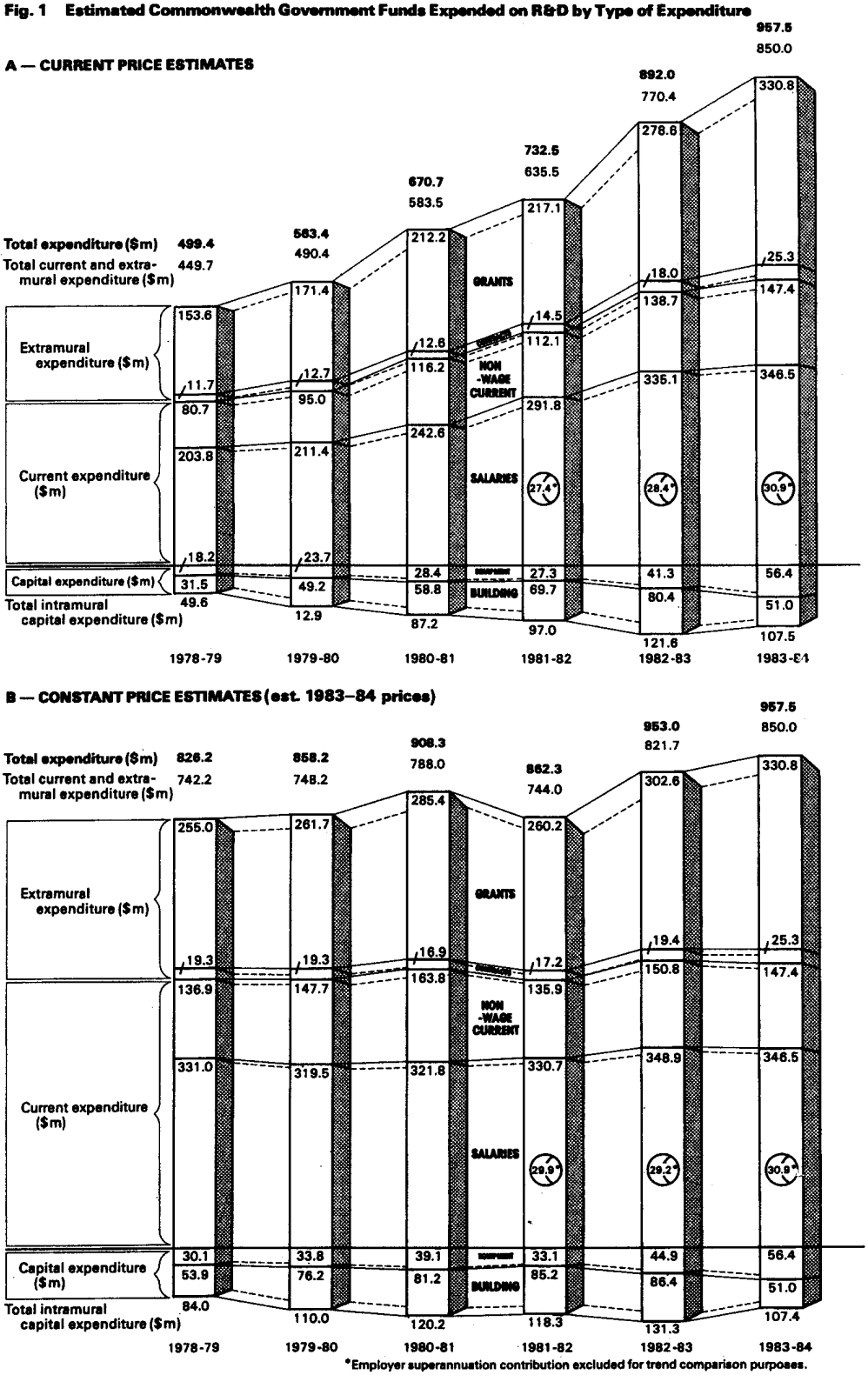
To discuss trends in expenditure in terms of the levels of activity being supported, the expenditures should ideally be expressed at constant price levels, and adjustments should be made to remove the effects of any expenditure changes which did not influence the level of real activity. This is discussed further in Appendix 5 under the heading "Estimation of trends in real terms". Price indices used to obtain constant price estimates for sector and socio-economic objective aggregates are presented there, together with the resulting estimates of constant price expenditures and real growth rates (Tables 29 to 32). Part B of Figure 1 and some lines of Table 1 summarise some constant price information. All other expenditures throughout the document are at current prices.

Over the period 1978-79 to 1983-84 the average real growth rate in R&D expenditure funded through the Budget sector is 45K 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 $31m identified in the 1983-84 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%.

Table 1: Summary of trends in Commonwealth Government support for S&T, 1978-79 to projected 1983-84.

($ million)	R&D						S&T (including R&D)				
						Projected					Projected
	78-79	79-80	80-81	81-82	82-83	83-84	79-80	80-81	81-82	82-83	83-84
A. 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											
($m current)	466	527	623	678	818	891	907	1069	1201	1392	1526
% Total Commonwealth outlays (%)	1.61	1.66	1.72	1.64	1.67	1.57	2.87	2.95	2.91	2.84	2.69
% GDP (%)	.454	.455	.473	.453	.499	.469	.784	.811	.803	.850	.803
Identifiable* Commonwealth Government funds expended on S&T (including Non-Budget Sector)											
- excluding Cwlth-owned BE											
($m current)	470	533	630	688	843	906	914	1079	1213	1392	1544
% GDP (%)	.458	.460	.478	.460	.515	.477	.790	.817	.810	.849	.813
($m constant 83-84 prices)	*778*	*811*	*852*	*810*	*901*	*906*	*1411*	*1476*	*1442*	*1537*	*1564*
- including Cwlth-owned BE											
($m current)	499	563	671	732	892	957	1015	1196	1354	1569	1689
% GDP (%)	.487	.487	.509	.489	.544	.504	.878	.907	.905	.958	.889
($m constant 83-84 prices)	*827*	*858*	*908*	*862*	*953*	*957*	*1563*	*1639*	*1609*	*1694*	*1709*
B. Identifiable* R&D Expenditure by Major Socio-Economic Objective Group, R&D only (Table 3)											
Expenditure on National Security											
Intramural (Tables 13 & 15)											
- Capital	7	9	8	8	15	23					
- Current	79	83	98	104	125	123					
Extramural (Tables 14 & 16)	0.4	0.4	0.4	0.7	1.0	0.9					
Expenditure on Economic Development											
Intramural (Tables 13 & 15)											
- Capital	32	50	67	75	77	48					
- Current	150	160	186	216	239	256					
Extramural (Tables 14 & 16)	48	60	80	59	90	109					

Fig. 1 Estimated Commonwealth Government Funds Expended on R&D by Type of Expenditure



($ million)	R&D						S&T (including R&D)				
	78-79	79-80	80-81	81-82	82-83	Projected 83-84	79-80	80-81	81-82	82-83	Projected 83-84
Expenditure on Community Welfare											
Intramural (Tables 13 & 15)											
- Capital	5	6	5	6	10	9					
- Current	27	33	35	41	54	55					
Extramural (Tables 14 & 16)	30	31	40	55	68	88					
Expenditure on Advancement of Knowledge											
Intramural (Tables 13 & 15)											
- Capital	5	7	7	8	19	28					
- Current	29	31	40	44	56	60					
Extramural* (Tables 14 & 16)	87	92	104	118	138	158					
Total* (direct Commonwealth funding)	499	563	671	732	892	957					
C. Identifiable* S&T Expenditure by Broad Field of Science											
Expenditure on Natural Sciences and Engineering											
Intramural (Table 9)											
- Capital	48	71	86	96	121	107	123	132	144	168	149
- Current	274	294	344	387	457	476	496	579	664	764	798
Extramural* (Table 10)	132	150	186	187	247	298	245	302	317	411	498
Sub-total*	454	515	616	670	825	881	863	1012	1125	1343	1446
Expenditure on Social Sciences and Humanities											
Intramural (Table 11)											
- Capital	1	2	2	..	..	1	3	14	7	10	8
- Current	11	13	15	17	16	18	94	113	153	131	137
Extramural* (Table 12)	33	34	38	44	50	58	55	57	70	85	99
Sub-total*	45	49	54	62	67	77	152	184	229	226	244
Total* (direct Commonwealth funding)	499	563	671	732	892	957	1015	1196	1354	1569	1689

($ million)	R&D						S&T (including R&D)				
	78-79	79-80	80-81	81-82	82-83	Projected 83-84	79-80	80-81	81-82	82-83	Projected 83-84
D. Commonwealth Identifiable* S&T Expenditure Estimates Compared to Outlays and GDP (FINANCIAL PERSPECTIVE #)											
Identifiable* Commonwealth Government Budget sector funds expended on S&T											
($m current)	466	527	623	705	846	921	907	1069	1230	1422	1559
% Total Commonwealth outlays (%}	1.61	1.66	1.72	1.71	1.73	1.62	2.87	2.95	2.98	2.90	2.75
% GDP (%)	.454	.455	.473	.471	.516	.485	.784	.811	.822	.868	.821
Identifiable* Commonwealth Government funds expended on S&T (including Non-Budget sector)											
($m current)	499	563	671	760	920	988	1015	1196	1384	1600	1722
% GDP (%)	.487	.487	.509	.508	.562	.520	.878	.907	.925	976	907
Total Commonwealth outlays ($m)	29015	31661	36290	41338	48982	56703					
GDP ($m)	102565	115667	131865	149649	163857	190000##					

BE Wholly Commonwealth-owned business enterprises.

Note : Tables 7 to 18 are located in Appendix 1. Table 7 presents a breakdown of intramural expenditure by ministry and agency with major R&D performance. Table 8 presents a similar breakdown of extramural payments by ministry and major granting program. Detail on contracts and grants is provided in Appendix 3.

* The data shown do not contain estimates for the research components of higher education sector teaching-and-research expenditures - see page 56.

\# 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 A for changed superannuation arrangements involving increased expenditure by some major agencies, without any corresponding change in function or level of activity. The same adjustment is made in Tables B and C and elsewhere in the Statement, except in the body of those tables where the adjustment is made explicitly to the total. Those whose major concern is expenditure per se will find Table D, where no adjustment is made, more appropriate for most purposes.

DST estimate, April 1984.

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 2, which is confined to the years 1982-83 and (projected) 1983-84, 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. 2 Estimated Commonwealth Government Funds Expended on S&T by Ministry

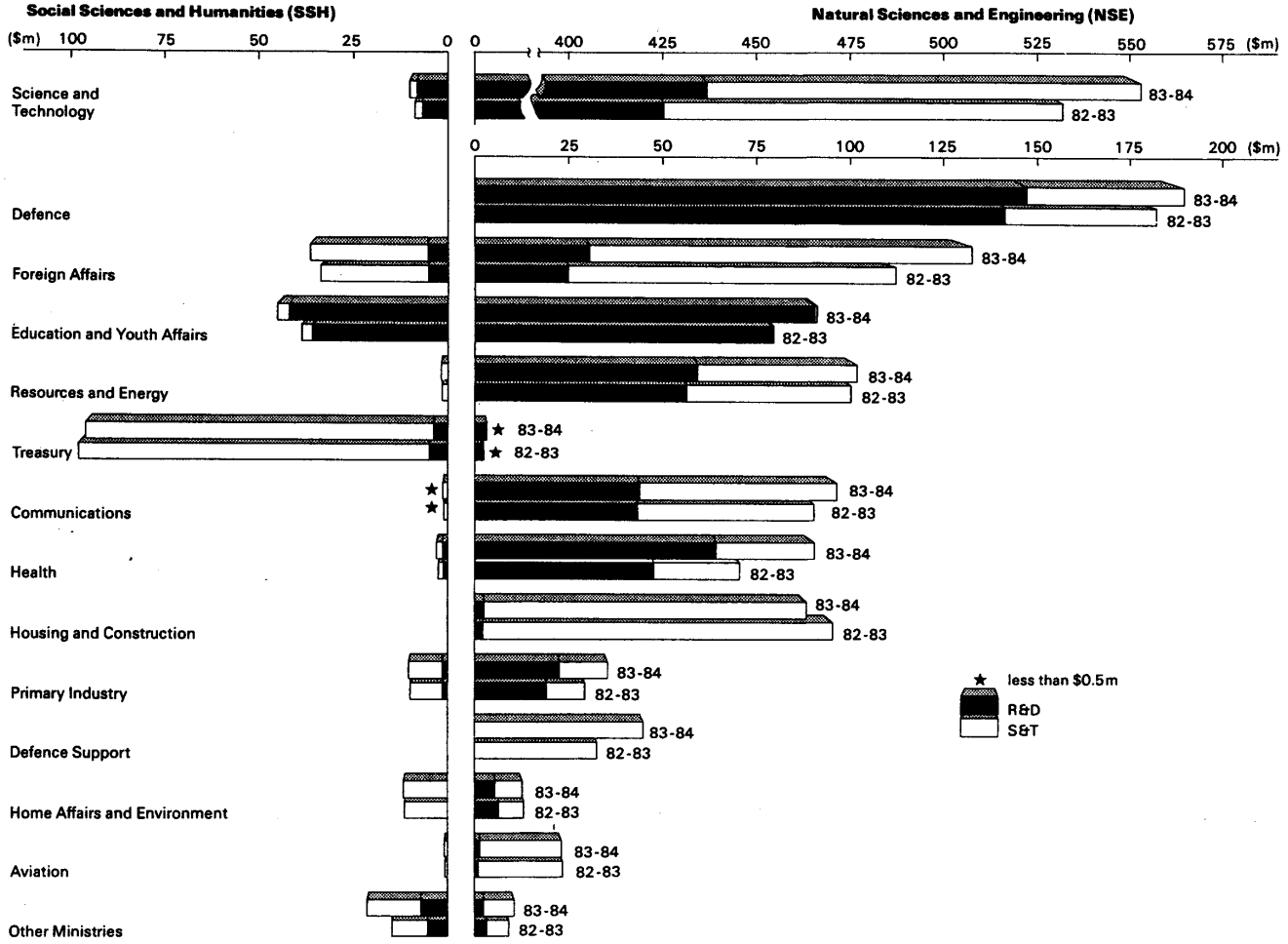


Table 2: Estimated Commonwealth Government funds expended on S&T by ministry with prime responsibility for planning the expenditure*

($ million)	R&D					S&T (including R&D)			
				Projected					Projected
	79-80	80-81	81-82	82-83	83-84	80-81	81-82	82-83	83-84
A. Commonwealth Budget sector net expenditure									
Aboriginal Affairs	1.19	0.92	0.62	0.53	0.58	3.00	2.75	3.00	3.36
Admin. Services	-	-	0.01	-	-	-	0.01	0.14	0.13
Attorney -General's	1.52	2.20	2.82	3.46	4.12	3.14	3.85	4.48	5.17
Aviation	1.27	1.30	1.35	1.05	1.44	16.21	17.62	24.33	24.10
Communications	0.33	0.30	0.52	0.36	0.37	0.50	1.04	1.21	1.50
Defence	92.33	105.89	112.91	141.37	147.19	136.18	143.45	182.07	189.68
Defence Support	0.03	0.03	-	-	-	17.19	30.65	32.79	44.98
Education & Y.A.	79.5	88.3	98.4	115.2	132.7	91.5	101.0	117.8	136.0
Employment and Ind. Relations	0.42	0.82	1.71	0.75	1.45	1.80	2.43	1.81	4.90
Foreign Affairs**	12.47	15.64	20.67	30.18	36.03	80.51	108.44	145.96	169.03
Health	24.29	29.22	38.40	46.37	61.87	48.25	58.95	70.31	89.15
Home Affairs & Environment	2.57	4.07	4.88	6.69	5.66	20.62	21.84	24.89	24.80
Housing & Construction	3.08	2.66	1.96	2.10	2.35	37.39	38.94	43.50	47.18
Immigration & Ethnic Affairs	0.45	0.53	0.38	0.43	0.60	2.42	3.13	3.70	5.44
Industry & Commerce	0.94	1.29	1.83	1.86	2.17	1.37	1.90	1.91	2.20
Primary Industry	15.47	18.27	18.40	20.61	24.22	32.92	31.52	37.01	43.04
P.M. & Cabinet	0.04	0.06	0.05	0.06	0.08	1.16	1.38	1.48	1.71
Resources & Energy	31.27	37.79	50.80	45.56	59.61	74.97	96.00	87.96	102.79
Science & Technology	252.69	306.28	340.81	418.68	430.82	397.54	438.63	526.13	551.95
Social Security	0.80	1.10	1.51	1.67	1.62	1.72	2.56	2.29	2.55
Special Ministry	0.12	0.19	0.22	0.51	0.38	0.25	0.44	1.20	0.76
Territories & L.G.	0.25	0.28	0.32	0.37	0.42	3.82	3.86	4.17	5.77
Transport	3.36	2.89	1.86	2.25	2.67	9.50	5.47	6.56	7.46
Treasury	1.86	2.64	3.99	5.36	4.21	86.41	114.05	96.96	94.90
Veterans' Affairs	0.40	0.40	0.47	0.57	0.60	0.40	0.47	0.57	0.60
Total (Budget sector)	526.7	623.1	704.8	846.0	921.1	1068.8	1230.3	1422.2	1559.2
Adjusted Budget Total#	526.7	623.1	678.1	818.0	890.7	1068.8	1201.3	1392.1	1526.3
B. Commonwealth Non-Budget sector, BE excluded									
Aboriginal Affairs	0.03	0.21	-	-	-	0.29	0.21	0.17	0.20
Attorney General's	0.02	0.01	0.03	0.09	0.10	0.04	0.06	0.11	0.15
Education & Y.A.	0.11	0.28	0.17	0.06	0.05	0.65	0.39	0.84	0.48
Health	-	-	-	-	-	0.28	0.26	0.36	0.47
Home Affairs & Environment	-	-	-	-	-	0.02	0.01	0.03	..
Housing & Construction	0.04	0.07	0.05	0.06	0.09	0.07	0.05	0.06	0.09
Immigration & Ethnic Affairs	-	..	0.01	0.02	0.01	0.03	0.02	0.04	0.05

($ million)	R&D					S&T (including R&D)			
	78-79	79-80	80-81	81-82 Projected	82-83 Projected	79-80	80-81	81-82 Projected	82-83 Projected
Industry & Commerce	0.13	0.05	0.05	0.12	0.12	0.05	0.06	0.15	0.17
Resources & Energy	-	-	-	11.69	0.82	-	-	13.87	0.97
Science & Technology	5.55	5.97	9.92	13.52	14.14	6.55	10.58	14.40	15.10
Territories and Local Govt.	0.02	0.03	0.01	0.04	0.03	0.08	0.16	0.17	0.20
Total (Non-Budget, ex-BE)	5.90	6.61	10.25	25.58	15.35	8.07	11.79	30.19	17.88
Adjusted Total#	5.90	6.61	9.81	25.17	14.93	8.07	11.33	29.76	17.44
Total (Direct Commonwealth funding, ex-BE)	532.6	629.1	715.1	871.6	936.5	1076.8	1242.1	1452.4	1577.0
Adjusted Total#, non-BE	532.6	629.1	687.9	843.2	905.6	1076.8	1212.6	1421.9	1543.7
C. Commonwealth Non-Budget sector, BE only									
Communications	28.1	37.3	39.7	44.1	44.9	70.4	82.4	90.4	96.6
Health	1.25	2.08	2.43	2.70	4.13	2.08	2.43	2.70	4.13
Housing & Construction	0.04	0.01	-	-	-	44.97	54.20	52.07	41.40
Treasury (Financial) Enterprise sector)	1.38	1.63	2.48	2.09	2.85	1.78	2.61	2.33	3.20
Total (BE only)	30.8	41.0	44.6	48.9	51.8	119.2	141.6	147.5	145.3
Total (All Non-Budget)	36.7	47.6	54.8	74.4	67.2	127.3	153.4	177.7	163.2
Adjusted Non-Budget Total#	36.7	47.6	54.4	74.0	66.8	121.3	153.0	177.3	162.8
Total (All direct Commonwealth funding)	563.4	670.7	759.6	920.4	988.3	1196.1	1383.8	1599.9	1722.4
ADJUSTED TOTAL#	563.4	670.7	732.5	892.0	957.5	1196.1	1354.3	1569.3	1689.1

* 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 62 to 64).

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 Commonwealth R&D expenditures at current prices directed towards the various socio-economic objective categories. Because of the change in Government in March 1983, the following discussion is divided into two phases: the average real trends to 1982-83, and the projected real changes from 1982-83 to 1983-84. As outlined at the beginning of this Chapter, the trends are discussed in real terms using the methodology and data presented in Appendix 5, Tables 29 to 32.

Figure 3 is a visual presentation, for the years 1982-83 and 1983-84 (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.

Trends from 1979-80'to 1982-83:

Socio-economic objective categories ranked according to real growth in Commonwealth R&D support, and the corresponding average real annual growth rates, are: welfare (+21%); community services n.e.i. *(+18%);* earth, ocean and atmosphere (+15%); energy (+11%); environment (+9%); health (+9%); general advancement of knowledge (+3%); communications (+3%); manufacturing (+3%); mining (+2%); defence (+2%); agriculture (0%); economic services n.e.i. (-1%); other primary industries (-1%); urban and regional planning (-5%); construction (-9%); education (-18%); and transport (-23%).

Because of the "lumpiness" introduced into expenditure time series by large capital expenditures for major facilities it is also of interest to consider growth in support for expenditures other than intramural capital. On this basis the ranking would be: welfare (+21%); community services n.e.i. (+17%); energy (+11%); health (+10%); earth, ocean and atmosphere (+9%); environment (+8%); general advancement of knowledge (+3%); manufacturing (+3%); defence (+2%); communications (+1%); economic services n.e.i. (+1%); mining (+1%); agriculture (-2%); other primary industries (-2%); urban and regional planning (-5%); construction (-8%); education (-18%); and transport (-22%).

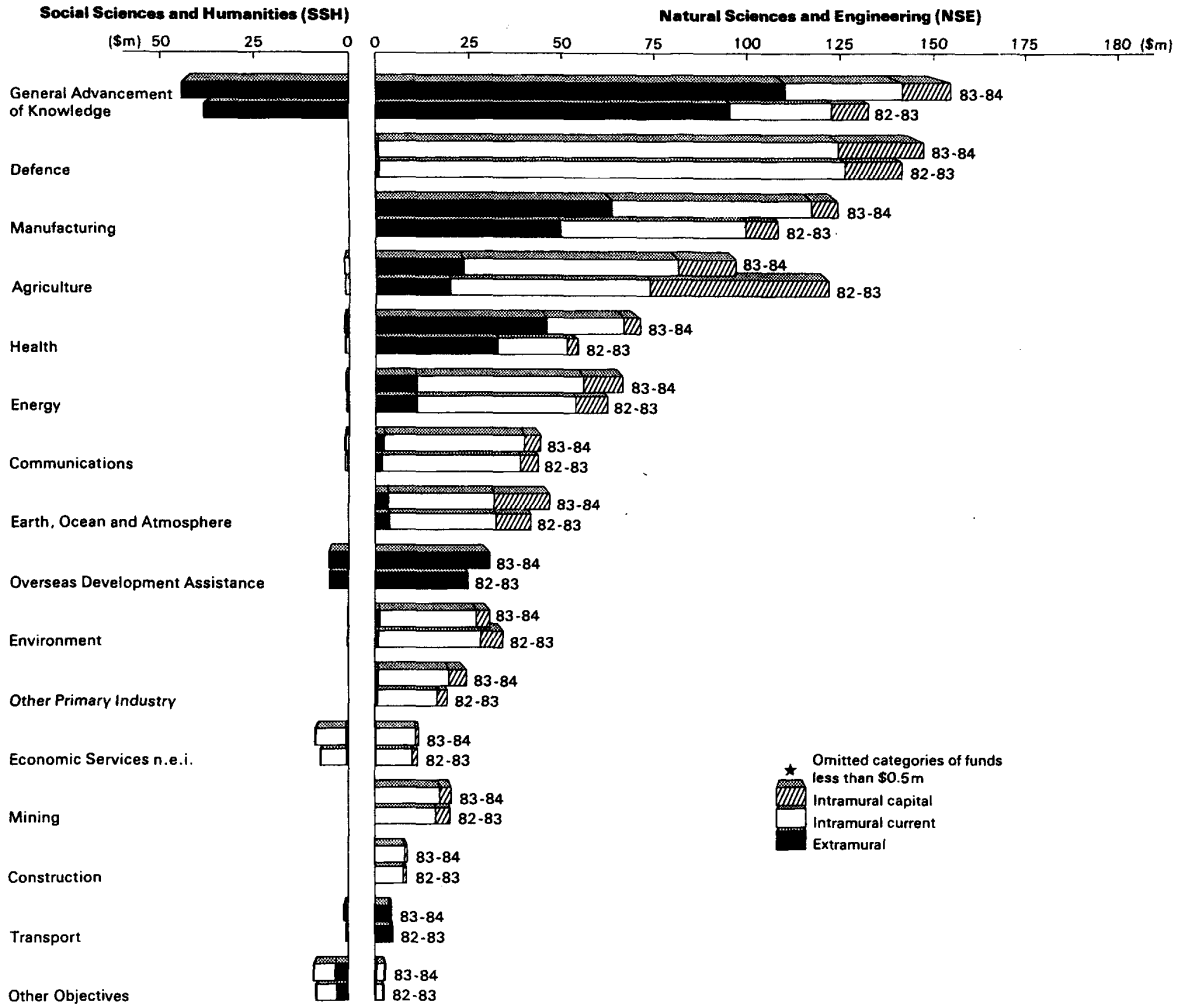
In interpreting these rankings it is important to consider the major components of the growth. For example, the large percentage rise for welfare is almost entirely due to work in the Australian Bureau of Statistics in 1982-83, whereas that for community services n.e.i. is due to the R&D component of Australian overseas development assistance. The main components of each category are listed under the heading of "Projected trends from 1982-83 to 1983-84".

Projected trends from 1982-83 to 1983-84:

Socio-economic objective categories ranked according to projected real growth in Commonwealth support for R&D, and the corresponding projected percentage increases, are: other primary industries (+23%); health (+22%); education (+13%); community services n.e.i (+10%); general advancement of knowledge (+8%); manufacturing (+7%); earth, ocean and atmosphere (+5%); urban and regional planning (+3%); economic services n.e.i. (+3%); energy (+1%); mining (+1%); transport (0%); defence (-1%); construction (-2%); communications (-4%); welfare (-14%); environment (-14%); and agriculture (-25%).

Excluding intramural capital expenditures the ranking would be: health (+21%); other primary industries (+15%); education (+13%); community services n.e.i. (+11%); manufacturing (+10%); general advancement of knowledge (+7%); economic services n.e.i. (+6%); urban and regional planning (+5%); agriculture (+3%); mining (+1%); construction (-1%); energy (-2%); transport (-2%); communications (-2%); defence (-6%); earth, ocean and atmosphere (-7%); environment (-9%); and welfare (-14%).

Fig. 3 Estimated Commonwealth Government Funds Expended on R&D by Socio-Economic Objective



In these two rankings, with and without intramural capital, only three categories have changed their rank by more than two positions. These are: earth, ocean, and atmosphere (rank 7 to rank 16); construction (rank 14 to rank 11); and agriculture (rank 18 to rank 9). Of these, only for two do the growth percentages differ by more than two percentage points. These are: earth, ocean, and atmosphere (from +5% to -7%); and agriculture (from *-25%* to +3%). In both these cases the difference is almost entirely due to CSIRO capital expenditures. For agriculture, the completion of the Australian National Animal Health Laboratories is responsible for the sudden massive drop in capital expenditure.

The major agencies and/or programs contributing to projected 1983-84 expenditures for R&D in each of the socio-economic objective categories, and the major contributions to the rises and falls shown in the first list of rankings (including intramural capital) will now be outlined:

. Other primary industries (+22.795)

Major elements are: CSIRO (90%); Department of Primary Industry Fishing Industry Research Trust Fund (5%); Management of Torres Strait Fisheries (256). Growth is due to CSIRO (20.8 percentage points) and small increases in other items.

. Health (+21.9%)

Major elements are: the National Health and Medical Research Council (NH&MRC) *(53%);* Department of Health (grant to the Walter and Eliza Hall Institute, 11%; National Biological Standards Laboratory, *5%;* Australian Radiation Laboratory, 4%; National Acoustics Laboratory (NAD, 4%; Commonwealth Institute of Health, 4%); Commonwealth Serum Laboratories (9%); CSIRO (5%); and the Australian Atomic Energy Commission (2%).

The main contributors to the 21.9% rise, and the percentage points contributed, are: NH&MRC (10.0), grant to the Walter and Eliza Hall Institute (8.0), CSL (1.7), NBSL (1.5), and NAL (1.0). There were small falls in other items.

. Education (+13.0%)

This category contains R&D activities directed towards understanding, improving, or evaluating the education process. It does not include the large grants given on the advice of the Tertiary Education Commission for the purposes of furthering research in the tertiary education sector or training researchers; nor does it include the Postgraduate Research Awards administered by the Department of Education for similar purposes. These have been classified to the socio-economic objective category" general advancement of knowledge". See Appendix 5 for further discussion.

Major elements are: Department of Education (Transition Program, 15%; grant to the Australian Council for Educational Research, 15%; contribution to the TAFE National R&D Centre Limited, 11%; Education Review and Evaluation, 5%) and Curriculum Development Centre (27%).

The Government decision to reverse the termination of the Curriculum Development Centre, which had been ordered by the previous Government as an outcome of the April 1981 Review of Commonwealth Functions, is the major component of growth (15.8 percentage points). There was also a significant contribution from the Transition Program (7.5 percentage points). These were offset by negative trends in the Education Research and Development Committee, which was abolished in 1982-83 (-5.8 percentage points), and the Schools Commission (-3.9).

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

Objective Category	1978-79	1979-80	1980-81	$m 1981-82	1982-83	Projected 1983-84
National security						
. Defence	85.91	92.37	105.92	112.91	141.37	147.19
Economic development						
. Agriculture	64.39	86.65	103.40	114.09	122.36	98.00
. Other primary industries	11.27	13.20	13.38	15.86	18.28	23.82
. Mining	14.38	12.39	16.08	21.25	19.02	20.24
. Manufacturing	60.07	69.27	93.11	78.72	108.21	124.23
. Construction	7.45	7.12	7.03	7.05	7.69	7.96
. Energy	26.56	31.16	38.97	48.86	61.97	66.37
. Transport	7.08	8.75	7.12	5.60	5.74	6.13
. Communications	27.7	28.6	37.6	40.3	44.6	45.4
. Economic services n.e.i.	11.67	13.49	15.85	18.09	18.79	20.32
Sub-total	230.5	270.6	332.6	349.8	406.6	412.4
Community welfare						
. Urban and regional planning	1.25	1.60	1.27	1.60	1.95	2.12
. Environment**	14.81	18.17	18.71	22.71	33.66	30.62
. Health	27.04	30.14	35.55	44.75	54.90	71.93
. Education#	3.57	3.10	3.94	3.70	2.37	2.89
. Welfare	1.05	1.69	2.51	3.53	4.24	3.87
. Community services n.e.i.##						
- Overseas development assistance	12.51	12.47	15.64	20.67	30.18	36.03
- Other community services	2.38	2.64	3.25	3.77	4.09	4.57
Sub-total	62.63	69.81	80.86	100.72	131.38	152.01
Advancement of knowledge						
. Earth, ocean and atmosphere	13.90	19.29	27.82	31.83	41.74	46.82
. General advancement of knowledge	106.4	111.3	123.5	137.2	170.9	199.0
Sub-total	120.3	130.6	151.3	169.0	212.7	245.8
Total	499.4	563.4	670.7	732.5	892.0	957.5

* 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 R&D expenditure by OECD objective category. See Tables 29 to 30, Appendix 5 for constant price estimates.

\# 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.

. Community services n.e.i. (+9,5%)

Major elements are: the Australian Development Assistance Bureau (71%), the Australian Centre for International Agricultural Research (17%), the Law Reform Commission (5%), the Human Rights Commission (2%), and the Australian Institute of Criminology (1%).

The main components of growth are ACIAR (15.8 percentage points) and the Law Reform Commission (1.2), offset by ADAS (-6.8).

. General advancement of knowledge (+7.6%)

Major elements are: grants to universities (55%), Australian Research Grants Scheme (11%), Commonwealth Postgraduate Research Awards (7%), Commonwealth Special Research Centres (3%), Antarctic Division (9%), CSIRO (9%), AAEC (3%), AATB (1%), and biotechnology grants (1%).

Main contributions to growth are from: grants to universities (3.1 percentage points), CSIRO (3.0), Commonwealth Postgraduate Research Awards (1.4), and biotechnology grants (0.8).

. Manufacturing (+7.2%)

Major elements are: the Australian Industrial Research and Development Incentives Scheme (Project Grants, 37%; and Commencement Grants, 13%), CSIRO (49%), and grants to industry Research Associations (1%).

Growth is due to AIRDIS Project Grants (6.6 percentage points) and Commencement Grants (1.7). The CSIRO component declined (-1.2).

. Earth, ocean and atmosphere (+5.1%)

Major elements are: CSIRO (60%); the Australian Institute of Marine Science (15%); the Bureau of Mineral Resources, Geology and Geophysics (11%); marine science grants and fellowships (5%); the Bureau of Meteorology (4%); and the Water Division of the Department of Resources and Energy (2%).

The rise is due to a large increase in CSIRO capital expenditure (contributing 10.7 percentage points) offset by falls in CSIRO current expenditure (-3.9), the Water Division (-1.4), and others.

. Urban and regional planning (+3.0%)

Major elements are: CSIRO (89%), Albury-Wodonga Development Corporation (6%), and the Housing Branch of the Department of Territories and Local Government (6%).

Growth is in CSIRO expenditure (5.2 percentage points) while the contribution of the Albury-Wodonga Development Corporation declined (-2.8).

. Economic services n.e.i. (+2.6%)

Major elements are: CSIRO (64%), Australian Bureau of Statistics (15%), Bureau of Industry Economics (10%), Australian Government Analytical Laboratories (3%), and Reserve Bank (2%).

. Energy (+0.8%)

Major elements are: CSIRO (45%), AAEC (26%), Energy Research Trust Account administered by Department of Resources and Energy on the advice of the National Energy Research Development and Demonstration Council (18%), and BMR (12%).

. Mining (+0.6%)

Elements are: CSIRO (77%), and BMR (23%).

. Transport (-0.2%)

Major elements are: InterScan (30%); Department of Transport grant to the Australian Road Research Board (26%); Department of Aviation (22%); and Office of Road Safety (16%).

. Defence (-1.5%)

R&D for this category was only reported by the Department of Defence. All Department of Defence Support activities were reported as S&T (other than R&D).

. Construction (-1.8%)

Major elements are: CSIRO (69%), and Department of Housing and Construction (Central Investigation and Research Laboratory, 17%; and Experimental Building Station, 12%).

The decline is due to decreased CSIRO activity. Communications (-4.2%)

Major elements are: Telecom (95%), Australia Post (2%), and Overseas Telecommunications Commission (2%).

The decline is due to reduced Telecom R&D expenditures (-4.9 percentage points).

. Welfare (-13.7%)

Major elements are: Bureau of Labour Market Research (35%), Department of Social Security (Social Welfare Policy Secretariat, 19%; welfare research, 16%; and rehabilitation studies, 6%), Department of Immigration and Ethnic Affairs (study of English language learning needs, 8%; and welfare research, 6%), and Australian Bureau of Statistics (8%).

Contributing to the decline were: ABS (-27.5 percentage points), and rehabilitation studies (-4.6). These outweighed growth in : BLMR (12.7), study of English language learning needs (2.8), welfare research (immigration and ethnic affairs) (2.4), and Social Welfare Policy Secretariat R&D (2.0). The decline for ABS is probably associated with completion of survey development work.

. Environment (-14.2%)

Major elements are: CSIRO (74%), Office of the Supervising Scientist for the Alligator Rivers Region (15%), and AAEC (8%).

Contributing to the decline were: CSIRO (-9.1 percentage points), and Supervising Scientist (-4.7). In CSIRO, both capital and current expenditure for this category declined, with the decline in current expenditure being more significant (-7.5). In the Office of the Supervising Scientist the decline was in capital expenditure (-5.5).

. Agriculture (-24.9%)

Major elements are: CSIRO (75%), Research Trust Funds administered by Department of Primary Industry (wool, 9%; meat, 5%; wheat,4%; and others, 4%), Reserve Bank Rural Credits Development Fund (2%), and Bureau of Agricultural Economics (2%).

The decline is entirely due to the decrease in CSIRO capital expenditure arising from the completion of the Australian National Animal Health Laboratories (-26.9 percentage points). If CSIRO capital funding is excluded there would be 3.45K growth projected in this category.

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", and "water supply and electricity". In the latter two 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.

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)				
					Projected					Projected	
	78-79	79-80	80-81	81-82	82-83	83-84	79-80	80-81	81-82	82-83	83-84
Defence	3.3	3.1	3.0	2.7	3.0	2.8	4.6	4.3	4.2	4.5	4.4
Education	3.0	3.1	3.0	3.0	3.0	3.2	3.2	3.1	3.0	3.1	3.2
Health	0.8	0.8	0.8	1.3	1.4	1.3	1.3	1.3	2.0	2.1	2.1
Social Security and Welfare	..	..	..	..	..	..	0.1	0.1	0.1	0.1	0.1
Housing	..	..	..	..	..	..	0.1	0.1	0.1	..	..
Urban and Regional Development n.e.c. and the Environment	0.8	1.9	3.4	5.9	5.2	3.6	7.5	10.4	12.3	10.0	8.1
Culture & Recreation	0.2	0.2	0.1	0.2	0.1	0.1	3.1	2.9	2.9	2.8	2.5
Economic Services											
. Transport and Communications	0.7	0.6	0.4	0.3	0.2	0.2	2.6	2.6	2.0	1.8	1.9
. Water Supply and Electricity	-	-	-	-	-	-	-	-	-	-	-
. Industry Assistance and Development	11.3	10.4	10.0	7.2	8.1	10.8	15.9	14.7	10.9	11.7	15.1
. Labour & Employment	0.1	0.2	0.2	0.4	0.1	0.1	0.6	0.5	0.6	0.3	0.4
. Other Economic Services	0.7	1.2	1.4	1.6	2.1	2.1	56.0	62.0	63.5	82.4	83.6
Total Economic Services	3.6	3.8	3.8	2.7	2.6	3.1	9.4	9.0	7.2	6.5	7.0
General Public Services											
. Legislative Services	-	-	-	-	-	-	-	-	-	-	-
. Law, Order and Public Safety	0.8	0.8	0.9	0.9	1.0	1.0	1.3	1.3	1.3	1.3	1.3
. Foreign Affairs and Overseas Aid	2.2.	1.7	1.7	1.9	2.6	2.8	8.2	8.5	9.7	11.7	12.2
General and Scientific Research n.e.c.	88.3	87.0	88.5	87.1	90.0	90.3	100.0	100.0	100.0	100.0	100.0
Admin. Services	0.5	0.5	0.5	0.5	0.6	0.4	12.9	13.7	14.3	11.5	10.1
Total General Public Services	11.5	11.9	12.1	12.9	13.0	11.7	21.6	22.0	23.6	22.7	20.9
Not allocated to function	-	-	-	-	-	-	-	-	-	-	-
Total (Budget sector)	1.6	1.7	1.7	1.7	1.7	1.6	2.9	3.0	3.0	2.9	2.8

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

($ million)	1978-79	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
Defence	2616	3019	3550	4134	4782	5280
Education	2529	2611	2930	3341	3802	4211
Health	2901	3169	3650	2912	3425	4295
Social Security & Welfare	8095	8784	9918	11501	14112	16843
Housing	382	343	341	458	740	912
Urban & Regional Development n.e.c. & the Environment	126	116	111	77	126	148
Culture & Recreation	281	321	402	482	523	599
Economic Services						
. Transport & Communication	723	807	989	1180	1760	1705
. Water Supply, Electricity & Gas	6	25	54	67	103	89
. Industry Assistance & Development	492	613	345	942	1109	1104
. Labour & Employment	332	302	337	460	685	1124
. Other Economic Services	77	92	99	109	96	99
Total Economic Services	1630	1840	2373	2757	3753	4121
General Public Services						
. Legislative Services	70	79	112	132	199	223
. Law, Order & Public Safety	173	200	222	258	322	376
. Foreign Affairs & Overseas Aid	608	664	748	860	958	1085
General & Scientific Research n.e.c.	229	271	314	394	439	439
Administrative Services	832	925	1087	1241	1431	1672
Total General Public Services	1912	2138	2483	2885	3349	3795
Not allocated to function	8544	9323	10532	12789	14369	16499
Total (Budget sector)	29015	31661	36290	41338	48982	56703

* 1983-84 Budget paper No. 1, Budget Statements 1983-84, Statement No. 6.

Commonwealth Contribution to Gross Domestic Expenditure on R&D (GERD)

Table 6, based on the Project SCORE surveys of R&D performers in all sectors, shows the contribution of each sector to funding GERD. The SCORE surveys have shown that Commonwealth Government support for R&D activities rose substantially between 1968-69 and 1973-74 and has approximately kept pace with inflation since that time. The sharp initial rise was due primarily to changed administrative arrangements between the Commonwealth and States for funding higher education. When the general government sector as a whole is considered (ie, Commonwealth plus States), government maintained an almost constant level of support from 1968-69 to 1978-79. However, the 1981-82 survey results (when adjusted to remove certain expenditure for that year which did not correspond to an increased level of activity) show a small decrease in the level of government support. Table 19 (Appendix 2) which shows some Australian trends as % GDP, rather than % GERD, shows a more accentuated decrease.

In contrast to the stability of support by government, 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 17%, and correspondingly increased the Commonwealth Government share from 58% to 66%. These shares have remained at about the same levels since that time.

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	938#
- Public Enterprise	n.a.	n.a.	38	29	39
Sub- total	173	333 **	579	695	977#
State Government					
- General Government	n.a.	n.a.	111	140	179
- Public Enterprise	n.a.	n.a.	6	8	16
Sub- total	61	67 **	117	148	194
Private Enterprise	116	186	152	180	265
Other Australian	9	7	10	18	32
Overseas	10	11	14	13	16
Total (GERD)	368	655	873	1054	1485#
Commonwealth Government funding as % GERD	(%) 47	58 **	66	66	66
State Government funding as % GERD	(%) 17	10	13	14	13
Private Enterprise funding as % GERD	(%) 32	28	17	17	18

Note: 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 56. For consistency with later practice some other adjustments have been made to figures for the first three surveys.

\# A downward adjustment of $37m has been made to allow valid trend comparisons on the level of support for R&D activities. The adjustment allows for changed superannuation arrangements ($27m) and an additional pay period in 1981-82 ($10m) for Commonwealth bodies.

* The attribution of public business enterprise funding between Commonwealth owned and State owned enterprises is based on estimates by the Department of Science and Technology.

** Much of the large rise between 1968-69 and 1973-74 is due to changed funding arrangements for universities. For the same reason, the rise in State funding between 1968-69 and 1973-74 is minimal.

Sources: Figures are based on:

- Project SCORE 1968-69, 1973-74, 1976-77, 1978-79
- Research and Experimental Development - All sector Summary, Australia 1981-82, ABS Catalogue No. 8112.0 (3 April 1984).
- Research and Experimental Development - General Government Organisations, Australia, 1981-82, ABS Catalogue No. 8109.0 (27 January 1984).
- Research and Experimental Development, Business Enterprises, Australia 1981-82, ABS Catalogue No. 8104.0 (1 March 1984).
- Research and Experimental Development, Higher Education Organisations, Australia, 1981, ABS Catalogue No. 8111.0 (6 October 1983).
- Quarterly Estimates of National Income and Expenditure, Australia - December Quarter, 1983, ABS Catalogue No. 5206.0 (29 March 1984).

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. (See Appendix 5 for definitions and further details).

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 and 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 drafted. 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)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Aboriginal Affairs	S(b)	-	-	-	-	-	0.063	-
	S(c)	0.152	0.073	0.088	0.094	0.076	0.094	0.091
	N(c)	-	-	0.006	0.006	-	0.006	-
Applied Ecology Pty Ltd	N(a)	0.140	0.142	-	-	-	-	-
	N(b)	0.425	0.220	-	-	-	-	-
Australian Institute of Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.103	0.151
	S(b)	-	-	-	-	-	1.922	2.272
	η S(c)	0.471	0.489	0.530	0.559	0.500	0.856	0.849
Total (Budget sector)		1.188	0.924	0.623	0.659	0.576	3.045	3.362
B. Commonwealth Non-Budget sector								
Applied Ecology Pty Ltd	N(a)	0.008	0.083	-	-	-	-	-
	N(b)	0.026	0.127	-	-	-	-	-
Australian Institute of Aboriginal Studies	S(a)	-	-	-	-	-	0.009	0.012
	S(b)	-	-	-	-	-	0.155	0.188
Total (Non-Budget sector)		0.034	0.210	-	-	-	0.165	0.200
Total (Direct Commonwealth funding)		1.222	1.134	0.623	0.525	0.576	3.160	3.562
C. Expenditure from other sources								
Department of Aboriginal Affairs								
. Payment to Central Land Council (anthropological investigations)	S(c)	-	-	-	-	-	0.297	0.300
Australian Institute of Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.006	-
	S(b)	-	-	-	-	-	0.096	-
Total (Other sources)		-	-	-	-	-	0.399	0.300
Total (A+B+C)		1.222	1.134	0.623	0.525	0.576	3.559	3.862

N Natural sciences and engineering S Social sciences and humanities

nS 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 Aboriginals, 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 Aboriginals 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.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Administrative Services								
. Aust. Survey Office	N(a)	-	-	-	-	-	0.062	-
	N(b)	-	-	0.006	-	-	0.079	0.132
Total (Direct Commonwealth funding)		-	-	0.006	-	-	0.141	0.132

N Natural sciences and engineering

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

Department of Administrative Services

. Australian Survey Office

The Australian Survey Office is the Commonwealth's central surveying service authority and is responsible for land, engineering and topographic surveys for Commonwealth purposes. Past remote sensing achievements have included participation in a joint project with the CSIRO to develop and test computer assisted techniques for the analysis and enhancement of satellite data. The software and methodologies developed have proven to be a cost effective and timely source of information for most regional planning purposes. The Office is now engaged in the transfer of these technologies to a production system. A new objective is to demonstrate the capability of close range photogrammetry as a tool for measuring complex surfaces, for example the extent of damage to RAN ships propellers.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Australian Institute of Criminology	S(a)	0.002	0.016	0.001	0.001	0.002	0.005	0.008
	S(b)	0.400	0.390	0.470	0.425	0.458	1.185	1.209
Commonwealth Legal Aid Council**	S(a)	-	0.004	-	-	-	-	-
	S(b)	0.148	0.165	0.177	0.159	0.158	0.159	0.158
	S(c)							
Criminology Research Council*		0.021	0.045	0.041	0.086	0.091	0.086	0.091
	S(b)	-	-	-	-	-	0.001	-
	S(c)	0.030	0.034	0.030	0.054	0.056	0.054	0.056
Human Rights Commission	S(a)	-	-	-	0.117	0.054	0.129	0.060
	S(b)	-	-	0.263	0.513	0.628	0.537	0.658
	S(c)	-	-	0.004	0.089	0.129	0.093	0.137
Institute of Family Studies	S(a)	-	-	-	0.018	0.037	0.024	0.054
	S(b)	0.018	0.243	0.418	0.510	0.565	0.717	0.789
	S(c)	-	0.250	0.250	0.114	0.060	0.114	0.060
Law Reform Commission	S(b)	0.900	1.055	1.163	1.373	1.884	1.373	1.884
Total (Budget sector)		1.519	2.203	2.816	3.459	4.122	4.477	5.165
B. Commonwealth Non-Budget sector								
Australian Institute of Criminology	S(b)	-	-	-	-	-	0.020	0.049
Criminology Research Council*								
. Attributable to past Commonwealth contributions	S(c)	0.020	0.007	0.012	0.013	0.008	0.013	0.008
Law Reform Commission	S(b)	-	-	0.019	0.075	0.094	0.075	0.094
Total (Non-Budget sector)		0.020	0.007	0.031	0.088	0.102	0.108	0.151
Total (Direct Commonwealth funding)		1.539	2.211	2.847	3.547	4.224	4.585	5.316

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
C. Expenditure from other sources								
Criminology Research Council*								
. Attributable to State contributions	S(b)	-	-	-	-	-	0.001	0.001
	S(c)	0.050	0.042	0.042	0.066	0.065	0.066	0.065
Total (Other sources)		0.050	0.042	0.042	0.066	0.065	0.067	0.067
Total (A+B+C)		1.589	2.252	2.889	3.613	4.289	4.652	5.383

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 5.

** Figures for 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.

During 1982-83, the Institute's research program included work on a National Prison Census, Youth and Crime in Australia, Political Terrorism, Public Order Policing, While Collar Crime and Aborigines and Criminal Justice.

In the international sphere of crime prevention and correction activities the Institute was represented at the Second International Seminar on Victimology held in Bellagio, Italy. A senior criminologist conducted seminars as a visting professor to two universities in Canada on a range of subjects concerned with criminal violence and current issues in criminology and corrections. The Institute conducted eight seminars/training projects during the year on a range of subjects including the Policing of Political Violence, Police Research, Retailers as Victims of Crime and the First National Conference on Arson.

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 1982-83 the Council awarded fifteen grants for research projects, including as typical examples a study on the Dynamics of Truant Behaviour, an Investigation of the Relationships of Aboriginal Customary Law to Australian Common and Statute Law, the Place of Prosecution in Consumer Protection, and the Literacy Skills and Needs of Inmates of Victorian Prisons.

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 the Attorney-General's Department staff and externally contracted consultants.

A recent project involving studies of the legal needs of social security claimants and of institutionalised people is nearly complete.

A major project now underway is designed to give legal aid offices throughout Australia access to computers. By providing this service, the National Legal Aid Computer Project will significantly improve the delivery of legal aid and upgrade office management procedures and efficiency. The new computer system will provide the sophistication needed to predict in detail the future levels of demand for legal aid and give the necessary statistical backup for the appropriate policies to meet that demand.

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's 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 eleven such References - Consumer Insolvency Stage 2 - Debt Recovery and Insolvency; Access to the Courts; Aboriginal Customary Laws; Sentencing Stage 2; Evidence; Foreign State Immunity; Admiralty; Service and Execution of Civil and Criminal Process; Contempt of Court; and Matrimonial Property.

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.

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 1983-84 include Epilepsy and Human Rights; Review of Conciliation Procedures under the Racial Discrimination Act; Guardianship for Intellectually Disadvantaged People; and Rights of Commonwealth Prisoners.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Aviation								
. Air transport forecasting and statistics	S(a)	-	-	-	-	-	-	0.002
	S(b)	-	-	-	-	-	0.628	0.812
	S(c)	-	-	-	-	-	0.001	-
. Bureau of Air Safety Investigation	S(b)	-	-	-	-	0.083	-	0.083
. Major Projects	N(b)	-	-	0.014	0.020	0.026	0.020	0.026
	N(c)	-	-	-	-	-	0.282	0.315
. Provision of Meteoro-logical Services	N(c)	-	-	-	-	-	15.771	16.031
. Provision, Operation & Maintenance of Airways Facilities	N(a)	0.700	0.800	0.700	0.380	0.500	6.380	5.500
	N(b)	0.220	0.240	0.270	0.328	0.344	0.928	0.844
	N(c)	0.110	0.100	0.235	0.235	0.260	0.235	0.260
. Regulation of Air Transport								
- Environment and security	S(b)	0.129	-	-	-	-	-	-
	S(c)	-	0.027	0.014	-	-	-	-
- Aviation medicine	N(c)	0.035	0.043	0.044	0.040	0.090	0.040	0.090
- Airworthiness	N(b)	0.020	0.020	-	-	-	-	-
	N(c)	0.060	0.069	0.071	0.050	0.139	0.050	0.139
Total (Direct Commonwealth funding)		1.274	1.299	1.347	1.053	1.442	24.334	24.101

N Natural sciences and engineering S Social sciences and humanities

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

Department of Aviation

. Bureau of Air Safety Investigation

The Bureau of Air Safety Investigation is responsible for investigating all civil aircraft accidents and incidents occurring in Australia and to Australian registered aircraft overseas. In April 1983, a major reorganisation was implemented which placed greater emphasis on the role of data analysis in accident prevention and created a specialist Air Safety Research Group. Research will include projects identified on the basis of experience in the field and statistical analysis of the Bureau's computerised Accident and Incident data base.

. 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. An example of the work which supports master-planning and project development is a study at Kingsford-Smith Airport involving collection of a comprehensive range of usage statistics including air passenger characteristics and flows through the airport.

. 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.

The capital expenditure reported includes a large expenditure for the installation of earth stations in conjunction with the use of the national communications satellite when it becomes operational in 1985-86.

. 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 co-ordinates operational (airways/airports) protective security and related intelligence arrangements. No expenditure has been reported for these activities this year.

- 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 on-going 'crash protection' project (Aeronautical Research Laboratory), a study on oxygen saturation in patients with head injuries, research on risk factors in aircrews with specific regard to epilepsy, and an investigation to be instigated in 1983-84 into new aircraft instrumentation and their effect on pilots with colour vision problems. Additionally the Department will be continuing an investigation of suitable spectacle prescriptions for flight crew with presbyopia.

- Airworthiness

The Department has responsibilities under the Air Navigation Act and Regulations which necessitate the development and implementation of standards for aircraft airworthiness. 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 and engine failure. 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. In 1983-84 the Government Aircraft Factories are to carry out fatigue testing of Nomad N22 aircraft.

. 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. The services are provided in accordance with Air Navigation Regulations and working arrangements between the Department of Aviation and the Bureau of Meteorology.

. Air Transport Forecasting and Statistics

Science and Technology activities are the collection and publication of aviation activity statistics and the forecasting of aviation activity by airports for the period 1985-2010.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Communications	N(a)	0.015	0.011	-	-	-	0.224	0.508
	N(b)	0.072	0.027	-	-	-	0.300	0.290
	N(c)	0.013	0.013	-	-	-	-	-
	S(b)	-	-	0.012	-	-	-	-
	S(c)	-	-	0.043	-	-	-	-
Australian Broadcasting Corporation	N(a)	0.020	0.051	0.030	0. 049	0. 040	0.098	0.080
	N(b)	0.087	0.094	0.093	0. 129	0. 143	0.258	0.286
Australian Broadcasting Tribunal	nS(b)	0.090	0.102	0.195	0. 186	0. 185	0.297	0.299
	nS(c)	0.029	-	0.144	-	-	0.029	0.040
Total (Direct Commonwealth funding, excluding BE)		0.326	0.297	0.518	0. 364	0.368	1.206	1.503
B. Commonwealth Non-Budget sector								
Australia Post BE	N(a)	0.070	0.130	0.085	0. 065	0. 080	0.250	0.250
	N(b)	0.565	0.605	0.459	0. 707	0. 874	2.026	2.370
	N(c)	0.060	0.060	0.085	0. 085	0. 087	0.285	0.307
Overseas Telecommunications Commission, Australia (OTC) BE	N(b)	-	-	-	0. 013	0. 035	0.075	0.075
	N(c)	0.181	0.195	0.345	0. 592	0. 681	0.760	0.891
Telecom Australia BE	sN(a)	2.1	7.9	6.3	4. 8	4. 2	9.2	8.4
	sN(b)	24.9	27.7	31.8	36. 9	37. 6	71.9	75.0
	sN(c)	0.269	0.671	0.717	0. 905	1. 310	5.9	9.3
Total (Non-Budget sector)		28.1	37.3	39.7	44. 1	44. 9	90.4	96.6
Total (Direct Commonwealth funding, including BE)		28.5	37.6	40.2	44. 4	45. 2	91.6	98.1
C. Expenditure from other sources								
Telecom Australia	N(a)	-	0.022	0.050	0. 034	0. 030	0. 034	0.030
	N(b)	-	0.078	0.250	0. 266	0. 270	0.266	0.270
Total (Other sources)		-	0.100	0.300	0. 300	0. 300	0.300	0.300
Total (A+B+C)		28.5	37.7	40.5	44.7	45.5	91.9	98.4

N Natural sciences and engineering S Social sciences and humanities

$_{n}$S Includes some natural sciences and engineering

$_{s}$N 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. An intensive program of field and laboratory investigations is being undertaken to determine system 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 is also involved in investigations of the technical viability of stereo sound with amplitude modulated radio broadcasting aimed at preparing an engineering standard; dual sound for television broadcasting; supplementary monophone transmission on an FM broadcast transmission; and preparation of a reference television receiving system specification for spectrum planning purposes.

Australian Broadcasting Corporation (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 specialised 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 overseeing 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 being undertaken during 1983-84 include a survey of youth and culture, particularly regarding radio, music, Australian content, and the influence of television on driving. This last study is a preliminary examination of the influence on young people of television programs which glamorise the association of vehicles, alcohol and speed. The study was recommended by the Report of the House of Representatives Standing Committee on Road Safety.

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 electronic mail containerisation, robotics, control circuity and mail coding.

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. This stems 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 perfomance 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&O 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. The many research investigations being pursued in 1983-84 encompass:

- signal processing techniques;
- multi-mode and single mode optical fibre transmission systems;
- digital microwave radio transmission systems;
- teleconferencing;
- software architectures and specification and description techniques for real time control of telecommunications systems;
- common channel signalling techniques in stored program controlled exchange networks;
- communication protocols;
- circuit and packet switched digital networks for voice and data;
- telecommunications network dimensioning and dynamic management techniques;

- digital reticulation in the local subscriber network;
- customer access and network interface standards in the evolution of an Integrated Services Digital Network;
- advanced voice and non-voice, real-time and non-real time business communications services and networks;
- radiocommunications antennas and propagation techniques;
- microelectronics technology;
- advanced semiconductor and optical devices;
- reliability of telecommunications plant and equipment;
- formulation of polymer materials for reliable application in telecommunications plant; and
- analytical techniques for the assessment of hazardous chemicals arising in telecommunication operations.

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.

Major components of expenditure for 1983-84 include contracts for studies of telephone service price elasticity, development of improved demand forecasting methods and the QTC allocation of R&D programs conducted by the International Telecommunications Satellite Organization (INTELSAT) and the International Maritime Satellite Organization (INMARSAT).

DEFENCE

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Defence	N(a)	9.394	7.931	8.265	15.327	22.838	18.837	25.690
	N(b)	82.563	97.562	103.906	124.994	123.436	162.180	163.080
	N(c)	0.370	0.399	0.742	1.049	0.912	1.049*	0.912*
Total (Budget sector)		92.327	105.892	122.913	141.370	147.186	182.066*	189.682*
B. Expenditure from other sources								
Department of Defence	N(b)	1.410	1.832	1.134	0.085	0.255	0.085	0.255
Total (A+B)		93.737	107.724	114.047	141.455	147.441	182.151*	189.937*

N Natural sciences and engineering S Social sciences and humanities

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

(c) Extramural expenditure

* Not including funds appropriated to Department of Defence but administered by Department of Defence Support.

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:

- Most capital and current expenditure by the Defence Science and Technology Organisation (DSTO), including salaries of some Service Personnel attached to the DSTO; 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:

- a portion of DSTO expenditure relating to the operation of a centralised library and information service;
- broad estimates for identifiable elements of the Services conducting work classifiable as S&T; and

- expenditure of funds appropriated to this Department and administered by the Industry Strategy Branch of the Department of Defence Support. Under the guidelines used to construct this Statement these expenditures, amounting to $18 347 m in 1982-83 and $28 090 m (projected) in 1983-84, are shown in the table for Department of Defence Support.

Department of Defence

. Defence Science and Technology Organisation (DSTO)

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 materiel; 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.

Current projects of significance include the JINDALEE over the horizon radar and the WINNIN active expendable decoy to protect ships against anti-ship missiles.

DSTO actively participates in international cooperative programs in science and technology, notably the Technical Cooperation Program (UK, USA, Canada, Australia, NZ).

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 including tertiary institutions both in Australia and overseas.

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 and $3.9 m for the development, operation and maintenance of the JINDALEE Experimental Facility.

DSTO's program of research agreements with tertiary education institutions has grown considerably in recent years. Recent research agreements have been arranged in areas of signal processing, aerodynamics, lasers, adhesive bonding, ion implantation, propellant combustion, digital control systems and electromagnetic propulsion. DSTO is represented on and provides modest funding for the Radio Research Board and the Computer Research Board.

. Australian industry assistance

Expenditure of Defence funds in industry by the Industry Strategy Branch, Department of Defence Support assists the establishment in Australia of new products or processes, generally embodying new technology.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Defence Support								
. Aircraft Guided Weapons and Electronics Supply	N(a)	-	-	-	-	-	1.389	0.344
	N(b)	-	-	-	-	-	4.751	5.834
. Industry Development Branch*	N(c)	-	-	-	-	-	18.347	28.090
. Munitions Supply	N(a)	-	-	-	-	-	1.220	1.331
	N(b)	0.027	0.032	-	-	-	7.085	9.381
	N(c)	-	-	-	-	-	-	-
Total (Budget sector)		0.027	0.032	-	-	-	32.792	44.980
B. Expenditure from other sources								
Department of Defence Support								
. Munitions Supply	N(a)	-	-	-	-	-	0.791	0.863
	N(b)						4.597	6.088
Total (Other sources)		-	-	-	-	-	5.388	6.951
Total (A+B)		0.027	0.032	-	-	-	38.180	51.931

N Natural sciences and engineering S Social sciences and humanities

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

* Capital extramural expenditures on behalf of this Branch are paid by the Department of Defence.

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 overseas defence aircraft activities in the private sector.

. Industry Development Branch (including Industry Development Regional Office)

- Formulates and develops local industry development policies.

- Co-ordinates industry development and assistance activities across the department.

- Maintains liaison with other organisations and departments in relation to industry technology of defence interest.

- 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.

- Develops and implements proposals for the establishment in specific fields of technology.

- Manages specific development programs to meet unique defence requirements based on both local and imported R&D.

Among the technologies being developed in industry in support of defence capability, but which have potential for civilian uses, are micro-electronics, multi-layer circuit boards, thick film hybrids, piezo-electric ceramics, precision optics, infrared sensors and thermal imagers, lasers, optical fibres, lithium batteries, and crack patching for aircraft.

. 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 coordinates 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)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Education and Youth Affairs								
. Australian Council for Educational Research	S(c)	0.295	0.319	0.370	0.420	0.423	0.420	0.423
. CERI participation	S(b)	-	-	-	-	-	0.004	0.006
. Curriculum Development*	S(b)	0.605	0.602	0.469	0.200	0.301	0.600	0.818
	S(c)	0.438	0.445	0.408	0.093	0.433	0.093	0.482
. Education Research and Development Committee	S(c)	0.963	0.992	0.679	0.135	-	0.135	-
. Education Review and Evaluation Studies	S(c)	0.139	0.140	0.070	0.129	0.138	0.129	0.138
. Educational use of Communications Technology	S(b)	-	-	-	-	-	0.003	0.006
	S(c)	-	-	-	0.048	0.083	0.048	0.104
. Office of Youth Affairs	S(b)	-	-	-	-	-	0.068	0.063
	S(c)	-	-	0.028	0.012	0.026	0.012	0.026
. Participation and Equity Program***	S(c)	-	0.250	0.236	0.218	0.429	0.218	0.429
. Postgraduate Awards	SN(c)	7.583	7.756	8.537	11.165	14.585	12.567	16.416
. Research Statistics Branch	S(b)	0.068	0.067	0.066	0.040	0.082	0.125	0.171
. TAFE National R&D Centre	S(c)	-	0.020	0.212	0.282	0.320	0.282	0.320
A.C.T. Schools Authority	S(b)	0.101	0.118	0.152	0.175	0.167	0.217	0.214
Commonwealth Schools Commission	S(c)	0.114	0.369	0.495	0.314	0.242	0.611	0.656
Commonwealth Tertiary Education Commission								
. Evaluations and Investigations	S(b)	0.094	0.078	0.035	-	-	-	-
	S(c)	0.122	0.186	0.095	0.095	0.055	0.400	0.376
Grants to universities**								
. Commonwealth Special Research Centres	SN(c)	-	-	1.5	5.9	5.4	5.9	5.4
. Other	SN(c)	69.0	77.0	85.0	96.0	110.0	96.0	110.0
Total (Budget sector)		79.5	88.3	98.4	115.2	132.7	117.8	136.0

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
B. Commonwealth Non-Budget sector								
Curriculum Development*	S(b)	0.066	0.158	0.089	0.063	0.048	0.190	0.229
	S(c)	0.048	0.117	0.077	-	-	0.651	0.252
Total (Non-Budget sector)		0.113	0.275	0.166	0.063	0.048	0.841	0.481
Total (Direct Commonwealth funding)		79.6	88.6	98.5	105.3	132.7	108.7	136.5
C. Expenditure from other sources								
Department of Education and Youth Affairs								
. Educational use of Communications Technology	S(b)	-	-	-	-	-	0.003	0.006
	S(c)	-	-	-	0.048	0.083	0.043	0.104
A.C.T. Schools Authority	S(b)	-	-	-	-	0.035	-	0.035
Total (Other sources)		-	-	-	0.048	0.118	0.051	0.145
Total (A+B+C)		79.6	88.6	98.5	105.3	132.9	108.7	136.7

N Natural sciences and engineering S Social sciences and humanities

^{S}N Includes significant proportion of social sciences and humanities

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

* 1979-80, 1980-81 and 1981-82 expenditure figures are DST estimates.

** 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 1982-83 and 1983-84 are based on the assumption that the proportion of general recurrent grants and equipment grants expended on research in 1982 is maintained for 1983 and 1984, and take into account the level of the special research grant approved for these years.

*** The Transition Program, reported in last years table, is now subsumed in the Participation and Equity Program. See the text.

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 1982-83 the direct Commonwealth contribution represented 50% of the total core grant received by ACER, and 25% 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; advisory services; and publishing. The research program contains many diverse projects. Examples of substantial projects current in 1982-83 and continuing (unless otherwise stated) in 1983-84 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;
- Patterns of Participation in Post-Secondary Education in Victoria, which was designed to establish the extent to which home location in Victoria influences participation in post secondary studies;
- Youth in Transition (formerly known as the Survey of School Leavers) addresses questions relating to the transition from school to work; and
- the ACER Review and Progress Tests in Mathematics (RAPT) providing a range of criteria - referenced tests for assessing achievement of computational skill which was published during the 1982-83 financial year.

. OECD Centre for Educational Research and Innovation

Participation in the OECD Centre for Educational Research and Innovation (CERI) is directed to the Education and Local Development (ELD) Project. Australia's participation in the project is confined to rural aspect of ELD in Western Australia, Victoria, New South Wales and Tasmania.

. Curriculum Development

The Curriculum Development Centre (CDC) 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 curriculum developments, 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 Branch 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 outstanding CDC publishing commitments met.

The Labor Government since coming to office has taken steps to reactivate the former CDC. However, at this stage no new programs have been undertaken.

. 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 1983-84 the Commonwealth is providing $110 000 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.

Eight trial projects have received funding for 1983-84. Those projects of a research nature are experimentation in the coordination of satellite access for educational trials using Voice-Bank Teleconferencing and Classroom Facilities; an interactive television teaching program; the use of distance learning materials by the Primary School child as an isolated learner; and the use of an FM radio sub-carrier for the provision of tutorial interaction in University distance education.

. Research and Statistics

The Research and Statistics Branch is concerned broadly with education at the national level, and with coordination of the Commonwealth Governments' activities in education.

Included amongst the Research and Statistics Branch 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 Research and Statistics Branch 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.

. Participation and Equity Program

In 1983 a maximum of $360 000 was allocated centrally for National Projects and Evaluation within the Transition Program which is to be subsumed within the new Participation and Equity Program in 1984. The funds were to be spent mainly in the areas of evaluation, research, dissemination and conference activities. For 1984 the figure allocated for these purposes will be $400 000. The commencement of a number of projects in 1983 under the Transition Program was delayed pending resolution of the future of that program in relation to the Participation and Equity Program.

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 1983-84 include a longitudinal study of school leavers; the role of part-time work in the transition process; 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 have been terminated following the Review of Commonwealth Functions. The last of its programs was completed by the end of March 1983.

. Youth Studies

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. In 1983 the Office became part of the Department of Education and Youth Affairs.

Activities for 1983-84 include a national study on youth in remote areas, and two programs on migrant youth relating to employment experience, and health problems and needs. Other activities are a study of exploitation in employment and a review of alcohol and drug abuse in NT.

. 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 1984 from $6 850 to $7 330.

. TAFE National Research and Development Centre Ltd

The TAFE National Centre for Research and Development Ltd was established jointly by the Commonwealth and the States as a company in South Australia. Its members are the Commonwealth and State Education Ministers. A Board of Directors, consisting of TAFE administrators and business people, manages the company on behalf of the members. The purpose of the Centre is to stimulate and co-ordinate research and curriculum development in technical and further education throughout Australia.

1983 activities consisted of four major in-house projects (national core curriculum development, reading and mathematics problems of trade students, attendance patterns in trade training, common skills across trades), eight other studies on various aspects of curriculum development, including the impact of technological change and twenty-two commissioned research projects relevant to qualitative improvements in TAFE. The Centre also operates the National TAPE Clearinghouse, which disseminates information on TAFE research and development projects.

Commonwealth Tertiary Education Commission

The prime functions of the Commission under the Commonwealth Tertiary Education Commission Act 1977 are to 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, and to administer approved policies and grants. The Act specifies that the commission is to perform its functions with the object of promoting:

. the balanced and coordinated development of the provision of tertiary education in Australia; and

. the diversifying of opportunities for tertiary education.

. Evaluations and Investigations Program

For the years 1979-80 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 out when 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 in the current program involving research are : an ACER longitudinal study - youth in transition; and the evaluation of general basic nursing education programs in NSW.

Grants to universities

. Commonwealth Special Research Centres

In 1982, ten Special Research Centres were established under the Commonwealth Program for Promotion of Excellence in Research. Grants of $4.8m, $5.2m and $6.0m were approved for 1982, 1983 and 1984 respectively.

. Other Grants

Expenditure on research and development in universities falls into three categories.

These are:

1 Funds specifically earmarked for research in the States grants legislation (known as Special Research Grants), together with other funds earmarked for research by the institutions themselves from recurrent and equipment grants provided under this legislation, or, in the case of the Australian National University, from its direct appropriation. These identifiable research expenditures are shown in the above table.

2 Funds specifically allocated to research activities but which are derived from sources other than those in Category 1 . It is assumed that the Commonwealth components of such funding eg ARGC, NH&MRC, NERDDC have been included as extramural expenditure by the departments and authorities concerned.

3 Expenditure on research activities which is funded from grants provided under the States grants legislation but which is part of the general teaching and research functions of the university. While the value of this research cannot be separately identified, an imputed value of $280m was estimated for 1981 in the 1981-82 Project SCORE Survey. If the 1981 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 $310 m in 1982 and $330 m in 1983. Comparable figures for earlier years are $220 m in 1979 and $250 m in 1980.

For colleges of advanced education the R&D reported to Project SCORE for 1981 was $9 m which represented 1.558 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 based on subjective assessments and are thus subject to some degree of uncertainty.

Because financial accounting in universities is on a calendar year basis, the amounts shown in the above table are based on the following actual expenditures:

Identifiable research expenditure	1979	1980	1981	1982
	$m	$m	$m	$m
- from general funds	52.2	57.9	65.3	72.2
- special research grants	5.6	6.2	7.1	8.0
- from equipment grants	7.7	8.3	8.7	9.5
TOTAL	65.5	72.4	81.1	89.7

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 evaluation of schools, design and implementation of a research program for the High School Review, and establishment of a test development program.

Commonwealth 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.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Employment and Industrial Relations								
. Australian Standard Classification of Occupations	S(b)	-	-	-	-	-	0.364	0.309
	S(c)						0.009	0.020
. Bureau of Labour Market Research	S(a)	-	-	0.009	-	-	-	-
	S(b)	-	0.089	0.626	0.690	1.178	0.986	1.632
	S(c)	-	0.006	0.067	0.047	0.168	0.151	2.393
. Employee Relations Program	S(b)	-	-	-	-	-	0.130	0.252
. Grant to National Safety Council	N(c)	-	-	-	-	-	0.160	0.160
	S(c)	-	0.021	0.025	0.009	0.102	0.009	0.102
. Physical environment standards	S(b)	0.044	0.077	0.137	-	-	-	-
	N(b)	0.066	0.116	0.206	-	-	-	-
	N(c)	-	0.007	-	-	-	-	-
Total (Direct Commonwealth funding)		0.110	0.316	1.069	0.746	1.447	1.809	4.918

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 oversights 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. Funding for 1983-84 will provide for the preliminary phase of the Longitudinal survey of the Long Term Unemployed which will investigate the processes of change in the labour market with particular emphasis on unemployed persons. It is expected to examine the labour market status and behaviour of approximately 10 000 individuals over a period of three to five years, having regard to their characteristics, attributes and household circumstances. Research will also be carried out into three areas of women's employment. The areas are: the entry of women into professional careers; women in management; and small employer attitudes to the entry of females into non-traditional trades.

. 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 and Commonwealth Government departments and authorities (including 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 assist:

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

A working draft of ASCO was released in August 1983.

. Working Environment Branch

The Branch develops and implements policies on working environment issues including employee participation and occupational health and safety. It pursues Government policy commitments in these areas.

The Branch also undertakes and stimulates research into the human social and physical aspects of the work environment and provides information and advice in relation to these matters. It produces a wide range of training programs and resource materials aimed at increasing the understanding and application of improved participative and occupational health and safety practices.

The Branch supports tripartite and Commonwealth/State consultative machinery which co-ordinates programs and initiatives in the fields of employee participation and occupational health, safety and welfare.

- The Employee Relations Program covers research, documentation and advisory activities in the fields of employee participation and advanced management systems. Five research projects in 1983-84 will examine various aspects of Employee Participation/Industrial Democracy. A cost subsidisation program to promote Industrial Democracy will also be conducted.

- The Physical Working Environment Section's programs cover occupational safety and health, ergonomics, engineering and architectural aspects of the working environment. The work of the section also involves the development of uniform standards and uniform safety policies for Commonwealth Government employment. 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.

- implementation of review of Codes of Practice for occupational health and safety;

- 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.

. National Safety Council of Australia

The National Safety Council of Australia aims to encourage, and work for, the spread of safety awareness and safety practices throughout Australia by providing an authoritiative source of information, opinion and advice to industry, unions, Governments, media and the community.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Foreign Affairs								
. Bilateral Agreements	N(c)	-	-	-	-	-	0.125	0.100
	S(c)	-	-	-	-	-	0.101	0.100
. Economic Studies	S(c)	-	0.332	0.172	0.332	0.332	0.332	0.332
. Multilateral Grants	N(c)	0.012	0.012	0.011	0.012	0.012	0.012	0.012
	S(c)	0.037	0.037	0.030	0.034	0.033	0.034	0.033
Australian Centre for International Agricultural Research (ACIAR)	N(b)	-	-	-	-	-	0.390	1.251
	N(c)	-	-	-	0.960	6.887	1.113	7.417
Australian Development Assistance Bureau (ADAB)*								
. Administration	N(b)	-	-	-	-	-	1.785	1.948
	S(b)	-	-	-	-	-	0.543	0.574
. ASEAN Australian Economic Cooperation Program (AAECP)	N(c)	1.518	2.204	2.478	4.900	4.872	7.203	9.927
	S(c)	0.044	1.104	2.200	2.339	2.023	2.814	2.621
. Bilateral Aid – South East Asia and Pacific Region	N(c)	3.971	4.048	5.525	6.406	6.016	45.470	47.050
	S(c)	0.156	0.026	0.073	0.087	0.408	1.653	1.866
. Bilateral Aid - n.e.i.	N(c)	0.261	0.490	0.422	0.977	0.835	14.090	18.698
	S(c)	-	-	-	0.116	0.091	1.411	1.244
. Co-financing with International Financial Institutions	N(c)	-	-	-	-	-	0.750	1.116
	S(c)	-	-	-	-	-	-	0.450
. Development Training	N(c)	1.457	1.760	2.065	3.135	3.455	13.372	14.787
	S(c)	0.960	1.163	1.300	2.121	2.357	13.129	14.517
. International Science, Technology and Research Programs	N(c)	3.287	3.736	4.717	6.477	6.490	6.626	6.680
. Multilateral support	N(c)	-	-	-	-	-	12.921	13.098
	S(c)	-	-	0.050	0.055	-	11.693	
. Non Government Organisations	N(c)	-	0.010	0.075	0.083	0.083	0.378	11.885 0.378
	S(c)	-	0.030	0.075	0.083	0.083	0.116	0.116
. Regional Programs and Organisations	N(c)	0.683	0.596	1.309	1.950	1.934	4.409	4.442
	S(c)	0.083	0.083	0.117	0.093	0.093	0.443	0.446
. Scientific and Technological Aid	N(c)	-	-	0.038	-	0.021	2.796	4.770
	S(c)	-	0.009	0.009	0.016	0.011	1.625	2.473
Total (Direct Commonwealth funding)		12.469	15.640	20.666	30.175	36.033	145.957	169.034

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 compiled by DST with ADAB cooperation.

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 Economic 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. 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 research institutes.

. Regional Programs and Organisations

This program provides funds for institutional and program support and fellowship grants for regional organisations and programs in the Asian and Pacific regions. Institutes and Centres receiving support include the Asian and Pacific Development Centre, Kuala Lumpar, the Statistical Institute for Asia and the Pacific, Tokyo and the South Pacific Commission

. Bilateral Projects

These projects are undertaken in response to requests from developing countries and many of them have a substantial scientific component or draw heavily on Scientific knowledge or expertise. 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 associated with the projects.

. Scientific and Technological Aid

Programs funded include the International Seminars Support Scheme, the Australian Universities International Development Program, the Research for Development Seminar series, support for the South East Asian Ministers for Education Organisation and support for regional scientific projects. Activities recently supported under these programs include a Virus information exchange newsletter, Research for Development seminars on 'Acute Respiratory Infections in Childhood' and the 'Micro Approach to the Collection of Demographic Data[1], and networking arrangements to facilitate communication and research on microbiology, chemistry of national products and fibrous agricultural residues.

. ASEAN Australian Economic Co-Operation Program (AAECP)

The AAECP facilitates 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 has laid the foundation for further co-operation among ASEAN countries. Australia has established close contact with the ASEAN Committee on S&T (COST) through the five ongoing R&D projects in the food technology and energy areas. There are also others in the pipeline in the fields of marine science, research and development management training, diabetes research and food habits.

. Co-financing with International Financial Institutions

The co-financing facility which began in 1982-83 provides funds in co-operation with the World Bank for financing and implementing development projects. In consultation with the World Bank a program in the Asia/Pacific region has been developed which concentrates on project preparation studies. In 1983-84 $10 m has been allocated to this program.

. Development Training

Training assistance enables Australia to assist in the development of skilled manpower resources in developing countries. The governments of developing countries 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 1982-83 Australia sponsored approximately 3 600 students and trainees.

. Multilateral Programs

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 mainly 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.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Health								
. Australian Radiation Laboratory	N(a)	0.550	0.190	0.190	0.510	0.225	0.625	0.337
	N(b)	1.325	1.590	1.915	2.265	2.470	3.405	3.703
. Building grants to W. & E. Hall Institute	N(c)	0.100	0.294	2.170	3.211	8.185	3.211	8.185
. Commonwealth Institute of Health	N(a)	0.170	0.476	0.150	0.100	0.262	0.100	0.262
	N(b)	1.491	1.715	1.914	2.265	2.349	3.368	3.492
. Health Services R&D Grants Program	N(c)	-	-	0.218	0.293	0.286	1.571	1.512
. National Acoustics Laboratories	$_S$N(a)	0.196	0.126	0.700	1.232	1.897	3.240	4.925
	$_S$N(b)	0.608	0.619	0.645	0.652	0.755	1.701	1.892
. National Biological Standards Laboratory	N(a)	0.059	0.171	0.046	0.241	1.117	0.314	2.401
	N(b)	1.807	2.116	2.220	2.450	2.602	5.214	5.537
	N(c)	-	-	-	-	-	0.006	0.007
. National Health and Medical Research Council	$_S$N(c)	14.000	18.698	25.648	29.557	37.979	29.557	37.979
. Pathology Laboratories	N(a)	-	-	-	-	-	0.292	0.465
	N(b)	-	-	-	-	-	13.188	13.570
. Ultrasonics Institute	N(a)	0.227	0.194	0.047	0.094	0.115	0.138	0.230
	N(b)	0.492	0.530	0.308	0.341	0.374	0.682	0.748
	N(c)	0.022	0.007	-	-		-	-
. Other*	N(a)	0.056	0.589	0.037	0.030	0.178	0.030	0.178
	N(b)	0.416	0.363	0.259	0.133	0.150	0.176	0.195
	$_S$N(c)	0.516	0.306	0.264	0.475	0.503	0.485	0.703
Capital Territory Health Commission	N(c)	0.004	0.004	0.004	-	-	-	-
Commonwealth Serum Laboratories	N(a)	0.046	0.040	0.078	0.078	0.059	0.085	0.068
	N(b)	2.203	1.103	1.359	2.222	2.076	2.653	2.475
	N(c)	–	0.083	0.224	0.220	0.284	0.220	0.284
Total (Direct Commonwealth funding excluding BE)		24.288	29.215	38.395	46.369	61.867	70.309	89.149

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
B. Commonwealth Non-Budget sector								
Commonwealth Serum Laboratories BE	N(a)	0.026	0.074	0.132	0.092	0.114	0.097	0.125
	N(b)	1.222	2.004	2.297	2.608	4.012	2.959	4.471
Total (Non-budget Sector)		1.248	2.078	2.429	2.699	4.126	3.056	4.596
Total (Direct Commonwealth funding, including BE)		25.536	31.292	40.824	49.068	65.994	73.366	93.744
C. Expenditure from other sources								
Department of Health								
. Other*	N(a)	0.005	0.002	0.001	-	-	-	-
	N(b)	0.033	0.057	0.032	-	-	-	-
Capital Territory Health	N(a)	-	-	-	0.001	-	0.001	-
Commission	N(b)	0.057	0.080	0.164	0.110	0.074	0.110	0.074
Total (Other sources)		0.095	0.139	0.196	0.111	0.074	0.111	0.074
Total (A+B+C)		25.631	31.431	41.021	49.180	66.068	73.477	93.818

N Natural sciences and engineering S Social sciences and humanities

$_S$N 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 mostly in radiation physics and chemistry relating to the public and occupational health implications of the uses of ionising radiations, radioactive materials, non-ionising radiation, and of uranium mining and milling and of levels of radioactivity in the Australian environment. During 1982-83 extensive remodelling of a section of the Laboratory was completed to allow installation in 1983-84 of an electron linear accelerator (LINAC). This facility will enable the Laboratory to extend its dosimetry calibration for cancer therapy centres and assist in the support of the research programs in medical physics and allow the Laboratory to carry out studies in applied radiation physics and chemistry.

. 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; completion is expected in 1984-85.

. 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.

Major projects recently undertaken by the Institute have included participation, at the invitation of the CSIRO Division of Forest Research, in 'Project Aquarius', a large-scale study of fire behaviour and control measures. This involved an extensive series of experimental fires providing an opportunity to investigate some of the medical problems associated with bushfire fighting. Other major projects have been a study (to continue over 3 years) of the syndrome of Wernicke's encephalopathy and Korsakoff's psychosis - a syndrome related to thiamin deficiency and associated with alcohol abuse. The aim is to provide baseline data on prevalence and incidence against which the impact of possible public health interventions can be assessed. A number of projects were conducted on nutritional problems of public health importance in Australia.

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 a randomised controlled trial of a Geriatric Assessment Unit, evaluation of hospital casemix classification schemes, a study of neuropsychological and psychosocial outcome after severe head injury and a study of the impact of coronary artery surgery on death and myocardial infarction rates.

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 of an operational nature, including the development and evaluation of techniques to eliminate pests and diseases in imported plants and plant products.

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 disinfestation.

. Family Planning Program

Funds are provided under the Family Planning Program to encourage research into social, medical and demographic aspects of family planning, as one means of advancing the knowledge and practice of family planning to improve the health and quality of life of the community.

. National Diseases Control Program

A component of the National Diseases Control Program provides funds for research into insect vectors and vector borne pathogens that affect humans.

. Pathology Laboratories

The department provides high quality Pathology Laboratory services to medical practitioners and hospitals in the regional area served. Laboratories are currently located at Albury, Bendigo, Cairns, Hobart, Launceston, Lismore, Port Pirie, Rockhampton, Tamworth, Toowoomba and Townsville.

. Howard Florey Institute

The Commonwealth is providing a grant of $400 000 in 1983-84 to the Institute to ensure that the impetus of its Gene Synthesis Laboratory is maintained. The Laboratory is the most advanced in Australia at present in the fields of biotechnology and genetic engineering. The research work is directed to the synthesising of genes and ensuring that they effectively produce their product when cloned into bacteria, and animal cells.

. Centenary Institute of Cancer Research and Cell Biology - Feasibility Study.

The Commonwealth and NSW Government are jointly funding a feasibility study to establish and build facilities for the Centenary Institute of Cancer Research and Cell Biology. The study is being carried out by Sydney University.

. Dental Health Unit

The Dental Health Unit undertakes science and technology activities in relation to the continuing assessment of dental health of children as part of the determination of dental health of the general community and the floridation status of Australian cities and towns.

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;

- a study of sensitivity to alcohol following head injuries.
- research into congenital anomoly reporting systems; and
- study of behavioural characteristics related to alcohol tolerance.

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 including scale-up of fermenter's capacity and development of new vaccines, development of new diagnostic tests based on enzyme immunoassay and monoclonal antibodies, isolation of human and interferon genes into micro-organisms, and clinical studies on the immunogenicity and reactivity of submit and live attenuated influenza vaccine in volunteers.

HOME AFFAIRS AND ENVIRONMENT

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Home Affairs and Environment								
. Bureau of Flora and Fauna	N(b)	0.003	0.009	0.034	0.128	0.149	0.618	0.729
	N(c)	0.061	0.267	0.409	0.362	0.399	0.755	0.809
. Environmental Activities								
- Australian Environment Council Trust Fund	N(c)	-	-	-	-	-	0.026	0.051
- Other	N(b)	-	-	-	-	-	3.220	3.193
	N(c)	-	-	-	-	-	0.640	1.039
Australian Film and Television School	S(a)	0.004	-	0.015	0.005	-	0.005	-
	S(b)	0.061	0.080	0.094	0.090	0.105	0.129	0.145
	S(c)	0.036	0.009	0.033	0.014	0.005	0.016	0.008
Australian National Parks and Wildlife Service (ANPWS)	N(c)	0.193	0.198	0.140	0.071	0.185	0.230	0.374
Great Barrier Reef Marine Park Authority	N(b)	0.056	-	-	-	-	0.018	0.007
	N(c)	0.057	0.066	0.097	0.032	0.050	0.216	0.231
	S(b)	-	-	-	-	-	-	-
	S(c)	.	0.008	-	-	0.032	0.022	0.103
National Library of Australia	N(a)	-	-	-	-	-	1.156	1.267
	N(b)	-	-	-	-	-	0.450	0.450
	N(c)	-	0.009	0.007	-	-	-	-
	S(a)	-	-	-	-	-	2.428	2.612
	S(b)	-	-	-	-	-	8.969	9.055
	S(c)	-	-	-	0.011	0.010	0.011	0.010
Office of the Supervising Scientist for the Alligator Rivers Region	N(a)	0.401	0.972	1.654	2.855	1.100	2.855	1.100
	N(b)	1.281	2.062	2.060	2.814	3.270	2.814	3.270
	N(c)	0.420	0.384	0.333	0.313	0.350	0.313	0.350
Total (Budget Sector)		2.573	4.065	4.876	6.694	5.655	24.892	24.803

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
B. Commonwealth Non-Budget Sector								
Department of Home Affairs and Environment								
. Environmental Activities								
- Australian Environment Council Trust Fund	N(c)	-	-	-	-	-	0.028	0.002
Total (Non-budget Sector)		-	-	-	-	-	0.028	0.002
Total (Direct Commonwealth funding, including BE)		2.573	4.065	4.876	6.694	5.655	24.920	24.805
C. Expenditure from other sources								
Department of Home Affairs and Environment								
. Environmental Activities								
- Australian Environment Council Trust Fund	N(c)	-	-	-	-	-	0.068	0.053
Australian Film and Television School	S(b)	-	0.001	-	-	-	-	-
National Library of Australia	S(c)	-	-	0.001	-	-	-	-
Total (Other sources)		-	0.001	0.001	-	-	0.068	0.053
Total (A+B+C)		2.573	4.066	4.877	6.694	5.655	24.989	24.858

N Natural sciences and engineering S Social sciences and humanities

$\bar{S}$N Includes a small component of social sciences and humanities for 1979-80

^{S}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

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 often 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, Zoological Catalogue of Australia, Fauna of Australia, Australian Plant Name Index, Census of Australian Plants, and the computer-based Australian Biogeographic 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.

A National Air Quality Data Program is being commenced to expand the data provided by the States to the National Air Quality Data Centre. This data is used for the development of long term strategies for the control of motor vehicle emissions and the establishment of national air quality goals and standards.

A National Notification and Assessment Scheme for industrial chemicals is being developed. The department is also completing *a* National Inventory of Existing Chemicals.

Marine environment activities have included work on the marine quality assessment program which includes monitoring baseline pollution levels and bio-indicator studies.

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 1974. The assessment of uranium mining, mineral sands mining and woodchipping have been particularly important.

The National Tree Program aims to promote action at the Government, community and individual level to conserve, regenerate, plant and maintain trees.

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.

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-fertilization 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. In 1983 research was undertaken by a lecturer in information studies into the feasibility of establishing networks for media data information.

Australian National Parks and Wildlife Service

The Australian National Parks and Wildlife Service is responsible for providing policy advice to the Commonwealth Government. It's role embraces both terrestrial and marine nature conservation issues which are nationally and internationally significant. The Service's diverse role necessitates extensive information requirements for policy development and for planning and managing national parks.

Scientific information gathering is achieved primarily through the Service's Research and Survey Program. The prime objective of this program is to sponsor research, survey and monitoring projects to collect information on ecological resources and ecological processes. The program covers *a* wide range of nature conservation policy and park management related issues. Current research areas include:

- Kakadu National Park - landscape appraisal, indigenous culture resources, and wildlife dynamics;
- Marine Resources/Marine Mammals;
- Ecological Resources of External Territories - Christmas Island/Cocos-Keeling, Norfolk/Philip Islands;
- Migratory Birds;
- 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;
- an integrated land classification system for nature conservation management in Kakuda National Park; and
- monitoring of Abbott's Booby on Christmas Island.

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 t anticipate changing patterns and intensities of use and adjust its planning accordingly.

Current research projects include:

- evaluation of LANDSAT imagery versus aerial photography;
- evaluation of tourist impact on reef coral;
- evaluation of surface current in the Great Barrier Reef Region;
- development of techniques for coral recolonisation; and
- Aboriginal hunting and fishing activities in Great Barrier Reef Region.

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.

Research projects funded for 1982-83 were:

- Australian Bibliographic Network Local Interfaces Study;
- Development of Language Codes for South East Asia for use in MARC (Machine Readable Cataloging) records;
- Feasibility Study for a Manual of Australia Hospital Library Practice; and
- A Statistical Program Package to Study Inter-Library Loan Transactions.

One project has been funded for 1983-84. $10 000 has been allocated for the Grainger Sound Archive Project. This project is to compile a complete catalogue of the works of the composer Percy Grainger.

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)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Housing and Construction								
. Central Investigation and Research Laboratories	N(a)	0.140	0.100	0.122	0.130	0.143	0.270	0.297
	N(b)	1.100	0.800	0.978	1.020	1.122	2.130	2.343
. Contributions to								
- Australian Housing Research Council	N(c)	0.046	0.067	0.058	0.078	0.091	0.078	0.091
- Australian Road Research Board	N(c)	0.259	0.259	-	-	-	-	-
- Australian Uniform Building Regulations Coordinating Council	N(c)	-	0.031	0.028	0.012	0.044	0.012	0.044
. Experimental Building Station	N(a)	0.179	0.221	0.094	0.053	0.055	0.061	0.066
	N(b)	1.357	1.183	0.681	0.811	0.890	1.376	1.476
. Technical Services	N(a)	-	-	-	-	-	1.080	1.160
	N(b)	-	-	-	-	-	35.290	37.700
	N(c)	-	-	-	-	-	3.290	4.000
Total (Budget Sector)		3.081	2.661	1.961	2.104	2.345	43.497	47.177
B. Commonwealth Non-Budget sector								
Department of Housing and Construction								
. Contribution to								
- Australian Housing Research Council	N(c)	0.038	0.067	0.038	0.055	0.035	0.055	0.035
- Australian Uniform Building Regulations Coordinating Council	N(c)	-	-	0.011	0.007	0.055	0.007	0.055
Snowy Mountains Engineering Corporation (SMEC) BE	N(a)	-	-	-	-	-	10.413	4.000
	N(b)	0.042	0.014	-	-	-	39.859	36.000
	N(c)	-	-	-	-	-	1.796	1.400
Total (Non-Budget Sector)		0.080	0.081	0.049	0.062	0.090	52.131	41.490
Total (Direct Commonwealth funding, including BE)		3.161	2.742	2.010	2.166	2.435	95.628	88.667
Total (Direct Commonwealth funding, excluding BE)		3.119	2.728	2.010	2.253	2.435	43.397	47.177

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
C. Expenditure from other sources								
Department of Housing and Construction								
. Experimental Building Station	N(a)	0.018	0.028	0.035	0.014	0.012	0.015	0.012
	N(b)	0.138	0.147	0.255	0.217	0.188	0.221	0.231
. Contribution to								
- Australian Housing Research Council	N(c)	0.048	0.121	0.092	0.127	0.124	0.127	0.124
- Australian Uniform Building Regulations Coordinating Council	N(c)	-	0.031	0.039	0.019	0.099	0.019	0.099
Total (Other sources)		0.205	0.326	0.421	0.376	0.423	0.422	0.466
Total (A+B+C)		3.366	3.068	2.431	2.542	2.857	96.050	89.132

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 contibutes to the development of national standards, building regulations and other public interest activities requiring research and other technical services.

. Australian Uniform Building Regulations Coordinating Council (AUBRCC)

AUBRCC is responsible for the further development of the Australian Model Uniform Building Code as the technical basis for building control in Australian States and Territories. 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;

- economic assessment of building regulations;

- research into size of habitable rooms;

- examination of appropriate evacuation times from buildings in respect to fire safety measures; and

- development of a risk model for the analysis of risk to occupants of buildings.

. 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.

Recent research programs include continuing studies of the social and economic effects on increasing rents on public housing, the housing needs of single parents, studies of mobile granny flats, and housing alterations and additions. Reports recently published include: Youth Housing Policy. Darwin Post Disaster Housing Study, Who Misses out on Public Housing and Why and Cluster Housing in Australia and North America: A Sociological Evaluation.

. 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.

Projects being undertaken in the various sections of the laboratory include:

- research into the effects of electrical transient voltages on fire alarm equipment, looking particularly at surges induced by lightning;

- development of recirculating smoke tunnel apparatus for examining the effects of airflow and different particular combustion products on optical and ionization type smoke detectors typically used to give early warning of fires in buildings;

- evaluation of a Polyvinyllidene fluoride (PVF2) coated composite aluminium panelling as a wall cladding both in respect of physical and mechanical properties and the durability and aesthetic performance of the coating.

. Experimental Building Station (EBS)

The EBS conducts applied research into the design and construction of buildings and related engineering works, incuding 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.

Some research projects proposed for 1983-84 are determination of the maximum potential strength of masonry walling; determination of the fire resistance of elements of vertical construction and of horizontal construction; investigations on the transmission of noise through various types of construction; and examination of the structural and functional sufficiency of windows, doors and wall panels. The EBS also participates in international co-operative research programs related to the International Standards Organisation.

. Technical Services

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 and rock mechanics, surveying, estimating, contract supervision, irrigation, agriculture, economics, training, equipment procurement and project management.

The Corporation has also developed special expertise in the areas of hydrology, fluid mechanics and geomechanics and has well established fluid mechanics and geomechanics laboratories.

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 largest part of the work is now performed overseas.

IMMIGRATION AND ETHNIC AFFAIRS

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Immigration and Ethnic Affairs								
. Studies and Research*	S(b)	0.121	0.164	0.117	0.199	0.314	0.791	0.809
	S(c)	0.333	0.364	0.270	0.234	0.286	0.296	0.381
Australian Institute of Multicultural Affairs	S(a)	-	-	-	-	-	0.388	2.006
	S(b)	-	-	-	-	-	1.892	1.852
	S(c)	-	-	-	-	-	0.335	0.395
Total (Budget Sector)		0.453	0.527	0.387	0.432	0.600	3.702	5.443
B. Commonwealth Non-budget sector								
Department of Immigration and Ethnic Affairs								
. Studies and Research*								
- Attributable to past Commonwealth contributions	S(c)	-	0.002	0.006	0.021	0.009	0.023	0.038
Australian Institute of Multicultural Affairs	S(a)	-	-	-	-	-	0.002	0.006
	S(b)	-	-	-	-	-	0.011	0.006
Total (Non-Budget Sector)			0.002	0.006	0.021	0.009	0.036	0.050
Total (Direct Commonwealth funding)		0.453	0.528	0.386	0.453	0.609	3.738	5.493
C. Expenditure from other sources								
Department of Immigration and Ethnic Affairs								
. Studies and Research*								
- Attributable to State contributions	S(c)	-	0.007	0.012	0.034	0.016	0.038	0.066
Total (Other sources)		-	0.007	0.012	0.034	0.016	0.038	0.066
Total (A+B+C)		0.453	0.534	0.398	0.487	0.624	3.776	5.559

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 Australian Population and Migration Research Program Trust Account. 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.

Department of Immigration and Ethnic Affairs

The Department of Immigration and Ethnic Affairs develops, undertakes and oversights research projects to increase the Department's awareness on migrant and population issues and to evaluate settlement services and migration policy. Examples of research undertaken are studies of settlement experiences of family reunion migrants, Turkish and Yugoslav ethnic press in Melbourne and the settlement experiences of the Lebanese community in Sydney.

The Department entered into a joint project with the Committee on 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.

Activities are also directed to establishing the English language learning needs of migrants, to improving the methodology and content of courses and to evaluating the cost-effectiveness of specific program arrangements.

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 studies. Studies being undertaken at present include

- a Review of Manpower Programs and Services for Migrant and Refugee Youth;
- the Migrant Experience - a community education project to include a six part documentary film series, a book and an educational kit;
- a study of the changing demographic characteristics of the Ethnic Aged and the implications for health and welfare services;
- a study of the impact of multicultural television;
- the preparation of a series of demographic profiles of ethnic community groups in Australia;
- the development of an integrated information system for Australian and international multicultural publications.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Industry and Commerce								
. Bureau of Industry Economics	S(b)	0.722	1.047	1.454	1.521	1.918	1.521	1.918
	S(c)	-	0.013	0.093	0.099	0.080	0.099	0.080
. Grant-in-aid to Australian Institute of Urban Studies	S(c)	-	-	-	-	-	0.035	0.035
. Ship Design	N(a)	0.001	-	-	-	-	-	-
	N(b)	0.015	-	-	-	-	-	-
Albury Wodonga Development Corporation	N(a)	0.029	0.009	0.002	0.006	-	0.009	-
	N(b)	0.015	0.016	0.028	0.040	-	0.060	-
Industries Assistance Commission								
. IMPACT Project	S(a)	-	0.001	-	-	-	-	-
	S(b)	0.156	0.209	0.257	0.108	0.031	0.108	0.081
	S(c)	-	-	-	0.082	0.090	0.082	0.090
Total (Budget Sector)		0.938	1.294	1.833	1.855	2.169	1.913	2.204
B. Commonwealth Non-budget sector								
Albury Wodonga Development Corporation	N(a)	0.030	0.010	0.002	0.006	0.011	0.009	0.018
	N(b)	0.015	0.018	0.030	0.042	0.086	0.060	0.126
	N(c)	0.081	0.017	0.015	0.076	0.025	0.076	0.025
Total (Non-Budget Sector)		0.126	0.045	0.047	0.124	0.122	0.145	0.169
Total (Direct Commonwealth funding)		1.064	1.339	1.880	1.979	2.322	2.058	2.404

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
C. Expenditure from other sources								
Department of Industry and Commerce								
. Bureau of Industry Economics	S(c)	-	-	-	-	-	-	0.020
Albury Wodonga Development Corporation	N(a)	0.074	0.022	0.004	0.009	0.009	0.014	0.014
	N(b)	0.037	0.037	0.056	0.063	0.066	0.096	0.099
Total (Other sources)		0.111	0.059	0.060	0.072	0.075	0.111	0.133
Total (A+B+C)		1.175	1.398	1.940	2.051	2.397	2.169	2.537

N Natural sciences and engineering S Social science s 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;
- industrial development policies;
- 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;
- regional development and structural change;
- productivity in Australia's manufacturing sector;
- evolving economic relations between Australia and North-east Asia, and
- small business.

A re-organisation of the Department of Industry and Commerce has resulted in the establishment within the Bureau of Industry Economics of, inter-alia, a Small Business Research Unit. In undertaking on-going research into the small business sector, the Unit is to identify and find solutions to the problems of small business and to produce annually a report showing the importance of small business to the national economy, monitoring trends in small business activity and problems affecting it.

. Grant to the Australian Institute of Urban Studies (AIUS)

The AIUS is an independent organisation concerned with urban and regional development in Australia. The stated objectives of the Institute are to promote research on urban matters in Australia and to act as a body to initiate debate on urban issues. This role includes the ability for the Institute to give independent advice to various levels of Government on policy matters relating to urban affairs.

The AIUS plans to develop a long term analysis of macro economic, social and demographic trends in Australia and their implications for future urban development and management in both metropolitan and non-metropolitan areas. A major project is to provide advice on urban matters pertaining to ASEAN countries to the Australian Development Assistance Bureau.

. 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)

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, La Trobe University and the Australian National 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.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Primary Industry								
. Administrative support for S&T, not elsewhere included								
- Library Services	N(b)	-	-	-	-	-	0.321	0.333
- Ministerial Councils	N(b)	-	-	-	-	-	0.200	0.206
- Statutory Research Funds and Special Research Grants	N(b)	-	-	-	-	-	0.629	0.648
. Australian Agricultural Council Sponsored Projects	N(c)	0.053	0.055	0.058	0.076	0.062	0.198	0.182
. Australian Wine Research Institute Grant	N(c)	0.099	0.148	0.165	0.255	0.267	0.255	0.267
. Barley Improvement Schemes (S.A., Vic., W.A.)	N(c)	0.145	0.148	-	-	-	-	-
. Bureau of Agricultural Economics	S(b)	0.843	0.853	1.056	1.309	1.429	7.307	7.326
. Bureau of Animal Health	N(a)	-	-	0.029	0.004	0.002	0.074	0.143
	N(b)	0.184	0.192	0.276	0.243	0.268	1.759	1.955
	N(c)	-	-	-	-	-	1.178	1.491
. Commonwealth Extension	N(c)	1.545	1.382	-	-	-	-	-
Services Grant	S(c)	0.339	0.303	-	-	-	-	-
. Commonwealth Special Research Grant	N(c)	0.237	0.248	0.279	0.255	0.266	0.268	0.276
. Fisheries Division	N(a)	-	-	-	-	-	-	0.-150
	N(b)	-	-	-	-	-	1.215	1.522
	N(c)	-	-	-	-	-	0.919	1.136
. Fishery Management (Torres Strait)	N(c)	0.073	0.174	0.175	0.275	0.509	0.275	0.509

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure (continued)								
. Forestry Research Grants	N(c)	0.031	0.033	0.022	0.037	0.037	0.037	0.037
. Plague Locust Commission	N(a)	0.011	0.011	0.015	0.014	0.010	0.045	0.010
	N(b)	0.043	0.052	0.051	0.059	0.065	0.365	0.409
Sub-total		3.601	3.599	2.127	2.585	2.978	15.046	16.599
. Statutory Rural Industry Research Schemes *								
- Barley	N(c)	-	-	0.276	0.304	0.376	0.350	0.432
- Cotton	N(c)	-	-	-	-	0.411	-	0.411
- Chicken Meat	N(c)	0.158	0.183	0.180	0.194	0.228	0.218	0.256
- Dairying	N(c)	0.236	0.305	0.272	0.348	0.380	0.546	0.596
- Dried Fruit	N(c)	0.049	0.066	0.049	0.083	0.105	0.122	0.156
	S(c)	0.005	0.007	-	-	-	-	-
- Fishing Industry Development #	N(c)	-	-	-	-	-	0.300	0.348
- Fishing Industry Research **	N(c)	0.490	0.427	0.458	0.663	1.084	2.079	3.400
- Honey	N(c)	-	-	0.022	0.045	0.065	0.045	0.065
- Meat	N(c)	2.683	3.196	3.405	4.123	4.720	4.608	5.275
	S(c)	0.233	0.278	0.290	-	-	-	-
- Oilseeds	N(c)	0.217	0.275	0.298	0.307	0.318	0.339	0.350
- Pig Industry	N(c)	0.189	0.177	0.193	0.256	0.314	0.405	0.497
	S(c)	0.010	0.010	0.007	0.014	0.018	0.014	0.018
- Poultry	N(c)	0.045	0.067	0.066	0.131	0.156	0.150	0.178
- Tobacco	N(c)	0.323	0.275	0.197	0.420	0.474	0.600	0.677
- Wheat	N(c)	2.143	2.708	2.845	3.201	3.433	3.548	3.804
- Wine	N(c)	0.082	0.088	0.088	0.088	0.088	0.088	0.088
- Wool	N(c)	5.000	6.611	7.616	7.846	9.074	8.553	9.891
Sub-total (Commonwealth derived expenditure on rural research schemes)		11.865	14.674	16.268	18.023	21.242	21.965	26.443
Total (Direct Commonwealth funding)		15.466	18.273	18.395	20.608	24.220	37.011	43.042

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
B. Expenditure from other sources								
Department of Primary Industry								
. Bureau of Agricultural Economics ##	S(a)(b)	0.094	0.094	0.096	0.141	0.211	0.785	1.129
. Bureau of Animal Health	N(c)	0.010	0.022	0.017	0.029	0.020	20.052	23.862
. Plague Locust Commission (State-contributed funds)	N(a)	0.011	0.011	0.015	0.014	0.010	0.045	0.010
	N(b)	0.043	0.052	0.051	0.059	0.065	0.365	0.409
Sub-total		0.157	0.179	0.179	0.241	0.306	21.247	25.410
. Statutory Rural Industry Research Schemes *								
- Barley	N(c)	-	-	0.222	0.336	0.416	0.387	0.478
- Cotton	N(c)	-	-	-	-	0.411	-	0.411
- Chicken Meat	N(c)	0.171	0.145	0.193	0.203	0.239	0.228	0.268
- Dairying	N(c)	0.318	0.274	0.309	0.469	0.513	0.736	0.804
- Dried Fruit	N(c)	0.048	0.059	0.049	0.087	0.111	0.129	0.164
	S(c)	0.005	0.007	0.005	0.011	-	0.011	-
- Fishing Industry Development	N(c)	-	-	-	-	-	0.132	0.152
- Honey	N(c)	-	-	0.032	0.044	0.063	0.044	0.064
- Meat	N(c)	2.590	2.870	3.740	5.128	5.871	5.732	6.561
	S(c)	0.225	0.250	0.318	-	-	-	-
- Oilseeds	N(c)	0.208	0.313	0.275	0.295	0.305	0.325	0.336
- Pig Industry	N(c)	0.167	0.235	0.225	0.264	0.324	0.418	0.513
	S(c)	0.009	0.014	0.007	0.015	0.018	0.015	0.018
- Poultry	N(c)	0.063	0.050	0.088	0.163	0.194	0.187	0.223
- Tobacco	N(c)	0.368	0.565	0.596	0.461	0.520	0.659	0.744
- Wheat	N(c)	2.343	2.898	2.443	2.923	3.134	3.239	3.473
- Wool	N(c)	7.383	5.578	6.664	8.653	10.007	9.432	10.909
Sub-total (Industry-derived expenditure on rural research schemes)		13.897	13.258	15.169	19.042	22.125	21.663	25.117
Total (Other sources) ##		14.055	13.438	15.348	19.283	22.431	42.910	50.527

($ million)	R&D					S&T (including R&D)	
	79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
Total (A+B) ##	29.520	31.710	33.742	39.892	46.651	79.921	93.569
Less intra-Ministry transfers	(0.094)	(0.094)	(0.096)	(0.141)	(0.211)	(0.785)	(1.129)
Total	29.426	31.616	33.646	39.751	46.440	79.136	92.440

N Natural sciences and engineering S Social sciences and humanities

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

($^{a}_{b}$) Intramural expenditure (capital and current (c) Extramural expenditure

* Amounts indicate payments for research made from the Trust Funds concerned, attributable to commonrated appropriation (Table A) or industry contribution (Table B). 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 made from the Trust Fund. Commonwealth contributions to the Trust Fund were $746 000 (1978-79), $850 000 (1979-80) $820 000 (1980-81), $2 428 000 (1981-82), $1 600 000 (1982-83) and $5 298 000 (projected 1983-84).

\# Amounts indicate payments made from the Trust Fund. Commonwealth contributions to the Trust Fund were $300 000 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. Current projects include fresh fruit disinfestation, Support for the Fruit Variety Foundation, and the Commonwealth Advisory Laboratory, and the pig carcass classification scheme.

. Australian Wine Research Institute

The Institute undertakes research on behalf of the wine and brandy industry into the scientific and technical aspects of wine and spirit manufacture. Work undertaken at the Institute but related to the composition and stabilisation of wines and the complex interactions between wine components and micro-flora. In 1979-80, the Commonwealth moved to a dollar for dollar matching arrangement with the then Australian Wine Board to support the Institute, bringing arrangements for financing wine industry research into line with those applying to other rural industries.

. 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 Bureau's responsibilities include economic research and analysis for the agricultural, pastoral, horticultural, dairying, intensive livestock, forest and fishing industries. The BAE provides government with reports and economic studies necessary for policy formulation and review. To aid decision making by farmers, farmer organisations, industry bodies and others associated with agriculture, the Bureau disseminates analyses and reports of the agricultural situation and prospects.

Subject to its existing commitments and demands for specific investigations, the Bureau is free, indeed expected, to direct its work into economic research and investigation it considers most useful.

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.

With the change of government in March 1983, the Bureau brought forward its release of April economic forecasts of agricultural performance just prior to the National Economic Summit Conference in mid-April 1983. These forecasts included, for the first time, estimates of Gross Farm Product, which are used in macroeconomic forecasting. They will now be updated and released every quarter. Studies specifically undertaken at the request of the Minister since March, include:

- a task force study of prospects for horticultural products, the aim being to identify those with longer-term prospects for growth and viability;

- a study of Australia's grain handling and transport - to form a basis for future decisions on infrastructure investment for the grain industry;

- an analysis of the impact of alternative taxation measures on soil conservation; and

- a consideration of alternative methods of pricing milk by quality.

. Australian Bureau of Animal Health (ABAH)

The ABAH is responsible for the coordination of national animal health programs for endenic 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 projects funded in 1983-84 include the development and assessment of mechanisation extension techniques for intensive agriculture and the effects of soil erosion on crop productivity.

. Fisheries Division

The Division manages 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.

Other activities include the development of legislation affecting the management of fisheries; participation in the education/training of Commonwealth and State fisheries' officers involved in activity under Commonwealth delegation (including the training of professional fishermen, for example in the use of sonar equipment); encouraging the 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 administered by the Division); provision of secretariat facilities to committees of the Standing Committee on Fisheries; participation in negotiations within international organisations or with foreign governments on fisheries matters and in the formulation of agreements with foreign governments or corporations; dissemination of 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, the provision of 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.

. National Soil Conservation Program

This new program has been established to provide funds to the States and the Northern Territory for priority conservation projects and increased effort in research and extensions related to soil conservation. $1 million has been appropriated for 1983-84.

. 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 Finds, 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 to money raised from producers in the form of a levy on their produce.

Industry Contributions to Primary Industry Trust Accounts

($ million)	78-79	79-80	80-81	81-82	82-83	Projected 83-84
Barley	-	-	0.311	0.472	0.290	1.028
Chicken Meat	0.189	0.226	0.235	0.216	0.241	0.234
Cotton	-	-	-	-	0.196	0.254
Dairying	0.435	0.459	0.422	0.421	0.535	0.565
Dried Fruit	0.089	0.090	0.119	0.119	0.120	0.093
Honey	-	-	0.018	0.056	0.045	0.050
Meat	3.198	3.178	3.297	3.021	4.164	3.608
Oilseeds	0.349	0.412	0.275	0.299	0.229	0.295
Pig Industry	0.290	0.288	0.389	0.415	0.401	0.415
Poultry*	0.138	0.096	0.142	0.146	0.150	0.150
Tobacco	0.393	0.389	0.378	0.412	0.473	0.546
Wheat	3.466	3.086	2.012	3.108	1.967	4.650
Wool	1.932	10.239	7.538	8.766	8.832	10.000
Totals	10.479	18.463	15.136	17.392	17.643	21.888

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

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.

Some of the R&D supported by the finds includes the following:

- For wool five fields of research are supported - production, wool harvesting, distribution, economic and textile research. Production research covers soil deficiences through to research in the chemical structure of the messenger protein controlling wool production. Current programs aim to produce new plants with high resistance to insects, pests and plant diseases, particularly clover starch and root rots. The wool harvesting program is concerned with the development of improved shearing methods for use in traditional and automated shearing. A major project involves the biological defleecing program with very promising work on Epidermal Growth Factor.

- The Meat Research Trust Fund supports continuing research into cattle and sheep diseases: control of buffalo fly, tick control, reproductive problems in Bos indicus cattle in Northern Australia, studies on the nutrition of sheep and cattle and a computerised system of selling cattle. Funds are also provided for research into meat processing technology, ie. various economic studies and promotional and marketing opportunities in the domestic beef industry. Major projects supported include:- sheep blowfly investigation; co-operative research in WA flocks; gene mutation; evaluation of weaning as a management technique in pastoral beef industry; genetic studies; tick resistance; ecology and control of buffalo fly; evaluation of introduced pasture plants; viral bacterial and leptospiral diseases; and control of sex of off-spring in cattle.

- Wheat research programs cover a very wide range of projects including diseases of wheat and pest control, studies of the nitrogen cycle and fertilisation, genetic research, and harvesting methods.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Auditor-General's Office	S(a)	-	-	-	-	-	-	0.018
	S(b)						0.161	0.229
Australian Science and Technology Council (ASTEC)								
	$_{S}$N(b)	-	-	-	-	-	0.772	0.851
	$_{S}$N(c)	-	-	-	-	-	0.023	0.035
Office of Public Service Board								
. Human resources planning	S(a)	-	-	-	-	-	-	0.007
	S(b)	-	-	-	-	-	0.369	0.333
. Postgraduate Awards	^{n}S(c)	0.044	0.060	0.046	0.063	0.076	0.157	0.190
Total (Direct Commonwealth funding)		0.044	0.060	0.046	0.063	0.076	1.481	1.713

N Natural sciences and engineering S Social sciences and humanities
$_{S}$N Includes small component of social sciences and humanities
^{n}S 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 science and technology activities are conducted by full-time staff of the Office and are 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 (ASTEC)

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 is placing increased emphasis on its tactical and strategic roles 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.

ASTEC reports tabled in Parliament in 1982-83 included 'Australian Science and Technology in International Co-operation and Development Assistance', 'Biotechnology in Australia' and 'Robots'. In 1982-83 consultants were employed to conduct a technical assessment of the Bureau of Meteorology's capital re-equipment program and to report on overseas' experience in videotex systems. Studies presently underway include 'Technological change and Migrant Employment', 'Management and Funding of National Research Facilities', and 'Fundamental and Strategic Research Funding'.

Office of the Public Service Board

. Human Resource Planning

Human resource 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.

Major projects undertaken in 1982-83 included a study, now published, 'Women in the Australian Public Service: Distribution and Career Patterns' and work on the incidence of invalidity retirement in the Service.

. 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 1982-83 twenty-five awards were granted in the general category (ten being taken up at overseas institutions and twenty-one in Australia) and seven under the management studies scheme (three being taken up overseas and four in Australia).

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Resources and Energy								
. Australia/FRG Coal Liquefaction Study	N(c)	0.109	0.323	0.008	-	-	-	-
. Energy Research and Development Division	N(a)	-	-	-	-	-	0.025	0.034
	N(b)	-	-	-	-	-	1.645	1.829
. National Energy Research Development and Demonstration (NERD&D) Program: Energy Trust Account	N(c)	4.647	6.282	8.917	-*	10.110	-*	12.137
	S(c)	0.065	0.069	0.351	-*	0.763	-*	0.763
. National Water Programs	N(b)	-	0.013	0.029	0.076	0.180	0.201	0.287
	N(c)	0.658	0.896	1.371	1.343	0.790	11.532	8.462
	S(b)	-	-	-	-	-	0.033	0.026
	S(c)	0.023	0.026	0.012	-	-	0.533	0.750
. Bureau of Mineral Resources, Geology and Geophysics	N(a)	0.325	0.453	0.573	2.006	2.820	2.246	2.881
	N(b)	7.845	9.089	13.056	14.556	14.932	19.656	20.299
	N(c)	0.200	0.010	0.010	0.010	-	0.010	-
. Australian Safeguards Office	N(a)	0.010	0.004	0.004	-	-	-	-
	N(b)	0.004	0.004	0.005	0.025	0.025	0.025	0.025
	N(c)	-	-	-	0.003	-	0.003	0.006
. Division of National Mapping	^{S}N(a)	-	-	-	-	-	0.468	0.651
	^{S}N(b)	-	-	-	-	-	11.726	11.850
	^{S}N(c)	-	-	-	-	-	0.530	0.578
Australian Atomic Energy Commission	N(a)	1.012	0.878	1.632	2.170	3.569	3.078	4.930
	N(b)	15.721	19.113	24.021	24.722	25.836	35.596	36.703
	N(c)	0.649	0.625	0.808	0.651	0.582	0.651	0.582
Total (Budget sector)		31.269	37.785	50.795	45.562	59.606	87.957	102.792
Less AAEC Superannuation employer contribution**		-	-	(2.655)	(2.605)	(2.911)	(3.752)	(4.179)
Total (less Superannuation adjustment)		31.269	37.785	48.140	42.957	56.695	84.205	98.613

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
B. Commonwealth Non-Budget sector								
Department of Resources and Energy								
. NERD&D Program								
Energy Research Trust Account	N(c)	-	-	-	10.875	0.760	13.054	0.913
	S(c)	-	-	-	0.318	0.057	0.818	0.057
Total (Non-Budget sector)		-	-	-	11.692	0.818	13.872	0.970
Total (Direct Commonwealth funding)**		31.269	37.785	48.140	54.649	57.513	98.077	99.583
C. Expenditure from other sources								
Department of Resources and Energy								
. Australian Safeguards Office	N(b)	-	-	-	-	-	0.011	0.080
	N(c)	-	-	-	-	-	-	0.042
. CHOGRM Energy Projects	N(a)	-	-	-	-	-	0.012	-
	N(b)	-	-	-	-	-	0.121	0.002
	N(c)	-	-	-	-	-	0.018	0.131
. Coal Research Trust Account	N(c)	5.471	3.793	4.766	3.958	3.960	4.275	4.280
. Australia/FRG Coal Liquefaction Study	N(c)	0.725	0.625	0.026	-	-	-	-
. Bureau of Mineral Resources, Geology and Geophysics	N(a)	0.004	0.026	0.006	0.027	-	0.027	-
	N(b)	0.092	0.349	0.214	0.207	-	0.207	-
Australian Atomic Energy Commission	N(a)	0.018	0.024	0.060	0.061	0.054	0.061	0.054
	N(b)	0.273	0.522	0.821	0.688	0.410	0.688	0.410
Total (Other sources)		6.583	5.339	5.893	4.941	4.424	5.422	4.999
Total (A+B+C)**		37.852	43.124	54.033	59.590	61.937	103.499	104.582
Less intra- Ministry transfers#		(0.387)	(0.705)	(0.897)	(0.647)	(0.160)	(0.647)	(0.160)
Total**		37.465	42.419	53.136	58.843	61.777	102.852	104.422

N Natural sciences and engineering S Social sciences and humanities

SN 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 (NERD&D) Program

The National Energy Research, Development and Demonstration Council (NERDOC) 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 around $115m have been approved on the advice of the Council.

The Energy Research and Development Division 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.

Current activities include:

- National Water Resources Program
- National Water Resources Assessment Program

Under the National Water Resources Program financial assistance has been provided to the States each year over a five year period to undertake works of high priority. In recent years this has amounted to over $40m in a year. 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. A considerable body of data on Australia's water resources has been amassed over a period of almost 20 years.

The Perspective on Water Resources to the Year 2000 Study was undertaken over a 12 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 and economic and financial issues, water quality and salinisation, erosion and sedimentation, flooding and droughts. The results of the Study have now been published as the report, WATER 2000. The Government is now considering its response to the report's recommendations and this will form the basis of new Commonwealth policies and programs for water development and management.

The National Water Research Program, referred to in the previous Statement, was not commenced. With the change of Government in March 1983, it was decided to put the activities of the National Water Research Council in abeyance while consideration was given to the establishment of an Institute of Freshwater Studies. This should be completed by May 1984. The former research program based on the recommendation of the Australian Water Resources Council is not being extended during this period.

. Bureau of Mineral Resources, Geology and Geophysics (8MR)

BMR is the national 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 Australian Antarctic Territory to support the fullest development of Australia's mineral and energy resources.

BMR comprises four research divisions (Continental Geology; Petrology & Geochemistry; Geophysics; Marine Geosciences & Petroleum Geology), the Baas Becking Geobiological Laboratory (a joint BMR/CSIRO facility), a Resource Assessment Division, a Special Projects & Geoscience Services Branch, and a Planning & Programs Branch.

BMR's scientific projects are grouped into eight broad programs:

- Fossil Fuels
- Minerals
- Groundwater
- Earthquake Hazards
- National and International Geoscience Maps

- Overseas Programs
- Petroleum and Minerals Resource Assessment
- Geoscience Database.

. 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 and ensures that agreed physical protection measures are applied.

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 reverifiction 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 waste management, including development of the Synroc process for the immobilisation of high level radioactive wastes;

- providing to departments of nuclear medicine in Australian hospitals locally-produced radiopharmaceuticals and radioisotopes for diagnosis and therapy;

- the use of radioisotopes and radiation for industrial processing, tracing applications, food irradiation and sterilisation;

- environmental science with special reference to the Australian uranium mining industry; and

- supporting research in fields of fusion technology, safeguards, fission and health and safety assessments of nuclear plant and operations.

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 Nuclear Energy Agency, national and international governmental authorities, Australian State government bodies and universities.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Science and Technology (DST)								
. Administrative and other costs not elsewhere included	N(a)	-	-	-	-	-	0.104	0.098
	N(b)	-	-	-	-	-	14.644	15.230
	N(c)	-	0.007	-	-	-	0.174	0.775
. Antarctic Activities								
- Antarctic Division	N(a)	4.465	3.921	2.285	6.981	6.593	13.096	11.813
	N(b)	7.337	8.474	8.796	10.470	12.001	18.619	21.477
	N(c)	0.024	0.028	0.034	0.017	0.017	0.017	0.017
- Antarctic Air Transport Study	N(a)	-	-	-	-	-	-	2.150
	N(b)	-	-	-	-	-	0.120	0.201
	N(c)	-	-	-	-	-	-	-
- Antarctic Ship Design Study	N(b)	-	-	-	-	-	0.199	0.378
	N(c)	-	-	-	-	-	-	-
- CCAMLR Contrib.	N(c)	-	-	-	-	-	0.098	-
- Scott Polar Research Institute Grant	N(c)	-	-	-	-	-	0.010	0.010
. Australian Government Analytical Laboratories	N(a)	0.015	0.025	0.019	0.025	0.020	0.489	0.594
	N(b)	0.252	0.298	0.343	0.528	0.603	6.503	6.700
. Baseline Air Pollution Monitoring Station	N(a)	-	-	-	-	-	0.002	0.001
	N(b)	-	-	-	-	-	0.527	0.420
. Bureau of Meteorology	N(a)	-	-	0.003	0.031	0.100	4.393	2.491
	N(b)	0.803	0.941	1.180	1.701	1.721	41.084	42.110
- International Activities	N(b)	-	-	-	-		0.520	0.498
	N(c)	-	-	-	-	-	0.338	0.297
. Commercial Development of Technology								
- InterScan support	N(b)	-	-	-	-	-	0.010	0.010
	N(c)	3.702	2.450	2.068	2.194	1.850	2.194	1.850
	N(b)	-	-	-	-	-	0.391	0.418
- Public Interest Projects	N(c)	-	-	-	-	-	4.935	10.000
. Grants-in-Aid								
- Academies and ANZAAS	N(c)	-	-	-	-	-	0.426	0.426
	S(c)	-	-	-	-	-	0.140	0.140
- Industrial Design Council	N(b)	-	-	-	-	-	0.009	0.011
	N(c)	-	-	-	-	-	0.050	0.180
- National Association of Testing Authorities	N(b)	-	-	-	-	-	0.007	0.008
	N(c)	-	-	-	-	-	0.811	0.811

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
- Research Associations	N(b)	-	-	-	-	-	0.062	0.069
	N(c)	-	-	1.209	1.341	1.680	1.341	1.680
- Standards Association of Australia	N(b)	-	-	-	-	-	0.010	0.013
	N(c)	-	-	-	-	-	2.583	2.583
. Industrial R&D Grants								
- Commencement Grants	N(c)	7.000	9.657	9.700	13.075	16.150	13.075	16.150
- Project Grants	N(c)	22.950	36.056	12.053	34.797	45.460	34.797	.45.460
. International Cooperation								
- Academies' Scientific Exchanges with China	SN(c)	-	-	-	-	-	0.126	0.126
- Association for Science Cooperation in Asia	N(b)	-	-	-	-	-	-	0.005
	N(c)	-	-	-	-	-	0.016	0.021
- Bilateral Agreements (India, Japan, Mexico, U.S.A., West Germany)	SN(c)	0.071	0.072	0.079	0.156	0.174	0.299	0.321
- Commonwealth Science Council	N(c)	-	-	-	-	-	0.079	0.090
. Ionospheric Prediction Service	N(a)	0.005	0.076	0.006	0.009	0.008	0.043	0.046
	N(b)	0.100	0.015	0.085	0.111	0.119	1.275	1.314
. National NMR Centre	N(b)	0.108	0.114	0.093	0.048	-	0.048	-
. Patent Activities								
- Patent Office*	N(a)	-	-	-	-	-	0.148	0.300
	N(b)	-	-	-	-	-	12.505	14.627
	N(c)	-	-	-	-	-	0.200	0.110
- Contributions to international patent bodies	N(c)	-	-	-	-	-	0.525	0.317
. Productivity Promotion Council (admin support)	S(a)	0.005	0.009	-	-	-	-	
	S(b)	0.023	0.026	0.012	-	-	1.150	0.022
	S(c)	0.008	0.008	0.016	-	-	0.580	1.700
. Research Grants and Fellowships								
- ARCS Grants	N(b)	-	-	-	-	-	0.109	0.145
	N(c)	10.208	11.553	13.187	14.544	16.285	14.544	16.235
	S(b)	-	-	-	-	-	0.032	0.040
	S(c)	2.592	2.934	3.803	4.193	4.550	4.193	4.550
- Biotechnology Grants	N(b)	-	-	-	-	-	-	0.034
	N(c)	-	-	-	-	1.466	-	1.466
- Fellowships	N(b)	-	-	-	-	-	0.019	0.020
	N(c)	0.503	0.560	0.671	0.659	0.800	0.659	0.800
- Marine Science Grants	N(b)	-	-	-	-	-	0.037	0.056
	N(c)	0.394	2.000	1.899	2.125	1.962	2.125	1.962
- Marine Science Fellowships	N(b)	-	-	-	-	-	0.010	0.012
	N(c)	0.245	0.250	0.336	0.257	0.345	0.257	0.345

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
- National Fellowships Scheme	N(b)	-	-	-	-	-	-	0.011
	N(c)	-	-	-	-	0.392	-	0.392
	S(b)	-	-	-	-	-	-	0.005
	S(c)	-	-	-	-	0.168	-	0.168
. Space and Upper Atmosphere Activities								
- LANDSAT Station	N(a)	-	-	-	-	-	0.623	0.073
	N(b)	-	-	-	-	-	0.670	0.937
	N(c)	-	-	-	-	-	1.162	1.380
- Space Projects	N(b)	-	-	-	-	-	0.140	0.140
. Technology Development								
- Assistance to inventors	N(b)	-	-	-	-	-	0.140	0.157
	N(c)	-	-	-	-	-	0.120	0.145
- Materials handling	N(a)	-	-	-	-	-	-	0.260
	N(b)	-	-	-	-	-	0.859	0.910
- Technological innovation programs	N(b)	-	-	-	-	-	0.520	0.617
	N(c)	-	-	-	-	-	0.670	1.960
- Technology Transfer Network	N(b)	-	-	-	-	-	0.065	0.069
	N(c)	-	-	-	-	-	0.600	0.980
Anglo-Australian Telescope Board (AATB)	N(a)	0.188	0.679	0.554	0.566	0.408	0.566	0.408
	N(b)	0.824	0.851	1.058	1.227	1.319	1.227	1.319
	N(c)	-	-	0.126	0.091	0.108	0.091	0.108
Australian Institute of Marine Science (AIMS)	N(a)	0.476	0.593	0.527	0.581	0.663	0.581	0.663
	N(b)	3.100	4.631	5.195	5.801	6.237	5.801	6.237
Commonwealth Scientific and Industrial Research Organization (CSIRO) **	N(a)	49.946	58.641	70.792	81.306	55.029	81.835	56.630
	N(b)	131.304	157.930	200.976	233.246	251.346	243.707	263.157
	N(c)	1.762	1.892	1.032	1.133	1.142	1.201	1.210
	S(a)	1.221	0.377	0.125	0.174	0.269	0.174	0.269
	S(b)	3.054	1.222	1.488	1.237	1.782	1.237	1.782
	S(c)	0.002	-	0.058	0.052	0.052	0.052	0.052
National Standards Commission	N(a)	-	-	-	-	-	0.021	0.016
	N(b)	-	-	-	-	-	0.772	0.849
Total		252.688	306.282	340.810	418.676	430.820	543.590	570.706

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
Less recoveries from patent-related charges*		-	-	-	-	-	(14.514)	(16.70
Less other DST recoveries##		-	-	-	-	-	(2.950)	(2.05
Total (Budget sector net expenditure)		252.688	306.282	340.810	418.676	430.820	526.126	551.95
Less CSIRO superannuation employer contribution #		-	-	(24.315)	(25.408)	(27.543)	(26.389)	(28.66
Total (Less superannuation adjustment)		252.688	306.282	316.495	393.268	403.277	499.737	523.28
B. Commonwealth Non-budget sector								
Anglo-Australian Telescope Board (funds brought forward and other revenue)	N(a)	-	0.039	-	-	-	-	-
	N(b)	0.022	0.072	0.016	0.023	0.019	0.023	0.0
Australian Institute of Marine Science (AIMS)	N(a)	-	-	0.003	0.028	0.020	0.028	0.0
	N(b)	-	-	0.034	0.281	0.188	0.281	0.1
Commonwealth Scientific and Industrial Research Organization (CSIRO)	N(a)	0.573	0.960	0.582	1.173	2.401	1.202	2.4
	SN(b)s	4.952	4.901	9.282	12.014	11.511	12.699	12.2
National Standards Commission	N(ab)	-	-	-	-	-	0.169	0.2
Total (Non-Budget sector)		5.547	5.972	9.917	13.519	14.139	14.402	15.1
Less CSIRO superannuation employer Contribution #		-	-	(0.434)	(0.408)	(0.421)	(0.428)	(0.4
Total (less superannuation adjustment)		5.547	5.972	9.483	13.111	13.718	13.974	14.6
Total (Direct Commonwealth funding)*		258.235	312.254	325.978	406.379	416.995	513.711	537.9

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
C. Expenditure from other sources								
Department of Science and Technology								
. Bureau of Meteorology	N(a)	-	-	-	-	-	1.721	0.773
	N(b)	-	-	-	-	-	17.111	18.507
. National NMR Centre	N(b)	0.007	0.015	0.044	0.011	-	0.011	-
. Productivity Promotion								
- Productivity Promotion Council(admin. support – industry contribution)	S(a) S(b) S(c)	0.009 0.012	0.012 0.011	0.010 0.010	- -	- -	- -	- -
. Space and Upper Atmosphere Activities								
- Space Projects (U.S. contribution)	N(b)	-	-	-	-	-	2.108	2.290
	N(c)	-	-	-	-	-	9.712	10.460
Anglo-Australian Telescope Board (U.K. contribution and other revenue)	N(a)	0.188	0.718	0.554	0.566	0.408	0.566	0.408
	N(b)	0.846	0.923	1.074	1.250	1.338	1.250	1.338
	N(c)	-	-	0.126	0.091	0.108	0.091	0.108
Commonwealth Scientific and Industrial Research Organization**	$_{S}$N(a)	2.047	1.947	1.838	2.668	5.058	2.678	5.069
	$_{S}$N(b)	17.883	21.140	25.377	29.382	28.626	29.626	28.882
Total (Other sources)		20.992	24.766	29.032	33.968	35.538	64.874	67.835
Less CSIRO Superanuation employer contribution		-	-	-	(2.085)	(2.146)	(2.100)	(2.163)
Total (less Superannuation adjustment)		20.992	24.766	29.032	31.883	33.392	62.774	65.672
Total (A+B+C)#		279.228	339.020	355.010	438.262	450.387	576.485	603.618

N Natural sciences and engineering S Social sciences and humanities

$_{S}$N Includes some social sciences and humanities

$_{S}$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, $14.514m in 1982-83, and $16.7m (estimated) for 1983-84.

** 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.

Department of Science and Technology

Since the change of Government in March 1983, the Department has given particular attention to fostering national capabilities in the new technologies. The objective is to stimulate the development of new industries and to improve the efficiency of the traditional sectors. Recent events of particular note have included the following:-

- The National Technology Conference (September 1983) which brought together for the first time a broad group of industrial, union and political leaders to discuss the impact of new technology and technological change on Australia's economic development. A national technology strategy is being formulated as a result of the Conference. A discussion draft based on Conference deliberations was released in April 1984 to promote public discussion and assist in the development of community consensus on the shape of such a strategy. (See pp 3-4.)

- Implementation of major recommendations of the Espie Report on the financing of high technology in the form of the Management of Investment Companies Act 1983 and associated legislation which will attract investment in licensed management and investment companies (MICs) by offering a 100% tax deduction. The aim is to provide venture capital for the formulation and development of Australian businesses which utilize innovative technology, have the potential for rapid growth, are skill intensive, export oriented, internationally competitive and are significant generators of employment in Australia. (See page 5.)

The Department has a broad policy role in relation to science, technology, and the development of innovation and industry and has administrative and operational responsibilities across a wide span of research, scientific, technological and industrial activities. These are described in detail under the following headings.

. 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 the 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. Since January 1984 the station has been operated by the Bureau of Meteorology.

. 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 was 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 ndustrial Research and Development Incentives Act 1976 are considered in the light of the overnment'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.

nly proposals which are of outstanding merit and which meet the above criteria are rovided with financial support by the Government. Projects funded under the scheme have ncluded:

. the design, construction and operation of demonstration water treatment plants for three CSIRO invented processes to demonstrate for potential customers their capabilities in relation to large scale economic treatment of low quality waters;

. commercial development of an electronic hearing device invented at the University of Melbourne for the profoundly nerve-deaf who cannot be helped by conventional hearing aids;

. a feasibility study for Australian participation in the STARLAB Program to put a wide field optical/ ultraviolet telescope into orbit for astronomical studies;

. development of techniques in selective laser photochemistry relevant to commercially important chemicals and determination of factors for sealing up of industrial production levels; and

. productivity improvement of the Australian cheese industry, including the development of advanced cheese making technology.

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 53rd Congress in August 1983. The grants to the four learned academies contribute toward the costs of their affiliations with overseas and international organisations, and general administration, i.e. Australian Academy of the Humanities, Australian Academy of Science, Academy of the Social Sciences in Australia and Australian Academy of Technological Sciences. These grants have also assisted academies to participate in exchange programs with their Chinese counterparts. A special grant of up to $20 000 is to be made to the Australian Academy of Science in 1983-84 for a feasibility study on the establishment of an Australian Prize for Scientific Achievement promoting the welfare of the peoples of the world.

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 (NATA) and the National Safety Council. The grant to the Standards Association is a contribution towards its administrative costs in recognition of the Associations's role in preparing and publishing Australian Standards and to promoting the general adoption of standards relating to structures, commodities, materials, practices,

and operations and other matters. The grant to the National Association of Testing Authorities is in recognition of the important support provided by NATA to the technology-based industries including the provision of an independent registration system for laboratories.

Research associations were formerly supported by the Government through CSIRO, but since 1981-82 have received 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. Associations previously recognised were the Bread Research Institute of Australia, Australian Welding Research Association, Sugar Research Institute, the Brick Development Research Institute, and the Radiata Pine Research Institute. Three new associations have been supported under the 1983-84 funding. These are the Australian Particle Board Research Institute, the Australian Timber Research Institute and the Medical Engineering Research Association. All the research associations operate in close co-operation with CSIRQ.

. 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.

- Total funds available under these schemes were increased markedly in 1983-84. Project grants were increased to $45.46m (projected) from $34.80m in 1982-83. Commencement grants rose from $13.08m in 1982-83 to a projected figure of $16.15m. At the same time a number of steps have been taken to increase the scope and effectiveness of the scheme:

  . The scope for support of computer software development projects has been extended to encompass the important growth areas of computer systems development and 'information sector' services. Additional emphasis has also been given to support of biotechnology projects.

  . Collaboration between industry and specialist research organisations, including those associated with tertiary education institutions, is to be encouraged by new provisions allowing research companies to obtain funding support for IR&D projects undertaken on behalf of two or more unrelated corporate clients.

- The cash flow problems associated with IR&D have been alleviated by amendments to the Act to allow limited grant payments to be made in advance of IR&D performance.

- The Minister has directed that new criteria be employed in assessing IR&D project applications for Commonwealth funding support. Compliance with these new criteria will place a greater obligation on applicants to demonstrate that they have a sound business plan to see their project through from conception to commercial reality. To this end prior legislative restrictions have been removed to allow the Incentives Board to liaise with venture capitalists and other funding institutions if such consultation is considered likely to assist recipients of grants in carrying through their projects to a profitable commercial outcome.

. 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). The Association exists to encourage scientific and technical co-operation among member countries with a view to promoting development in the region. Australia has been involved in a number of ASCA projects including a study of marine resources throughout the Indo-Pacific region, and a Science and Technology Information Registry on policy and planning. In 1982-83 Australia contributed to the publication of the ASCA Handbook on Indigenous Fermented Foods and participated in a seminar on International Research and Development Co-operation held in Tokyo in March 1983.

Australia contributes 17.8% of the budget for the Commonwealth Science Council, a liaison body formed in 1946 to facilitate collaboration and exchange of information between Commonwealth scientists. Two fields in which Australia has been actively involved have been the management of water hyacinths and solar cooling for food preservation.

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 to HF radio communicators through the distribution of long-term operational and planning radio predictions, and to radio communicators, geophysicists and other users of the earth-space environment through 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 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, Trade Marks and Designs Acts, and international industrial 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 support for the Productivity Promotion Council of Australia in its productivity improvement activities. The PPCA provides and promotes a range of services to improve productivity levels through improved management practices. As a tripartite organisation representing an interface between industry, unions and government, the Council promotes the improvement of productivity at all levels and in all sectors of Australian industry. It also promotes an understanding within the community of the meaning and implications of productivity and of social issues arising from technological change. PPCA is seeking to improve its effectiveness in the delivery of these programs and the funding of $1.7 million provided in 1983-84 will assist it to do so.

. Research Grants and Fellowships

- Australian Research Grants Scheme (scientific research)

The Australian Research Grants Scheme (ARCS) supports high level research by individuals and research teams in universities and other non-government institutions. Grants are provided on the basis of the quality of the proposed research and the ability of the investigators. Scientific excellence is the sole criterion. Total amounts of $19.25m and $22.42m were allocated to individual research scientists and research teams for the calendar years 1983 and 1984 respectively under the ARCS. By making a smaller number of larger grants, the scheme now places greater emphasis to those basic and applied research projects of exceptionally high quality. Grants are awarded in eight disciplines - biological sciences (molecular), biological sciences (plant and animal), chemical sciences, earth sciences, engineering and applied sciences, physical sciences, social sciences and humanities, and economics.

- Biotechnology Research Grants Scheme

This scheme, funded for the first time in 1983-84, is to provide financial support for selected strategic R&D programs holding the greatest promise for commercial development of biotechnology in Australia. Priority areas have been identified as genetic manipulation, cell manipulation and culture, and enzyme applications and fermentation technology. Eight programs, to cost $4.51m over the three year period 1984-1986, have been approved. Funding provided for 1983-84 is up to $1.5 million to cover grant payments in the first half of the 1984 calendar year and administration of the Scheme.

- National Research Fellowships

This new scheme will provide 50 three year post-doctoral fellowships commencing in 1984. Fellowships will be awarded on the basis of recommendations from an advisory committee and allocated to priority areas of national interest, industry based research and fundamental research.

- 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 (DPP) at Canberra where this data is sent for processing into images and computer compatible tapes for clients. The Station is passing to the National Mapping Division of the Department of Resources and Energy in the first half of 1984.

- 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 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;

- new enterprises based on Australian innovation through:

  . the Assistance to Inventors Scheme, which provides grants of up to $20 000 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 the enterprise workshop program in innovation and entrepreneurship, for graduates in commercial and technological disciplines, which provide practical experience in the commercial exploitation of Australian inventions;

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

- programs to implement the promotion and development of high technology growth industries, assist with new product development for government procurement, analysis of market opportunities to assist new technology-baser) firms in the identification and assessment of market opportunities for specific new technologies, demonstration of new technology, improvement of industry awareness of new technology through workshops and seminars in specialised areas, and interprogram co-ordination aimed at establishing better co-ordination between those Government programs set up to assist high technology growth industries.

National Materials Handling Bureau

The Bureau functions as a national development authority with a charter to research, develop and promote the application of improved materials handling including the equipment, systems, standards, methods, management and control aspects involved in the supply, production, movement, packaging, storage and distribution of goods and materials.

. Technology Transfer Network

The Technology Transfer Council (TTC) was established three years ago 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 was originally designed to perform a technology transfer role in the manufacturing sector through transferring the results of both overseas and Australian R&D to manufacturing firms. The Government assists this technology transfer through the provision of financial assistance.

It is proposed to expand the activities of the TTC within the metals industry. The support of $980 000 granted for 1983-84 is designed to assist the metals industry to adopt new technology more quickly and to promote the development of new businesses and employment opportunities.

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 all fields of astrophysics.

Australian Institute of Marine Science (AIMS)

The Australian Institute of Marine Science carries out research towards a predictive understanding of the systems and processes of the marine environment. The mandate granted the Institute does not limit the topics or regions which may be the subject of its research. However, for the foreseeable future emphasis is placed on research on mangrove dominated coastlines, the Great Barrier Reef and adjacent waters. The Institute is situated near Townsville.

Organisationally, the search for understanding and predictive capability is administered under five major, co-operative, interdisciplinary programs whose details have been recently developed in an extensive set of research proposals. The programs are:

. The Mangrove Program, which includes studies on the development of mangrove forests through time and the development of techniques for the determination of the age of forests.

. The Nearshore Environment Program, which seeks to understand the processes and trophic interactions within the nearshore environment.

. Energy Flows, Resource Cycling and their consequences within Reef Ecosystems. This program will provide the means to assess how coral reefs respond to, and are controlled by their environments.

. Patterns, Abundances and Relationships in Reef Systems. This program is directed to characterising the patterns of coral reef communities in space and time, elucidating the factors which determine those patterns and to the production of explanatory and predictive models of the ecosystem and its components.

. The Shelf Sea of the Great Barrier Reef Region. This research program aims to elucidate the major abiotic and biotic factors which influence the distribution and abundance of organisms within the Shelf Sea of the Great Barrier Reef Region; to evaluate the mechanisms governing the dispersal and recruitment of reef dwelling animals and to describe the responses of different systems within the region to temporal variations of nutrient concentrations in order to determine the importance of upwelling events.

Commonwealth Scientific and Industrial Research Organization (CSIRO)

CSIRO was established as an independent statutory corporation by the Science and Industry Research Act 1949. It succeeded the former Council for Scientific and Industrial Research established in 1926. The Act was substantially amended in 1978.

The main role of the Organization is to plan and execute a comprehensive program of general scientific research on behalf of the Commonwealth.

Research is carried out mainly in the physical and biological sciences, with the emphasis on strategic research. Strategic research is undertaken to achieve practical results and is characterized by its orientation towards the basic research end of the research and development spectrum.

The transfer of research results into commercial use or other benefitical applications is a principal aim of CSIRQ. Other activities are undertaken to the extent that they can be carried out conveniently in conjunction with the Organization's main research and technology transfer activities.

CSIRO’s statutory functions, in summary form, 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;

- to encourage and facilitate the application and utilisation of 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, 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.

The Organization is funded primarily by direct appropriations from the Commonwealth Parliament. Decisions on research priorities are made by CSIRO in the light of advice received from the CSIRO Advisory Council and other interested bodies.

CSIRO is governed by an Executive comprising three full-time members, one of whom is Chairman, and five part-time members. The Chairman is the chief executive of the Organization and is assisted in this role by the other two full-time members of the Executive.

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. The latter are headed by Chiefs and Officers-in-Charge respectively. Divisions and Units are each responsible for coherent sets of research programs, with Units generally being responsible for narrower fields of research and having fewer staff than Divisions.

Support services are provided as follows:

- Planning and Evaluation Advisory Unit	Assistance in setting research priorities and allocating resources.
- Bureau of Scientific Services	Technology transfer, information services and international aid.
Office of the Executive	Corporate policies, coordination and development.
Finance and Administration	Budget, works, administrative services and systems.
Personnel	Policy advice and operational assistance in all staff matters.

On 30 June 1983, CSIRO had a total staff of 7 574 in more than 100 locations throughout Australia. About one-third of the staff were professional scientists, with the others providing technical, administrative or other support.

The CSIRO Advisory Council is supported by six State Committees and a Northern Territory Committee. The Council comprises the chairmen of its State and Territory Committees, senior representatives of Commonwealth agencies with interests in science and technology, and persons representing industry, tertiary education and community interests.

ASTEC, 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.

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 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
Australian National Animal Health Laboratory.

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 diet and health.

The Institute's activities include research on:

- control of indigenous and exotic 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.

. Institute of Biological Resources

The Institute comprises the following Divisions and Unit:

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.

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.

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.

. Institute of Energy and Earth Resources

The Institute comprises the following Divisions and Units:

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

The Institute conducts and fosters scientific and technological research aimed at contributing to the better definition, utilization and management of Australia's mineral, energy and groundwater resources with due recognition of the environmental consequences of these activities.

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 minimization of environmental stresses.

. Institute of Industrial Technology

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.

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

In the resource-based industries, the Institute's activities include research on:

- properties, processing and use of wool and leather;
- protein science;
- preservation and properties of wood;
- forest products, pulp and paper;
- utilisation of lignocellulose resources;
- agricultural engineering;
- chemicals from coal;
- substitute liquid fuels.

In the technology-based industries, activities include research on:

- industrial microbiology;
- biologically active materials;
- specialty polymers and resins;
- building materials;
- metals fabrication;
- automated production technology;
- building and construction;
- safety and comfort in domestic, industrial and commercial buildings;
- purification of water and waste-water.

. Institute of Physical Sciences

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.

The Institute conducts scientific and technological research in the physical, chemical and mathematical sciences aimed at meeting the needs of Australian industry and the community generally. The research includes work directed to increasing understanding of the physical environment, and undertaken both in the national interest and in accord with the Organization's obligation to contribute to the discharge of Australia's international scientific responsibilities in areas such as astronomy, oceanography and the atmospheric sciences.

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 communication;
- 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.

. 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 1983-84) 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.

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 $157m 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 finding which have occurred. In 1981-82 CSIRO became liable for the employer's share of superannuation ($26m in 1981-82, $29m in 1982-83 and $31m in 1983-84) 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 1931-82 and CSIRO provided associated expenditure for four months of that year. From 1983-84, funds which were previously appropriated to Commonwealth departments for capital works, repairs and maintenance, and acquisitions on behalf of CSIRO, have been directly appropriated to CSIRO. Caution must also 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.

CSIRO EXPENDITURE

($ million)	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
A. Rural Industries					
Agriculture					
. Plant Improvement	4.089	5.360	6.228	7.927	8.200
. Plant Physiology & Biochemistry	4.547	4.171	7.393	8.255	9.100
. Soils & Plant Nutrition	4.939	5.937	6.812	9.776	10.000
. Crop & Pasture Pests & Diseases	6.222	6.592	12.609	13.147	9.500
. Livestock Production	16.586	17.138	15.524	18.648	20.000
. Livestock Health	31.055	45.537	54.945	59.494	33.500
. Agricultural Systems	8.210	6.727	8.197	9.660	9.900
. Agricultural Engineering	.741	.675	-	-	-
Total (Agriculture)	76.389	92.187	111.708	126.907	100.200
Forestry					
. Forest Science	7.694	8.052	10.118	11.237	12.500
Total (Forestry)	7.694	8.052	10.118	11.237	12.500
Fishing					
. Resource Assessment	6.411	7.223	-	-	-
. Fisheries Biology	-	-	7.505	8.291	12.200
. Marine Biology	-	-	2.829	3.878	4.200
Total (Fishing)	6.411	7.223	10.334	12.169	16.400
Total - Rural Industries	90.494	107.462	132.160	150.313	129.100

($ million)	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
B. Mineral, Energy and Water Resources					
Mineral resources					
. Exploration	4.290	6.130	7.712	10.200	10.200
. Mining and Beneficiation	5.986	6.313	8.359	9.994	11.200
. Environment	.737	1.068	1.326	.442	.500
Total (Mineral resources)	11.013	13.511	17.397	20.636	21.900
Energy resources					
. Coal	4.018	5.344	8.109	8.806	8.600
. Petroleum, Gas and Oil Shale	.651	.996	2.139	1.694	1.500
. Substitute Liquid & Gaseous Fuels	6.379	6.893	10.038	16.071	15.000
. Renewable Energy	1.911	3.604	3.021	2.684	2.600
. Energy Storage and Conservation	1.057	2.121	-	-	-
. Energy Storage	-	-	.941	1.025	1.000
. Energy Conservation	-	-	3.007	3.757	4.200
TOTAL (Energy resources)	14.016	18.958	27.255	34.037	32.900
Water resources					
. Water Management	3.293	3.842	5.242	6.080	7.500
. Water Technology	.997	1.670	2.597	2.297	1.400
Total (Water resources)	4.290	5.512	7.839	8.377	8.900
Total - Mineral, Energy and Water Resources	29.319	37.981	52.491	63.050	63.700
C. Manufacturing Industries					
Resource-based manufacturing industries					
. Food Processing	11.078	11.875	14.677	16.157	17.100
. Textiles	10.189	11.087	14.023	17.088	16.800
. Hides and Leather	.520	.889	1.201	1.339	1.400
. Cellulose & Forest Products	2.667	3.515	7.797	6.659	6.400
. Basic Metal Products	2.360	2.703	3.274	3.748	3.900
Total (Resource-based manufacturing industries)	26.814	30.069	40.972	44.991	45.600

($ million)	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
Technology-intensive industries					
. Instruments & Electronic Equipment	3.157	3.524	7.923	11.072	12.300
. Advanced Materials	2.391	2.852	6.346	7.645	10.200
. Specialty Polymers	.910	.870	1.212	1.382	1.400
. Agricultural Chemicals, Pharmaceutical & Veterinary Products	4.394	4.833	6.169	7.105	8.600
. Materials Fabrication	2.207	2.940	7.642	8.030	10.500
Total (technology-intensive industries)	13.059	15.019	29.292	35.234	43.000
Standards					
. Standards of Measurement	9.945	10.805	7.712	7.594	5.900
Total (Standards)	9.945	10.805	7.712	7.594	5.900
Total – Manufacturing Industries	49.818	55.893	77.976	87.819	94.500
D. Knowledge and Management of the Natural Environment					
Biosphere					
. Fauna	6.170	7.087	7.189	8.585	8.400
. Flora	1.621	1.656	2.189	1.521	1.500
. Land	9.239	11.478	13.257	14.034	15.400
. Oceans	2.406	2.613	4.737	10.925	15.500
Total (Biosphere)	19.436	22.834	27.372	35.065	40.800
Atmosphere					
. Atmospheric Science	4.488	5.024	5.414	5.966	6.300
. Environmental Protection	2.575	2.728	3.467	4.103	3.500
Total (Atmosphere)	7.063	7.752	8.881	10.069	9.800

($ million)	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
Extra-terrestrial					
. Astronomy	5.480	5.986	7.301	7.077	11.000
Total (Extra-terrestrial)	5.480	5.986	7.301	7.077	11.000
Total - Knowledge and Management of the Natural Environment)	31.979	36.572	43.554	52.211	61.600
E. Information and Services Industries					
Information Services and Technologies					
. Mathematics and Statistics	3.473	4.120	4.950	5.447	6.000
. Information, Communications and Computing Services	5.888	6.073	4.442	3.104	3.800
Total - (Information Services & Technologies)	9.361	10.193	9.392	8.551	9.800
Service Industries					
. Building and Construction	5.941	6.455	7.742	8.512	3.800
. Public Health	3.896	3.643	3.517	3.955	4.200
Total - (Service Industries)	9.837	10.098	11.259	12.467	13.000
Total – Information and Service Industries	19.198	20.291	20.651	21.018	22.800
CSIRO Total	220.808	258.199	326.832	374.411	371.700
Type of Expenditure					
Intramural Capital					
- indirect	33.804	44.938	57.546	58.014	-
- direct	16.994	17.369	16.380	27.875	64.400
Intramural Current					
- indirect	4.221	4.851	4.381	5.001	-
- direct (salaries)	118.697	138.289	191.128	215.144	226.200
- direct (other)	45.258	50.784	56.229	67.124	79.800
Extramural	1.834	1.968	1.168	1.253	1.300

. 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:

- biotechnology;
- advanced materials;
- generic manufacturing technologies;
- information technologies;
- water and soils;
- plant pathology; and
- oceanography.

Additional resources for the first four areas were made available by the Government in the 1983-84 budget.

. 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. A variety of agricultural applications of biotechnology are 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, the conversion of lignocellulosic materials to high value chemicals and products, and the use of micro-organisms in industrial processes.

. Advanced Materials

Research on a wide range of advanced materials has been expanded. This includes research on zircon-based materials, which takes two main forms. Work on the engineering ceramic, partially-stabilized zirconia (PSZ), has been stepped up to consolidate earlier work and to protect Australia's present lead in this technology. Several techniques for processing zircon to the high-purity zirconia required for PSZ are also being investigated.

Other advanced materials that are the subject of an increased research effort include specialist polymers and composites for a range of applications. There is also an increased emphasis on glassy metals and very high temperature properties of solids.

. Generic Manufacturing Technologies

Research on integrated engineering manufacture (encompassing robotics, machine tool control systems, CAD/CAM and VLSI chip applications in sensing) has heen expanded. This research can be guaranteed to have a continuing influence on Australia's manufacturing industries only if other related areas of activity are also expanded or commenced. On this basis, the Division of Manufacturing Technology's effort in metal-forming research at its Adelaide laboratory has been increased.

That laboratory's energy management sub-program has been terminated as part of the Organization's rationalization of its manufacturing technology research.

. Information Technologies

Information technology is emerging, not only as the basis of entirely new major industries, hut also as an essential future component of those existing industries likely to survive past the end of the decade. CSIRO has a scientific base in information technology in Divisions such as Computing Research, Applied Physics and Radiophysics. The increase in funds from the Government and other CSIRO resources will be used in a co-ordinated effort in the areas of software technology and related hardware, man-machine interface, device and systems hardware technologies, information management and computer networking.

. 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 of lower priority to water resources research. Salinity and other aspects of water quality, groundwater and catchment hydrology have been identified as areas for expanded research effort. Other work includes 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.

. Plant Pathology

CSIRO is reviewing its effort in plant pathology. 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.

. 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 snipping, leisure activities, waste disposal, and the cost of offshore gas, oil and mineral exploration and production. The Divisions are beginning to occupy a marine laboratory complex being established in Hobart at a cost of $12.9m, and a 55-metre oceanographic vessel is to be built at a cost of $12.2m for operation by CSIRO as a national facility.

. Energy

Significant expansion of energy research activities has taken place in recent years and, while research in this area remains of high importance, the Executive believes that an adequate proportion of the Organization's resources are now being devoted to this area.

. Other Initiatives

- Construction of the Australia Telescope has been approved by government. It is estimated that it will cost about $30.7m (March 1983 prices). The telescope, which is a combination of new and existing antennas, will have a capacity far beyond all current Australian radio telescopes.

- A contract has been let for the construction of the Materials Science Laboratories at Clayton, Vic. The value of the contract is $9.2m.

- Design work has begun on the Applied Organic Chemistry Laboratories to be constructed at Clayton, Vic. The current estimate of cost is $13m.

- The Government has allocated $196 000 for the formation of a company, 'SIROTECH', to assist in the two-way task of stimulating awareness of industry requirements in CSIRO Divisions and promoting CSIRO inventions and technology in industry.

- A new program has been established which will aid the transfer of new technology to industry by allowing staff from Australian companies to spend time in CSIRO.

National Standards Commission (NSC)

The National Standards Commission is responsible for establishing uniform units and standards of measurement of physical quantities. The Commission operates the Pattern Examination Laboratory for these purposes and for the examination and approval of patterns of measuring instruments used for trading purposes in Australia.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Social Security								
. Office of Child Care	S(b)	-	-	0.082	0.012	0.025	0.077	0.190
	S(c)	0.053*	0.052	0.124	0.041	0.006	0.293	0.402
. Studies on Rehabilitation and Services for the Handicapped	S(c)	0.096	0.096	0.113	0.399	0.228	0.399	0.251
. Welfare Research	S(b)	-	-	-	-	-	0.281	0.331
	S(c)	0.168	0.409	0.550	0.594	0.612	0.614	0.637
. Social Welfare	S(b)	0.479	0.542	0.642	0.602	0.732	0.602	0.732
	S(c)	-	-	-	0.023	0.012	0.023	0.012
Total (Direct Commonwealth funding)*		0.796	1.099	1.511	1.671	1.615	2.288	2.554

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 security, child care, rehabilitation and services for the aged and handicapped.

. Office of Child Care

Projects current in 1982-83 included research on Aboriginal patterns of socialisation and the impact of government programs on Aboriginal communities, a study of how parents see their role and responsibilities toward their children and evaluation of a three year experimental neighbourhood development project at Mt Druitt Sydney. Other S&T programs included a National program to investigate, report and disseminate information on technical aids for young disabled persons, 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) and the promotion of use of the latest information and techniques on delivery of early childhood services.

. Studies on Rehabilitation and Services for the Handicapped.

Studies carried out are aimed at improving rehabilitation and services for the handicapped through specific program upgrading measures directed at service content, staff development and training. The 1982-83 studies program included projects to test the hypothesis that severely developmentally disabled people can learn fairly complex technical skills, the development of an information kit for services funded under the Handicapped Persons Welfare Program and the design of the Rossburne House Evaluation Model. New and continuing studies in 1983-84 include the identification of guidelines to enable improvement of programs and lifestyles in residential accommodation, the production of an effective accreditation manual for sheltered workshops and a report on existing resources for children and adults with multiple handicaps, including sensory impairment who cannot participate in open employment at completion of schooling.

. Welfare Research

Intramural S&T 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, a pilot project of the utilisation of bilingual and multilingual staff and the development of methodology for domiciliary needs analysis for aged persons. 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 Australian Bureau of Statistics, the Commonwealth Department of Social Security and the 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.

The extramural expenditure covers the Department's contribution to the Social Welfare Research centre in the University of NSW and the Australian Council of Trade Unions Social Welfare Research Unit.

. Social Welfare Policy Secretariat

The Social Welfare Policy Secretariat was established in 1978 and is responsible to the Minister for Social Security. Although it is closely associated with the Department for administrative purposes the Secretariat is separately staffed and financed and functions as an independent organisation.

The role of the Secretariat is to provide advice on, and promote the coordinated development and review of policies and programs in the broad field of health and welfare; and to promote the direction of appropriate research and statistical activities to these ends.

Major analytical studies undertaken and published have included 'Report on Poverty Measurement (1981)', 'Alternative Strategies to Meet the Income Needs of the Aged (1982)', 'The impact of population changes on Social Expenditure: Projections from 1980-81 to 2021' and Income Support for Young People[1] (1984) - a report prepared jointly with the Office of Youth Affairs.

SPECIAL MINISTRY OF STATE

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of the Special Minister of State								
. Support for International Congresses and Other Grants-in-Aid	N(c)	-	-	-	-	-	0.078	0.09
	S(c)	-	-	-	-	-	0.049	0.03
. Inquiry into Commonwealth Laboratories	N(b)	-	-	-	-	-	0.509	0.20
. National Police Research Unit	$_{S}$N(a)	-	-	-	0.029	0.013	0.029	0.01
	$_{S}$N(b)	-	-	-	0.040	0.149	0.040	0.14
	$_{S}$N(c)	-	-	-	-	0.007	-	0.00
Australian Federal Police								
. Forensic research	N(a)	-	-	0.018	0.327	0.068	0.335	0.07
	N(b)	-	-	0.011	0.010	0.011	0.054	0.05
	N(c)	0.124	0.194	0.194	0.105	0.128	0.105	0.12
Total (Direct Commonwealth Funding)		0.124	0.194	0.223	0.512	0.376	1.199	0.75
B. Expenditure from other sources								
. National Police Research Unit (State funding)	N(a)	-	-	-	0.059	0.026	0.059	0.02
	N(b)	-	-	-	0.081	0.298	0.081	0.29
	N(c)	-	-	-	-	0.015	-	0.01
Total (Other sources)		-	-	-	0.132	0.338		
Total (A+B)		0.124	0.194	0.223	0.651	0.715	1.338	1.09

N Natural sciences and engineering S Social sciences and humanities

$_{S}$N 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 provides grants to national organisations and international conferences held in Australia, some of which are primarily of a scientific nature. During 1982-83 $127 071 was granted for this purpose. Larger grants were made to the 12th International Biochemistry Congress, the 19th International Federation of Automotive Engineering Societies Conference and the 1st Asian Regional Seminar on Humanitarian Law. Grants approved for 1983-84 include support for the Solar World Congress, the 29th International Congress of Physiological Sciences and the 18th International Ethological Conference.

. Inquiry into Commonwealth Laboratories

The Department had servicing responsibilities for the Inquiry into Commonwealth Laboratories which was established in January 1982. The Inquiry has been completed and the report was tabled in Parliament 2nd March 1984. S&T activities were 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. The Unit's objectives are to undertake, coordinate and sponsor research into methods, equipment and techniques to assist participating forces to meet their functions of protecting life and property, preventing crime, detecting criminal offenders and preserving the peace.

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 research conducted by commissioning work to external agencies possessing specialist expertise and resources and by conducting some projects 'in house'.

Research projects include the development of remote sensing techniques for detection of cannibas crops, the use of specialist comparative techniques to identify arson and the nature of the materials used and techniques for making fingerprints visible on difficult surfaces. Techniques developed in the arson and fingerprint projects have been used in a number of important criminal cases. Results from the forensic adontology research project have been used successfully to identify persons from skeletal remains and also to relate suspects to bank hold-ups through video super imposition.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Territories and Local Government								
. National Botanic Gardens	N(a)	0.004	0.005	0.002	0.010	0.006	0.147	1.158
	N(b)	0.166	0.184	0.194	0.232	0.257	1.983	2.205
. Other	N(a)	-	-	0.001	-	-	0.138	0.125
	N(b)	-	-	0.022	-	-	1.019	1.173
	S(b)	0.064	0.072	0.092	0.103	0.119	0.273	0.306
National Capital Development Commission	N(b)	0.001	-	0.003	0.002	0.002	0.076	0.088
	N(c)	0.013	0.016	0.009	0.020	0.035	0.085	0.256
	S(b)	-	-	-	-	-	0.400	0.400
	S(c)	-	-	-	-	-	0.050	0.060
Total (Budget sector)		0.248	0.277	0.323	0.367	0.419	4.170	5.771
B. Commonwealth Non-Budget Sector								
Department of Territories and Local Government								
. A.C.T. Forestry Trust Account	N(b)	0.020	0.035	0.030	0.010	0.027	0.170	0.197
Total (Non-budget sector)		0.020	0.035	0.030	0.010	0.027	0.170	0.197
Total (Direct Commonwealth funding)		0.268	0.312	0.353	0.377	0.446	4.340	5.968
C. Expenditure from other sources								
Department of Territories and Local Government								
. National Botanic Gardens	N(b)	0.012	0.002	0.007	0.007	0.009	0.007	0.009
Total (Other sources)		0.012	0.002	0.007	0.007	0.009	0.007	0.009
Total (A+B+C)		0.280	0.315	0.361	0.384	4.455	4.347	5.977

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, the Jervis Bay Territory, the Territory of Cocos (Keeling) Islands, the Territory of Christmas Island, the Coral Sea Islands Territory and the Territory of Ashmore and Cartier Islands, and of Commonwealth responsibilities on Norfolk Island. 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 $138 600 has been allocated to the Branch for 1983-84 for science and technology-related activities.

A total of $150 636 has been allocated to the Weight and Measures Office in 1983-34. The Office inspects and verifies all weighing and measuring instruments in use for trade purposes and checks the quantitites 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 oasis. A total of $68 138 is projected expenditure during 1983-84.

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 $237 716 is projected for expenditure during 1983-84.

City Parks Administration manages urban open space within the ACT and has a responsibility for science and technology in relation to this responsibility, through its Horticultural Services Unit and the National Botanic Gardens.

Canberra probably has the largest range of urban vegetation of any major city in the world. The Horticultural Services Unit handles a program of plant introduction, plant breeding, plant propogation, pest and disease control, turf grass selection and management, and aquatic weed growth. This program ensures a continuing high standard of horticultural practice. The Unit has allocated $732 000 in 1983-84 for S&T.

. 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 micropropaqation and the introduction and propagation of rare and endangered species.

. Australian Capital Territory Forestry Trust Account

The ACT forests are administered by the Forestry Branch of the Department. Forest activities are run as a business undertaking with Commercial, conservation and amenity objectives and are funded by the ACT Forestry Trust Account. The Branch is researching environmental factors affecting plantation development and the effects of fire on catchment management. The 1983-84 projected expenditure is $197 000.

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 1983-84 include monitoring and analysis of water and air quality and traffic noise levels, a survey of natural regeneration in the rural land of the ACT, geotechnical and hydrogeological investigations for future land use and economic evaluations of land and housing, retailing, industry and tourism developments.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Transport and Construction								
. Marine Navigational Aids	N(a)	0.050	-	-	0.002	0.005	0.012	0.017
	N(b)	0.110	-	-	0.013	0.018	0.013	0.018
	N(c)	-	-	-	-	-	0.001	0.002
. Office of Road Safety:								
- Emissions research	N(a)	0.006	0.005	0.005	0.008	0.030	0.079	0.300
	N(b)	0.006	0.007	0.007	0.012	0.017	0.119	0.174
- Road Safety	S(b)	0.150	0.029	0.060	0.150	0.157	0.150	0.157
	S(c)	0.300	0.268	0.149	0.208	0.800	0.208	0.800
. Transport Statistics and Related Information	S(b)	-	-	-	-	-	0.255	0.268
. Grants for Transport Planning and Financial Assistance	N(c)	-	0.500	0.308	0.264	-	0.594	0.440
	nS(c)	2.700	2.000	1.320	1.591	1.591	1.989	1.989
Bureau of Transport Economics	S(a)	-	-	-	-	0.003	0.075	0.160
	S(b)	0.010	0.019	-	-	0.051	2.986	3.031
	S(c)	-	-	-	-	-	0.076	0.100
	N(b)	0.027	0.052	-	-	-	-	-
	N(c)	0.002	0.006	0.010	0.004	-	0.004	-
Total (Direct Commonwealth Funding)		3.361	2.886	1.859	2.252	2.672	6.561	7.455

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

Department of Transport

. 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.

. 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 Indus tires, their customers and governments, in policy and management decision-making. Statistics relating to non-government railways are also collected.

Bureau of Transport Economics (BTE)

The BTE is *a* professional research body undertaking independent studies and investigations to assist the Commonwealth Government in the formulation of policy. It advises on the economic, technical and financial aspects of transport. Work undertaken to provide this advice includes:

- 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.

One of the Bureau's major studies is an assessment of the value of travel time savings due to transport system changes. Work is proceeding in relation to non-urban road users.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of the Treasury								
. Balance of Payments	S(a)	-	-	0.002	0.001	-	0.001	-
	S(b)	-	-	0.020	0.005	-	0.005	-
. Econometric Forecasting	S(b)	0.050	0.092	0.083	0.074	0.091	0.185	0.219
. Quantitative Studies	S(b)	-	-	-	-	-	0.019	0.020
Australian Bureau of Statistics	nS(a)	0.021	0.229	0.128	-	-	6.516	1.845
	nS(b)	1.784	2.316	3.758	5.277	4.119	91.875	94.440
Total (Direct Commonwealth funding, excluding FE)		1.855	2.637	3.991	5.357	4.210	98.601	96.524
Less recoveries from ABS Charges		-	-	-	-	-	(1.644)	(1.628)
Total (less ABS recoveries)		1.855	2.637	3.991	5.357	4.210	96.957	94.896
B. Financial Enterprises sector								
Commonwealth Bank FE	N(c)	0.014	0.007	0.018	0.018	0.018	0.034	0.025
	S(c)	-	-	-	-	-	0.003	0.103
Reserve Bank of Australia FE								
. Grant Schemes								
- Rural Credits	N(c)	1.080	1.260	1.990	1.721	2.400	1.721	2.400
- Economic and Financial Research	S(c)	0.119	0.124	0.155	0.178	0.225	0.178	0.225
. Studies of Australian financial system	S(b)	0.169	0.240	0.304	0.175	0.210	0.391	0.447
Total (Financial Enterprises sector)		1.382	1.631	2.467	2.092	2.853	2.327	3.199
Total (Direct Commonwealth funding including FE)		3.237	4.268	6.458	7.449	7.063	99.284	98.095

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

Department of the Treasury

. Balance of Payments Section

The Section undertakes research to improve the monitoring and forecasting of Australian imports with the aid of a new data base.

. Forecasting Unit

The Unit is developing an econometric model of the Australian economy 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.

. Quantitative Studies Section

The Section undertakes economic analysis of such issues as:

- availability of skilled workers, trade training and other labour market matters;
- aspects of resource development;
- wage and price relationships; and
- factor shares and real unit labour costs.

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 1982-83 the R&D expenditure showed an increase as a result of increased expenditure on a number of projects, but in particular on increase in respect of the continued development of the integrated set of employer based sample surveys measuring man power statistics.

Commonwealth Banking Corporation

The Commonwealth Banking Corporation was established under legislation enacted by the Australian Parliament and comprises the Commonwealth Trading Bank of Australia, the Commonwealth Savings Bank of Australia and the Commonwealth Development Bank of Australia and their subsidiary and associated companies. Current research projects are directed towards elimination of disease in honey bees and water related problems in Australia.

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 Find, the Bank assists post-graduate research outside the Bank into economic and financial topics relevant to Australia;

- 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. Sixty-seven grants totalling about $2m have been allocated in 1983-84 from the Rural Credits Development Fund. Amongst the many fields of research to receive support are new projects on:

  . growth and development of guayule;

  . production of diagnostic antisera in ruminant foetuses;

  . solarization of soil for control of root diseases in horticultural production;

  . genetics and breeding for rust resistance in triticale;

  . establishment of Atlantic Salmon brood stocks in Tasmania.

($ million)		R&D					S&T (including R&D)	
		79-80	80-81	81-82	82-83	Projected 83-84	82-83	Projected 83-84
A. Commonwealth Budget sector net expenditure								
Department of Veterans' Affairs								
. Central Development Unit	N(b)	0.127	0.129	0.145	0.168	0.174	0.168	0.174
. Central Medical Research Advisory Committee	N(a)	0.029	0.042	0.040	0.050	0.040	0.040	0.050
	N(b)	0.244	0.232	0.280	0.372	0.357	0.357	0.372
Total (Direct Commonwealth funding)		0.400	0.402	0.465	0.565	0.596	0.565	0.596

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.

. Pathology Laboratories

As part of its service to veterans and their dependants, the Department of Veterans' Affairs operates Pathology Laboratories to provide pathology services for its Repatriation General Hospitals. Expenditure in 1981-82 was $6.4m. At the time of going to press, the Department had been unable to provide additional information for inclusion in this Statement. This data is expected to be available for the 1984-85 Statement.

FURTHER DISSECTIONS OF AGGREGATE EXPENDITURES

A. Expenditure by Ministry

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

($ million)	R&D					S&T (including R&D)			
	79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	0.60	0.57	-	-	-	2.25	2.06	2.24	2.62
Admin. Services	-	-	0.01	-	-	-	0.01	0.14	0.13
Attorney-General's	1.47	1.87	2.51	3.19	3.88	2.85	3.57	4.22	4.96
Aviation	1.07	1.06	0.98	0.73	0.95	4.06	4.09	7.96	7.27
Communications									
. Telecom	27.0	35.6	38.0	41.7	41.8	62.2	72.5	81.1	83.4
. Other	0.92	1.02	0.87	1.15	1.36	1.99	4.40	3.53	4.16
Defence	91.96	105.49	112.17	140.32	146.27	135.78	142.70	181.02	188.77
Defence Support	0.03	0.03	-	-	-	10.71	14.02	14.45	16.89
Education & Y.A.	0.93	1.02	0.81	0.48	0.60	2.70	2.20	1.17	1.46
Employment & Ind. Relations	0.42	0.78	1.60	0.69	1.18	1.59	2.10	1.48	2.24
Foreign Affairs	-	-	-	-	-	1.49	1.99	2.72	3.77
Health									
. Aust. Radiation. Lab	1.88	1.78	2.11	2.78	2.70	2.67	3.16	4.03	4.04
. Inst. of Health	1.66	2.19	2.06	2.37	2.61	3.05	3.02	3.48	3.75
. Comm. Serum Lab.	3.50	3.22	3.87	5.00	6.26	3.87	4.51	5.79	7.11
. National Biol. Standards Lab.	1.87	2.29	2.27	2.69	3.72	5.12	4.90	5.53	7.94
. Other	2.00	2.43	2.00	2.48	3.47	14.60	15.96	19.50	22.22
Home Affairs & Environment									
. Supervising Scientist	1.68	3.03	3.71	5.67	4.37	3.03	3.71	5.67	4.37
. Other	0.13	0.09	0.14	0.22	0.25	12.81	16.27	16.99	17.46
Housing & Construction	2.82	2.32	1.88	2.01	2.21	79.36	89.52	90.48	83.01
Immigration & Ethnic Affairs	0.12	0.16	0.12	0.20	0.31	1.74	2.42	3.09	4.68
Industry and Commerce	0.98	1.31	1.77	1.72	2.10	1.33	1.80	1.77	2.14
Primary Industry	1.08	1.11	1.43	1.63	1.77	9.86	11.77	11.92	12.70
P.M. & Cabinet	-	-	-	-	-	0.95	1.19	1.30	1.49
Resources & Energy									
. AAEC	16.73	19.99	23.00	24.29	26.49	28.37	37.39	34.92	37.45
. BMR	8.17	9.54	13.63	16.56	17.75	15.62	19.59	21.90	23.18
. Other	0.01	0.02	0.04	0.10	0.20	11.22	12.36	14.12	14.70

($ million)	R&D					S&T (including R&D)			
	79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Science & Technology									
. AATB (Australian funds only)	1.03	1.64	1.63	1.82	1.75	1.64	1.63	1.82	1.75
. Antarctic Div.	11.80	12.39	12.08	17.45	18.59	22.64	21.91	32.03	36.02
. AIMS	3.58	5.22	5.76	6.69	7.11	5.22	5.76	6.69	7.11
. CSIRO	191.05	224.03	258.77	303.33	294.39	232.74	272.10	314.04	307.39
. Other	1.31	1.50	1.73	2.46	2.58	62.14	65.48	70.95	70.79
Social Security	0.48	0.54	0.72	0.61	0.76	0.74	1.21	0.96	1.25
Special Ministry	-	-	0.03	0.41	0.24	0.01	0.12	0.97	0.50
Territories & L.G.	0.26	0.30	0.34	0.36	0.41	3.27	3.92	4.21	5.65
Transport	0.36	0.11	0.07	0.19	0.28	2.91	3.10	3.69	4.13
Treasury									
. ABS	1.81	2.55	3.89	5.28	4.12	86.26	113.87	96.75	94.66
. Other	0.22	0.23	0.41	0.26	0.30	0.54	0.63	0.60	0.69
Veterans' Affairs	0.40	0.40	0.47	0.57	0.60	0.40	0.47	0.57	0.60
Total (Direct Commonwealth funding of intramural expenditure)	379.3	446.0	500.9	595.4	601.4	837.2	967.4	1073.5	1092.5

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)			
	79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	0.62	0.56	0.62	0.53	0.58	1.04	0.91	0.92	0.94
Attorney-General's	0.07	0.34	0.34	0.36	0.34	0.34	0.34	0.36	0.35
Aviation	0.21	0.24	0.36	0.33	0.49	12.15	13.53	16.38	16.84
Communications	0.55	0.94	1.33	1.58	2.08	6.71	6.54	6.98	10.55
Defence	0.37	0.40	0.74	1.05	0.91	0.40	0.74	1.05	0.91
Defence Support	-	-	-	-	-	6.48	16.63	18.35	28.09
Education & Y.A.									
. Post-grad. awards	7.58	7.76	8.54	11.17	14.59	8.81	9.58	12.57	16.42
. Special Research Grants	69.0	77.0	85.0	96.0	110.0	77.0	85.0	96.0	110.0
. Other	2.12	2.84	4.17	7.65	7.55	3.64	4.60	8.90	8.61
Employment & I.R.	-	0.03	0.11	0.06	0.27	0.22	0.33	0.33	2.66
Foreign Affairs									
. ACIAR	-	-	-	0.96	6.89	-	-	1.11	7.42
. ADAB	12.42	15.26	20.45	28.84	28.77	77.79	105.42	140.90	156.56
. Other	0.05	0.38	0.21	0.38	0.38	1.23	1.03	1.23	1.28
Health									
. NH&MRC	14.00	18.70	25.65	29.56	37.98	18.70	25.65	29.56	37.98
. Other	0.64	0.69	2.88	4.20	9.26	2.60	4.44	5.49	10.69
Home Affairs & Envir	0.77	0.94	1.02	0.80	1.03	4.80	1.86	2.26	2.98
Housing & Construction	0.34	0.42	0.14	0.15	0.23	3.07	3.67	5.15	5.63
Immigration & E.A.	0.33	0.37	0.27	0.25	0.29	0.71	0.73	0.65	0.81
Industry & Commerce	0.08	0.03	0.11	0.26	0.20	0.09	0.16	0.29	0.23
Primary Industry									
. Rural Research	11.87	14.67	16.27	18.02	21.24	16.29	18.23	21.97	26.44
. Other	2.52	2.49	0.70	0.96	1.21	6.77	1.52	3.13	3.90
P.M. & Cabinet	0.04	0.06	0.05	0.06	0.08	0.22	0.18	0.18	0.23
Resources & Energy									
. Energy R,D&D grants	4.71	6.35	9.27	11.69	11.69	7.00	10.41	13.87	13.87
. Other	1.64	1.88	2.21	2.01	1.37	12.77	12.82	13.26	10.38
Science & Technology									
. AIRDIB	29.95	45.71	21.75	47.87	61.61	45.71	21.75	47.87	61.61
. AMSTAC-FAP	0.39	2.00	1.90	2.13	1.96	2.00	1.90	2.13	1.96
. ARGC	12.80	14.49	16.99	18.74	20.84	14.49	16.99	18.74	20.84
. Research Association grants	-	-	1.21	1.34	1.68	-	1.21	1.34	1.68
. Other	6.32	5.27	4.42	4.56	6.52	17.99	14.43	18.41	28.80
Social Security	0.32	0.56	0.79	1.06	0.86	0.98	1.35	1.33	1.30
Special Ministry	0.12	0.19	0.19	0.11	0.14	0.23	0.32	0.23	0.26
Territories & L.G.	0.01	0.02	0.01	0.02	0.04	0.64	0.09	0.14	0.32
Transport	3.00	2.77	1.79	2.07	2.39	6.59	2.37	2.87	3.33
Treasury									
. Reserve Bank grants	1.21	1.39	2.16	1.92	2.64	1.39	2.17	1.94	2.75
Total (Direct Commonwealth funding of extramural expenditure)	184.1	224.7	231.6	296.6	356.1	358.8	386.9	495.9	596.6

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

($ million)		R&D					S&T (including R&D)			
		79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	(a)	0.15	0.23	-	-	-	0.23	-	-	-
	(b)	0.45	0.35	-	-	-	0.35	-	-	-
Administrative Services	(a)	-	-	-	-	-	-	-	0.06	-
	(b)	-	-	0.01	-	-	-	0.01	0.08	0.13
Aviation	(a)	0.70	0.80	0.70	0.38	0.50	2.40	2.10	6.38	5.50
	(b)	0.24	0.26	0.28	0.35	0.37	1.06	1.22	0.95	0.87
Communications	(a)	2.2	8.0	6.3	4.8	4.2	10.4	10.4	9.6	9.1
	(b)	25.0	27.7	31.5	37.0	37.7	52.9	65.3	73.8	77.1
Defence	(a)	9.39	7.93	8.27	15.33	22.84	14.70	12.60	18.84	25.69
	(b)	82.56	97.56	103.91	124.99	123.44	121.09	130.11	162.18	163.08
Defence Support	(a)	-	-	-	-	-	1.79	3.11	2.61	1.68
	(b)	0.03	0.03	-	-	-	8.92	10.92	11.84	15.22
Employment & Ind Relations	(a)	-	-	-	-	-	..	-	-	-
	(b)	0.07	0.12	0.21	-	-	0.26	0.29	-	-
Foreign Affairs	(b)	-	-	-	-	-	1.18	1.54	2.18	3.20
Health	(a)	1.33	1.86	1.38	2.38	3.97	3.58	2.59	4.81	8.75
	(b)	9.57	10.04	10.92	12.94	14.79	25.64	28.84	33.26	35.99
Home Affairs & Environment	(a)	0.40	0.97	1.65	2.86	1.10	2.11	2.82	4.01	2.37
	(b)	1.34	2.07	2.09	2.94	3.42	4.67	5.73	7.12	7.65
Housing & Construction	(a)	0.32	0.32	0.22	0.18	0.20	16.18	21.42	11.83	5.52
	(b)	2.50	2.00	1.66	1.83	2.01	63.18	68.09	78.65	77.52
Industry & Commerce	(a)	0.06	0.02	..	0.01	0.01	0.02	0.01	0.02	0.02
	(b)	0.04	0.03	0.06	0.08	0.09	0.05	0.09	0.12	0.13
Primary Industry	(a)	0.01	0.01	0.04	0.02	0.01	0.04	0.61	0.12	0.30
	(b)	0.23	0.24	0.33	0.30	0.33	4.37	4.56	4.49	5.07

($ million)		R&D					S&T (including R&D)			
		79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Prime Minister and Cabinet	(b)	-	-	-	-	-	0.55	0.60	0.62	0.68
Resources & Energy	(a)	1.35	1.34	2.21	4.18	6.39	2.65	3.89	5.81	8.48
	(b)	23.57	28.22	34.46	36.78	38.06	52.55	65.17	64.82	66.53
Science and Technology	(a)	55.44	64.12	75.67	90.63	67.35	77.14	83.81	103.07	80.11
	(b)	147.57	174.99	200.83	238.67	253.92	239.06	277.81	318.52	339.74
Special Ministry	(a)	-	-	0.02	0.36	0.08	-	0.02	0.36	0.09
	(b)	-	-	0.01	0.05	0.16	0.01	0.11	0.60	0.41
Territories & L.G.	(a)	..	0.01	..	0.01	0.01	0.35	0.58	0.29	1.28
	(b)	0.19	0.22	0.25	0.24	0.29	2.40	2.73	3.25	3.66
Transport	(a)	0.06	0.01	0.01	0.01	0.04	0.09	0.07	0.09	0.32
	(b)	0.14	0.06	0.01	0.03	0.04	0.12	0.07	0.13	0.19
Treasury	(a)	-	-	..	-	-	-	..	-	-
	(b)	-	-	0.13	0.67	0.72	-	0.13	0.67	0.72
Veterans' Affairs	(a)	0.03	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.05
	(b)	0.37	0.36	0.43	0.53	0.55	0.36	0.43	0.53	0.55
Total (Direct Commonwealth funding)		365.2	429.9	483.6	578.5	582.6	710.4	807.8	931.7	947.6

(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)			
	79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	-	-	0.01	-	-	0.10	0.13	0.13	0.16
Aviation	0.21	0.21	0.35	0.33	0.49	12.12	13.50	16.23	16.79
Communications	0.5	0.9	1.2	1.6	2.1	6.7	6.3	7.0	10.5
Defence	0.37	0.40	0.74	1.05	0.91	0.40	0.74	1.05	0.91
Defence Support	-	-	-	-	-	6.48	16.63	18.35	28.09
Education & Y.A.	53.8	60.8	66.1	79.4	90.6	61.4	66.4	79.7	91.1
Employment & Ind Relations	-	0.01	-	-	-	0.17	0.16	0.16	0.16
Foreign Affairs	11.19	12.86	16.64	24.90	30.60	62.70	82.00	109.89	129.18
Health	14.21	18.61	27.36	32.58	45.79	18.62	27.37	32.59	46.00
Home Affairs & Environment	0.73	0.92	0.99	0.78	0.98	4.71	1.80	2.21	2.86
Housing and Construction	0.34	0.42	0.14	0.15	0.23	3.07	3.67	5.15	5.63
Industry and Commerce	0.08	0.02	0.02	0.08	0.03	0.02	0.02	0.08	0.03
Primary Industry	13.80	16.57	16.67	18.97	22.43	22.44	19.44	25.08	30.32
P.M. & Cabinet	0.03	0.05	0.03	0.03	0.03	0.05	0.04	0.08	0.09
Resources & Energy	6.26	8.14	11.11	12.38	12.24	19.33	22.51	25.77	22.67
Science & Technology	46.86	64.53	42.40	70.39	87.83	77.11	52.07	83.49	108.24
Special Ministry	0.12	0.19	0.19	0.11	0.14	0.22	0.26	0.18	0.23
Territories & L.G.	0.01	0.02	0.01	0.02	0.04	0.41	0.08	0.09	0.26
Transport	..	0.51	1.48	1.67	1.40	4.26	1.93	2.40	2.24
Treasury	1.09	1.27	2.01	1.74	2.42	1.27	2.01	1.76	2.43
Total (Direct Commonwealth funding)	149.6	186.4	187.4	246.6	298.3	301.6	317.1	411.4	497.9

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

($ million)		R&D					S&T (including R&D)			
		79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	(a)	-	-	-	-	-	0.16	0.09	0.12	0.16
	(b)	-	-	-	-	-	1.52	1.97	2.12	2.46
Attorney-General's	(a)	..	0.02	..	0.14	0.09	0.03	0.02	0.16	0.12
	(b)	1.47	1.85	2.51	3.06	3.79	2.81	3.55	4.01	4.84
Aviation	(a)	-	-	-	-	-	-	-	-	-
	(b)	0.13	-	-	-	0.08	0.60	0.77	0.63	0.89
Communications	(a)	0.06	0.07	0.10	0.11	0.10	0.07	0.10	0.11	0.10
	(b)	0.74	0.83	0.99	0.98	1.19	0.85	1.04	1.09	1.30
Education & Y.A.	(b)	0.93	1.02	0.81	0.48	0.60	2.70	2.20	1.17	1.46
Employment & Ind Relations	(a)	-	-	0.01	-	-	..	0.01	-	-
	(b)	0.35	0.67	1.38	0.69	1.18	1.32	1.80	1.48	2.24
Foreign Affairs	(b)	-	-	-	-	-	0.30	0.45	0.54	0.57
Health	(a)	-	-	-	-	-	0.02	0.06	0.16	0.24
	(b)	-	-	-	-	-	0.07	0.07	0.08	0.09
Home Affairs & Environment	(a)	..	-	0.02	0.01	-	1.41	1.95	2.43	2.61
	(b)	0.06	0.08	0.09	0.09	0.11	7.65	9.49	9.10	9.20
Immigration & Ethnic Affairs	(a)	-	-	-	-	-	0.22	0.14	0.39	2.01
	(b)	0.12	0.16	0.12	0.20	0.31	1.52	2.28	2.70	2.67
Industry & Commerce	(a)	-	..	-	-	-	..	-	-	-
	(b)	0.88	1.26	1.71	1.63	2.00	1.26	1.71	1.63	2.00
Primary Industry	(a)	-	-	-	-	-	0.03	-	-	-
	(b)	0.84	0.85	1.06	1.31	1.43	5.42	6.60	7.31	7.33
P.M. & Cabinet	(a)	-	-	-	-	-	-	-	-	0.03
	(b)	-	-	-	-	-	0.40	0.59	0.68	0.78
Resources & Energy	(a)	-	-	-	-	-	-	0.01	0.01	0.01
	(b)	-	-	-	-	-	0.01	0.27	0.31	0.31
Science & Technology	(a)	1.45	1.20	0.23	0.24	0.47	1.20	0.23	0.24	0.47
	(b)	4.31	4.48	3.23	2.21	2.67	6.50	5.03	3.39	2.74
Social Security	(b)	0.48	0.54	0.72	0.61	0.76	0.74	1.21	0.96	1.25
Territories & L.G.	(b)	0.06	0.07	0.09	0.10	0.12	0.52	0.61	0.67	0.71
Transport	(a)	-	-	-	-	..	0.01	0.05	0.08	0.16
	(b)	0.16	0.05	0.06	0.15	0.21	2.69	2.91	3.39	3.46
Treasury	(a)	0.02	0.23	0.13	..	-	11.14	4.20	6.52	1.85
	(b)	2.00	2.65	4.03	4.87	3.70	75.66	110.15	90.17	92.78
Total (Direct Commonwealth funding)		14.07	16.02	17.29	16.86	18.80	126.81	159.55	141.71	144.85

(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)			
	79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	0.62	0.56	0.62	0.53	0.58	0.95	0.77	0.79	0.78
Attorney -General's	0.07	0.34	0.34	0.36	0.34	0.34	0.34	0.36	0.35
Aviation	-	0.03	0.01	-	-	0.03	0.03	0.15	0.05
Communications	0.03	-	0.18	-	-	-	0.21	0.03	0.04
Education & Youth Affairs	24.9	26.8	31.6	35.4	41.5	28.0	32.8	37.7	43.9
Employment & Industrial Relations	-	0.03	0.11	0.06	0.27	0.05	0.17	0.17	2.50
Foreign Affairs	1.28	2.78	4.03	5.28	5.43	16.32	24.45	33.35	36.08
Health	0.43	0.78	1.16	1.18	1.45	2.68	2.72	2.46	2.67
Home Affairs and Environment	0.04	0.02	0.03	0.03	0.05	0.10	0.07	0.05	0.12
Immigration & Ethnic Affairs	0.33	0.37	0.27	0.25	0.29	0.71	0.73	0.65	0.81
Industry and Commerce	-	0.01	0.09	0.18	0.17	0.08	0.14	0.22	0.21
Primary Industry	0.59	0.60	0.30	0.01	0.02	0.62	0.31	0.01	0.02
Prime Minister and Cabinet	0.01	0.02	0.01	0.04	0.05	0.17	0.14	0.10	0.13
Resources & Energy	0.09	0.10	0.36	0.82	0.82	0.43	0.72	1.36	1.58
Science and Technology	2.60	2.94	3.88	4.25	4.78	3.09	4.21	5.00	6.65
Social Security	0.32	0.56	0.79	1.06	0.86	0.98	1.35	1.33	1.30
Special Ministry	-	-	-	-	-	0.02	0.06	0.05	0.03
Territories & L.G.	-	-	-	-	-	0.23	0.01	0.05	0.06
Transport	3.00	2.27	0.31	0.40	0.99	2.33	0.45	0.48	1.09
Treasury	0.12	0.12	0.16	0.18	0.23	0.13	0.16	0.18	0.33
Total (Direct Commonwealth funding)	34.4	38.3	44.3	50.0	57.8	57.3	69.8	84.5	98.7

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		1978-79	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
				($m)			
National security							
. Defence	(a)	6.87	9.40	7.93	8.27	15.33	22.84
	(b)	78.64	82.61	97.59	103.91	124.99	123.44
Economic development							
. Agriculture	(a)	15.81	31.71	41.82	45.89	48.20	16.75
	(b)	34.20	39.14	42.88	48.62	52.97	56.41
. Other primary industries	(a)	1.15	1.55	0.74	1.85	2.69	4.80
	(b)	9.53	10.97	11.71	13.19	14.38	17.22
. Mining	(a)	1.39	1.51	2.19	2.90	2.79	3.02
	(b)	12.37	10.78	13.72	18.17	16.08	17.08
. Manufacturing	(a)	5.32	5.99	5.89	9.65	8.71	7.08
	(b)	31.18	32.33	40.40	45.75	49.86	53.44
. Construction	(a)	1.16	0.76	0.53	0.51	0.55	0.50
	(b)	6.12	6.06	6.08	6.38	6.96	7.21
. Energy	(a)	2.86	3.55	4.30	5.50	7.59	9.62
	(b)	19.65	22.35	27.76	33.81	42.48	44.78
. Transport	(a)	0.62	0.76	0.81	0.71	0.39	0.54
	(b)	0.34	0.38	0.32	0.30	0.37	0.41
. Communications	(a)	1.9	2.2	8.1	6.3	4.8	4.2
	(b)	24.5	25.1	27.7	31.6	37.1	37.8
. Economic services n.e.i.	(a)	0.55	0.59	1.02	1.77	1.37	0.70
	(b)	5.20	5.04	6.05	7.82	9.74	10.72
Sub-total	(a)	31.3	48.6	65.4	75.0	77.1	47.2
	(b)	143.1	152.1	176.7	205.6	229.9	245.1
Community welfare							
. Urban and regional planning	(a)	0.18	0.11	0.08	0.06	0.10	0.08
	(b)	0.96	1.33	1.08	1.41	1.67	1.89
. Environment	(a)	2.29	3.16	2.82	3.74	6.19	4.10
	(b)	11.80	14.19	14.88	17.97	26.67	25.45
. Health	(a)	2.97	2.67	2.44	1.67	2.84	4.33
	(b)	10.38	12.66	13.57	14.45	18.22	20.29
. Education		-	-	-	-	-	-
. Welfare		-	-	-	-	-	-
. Community services n.e.i.	(a)	0.01	0.01	..	0.02	0.36	0.08
	(b)	0.21	0.24	0.22	0.22	0.05	0.16
Sub-total	(a)	5.45	5.95	5.34	5.48	9.49	8.58
	(b)	23.35	28.42	29.75	34.04	46.60	47.79

Objective Category		1978-79	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
				($m)			
Advancement of knowledge							
. Earth, ocean and atmosphere	(a)	1.24	1.86	1.74	3.15	9.61	15.09
	(b)	12.01	16.03	22.86	25.02	28.36	28.59
. General advancement of knowledge	(a)	3.65	5.63	5.26	4.54	9.64	13.03
	(b)	16.65	14.68	17.42	18.47	27.47	30.99
Sub-total	(a)	4.89	7.48	7.00	7.69	19.25	28.11
	(b)	28.66	30.71	40.28	43.49	55.83	59.58
Total	(a)	48.5	71.4	85.6	96.5	121.2	106.7
	(b)	273.7	293.9	344.3	387.1	457.4	475.9

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

Objective Category	1978-79	1979-80	1980-81	($m) 1981-82	1982-83	Projected 1983-84
National security						
. Defence	0.40	0.37	0.40	0.74	1.05	0.91
Economic development						
. Agriculture	12.59	14.37	17.24	18.22	19.87	23.40
. Other primary industries	0.59	0.69	0.93	0.82	1.20	1.81
. Mining	0.12	0.11	0.16	0.18	0.15	0.14
. Manufacturing	23.55	30.91	46.78	23.29	49.64	63.72
. Construction	0.12	0.18	0.25	0.15	0.18	0.26
. Energy	3.94	5.20	6.81	9.16	10.96	10.97
. Transport	2.67	4.18	3.44	3.91	4.20	3.75
. Communications	0.4	0.5	0.9	1.2	1.6	2.1
. Economic services n.e.i.	0.11	0.10	0.10	0.09	0.10	0.10
Sub-total	44.2	56.3	76.7	57.0	87.9	106.2
Community welfare						
. Urban & regional planning	0.11	0.10	0.04	0.02	0.08	0.03
. Environment	0.66	0.82	1.00	1.01	0.80	1.03
. Health	13.22	14.24	18.62	27.36	32.59	45.80
. Education*	-	-	-	-	-	-
. Welfare	-	-	-	-	-	-
. Community services n.e.i.						
- Overseas development assistance	11.34	11.19	12.86	16.64	24.90	30.60
- Other services	0.05	0.15	0.23	0.22	0.12	0.15
Sub-total	25.38	26.50	32.75	45.25	58.49	77.61
Advancement of knowledge						
. Earth, ocean and atmosphere	0.62	1.37	3.19	3.65	3.77	3.14
. General advancement of knowledge	61.5	65.1	73.4	80.8	95.4	110.4
Sub-total	62.1	66.5	76.6	84.4	99.2	113.5
Total	132.1	149.6	186.4	137.4	246.6	293.3

* 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.

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

Objective Category		1978-79	1979-80	($m) 1980-81	1981-82	1982-83	Projected 1983-84
National security							
. Defence		-	-	-	-	-	-
Economic development							
. Agriculture	(a)	-	-	-	-	-	-
	(b)	0.88	0.84	0.86	1.06	1.31	1.43
. Other primary industries		-	-	-	-	-	-
. Mining		-	-	-	-	-	-
. Manufacturing	(a)	-	0.01	0.01	-	-	-
	(b)	0.02	0.02	0.03	0.01	-	-
. Construction	(a)	-	..	0.01	-	-	-
	(b)	0.05	0.13	0.15	-	-	-
. Energy	(a)	-	-	..	..	-	-
	(b)	0.01	-	0.04	0.04	0.13	0.18
. Transport	(a)	..	..	0.02	0.01	-	..
	(b)	0.49	0.43	0.24	0.35	0.38	0.44
. Communications	(a)	0.05	0.06	0.07	0.10	0.11	0.10
	(b)	0.71	0.74	0.83	0.99	0.98	1.19
. Economic services n.e.i.	(a)	1.08	1.45	1.27	0.30	0.24	0.47
	(b)	4.61	6.19	6.91	7.56	6.52	7.44
Sub-total	(a)	l.13	1.51	1.38	0.41	0.35	0.58
	(b)	6.77	8.35	9.05	10.01	9.31	10.67
Community welfare							
. Urban & regional planning	(a)	-	-	-	..	-	-
	(b)	-	0.06	0.07	0.11	0.10	0.12
. Environment	(a)	-	-	-	-	-	-
	(b)	0.06	-	-	-	-	-
. Health	(a)	-	-	-	..	-	-
	(b)	0.08	0.15	0.13	0.11	0.08	
. Education	(a)	..	-	..	0.01	-	-
	(b)	1.21	0.95	1.06	1.02	0.61	0.73
. Welfare	(a)	0.01	0.01	0.03	0.02	-	-
	(b)	0.72	l.02	1.56	2.38	2.94	2.52
. Community services n.e.i.	(a)	0.01	0.01	0.08	0.03	0.14	0.09
	(b)	1.87	2.00	2.65	3.02	3.31	3.97
Sub-total	(a)	0.03	0.02	0.13	0.06	0.14	0.09
	(b)	3.94	4.18	5.47	6.64	7.03	7.41

Objective Category		1978-79	1979-80	1980-81	1981-82	1982-83	Projected 1983-84
				($m)			
Advancement of knowledge							
. Earth, ocean and atmosphere		-	-	-	-	-	-
. General advancement of knowledge	(a)	-	-	-	0.01	-	-
	(b)	0.04	-	-	0.17	0.03	0.05
Sub-total	(a)	-	-	-	0.01	-	-
	(b)	0.04	-	-	0.17	0.03	0.05
Total	(a)	1.16	1.53	1.51	0.48	0.49	0.67
	(b)	10.75	12.53	14.51	16.82	16.38	18.13

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

Objective Category	1978-79	1979-80	($m) 1980-81	1981-82	1982-83	Projected 1983-84
National security						
. Defence	-	-	-	-	-	-
Economic development						
. Agriculture	0.91	0.59	0.60	0.30	0.01	0.02
. Other primary industries	-	-	-	-	-	-
. Mining	-	-	-	-	-	-
. Manufacturing	0.01	0.01	0.01	0.02	-	-
. Construction	-	-	-	-	-	-
. Energy	0.09	0.07	0.07	0.35	0.82	0.82
. Transport	2.95	3.00	2.30	0.32	0.40	0.99
. Communications	-	0.03	-	0.18	-	-
. Economic services n.e.i.	0.12	0.12	0.49	0.55	0.82	0.88
Sub-total	4.08	3.81	3.46	1.72	2.05	2.71
Community welfare						
. Urban & regional planning	-	-	-	-	-	-
. Environment	-	-	0.01	-	-	0.03
. Health	0.39	0.43	0.78	1.16	1.18	1.45
. Education*	2.36	2.16	2.88	2.67	1.77	2.16
. Welfare	0.32	0.65	0.93	1.13	1.30	1.35
. Community services n.e.i.#						
- Overseas development assistance	1.17	1.28	2.78	4.03	5.28	5.43
- Other services	0.24	0.23	0.06	0.27	0.11	0.12
Sub-total	4.48	4.75	7.43	9.25	9.63	10.52
Advancement of knowledge						
. Earth, ocean and atmosphere	0.02	0.02	0.03	0.01	-	-
. General advancement of knowledge	24.6	25.9	27.4	33.3	38.3	44.6
Sub-total	24.6	25.9	27.4	33.3	38.3	44.6
Total	33.2	34.4	38.3	44.3	50.0	57.8

* 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.

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		79-80	80-81	$m 81-82	82-83	Projected 83-84
Promotional S&T						
. Demonstration of both technical and commercial viability	(ab)	6.9	8.2	11.2	10.7	11.4
	(c)	4.8	7.1	4.8	8.4	13.5
. Design for innovative production	(ab)	27.7	30.4	37.5	38.7	41.1
	(c)	9.7	12.3	20.5	22.9	35.6
. Technology transfer, extension services, other active diffusion of S&T skills and know-how	(ab)	5.0	8.7	9.2	9.4	10.2
	(c)*	29.3	32.7	37.3	49.8	59.4
Sub-totals	(ab)	39.6	47.4	57.9	58.8	62.7
	(c)	43.8	52.1	62.7	80.9	108.5
S&T Services						
. Advanced scientific or engineering services	(ab)	74.5	77.7	93.5	106.5	101.4
	(c)	11.9	15.3	19.8	24.3	28.3
. Policy -related studies using advanced techniques	(ab)	0.6	1.9	2.0	2.6	2.6
	(c)	0.9	1.9	0.6	0.9	1.4
. Testing, standardisation, metrology and quality control	(ab)	44.7	51.4	58.3	54.9	54.4
	(c)	4.7	5.0	4.3	5.9	6.5
. Patenting and licensing	(ab)	5.5	6.4	8.1	8.9	10.5
	(c)	0.2	0.3	0.3	0.7	0.4
. Data collection in the natural sciences	(ab)	50.3	56.1	57.7	72.9	80.9
	(c)	21.8	26.8	26.2	30.4	28.9
. Scientific and technological information and documentation	(ab)	16.0	17.9	20.6	26.0	27.7
	(c)	0.7	1.0	1.2	1.7	2.3
. Services associated with scientific and technological collections	(ab)	1.3	1.8	2.2	2.2	3.4
	(c)	..	0.1	0.1	0.1	0.7
Sub-totals	(ab)	193.5	213.2	242.5	274.0	280.9
	(c)	40.1	50.2	52.4	64.0	67.8
Administration of S&T activities, policy, planning and other studies of S&T, n.e.c.	(ab)	28.2	30.2	37.9	36.7	39.3
	(c)	1.6	1.7	1.9	3.0	3.1
Scientific and technical education and training	(ab)	2.6	2.6	3.3	3.4	3.6
	(c)	9.1	10.8	12.7	16.7	20.2
Less recoveries etc.#		(10.4)	(12.9)	(19.3)	(21.6)	(23.7)
TOTAL		348.5	395.7	451.9	515.8	562.3

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

* The figures here are dominated by ADAB expenditure.

\# Includes employer superannuation contribution from 1981-82 onwards.

Tables 17 and 18 present approximate information for individual categories of S&T (other than R&D). It is considered that the quality of the data is markedly better from that presented in previous Statements, but caution is still necessary in drawing conclusions from any apparent trends. 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:

. 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.

. 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 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 data base has been considerably revised for the determination of these tables, but a number of aspects are capable of further refinement.

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

S&T Category		79-80	80-81	$m 81-82	82-83	Projected 83-84
Promotional S&T						
. Demonstration of both technical and	(ab)	..	..	..	0.4	0.3
commercial viability	(c)	1.0	..	-	..	0.1
. Design for innovative production		-	-	-	-	-
. Technology transfer, extension						
services, other active diffusion of	(ab)	3.6	3.6	3.3	2.2	1.9
S&T skills and know-how	(c)	6.2	4.8	9.0	13.9	15.6
Sub-totals	(ab)	1.6	3.7	3.3	2.6	2.2
	(c)	7.2	4.9	9.1	13.9	15.7
S&T Services						
. Advanced services in the social	(ab)	1.3	1.0	1.1	1.2	1.3
sciences	(c)	0.3	0.4	0.5	0.6	0.4
. Policy -related studies using	(ab)	2.0	3.0	3.5	4.0	4.7
advanced techniques	(c)	1.7	1.2	1.8	1.2	1.4
. Testing, standardisation,	(ab)	-	-	-	-	-
metrology and quality control	(c)	-	-	-	-	0.1
. Patenting and licensing		-	-	-	-	-
. Data collection in the social sciences	(ab)	65.6	89.2	116.7	99.3	93.9
	(c)	2.7	2.3	2.0	2.4	4.9
. Scientific and technological	(ab)	9.9	11.5	14.0	14.3	14.8
information and documentation	(c)	0.2	0.3	0.4	0.4	0.5
. Services associated with scientific						
and technological collections	(ab)	0.7	0.8	0.9	1.0	1.2
	(c)	0.1	0.1	..	0.1	..
Sub-totals	(ab)	79.5	105.4	136.3	119.8	121.0
	(c)	5.0	4.3	4.6	4.7	7.4
Administration of S&T activities, policy,	(ab)	1.9	2.7	3.4	3.9	4.4
planning and other studies of S&T, n.e.c.	(c)	0.3	0.4	0.4	0.5	0.5
Scientific and technical education and	(ab)	0.4	0.5	0.3	0.2	0.1
training	(c)	7.9	9.4	11.4	15.4	17.3
Less recoveries etc.		(2.5)	(1.5)	(1.1)	(1.6)	(1.6)
TOTAL		103.4	129.7	167.8	159.3	167.0

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

INTERNATIONAL COMPARISONS AND TRENDS (1)

General

Because the OECD Science and Technology Indicators Unit (STIU) has not yet released comprehensive data later than 1979, some of the material presented in this Appendix is unchanged from that presented in the science and technology statement 1982-83. Figures 4 and 5 and Tables 19 to 21 are the same as Figures 3 and 4 and Tables 19 to 21 respectively in the 1982-83 statement, except that some numbers in the tables have been adjusted either to correct errors or to take account of small changes in final data published by STIU.

New material includes Figures *6* and 7, which map the national R&D expenditures of OECD countries in relation to GDP and domestic product of manufacturing industry on per capita bases. Figure 8 is an updated version of Figure 5 in the 1982-83 Statement, and shows how Australia's relative position in terms of exports of technology-based products, already poor in 1978, has deteriorated markedly since that time.

Total resources devoted to R&D

Figure 4 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 5 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 1975 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.

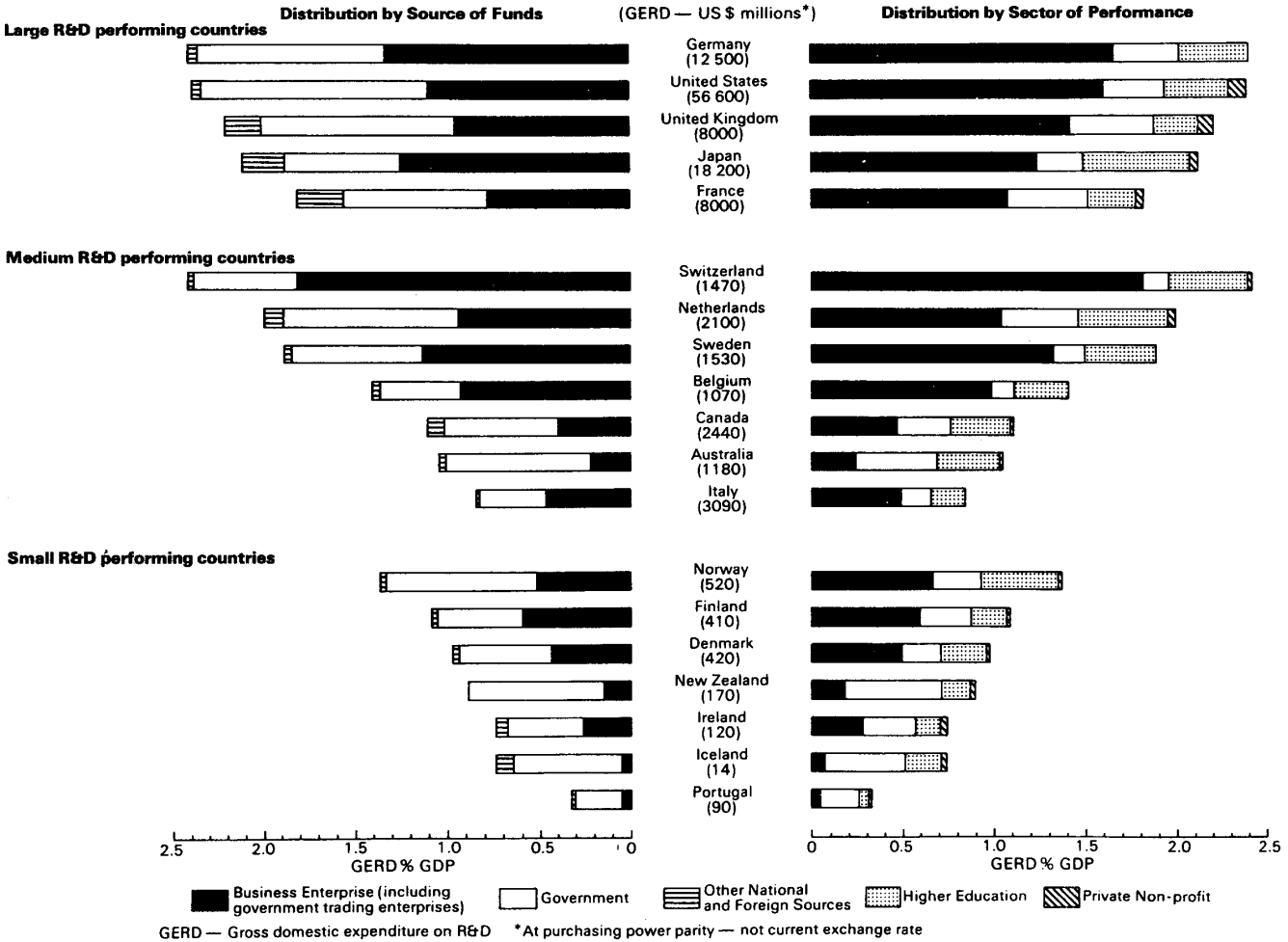
---

(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, Resources Devoted to R&D, OECD, Paris 1984
- Science Resources Newsletter, No 6, Simmer 1981, QECD/DSTI Science and Technology Indicators Unit, Paris.

(2) Research and Experimental Development - Business Enterprises, Australia - 1981-82, Australian Bureau of Statistics Catalogue No 8104.0, April 1983.

Fig. 4 R&D Expenditure by Country — 1979 or nearest year.



GERD — Gross domestic expenditure on R&D *At purchasing power parity — not current exchange rate

Figure 6 compares the total R&D efforts of OECD countries simultaneously on GERD per capita of total population and GERD as a percentage of GDP, and also locates each country relative to a scale of GDP per capita of total population. Figure 7 makes an analogous comparision of manufacturing industry R&D expenditure per capita and as a percentage of the manufacturing component of the domestic product of industry (DPI), and locates each country relative to a scale of DPI per capita.

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 and 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).

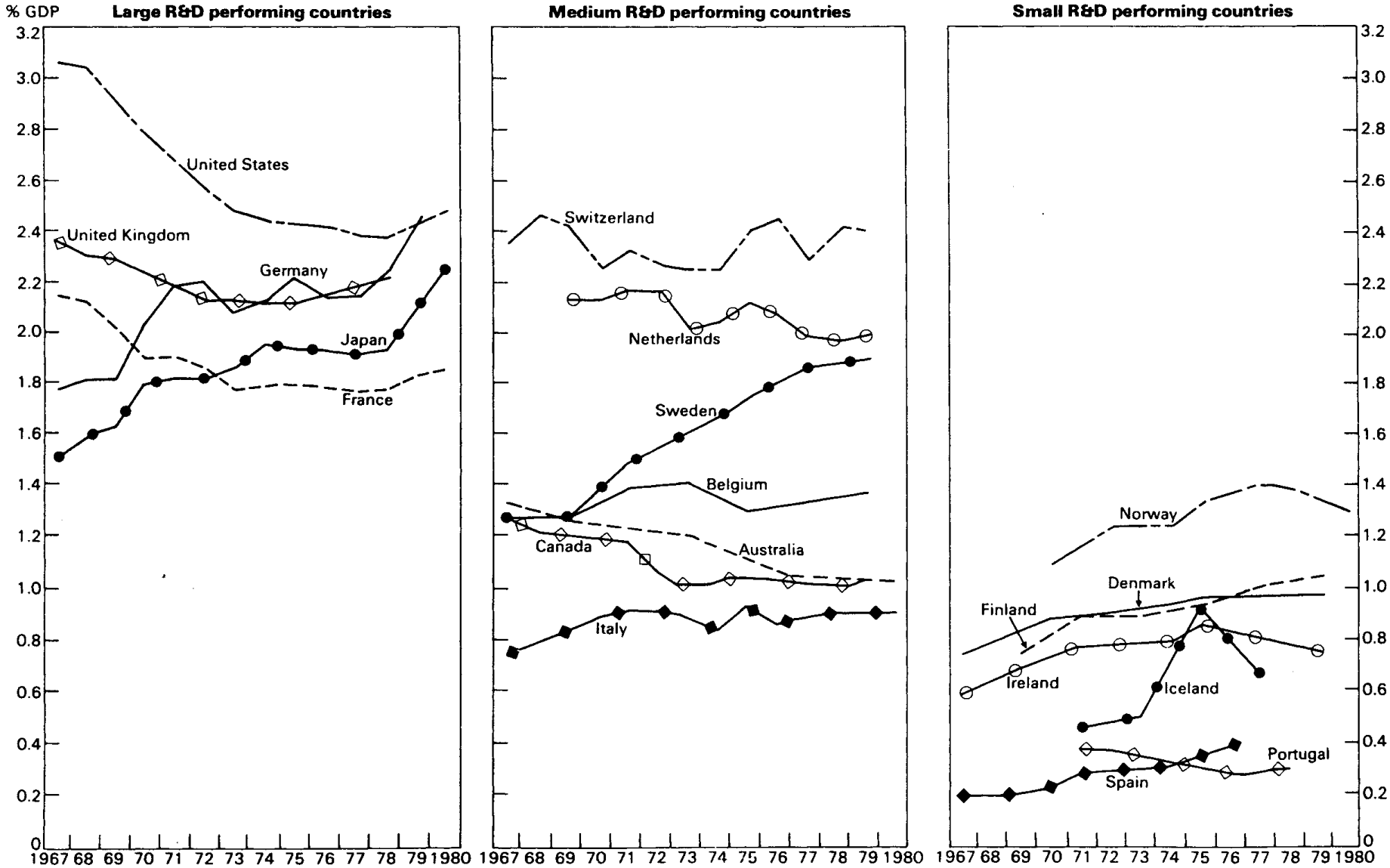
Table 19: Comparisons between OECD nations - R&D employment as % Total Workforce and gross domestic expenditure on R&D (GERD) as % GDP (1979)

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
Large R&D Performers							
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)	1.17	2.20	1.09	1.03	1.41	0.36	0.36
U.K.	1.17	2.20	0.95	1.06	1.41	0.46	0.24
Japan	1.07	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
Medium R&D Performers							
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)	0.78	1.40	0.92	0.62	0.98	0.20	0.33
Belgium	0.78	1.40	0.92	0.43	0.98	0.13	0.29
Canada	0.52	1.07	0.39	0.60	0.45	0.29	0.32
AUSTRALIA	0.63	1.03	0.21	0.79	0.24	0.46	0.32
Italy	0.42	0.85	0.47	0.37	0.49	0.20	0.15
Small R&D Performers							
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)	0.60	0.89	0.26	0.50	0.27	0.28	0.19
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	0.64	0.07	0.44	0.20
Portugal	0.16	0.32	0.04	0.27	0.04	0.21	0.06
Australian Trends							
Australia (1968-69)	0.80	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)	0.70	1.05	0.24	0.78	0.24	0.50	0.29
Australia (1978-79)	0.68	1.03	0.21	0.79	0.24	0.46	0.32
Australia (1981-82)	0.65	1.00**	0.22	0.76**	0.23	0.45**	0.31

* 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 finds includes the "Own funds" of public universities. Note that there are sectors other than those shown, so that the totals are less than the % GERD/GDP.

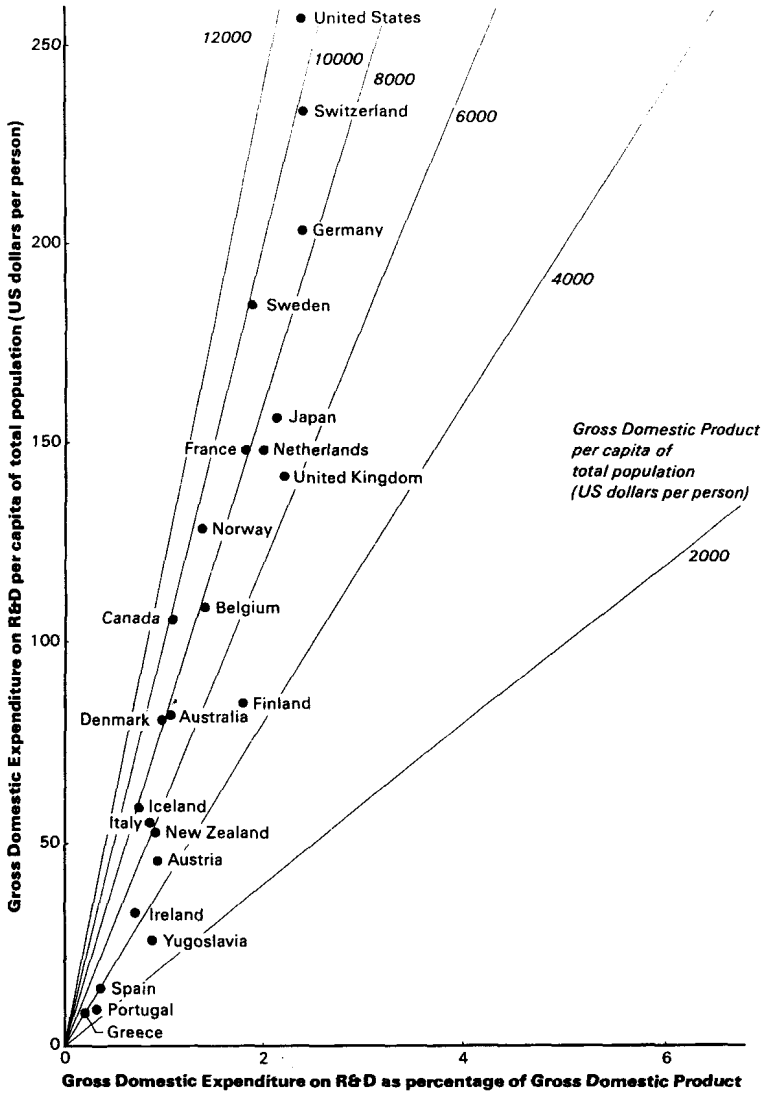
** The figures are adjusted for trend comparison purposes (to remove the effect of changed superannuation arrangements and the additional pay period in 1981-82 for Commonwealth bodies). For unadjusted figures (more appropriate for international comparisons) substitute 1.03 for 1.00, 0.78 for 0.76, and 0.48 for 0.45.

Fig. 5 R&D Expenditure in OECD Member Countries as a Percentage of GDP — by year.



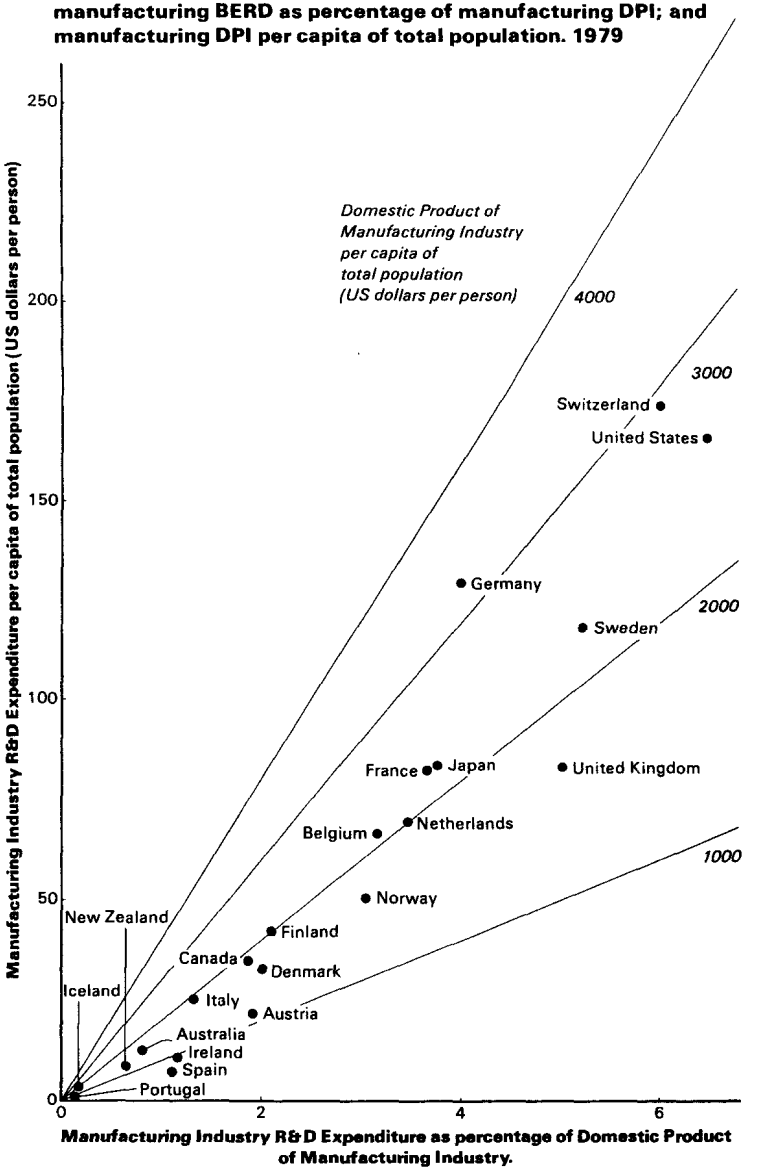
Source: OECD Science and Technology Indicators Unit

Fig. 6 GERD per capita of total population; GERD as percentage of GDP, and GDP per capita 1979



Source: OECD Science and Technology Indicators: Resources Devoted to R&D, OECD Paris 1984

Fig. 7 Manufacturing BERD per capita of total population; manufacturing BERD as percentage of manufacturing DPI; and manufacturing DPI per capita of total population. 1979



Source: OECD Science and Technology Indicators: Resources Devoted to R&D, OECD Paris 1984

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
Netherlands	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.)	4.0	8.9	7.2	1.2	5.0	4.2	23.8	7.9	7.1

* OECD socio-economic objectives

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

\# 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, Advancement of Knowledge 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) 1977

Japan	0.22	Finland	0.10	New Zealand (77-78)	0.06
Netherlands	0.20	Australia	0.10	Switzerland	0.06
Norway	0.17	Ireland	0.07	Iceland	0.05
Canada	0.11	Belgium	0.07	Italy	0.04
F.R. Germany	0.11	United Kingdom	0.07	France	0.04
Denmark	0.10	Sweden	0.09	Portugal	0.03

Technology-based export performance

Figure 8 gives an indication in broad terms of Australia's low position among OECD countries in relation to exports of "technology-based" products. While all manufactured products are technology-based according to a strict definition of technology (1), the term "technology-based" is used in this report to refer to products falling within Standard International Trade Classification divisions which include the recognised "high-technology" or "technology-intensive" product classes. The data are drawn from OECD publications (2), in the Standard International Trade Classification divisions 51 (organic chemicals), 52 (inorganic chemicals), 53 (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), 73 (metalworking machinery), 74 (general industrial machinery and equipment n.e.i. and machine parts n.e.i.), 75 (office machines and automatic data processing equipment), 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).

Although some of the products in these product divisions would not be regarded as technology-intensive on the usually accepted basis of above average R&D intensity in the associated industry class, and some high technology products (eg. aircraft and associated parts) have not been included, taken overall it is thought that exports in these fifteen product divisions may be regarded as a reasonably satisfactory comparative measure of a country's capability in producing technology-based products. Aircraft and parts were excluded because Australia's exports in this product class are almost entirely re-exports of imported products.

(1) "Technology is a perishable resource comprising knowledge, skills, and the means of using and controlling factors of production for the purpose of producing, delivering to users, and maintaining goods and services from which there is an economic and/or social demand."

(2) (i) OECD Trade by Commodities Market Summary: Exports 1978-82
(ii) OECD Trade by Commodities Market Summary: Imports 1978-82
(iii) National Accounts, Main Aggregates, Volume 1, 1953-1982, OECD, Paris, 1984

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. However, 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.

The following discussion is based on Figure 8, but includes some additional information:

- Australia's position in regard to both technology-based exports per capita and ratio of technology-based exports to imports declined from 1978 to 1980, and had declined even further by 1982. The values of these two indicators for Australia in 1982 were 73 US$ per person and 0.12 as compared with overall OECD averages of 503 US$ per person and 1.34 respectively.

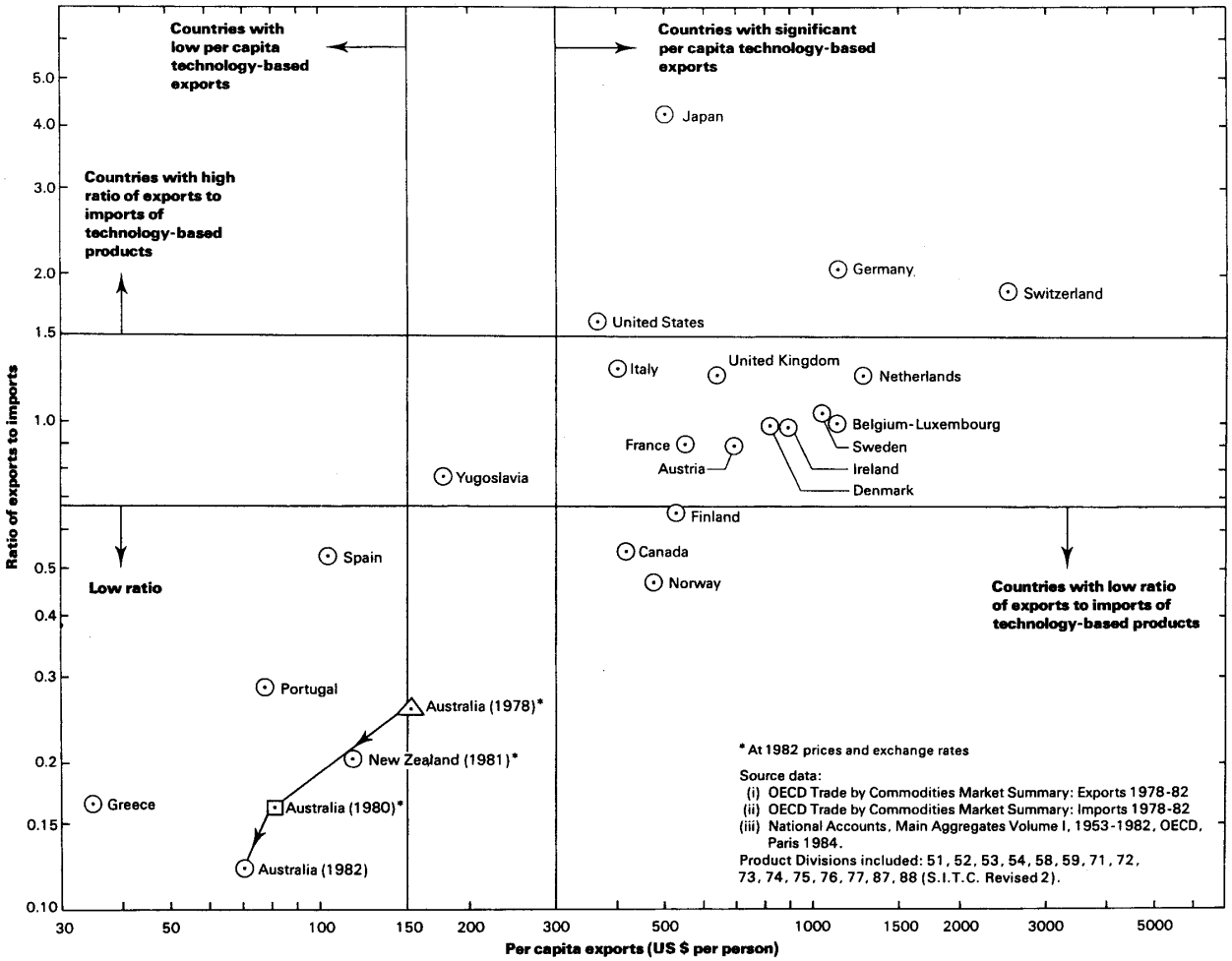
- In 1982 the top eight countries contributed 85% of the total exports by OECD countries in technology-based products. They were: US (21.5%), FRG (17.8%), Japan (14.9%), UK (8.9%), France (7.6%), Italy (5.8%), Netherlands (4.6%), and Switzerland (4.1%).

- Australia, with 0.3% of the OECD total exports of technology-based products ranked 19th on this indicator. By way of comparison, Australia in 1982 contained 1.9% of the total OECD population (including Yugoslavia), generated 2.1% of the GDP, and on an expenditure basis performed about 1.0% of the R&D in the OECD area.

- On a per capita basis, the eight top countries in 1982 were: Switzerland (35 times the Australian level), Netherlands (17 times), FRG (16 times), Belgium-Luxembourg (16 times), Sweden (15 times), Denmark (12 times), Austria (10 times), and the UK (9 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 for all 24 OECD countries suggests that imports are roughly proportional to the square root 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. 8 Trade per head of population in selected technology-based products 1982



COMMONWEALTH CONTRACTS AND GRANTS IN SUPPORT OF S&T

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.

The data presented in Tables 22 to 26, which represent the best estimates available at present, should therefore be utilised with some caution. 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.

One revision of particular note, which is also instructive in terms of the cautionary notes above, involves a reduction since the last Statement in the estimated level of contracts to private enterprise. In this case, payments to InterScan Pty Ltd had been incorrectly designated as being made to a private business enterprise rather than to "other" (which contracting category includes public business enterprises such as InterScan, as well as the Private Non-Profit Sector, State Government, and overseas bodies).

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

($ million)		R&D					S&T (including R&D)			
					Projected					Projected
		79-80	80-81	81-82	82-83	83-84	80-81	81-82	82-83	83-84
Aviation	CW	0.06	0.05	0.07	0.06	0.14	11.94	12.99	15.83	16.17
	PE	0.02	0.02	0.01	-	-	0.03	0.01	0.13	0.27
	HE	0.10	0.10	0.27	0.27	0.35	0.10	0.51	0.27	0.35
	OR	0.03	0.04	-	-	..	0.04	-	-	..
Communications	CW	0.03	0.02	0.04	0.04	0.04	0.04	0.08	0.08	0.08
	PE	0.31	0.53	0.72	1.18	1.34	6.29	5.85	6.51	9.72
	HE	0.05	0.23	0.17	0.22	0.40	.23	0.17	0.22	0.41
Defence	CW	0.37	0.40	0.43	0.55	0.57	0.40	0.43	0.55	0.57
	HE	-	-	0.31	0.50	0.34	-	0.31	0.50	0.34
Defence Support	CW	-	-	-	-	-	-	0.55	4.25	6.57
	PE	-	-	-	-	-	6.48	16.08	14.10	21.53
Employment and Industrial Relations	HE	-	0.01	-	-	-	0.01	-	-	-
Foreign Affairs	CW	2.89	2.76	2.34	2.44	4.53	5.51	5.05	7.01	8.10
	PE	0.06	0.05	0.62	0.49	0.57	13.55	21.00	26.62	41.46
	HE	1.00	1.22	2.77	4.38	7.23	1.97	3.76	5.20	9.42
	OR	0.21	0.21	0.21	0.71	1.72	17.33	18.17	20.15	17.45
Health	PE	0.02	0.01	-	-	-	0.01	0.01	-	-
	HE	0.01	0.08	0.22	0.22	0.28	0.08	0.22	0.22	0.48
	OR	0.02	-	-	-	-	-	-	0.01	0.01
Home Affairs and Environment	CW	0.03	0.03	0.04	0.06	0.18	0.25	0.18	0.25	0.63
	PE	0.04	0.01	0.05	0.02	0.01	0.13	0.12	0.51	0.47
	HE	0.45	0.42	0.36	0.23	0.27	0.53	0.38	0.31	0.39
	OR	0.10	0.09	0.05	0.07	0.08	3.06	0.18	0.28	0.36
Housing and Construction	PE	0.02	0.03	0.03	0.04	0.08	2.68	3.56	5.04	5.48
	HE	0.05	0.10	0.09	0.10	0.11	0.10	0.09	0.10	0.11
	OR	0.01	0.03	0.02	0.02	0.04	0.03	0.02	0.02	0.04
Industry and Commerce	CW	-	0.01	-	0.08	0.02	0.01	-	0.08	0.02
	PE	-	0.01	0.01	..	..	0.01	0.01	..	..
	HE	-	-	-	..	..	-	-	..	..
	OR	0.08	-	0.01	-	-	-	0.01	-	-
Primary Industry	CW	0.07	0.17	0.18	0.28	0.51	0.18	0.18	0.28	0.52
	PE	-	-	-	-	..	..	-	-	..
	OR	-	-	-	0.04	0.05	0.87	0.67	0.96	1.19
Prime Minister and Cabinet	PE	-	-	-	-	-	-	0.01	0.01	0.01
	HE	-	-	-	-	-	0.01	-	..	..
Resources and Energy	CW	0.26	0.14	0.02	0.09	0.04	0.14	0.02	0.11	0.09
	PE	0.13	0.06	0.11	.28	0.27	0.51	0.58	0.81	0.82
	HE	0.26	0.36	0.35	0.46	0.13	0.40	0.40	0.60	0.15
	OR	0.40	0.47	0.32	0.20	0.05	0.47	0.36	0.35	0.17

Science and Technology	CW	0.25	0.25	0.25	0.25	0.25	0.30	0.26	0.25	0.2
	PE	0.17	0.16	0.16	0.33	0.31	6.43	3.83	6.05	13.3
	HE	0.02	0.03	0.09	0.02	0.06	0.96	1.11	2.05	2.1
	OR	3.70	2.45	2.12	2.22	1.88	2.76	2.12	2.22	1.9
Special Ministry of State	CW	-	-	..	-	-	-	..	-	-
	PE	-	0.05	-	-	-	0.05	-	-	-
	HE	0.09	0.10	0.17	0.11	0.13	0.10	0.17	0.11	0.1
	OR	0.04	0.05	0.02	-	-	0.05	0.02	-	-
Territories and Local Government	CW	-	-	0.01	-	-	0.13	0.03	0.04	0.0
	PE	-	-	..	0.02	-	0.24	0.05	0.04	0.1
	HE	0.01	0.02	-	-	0.02	0.05	0.01	0.01	0.0
	OR	-	-	-	-	0.02	-	-	-	
Transport	PE	..	..	0.01	..	-	..	0.01	..	-
	HE	-	..	-	-	-	..	..	..	..
Total (Direct Commonwealth funding, all NSE contracts)		11.32	10.76	12.62	15.94	22.01	84.44	99.53	112.08	161.4

CW Contracts to other Commonwealth agencies
PE Contracts to private bus. enterpris
HE Contracts to institutions of higher education
OR Contracts to other bodies.

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

($ million)		R&D					S&T (including R&D)			
				Projected						Projected
		79-80	80-81	81-82	82-83	83-84	80-81	81-82	82-83	83-84
Attorney-General's	PE	0.01	0.15	0.07	0.04	0.06	0.15	0.07	0.04	0.06
	HE	0.01	0.09	0.06	0.17	0.09	0.09	0.06	0.17	0.09
	OR	0.01	0.04	0.14	0.06	0.11	0.04	0.14	0.06	0.11
Aviation	CW	-	0.03	0.01	-	-	0.03	0.01	-	-
	PE	-	-	..	-	-	-	0.02	0.15	0.05
Communications	PE	0.03	-	0.17	-	-	-	0.20	0.03	0.04
	HE	-	-	0.01	-	-	-	0.01	-	-
Education and Youth Affairs	CW	-	-	0.02	-	0.01	-	0.02	-	0.01
	PE	-	-	0.02	0.01	0.01	-	0.02	0.51	0.18
	HE	0.16	0.45	0.34	0.28	0.46	0.70	0.60	0.61	0.81
	OR	0.17	0.19	0.15	0.27	0.58	0.22	0.17	0.42	0.71
Employment and Industrial Relations	PE	-	0.01	0.02	-	-	0.02	0.08	0.01	-
	HE	-	0.01	0.03	0.01	0.04	0.01	0.03	0.11	0.27
	OR	-	-	-	-	-	-	-	-	2.00
Foreign Affairs	CW	0.14	-	0.03	0.07	0.40	-	0.05	0.23	0.44
	PE	0.02	0.03	0.04	0.01	0.01	0.51	0.72	1.11	1.86
	HE	-	-	-	0.01	..	0.11	0.70	1.02	0.81
	OR	-	-	-	0.12	0.08	0.20	0.13	0.62	0.43
Health	HE	-	-	-	-	-	0.03	-	0.01	-
Home Affairs and Environment	CW	-	-	-	-	-	-	0.01	-	-
	PE	..	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01
	HE	-	-	0.03	0.01	0.01	0.05	0.05	0.03	0.08
	OR	0.03	-	-	-	-	0.01	-	-	-
Immigration and Ethnic Affairs	CW	-	-	-	0.02	0.05	0.02	0.10	0.10	0.07
	PE	0.08	0.05	0.12	0.14	0.21	0.36	0.46	0.34	0.59
	HE	0.22	0.26	0.11	0.07	0.01	0.28	0.13	0.18	0.12
	OR	0.03	0.05	0.03	0.03	0.03	0.05	0.04	0.03	0.03
Industry and Commerce	CW	-	-	-	-	-	0.01	-	-	-
	PE	-	0.01	0.08	0.09	-	0.01	0.09	0.09	-
	HE	-	0.01	-	0.01	-	0.01	-	0.01	-
	OR	-	-	0.02	..	0.08	-	0.02	..	0.08
Prime Minister and Cabinet	PE	-	-	-	-	-	0.01	0.02	0.01	0.01
	HE	-	-	-	-	-	-	-	..	..
Resources and Energy	CW	-	-	-	-	-	-	..	0.01	0.02
	PE	-	-	-	-	-	-	0.01	0.02	0.01
	HE	0.02	0.03	0.01	-	-	0.03	0.03	0.05	-
	OR	-	-	-	-	-	-	0.02	0.06	0.03

Science and Technology	PE	0.01	0.01	0.01	-	-	0.01	0.01	-	-
	HE	-	-	0.01	-	-	-	0.01	-	-
Social Security	CW	-	-	-	-	-	-	0.05	-	-
	PE	-	-	0.05	0.12	0.03	-	0.22	0.12	0.05
	HE	0.15	0.15	0.11	0.29	0.13	0.26	0.15	0.29	0.13
	OR	-	-	0.08	O.Q5	0.09	0.08	0.08	0.07	0.09
Territories and Local Government	CW	-	-	-	-	-	0.06	-	-	-
	PE	-	-	-	-	-	0.17	0.01	0.05	0.06
Transport	CW	0.01	0.01	..	0.01	..	0.01	0.06	0.01	..
	PE	0.13	0.11	0.10	0.10	0.70	0.17	0.18	0.15	0.77
	HE	0.11	0.10	0.03	0.04	0.06	0.11	0.04	0.06	0.09
	OR	0.06	0.05	0.02	0.06	0.04	0.05	0.02	0.06	0.04
Treasury	OR	-	-	-	-	-	-	-	-	0.10
Total (Direct Commonwealth funding, all SSH contracts)		1.38	1.82	1.92	2.09	3.29	3.86	4.81	6.88	10.26

CW Contracts to other Commonwealth agencies
HE Contracts to institutions of higher education
PE Contracts to private bus. enterprise
OR Contracts to other bodies.

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

($ million)		R&D						S&T (including R&D)				
							Projected					Projected
		78-79	79-80	80-81	81-82	82-83	83-84	79-80	80-81	81-82	82-83	83-84
Private Enterprise	N	0.73	0.77	0.93	1.70	2.36	2.58	28.29	36.41	51.09	59.81	93.26
	S	0.30	0.27	0.38	0.69	0.52	1.03	0.77	1.42	2.11	2.65	3.70
	N+S	1.03	1.04	1.31	2.39	2.88	3.61	29.06	37.82	53.21	62.46	96.96
Commonwealth agencies	N	5.06	3.95	3.83	3.38	3.83	6.28	17.78	18.89	19.77	28.71	33.05
	S	0.10	0.15	0.04	0.06	0.09	0.46	0.17	0.12	0.29	0.36	0.54
	N+S	5.15	4.10	3.87	3.44	3.93	6.74	17.95	19.01	20.05	29.07	33.59
Higher Education	N	1.72	2.03	2.67	4.79	6.50	9.31	3.00	4.54	7.12	9.59	13.97
	S	0.57	0.67	1.08	0.73	0.89	0.80	1.06	1.66	1.80	2.56	2.40
	N+S	2.28	2.69	3.75	5.52	7.39	10.12	4.07	6.20	8.91	12.14	16.38
Other Bodies	N	2.96	4.57	3.33	2.75	3.26	3.83	21.85	24.61	21.56	23.98	21.16
	S	0.23	0.29	0.33	0.44	0.59	1.00	0.39	0.66	0.62	1.32	3.61
	N+S	3.19	4.87	3.66	3.19	3.84	4.84	22.25	25.27	22.17	25.29	24.77
Total (Direct Commonwealth finding all contracts)		11.66	12.70	12.59	14.54	18.03	25.30	73.32	88.29	104.35	128.97	171.70

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)			
		79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	PE	-	-	..	-	-	-	..	-	-
	HE	-	-	..	-	-	-	..	-	-
	OR	-	-	-	-	-	0.10	0.13	0.13	0.16
Communications	HE	0.02	0.03	0.04	0.09	0.09	0.03	0.04	0.09	0.09
	OR	0.12	0.13	0.19	0.05	0.21	0.13	0.19	0.05	0.21
Education and Youth Affairs	HE	49.1	6.0	61.0	72.8	82.0	56.0	61.0	72.8	82.0
	OR	4.7	4.8	5.1	6.6	8.6	5.4	5.4	7.0	9.1
Employment and Industrial Relations	OR	-	-	-	-	-	0.16	0.16	0.16	0.16
Foreign Affairs	PE	-	-	-	-	-	..	..	..	..
	HE	1.46	1.76	2.07	3.14	3.46	9.28	10.81	15.46	18.43
	OR	5.57	6.86	8.64	13.76	13.10	15.07	23.22	35.44	34.33
Health	HE	7.00	9.33	12.78	14.72	18.90	9.33	12.78	14.72	18.90
	OR	7.17	9.19	14.36	17.64	26.61	9.19	14.36	17.64	26.61
Home Affairs and Environment	PE	-	0.01	-	-	-	0.03	0.05	0.05	0.05
	HE	0.06	0.14	0.24	0.21	0.25	0.22	0.34	0.28	0.37
	OR	0.06	0.23	0.25	0.19	0.21	0.50	0.55	0.54	0.60
Housing and Construction	OR	0.26	0.26	-	-	-	0.26	-	-	-
Industry & Commerce	HE	-	..	..	-	-	..	..	-	-
	OR	..	-	-	-	-	-	-	-	-
Primary Industry	PE	0.08	0.09	0.09	0.59	0.66	0.09	0.09	1.07	1.35
	HE	2.97	3.59	4.03	4.52	5.65	3.80	4.33	4.88	6.14
	OR	10.68	12.71	12.37	13.54	15.55	17.50	14.17	17.91	21.13
Prime Minister and Cabinet	OR	0.03	0.05	0.03	0.03	0.03	0.05	0.03	0.06	0.08
Resources and Energy	PE	1.77	2.40	3.31	4.56	4.56	2.72	3.77	5.20	5.20
	HE	1.66	1.99	2.72	3.91	3.83	2.05	3.02	4.59	4.51
	OR	1.79	2.72	4.29	3.38	3.36	13.04	14.37	14.11	11.73

Science and Technology	PE	29.95	45.72	22.96	49.21	63.37	49.53	26.57	52.78	67.09
	HE	10.62	12.98	14.68	16.20	18.09	13.00	14.73	16.29	18.13
	OR	2.15	2.94	2.13	2.15	3.87	4.12	3.45	3.86	5.32
Special Ministry of State	HE	-	-	-	-	..	-	-	-	..
	OR	-	-	-	-	..	0.02	0.06	0.08	0.10
Transport	OR	-	0.50	1.47	1.66	1.40	4.25	1.91	2.39	2.24
Treasury	HE	0.64	0.73	0.72	0.72	0.01	0.73	0.72	0.74	0.02
	OR	0.46	0.53	1.29	1.02	2.41	0.53	1.29	1.02	2.41
Total grants to higher educ.		73.6	86.5	98.3	116.3	132.3	94.4	107.8	129.8	148.6
Total grants to private enterprise		31.81	48.21	26.37	54.37	68.59	52.37	30.49	59.10	73.69
Total grants to others		32.94	40.89	50.13	59.99	75.35	70.31	79.31	100.32	114.12
Total (Direct Commonwealth funding, all NSE grants)		138.3	175.6	174.8	230.7	276.2	217.1	217.6	289.3	336.4

PE Grants to private enterprise or in support of industry

HE Grants to institutions of higher education

OR Grants to other bodies

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

($ million)		R&D					S&T (including R&D)			
		79-80	80-81	81-82	82-83	Projected 83-84	80-81	81-82	82-83	Projected 83-84
Aboriginal Affairs	PE	0.03	0.02	0.02	0.02	-	0.02	0.02	0.02	-
	HE	0.12	0.06	0.07	0.04	0.06	0.06	0.07	0.04	0.06
	OR	0.47	0.49	0.53	0.47	0.52	0.87	0.68	0.73	0.73
Attorney-General's	HE	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.04	0.04
	OR	0.02	0.03	0.04	0.05	0.05	0.03	0.04	0.05	0.05
Education and Youth Affairs	PE	-	-	..	-	-	-	..	-	-
	HE	21.0	22.1	26.3	29.3	33.5	22.2	26.4	29.4	33.6
	OR	3.6	4.1	4.8	5.6	6.9	4.9	5.6	6.8	8.5
Employment and Industrial Relations	PE	-	-	..	-	-	-	..	-	-
	HE	-	0.01	..	0.05	0.23	0.03	..	0.05	0.23
	OR	-	-	0.06	-	-	-	0.06	-	-
Foreign Affairs	HE	0.96	1.34	1.47	2.29	2.53	9.70	11.29	14.35	16.51
	OR	0.16	1.42	2.48	2.78	2.40	5.80	11.56	16.01	16.05
Health	HE	0.23	0.30	0.58	0.72	0.36	0.99	1.38	1.63	1.85
	OR	0.20	0.48	0.59	0.46	0.58	1.67	1.34	0.83	0.82
Home Affairs and Environment	HE	-	0.01	-	-	0.03	0.01	..	..	0.03
	OR	-	..	-	-	-	0.01	-	-	-
Industry and Commerce	HE	-	-	-	0.08	0.09	-	-	0.08	0.09
	OR	-	-	-	-	-	0.05	0.04	0.04	0.04
Primary Industry	HE	0.10	0.10	0.06	-	-	0.10	0.06	-	-
	OR	0.49	0.50	0.24	0.01	0.02	0.51	0.25	0.01	0.02
Prime Minister and Cabinet	OR	0.01	0.02	0.01	0.04	0.05	0.16	0.13	0.09	0.11
Resources and Energy	PE	0.05	0.05	-	-	-	0.05	-	-	-
	HE	0.02	0.02	0.15	0.64	0.64	0.02	0.15	0.64	0.64
	OR	-	-	0.20	0.18	0.18	0.34	0.52	0.57	0.88
Science and Technology	PE	-	-	-	-	0.03	-	0.18	0.58	1.73
	HE	2.56	2.90	3.76	4.08	4.53	2.90	3.76	4.08	4.53
	OR	0.04	0.04	0.10	0.17	0.21	0.19	0.25	0.34	0.39
Social Security	HE	.17	.41	.55	0.59	0.61	0.41	0.55	0.59	0.61
	OR	-	-	-	-	-	0.23	0.31	0.25	0.42
Special Minister of State	OR	-	-	-	-	-	0.02	0.06	0.05	0.03
Transport	OR	2.70	2.00	0.16	0.19	0.19	2.00	0.16	0.19	0.19
Treasury	HE	0.12	0.12	0.16	0.18	-	0.12	0.16	0.18	-
	OR	-	-	-	..	0.23	..	..	0.01	0.23

Total grants to private enterprise	0.08	0.07	0.02	0.02	0.03	0.07	0.20	0.60	1.73
Total grants to higher educ.	25.3	27.4	33.1	38.0	43.1	36.6	43.8	51.1	58.2
Total grants to other bodies	7.73	9.04	9.17	9.89	11.36	16.75	20.98	25.93	28.49
Total (Direct Commonwealth funding, all SSH grants)	33.1	36.5	42.3	47.9	54.5	53.4	65.0	77.6	88.5

PE Grants to private enterprise or in support of industry

OR Contract to other bodies

HE Grants to institutions of higher education

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). Activities under the agreements have included short term research visits, seminars, workshops, and exchanges of policy delegations. The operation of the Agreement with the USSR is being reviewed following the change in policy by the new Government.

Applications under each of the agreements are sought from the research community. Additionally proposals in specific fields are developed in collaboration with the partner country following identification of priority areas. Program selection is on the basis of scientific or technological merit together with the likely contribution of proposals to the economic development of Australia 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 table shows funds outlayed under the Agreements for the 1978-79 to 1983-84 fiscal years disaggregated by subject area.

Table 27: Summary of Australian support for bilateral science and technology cooperation agreements

US/Australia Agreement for Scientific and Technical Cooperation	1978-79 $	1979-80 $	1980-81 $	1981-82 $	1982-83 $	Projected 1983-94 $
Physical and Chemical Sciences	14 294	15 254	16 194	22 793	19 377	31 198
Engineering and Applied Sciences	21 207	9 794	11 269	5 200	7 255	12 855
Biological and Agricultural Sciences	30 014	41 276	43 200	28 400	21 568	20 235
Earth Sciences	2 249	14 506	-	9 474	28 401	19 100
Social Sciences	1 176	9 428	4 331	11 050	2 875	6 612
Sub-total	68 940	90 258	74 994	76 917	79 476	90 000
India/Australia Science and Technology Agreement						
Physical and Chemical Sciences	-	-	-	10 856	1 672	2 328
Engineering and Applied Sciences	1 990	1 584	2 105	1 200	-	1 600
Biological and Agricultural Sciences	8 953	25 239	12 775	2 790	800	-
Earth Sciences	13 471	3 395	18 082	23 160	10 422	10 572
Social Sciences	-	-	-	-	-	-
Sub-total	24 414	30 218	32 962	38 006	12 894	14 500

FRG/Australia Science and Technology Agreement	1978-79 $	1979-80 $	1980-81 $	1981-82 $	1982-83 $	Projected 1983-84 $
Physical and Chemical Sciences	-	9 526	4 324	2 700	3 930	-
Engineering and Applied Sciences	20 442	-	-	1 300	2 994	-
Biological and Agricultural Sciences	1 900	4 278	4 775	7 975	21 999	15 000
Earth Sciences	10 266	11 428	15 900	9 000	8 070	-
Social Sciences	-	-	-	-	-	-
Sub-total	32 608	25 282	24 999	20 975	36 993	15 000
Japan/Australia Science and Technology Agreement						
Physical and Chemical Sciences	-	-	-	-	13 400	-
Engineering and Applied Sciences	-	-	28 140	7 483	50 009	46 500
Biological and Agricultural Sciences	-	-	27 400	21 700	67 002	41 757
Earth Sciences	-	-	-	-	2 300	26 743
Social Sciences	-	-	-	-	-	-
Other	-	-	-	6 035	1 207	35 000
Sub-total	-	-	55 540	35 318	133 918	150 000
Mexico/Australia Science and Technology Agreement						
Physical and Chemical Sciences	-	-	-	-	3 000	-
Engineering and Applied Sciences	-	-	-	2 854	3 000	-
Biological and Agricultural Sciences	-	-	-	-	25 436	75 000
Earth Sciences	-	-	-	-	-	-
Social Sciences	-	-	-	-	-	-
Other (Senior Scientific Delegations)	-	-	-	22 030	711	14 000
Sub-total	-	-	-	24 884	32 147	21 500
China/Australia Science and Technology Agreement						
Physical and Chemical Sciences	-	-	-	-	-	-
Engineering and Applied Sciences	-	-	-	-	-	-
Biological and Agricultural Sciences	-	-	-	-	-	5 000
Earth Sciences	-	-	-	-	2 820	-
Social Sciences	-	-	-	-	-	-
Other (Senior Scientific Delegations)	-	-	-	19 000	752	25 000
Sub-total	-	-	-	19 000	3 572	30 000
Total	125 962	145 753	188 225	215 000	299 000	321 000

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 current 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&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 anoint 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).

---

(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 .(3)
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 (4). 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

---

(3) The classes within the "Promotion of science and technology" group were modified in the Project SCORE context during the 1983-84 review of R&D surveys conducted jointly by the Department of Science and Technology and the Australian Bureau of Statistics, to permit more comprehensive collection of data on the innovative process. Subsequent Statements are therefore likely to incorporate changes in these classes of technological activities.

(4) 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(5) 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(6) 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).

---

(5) Op cit.
(6) 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(7) 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.

Subsequent to the collection of data for the 1983-84 Statement, the Department adopted *a* definition of "technology" formulated by the US National Academy of Science:

> "Technology is a perishable resource comprising knowledge, skills, and the means of using and controlling factors of production for the purpose of producing, delivering to users, and maintaining goods and services for which there is an economic and/or social demand."

However adoption of this definition does not remove the need to list individual classes of activities to be included in the data collection.

The nature of S&T data included in Science and Technology Statements from 1982-83 onwards

In Statements prior to 1982-83, S&T (other than R&D) was collected for all or most agencies on a different basis from R&D (8). In collecting data for the 1982-83 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.

---

(7) See for example The Concise Oxford Dictionary.

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

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:

(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, earth 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(7). 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&O 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 finds 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 finds 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 Find, Trust Fund and Loan Fund, as reported in the Budget Statements(9). 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 taxi.

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.

---

(9) See for example 1983-84 Budget Paper No. 1, Appendix, p377.

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 find 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 find 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(10) 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 1983-84 Budget Papers(10).

---

(10) See 1983-8A Budget Paper No. 1, Appendix, pp 380-387 for detailed description of the classification. For treatment of individual items, see 'Program presentation of appropriations and outlays - Departmental estimates 1983-84' an exploratory presentation of information on Commonwealth programs tabled on a trial basis in association with the Budget papers.

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&O survey, as follows:

Science and Technology Statement	Project SCORE
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)
	Prospecting & resource assessment techniques - uranium
	Prospecting & resource assessment technqiues - coal
	Prospecting & resource assessment techniques - oil, gas, oil shale and tar sands
	Extraction techniques – uranium
	Extraction techniques - coal
	Extraction techniques - oil, gas, oil shale and tar sands
Manufacturing(11)	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

(11) Promotion of industry aspects only e.g. funding of development of transport equipment for Australia's transport system is included under "Transport".

	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 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	Production and utilisation of energy from - Oil and gas - Coal - Solar - Nuclear - Other primary sources Production and utilisation of synthetic fuels from - Coal conversion - 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	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
Earth, ocean & atmosphere	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	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 1981 were Advancement of knowledge, 48%; Community welfare, 28%; and Economic development 24%.

. 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.

($ million)	Type of activity			
Objective category	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 past Statements have been 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(12). 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.

(12) Australian National Accounts, National Income and Expenditure 1976-77, Australian Bureau of Statistics, Catalogue No. 5204.0, pp 109-112.

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(12). Nevertheless, because of the difficulty of constructing accurate R&D deflators, the GDP implicit price deflator has been 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. 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.

A major inhibiting factor in the presentation of estimated constant price expenditures in previous Statements has been the absence of a fully satisfactory salaries index appropriate to Commonwealth research personnel. A simple research scientists and engineers salaries index was constructed for the Statement on a basis adequate for establishing trends using data at two- or three-year intervals, but this index (which took salaries at a fixed time in each year) did not adequately account for variations in the timing of new awards from year to year and was unsuitable for use with data at annual intervals. Using Public Service Board data on the timing of all salary adjustments for selected grades since 1976, we have recently developed a Commonwealth research salary payment index as a replacement. This is based on the total annual salary payments attributable to a fixed 'basket' of personnel relevant to a research organisation. The personnel grades selected, and the weighting given to each in the construction of the index, were based on a study of the staff structure of CSIRO. This new index, and others used in the derivation of constant price estimates used in this Statement, are presented in Table 28. Tables 29 to 32 illustrate the application of the deflators to expenditure classified according to socio-economic objectives.

TABLE 28: Deflator series relevant to Commonwealth-funded R&D

Price index or deflator	Index values for year (1979-80 = 100)								
	73-74	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84
A. GDP implicit price deflator	51.2	77.5	83.5	90.1	100.0	109.9	121.2	134.6	not estimated
B. Gross non-farm implicit price deflator	49.89	78.9	85.4	91.1	100.0	110.1	122.9	137.0	148.9 est*
C. Government final consumption expenditure implicit price deflator	50.1	79.4	86.0	91.5	100.0	112.3	127.1	139.6	not estimated
D. Consumer price index[1]	51.1	76.7	83.9	90.8	100.0	109.4	120.8	134.7	146.1 est*
E. Commonwealth research salary payment index[2]	56.6	82.7	88.4	92.9	100.0	114.0	133.4#	145.2	151.2
F. Private other non-dwelling construction implicit price deflator[3]	46.6	77.5	84.2	90.5	100.0	112.2	126.6	144.1	154.9 est*
G. Private enterprise intramural R&D expenditure implicit price deflator[4]	46.5	74.4	82.2	90.9	100.0	114.4	130.8	145.8	158.6 est*
H. Universities aggregate price deflator[5]	n.a.	80.9	87.1	92.2	100.0	114.2	126.9	139.8	151.0 est*
I. ABS R&D other capital expenditure deflator [6]	n.a.	73.6	81.0	86.0	100.0	103.5	117.6	131.1**	140.6 est*
J. ABS R&D non-salary current expenditure deflator[6]	n.a.	79.2	84.9	91.5	100.0	110.2	128.2	142.9**	155.4 est*
K. Commonwealth extramural R&D payments deflator [7]	n.a.	n.a.	n.a.	92.1	100.0	112.2	131.3	143.6	151.4 est*

Sources : Budget papers, ABS bulletins and unpublished data, Commonwealth Tertiary Education Commission data, Department of Science and Technology unpublished data based on Public Service Board salaries information.

Note : Series A and C are included for comparison purposes, but were not used in deriving constant price estimates.

* DST estimates based on most recent ABS information and assumptions in the Budget papers for 1983-84 (i.e., GDP non-farm deflator to increase by 8%, CPI to increase by 7.5%, average weekly earnings to increase by 7%).

** DST estimates based on increase in GDP non-farm implicit price deflator.

\# Takes account of an additional pay period falling during 1981-82 in that application of this value also adjusts *deflated* expenditure to a 26-pay period basis. (Australian Public Service salaries are paid on a fortnightly basis and at eleven or twelve year intervals there are 27 payments rather than 26.) For applications where the adjustment is not desired use 128.4.

1 Figures derived by DST from original series having a 1980-81 base.

2 See text preceding the Table. The figure for 1983-84 incorporates the recent 4.1% National Wage Case increase and is unlikely to require revision.

3 A public other non-dwelling construction deflator is available to 1981-82 in unpublished working estimates of the ABS. The private construction deflator (which differs little from the public one) is used here as figures are available, or readily estimated, after 1981-82.

4 Estimated by DST using the current constant 1979-80 price figures for the years 1976-79 and 1981-82 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, readers 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.

5 This deflator is based on indices maintained by CTEC for adjusting recurrent grants to higher education institutions for cost increases. See Appendix 11, Vol. 4 of the CTEC Report for the 1982-84 triennium.

6 These series are unpublished working estimates made available by ABS.

7 Used for extramural payments made by agencies to other Commonwealth bodies. Based on weighting factors derived from an analysis of CSIRO 'Other Source' (ie, excluding Budget and Non-budget) expenditure and applied to other indices.

Outline of the application of indices in the derivation of the constant price estimates

. For capital land and building expenditure - series F.

. For capital equipment expenditure - series I.

. For wages and salaries - series E.

. For other current expenditure - series J.

. For extramural expenditures - series B, D, G, H or K were used according to the destination of the funds.

Tables illustrating the application of constant price R&D deflators to socio-economic objective expenditures

Table 29: Estimated direct Commonwealth-funded R&D by socio-economic objective at constant 1983-84 prices

Objective Category	($m constant prices) 1979-80	1980-81	1981-82	1982-83	Projected 1983-84
National security					
. Defence	140.35	143.11	130.24	149.35	147.19
Economic development					
. Agriculture	132.35	140.66	135.35	130.43	98.00
. Other primary industries	20.12	18.19	18.55	19.42	23.82
. Mining	18.80	21.76	24.72	20.13	20.24
. Manufacturing	107.03	127.43	92.81	115.92	124.23
. Construction	10.80	9.48	8.13	8.10	7.96
. Energy	47.57	53.26	57.29	65.87	66.37
. Transport	13.22	9.57	6.59	6.14	6.13
. Communications	43.4	51.3	47.2	47.4	45.4
. Economic services nei	20.50	21.51	20.97	19.81	20.32
Sub-total	413.8	453.1	411.7	433.2	412.4
Community welfare					
. Environment	27.60	25.45	26.53	35.67	30.60
. Urban & regional planning	2.43	1.71	1.85	2.07	2.12
. Health	45.79	47.72	52.95	59.03	71.93
. Education*	4.72	5.27	4.40	2.55	2.89
. Welfare	2.56	3.36	4.11	4.49	3.87
. Community services nei					
- Overseas development assistance	18.77	21.05	24.82	32.73	36.03
- Other community services	4.02	4.40	4.40	4.34	4.57
Sub- total	105.89	108.96	119.05	140.38	152.01
Advancement of knowledge					
. Earth, ocean & atmosphere	29.36	37.72	37.35	44.55	46.82
. General advancement of knowledge	168.8	165.3	164.0	185.0	199.0
Sub-total	198.2	203.0	201.4	229.6	245.8
Total	858.2	908.3	862.3	953.0	957.5

* 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.

Table 30: Estimated Percentage Increase of Estimated Direct Commonwealth funding of R&D by Socio-Economic Objective at constant 1983-84 prices

Objective Category	% increase 79-80 to 80-81	80-81 to 81-82	81-82 to 82-83	82-83 to 83-84	Annual average compound % increase 79-80 to 82-83	79-80 to 83-84
National security						
. Defence	1.97	-8.99	14.67	-1.45	2.09	1.20
Economic development						
. Agriculture	6.28	-3.78	-3.63	-24.86	-0.49	-7.24
. Other primary industry	-9.59	1.97	4.71	22.66	-1.17	4.32
. Mining	15.74	13.64	-18.60	0.55	2.30	1.86
. Manufacturing	19.07	-27.17	24.91	7.17	2.70	3.80
. Construction	-12.20	-14.22	-0.37	-1.81	-9.13	-7.35
. Energy	11.96	7.58	14.96	0.77	11.46	8.69
. Transport	-27.63	-31.18	-6.74	-0.23	-22.56	-17.49
. Communications	18.03	-7.86	0.24	-4.22	2.92	1.08
. Economic services nei	4.90	-2.51	-5.50	2.57	-1.13	-0.22
Sub-total	9.50	-9.16	5.23	-4.79	1.54	-0.08
Community welfare						
. Environment	-7.79	4.25	-34.45	-14.22	8.93	2.61
. Urban & regional planning	-29.51	7.94	11.20	2.97	-5.42	-3.39
. Health	4.20	10.96	11.49	21.86	8.83	11.95
. Education*	11.77	-16.62	-41.89	13.00	-18.49	11.55
. Welfare	31.11	22.23	9.20	-13.73	20.51	10.85
. Community services nei						
- Overseas development assistance	12.17	17.92	31.88	10.08	20.38	17.72
- Other community services	9.51	-0.09	-1.27	5.28	2.60	3.26
Sub-total	2.90	9.26	18.33	7.90	9.98	9.46
Advancement of knowledge						
. Earth, ocean & atmosphere	28.47	-0.97	19.26	5.09	14.91	12.37
. General advancement of knowledge	-2.06	-0.80	12.81	7.57	3.10	4.20
Sub-total	2.46	-0.83	14.00	7.09	5.02	5.54
Total	5.83	-5.06	10.51	0.47	3.55	2.77

* See footnote to Table 29.

Table 31: Estimated Direct Commonwealth-funding R&D expenditure (excluding capital items) by socio-economic objective at constant 1983-84 prices

Objective Category	($m constant prices) 1979-80	1980-81	1981-82	1982-83	Projected 1983-84
National security					
. Defence	126.28	132.18	120.19	132.77	124.35
Economic development					
. Agriculture	83.59	82.94	79.26	78.56	81.26
. Other primary industries	17.81	17.16	16.29	16.52	19.03
. Mining	16 .57	18.73	21.20	17.11	17.22
. Manufacturing	98.17	119.31	81.05	106.50	117.15
. Construction	9.68	8.73	7.51	7.51	7.46
. Energy	42.34	47.33	50.59	57.66	56.75
. Transport	12.14	8.43	5.72	5.72	5.59
. Communications	40.3	40.0	39.5	42.0	41.1
. Economic services nei	17.48	18.35	18.44	18.07	19.14
Sub-total	338.1	361.0	319.5	349.7	364.7
Community welfare					
. Environment	22.89	21.56	21.98	29.00	26.50
. Urban & regional planning	2.27	1.61	1.78	1.95	2.04
. Health	41.80	44.34	50.91	55.96	67.61
. Education*	4.72	5.27	4.39	2.55	2.89
. Welfare	2.55	3.32	4.09	4.49	3.87
. Community services nei					
- Overseas development assistance	18.77	21.05	24.82	32.73	36.03
- Other community services	3.99	4.28	4.34	3.80	4.40
Sub- total	96.99	101.42	112.30	130.48	143.34
Advancement of knowledge					
. Earth, ocean & atmosphere	26.62	35.32	33.52	34.17	31.73
. General advancement of knowledge	160.3	158.1	158.5	174.6	186.0
Sub-total	186.9	153.4	192.0	208.8	217.7
Total	748.2	788.0	744.0	821.7	850.1

* See footnote to Table 29.

Table 32: Estimated percentage increase of direct Commonwealth Finding (excluding capital item) of R&D by socio-economic objective at constant 1983-84 prices

Objective Category	% increase				Annual average compound % increase	
	79-80 to 80-81	80-81 to 81-82	81-82 to 82-83	82-83 to 83-84	79-80 to 82-83	79-80 to 83-84
National security						
. Defence	4.67	-9.07	10.46	-6.34	1.68	-0.38
Economic development						
. Agriculture	-0.78	-4.44	-0.88	3.43	-2.05	-0.71
. Other primary industries	-3.63	-5.11	1.41	15.20	-2.48	1.67
. Mining	13.02	13.17	-19.29	0.63	1.07	0.96
. Manufacturing	21.54	-32.07	31.40	10.01	2.75	4.52
. Construction	-9.80	-13.96	-0.03	-0.64	-8.11	-6.30
. Energy	11.78	6.90	13.97	-1.57	10.84	7.60
. Transport	-30.54	-32.20	-0.02	-2.24	-22.21	-17.63
. Communications	-0.63	-1.37	6.46	-2.34	1.43	0.47
. Economic services nei	4.98	0.50	-2.01	5.94	1.12	2.30
Sub-total	6.79	-11.49	9.43	4.28	1.13	1.91
Community welfare						
. Environment	-5.81	1.91	31.95	-8.60	8.20	3.73
. Urban & regional planning	-29.27	10.83	9.26	4.68	-5.03	-2.69
. Health	6.07	14.83	9.92	20.81	10.21	12.77
. Education*	11.68	-16.71	-14.78	13.00	-18.49	-11.55
. Welfare	30.40	23.04	9.82	-13.73	20.78	11.04
. Community services nei						
- Overseas development assistance	12.17	17.92	31.88	10.08	20.38	17.72
- Other community services	7.27	1.45	-12.46	15.63	-1.60	2.45
Sub-total	4.58	10.73	16.19	9.85	10.39	10.26
Advancement of knowledge						
. Earth, ocean & atmosphere	32.65	-5.10	1.96	7.16	8.68	4.48
. General advancement of knowledge	-1.36	0.25	10.17	6.53	2.90	3.79
Sub-total	3.49	-0.73	8.74	4.29	3.76	3.89
Total	5.32	-5.58	10.44	3.45	3.17	3.24

* See footnote to Table 29.

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.

In years subsequent to 1983-84 the operation of the Management and Investment Companies Act 1983 will provide substantial taxation concessions to promote a private sector venture capital market that will encourage formation and development of Australian businesses which utilise innovative technology, have potential for rapid growth, are skill intensive, export oriented, internationally competitive, and significant generators of employment in Australia. The considerations discussed in the paragraph above also apply to revenue foregone by the Commonwealth under this scheme.

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
(ab) or $\binom{a}{b}$	Total Intramural Expenditure
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
AEC	Australian Education Council
AFP	Australian Federal Police
AGAL	Australian Government Analytical Laboratories
AHRC	Australian Housing Research Council
AIAS	Australian Institute of Aboriginal Studies
AIMS	Australian Institute of Marine Science
AIRDIB	Australian Industrial Research and Development Incentives Board
AIRDIS	Australian Industrial Research and Development Incentives Scheme
AIUS	Australian Institute of Urban Studies
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
ANU	Australian National University
ANZAAS	Australian New Zealand Association for the Advancement of Science
ARGC	Australian Research Grants Committee (Since 1981 incorporated in QEFARGC)
ARGS	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 Coordinating Council
AUSINET	Australian Information Network (Data Base Network)
Australia Post	Australian Postal Commission
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
BMRC	Bureau of Meteorology Research Centre
BTE	Bureau of Transport Economics

(c)	Extramural Expenditure
CAD	Computer Assisted Design
CAM	Computer Assisted Manufacture
CCAMLR	Convention on the Conservation of Antarctic and Marine Living Resources
CCRD	Consultative Committee on R&D (ADAS)
CEDA	Committee on the Economic Development of Australia
CERI	OECD Centre for Educational Research and Innovation
CDC	Curriculum Development Centre
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
COST	ASEAN Committee on Science and Technology
CPI	Consumer Price Index
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSIRONET	National Computer Network Operating within Australia
CSL	Commonwealth Serum Laboratories
CTEC	Commonwealth Tertiary Education Commission
CTHC	Capital Territory Health Commission
CWLTH	Commonwealth Government (i.e., Australian Federal Government)
D/F	Data Acquisition Facility
DMA	Deoxyribonucleic Acid
DPF	Data Processing Facility
DPI	Domestic Product of Industry
DST	Department of Science and Technology
DSTO	Defence Science and Technology Organisation

EBS	Experimental Building Station
ELD	Education and Local Development Project
EPG	Education Planning Group
ERDC	Education Research and Development Committee
FE	Commonwealth Financial Enterprise
FM	Frequency Modulation
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
HF	High Frequency
HIAF	Heavy Ion Analytical Facility
HIF	Health Facilities Information File
HIFAR	High Flux Australian Reactor
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
INMARSAT	International Maritime Satellite Organisation
INTELSAT	International Telecommunications Satellite
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
kW	Kilowatt

Landsat	NASA Remote Sensing Satellite
LINAC	Electronic Linear Accelerator
Ltd	Limited Liability
MARC	Machine Readable Cataloging
MATPAK	Materials Handling Program
MCB	Metric Conversion Board
MEDLINE	U.S. National Library of Medicine (Database Network)
MERLCO	Minerals (Exploration) Research Liaison Committee
MICs	Licenced Management and Investment Companies
MLS	Australian Microwave Landing System (INTERSCAN)
MPC	Multi-Project Silican Wafer Chip
MW	Megawatt
N	Natural Sciences and Engineering
n.a.	not available
NAL	National Acoustic Laboratory
NASA	United States National Aeronautics and Space Administration
NATA	National Association of Testing Authorities
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
NERD&D	National Energy Research, Development and Demonstration
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
NT	Northern Territory (of Australia)
NL	No Liability

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)
PhD	Doctor of Philosophy
PPCA	Productivity Promotion Council of Australia
PR&I	Planning Research and Information Branch (Public Service Board)
PSZ	Partially - Stabilized Zirconia
Pty	Proprietary
QEFARGC	Queen Elizabeth II Fellowships and Australian Research Grants Committee
QFMRAAC	Queen's Fellowships and Marine Research Allocations Advisory Committee
RAN	Royal Australian Navy
RAPT	Review and Progress Test in Mathematics
RCF	(Ministerial) Review of Commonwealth Functions (April 1981)
R&D	Research and (Experimental) Development
R,D&D	Research, Development and Demonstration
S	Social Sciences and Humanities
^{n}S	Includes some Natural Science and Engineering
SA	South Australia
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
STIU	OECD Science and Technology Indicators Unit
STS	Scientific and Technological Services
TAFE	Technical and Further Education
Telecom	Australian Telecommunications Commission

TTC	Technology Transfer Cornell
UHF	Ultra High Frequency
UK	United Kingdom of Great Britain and Northern Ireland
UNESCO	United Nations Educational, Scientific and Cultural Organisation
US	United States (of America)
USA	United States of America
USSR	Union of Soviet Socialist Republics
Vic.	Victoria (Australia)
W.A.	Western Australia
VLSI	Very Large Scale Integrated Circuits
WELSTAT	Welfare Statistics Project
..	Figure non-zero, but insignificant for purposes of presentation.
.	Figure non-zero but not separately available is included elsewhere.

R83/1565 Cat. No. 84 0975 9