

NEW ISSUE



**RESEARCH AND EXPERIMENTAL
DEVELOPMENT
HIGHER EDUCATION ORGANISATIONS
AUSTRALIA
1978**

CATALOGUE NO. 8111.0

AUSTRALIAN BUREAU OF STATISTICS Canberra

NOON 7 JANUARY 1982

**RESEARCH AND EXPERIMENTAL
DEVELOPMENT
HIGHER EDUCATION ORGANISATIONS
AUSTRALIA
1978**

R. J. CAMERON
Australian Statistician

AUSTRALIAN BUREAU OF STATISTICS

CATALOGUE NO. 8111.0

PHONE INQUIRIES *for more information about these statistics—contact Mr Ian Laine on Canberra (062) 52 5627 or any of our State offices.*
other inquiries including copies of publications—contact Information Services on Canberra (062) 52 6627 or in any of our State offices.

MAIL INQUIRIES *write to Information Services, ABS, P.O. Box 10, Belconnen, A.C.T. 2616 or any of our State offices.*

CONTENTS

<i>Table</i>		<i>Page</i>
...	Preface	iv
...	Main features	1
...	Explanatory notes	1
Research and experimental development (R & D) carried out by higher education organisations		
1.	R & D expenditure 1976 and 1978 at current and constant (average 1974-75) prices	5
2.	R & D manpower 1976 and 1978	5
3.	R & D expenditure and R & D manpower 1976 and 1978 by socio-economic objective	5
4.	R & D expenditure and R & D manpower 1976 and 1978 by field of science	6
5.	R & D expenditure 1976 and 1978 by type of expenditure (Universities only)	6
6.	R & D expenditure by socio-economic objective by source of funds	7
7.	R & D expenditure by socio-economic objective by type of expenditure and type of activity	8
8.	R & D expenditure in the natural sciences by socio-economic objective by type of expenditure and type of activity	9
9.	R & D expenditure in the social sciences by socio-economic objective by type of expenditure and type of activity	10
10.	R & D manpower by socio-economic objective by major field of science and type of employee	11
11.	Details of R & D expenditure and R & D manpower by field of science	12
12.	R & D expenditure and R & D manpower by State	12
13.	R & D expenditure by socio-economic objective by State	13
14.	R & D manpower by socio-economic objective by State	14
15.	R & D expenditure and R & D manpower by socio-economic objective by type of organisation and major field of science	15
16.	R & D expenditure and R & D manpower by field of science by type of organisation	16
Appendixes		
A.	University R & D survey questionnaire	
B.	College of Advanced Education R & D survey questionnaire	

PREFACE

This publication presents statistics on research and experimental development (R & D) carried out by higher education organisations in Australia during the calendar year 1978. These statistics form part of the Department of Science and Technology's Project SCORE (Survey and Comparisons of Research Expenditures), the main purpose of which is to measure the financial and manpower resources devoted to Australian R & D.

Comparable information, in respect of the financial year 1978-79, is collected and compiled by the ABS for the Business Enterprise, General Government and Private Non-profit Sectors. Comprehensive results for the Business Enterprise and General Government Sectors were published in August and December 1981 respectively.

Previous Project SCORE surveys were conducted for 1968-69, 1973-74 and 1976-77.

The ABS invites comments on the usefulness and appropriateness of these statistics. Such comments would be of assistance in planning future surveys.

Australian Bureau of Statistics
Belconnen A.C.T. 2616

R. J. CAMERON
Australian Statistician

MAIN FEATURES

Note: Previous statistics in this series were published by the then Department of Science and the Environment—see paragraph 4 of the Explanatory notes.

The estimate of expenditure on R & D carried out by organisations in the Higher Education Sector in Australia during 1978 was \$326m at current prices. This represents a 33% increase in expenditure compared with 1976. At constant (average 1974-75) prices R & D expenditure is estimated to have increased by 7% over this period.

Of the total R & D expenditure of \$326m at current prices, universities accounted for 98% and colleges of advanced education (CAE's) 2%; general government sources funded \$313m or 96% of the total.

R & D expenditure in 1978 in the natural sciences was \$235m and in the social sciences was \$91m. R & D expenditure on community welfare objectives was \$87m and on economic development objectives was \$70m. The remainder, \$168m, was attributed almost entirely to advancement of knowledge.

The manpower effort devoted to R & D carried out by Higher Education organisations in Australia during 1978 was 16,050 man-years. This represents a 5% increase in manpower effort compared with 1976. The manpower effort devoted to R & D carried out by universities was 15,524 man-years (a 4% increase) and by CAE's was 526 man-years (a 46% increase).

EXPLANATORY NOTES

Introduction

This publication presents statistics of the level and distribution of expenditure and manpower resources devoted to research and experimental development (R & D) carried out by organisations in the Higher Education Sector in Australia during the calendar year 1978. They are the first compiled and published by the ABS in respect of this Sector. The (now) Department of Science and Technology compiled and published previous statistics in respect of this Sector (see paragraph 30 for details of previous R & D publications).

2. Tables 1 to 5 compare 1978 R & D data for higher education organisations with those for 1976. Tables 6 to 14 show 1978 R & D details and Tables 15 and 16 show 1978 R & D details separately for universities and colleges of advanced education (CAE's). Some limited additional information (e.g. more detailed information on socio-economic objectives and fields of science) is available on request.

Data sources

3. The 1978 R & D manpower statistics for universities and the 1978 R & D manpower and R & D expenditure statistics for CAE's were compiled from data collected

directly by the ABS in its Survey of Research and Experimental Development. However university R & D expenditure statistics were derived indirectly. University R & D manpower data from the survey were used, in conjunction with general expenditure data collected by the Tertiary Education Commission (TEC) in its 1978 statistical collection, to derive estimates of 1978 university R & D expenditures (for details of the methodology used, see paragraphs 18 and 19). The survey was conducted by means of mailed questionnaires to individual university and CAE departments. A complete response was obtained.

4. The 1976 statistics shown in Tables 1 to 5 were obtained by the Department of Science and the Environment in a similar fashion to the 1978 statistics.

Definitions

5. *Research and experimental development* is defined in accordance with the Organisation for Economic Cooperation and Development (OECD) standard as comprising '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'.

6. To be classified as R & D, an activity should contain an appreciable amount of novelty or innovation, should have investigation as a primary objective, and should have a potential to produce results that recognisably increase mankind's stock of knowledge. 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. R & D ceases and pre-production begins when work is no longer experimental.

7. R & D activity extends to substantial modifications to existing products or processes. However, some activities often regarded as R & D are excluded except if they are used primarily for the support of specific R & D programs or to develop new techniques. Examples of these types of activities are provided on page 2 of the survey questionnaires, copies of which are shown as Appendixes A and B.

8. *R & D expenditure* includes capital expenditure on the acquisition (less disposals) of fixed tangible assets such as land, buildings, vehicles, plant, machinery and equipment, and current expenditure on such items as wages, salaries, materials, fuels, rent and leasing, repairs and maintenance, data processing, etc., and a proportion of expenditure on general services and overhead costs attributable to the R & D effort.

9. The item *man years of effort on R & D* includes the effort of researchers, technicians and other staff directly supporting R & D. *Overhead staff*, i.e. administrative and general service employees such as personnel officers, canteen staff, pay clerks, janitors, cleaners, groundsmen, etc., whose work indirectly supports R & D, are excluded.

10. *Researchers* refers to persons actually engaged in the conception and/or creation of new knowledge, products, processes, methods and systems. Included are executives and directors responsible for administering the R & D programs, but executives and managers who are concerned primarily with budget and manpower constraints rather than program content are excluded. *Technicians* refers to persons performing technical tasks in support of R & D, normally under the direction and supervision of a researcher. These tasks include assisting with or performing experiments (under supervision), tests and analyses; preparing materials and equipment for experiments, taking records, making calculations and preparing charts and graphs; maintaining and operating advanced machinery and equipment; interviewing in social science surveys; and computer programming. *Other supporting staff* refers to skilled and unskilled craftsmen, secretarial and clerical staff working on or directly associated with R & D.

11. The definitions of other data items used in the 1978 survey are also provided in Appendixes A and B.

Sector classification

12. The sector classification used in the compilation of these statistics is adapted from the guidelines specified by the OECD for use in the conduct of R & D studies. Four institutional sectors are recognised: Business Enterprises, General Government, Private Non-profit and Higher Education.

Scope and coverage

13. The Higher Education Sector is defined by the OECD as including all universities, CAEs and other institutions of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of, or administered by, or associated with, higher education establishments. However, for Australian R & D surveys of this Sector, only universities and CAEs and their associated research institutes, etc. are surveyed. Other institutions of post-secondary education (e.g. Technical and Further Education (TAFE) colleges) are excluded because it is considered that their contribution to total R & D activity is very small.

Socio-economic objective and field of science classifications

14. Most of the statistical information in this publication is classified by socio-economic objective and/or field of science.

15. Each university and CAE department was asked to classify each of its R & D programs to a particular socio-economic objective and then to report the manpower devoted to those programs. Expenditure data was also collected from each CAE. The R & D programs are classified to socio-economic objectives according to the ultimate purpose of the program (which may not necessarily be the immediate objectives of the researcher). For example, an R & D program concerned with chemical studies of products from coal hydrogenation may involve

several short term objectives, but as the ultimate objective is the production and utilisation of energy from coal the R & D program would be classified to energy.

16. The ABS classified university and CAE departmental returns to fields of science according to the fields which were applicable to the topic of concern of each department.

17. For a more detailed description and explanation of socio-economic objective and field of science classifications please contact the ABS.

Methodology for deriving university R & D expenditure estimates

18. Universities were required to report R & D manpower details but not expenditures associated with R & D activities for the 1978 ABS Survey of Research and Experimental Development. However, the Tertiary Education Commission (TEC) conducts an annual survey which collects detailed expenditure and manpower statistics which relate to each individual university's activities. The ABS was therefore able to derive estimates of universities' R & D expenditure by using R & D manpower data (collected in the ABS survey) in conjunction with expenditure details obtained from the 1978 TEC survey.

19. In very broad terms the estimation of universities' R & D expenditure was carried out in the following manner:

- (a) *Direct R & D expenditure.* The ratio of R & D manpower to the total manpower of each university department was calculated from information supplied directly on ABS statistical returns. These ratios were applied to data obtained from detailed TEC departmental expenditure statistics (covering both capital and current expenditures) in respect of academic activities (i.e. 'research' and 'teaching and research' activities) to derive estimates for departmental R & D expenditure.
- (b) *Overhead R & D expenditure.* The ratio of total R & D manpower to total university manpower was calculated for each university from directly collected ABS manpower data and TEC manpower data. These ratios were applied to capital and current expenditures associated with academic services and general university services (obtained from the TEC statistics) for each university to derive overhead expenditure estimates. Overhead expenditure estimates for each university were allocated to socio-economic objective and field of science in the same proportions as those for direct R & D activity. Certain expenditures, e.g. those associated with student services, public services, etc., were excluded from the calculation because in general they are not supportive of R & D activity.

20. The methodology employed for the 1976 university expenditures was basically the same except that the 1976 details previously compiled and published by the Department of Science and the Environment did not include expenditures attributed to university staff whose work indirectly supports R & D (see paragraph 19(b) above). An estimate of the 1976 university overhead R & D expenditure (both capital and current expenditures)

has been made and is included in Tables 1 and 5 (see paragraph 26). However, overheads have not been included in the 1976 R & D expenditure details by socio-economic objective or field of science shown in Tables 3 and 4 because of the extent of estimation required. In order to provide a comparison between the 1976 and 1978 data, the 1978 R & D expenditure details by socio-economic objective and field of science in Tables 3 and 4 have been shown on two bases, one excluding university overhead expenditure and one including such expenditure.

Constant price estimates

21. Estimates of total R & D expenditure for 1976 and 1978 are shown at both current and constant (average 1974-75) prices in Table 1. In concept, constant price estimates are measures from which the direct effects of price change have been eliminated. Although expressed in monetary terms, the constant price measures shown in this publication vary only with changes in the underlying quantities in inputs purchased (including labour). In effect, quantities of broadly defined categories of inputs are weighted by their prices in the base year (1974-75). Because the measures relate to input quantities, they do not reflect changes in the efficiency with which labour, capital and other inputs are used.

22. The estimates of the wages, salaries and other labour cost components of these constant price estimates were obtained by multiplying, for each broad category of labour, the quantity (man-years) of labour used in each period by the relevant average labour cost in the base period. The non-labour cost components were estimated by deflating each current price value by a composite price index of relevant materials or capital expenditure items. In revaluing R & D expenditure, extensive use has been made of price series used in deriving constant price national accounts estimates.

23. For a more comprehensive description of constant price concepts and estimation procedures see *Australian National Accounts, Gross Product by Industry at Current and Constant Prices, 1977-78*, (52.11.0) Section C, page 4.

Reliability of statistics

24. Many university and CAE departments had to make estimates when completing the survey questionnaire because they did not record data on R & D activity separately. Additionally, the OECD standard definition of R & D used for the survey differs in some respects from what particular respondents may regard as research and development.

25. Some respondents found difficulty in allocating their R & D programs to a particular socio-economic objective, and a degree of subjectivity was required to classify those programs. The objective 'general advancement of knowledge' was used for those R & D programs for which it was the clear socio-economic objective, however, it was also used for those R & D programs that contributed to two or more of the listed objectives and where no single objective was selected as predominant. As a result data shown in the general advancement of

knowledge classification may be slightly overestimated. It is considered that 1976 data in respect of the general advancement of knowledge objective are also overestimated and to a greater extent than those for 1978.

26. The university overhead expenditure component of 1976 data shown in Tables 1 and 5 was estimated by applying 1978 (not 1976) ratios of R & D manpower to total manpower (see paragraph 19 above for general methodology). However, it is considered that these results would differ only marginally from those which would have been obtained had 1976 ratios been available.

27. Caution should be exercised in any analysis of movements in R & D expenditure data between 1976 and 1978 because the expenditure data for universities are estimated (see paragraphs 18 to 20 above).

28. Because of the method of collection, research student stipends, other than those reported as research scholarships in the TEC universities statistics collection, are not included in these data. They are similarly excluded from previous R & D surveys of this sector by the Department of Science and Technology.

29. As a result of the factors mentioned above, some caution should be exercised when interpreting the statistics contained in this publication.

Related publications

30. Users may also wish to refer to the following publications:

Research and Experimental Development, Business Enterprises, Australia, 1978-79 (8104.0)

Research and Experimental Development, General Government Organisations, Australia, 1978-79 (8109.0)

Project SCORE, Research and Development in Australia, 1976-77, All Sector Results, (Department of Science and the Environment, Canberra, Australia, 1980)

Project SCORE, Research and Development in Australia, 1968-69 (Department of Science, Canberra, Australia, 1973), contains statistics relating to sectors other than the private enterprise sector, and to all sectors combined.

Research and Experimental Development, Energy Production, Utilisation and Conservation, All Sectors, Australia, 1979-80 (8110.0)

Trends in Industrial R & D in Selected OECD Member Countries, 1967-75 (OECD, Paris 1978 (SPT (78) 20)) contains statistics from other OECD countries which are broadly comparable with those in this publication.

Science and Technology Statement 1980-81 (Department of Science and Technology, Canberra, Australia, 1981).

The Measurement of Scientific and Technical Activities ('Frascati Manual') OECD, Paris, 1981

31. A publication, *Research and Experimental Development, All Sector Summary, Australia, 1978-79* (8112.0) incorporating separate results for the Private Non-profit Sector will be published shortly.

32. Current publications produced by the ABS are listed in the *Catalogue of Publications, Australia*, (1101.0) which is available free of charge from any ABS office.

Symbols and other usages

- r figure or series revised since previous issue
- n.e.c. not elsewhere classified
- nil or rounded to zero

33. Where figures have been rounded, discrepancies may occur between sums of the component items and totals.

TABLE 1. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1976 AND 1978
R & D EXPENDITURE AT CURRENT AND CONSTANT PRICES
(£ m)

Higher education organisations(a)	1976	1978
AT CURRENT PRICES		
Universities	239.9	318.8
CAEs	4.2	6.7
Total	244.1	325.5
AT CONSTANT (AVERAGE 1974-75) PRICES(b)		
Universities	209.9	224.7
CAEs	3.8	4.8
Total	213.7	229.5

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 21 to 23 of the Explanatory notes.

TABLE 2. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1976 AND 1978
R & D MANPOWER

Higher education organisations(a)	Man-years of effort on R & D	
	1976	1978
Universities	14,929	15,524
CAEs	361	526
Total	15,290	16,050

(a) See paragraph 13 of the Explanatory notes.

TABLE 3. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1976 AND 1978
R & D EXPENDITURE AND R & D MANPOWER BY SOCIO-ECONOMIC OBJECTIVE(b)

Socio-economic objective(b)	R & D expenditure (£ m)			Man-years of effort on R & D	
	Excluding university overheads(c)		Including university overheads(c)	1976	1978
	1976	1978	1978		
National security (defence)	0.1	0.2	0.3	9	10
Economic development—					
Agriculture	11.2	19.2	25.8	991	1,384
Forestry and fisheries	1.2	1.4	2.0	134	114
Mining (prospecting)—					
energy sources	0.2	0.2	0.3	24	17
other	0.4	0.7	1.1	47	61
Mining (extraction)—					
energy sources	0.2	0.2	0.3	18	18
other	0.5	1.3	1.8	44	94
Manufacturing	5.5	8.5	11.2	488	657
Construction	1.2	1.6	2.0	109	97
Energy	3.8	7.1	9.0	290	411
Transport	1.3	1.8	2.3	104	131
Communications	0.9	1.7	2.2	90	125
Economic services n.e.c.	6.4	9.6	12.2	461	612
Total economic development	32.8	53.3	70.1	2,800	3,721
Community welfare—					
Urban and regional planning	1.4	1.8	2.5	123	152
Environment	3.1	3.6	4.7	258	230
Health	20.5	47.4	56.9	1,412	2,284
Education	5.4	9.0	11.4	494	585
Welfare	1.0	2.6	3.3	73	157
Community services n.e.c.	3.0	6.4	8.1	184	365
Total community welfare	34.4	70.8	86.9	2,544	3,773
Advancement of knowledge—					
Earth, ocean and atmosphere n.e.c.	8.2	12.9	17.6	700	996
General advancement of knowledge	108.9	116.3	150.7	9,233	7,551
Total advancement of knowledge	117.1	129.3	168.2	9,933	8,547
Total	184.3	253.6	325.5	15,290	16,050
Universities' contribution	180.1	246.9	318.8	14,929	15,524
CAEs' contribution	4.2	6.7	6.7	361	526

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See paragraphs 18 to 20 of the Explanatory notes and Table 5.

TABLE 4. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1976 AND 1978
R & D EXPENDITURE AND R & D MANPOWER BY FIELD OF SCIENCE(b)

Field of science(b)	R & D expenditure (\$ m)				
	Excluding university overheads(c)		Including university overheads(c)	Man-years of effort on R & D	
	1976	1978	1978	1976	1978
Natural sciences—					
Physical sciences	21.4	27.6	34.4	1,485	1,496
Chemical sciences	14.4	18.3	23.9	1,136	1,202
Biological sciences	29.6	43.4	56.5	2,518	2,771
Earth sciences	9.0	10.3	13.6	748	741
Engineering and applied sciences	19.6	28.0	36.2	1,786	2,007
Agricultural sciences	11.3	18.1	24.7	1,096	1,274
Medical sciences	25.9	38.6	45.2	1,692	1,649
<i>Total natural sciences</i>	<i>131.2</i>	<i>184.3</i>	<i>234.5</i>	<i>10,461</i>	<i>11,140</i>
Social sciences and humanities—					
Economics	6.4	10.0	12.1	463	469
Education	6.8	7.9	11.0	681	777
Management	0.7	0.8	1.0	40	52
Political science	1.5	3.7	4.8	121	236
Sociology	2.1	3.5	4.7	215	264
Other social sciences and humanities	35.6	43.4	57.4	3,308	3,112
<i>Total social sciences and humanities</i>	<i>53.1</i>	<i>69.3</i>	<i>91.0</i>	<i>4,828</i>	<i>4,910</i>
Total	184.3	253.6	325.5	15,290	16,050

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See paragraphs 18 to 20 of the Explanatory notes and Table 5.

TABLE 5. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY UNIVERSITIES, AUSTRALIA, 1976 AND 1978
R & D EXPENDITURE BY TYPE OF EXPENDITURE (\$ m)

Type of expenditure	Universities R & D expenditure			
	Excluding university overheads(a)		Including university overheads(a)	
	1976	1978	1976	1978
Land and buildings	8.4	8.1	8.4	8.1
Other capital expenditure	8.0	19.6	9.6	23.7
Wages and salaries	141.5	189.2	180.7	234.2
Other current expenditure	22.2	30.1	41.1	52.9
Total	180.1	246.9	239.9	318.8

(a) See paragraphs 18 to 20 of the Explanatory notes.

TABLE 6. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a),
AUSTRALIA, 1978
R & D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE(b) BY SOURCE OF FUNDS
(\$'000)

Socio-economic objective(b)	Source of funds					Total
	Commonwealth government	State government	Business enterprises	Private non-profit organisations	Overseas sources	
National security (defence)	230	—	—	7	33	270
Economic development—						
Agriculture	23,716	869	330	733	189	25,837
Forestry and fisheries	1,914	29	9	20	10	1,982
Mining (prospecting) —						
energy sources	314	3	5	1	2	325
other	1,035	4	11	6	3	1,059
Mining (extraction) —						
energy sources	278	1	30	8	—	317
other	1,548	37	154	39	9	1,787
Manufacturing	10,669	107	198	154	49	11,177
Construction	1,926	21	10	19	4	1,979
Energy	8,479	223	113	135	30	8,981
Transport	2,241	16	11	30	2	2,301
Communications	2,181	8	7	14	14	2,223
Economic services n.e.c.	11,897	108	37	111	25	12,177
Total economic development	66,198	1,426	915	1,270	337	70,146
Community welfare—						
Urban and regional planning	2,447	31	4	36	2	2,519
Environment	4,450	126	29	62	15	4,681
Health	51,769	423	686	3,652	363	56,894
Education	10,984	171	16	163	77	11,411
Welfare	3,132	62	10	54	5	3,262
Community services n.e.c.	7,898	43	16	80	48	8,084
Total community welfare	80,680	856	761	4,047	510	86,851
Advancement of knowledge—						
Earth, ocean and atmosphere n.e.c.	16,967	273	143	165	40	17,587
General advancement of knowledge	145,337	1,323	1,046	2,087	866	150,658
Total advancement of knowledge	162,304	1,596	1,189	2,252	906	168,245
Total	309,412	3,879	2,865	7,574	1,784	325,514
Universities' contribution	303,440	3,545	2,753	7,332	1,763	318,833
CAEs' contribution	5,972	334	112	242	21	6,681

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes.

TABLE 7. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE(b) BY TYPE OF EXPENDITURE AND TYPE OF ACTIVITY(c)
(\$'000)

Socio-economic objective(b)	Total expenditure	Type of expenditure				Type of activity(c)			
		Land and buildings	Other capital expenditure	Wages and salaries	Other current expenditure	Pure basic research	Strategic basic research	Applied research	Experimental development
National security (defence)	270	3	12	182	72	33	203	30	4
Economic development—									
Agriculture	25,837	185	1,965	18,548	5,140	8,370	5,493	9,578	2,397
Forestry and fisheries	1,982	8	121	1,386	467	645	871	440	26
Mining (prospecting)—									
energy sources	325	—	29	243	55	69	72	139	46
other	1,059	3	115	723	218	97	278	650	34
Mining (extraction)—									
energy sources	317	1	25	240	51	75	32	124	86
other	1,287	5	152	1,309	321	410	295	820	263
Manufacturing	11,177	60	1,149	8,153	1,815	2,085	2,421	4,882	1,792
Construction	1,979	11	163	1,523	282	182	551	1,009	237
Energy	8,981	31	926	6,530	1,493	2,054	1,739	3,596	1,552
Transport	2,301	22	183	1,724	372	122	501	1,367	310
Communications	2,223	12	254	1,551	406	381	354	1,144	343
Economic services n.e.c.	12,177	69	696	9,650	1,762	2,152	3,173	5,623	1,230
Total economic development	70,146	407	5,778	51,580	12,382	16,642	15,778	29,372	8,356
Community welfare—									
Urban and regional planning	2,519	20	120	1,933	447	576	677	1,147	120
Environment	4,681	72	302	3,451	856	1,340	707	2,315	318
Health	56,894	4,988	4,537	39,422	7,946	17,309	14,070	21,751	3,763
Education	11,411	628	608	8,521	1,655	2,393	2,179	5,241	1,597
Welfare	3,262	21	126	2,673	443	1,046	1,046	1,161	212
Community services n.e.c.	8,084	111	341	6,475	1,157	3,540	2,416	1,751	380
Total community welfare	86,851	5,840	6,034	62,475	12,504	26,001	21,095	33,366	6,390
Advancement of knowledge—									
Earth, ocean and atmosphere n.e.c.	17,587	100	1,498	12,572	3,417	9,812	2,987	3,865	922
General advancement of knowledge	150,658	1,712	10,854	113,109	24,982	112,751	19,291	13,932	4,684
Total advancement of knowledge	168,245	1,812	12,352	125,681	28,399	122,563	22,278	17,797	5,606
Total	325,514	8,064	24,177	239,917	53,356	165,239	59,354	80,566	20,355
Universities' contribution	318,833	8,064	23,655	234,172	52,941	164,350	58,438	76,906	19,139
CAES' contribution	6,681	—	522	5,745	415	889	916	3,660	1,216

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See page 8 of Appendix A.

TABLE 8. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE IN THE NATURAL SCIENCES BY SOCIO-ECONOMIC OBJECTIVE(b) BY TYPE OF EXPENDITURE AND TYPE OF ACTIVITY(c)
(\$'000)

Socio-economic objective(b)	Type of expenditure					Type of activity(c)			
	Total expenditure	Land and buildings	Other capital expenditure	Wages and salaries	Other current expenditure	Pure basic research	Strategic basic research	Applied research	Experimental development
<i>National security (defence)</i>	41	—	2	34	5	3	7	26	4
Economic Development—									
Agriculture	25,436	184	1,943	18,241	5,069	8,304	5,366	9,375	2,391
Forestry and fisheries	1,860	6	117	1,294	442	576	856	401	26
Mining (prospecting)—									
energy sources	271	—	28	197	48	69	72	85	46
other	1,059	3	115	723	218	97	278	650	34
Mining (extraction)—									
energy sources	317	1	25	240	51	75	32	124	86
other	1,787	5	152	1,309	321	410	295	820	263
Manufacturing	11,039	59	1,144	8,046	1,789	2,052	2,411	4,784	1,792
Construction	1,979	11	163	1,523	282	182	551	1,009	237
Energy	8,798	30	922	6,376	1,469	2,000	1,709	3,497	1,592
Transport	1,967	20	174	1,449	324	74	415	1,197	282
Communications	1,802	9	221	1,218	354	206	312	977	307
Economic services n.e.c.	4,206	39	399	3,152	617	577	706	1,994	930
<i>Total economic development</i>	60,521	367	5,403	43,768	10,984	14,622	13,003	24,913	7,986
Community welfare—									
Urban and regional planning	1,122	13	77	791	241	163	317	566	75
Environment	3,755	70	272	2,702	712	1,150	555	1,753	297
Health	54,384	4,821	4,431	37,589	7,543	16,681	13,413	20,566	3,723
Education	1,619	488	119	835	178	162	216	553	688
Welfare	255	1	10	207	37	27	111	106	17
Community services n.e.c.	854	10	89	586	169	90	121	515	130
<i>Total community welfare</i>	61,989	5,403	4,998	42,709	8,880	18,273	14,733	24,059	4,924
Advancement of knowledge—									
Earth, ocean and atmosphere n.e.c.	16,420	90	1,453	11,682	3,195	9,295	2,839	3,382	904
General advancement of knowledge	95,538	1,318	8,554	69,061	16,604	70,607	13,039	8,216	3,675
<i>Total advancement of knowledge</i>	111,958	1,408	10,007	80,743	19,799	79,902	15,878	11,598	4,579
Total	234,511	7,181	20,411	167,251	39,668	112,800	43,620	60,597	17,494
Universities' contribution	229,855	7,181	19,971	163,325	39,379	112,257	42,986	57,953	16,659
CAEs' contribution	4,656	—	440	3,927	289	543	634	2,644	835

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See page 8 of Appendix A.

TABLE 9. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE IN THE SOCIAL SCIENCES BY SOCIO-ECONOMIC OBJECTIVE(b) BY TYPE OF EXPENDITURE AND TYPE OF ACTIVITY(c)
(\$'000)

Socio-economic objective(b)	Type of expenditure					Type of activity(c)			
	Total expenditure	Land and buildings	Other capital expenditure	Wages and salaries	Other current expenditure	Pure basic research	Strategic basic research	Applied research	Experimental development
National security (defence)	229	3	10	148	67	30	196	4	—
Economic development—									
Agriculture	401	1	22	307	71	66	127	203	6
Forestry and fisheries	122	2	4	92	25	69	15	39	—
Mining (prospecting)—									
energy sources	54	—	1	46	7	—	—	54	—
other	—	—	—	—	—	—	—	—	—
Mining (extraction)—									
energy sources	—	—	—	—	—	—	—	—	—
other	—	—	—	—	—	—	—	—	—
Manufacturing	139	1	5	107	26	33	10	98	—
Construction	—	—	—	—	—	—	—	—	—
Energy	183	1	4	154	24	54	30	99	—
Transport	334	2	9	275	48	48	86	170	28
Communications	421	3	33	333	52	175	42	167	36
Economic services n.e.c.	7,971	30	297	6,498	1,145	1,575	2,467	3,629	300
Total economic development	9,623	40	375	7,812	1,398	2,026	2,775	4,459	370
Community welfare—									
Urban and regional planning	1,397	7	43	1,142	206	413	360	581	45
Environment	925	2	30	749	144	190	152	562	21
Health	2,509	167	106	1,833	403	628	657	1,185	40
Education	9,792	140	489	7,687	1,477	2,231	1,963	4,688	909
Welfare	3,007	20	116	2,466	406	816	935	1,055	201
Community services n.e.c.	7,230	101	252	5,889	988	3,450	2,295	1,236	250
Total community welfare	24,880	437	1,036	19,766	3,624	7,728	6,362	9,307	1,466
Advancement of knowledge—									
Earth, ocean and atmosphere n.e.c.	1,167	10	45	890	222	517	148	483	18
General advancement of knowledge	55,120	394	2,300	44,048	8,378	42,144	6,252	5,716	1,009
Total advancement of knowledge	56,287	404	2,345	44,938	8,600	42,661	6,400	6,199	1,027
Total	91,003	883	3,766	72,665	13,688	52,439	15,734	19,969	2,861
Universities' contribution	88,978	883	3,684	70,847	13,562	52,093	15,452	18,953	2,480
CAEs' contribution	2,025	—	82	1,818	126	346	282	1,016	381

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See page 8 of Appendix A.

TABLE 10. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D MANPOWER BY SOCIO-ECONOMIC OBJECTIVE(b) BY MAJOR FIELD OF SCIENCE(b) AND TYPE OF EMPLOYEE(c)
(man-years)

Socio-economic objective(b)	Natural sciences				Social sciences				Total R & D manpower			
	Type of employee(c)			Total natural sciences	Type of employee(c)			Total social sciences	Type of employee(c)			Total
	Researchers	Technicians	Other supporting staff		Researchers	Technicians	Other supporting staff		Researchers	Technicians	Other supporting staff	
National security (defence)	2	—	—	3	5	—	2	7	7	—	2	10
Economic development—												
Agriculture	919	385	58	1,362	17	2	3	22	936	387	61	1,384
Forestry and fisheries	84	20	3	107	5	1	1	7	89	21	4	114
Mining (prospecting)—												
energy sources	10	4	1	15	1	—	—	2	11	4	1	17
other	44	13	4	61	—	—	—	—	44	13	4	61
Mining (extraction)—												
energy sources	12	5	1	18	—	—	—	—	12	5	1	18
other	66	23	6	94	—	—	—	—	66	23	6	94
Manufacturing	477	148	25	650	6	—	1	7	483	148	26	657
Construction	62	29	6	97	—	—	—	—	62	29	6	97
Energy	281	102	19	402	7	1	1	9	288	103	20	411
Transport	81	27	6	114	13	2	2	17	94	29	8	131
Communications	76	27	4	106	16	1	2	19	92	28	6	125
Economic services n.e.c.	172	52	13	237	297	37	42	375	469	89	55	612
Total economic development	2,284	835	146	3,263	362	44	52	458	2,646	879	198	3,721
Community welfare—												
Urban and regional planning	82	8	3	93	44	6	9	59	126	14	12	152
Environment	143	34	9	186	30	8	6	44	173	42	15	230
Health	1,287	694	149	2,130	128	16	10	154	1,415	710	159	2,284
Education	31	14	6	50	414	70	51	535	445	84	57	585
Welfare	5	1	—	7	125	12	12	150	130	13	12	157
Community services n.e.c.	34	6	2	43	269	16	36	322	303	22	38	365
Total community welfare	1,582	757	169	2,509	1,010	128	124	1,264	2,592	885	293	3,773
Advancement of knowledge—												
Earth, ocean and atmosphere n.e.c.	680	196	56	932	48	10	6	64	728	206	62	996
General advancement of knowledge	3,137	1,022	275	4,434	2,782	140	195	3,117	5,919	1,162	470	7,551
Total advancement of knowledge	3,817	1,218	331	5,366	2,830	150	201	3,181	6,647	1,368	532	8,547
Total	7,685	2,808	647	11,140	4,209	323	378	4,910	11,894	3,132	1,024	16,050
Universities' contribution	7,395	2,748	632	10,776	4,066	314	368	4,748	11,461	3,062	1,001	15,524
CAEs' contribution	290	61	14	364	143	9	10	162	433	70	24	526

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See paragraph 10 of the Explanatory notes.

TABLE 11. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
DETAILS OF R & D EXPENDITURE AND R & D MANPOWER BY FIELD OF SCIENCE(b)

Field of science(b)	R & D expenditure (\$'000)								R & D manpower (man-years)			
	Type of expenditure					Type of activity(c)				Type of employee(d)		
	Total expenditure	Land and buildings expenditure	Other capital expenditure	Wages and salaries expenditure	Other current expenditure	Pure basic research	Strategic basic research	Applied research	Experimental development	Researchers	Technicians	Other supporting staff
Natural sciences—												
Physical sciences	34,437	79	2,954	25,674	5,730	25,798	2,986	2,871	2,783	1,110	282	104
Chemical sciences	23,919	124	2,380	16,959	4,456	17,963	3,345	1,986	625	858	267	78
Biological sciences	56,485	969	4,893	40,459	10,165	37,959	9,282	7,936	1,308	1,934	711	126
Earth sciences	13,585	46	1,194	9,783	2,556	8,452	2,065	2,326	742	521	167	53
Engineering and applied sciences	36,161	192	3,554	26,569	5,847	6,430	7,609	16,703	5,420	1,446	468	93
Agricultural sciences	24,706	132	1,818	17,519	5,237	5,163	7,123	9,880	2,540	867	352	55
Medical sciences	45,217	5,639	3,618	30,283	5,678	11,036	11,211	18,896	4,076	949	561	138
Total natural sciences	234,511	7,181	20,411	167,251	39,668	112,800	43,620	60,597	17,494	7,685	2,808	647
Social sciences and humanities—												
Economics	12,122	45	692	9,577	1,809	3,157	3,443	5,062	460	389	33	48
Education	10,989	139	566	8,533	1,752	2,997	2,116	4,854	1,022	649	70	58
Management	1,034	5	31	796	202	157	272	546	61	39	6	7
Political science	4,775	11	155	3,860	749	3,488	1,124	126	37	210	8	18
Sociology	4,660	85	140	3,814	621	1,880	1,630	1,041	109	228	13	23
Other social sciences and humanities	57,421	599	2,182	46,085	8,554	40,759	7,149	8,340	1,173	2,693	194	225
Total social sciences and humanities	91,003	883	3,766	72,665	13,688	52,439	15,734	19,969	2,861	4,209	323	378
Total	325,514	8,064	24,177	239,917	53,356	165,239	59,354	80,566	20,355	11,894	3,132	1,024

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes. (c) See page 8 of Appendix A. (d) See paragraph 10 of the Explanatory notes.

TABLE 12. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE AND R & D MANPOWER BY STATE

State	Total expenditure	R & D manpower (man-years)			Total
		Type of employee(s)			
		Researchers	Technicians	Other supporting staff	
New South Wales	101,291	3,617	922	256	4,795
Victoria	69,766	3,358	634	231	4,223
Queensland	35,723	1,339	388	109	1,836
South Australia	30,562	1,129	321	76	1,526
Western Australia	21,672	871	213	85	1,168
Tasmania	6,536	247	62	14	323
Northern Territory	—	—	—	—	—
Australian Capital Territory	59,964	1,332	592	754	2,178
Total	325,514	11,894	3,132	1,024	16,050

(a) See paragraph 13 of the Explanatory notes. (b) See paragraph 10 of the Explanatory notes.

TABLE 13. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE BY SOCIO-ECONOMIC OBJECTIVE(b) BY STATE
(5'000)

Socio-economic objective(h)	State								Total
	N.S.W.	Vic.	Qld	S.A.	W.A.	Tas.	N.T.	A.C.T.	
National security (defence)	37	41	—	53	—	—	—	136	270
Economic development—									
Agriculture	8,813	3,525	4,825	3,428	2,133	673	—	2,440	25,837
Forestry and fisheries	218	488	273	149	33	119	—	702	1,982
Mining (prospecting)—									
energy sources	100	68	31	55	16	—	—	54	325
other	282	163	140	—	—	126	—	348	1,059
Mining (extraction)—									
energy sources	117	—	118	—	—	—	—	83	317
other	487	203	552	9	396	29	—	111	1,787
Manufacturing	5,568	2,420	1,311	728	410	278	—	462	11,177
Construction	1,036	373	276	235	61	—	—	—	1,979
Energy	3,714	1,106	1,450	630	334	36	—	1,709	8,981
Transport	956	628	275	271	36	71	—	75	2,223
Communications	755	205	682	233	241	32	—	65	2,301
Economic services n.e.c.	3,936	2,992	1,477	767	632	133	—	2,241	12,177
Total economic development	25,982	12,171	11,410	6,505	4,292	1,497	—	8,290	70,146
Community welfare—									
Urban and regional planning	887	397	411	252	215	28	—	331	2,519
Environment	999	1,265	832	251	141	338	—	854	4,681
Health	17,488	15,750	6,086	6,956	3,598	983	—	6,032	56,894
Education	4,623	2,292	1,382	626	806	205	—	1,477	11,411
Welfare	899	542	350	381	257	22	—	810	3,262
Community services n.e.c.	2,567	1,228	481	325	501	144	—	2,738	8,084
Total community welfare	27,463	21,574	9,542	8,791	5,518	1,720	—	12,242	86,851
Advancement of knowledge—									
Earth, ocean and atmosphere n.e.c.	5,128	2,835	2,955	1,824	1,188	531	—	3,126	17,587
General advancement of knowledge	42,683	33,144	11,813	13,387	10,672	2,788	—	36,169	150,658
Total advancement of knowledge	47,811	35,979	14,768	15,211	11,860	3,319	—	39,295	168,245
Total	101,291	69,766	35,723	30,562	21,672	6,536	—	59,964	325,514
Universities' contribution	100,105	67,270	34,870	29,522	20,809	6,491	—	59,766	318,833
CAEs' contribution	1,186	2,496	853	1,040	863	45	—	198	6,681

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes.

TABLE 14. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D MANPOWER BY SOCIO-ECONOMIC OBJECTIVE(b) BY STATE
(man-years)

Socio-economic objective(b)	State								Total
	N.S.W.	Vic.	Qld	S.A.	W.A.	Tas.	N.T.	A.C.T.	
National security (defence)	3	1	—	2	—	—	—	4	10
Economic development—									
Agriculture	468	205	288	190	104	39	—	90	1,384
Forestry and fisheries	17	25	16	6	1	10	—	39	114
Mining (prospecting)—									
energy sources	3	3	2	5	1	—	—	2	17
other	16	8	10	—	—	10	—	17	61
Mining (extraction)—									
energy sources	6	—	8	—	—	—	—	3	18
other	26	15	27	2	20	2	—	3	94
Manufacturing	335	164	65	36	23	11	—	22	657
Construction	48	20	14	12	3	—	—	—	97
Energy	176	65	72	25	20	2	—	51	411
Transport	49	45	15	12	3	4	—	3	131
Communications	37	14	41	15	14	1	—	4	125
Economic services n.e.c.	209	164	71	50	39	6	—	75	612
Total economic development	1,390	728	629	353	228	85	—	309	3,721
Community welfare—									
Urban and regional planning	57	30	20	22	10	1	—	11	152
Environment	56	57	45	11	8	19	—	34	230
Health	515	836	277	234	188	37	—	199	2,284
Education	252	121	70	29	42	8	—	63	585
Welfare	36	43	12	29	10	1	—	24	157
Community services n.e.c.	116	81	23	14	21	9	—	102	365
Total community welfare	1,032	1,169	447	339	279	75	—	433	3,773
Advancement of knowledge—									
Earth, ocean and atmosphere n.e.c.	275	180	175	116	82	32	—	134	906
General advancement of knowledge	2,095	2,145	585	716	579	131	—	1,298	7,551
Total advancement of knowledge	2,370	2,325	760	832	661	163	—	1,432	8,547
Total	4,795	4,223	1,836	1,526	1,168	323	—	2,178	16,050
Universities' contribution	4,723	3,991	1,786	1,447	1,093	320	—	2,165	15,524
CAEs' contribution	72	232	50	79	75	3	—	13	526

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes.

TABLE 15. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE AND R & D MANPOWER BY SOCIO-ECONOMIC OBJECTIVE(b) BY TYPE OF ORGANISATION
AND MAJOR FIELD OF SCIENCE(b)

Socio-economic objective(b)	Universities						CAE's					
	R & D expenditure (\$'000)			R & D manpower (man-years)			R & D expenditure (\$'000)			R & D manpower (man-years)		
	Major field of science			Major field of science			Major field of science			Major field of science		
	Natural	Social	Total	Natural	Social	Total	Natural	Social	Total	Natural	Social	Total
National security (defence)	29	218	247	2	7	9	12	11	23	1	—	1
Economic development—												
Agriculture	24,835	367	25,202	1,322	19	1,341	601	34	635	40	3	43
Forestry and fisheries	1,844	120	1,964	106	7	113	16	2	18	1	—	1
Mining (prospecting)—												
energy sources	257	55	312	14	2	16	14	—	14	1	—	1
other	1,046	—	1,046	60	—	60	13	—	13	1	—	1
Mining (extraction)—												
energy sources	292	—	292	16	—	16	25	—	25	2	—	2
other	1,774	—	1,774	92	—	92	13	—	13	2	—	2
Manufacturing	10,318	129	10,447	586	7	593	721	10	731	64	—	64
Construction	1,840	—	1,840	92	—	92	139	—	139	5	—	5
Energy	8,511	177	8,688	381	9	390	287	6	293	21	—	21
Transport	1,913	318	2,231	108	16	124	54	16	70	6	1	7
Communications	1,746	351	2,097	102	14	116	56	70	126	4	5	9
Economic services n.e.c.	3,778	7,909	11,687	208	370	578	428	62	490	29	5	34
Total economic development	58,154	9,425	67,579	3,087	444	3,531	2,367	200	2,567	176	14	190
Community welfare—												
Urban and regional planning	1,078	1,312	2,390	87	56	143	44	85	129	6	3	9
Environment	3,560	831	4,391	174	42	216	195	94	289	12	2	14
Health	53,462	2,413	55,875	2,046	148	2,194	922	96	1,018	84	6	90
Education	1,513	8,809	10,322	44	455	499	106	983	1,089	6	80	86
Welfare	255	2,802	3,057	7	126	133	—	205	205	—	24	24
Community services n.e.c.	804	7,057	7,861	40	306	346	50	173	223	3	16	19
Total community welfare	60,672	23,224	83,896	2,398	1,133	3,531	1,317	1,636	2,953	111	131	242
Advancement of knowledge—												
Earth, ocean and atmosphere n.e.c.	16,155	1,159	17,314	907	63	970	265	8	273	25	1	26
General advancement of knowledge	94,844	54,949	149,793	4,383	3,101	7,484	604	171	775	51	16	67
Total advancement of knowledge	110,999	56,108	167,107	5,290	3,164	8,454	869	179	1,048	76	17	93
Total	229,855	88,978	318,833	10,776	4,748	15,524	4,656	2,025	6,681	364	162	526

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes.

TABLE 16. RESEARCH AND EXPERIMENTAL DEVELOPMENT CARRIED OUT BY HIGHER EDUCATION ORGANISATIONS(a), AUSTRALIA, 1978
R & D EXPENDITURE AND R & D MANPOWER BY FIELD OF SCIENCE(b) BY TYPE OF ORGANISATION

Field of science(b)	Universities		CAEs	
	R & D expenditure (\$'000)	R & D manpower (man-years)	R & D expenditure (\$'000)	R & D manpower (man-years)
Natural sciences—				
Physical sciences	33,702	1,442	735	54
Chemical sciences	23,660	1,174	259	28
Biological sciences	56,186	2,748	299	23
Earth sciences	13,518	728	67	13
Engineering and applied sciences	33,995	1,862	2,166	145
Agricultural sciences	24,299	1,243	407	31
Medical sciences	44,495	1,579	722	70
<i>Total natural sciences</i>	<i>229,855</i>	<i>10,776</i>	<i>4,656</i>	<i>364</i>
Social sciences and humanities—				
Economics	12,092	463	30	6
Education	10,399	722	590	55
Management	1,018	52	16	—
Political science	4,775	236	—	—
Sociology	4,472	242	188	22
Other social sciences and humanities	56,221	3,035	1,200	77
<i>Total social sciences and humanities</i>	<i>88,978</i>	<i>4,748</i>	<i>2,025</i>	<i>162</i>
Total	318,833	15,524	6,681	526

(a) See paragraph 13 of the Explanatory notes. (b) See paragraphs 14 to 17 of the Explanatory notes.

AUSTRALIAN BUREAU OF STATISTICS

University
Department or School

FOR OFFICE USE ONLY	
FT	501
UC	
FS	

SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT — 1978
UNIVERSITY RETURN

The 1978 Survey of Research and Experimental Development is being conducted by the ABS as part of the Department of Science and the Environment's Project SCORE (Survey and Comparisons of Research Expenditures).

This return refers only to the Department or School mentioned above and relates to R & D, (as defined by the OECD — see definition on page 2) carried out during 1978.

If actual figures are not available, please supply careful estimates.

Should you encounter any difficulties in interpreting the instructions or definitions in this return, please discuss them with your university contact offices. (Additional copies of the form are available from your university contact officer if required).

Completed returns will be forwarded to the Department of Science and the Environment by your university contact officer. The Department will micro-copy the returns for its reference and then forward the returns to the ABS for statistical processing.

PLEASE FORWARD YOUR COMPLETED RETURN TO YOUR UNIVERSITY CONTACT OFFICER NOT LATER THAN

Name of University Contact Officer	Telephone No.
--	--------------------

AUSTRALIAN BUREAU OF STATISTICS

Project SCORE

SCORE surveys are the only comprehensive source of statistical data on expenditure and manpower devoted to research and experimental development in Australia.

The data obtained from SCORE surveys provide important background for informed discussion in relation to current science and technology policy, including issues related to economic planning, social welfare, education and the environment. Users of these statistics include advisors in fields related to scientific development and technological innovation, researchers and research managers developing cases for funding, and government departments and academic institutions interested in the interaction of science policy and economic growth.

Departmental Representative completing this return.

Name of Representative Telephone No.
(BLOCK LETTERS) (STD Code)

Signature Date

THE UNIVERSITY SURVEY

The university survey is one of a number of collections conducted by the ABS primarily for the purpose of providing aggregate statistics for Project SCORE. The survey was last conducted by the then Department of Science for the 1976 calendar year. Summary statistics relating to the Higher Education Sector (i.e. universities and colleges of advanced education) are shown in the accompanying brochure.

Project SCORE university statistics make use of information from the annual universities' statistics collection conducted by the Tertiary Education Commission, but this information needs to be supplemented by data from the current enquiry in order to produce statistics compatible with other SCORE surveys. In this way, consistent and comprehensive national statistics on R & D can be compiled.

University R & D statistics are also used for sector-by-sector and within-sector comparisons of the level and distribution of research activity in Australia.

Details are required from universities at the research programme level for a number of reasons, for example:—

- experience has shown that in most cases university R & D statistics need to be compiled at least at the programme level if a reasonable degree of accuracy is to be achieved;
- programme details are used by the Department of Science and the Environment to provide ministerial advice and for general science policy considerations;
- programme reporting enables a more accurate classification by socio-economic objective.

The information requested in the 1978 survey is basically the same as that requested for 1976, although the format and wording of the questionnaire have been simplified. No details are being collected in this survey year for the Australian Research Directory.

INTERPRETATION OF THE DEFINITION OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

This survey conforms to the standards for research and experimental development (R & D) statistics formulated by the Organisation for Economic Co-operation and Development (OECD). The OECD defines R & D as follows:

"Research and experimental development comprises 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."

Any activity classified as R & D should contain an appreciable amount of NOVELTY, it should have INVESTIGATION as a primary objective and should have 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 or object. For example, devising and validating an econometric model is R & D, but routine use of such a model is not.

THE FOLLOWING ACTIVITIES, often regarded as research or development, are to be EXCLUDED, EXCEPT where they are used primarily for the support of specific R & D projects or to develop new techniques.

- preparation for teaching
- literary and artistic activities such as writing books and composing music
- scientific and technical information services
- general purpose data collection (i.e. data collection not undertaken as part of a specific research project)
- standardisation and routine testing
- feasibility studies
- specialised routine medical care
- patent and licence work

[illegible]

DEPARTMENTAL MANPOWER IN 1978

SOCIO-ECONOMIC OBJECTIVES

Broad Objective Area	Objective	CODE
GENERAL ADVANCEMENT OF KNOWLEDGE	General advancement of knowledge	801A
AGRICULTURE	Animal	811G
	Plant	812L
	Other (please specify)	818T
FORESTRY	Forestry	821P
FISHERIES	Fisheries	831X
MINING (including resource assessment techniques, and relevant aspects of petroleum geology, geoscience technology, geotechnics, and mining engineering).	Extraction techniques — uranium	841O
	Extraction techniques — metallic minerals (other than uranium)	842G
	Extraction techniques — coal	843L
	Extraction techniques — oil and gas	844S
	Extraction techniques — other (please specify)	848P
	Prospecting & resource assessment techniques — uranium	851L
	Prospecting & resource assessment techniques — metallic minerals (other than uranium)	852P
	Prospecting & resource assessment techniques — coal	853T
	Prospecting & resource assessment techniques — oil and gas	854Z
	Prospecting & resource assessment techniques — other (please specify)	858X
MANUFACTURING		
Food, beverages & tobacco	Food	861S
	Beverages and malt	862X
	Tobacco	863A
Textiles, clothing and footwear	Textiles and textile products	864E
	Clothing and footwear	865K
Wood, wood products and furniture	Wood, wood products and furniture	866P
Paper, paper products, printing and publishing	Paper and paper products	867T
Chemical, petroleum and coal products	Printing and allied industries	868Z
	Chemical fertilisers	869C
	Industrial gases	870T
	Synthetic resins and rubber	871Z
	Organic industrial chemicals n.e.c.	872C
	Inorganic industrial chemicals n.e.c.	873G
	Paints	874L
	Pharmaceuticals	875S
	Veterinary products	876X
	Pesticides	877A
Non-metallic mineral products	Other chemicals, petroleum and coal products	878E
	Glass and glass products	879K
	Clay products and refractories	880A
	Cement and concrete products	881E
	Other non-metallic mineral products	882K
Basic metal products	Basic iron and steel	883P
	Basic non-ferrous metals and products	884T
Fabricated metal products	Structural and sheet metal products	885Z
	Other fabricated metal products	886C
Transport equipment	Motor vehicles and parts	887G
	Ships and boats	888L
	Railway rolling stock and locomotives	889S
	Aircraft	890G
Other machinery and equipment	Transport equipment n.e.c.	891L
	Photographic, professional and scientific equipment	892S
	Radio and T.V. receivers, audio equipment	893X
	Computers and electronic calculating machines	894A
	Other electronic equipment n.e.c.	895E
	Refrigerators and household appliances	896K
	Other electrical machinery and equipment n.e.c.	897P
	Agricultural machinery	898T
	Construction machinery	899Z
	Materials handling equipment	900E
	Other industrial machinery and equipment	901K
Miscellaneous manufacturing	Leather and leather products	902P
	Rubber products	903T
	Plastic and related products	904Z
	Other manufacturing	909X
ENERGY		
Production and utilisation of energy from	Oil and gas	611S
	Coal	612X
	Solar	613A
	Nuclear	614E
	Other primary sources	615K
Production and utilisation of synthetic fuels from	Coal	616P
	Biomass	617T
	Conservation of energy	618Z
Conservation of energy	Other energy R&D	619C
Other energy R&D (including supporting technologies such as electricity transmission and distribution, energy storage, energy systems analysis etc.)		

SOCIO-ECONOMIC OBJECTIVES

Broad Objective Area	Objective	CODE
TRANSPORT (other than aspects covered under MANUFACTURING)	Road accidents & safety 061T Other road 062Z Railway 063C Water transport 064G Air transport 065L Multimodal transport 066S Intermodal materials handling 067K Other transport (please specify) 068E Telecommunications & broadcasting 061A Postal 062E Other (please specify) 069L Construction 071G	
COMMUNICATIONS (other than aspects covered under MANUFACTURING)		
CONSTRUCTION (other than aspects covered under "non-metallic mineral products", "fabricated metal construction materials", and "Construction & earthmoving machinery & equipment")		
WHOLESALE & RETAIL TRADE	Wholesale & retail trade 081P	
BANKING, FINANCE & INSURANCE	Banking, finance & insurance 061X	
HEALTH - Medical (Based on the W.H.O. International Classification of Diseases)	Infective and parasitic diseases 701T Neoplasms 702Z Endocrine, nutritional and metabolic diseases 703C Diseases of the blood and blood-forming organs 704G Mental disorders 705L Diseases of the nervous system and sense organs 706S Diseases of the circulatory system 707X Diseases of the respiratory system 708A Diseases of the digestive system (including oral) 709E Diseases of the genitourinary system 710A Complications of pregnancy, childbirth and the puerperium 711A Diseases of the skin and subcutaneous tissue 712E Diseases of the musculoskeletal system and connective tissue 713K Pharmacology, toxicology 714P Other (please specify) 729I Health services 731P Environmental health 732T Occupational health 733Z Drug dependence (incl. alcoholism) 734C Other (please specify) 739A Water supply 741X	
HEALTH - Public		
WATER SUPPLY (except "water pollution" aspects)	Waste disposal & recycling (except aspects covered under ENERGY)	751C 759F
WASTE DISPOSAL & RECYCLING (except aspects covered under ENERGY)	ENVIRONMENT (n.e.s.)	761K 762P 763X 764G 765L 766S 767K 768E 769L 771G 772E 773K 774P 775L 776S 777X 778A 779E 781A 782E 783K 784C 789A
ENVIRONMENT (n.e.s.)		
INFORMATION TECHNOLOGY (n.e.s.)		
(including inter alia general ADP systems both hardware and general system software, but excluding those aspects covered under MANUFACTURING and COMMUNICATIONS as well as application of ADP systems in areas other than "Information")		
HOUSING (except CONSTRUCTION)		
URBAN & REGIONAL PLANNING (n.e.s.)		
EDUCATION		
ECONOMY (including national, state and regional economic aspects)		
WELFARE		
CONSUMER AFFAIRS		
ADMINISTRATION		
LAW & ORDER		
RECREATION		
FIRE		
INTERNATIONAL		
EARTH (except aspects covered under MINING and ENERGY)		
OCEAN (except aspects covered under FISHERIES)		
ATMOSPHERE		
REMOTE SENSING (as applied to natural resources and related)		
DEFENCE (n.e.s.) (Please use objectives other than DEFENCE where relevant to indicate the nature of the R&D)		
OTHER R&D (n.e.s.)		

EXPLANATORY NOTES

Predominant Socio-Economic Objective. In answering Question 1, classify each research programme to the most appropriate socio-economic objective in the list provided on pages 6 and 7. The term "objective" refers to the ultimate national needs rather than to the immediate objectives of the researcher or university. The objective 'General advancement of knowledge' should be used for those programmes for which this is the clear socio-economic objective (e.g. research into astronomy) together with those programmes that could contribute to several of the listed objectives in ways that do not allow one such objective to be selected as predominant.

Type of R&D Activity

Basic Research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Pure Basic Research is research which is carried out without looking for long term economic or social benefits other than advancement of knowledge. It includes all Humanities R&D.

Strategic Basic Research is 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.

Applied Research also refers to original investigation undertaken in order to acquire new knowledge. It is, however directed towards a specific practical aim or objective. Applied research is undertaken either to determine possible uses for the findings of basic research or to determine new methods or ways of achieving some specific and predetermined objectives.

Experimental Development refers to systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products and devices, to installing new processes and improving substantially those already produced or installed. In the social sciences experimental development may be defined as the process of translating knowledge gained through research into operational programmes including demonstration projects for testing and evaluation.

Man years of effort. For the purposes of this survey a person is considered capable of working only one man year each year, even though that person may have worked long hours and/or been extremely effective. Take into account each person's total working time (i.e. time spent on university activities) whether worked at the university, at home, on sabbatical leave etc. For example, a full-time academic who joined the department half way through the year and then devoted 40% of his working time to R&D would contribute $0.4 \text{ man} \times 0.5 \text{ years} = 0.2$ man years to Questions 1 and 3 (and 0.5 man years to Question 2), even if his average working time per week were, say, 60 hours.

Personnel Categories

Academic refers to persons who supervise or conduct teaching and/or research and whose salaries are related to academic salaries. *Include* Research Officers or Research Assistants with 'academic' duties.

Technical refers to persons undertaking technical or professional tasks in support of teaching and/or research activities and whose salaries are related to technical salaries. *Include* Research Officers or Research Assistants with no 'academic' duties.

Administrative refers to administrative and general service employees whose work indirectly supports teaching and/or research e.g. Administrative Officer, Typist.

Post-Graduate Research Student refers to students enrolled in PhD or other doctorate degrees, or in masters or other post-graduate research courses. *Exclude* bachelor honours and masters preliminary or qualifying students. *Exclude* full time academic personnel of this department or school enrolled for a higher degree offered by this department (who should be classified as academics).

Type of Staff

Teaching and Research refers to persons primarily concerned with the teaching functions of the university but who may also carry out or assist with research.

Research-Only refers to persons primarily expected to carry out or support research work but who also may be associated from time to time with teaching, the development of post-graduate courses or the limited supervision of post-graduate students.



APPENDIX B
PLEASE RETAIN ONE COPY FOR YOUR OWN RECORDS

FORM R07

AUSTRALIAN BUREAU OF STATISTICS

College
Department/School or equivalent

SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT - 1978
COLLEGE OF ADVANCED EDUCATION RETURN

FOR OFFICE USE ONLY	
FT	507
CC	
FS	

The 1978 Survey of Research and Experimental Development is being conducted by the ABS as part of the Department of Science and the Environment's Project SCORE (Survey and Comparisons of Research Expenditures).

This return refers only to the Department or School specified above and relates to R&D (as defined by the OECD - see definition on page 2) carried out during 1978.

If actual figures are not available, please supply careful estimates.

Should you encounter any difficulties in interpreting the instructions or definitions on this return, please discuss them with your college contact officer. (Additional copies of the form are available from him if required).

Completed returns will be forwarded to the Department of Science and the Environment by your college contact officer. The Department will micro-copy the returns for its reference and then forward the returns to the ABS for statistical processing.

PLEASE FORWARD YOUR COMPLETED RETURN TO YOUR COLLEGE CONTACT OFFICER NOT LATER THAN

Name of College Contact Officer	Telephone No.
---------------------------------------	--------------------

AUSTRALIAN BUREAU OF STATISTICS

Project SCORE

SCORE surveys are the only comprehensive source of statistical data on expenditure and manpower devoted to research and experimental development in Australia.

The data obtained from SCORE surveys provide important background for informed discussion in relation to current science and technology policy, including issues related to economic planning, social welfare, education and the environment. Users of these statistics include advisers in fields related to scientific development and technological innovation, researchers and research managers developing cases for funding, and government departments and academic institutions interested in the interaction of science policy and economic growth.

Departmental Representative completing this return.

Name of Representative Telephone No.
(BLOCK LETTERS) (STD CODE)

Signature Date

THE COLLEGE OF ADVANCED EDUCATION SURVEY

The C.A.E. survey is one of a number of collections conducted by the ABS primarily for the purpose of providing aggregate statistics for Project SCORE. The survey was last conducted by the then Department of Science for the 1976 calendar year. Summary statistics relating to the Higher Education Sector (i.e. universities and colleges of advanced education) are shown in the accompanying brochure.

R&D statistics from C.A.E.'s are necessary for the compilation of national aggregates. They are also used for sector-by-sector and within-sector comparisons of the level and distribution of research activity in Australia.

Details are required from colleges at the research programme level for a number of reasons, for example:-

- . experience has shown that in most cases C.A.E. R&D statistics need to be compiled at least at the programme level if a reasonable degree of accuracy is to be achieved.
- . programme details are used by the Department of Science and the Environment to provide ministerial advice and for general science policy considerations.
- . programme reporting enables a more accurate classification by socio-economic objective.

The information requested in the 1978 survey is basically the same as that requested for 1976, although the format and wording of the questionnaire have been simplified. No details are being collected in this survey year for the Australian Research Directory.

INTERPRETATION OF THE DEFINITION OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

This survey conforms to the standards for research and experimental development (R&D) statistics formulated by the Organisation for Economic Co-operation and Development (OECD). The OECD defines R&D as follows:

"Research and experimental development comprises 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."

Any activity classified as R&D should contain an appreciable amount of NOVELTY, it should have INVESTIGATION as a primary objective and should have 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 or object. For example, devising and validating an econometric model is R&D, but routine use of such a model is not.

THE FOLLOWING ACTIVITIES, often regarded as research or development, are to be EXCLUDED, EXCEPT where they are used primarily for the support of specific R&D projects or to develop new techniques.

- . preparation for teaching
- . literary and artistic activities such as writing books and composing music
- . scientific and technical information services
- . general purposes data collection (i.e. data collection not undertaken as part of a specific research project)
- . standardisation and routine testing
- . feasibility studies
- . specialised routine medical care
- . patent and licence work

- Provide below details of all research programmes undertaken by your Department or School during 1978 which involved any R&D activity (as defined by the OECD — see definition on page 2).
- The term 'research programme' refers to a group of research projects each of which has the same predominant socio-economic objective (in terms of those listed on pages 6 and 7). Report preferably at the programme level (though you may report at the sub-programme level if you wish).
- Number each programme and rule a line after each programme. Extra copies of this return are available from your college contact officer if you require more space.
- If, for reasons of privacy, you would prefer not to provide the Department of Science and the Environment and the ABS with a programme description, report the statistical details and mark the description "Not available".
- Columns 4 to 9 refer only to the R&D component of each programme and only to the effort of researchers and post-graduate students. Take into account the R&D activity of visiting academics, exchange personnel and persons occupying temporary positions. *Include* also the activity of research staff supervising R&D undertaken by post-graduate students.
- Columns 4 to 7 should sum to 100 for each programme, even though it is realised that estimates will be subjective.
- Additional instructions and definitions are provided in the explanatory notes on the back page.

Pro- gramme No.	Brief description of research programme (please type or print clearly)	Pre- dominant socio- economic objective code (see pages 6&7)	Type of R&D activity (% distribution)				Man years of R&D effort during 1978 (report to 1 decimal place)	
			Basic research		Applied research	Experi- mental develop- ment	Researcher	Post- graduate research student
			Pure	Strategic				
	2	3	4	5	6	7	8	9
TOTAL (carry forward to next page)								

Question 1 continued

Programme No.	Brief description of research programme (please type or print clearly)	Pre-dominant socio-economic objective code (see pages 6&7)	Type of R&D activity (% distribution)				Man years of R&D effort during 1978 (report to 1 decimal place)	
			Basic research		Applied research	Experimental development	Researcher	Post-graduate research student
			Pure	Strategic				
	2.	3.	4.	5.	6.	7.	8.	9.
TOTAL (brought forward from previous page)								
TOTAL								

2. MAN YEARS OF EFFORT ON R&D UNDERTAKEN BY YOUR DEPARTMENT DURING 1978

(see explanatory notes on the back page)

Report below the total number of man years which in 1978 were attributable to R&D (as defined by the OECD — see definition on page 2).

Include departmental activities directly supporting R&D (e.g. a proportion of time spent by departmental typists).

Include any R&D effort of visiting academics, exchange personnel and persons occupying temporary positions.

PERSONNEL CATEGORIES	Man years of effort attributable to R&D (Report to 1 decimal place)
Researchers	(a)
Post-graduate Students	(a)
Technical Staff	
Administrative Staff	
TOTAL	

(a) to agree with total all-programme aggregates reported for columns 8-9 of Question 1.

3. EXPENDITURE ON R&D UNDERTAKEN BY YOUR DEPARTMENT DURING 1978

(see explanatory notes on the back page)

Estimate below the expenditure incurred on R&D (as defined on page 2) undertaken by your department during 1978.

Where significant expenditure is shared by R&D and non-R&D activities (e.g. administration costs, fuel, rates, computing expenses, library costs, etc.), the R&D proportion should be estimated and included in the relevant figure.

	TYPE OF EXPENDITURE	EXPENDITURE \$
CURRENT EXPENDITURE	Wages, salaries and other labour costs (including superannuation, holiday pay etc.)	
	— Researchers	
	— Technical staff	
	— Administrative staff	
	Other current expenditure (exclude depreciation provisions)	
CAPITAL EXPENDITURE on new and second hand fixed tangible assets less value of disposals	Land, buildings and other structures	
	Vehicles, plant, machinery, equipment etc.	
TOTAL		

4. SOURCE OF FUNDS FOR EXPENDITURE ON R&D UNDERTAKEN BY YOUR DEPARTMENT DURING 1978

(see explanatory notes on the back page)

Estimate below the direct source of all funds for R&D (as defined on page 2) undertaken by your department during 1978. Include funding from grants, commissions, contracts etc.

SOURCE	EXPENDITURE \$
General college funds	
Australian Research Grants Committee (A.R.G.C.)	
Other Australian sources (specify)	

Overseas sources (specify)	

TOTAL (to agree with TOTAL in Q.3)	

Please comment below on any special or unusual circumstances concerning the figures reported in this return (or difficulties encountered in completing it).

SOCIO-ECONOMIC OBJECTIVES

Broad Objective Area	Objective	CODE
GENERAL ADVANCEMENT OF KNOWLEDGE	General advancement of knowledge	501A
AGRICULTURE	Animal	511G
	Plant	512L
	Other (please specify)	519T
FORESTRY	Forestry	521P
FISHERIES	Fisheries	531X
MINING (including resource assessment techniques, and relevant aspects of petroleum geology, geoscience technology, geotechnics, and mining engineering).	Extraction techniques — uranium	541O
	Extraction techniques — metallic minerals (other than uranium)	542G
	Extraction techniques — coal	543L
	Extraction techniques — oil and gas	544S
	Extraction techniques — other (please specify)	548P
	Prospecting & resource assessment techniques — uranium	551L
	Prospecting & resource assessment techniques — metallic minerals (other than uranium)	552P
	Prospecting & resource assessment techniques — coal	553T
	Prospecting & resource assessment techniques — oil and gas	554Z
	Prospecting & resource assessment techniques — other (please specify)	559X
MANUFACTURING		
Food, beverages & tobacco	Food	561S
	Beverages and malt	562X
	Tobacco	563A
Textiles, clothing and footwear	Textiles and textile products	564E
	Clothing and footwear	565K
Wood, wood products and furniture	Wood, wood products and furniture	566P
Paper, paper products, printing and publishing	Paper and paper products	567T
	Printing and allied industries	568Z
Chemical, petroleum and coal products	Chemical fertilisers	569C
	Industrial gases	570T
	Synthetic resins and rubber	571Z
	Organic industrial chemicals n.e.c.	572C
	Inorganic industrial chemicals n.e.c.	573G
	Paints	574L
	Pharmaceuticals	575S
	Veterinary products	576X
	Pesticides	577A
	Other chemicals, petroleum and coal products	578E
Non-metallic mineral products	Glass and glass products	579K
	Clay products and refractories	580A
	Cement and concrete products	581T
	Other non-metallic mineral products	582K
Basic metal products	Basic iron and steel	583P
	Basic non-ferrous metals and products	584T
Fabricated metal products	Structural and sheet metal products	585Z
	Other fabricated metal products	586C
Transport equipment	Motor vehicles and parts	587G
	Ships and boats	588L
	Railway rolling stock and locomotives	589S
	Aircraft	590G
	Transport equipment n.e.c.	591L
Other machinery and equipment	Photographic, professional and scientific equipment	592S
	Radio and T.V. receivers; audio equipment	593X
	Computers and electronic calculating machines	594A
	Other electronic equipment n.e.c.	595E
	Refrigerators and household appliances	596K
	Other electrical machinery and equipment n.e.c.	597P
	Agricultural machinery	598T
	Construction machinery	599Z
	Materials handling equipment	600E
	Other industrial machinery and equipment	601K
Miscellaneous manufacturing	Leather and leather products	602P
	Rubber products	603T
	Plastic and related products	604Z
	Other manufacturing	609X
ENERGY		
Production and utilisation of energy from	Oil and gas	611S
	Coal	612X
	Solar	613A
	Nuclear	614E
	Other primary sources	615K
Production and utilisation of synthetic fuels from	Coal	616P
	Biomass	617T
	Conservation of energy	618Z
Conservation of energy		
Other energy R&D (including supporting technologies such as electricity transmission and distribution, energy storage, energy systems analysis etc.)	Other energy R&D	619C

SOCIO-ECONOMIC OBJECTIVES

Broad Objective Area	Objective	CODE
TRANSPORT (other than aspects covered under MANUFACTURING)	Road accidents & safety	861T
	Other road	862Z
	Railway	863C
	Water transport	864G
	Air transport	865L
	Multimodal transport	866S
	Intermodal materials handling	867X
	Other transport (please specify)	868E
COMMUNICATIONS (other than aspects covered under MANUFACTURING)	Telecommunications & broadcasting	861A
	Postal	862E
	Other (please specify)	869L
CONSTRUCTION (other than aspects covered under "non-metallic mineral products", "Fabricated metal construction materials", and "Construction & earthmoving machinery & equipment")	Construction	871G
WHOLESALE & RETAIL TRADE	Wholesale & retail trade	881P
BANKING, FINANCE & INSURANCE	Banking, finance & insurance	891X
HEALTH - Medical (Based on the W.H.O. International Classification of Diseases)	Infective and parasitic diseases	701T
	Neoplasms	702Z
	Endocrine, nutritional and metabolic diseases	703C
	Diseases of the blood and blood-forming organs	704C
	Mental disorders	705L
	Diseases of the nervous system and sense organs	706S
	Diseases of the circulatory system	707X
	Diseases of the respiratory system	708A
	Diseases of the digestive system (including oral)	709E
	Diseases of the genito-urinary system	710X
	Complications of pregnancy, childbirth and the puerperium	711A
	Diseases of the skin and subcutaneous tissue	712E
	Diseases of the musculoskeletal system and connective tissue	713A
	Pharmacology, toxicology	714P
	Other (please specify)	729T
	Health services	731P
	Environmental health	732T
	Occupational health	733Z
	Drug dependence (incl. alcoholism)	734C
	Other (please specify)	739A
	Water supply	741X
WATER SUPPLY (except "water pollution" aspects)	Sewage	751C
WASTE DISPOSAL & RECYCLING (except aspects covered under ENERGY)	Other waste (please specify)	759F
ENVIRONMENT (n.e.i.)	Protection and rehabilitation of natural environment	761K
	Protection of man-made environment	762P
INFORMATION TECHNOLOGY n.e.i.	ADP systems n.e.i.	811K
Including n.e.i.'s general ADP systems both hardware and general system software, but excluding those aspects covered under MANUFACTURING and COMMUNICATIONS as well as application of ADP systems in areas other than "Information"	Other information media n.e.i.	812P
	Information indexing and retrieval systems	813T
	Information reproduction n.e.i.	814Z
	General statistical methodology	818C
	Other information technology (please specify)	819X
HOUSING (except CONSTRUCTION)	Housing	821S
URBAN & REGIONAL PLANNING n.e.i.	Urban & regional planning	831Z
EDUCATION	Education	841E
ECONOMY (including national, state and regional economic aspects)	Economy n.e.i.	851L
	Overseas trade	862S
	Productivity n.e.i.	863X
	Industrial relations	864A
WELFARE	Unemployment/unemployed	851T
	Aboriginal welfare	862Z
	Migrant welfare	863C
	Aged persons	864G
	Youth/child welfare	865L
CONSUMER AFFAIRS	Social services n.e.i.	866S
ADMINISTRATION	Consumer affairs	871A
LAW & ORDER	Public administration	881G
	Law reform	891P
RECREATION	Law enforcement	892T
	Corrective services	893Z
	Sport	901L
	Culture	902S
	Parks	903X
FIRE	Other recreation	909Z
INTERNATIONAL	Fire protection	911T
	International relationships	921A
EARTH (except aspects covered under MINING and ENERGY)	R&D primarily for the benefit of other countries	922E
	Geology	931G
	Geophysics	932L
	Geochimistry	933S
	Cartography	934X
	Geomechanics	935A
	Hydrology	936Z
	Other earth (please specify)	939T
OCEAN (except aspects covered under FISHERIES)	Coastal & ocean engineering	941P
	Biological marine science n.e.i.	942T
	Other ocean (please specify)	949A
ATMOSPHERE	Meteorology	951X
	Atmospheric physics n.e.i.	956A
	Other atmosphere (please specify)	959G
REMOTE SENSING (as applied to natural processes and resources)	Remote sensing	961C
DEFENCE n.e.i. (Please use objectives other than DEFENCE where relevant, to indicate the nature of the R&D)	Defence n.e.i.	071K
OTHER R&D n.e.i.	Other R&D n.e.i. (please specify)	981S

EXPLANATORY NOTES

Predominant Socio-Economic Objective. In answering Question 1, classify each research programme to the most appropriate socio-economic objective in the list provided on pages 6 & 7. The term 'objective' refers to the ultimate national needs rather than to the immediate objectives of the researcher or college. The objective 'General advancement of knowledge' should be used for those programmes for which this is the clear socio-economic objective, together with those programmes that could contribute to several of the listed objectives in ways that do not allow one such objective to be selected as predominant.

Type of R&D Activity

Basic Research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Pure Basic Research is research which is carried out without looking for long term economic or social benefits other than advancement of knowledge. It includes all Humanities R&D.

Strategic Basic Research is 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.

Applied Research also refers to original investigation undertaken in order to acquire new knowledge. It is, however, directed towards a specific practical aim or objective. Applied research is undertaken either to determine possible uses for the findings of basic research or to determine new methods or ways of achieving some specific and predetermined objectives.

Experimental Development refers to systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products and devices, to installing new processes and improving substantially those already produced or installed. In the social sciences experimental development may be defined as the process of translating knowledge gained through research into operational programmes, including demonstration projects for testing and evaluation.

Man Years of Effort. For the purposes of this survey a person is considered capable of working only one man year each year, even though that person may have worked long hours and/or been extremely effective. Take into account each person's total working time (i.e. time spent on college activities) whether worked at the college, at home, on sabbatical leave etc. For example, a full-time researcher who devoted 40% of his working time to R&D during half the survey year would contribute $0.4 \text{ man} \times 0.5 \text{ years} = 0.2 \text{ man years}$ to the R&D effort, even if his average working time per week, were, say 60 hours.

Personnel Categories

Researchers refers to staff engaged in the conception and/or creation of new knowledge, products, processes, methods or systems.

Post-Graduate Research Students refers to students enrolled in masters or other post-graduate research courses. *Exclude* bachelor honours and masters preliminary or qualifying students. *Exclude* full-time academic personnel of this department undertaking a higher degree offered by this department (they should be classified as researchers).

Technical Staff refers to persons undertaking technical tasks in support of research activities. These tasks include preparing materials and equipment for experiments, tests and analysis, taking records, etc.

Administrative Staff refers to administrative and general service employees whose work supports research e.g. Administrative Officer, Typist.

Type of Expenditure**Current Expenditure**

-Wages, salaries and other labour costs refer to gross earnings before taxation and other deductions. *Include* overtime earnings, shift allowance, penalty rates 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. An estimate of the proportion of the labour costs of overhead staff that is attributable to the support of R&D should be included where significant.

-Other current expenditure: *Include* expenditure on items such as materials, fuels, rent and leasing, repairs and maintenance, data processing, reference materials and special services in support of R&D (e.g. payments to outside organisations for use of specialised testing facilities). The estimated proportion of expenditure on general services and overhead costs attributable to the R&D effort should be included where significant.

Capital Expenditure. Only expenditure incurred in 1978 on the acquisition (less disposal) of fixed tangible assets, either new or second-hand, with an expected life of greater than one year should be reported. A proportion of expenditure on assets used partly for R&D should be included where significant.

-Land, buildings and other structures: *Include* major alterations, but *exclude* repairs and maintenance (which should be reported in "Other current expenditure").

Source of Funds

General college funds refers to contributions from the Commonwealth Government, appropriations for Colleges of Advanced Education and income (available for the college's own use) generated from the sale of services to outside bodies.