

# **RESEARCH AND EXPERIMENTAL DEVELOPMENT**

**BUSINESSES  
AUSTRALIA**

EMBARGO: 11.30AM (CANBERRA TIME) MON 3 JULY 2000

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■ For further information about these and related statistics, contact the National Information Service on 1300 135 070 or Kevin Squair on Canberra 02 6252 5707.

## NOTES

### RESEARCH AND DEVELOPMENT (R&D) GUIDELINES

Australian Bureau of Statistics (ABS) surveys of R&D are conducted in accordance with standard guidelines promulgated by the Organisation for Economic Co-operation and Development (OECD).

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### ABBREVIATIONS

ABS	Australian Bureau of Statistics
ANZSIC	Australian and New Zealand Standard Industrial Classification
BERD	Business Expenditure on R&D
FOR	Field of research
GDP	Gross Domestic Product
n.e.c.	not elsewhere classified
OECD	Organisation for Economic Co-operation and Development
R&D	Research and experimental development
SEO	Socio-economic objective

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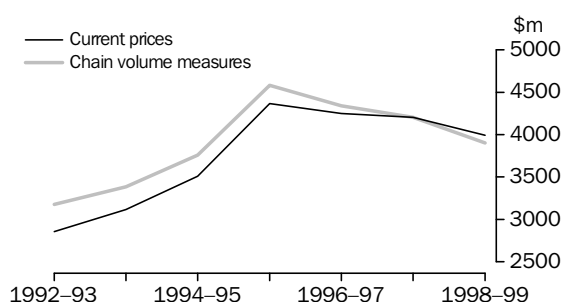
## MAIN FEATURES

### EXPENDITURE ON R&D

Business Expenditure on R&D (BERD) has fallen for the third year in a row. In 1998-99, BERD was estimated to be \$3,992m at current prices, a fall of 5% on 1997-98 and 9% lower than the record level of 1995-96.

In volume terms, BERD also continued to fall, with 1998-99 down 7% on 1997-98.

#### EXPENDITURE ON R&D



R&D Labour costs rose very slightly in 1998-99 (an increase of \$3m compared with 1997-98). Other current expenditure decreased by \$143m, while Capital expenditure fell by \$70m.

The change in BERD between 1997-98 and 1998-99 resulted from:

- Approximately 2,550 businesses undertaking expenditure in both years; they incurred \$3,880m of R&D in 1997-98 and \$3,733m in 1998-99, a fall of 4%. Not all businesses decreased their expenditure in 1998-99; 41% of continuing R&D performers recorded increases in expenditure of 10% or more, while 36% recorded decreases of greater than 10%.
- Approximately 650 businesses which recorded \$323m in 1997-98, not reporting any R&D in 1998-99.
- Approximately 620 businesses which did not report R&D in 1997-98, recording \$258m in 1998-99.

The Mining industry recorded a 10% decrease in R&D expenditure, while the Manufacturing industry also fell by 7%. R&D expenditure by Other industries (in total) remained the same.

### HUMAN RESOURCES

Human resources devoted to R&D in 1998-99 were 24,201 person years, 1% lower than in 1997-98.

#### RESOURCES DEVOTED TO R&D(a)

	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99
Expenditure							
At current prices (\$m)	2 861.9	3 119.2	3 508.3	r4 365.8	r4 246.9	r4 202.8	3 991.7
Chain volume measures (\$m)	3 176.3	3 389.6	3 760.9	4 580.8	4 338.6	4 202.8	3 902.6
Human resources (person years)	22 919	23 742	25 812	27 151	r26 498	r24 549	24 201

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(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

## MAIN FEATURES *continued*

### COMPARISON WITH GDP

Australia's BERD as a percentage of GDP fell to 0.67% in 1998-99, following decreases in 1996-97 and 1997-98. The falls followed significant increases to a high of 0.86% in 1995-96.

BERD AS A PERCENTAGE OF GDP



Australia's BERD/GDP ratio remains relatively low when compared with other OECD countries as shown in the table below.

BERD/GDP RATIOS OF OECD COUNTRIES

	1996- 97	1997- 98	1998- 99
	%	%	%
Korea	2.04	2.10	na
Japan	2.01	2.10	na
United States of America	1.95	2.01	2.08
Finland	1.72	1.83	1.98
Germany	1.52	1.56	1.57
France	1.43	1.37	1.37
United Kingdom	1.27	1.22	na
Denmark	1.12	1.18	1.19
Netherlands	1.10	1.15	na
Canada	0.97	1.01	1.03
Czech Republic	0.64	0.74	0.83
<b>Australia</b>	<b>0.80</b>	<b>0.74</b>	<b>0.67</b>
Italy	0.55	0.53	0.56
Spain	0.42	0.42	0.43
Poland	0.31	0.30	0.32
Hungary	0.28	0.30	0.26

na not available

## RESOURCES DEVOTED TO R&D

INDUSTRY COMPARISON	<p>R&amp;D expenditure by the Mining industry fell by 10% in 1998-99 to \$478m (12% of total R&amp;D expenditure). The Mining industry's R&amp;D human resources increased by 2% on 1997-98 whilst accounting for 4% of total R&amp;D human resources. The Manufacturing industry's R&amp;D expenditure declined by 7% on 1997-98 to \$1,983m (50% of total R&amp;D expenditure). Human resources devoted to R&amp;D by the Manufacturing industry decreased by 3% on 1997-98 and accounted for 54% of total R&amp;D human resources. The Finance and insurance industry recorded a decrease in R&amp;D expenditure of 48% in comparison with 1997-98, although R&amp;D human resources fell by only 18%.</p>
TYPE OF EXPENDITURE	<p>In 1998-99, Labour costs accounted for 40% of total R&amp;D expenditure. Other current expenditure made up 48%, while Capital expenditure accounted for 12%.</p> <p>The Mining industry had the lowest labour costs as a proportion of R&amp;D expenditure (16%) and the Finance and insurance industry had the highest (65%).</p>
TYPE OF ACTIVITY	<p>In 1998-99, Experimental development was the most significant type of R&amp;D activity undertaken by businesses. Expenditure on Experimental development was \$3,058m (77% of total R&amp;D expenditure). Applied research accounted for \$794m (20%), while Basic research only accounted for \$140m (4%). The Mining industry had a high proportion of its R&amp;D expenditure directed towards Experimental development (88%). Applied research was consistent across most industries (around 20% of total R&amp;D expenditure). It was higher (31%) in the Scientific research industry and lower (10%) in the Mining industry. Basic research was low in all industries except for Scientific research where it represented 17% of expenditure for businesses in that industry.</p>
SOURCE OF FUNDS FOR R&D	<p>The business sector provided most of the R&amp;D expenditure funds itself: \$3,549m (89%) was sourced from Own funds and \$141m (4%) from Other businesses. The Commonwealth Government provided \$84m (2%) from Competitive grants for industry R&amp;D and \$30m (1%) from Other Commonwealth Government sources. Overseas funding provided \$132m or 3%.</p> <p>The Scientific research industry was the only industry that did not provide the bulk of R&amp;D expenditure funding from Own funds (only 42%). A further 26% was provided by Other businesses with the Commonwealth Government providing another 13%.</p>
STATE COMPARISONS	<p>The leading States in terms of R&amp;D expenditure were Victoria with \$1,435m and New South Wales with \$1,329m, accounting for 36% and 33% of total R&amp;D expenditure respectively. Queensland recorded \$440m (11%), while Western Australia with \$433m (11%) had the next highest R&amp;D expenditure.</p> <p>Compared to 1997-98, R&amp;D expenditure fell by \$96m in New South Wales, \$47m in Queensland and \$30m in Western Australia.</p> <p>In the Mining industry, Western Australia accounted for \$214m (45%), New South Wales \$91m (19%) and Queensland \$75m (16%).</p> <p>Major contributors to R&amp;D in the Manufacturing industry were Victoria \$743m (37%) and New South Wales \$708m (36%).</p>

## RESOURCES DEVOTED TO R&D *continued*

EXPENDITURE BY SIZE OF BUSINESS	<p>The largest businesses, employing 1000 or more, accounted for 38% of total R&amp;D expenditure (39% in 1997-98). On average this was more than \$11m per business undertaking R&amp;D. Businesses employing less than 10 people accounted for only 5% of the R&amp;D (4% in 1997-98). This averaged out at approximately \$195,000 for each business undertaking R&amp;D.</p> <p>The ABS defines small business as those employing less than 100 people in Manufacturing industries and less than 20 in other industries. Small businesses accounted for 25% of Manufacturing R&amp;D and 13% of R&amp;D in other industries.</p>
SOCIO-ECONOMIC OBJECTIVE	<p>Most business R&amp;D, \$3,519m or 88%, was directed towards Economic development. Of this \$1,785m (51%) was directed towards Manufacturing. Approximately 4% was directed towards Society, 3% towards Defence, 3% towards Environment and 2% to Advancement of knowledge.</p>
FIELD OF RESEARCH	<p>Almost all the R&amp;D expenditure took place in the Natural sciences, technologies and engineering. Of this, 13% was in Computer software, 11% in Communication technologies, 11% in Mining and mineral processing, 10% in Manufacturing and process technologies and engineering and 10% in Mechanical and industrial engineering.</p>
EXPECTED R&D EXPENDITURE	<p>The 'actual' data in table 9 are the R&amp;D business expenditures reported in the 1996-97, 1997-98 and 1998-99 surveys.</p> <p>In each of these surveys, businesses were also asked to report the level of expenditure they expected to incur in the following 12 months. These estimates are respectively shown as 1997-98, 1998-99 and 1999-2000 'expected' data in the table.</p> <p>These estimates should be used with caution because, for many businesses, any forecast expenditure is a best guess.</p> <p>Businesses reported that they expected BERD to be \$3,739m in 1999-2000. This is 6% lower than the actual R&amp;D expenditure incurred in 1998-99. However, it should be noted that for 1997-98 and 1998-99, actual expenditure exceeded expectations by 8% and 7% respectively.</p>
HUMAN RESOURCES BY SIZE OF BUSINESS	<p>R&amp;D performing businesses employing 1,000 or more contributed 24% of human resource effort. However only 1% of their total employment was devoted to R&amp;D. Businesses with less than 10 employees devoted 43% of their total employment to R&amp;D, although this only contributed 7% of the total resources undertaking R&amp;D.</p> <p>The ABS defines small businesses as those employing less than 100 in Manufacturing industries and less than 20 in other industries. Small businesses contributed 30% of human resources to R&amp;D in Manufacturing and 22% in other industries.</p>
TYPE OF HUMAN RESOURCES	<p>Researchers comprised 58% of the human resources devoted to R&amp;D, followed by Technicians with 29% and Other supporting staff with 13%. In Mining, Researchers accounted for 45% and Technicians 41%. Researchers made up 56% in Manufacturing with 29% by Technicians. Within the Manufacturing industries, the proportion by Researchers ranged from a high of 70% in Electronic and electrical equipment and appliances to a low of 43% in Textiles, clothing, footwear and leather. Other industries</p>

## RESOURCES DEVOTED TO R&D *continued*

### TYPE OF HUMAN RESOURCES *continued*

had a high proportion of Researchers with 62%. Within Other industries, Property and business services had 66%, Scientific research 62%, Finance and insurance 59% and Wholesale and Retail trade had 55% Researchers.

### PAYMENTS AND RECEIPTS FOR TECHNICAL KNOW-HOW

Payments for technical know-how (TKH) were estimated to be \$440m while receipts were estimated to be \$290m. These payments and receipts were equivalent to 11% and 7% of BERD, compared with 11% and 6% respectively in 1996-97.

Motor vehicle and part and other transport equipment was the leading industry making payments for TKH at \$91m followed by Petroleum, coal, chemical and associated products at \$82m.

Property and business services was the leading industry earning receipts for TKH at \$109m followed by Motor vehicle and part and other transport equipment at \$38m.

## RESOURCES DEVOTED TO R&amp;D, by industry of business(a)

ANZSIC	NUMBER OF BUSINESSES . . . . .			EXPENDITURE ON R&D			HUMAN RESOURCES DEVOTED TO R&D . . .		
	1996- 97	1997- 98	1998- 99	1996- 97	1997- 98	1998- 99	1996- 97	1997- 98	1998- 99
	no.	no.	no.	\$m	\$m	\$m	person years	person years	person years
<b>Mining (including services to mining)</b>	108	r105	101	r562	r534	478	1 069	r936	957
<b>Manufacturing</b>									
Food, beverages and tobacco	r170	147	145	r231	r180	206	r1 330	r1 045	1 118
Textiles, clothing, footwear and leather	66	55	54	21	22	19	193	180	167
Wood and paper products	40	37	31	191	117	89	262	271	245
Printing, publishing and recorded media	39	39	40	17	19	26	168	184	228
Petroleum, coal, chemical and associated product	343	r309	306	309	r314	340	2 350	r2 309	2 206
Non-metallic mineral product	77	61	58	66	72	54	483	461	391
Metal product	r205	r179	171	r361	r331	269	r1 621	r1 326	1 113
Motor vehicle and part and other transport equipment	127	122	123	401	436	372	2 704	r2 675	2 711
Photographic and scientific equipment	100	95	94	91	93	102	r872	900	897
Electronic and electrical equipment and appliance	360	r327	324	r362	r398	378	r2 891	r2 778	2 797
Industrial machinery and equipment	283	245	223	144	124	110	1 292	1 159	1 038
Other manufacturing	78	73	75	46	36	18	199	208	187
<i>Total manufacturing</i>	r1 888	1 689	1 644	r2 240	r2 142	1 983	r14 366	r13 496	13 096
<b>Other industries</b>									
Wholesale and retail trade	r365	r341	304	r342	r325	345	r2 726	r2 534	2 352
Finance and insurance	46	39	30	96	85	44	1 138	430	354
Property and business services	r742	r757	772	r650	r665	631	r5 261	r5 105	5 308
Scientific research	94	r97	147	147	r164	179	981	r1 104	1 266
Other n.e.c.	179	178	179	210	289	331	958	r945	868
<i>Total other industries</i>	r1 426	r1 412	1 432	r1 445	r1 527	1 531	r11 063	r10 117	10 147
<b>TOTAL ALL INDUSTRIES</b>	<b>r3 422</b>	<b>r3 206</b>	<b>3 177</b>	<b>r4 247</b>	<b>r4 203</b>	<b>3 992</b>	<b>r26 498</b>	<b>r24 549</b>	<b>24 201</b>

r revised

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).



## TYPE OF R&amp;D EXPENDITURE (a)

	Total	Capital expenditure	Labour costs(b)	Other current expenditure
ANZSIC	\$'000	\$'000	\$'000	\$'000
<b>Mining (including services to mining)</b>	478 305	115 401	75 903	287 001
<b>Manufacturing</b>				
Food, beverages and tobacco	206 077	45 757	74 981	85 339
Textiles, clothing, footwear and leather	19 299	955	9 021	9 323
Wood and paper products	88 913	13 127	22 345	53 441
Printing, publishing and recorded media	25 784	1 530	14 579	9 675
Petroleum, coal, chemical and associated product	339 529	32 926	140 156	166 447
Non-metallic mineral product	54 340	5 527	22 065	26 748
Metal product	268 788	59 042	88 036	121 710
Motor vehicle and part and other transport equipment	371 844	24 818	157 132	189 893
Photographic and scientific equipment	102 244	6 549	57 606	38 088
Electronic and electrical equipment and appliance	378 429	21 470	182 098	174 861
Industrial machinery and equipment	109 755	6 635	59 571	43 548
Other manufacturing	17 606	2 512	9 075	6 019
<b>Total manufacturing</b>	<b>1 982 607</b>	<b>220 849</b>	<b>836 665</b>	<b>925 093</b>
<b>Other industries</b>				
Wholesale and retail trade	345 229	47 214	162 745	135 269
Finance and insurance	44 159	1 872	28 906	13 381
Property and business services	631 173	35 880	356 573	238 720
Scientific research	179 089	21 736	76 207	81 145
Other n.e.c.	331 174	23 744	54 046	253 383
<b>Total other industries</b>	<b>1 530 823</b>	<b>130 447</b>	<b>678 478</b>	<b>721 899</b>
<b>TOTAL ALL INDUSTRIES</b>	<b>3 991 735</b>	<b>466 696</b>	<b>1 591 046</b>	<b>1 933 993</b>

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) Includes wages and salaries, payroll tax, payments to contract staff on the payroll, fringe benefits tax, workers compensation insurance, overtime earnings, shift allowances, penalty rates, bonuses, commission payments, holiday pay, long service leave payments, sick pay, employer contributions to superannuation and pension schemes.

## R&amp;D EXPENDITURE, by type of activity(a)(b)

<i>ANZSIC</i>	<i>Total</i>	<i>Basic research</i>	<i>Applied research</i>	<i>Experimental development</i>
	\$'000	\$'000	\$'000	\$'000
<b>Mining (including services to mining)</b>	478 305	9 556	48 680	420 070
<b>Manufacturing</b>				
Food, beverages and tobacco	206 077	11 378	62 897	131 801
Textiles, clothing, footwear and leather	19 299	503	2 504	16 292
Wood and paper products	88 913	np	np	68 704
Printing, publishing and recorded media	25 784	np	np	22 956
Petroleum, coal, chemical and associated product	339 529	8 068	68 786	262 675
Non-metallic mineral product	54 340	np	np	35 119
Metal product	268 788	4 959	65 205	198 624
Motor vehicle and part and other transport equipment	371 844	4 219	46 717	320 908
Photographic and scientific equipment	102 244	6 116	22 851	73 276
Electronic and electrical equipment and appliance	378 429	10 881	63 477	304 071
Industrial machinery and equipment	109 755	2 563	15 986	91 205
Other manufacturing	17 606	603	5 544	11 459
<i>Total manufacturing</i>	1 982 607	56 947	388 570	1 537 090
<b>Other industries</b>				
Wholesale and retail trade	345 229	15 186	77 220	252 823
Finance and insurance	44 159	np	np	33 841
Property and business services	631 173	21 821	182 323	427 029
Scientific research	179 089	30 762	55 062	93 265
Other n.e.c.	331 174	np	np	293 695
<i>Total other industries</i>	1 530 823	73 725	356 446	1 100 652
<b>TOTAL ALL INDUSTRIES</b>	<b>3 991 735</b>	<b>140 227</b>	<b>793 697</b>	<b>3 057 812</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) See paragraph 7 of the Explanatory Notes.

## SOURCE OF FUNDS FOR R&amp;D(a)

ANZSIC	Total \$'000	Own funds \$'000	Other businesses \$'000	Comp- etitive Grants Scheme \$'000	Other Common- wealth Govern- ment \$'000	State and local govern- ment \$'000	Other Australian(b) \$'000	Overseas \$'000
<b>Mining (including services to mining)</b>	478 305	472 473	np	2 117	—	np	1 496	np
<b>Manufacturing</b>								
Food, beverages and tobacco	206 077	199 579	1 582	785	131	—	3 690	310
Textiles, clothing, footwear and leather	19 299	19 040	np	np	—	—	—	—
Wood and paper products	88 913	88 747	np	np	—	—	1	—
Printing, publishing and recorded media	25 784	25 195	np	np	2	—	np	—
Petroleum, coal, chemical and associated product	339 529	305 100	2 967	7 299	2 448	137	512	21 066
Non-metallic mineral product	54 340	54 028	np	191	—	np	—	—
Metal product	268 788	266 450	778	997	9	—	120	434
Motor vehicle and part and other transport equipment	371 844	347 047	np	818	—	—	7 292	np
Photographic and scientific equipment	102 244	83 676	np	5 598	np	30	np	np
Electronic and electrical equipment and appliance	378 429	311 616	53 134	11 248	np	201	1 609	np
Industrial machinery and equipment	109 755	99 432	2 709	3 903	np	np	807	np
Other manufacturing	17 606	16 771	np	678	—	—	np	—
<i>Total manufacturing</i>	<i>1 982 607</i>	<i>1 816 679</i>	<i>65 146</i>	<i>32 123</i>	<i>7 813</i>	<i>434</i>	<i>14 402</i>	<i>46 010</i>
<b>Other industries</b>								
Wholesale and retail trade	345 229	316 902	np	9 806	np	np	np	np
Finance and insurance	44 159	43 843	—	316	—	—	—	—
Property and business services	631 173	500 023	22 512	19 437	15 691	5 392	11 451	56 667
Scientific research	179 089	75 435	46 216	18 728	4 989	1 659	18 836	13 226
Other n.e.c.	331 174	323 927	4 309	1 237	np	np	np	23
<i>Total other industries</i>	<i>1 530 823</i>	<i>1 260 130</i>	<i>np</i>	<i>49 524</i>	<i>22 459</i>	<i>np</i>	<i>30 800</i>	<i>np</i>
<b>TOTAL ALL INDUSTRIES</b>	<b>3 991 735</b>	<b>3 549 282</b>	<b>140 722</b>	<b>83 764</b>	<b>30 272</b>	<b>8 874</b>	<b>46 698</b>	<b>132 124</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

— nil or rounded to zero (including null cells)

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) Includes Higher Education and Private Non-Profit sectors.

## LOCATION OF R&amp;D EXPENDITURE(a)(b)

						Other States and Territories		
	Total	NSW	Vic.	Qld	SA	WA	Overseas	
ANZSIC	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
<b>Mining (including services to mining)</b>	<b>478 305</b>	<b>91 349</b>	<b>31 440</b>	<b>74 901</b>	<b>34 031</b>	<b>213 525</b>	<b>22 368</b>	<b>10 691</b>
<b>Manufacturing</b>								
Food, beverages and tobacco	206 077	89 515	59 666	35 098	15 255	4 613	1 175	755
Textiles, clothing, footwear and leather	19 299	4 589	9 752	2 088	np	1 118	92	np
Wood and paper products	88 913	19 210	42 369	np	2 248	2 821	np	179
Printing, publishing and recorded media	25 784	6 322	15 306	483	1 056	np	np	np
Petroleum, coal, chemical and associated product	339 529	131 733	142 966	27 508	17 393	13 817	4 141	1 971
Non-metallic mineral product	54 340	25 458	9 712	6 884	np	6 378	np	97
Metal product	268 788	74 825	61 065	66 898	4 451	np	np	3 477
Motor vehicle and part and other transport equipment	371 844	27 880	260 831	11 663	28 752	np	2 845	np
Photographic and scientific equipment	102 244	44 474	30 070	np	np	3 837	93	np
Electronic and electrical equipment and appliance	378 429	230 354	76 115	23 053	30 591	14 004	2 565	1 747
Industrial machinery and equipment	109 755	46 899	31 229	14 130	4 066	8 083	3 549	1 799
Other manufacturing	17 606	7 216	3 761	3 384	2 262	885	np	np
<b>Total manufacturing</b>	<b>1 982 607</b>	<b>708 475</b>	<b>742 842</b>	<b>210 214</b>	<b>126 997</b>	<b>145 548</b>	<b>31 134</b>	<b>17 398</b>
<b>Other industries</b>								
Wholesale and retail trade	345 229	94 062	188 488	np	30 958	9 283	np	659
Finance and insurance	44 159	17 940	23 234	np	—	np	—	—
Property and business services	631 173	317 997	136 090	93 657	27 575	32 667	20 304	2 884
Scientific research	179 089	64 233	76 940	17 667	8 964	9 314	1 518	453
Other n.e.c.	331 174	34 811	235 518	22 566	6 556	np	np	189
<b>Total other industries</b>	<b>1 530 823</b>	<b>529 042</b>	<b>660 270</b>	<b>154 793</b>	<b>74 052</b>	<b>74 421</b>	<b>34 060</b>	<b>4 185</b>
<b>TOTAL ALL INDUSTRIES</b>	<b>3 991 735</b>	<b>1 328 866</b>	<b>1 434 552</b>	<b>439 908</b>	<b>235 080</b>	<b>433 493</b>	<b>87 562</b>	<b>32 274</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

— nil or rounded to zero (including null cells)

(a) This may not be the location of the organisation's head office.

(b) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

## EXPENDITURE ON R&amp;D, by business employment size(a)(b)

		Less than 10	10– 19	20– 49	50– 99	100– 199	200– 499	500– 999	1000 or more
ANZSIC	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
<b>Mining (including services to mining)</b>	478 305	7 705	5 515	np	np	62 826	68 215	41 830	259 699
<b>Manufacturing</b>									
Food, beverages and tobacco	206 077	372	2 562	8 368	14 097	8 647	14 515	18 658	138 858
Textiles, clothing, footwear and leather	19 299	792	1 038	2 526	3 466	5 324	1 760	np	np
Wood and paper products	88 913	553	np	np	—	np	3 098	7 343	77 439
Printing, publishing and recorded media	25 784	837	2 343	2 264	6 486	np	—	np	np
Petroleum, coal, chemical and associated product	339 529	5 141	10 769	30 762	34 382	65 058	50 512	78 670	64 235
Non-metallic mineral product	54 340	1 630	np	np	np	3 841	6 011	7 884	27 895
Metal product	268 788	2 685	2 095	46 382	76 393	5 874	10 905	15 537	108 917
Motor vehicle and part and other transport equipment	371 844	5 501	3 937	3 209	7 046	13 974	55 815	26 186	256 176
Photographic and scientific equipment	102 244	6 773	5 453	12 603	np	16 476	33 591	12 711	np
Electronic and electrical equipment and appliance	378 429	14 996	21 724	34 416	47 363	31 133	79 784	133 379	15 634
Industrial machinery and equipment	109 755	7 679	8 545	19 788	20 099	4 499	14 008	5 967	29 170
Other manufacturing	17 606	4 051	2 652	4 148	2 677	np	1 636	np	—
<b>Total manufacturing</b>	<b>1 982 607</b>	<b>51 009</b>	<b>64 773</b>	<b>165 345</b>	<b>220 368</b>	<b>161 281</b>	<b>271 635</b>	<b>313 751</b>	<b>734 445</b>
<b>Other industries</b>									
Wholesale and retail trade	345 229	17 136	12 704	27 911	22 566	22 545	67 783	33 885	140 699
Finance and insurance	44 159	986	—	np	np	np	np	np	24 956
Property and business services	631 173	70 293	68 687	108 582	np	76 302	49 168	np	97 139
Scientific research	179 089	20 995	29 229	47 257	62 313	np	np	—	—
Other n.e.c.	331 174	12 059	9 438	12 513	4 785	8 508	12 280	18 059	253 532
<b>Total other industries</b>	<b>1 530 823</b>	<b>121 468</b>	<b>120 058</b>	<b>np</b>	<b>np</b>	<b>115 803</b>	<b>146 465</b>	<b>133 898</b>	<b>516 326</b>
<b>TOTAL ALL INDUSTRIES</b>	<b>3 991 735</b>	<b>180 183</b>	<b>190 346</b>	<b>376 533</b>	<b>418 500</b>	<b>339 910</b>	<b>486 315</b>	<b>489 479</b>	<b>1 510 470</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

— nil or rounded to zero (including null cells)

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) Employment size is based on the number of persons employed by the business.

## RESOURCES DEVOTED TO R&amp;D, by Socio-economic Objective(a)

## TYPE OF EXPENDITURE . . . . .

	Total	Capital expenditure	Labour costs(b)	Other current expenditure	Human resources
<i>Socio-economic objective</i>	\$'000	\$'000	\$'000	\$'000	person years
<b>Defence</b>	134 070	6 298	62 697	65 076	903
<b>Economic development</b>					
Plant - production and primary products	43 741	6 552	21 732	15 457	381
Animal - production and primary products	33 822	3 029	11 097	19 696	195
Mineral resources (excl. energy)	375 263	104 862	67 981	202 420	882
Energy resources	153 518	13 321	41 381	98 816	465
Energy supply	84 560	18 576	34 572	31 412	559
Manufacturing	1 784 699	208 381	733 701	842 618	11 604
Construction	49 250	3 742	21 695	23 814	403
Transport	85 313	11 544	36 175	37 594	653
Information and communication services	819 123	42 299	378 695	398 128	5 299
Commercial services	88 099	9 100	43 516	35 484	604
Economic framework	1 954	121	1 542	291	21
<i>Total economic development</i>	3 519 342	421 527	1 392 085	1 705 730	21 066
<b>Society</b>					
Health	134 328	11 156	56 432	66 740	898
Education and training	3 932	241	2 435	1 257	56
Social development and community services	20 580	210	16 361	4 009	265
<i>Total society</i>	158 840	11 606	75 228	72 006	1 219
<b>Environment</b>					
Environmental knowledge	16 163	3 497	5 199	7 467	81
Environmental aspects of economic development	48 289	7 091	14 323	26 875	262
Environmental management and other aspects	42 818	7 172	15 836	19 810	209
<i>Total environment</i>	107 269	17 759	35 357	54 152	553
<b>Advancement of knowledge</b>	72 215	9 506	25 680	37 030	460
<b>TOTAL</b>	<b>3 991 735</b>	<b>466 696</b>	<b>1 591 046</b>	<b>1 933 993</b>	<b>24 201</b>

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) Includes wages and salaries, payroll tax, payments to contract staff on the payroll, fringe benefits tax, workers compensation insurance, overtime earnings, shift allowances, penalty rates, bonuses, commission payments, holiday pay, long service leave payments, sick pay, employer contributions to superannuation and pension schemes.

## RESOURCES DEVOTED TO R&amp;D, by Field of Research(a)

Field of research	TYPE OF EXPENDITURE . . . . .				
	Total	Capital expenditure	Labour costs(b)	Other current expenditure	Human resources
	\$'000	\$'000	\$'000	\$'000	person years
<b>Natural sciences, technologies and engineering</b>					
Mathematical sciences	9 737	1 130	5 044	3 563	76
Physical sciences	30 805	2 012	18 196	10 598	257
Chemical sciences	102 268	8 741	49 271	44 256	766
Earth sciences	143 583	11 489	45 066	87 028	509
Information systems and technologies	205 847	22 156	103 594	80 097	1 388
Computer software	535 160	32 391	336 245	166 524	4 903
Communication technologies	438 130	25 555	110 527	302 049	1 658
Other information, computers and communication technologies	202 888	14 230	91 470	97 188	1 272
Manufacturing and process technologies and engineering	416 666	39 212	162 688	214 766	2 558
Industrial biotechnology and food sciences	138 799	32 666	52 453	53 681	841
Material sciences and technologies	161 487	14 432	56 716	90 339	777
Other applied sciences and technologies	62 565	8 739	28 778	25 048	539
Mechanical and industrial engineering	410 833	31 432	175 646	203 755	2 914
Mining and mineral processing	424 279	143 796	55 395	225 087	816
Other general engineering	295 239	40 467	132 207	122 566	2 272
Biological sciences	86 808	4 463	34 818	47 527	557
Agricultural sciences	109 439	8 052	44 675	56 712	726
Medical and health sciences	211 214	25 102	83 886	102 226	1 293
<i>Total natural sciences, technologies and engineering</i>	<i>3 985 746</i>	<i>466 064</i>	<i>1 586 674</i>	<i>1 933 009</i>	<i>24 124</i>
<b>Social sciences and humanities</b>					
Social sciences	5 231	np	3 870	np	65
Humanities	757	np	503	np	12
<i>Total social sciences and humanities</i>	<i>5 989</i>	<i>632</i>	<i>4 372</i>	<i>985</i>	<i>77</i>
<b>TOTAL</b>	<b>3 991 735</b>	<b>466 696</b>	<b>1 591 046</b>	<b>1 933 993</b>	<b>24 201</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) Includes wages and salaries, payroll tax, payments to contract staff on the payroll, fringe benefits tax, workers compensation insurance, overtime earnings, shift allowances, penalty rates, bonuses, commission payments, holiday pay, long service leave payments, sick pay, employer contributions to superannuation and pension schemes.

# EXPECTED AND ACTUAL EXPENDITURE ON R&D(a)

	1996-97	1997-98	.....	1998-99	.....	1999-2000
	<i>Actual</i>	<i>Expected</i>		<i>Actual</i>	<i>Expected</i>	
<i>ANZSIC</i>	\$'000	\$'000		\$'000	\$'000	\$'000
<b>Mining (including services to mining)</b>	r562 054	390 089	r533 906	r326 246	478 305	321 688
<b>Manufacturing</b>						
Food, beverages and tobacco	r230 958	r207 356	r179 505	r165 375	206 077	177 149
Textiles, clothing, footwear and leather	21 350	20 752	22 078	20 345	19 299	18 179
Wood and paper products	191 353	96 309	116 612	111 627	88 913	79 063
Printing, publishing and recorded media	16 508	13 598	19 146	17 832	25 784	23 461
Petroleum, coal, chemical and associated product	309 135	348 662	r313 999	r288 885	339 529	346 753
Non-metallic mineral product	65 539	59 739	72 388	53 060	54 340	52 027
Metal product	r361 122	r413 068	r331 179	r247 879	268 788	183 546
Motor vehicle and part and other transport equipment	400 925	325 793	r436 175	r392 979	371 844	387 970
Photographic and scientific equipment	r91 047	95 763	93 230	90 925	102 244	113 521
Electronic and electrical equipment and appliance	r362 062	r335 218	r398 014	r375 028	378 429	352 596
Industrial machinery and equipment	143 698	126 267	123 489	119 313	109 755	121 917
Other manufacturing	45 841	33 666	35 927	24 930	17 606	18 738
<i>Total manufacturing</i>	r2 239 538	r2 076 191	r2 141 742	r1 908 177	1 982 607	1 874 922
<b>Other industries</b>						
Wholesale and retail trade	r342 090	r344 464	r324 463	r345 473	345 229	349 996
Finance and insurance	96 117	71 935	84 854	77 515	44 159	48 148
Property and business services	r649 870	r644 249	r664 695	r640 224	631 173	623 131
Scientific research	146 766	167 515	r163 817	r176 912	179 089	203 121
Other n.e.c.	210 429	183 814	r289 368	r246 019	331 174	318 275
<i>Total other industries</i>	r1 445 272	r1 411 977	r1 527 197	r1 486 143	1 530 823	1 542 671
<b>TOTAL ALL INDUSTRIES</b>	<b>r4 246 864</b>	<b>r3 878 257</b>	<b>r4 202 845</b>	<b>r3 720 566</b>	<b>3 991 735</b>	<b>3 739 281</b>

r revised

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).



## HUMAN RESOURCES DEVOTED TO R&amp;D, by business employment size(a)(b)

		Less than							1000 or more
	Total	10	10-19	20-49	50-99	100- 199	200- 499	500- 999	
ANZSIC	person years	person years	person years	person years	person years	person years	person years	person years	person years
<b>Mining (including services to mining)</b>	957	22	29	54	18	250	243	138	203
<b>Manufacturing</b>									
Food, beverages and tobacco	1 118	6	26	68	113	68	122	122	594
Textiles, clothing, footwear and leather	167	7	8	28	41	47	16	np	np
Wood and paper products	245	18	np	np	—	np	17	30	172
Printing, publishing and recorded media	228	12	24	20	70	np	—	np	np
Petroleum, coal, chemical and associated product	2 206	40	87	256	243	396	376	419	389
Non-metallic mineral product	391	13	35	np	np	27	32	59	173
Metal product	1 113	24	19	122	266	60	88	137	397
Motor vehicle and part and other transport equipment	2 711	42	41	36	73	83	502	294	1 640
Photographic and scientific equipment	897	72	np	110	np	147	272	92	np
Electronic and electrical equipment and appliance	2 797	184	241	306	451	241	557	701	115
Industrial machinery and equipment	1 038	57	92	195	198	53	140	42	262
Other manufacturing	187	30	27	51	36	np	24	np	—
<b>Total manufacturing</b>	<b>13 096</b>	<b>505</b>	<b>659</b>	<b>1 205</b>	<b>1 578</b>	<b>1 203</b>	<b>2 146</b>	<b>1 939</b>	<b>3 862</b>
<b>Other industries</b>									
Wholesale and retail trade	2 352	166	145	273	223	201	451	213	681
Finance and insurance	354	8	—	30	np	np	np	np	192
Property and business services	5 308	796	710	1 089	np	774	280	np	531
Scientific research	1 266	180	183	321	427	np	np	—	—
Other n.e.c.	868	89	68	98	36	24	143	90	320
<b>Total other industries</b>	<b>10 147</b>	<b>1 238</b>	<b>1 106</b>	<b>1 810</b>	<b>1 385</b>	<b>1 114</b>	<b>970</b>	<b>800</b>	<b>1 724</b>
<b>TOTAL ALL INDUSTRIES</b>	<b>24 201</b>	<b>1 765</b>	<b>1 794</b>	<b>3 069</b>	<b>2 981</b>	<b>2 568</b>	<b>3 358</b>	<b>2 876</b>	<b>5 789</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

— nil or rounded to zero (including null cells)

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

(b) Employment size is based on the number of persons employed by the business, whereas human resources data are person years of R&D effort.

## HUMAN RESOURCES DEVOTED TO R&amp;D, by type of employee(a)

	<i>Total</i>	<i>Researchers</i>	<i>Technicians</i>	<i>Other supporting staff</i>
<i>ANZSIC</i>	person years	person years	person years	person years
<b>Mining (including services to mining)</b>	957	430	396	131
<b>Manufacturing</b>				
Food, beverages and tobacco	1 118	612	324	182
Textiles, clothing, footwear and leather	167	71	55	41
Wood and paper products	245	117	81	47
Printing, publishing and recorded media	228	142	72	14
Petroleum, coal, chemical and associated product	2 206	1 170	713	322
Non-metallic mineral product	391	200	116	75
Metal product	1 113	567	339	207
Motor vehicle and part and other transport equipment	2 711	1 261	959	492
Photographic and scientific equipment	897	594	227	76
Electronic and electrical equipment and appliance	2 797	1 951	581	266
Industrial machinery and equipment	1 038	575	255	209
Other manufacturing	187	90	54	43
<i>Total manufacturing</i>	13 096	7 348	3 776	1 972
<b>Other industries</b>				
Wholesale and retail trade	2 352	1 305	831	215
Finance and insurance	354	208	100	45
Property and business services	5 308	3 522	1 267	520
Scientific research	1 266	783	338	145
Other n.e.c.	868	490	249	129
<i>Total other industries</i>	10 147	6 308	2 785	1 054
<b>TOTAL ALL INDUSTRIES</b>	<b>24 201</b>	<b>14 087</b>	<b>6 957</b>	<b>3 157</b>

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

## PAYMENTS AND RECEIPTS FOR TECHNICAL KNOW-HOW (a)

ANZSIC	PAYMENTS FOR TECHNICAL KNOW-HOW			RECEIPTS FOR TECHNICAL KNOW-HOW . . . . .		
	<i>Total</i>	<i>Patent licence fees and royalties</i>	<i>Other technical know- how</i>	<i>Total</i>	<i>Patent licence fees and royalties</i>	<i>Other technical know- how</i>
	\$m	\$m	\$m	\$m	\$m	\$m
<b>Mining (including services to mining)</b>	33.3	0.9	32.4	np	np	np
<b>Manufacturing</b>						
Food, beverages and tobacco	np	np	np	np	np	—
Textiles, clothing, footwear and leather	1.8	np	np	—	—	—
Wood and paper products	1.1	np	np	np	—	np
Printing, publishing and recorded media	np	—	np	np	np	np
Petroleum, coal, chemical and associated product	82.1	55.9	26.2	36.5	np	np
Non-metallic mineral product	5.9	np	np	np	np	np
Metal product	20.6	3.9	16.7	1.7	0.8	0.9
Motor vehicle and part and other transport equipment	91.1	np	np	37.9	np	np
Photographic and scientific equipment	np	np	np	np	np	np
Electronic and electrical equipment and appliance	28.0	2.4	25.6	7.0	0.4	6.6
Industrial machinery and equipment	5.8	3.4	2.4	2.9	0.9	2.0
Other manufacturing	0.3	0.1	0.3	0.6	np	np
<i>Total manufacturing</i>	328.8	155.1	173.7	126.3	61.8	64.5
<b>Other industries</b>						
Wholesale and retail trade	13.0	np	np	14.0	5.8	8.3
Finance and insurance	4.2	—	4.2	np	np	np
Property and business services	50.5	np	np	108.7	38.1	70.7
Scientific research	4.5	0.3	4.2	24.1	5.6	18.5
Other n.e.c.	5.4	0.6	4.7	9.3	1.9	7.4
<i>Total other industries</i>	77.4	40.6	36.9	np	np	np
<b>TOTAL ALL INDUSTRIES</b>	<b>439.5</b>	<b>196.6</b>	<b>242.9</b>	<b>289.6</b>	<b>116.8</b>	<b>172.8</b>

np not available for publication but included in totals where applicable, unless otherwise indicated

— nil or rounded to zero (including null cells)

(a) Excludes businesses in Agriculture, forestry and fishing (i.e. in ANZSIC Division A).

## EXPLANATORY NOTES

### INTRODUCTION

**1** This publication presents statistics on expenditure and human resources devoted to R&D carried out in Australia by the Business sector during 1998-99.

**2** For details of R&D statistics available for the General government, Private non-profit and Higher education sectors see paragraph 22.

### DATA SOURCES

**3** The 1998-99 data presented in this publication have been compiled from data collected from businesses in the Survey of Research and Experimental Development in respect of the year ended June 1999. This survey was based on a complete enumeration of businesses identified by the Australian Bureau of Statistics (ABS) as likely R&D performers. The survey was conducted by mailed questionnaires and a 90% response was obtained. The ABS believes that the non-respondents were non-R&D performers.

**4** The GDP figures used to derive BERD/GDP ratios are current at the time of manuscript finalisation (*Australian National Accounts: National Income, Expenditure and Product, March Quarter 2000* (Cat. no. 5206.0)) and, at current prices, are as follows: \$427,281m (1992-93); \$449,666m (1993-94); \$474,546m (1994-95); \$508,113m (1995-96); \$533,632m (1996-97); \$565,881m (1997-98) and \$594,933m (1998-99). The available BERD/GDP ratios for other OECD countries are current at the time of manuscript finalisation and are sourced from *Main Science and Technology Indicators, 1999-2*, OECD, Paris, 1999.

### STATISTICAL UNIT

**5** For businesses, the unit from which information is generally collected and published is the management unit. The management unit is the highest-level accounting unit within a business, having regard for industry homogeneity, for which accounts are maintained; in nearly all cases it coincides with the legal entity owning the business (i.e. company, partnership, trust, sole operator, etc.). In the case of large diversified businesses, however, there may be more than one management unit, each coinciding with a 'division' or 'line of business'. A division or line of business is recognised where separate and comprehensive accounts are compiled for it.

### DEFINITIONS

**6** R&D is defined in accordance with the Organisation for Economic Co-operation 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'.

**7** Type of R&D activity comprises basic research, applied research and experimental development. Data in this classification are subjectively allocated by respondents, using OECD/ABS definitions. The ABS makes every effort to ensure correct and consistent interpretation and reporting of these data and applies consistent processing methodologies. Analysts using this classification should bear the original subjectivity in mind.

**8** For a more comprehensive interpretation of the definition of R&D activity, contact the ABS or refer to the OECD publication, *The Measurement of Scientific and Technical Activities ('Frascati Manual' 1993)*, OECD, Paris, 1994.

### SCOPE

**9** The scope of this survey is all businesses within the Business sector of Australia which have undertaken R&D.

**10** The Business sector includes all businesses whose primary activity is the production of goods or services for sale to the general public at a price intended to cover at least the costs of production, and the private non-profit institutions mainly serving them.

## EXPLANATORY NOTES *continued*

### SCOPE *continued*

**11** The vast majority of businesses in this sector are private businesses. The remainder are public businesses mainly engaged in trading or financial activities.

### COVERAGE

**12** The 1998-99 R&D survey comprised a complete enumeration of businesses identified by the ABS as likely to have carried out R&D activity.

**13** The Business sector for the R&D survey excludes businesses mainly engaged in Agriculture, forestry and fishing (i.e. industries in Division A of the *Australian and New Zealand Standard Industrial Classification (ANZSIC), 1993* (Cat. no. 1292.0)), partly because of collection difficulties and partly because such businesses are believed to have very low R&D activity (agricultural R&D activity is generally carried out by specialised research institutes not included in ANZSIC Division A).

**14** Within the scope of the survey, businesses were included in the collection if they satisfied any of the following criteria:

- businesses which, in previous R&D surveys, reported R&D activity;
- businesses applying for the 125% Tax Concession and/or Competitive Grants for Industry R&D; or
- businesses identified from reports in newspapers, industrial journals, research compendia etc. as likely to have R&D activity.

**15** The ABS continues to investigate enhancement of the above criteria, or the introduction of additional criteria, with the aim of further improving the coverage of the R&D survey.

### INDUSTRY CLASSIFICATION

**16** The statistics in this publication are classified to industry in accordance with the 1993 edition of the *Australian and New Zealand Standard Industrial Classification (ANZSIC)*.

**17** Each management unit is classified by the ABS to the industry in which it mainly operates even though one or more of its component establishments (factories, shops, etc.) may be classified to other industries. In cases where an enterprise group sets up a dedicated research unit, that unit is classified to the predominant industry of the group rather than to ANZSIC 7810 Scientific research, in accordance with standards laid down in the Frascati Manual.

### SOCIO-ECONOMIC OBJECTIVE AND FIELD OF RESEARCH CLASSIFICATIONS

**18** Statistics of business R&D classified by Socio-economic objective (SEO) and Field of research (FOR) have been collected and presented in this publication. Each business undertaking R&D was asked to categorise its R&D activity according to the purpose of its research projects (SEO) and the fields in which its research was undertaken (FOR). For more information on these classifications see the *Australian Standard Research Classification (ASRC), 1993* (Cat. no. 1297.0).

### CHAIN VOLUME MEASURES

**19** The chain volume measures appearing in this publication are annually reweighted chain Laspeyres indexes referenced to the current price values in a chosen reference year (currently 1997-98). They can be thought of as current price values re-expressed in (i.e. based on) the prices of the previous year and linked together to form continuous time series. They are formed in a multi-stage process of which the major steps are described in Section 15 of the information paper, *Introduction of Chain Volume Measures in the Australian National Accounts* (Cat. no. 5248.0).

### RELIABILITY OF STATISTICS

**20** The statistics in this publication should be used with caution for the following reasons:

- many respondents made estimates because their accounts did not separately record data on R&D activity; and

## EXPLANATORY NOTES *continued*

### RELIABILITY OF STATISTICS

*continued*

- the OECD standard definition of R&D used in this survey differs in some respects from what data providers may regard as R&D activity. This is because the definitions used within the Competitive Grants for Industry R&D scheme (for the allocation of grants), and the 125% Tax Concession scheme (for tax deductibility for specific R&D activities) are slightly different from the international standard.

### UNPUBLISHED STATISTICS

- 21** Limited additional detailed R&D statistics are available at a charge from the ABS.

### RELATED PUBLICATIONS

- 22** Users may also wish to refer to the following publications:  
*Research and Experimental Development, All Sector Summary, Australia, 1996-97* (Cat. no. 8112.0)  
*Research and Experimental Development, General Government and Private Non-Profit Organisations, Australia, 1996-97* (Cat. no. 8109.0)  
*Research and Experimental Development, Higher Education Organisations, Australia, 1998* (Cat no. 8111.0)  
*Main Science and Technology Indicators 1999-2*, OECD, Paris, 1999  
*The Measurement of Scientific and Technological Activities ('Frascati Manual' 1993)* OECD, Paris, 1994
- 23** Current publications issued by the ABS are listed in the *Catalogue of Publications and Products* (Cat. no. 1101.0). The ABS also issues, on Tuesdays and Fridays, a *Release Advice* (Cat. no. 1105.0) which lists publications to be released in the next few days. The Catalogue and Release Advice are available from any ABS office.

### ROUNDING

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

## GLOSSARY

<b>Applied research</b>	Original work undertaken in order to acquire new knowledge with a specific application in view. It 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.
<b>Basic research</b>	Experimental and theoretical work undertaken primarily to acquire new knowledge without a specific application in view. It consists of pure basic research and strategic basic research. Pure basic research is carried out without looking for long-term benefits other than the advancement of knowledge. Strategic basic research is directed into specific broad areas in the expectation of useful discoveries. It provides the broad base of knowledge necessary for the solution of recognised practical problems.
<b>Capital expenditure</b>	Expenditure on the acquisition (less disposals) of fixed tangible assets such as land, buildings, vehicles, plant, machinery and equipment attributable to R&D activity.
<b>Experimental development</b>	Systematic work, using existing knowledge gained from research or practical experience, for the purpose of creating new or improved products/processes.
<b>Field of research</b>	Field in which the R&D activity was performed. The FOR classification is primarily structured around disciplines or activities. It describes what research is being performed.
<b>Human resources devoted to R&amp;D</b>	The effort of researchers, technicians and other staff directly involved with R&D activity. Overhead staff (e.g. administrative and general service employees such as personnel officers, janitors, etc.) whose work indirectly supports R&D, are excluded.
<b>Labour costs</b>	Wages and salaries, overtime allowances, penalty rates, leave loadings, bonuses, commission payments, all paid leave, employer contributions to superannuation and pension schemes, payroll tax, fringe benefits tax, payments to contract staff on the payroll, severance, termination and redundancy payments and workers compensation insurance.
<b>Other current expenditure</b>	Expenditure on materials, fuels, rent and hiring, repairs and maintenance, data processing etc. and the proportion of expenditure on general services and overheads which is attributable to R&D activity.
<b>Other supporting staff</b>	Skilled and unskilled craftpersons, secretarial and clerical staff directly associated with R&D activity.
<b>R&amp;D activity</b>	In the business context is systematic investigation or experimentation involving innovation or technical risk, the outcome of which is new knowledge, with or without a specific practical application or new or improved products, processes, materials, devices or services. R&D activity extends to modifications to existing products/processes. R&D activity ceases and pre-production begins when work is no longer experimental.
<b>Researchers</b>	Those involved with the conception and/or development of new products/processes e.g. executives and directors involved in the planning or management of scientific and technical aspects of R&D projects, and software developers/programmers. They exclude executive and directors concerned primarily with budgets and human resources rather than project content.
<b>Socio-economic objective</b>	The area of expected national benefit rather than the immediate objectives of the researcher. The SEO classification defines the main areas of Australian economic and social activity to which the results of research programs are applied. It describes the purpose of the research; i.e. why the research is being performed.
<b>Technical know-how (TKH)</b>	Specialised technical knowledge required to successfully produce a product or implement a process, etc. (e.g. patent licences; technical data and information;

## GLOSSARY *continued*

<b>Technical know-how (TKH)</b> <i>continued</i>	scientific, technical or engineering assistance) that increases technical knowledge and understanding in a business. Payments are those made directly to the holders of TKH which is new to a business. They exclude non-monetary transfers, and costs incurred by a business in obtaining TKH, such as overseas travel costs.
<b>Technicians</b>	Those performing technical tasks in support of R&D activity, normally under the direction and supervision of a researcher. These tasks include preparation of experiments, taking records, preparation of charts and graphs and coding computer programs.
<b>Type of R&amp;D activity</b>	Comprises basic research, applied research and experimental development.









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