



2010

8111.0

# RESEARCH AND EXPERIMENTAL DEVELOPMENT

AUSTRALIA

## HIGHER EDUCATION ORGANISATIONS

EMBARGO: 11.30AM (CANBERRA TIME) FRI 25 MAY 2012

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### INQUIRIES

For further information about these and related statistics, contact the National Information and Referral Service on 1300 135 070 or Amanda Baile on Perth (08) 9360 5357.

## INTRODUCTION

This release presents statistics on Research and Experimental Development (R&D) undertaken by Australian higher education institutions in respect of the calendar year ended 31 December 2010. These statistics, as well as time series data, are also available in spreadsheet format (data cubes); see the Downloads page for this issue (cat. no. 8111.0) on the ABS website <[www.abs.gov.au](http://www.abs.gov.au)>.

Users should refer to the Explanatory and Technical Notes for further contextual information when interpreting the statistics.

## CHANGES IN THIS ISSUE

For the 2010 reference year, statistics for HERD using the Australian and New Zealand Standard Research Classifications (ANZSRC) Fields of Research and Socio-Economic Objective have been collected at the group level (4 digit) only rather than field level (6 digit). Production of outputs at the 6 digit level, previously available upon request, is no longer possible.

For more information on this classification please refer to the *Australian and New Zealand Standard Research Classification (ANZSRC), 2008* (cat. no. 1297.0).

## DATA QUALITY

When interpreting the results in this release it is important to take into account factors that may affect the reliability of estimates. These factors are described in the Non-Sampling Error section of the Technical Note.

Users are also advised to exercise caution if comparing estimates over time. Factors impacting comparability of estimates include:

- improved record keeping by higher education institutions in 2010; and
- revisions to 2008 estimates.

Refer to the Revisions and Comparability of Estimates Over Time sections of the Technical Note for further details.

## ACKNOWLEDGEMENT

The ABS acknowledges the continued effort and contribution of higher education institutions in providing data for the compilation of statistics presented in this and previous issues.

Brian Pink  
Australian Statistician

## ABBREVIATIONS

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<b>\$'000</b>	thousand dollars
<b>\$m</b>	million dollars
<b>ABS</b>	Australian Bureau of Statistics
<b>ACT</b>	Australian Capital Territory
<b>ANZSRC</b>	Australian and New Zealand Standard Research Classification
<b>Aust.</b>	Australia
<b>CRC</b>	Cooperative Research Centre
<b>excl.</b>	excluding
<b>FOR</b>	Fields of Research
<b>GDP</b>	gross domestic product
<b>GSP</b>	gross state product
<b>HERD</b>	higher education expenditure on R&D
<b>NSW</b>	New South Wales
<b>NT</b>	Northern Territory
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PYE</b>	person years of effort
<b>Qld</b>	Queensland
<b>R&amp;D</b>	research and experimental development
<b>SA</b>	South Australia
<b>SEO</b>	socio-economic objective
<b>Tas.</b>	Tasmania
<b>Vic.</b>	Victoria
<b>WA</b>	Western Australia

## MAIN FEATURES

### HIGHER EDUCATION RESOURCES DEVOTED TO RESEARCH AND EXPERIMENTAL DEVELOPMENT (R&D)

During the 2010 calendar year, higher education expenditure on R&D (HERD) was \$8,203 million. Over the same period, human resources devoted to R&D by Australian higher education institutions represented 69,199 person years of effort (PYE).

### HIGHER EDUCATION RESOURCES DEVOTED TO R&D

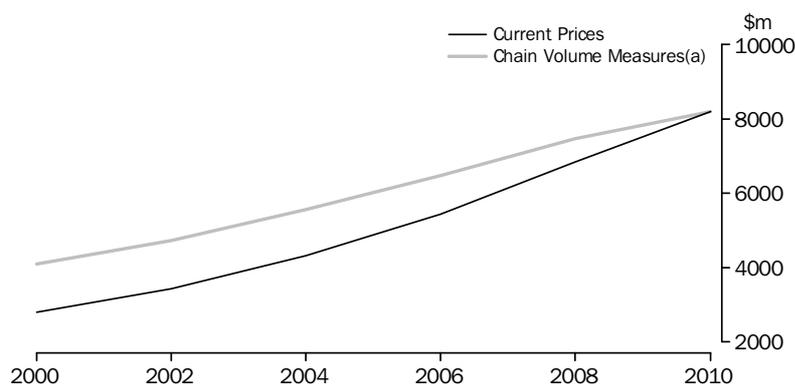
		2000	2002	2004	2006	2008(a)	2010
<b>Expenditure on R&amp;D</b>							
Current prices	\$m	2 790	3 430	4 327	5 434	6 844	8 203
Chain volume measures(b)	\$m	4 109	4 734	5 555	6 471	7 478	8 203
<b>Human resources devoted to R&amp;D</b>	PYE	46 287	49 612	55 204	58 905	61 773	69 199

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

(b) The reference year for chain volume measures is 2010. See Explanatory Notes 17 and 18 for details.

In 2010, HERD showed an increase of 20% in current price terms over 2008, and 10% in chain volume terms. This compares to average increases of 24% and 15% respectively, since the 2000 reference period.

### HIGHER EDUCATION EXPENDITURE ON R&D



(a) The reference year for chain volume measures is 2010. See Explanatory Notes 17 and 18 for details.

Subsequent expenditure figures and supporting commentary relate to current price terms.

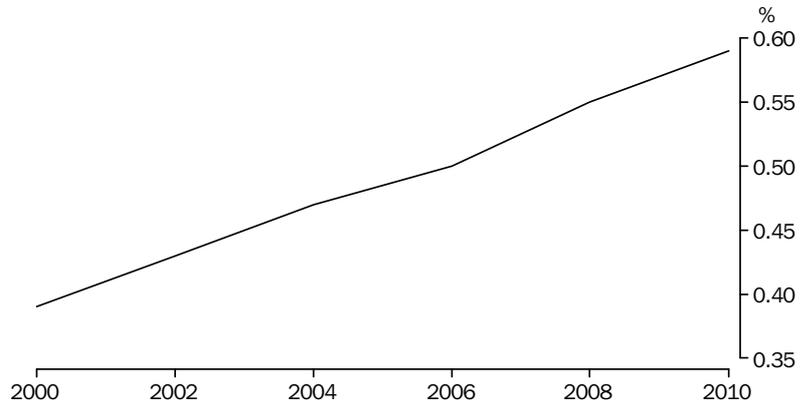
### HERD and Gross Domestic Product (GDP)

HERD as a proportion of Gross Domestic Product (GDP) increased from 0.55% in 2008 to 0.59% in 2010.

## MAIN FEATURES *continued*

*HERD and Gross Domestic Product (GDP) continued*

HERD, as a proportion of GDP(a)



(a) See Explanatory Notes 14 to 16 for details.

### TYPE OF EXPENDITURE

In 2010, HERD was comprised of \$7,395 million in Current expenditure and \$808 million in Capital expenditure. The largest component of HERD in 2010 was Other current expenditure, which totalled \$3,543 million (43% of HERD).

### SOURCE OF FUNDS

The two main sources of funds for HERD in 2010 were General university funds (\$4,637 million or 56% of HERD) and Australian competitive research grants (\$1,360 million or 17% of HERD). These were also the major sources of funds in 2008.

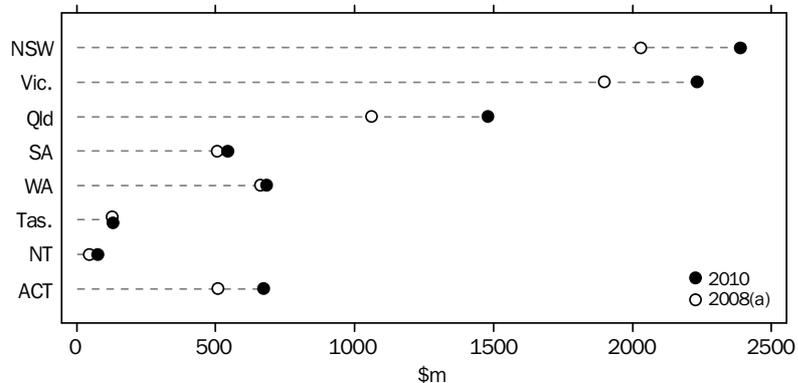
General university funds was the only source of funds with a change in its relative share of HERD of more than two percentage points; up from 53% of HERD in 2008.

### LOCATION

In 2010, higher education institutions based in New South Wales, Victoria and Queensland in combination contributed almost three quarters (74%) of HERD (at \$2,389 million, \$2,231 million and \$1,480 million, respectively). Refer to Explanatory Note 9 for further information regarding the location of R&D.

Compared to 2008, Queensland recorded the largest growth in HERD in absolute terms (up \$419 million).

HERD, by location



(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

## MAIN FEATURES *continued*

### HERD and Gross State Product (GSP)

The Australian Capital Territory had the largest increase in HERD as a proportion of Gross State Product (GSP) from 2008. South Australia, Western Australia and Tasmania experienced decreases in their HERD/GSP ratios.

### HERD, by location of expenditure—proportion of GSP(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT
	%	%	%	%	%	%	%	%
2010	0.54	0.70	0.56	0.60	0.31	0.52	0.44	2.22
2008	0.52	0.67	0.41	0.63	0.38	0.58	0.28	1.95

(a) See Explanatory Notes 14 to 16 for details.

### TYPE OF ACTIVITY

In the 2010 calendar year, 47% of HERD (\$3,836 million) was directed towards Applied research, 25% (\$2,052 million) to Pure basic research and 20% (\$1,653 million) to Strategic basic research. The remaining 8% (\$662 million) was directed towards Experimental development. The distribution of HERD across type of activity was largely unchanged from 2008. Applied research was the only activity to show an increase in the proportion of HERD.

### FIELDS OF RESEARCH (FOR)

Expenditure devoted to the Medical and health sciences FOR (\$2,351 million) represented 29% of HERD in 2010, and was almost triple the value of the next highest FOR, Engineering (\$772 million). In combination, the fields of Medical and health sciences, Engineering, Biological sciences and Studies in human society made up just over half (52%) of total HERD. The top four fields of research, in terms of expenditure, remained the same in 2008 and 2010.

### SOCIO-ECONOMIC OBJECTIVE (SEO)

In 2010, nearly a third (32% or \$2,658 million) of HERD was directed to the SEO of Health. At \$1,308m, the next most prevalent SEO was Expanding knowledge, with approximately half the expenditure of Health. The distribution of HERD across SEOs remained largely unchanged in 2010.

### TYPE OF RESOURCE

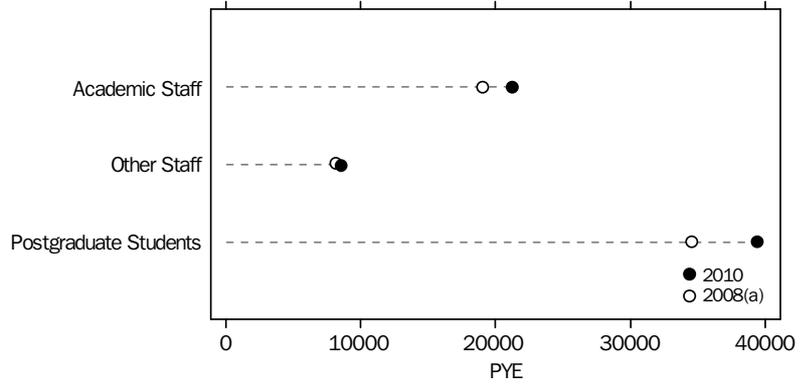
Australian higher education institutions devoted a total of 69,199 person years of effort (PYE) to R&D in 2010. This was an increase of 7,426 PYE or 12% from 2008. Most of the human resources devoted to R&D in 2010 were Postgraduate students (57%) and Academic staff (31%), with the remainder being Other staff supporting R&D (12%).

As with HERD, New South Wales, Victoria and Queensland accounted for three quarters (75%) of total human resources devoted to R&D in 2010.

**MAIN FEATURES** *continued*

TYPE OF RESOURCE  
*continued*

HIGHER EDUCATION HUMAN RESOURCES DEVOTED TO R&D, by type  
of resource



(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

# HIGHER EDUCATION EXPENDITURE ON R&D, by location—by type of expenditure—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
2010									
Capital expenditure									
Land, buildings and other structures	94 238	157 196	76 004	8 227	19 532	14 609	1 726	178 515	550 047
Other capital expenditure	78 332	56 906	56 142	13 986	17 783	6 169	290	28 806	258 415
Total	172 570	214 102	132 146	22 214	37 315	20 778	2 015	207 321	808 462
Current expenditure									
Labour costs	1 047 792	893 006	634 562	208 477	275 184	54 686	28 770	176 942	3 319 418
Scholarships	167 899	156 151	81 084	40 329	45 223	11 456	1 646	27 958	531 746
Other current expenditure	1 000 843	968 114	632 362	273 912	320 165	43 314	43 002	261 660	3 543 372
Total	2 216 534	2 017 271	1 348 007	522 718	640 571	109 456	73 419	466 560	7 394 537
<b>Total</b>	<b>2 389 104</b>	<b>2 231 374</b>	<b>1 480 154</b>	<b>544 932</b>	<b>677 887</b>	<b>130 234</b>	<b>75 434</b>	<b>673 881</b>	<b>8 202 999</b>
2008 (a)									
Capital expenditure									
Land, buildings and other structures	145 109	127 970	48 070	19 183	31 116	21 149	15	55 533	448 146
Other capital expenditure	68 771	54 018	52 476	7 619	23 766	5 288	256	47 965	260 159
Total	213 881	181 988	100 546	26 802	54 882	26 437	271	103 498	708 305
Current expenditure									
Labour costs	835 741	713 401	440 183	196 163	264 107	46 168	19 005	181 416	2 696 184
Scholarships	136 479	146 017	67 228	34 362	37 595	10 145	1 293	24 011	457 131
Other current expenditure	844 968	858 372	453 517	247 754	305 539	45 902	25 503	200 352	2 981 906
Total	1 817 188	1 717 790	960 927	478 279	607 241	102 215	45 801	405 779	6 135 221
<b>Total</b>	<b>2 031 069</b>	<b>1 899 778</b>	<b>1 061 473</b>	<b>505 080</b>	<b>662 123</b>	<b>128 652</b>	<b>46 073</b>	<b>509 277</b>	<b>6 843 526</b>

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

HIGHER EDUCATION EXPENDITURE ON R&D, by location—by type of expenditure:  
proportions—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	%	%	%	%	%	%	%	%	%
2010									
Capital expenditure									
Land, buildings and other structures	3.9	7.0	5.1	1.5	2.9	11.2	2.3	26.5	6.7
Other capital expenditure	3.3	2.6	3.8	2.6	2.6	4.7	0.4	4.3	3.2
<i>Total</i>	7.2	9.6	8.9	4.1	5.5	16.0	2.7	30.8	9.9
Current expenditure									
Labour costs	43.9	40.0	42.9	38.3	40.6	42.0	38.1	26.3	40.5
Scholarships	7.0	7.0	5.5	7.4	6.7	8.8	2.2	4.1	6.5
Other current expenditure	41.9	43.4	42.7	50.3	47.2	33.3	57.0	38.8	43.2
<i>Total</i>	92.8	90.4	91.1	95.9	94.5	84.0	97.3	69.2	90.1
<b>Total</b>	<b>100.0</b>								
2008 (a)									
Capital expenditure									
Land, buildings and other structures	7.1	6.7	4.5	3.8	4.7	16.4	—	10.9	6.5
Other capital expenditure	3.4	2.8	4.9	1.5	3.6	4.1	0.6	9.4	3.8
<i>Total</i>	10.5	9.6	9.5	5.3	8.3	20.5	0.6	20.3	10.4
Current expenditure									
Labour costs	41.1	37.6	41.5	38.8	39.9	35.9	41.3	35.6	39.4
Scholarships	6.7	7.7	6.3	6.8	5.7	7.9	2.8	4.7	6.7
Other current expenditure	41.6	45.2	42.7	49.1	46.1	35.7	55.4	39.3	43.6
<i>Total</i>	89.5	90.4	90.5	94.7	91.7	79.5	99.4	79.7	89.6
<b>Total</b>	<b>100.0</b>								

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

# HIGHER EDUCATION EXPENDITURE ON R&D, by location—by source of funds—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
2010									
Australian competitive grants									
Commonwealth schemes	351 592	339 678	260 377	110 522	102 811	16 915	12 760	99 550	1 294 205
Other schemes	18 890	12 383	10 240	3 622	15 575	864	4 367	182	66 123
Total	370 482	352 061	270 618	114 145	118 385	17 779	17 127	99 731	1 360 328
General university funds	1 368 564	1 271 610	810 472	227 464	359 164	55 078	38 292	506 173	4 636 818
Other commonwealth government	348 596	326 334	138 761	113 288	118 143	26 925	2 785	33 906	1 108 738
State and local government	84 930	101 331	123 711	36 446	42 681	14 940	12 975	6 597	423 611
Business	93 112	100 117	55 418	32 197	26 492	12 082	3 670	12 183	335 271
Donations, bequests and foundations	65 669	18 271	34 197	11 508	5 667	1 871	170	2 824	140 177
Other Australian	3 048	8 342	6 063	1 201	373	—	—	—	19 027
Overseas	54 702	53 307	40 914	8 685	6 980	1 558	416	12 468	179 030
<b>Total</b>	<b>2 389 104</b>	<b>2 231 374</b>	<b>1 480 154</b>	<b>544 932</b>	<b>677 887</b>	<b>130 234</b>	<b>75 434</b>	<b>673 881</b>	<b>8 202 999</b>
2008 (a)									
Australian competitive grants									
Commonwealth schemes	304 262	324 068	197 592	95 509	98 305	24 715	4 549	93 870	1 142 870
Other schemes	24 558	16 246	9 624	5 233	3 546	2 527	8	184	61 926
Total	328 820	340 314	207 216	100 742	101 850	27 242	4 556	94 055	1 204 796
General university funds	1 149 313	940 220	541 048	214 441	319 328	64 141	29 172	362 960	3 620 624
Other commonwealth government	324 545	318 586	97 928	106 537	113 587	10 257	4 315	25 565	1 001 321
State and local government	71 688	128 735	77 596	37 330	63 201	12 972	5 383	6 084	402 989
Business	75 758	105 571	70 060	25 221	41 254	9 896	1 563	8 832	338 156
Donations, bequests and foundations	29 831	15 869	27 269	11 565	6 760	3 557	80	972	95 902
Other Australian	1 123	25 579	11 865	124	2 021	—	292	—	41 004
Overseas	49 990	24 904	28 491	9 120	14 122	587	712	10 810	138 736
<b>Total</b>	<b>2 031 069</b>	<b>1 899 778</b>	<b>1 061 473</b>	<b>505 080</b>	<b>662 123</b>	<b>128 652</b>	<b>46 073</b>	<b>509 277</b>	<b>6 843 526</b>

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

# HIGHER EDUCATION EXPENDITURE ON R&D, by location—by source of funds: proportions—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	%	%	%	%	%	%	%	%	%
2010									
Australian competitive grants									
Commonwealth schemes	14.7	15.2	17.6	20.3	15.2	13.0	16.9	14.8	15.8
Other schemes	0.8	0.6	0.7	0.7	2.3	0.7	5.8	—	0.8
<b>Total</b>	<b>15.5</b>	<b>15.8</b>	<b>18.3</b>	<b>20.9</b>	<b>17.5</b>	<b>13.7</b>	<b>22.7</b>	<b>14.8</b>	<b>16.6</b>
General university funds	57.3	57.0	54.8	41.7	53.0	42.3	50.8	75.1	56.5
Other commonwealth government	14.6	14.6	9.4	20.8	17.4	20.7	3.7	5.0	13.5
State and local government	3.6	4.5	8.4	6.7	6.3	11.5	17.2	1.0	5.2
Business	3.9	4.5	3.7	5.9	3.9	9.3	4.9	1.8	4.1
Donations, bequests and foundations	2.7	0.8	2.3	2.1	0.8	1.4	0.2	0.4	1.7
Other Australian	0.1	0.4	0.4	0.2	0.1	—	—	—	0.2
Overseas	2.3	2.4	2.8	1.6	1.0	1.2	0.6	1.9	2.2
<b>Total</b>	<b>100.0</b>								
2008 (a)									
Australian competitive grants									
Commonwealth schemes	15.0	17.1	18.6	18.9	14.8	19.2	9.9	18.4	16.7
Other schemes	1.2	0.9	0.9	1.0	0.5	2.0	—	—	0.9
<b>Total</b>	<b>16.2</b>	<b>17.9</b>	<b>19.5</b>	<b>19.9</b>	<b>15.4</b>	<b>21.2</b>	<b>9.9</b>	<b>18.5</b>	<b>17.6</b>
General university funds	56.6	49.5	51.0	42.5	48.2	49.9	63.3	71.3	52.9
Other commonwealth government	16.0	16.8	9.2	21.1	17.2	8.0	9.4	5.0	14.6
State and local government	3.5	6.8	7.3	7.4	9.5	10.1	11.7	1.2	5.9
Business	3.7	5.6	6.6	5.0	6.2	7.7	3.4	1.7	4.9
Donations, bequests and foundations	1.5	0.8	2.6	2.3	1.0	2.8	0.2	0.2	1.4
Other Australian	0.1	1.3	1.1	—	0.3	—	0.6	—	0.6
Overseas	2.5	1.3	2.7	1.8	2.1	0.5	1.5	2.1	2.0
<b>Total</b>	<b>100.0</b>								

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

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## HIGHER EDUCATION EXPENDITURE ON R&D, by location—by type of activity—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
2010									
Pure basic research	612 383	678 456	209 321	125 584	178 866	24 759	1 004	221 859	2 052 232
Strategic basic research	476 199	363 641	351 355	145 281	111 180	29 722	3 109	172 477	1 652 965
Applied research	1 072 110	1 060 560	765 026	241 601	339 166	68 066	58 044	231 194	3 835 767
Experimental development	228 411	128 716	154 451	32 466	48 675	7 686	13 277	48 351	662 034
<b>Total</b>	<b>2 389 104</b>	<b>2 231 374</b>	<b>1 480 154</b>	<b>544 932</b>	<b>677 887</b>	<b>130 234</b>	<b>75 434</b>	<b>673 881</b>	<b>8 202 999</b>
2008 (a)									
Pure basic research	626 737	675 507	150 461	136 677	134 314	24 321	620	209 899	1 958 537
Strategic basic research	423 918	312 493	270 465	111 749	129 958	32 614	1 856	130 253	1 413 305
Applied research	742 224	793 973	523 893	202 382	336 511	65 603	43 597	136 685	2 844 867
Experimental development	238 189	117 804	116 654	54 272	61 340	6 115	—	32 440	626 816
<b>Total</b>	<b>2 031 069</b>	<b>1 899 778</b>	<b>1 061 473</b>	<b>505 080</b>	<b>662 123</b>	<b>128 652</b>	<b>46 073</b>	<b>509 277</b>	<b>6 843 526</b>

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

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## HIGHER EDUCATION EXPENDITURE ON R&D, by location—by type of activity: proportions—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	%	%	%	%	%	%	%	%	%
2010									
Pure basic research	25.6	30.4	14.1	23.0	26.4	19.0	1.3	32.9	25.0
Strategic basic research	19.9	16.3	23.7	26.7	16.4	22.8	4.1	25.6	20.2
Applied research	44.9	47.5	51.7	44.3	50.0	52.3	76.9	34.3	46.8
Experimental development	9.6	5.8	10.4	6.0	7.2	5.9	17.6	7.2	8.1
<b>Total</b>	<b>100.0</b>								
2008 (a)									
Pure basic research	30.9	35.6	14.2	27.1	20.3	18.9	1.3	41.2	28.6
Strategic basic research	20.9	16.4	25.5	22.1	19.6	25.4	4.0	25.6	20.7
Applied research	36.5	41.8	49.4	40.1	50.8	51.0	94.6	26.8	41.6
Experimental development	11.7	6.2	11.0	10.7	9.3	4.8	—	6.4	9.2
<b>Total</b>	<b>100.0</b>								

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
2010									
Mathematical Sciences	43 047	36 571	23 580	11 026	10 482	2 307	27	23 296	150 337
Physical Sciences	75 102	56 111	26 387	14 256	17 406	2 384	754	71 501	263 901
Chemical Sciences	84 450	76 429	55 737	28 920	18 275	5 447	606	23 473	293 338
Earth Sciences	45 644	36 183	41 541	14 070	22 982	12 662	147	33 673	206 903
Environmental Sciences	39 263	38 410	88 697	21 401	24 516	10 652	14 220	14 808	251 967
Biological Sciences	179 107	194 175	199 909	42 007	60 500	18 724	4 085	52 799	751 305
Agricultural and Veterinary Sciences	76 636	41 992	73 518	41 792	40 537	20 527	6 063	6 832	307 897
Information and Computing Sciences	118 554	136 047	43 656	11 774	23 084	7 855	344	17 267	358 582
Engineering	246 252	212 456	150 967	37 751	86 236	2 785	986	34 804	772 237
Technology	26 259	56 406	40 508	17 504	5 493	665	16	10 259	157 110
Medical and Health Sciences	740 902	706 473	365 043	206 567	177 527	28 102	30 292	96 316	2 351 222
Built Environment and Design	17 457	50 622	15 544	8 965	12 840	824	200	847	107 299
Education	93 440	78 468	46 102	17 000	45 389	3 465	7 189	23 396	314 449
Economics	76 022	64 575	15 635	5 036	14 878	1 284	880	40 532	218 841
Commerce, Management, Tourism and Services	103 190	100 037	85 655	15 454	25 578	1 647	1 668	18 828	352 057
Studies in Human Society	89 605	112 209	67 804	20 383	35 674	3 173	3 936	99 957	432 741
Psychology and Cognitive Sciences	93 019	54 331	46 007	13 965	19 013	2 168	101	11 634	240 237
Law and Legal Studies	41 647	34 629	26 846	1 317	6 566	695	1 359	24 729	137 788
Studies in Creative Arts and Writing	43 898	32 083	16 075	5 062	6 507	1 253	933	16 542	122 353
Language, Communication and Culture	73 203	56 740	35 145	8 481	14 950	2 437	979	20 617	212 551
History and Archaeology	37 526	31 466	10 159	1 565	6 381	819	619	24 137	112 672
Philosophy and Religious Studies	44 882	24 961	5 641	637	3 071	359	28	7 634	87 213
<b>Total</b>	<b>2 389 104</b>	<b>2 231 374</b>	<b>1 480 154</b>	<b>544 932</b>	<b>677 887</b>	<b>130 234</b>	<b>75 434</b>	<b>673 881</b>	<b>8 202 999</b>
2008 (a)									
Mathematical Sciences	46 806	31 707	16 682	7 124	11 453	979	—	18 877	133 628
Physical Sciences	79 769	45 839	19 786	7 416	17 833	851	461	53 898	225 853
Chemical Sciences	75 247	66 849	48 247	23 661	18 452	4 602	833	19 591	257 483
Earth Sciences	42 766	33 747	26 452	16 791	29 653	12 923	278	32 566	195 176
Environmental Sciences	38 083	34 925	46 544	18 201	24 843	10 503	10 695	12 155	195 947
Biological Sciences	145 986	253 534	130 252	34 673	63 004	19 186	4 162	45 732	696 528
Agricultural and Veterinary Sciences	88 004	40 114	45 191	31 356	48 118	20 649	1 122	6 241	280 795
Information and Computing Sciences	63 438	72 490	34 352	14 995	28 712	1 182	107	15 567	230 844
Engineering	186 981	175 757	120 417	34 452	54 175	3 252	1 701	18 361	595 097
Technology	46 123	34 984	42 363	21 515	22 176	367	117	10 713	178 358
Medical and Health Sciences	657 278	598 703	289 659	185 418	213 369	30 185	6 737	90 711	2 072 060
Built Environment and Design	22 377	28 570	9 749	5 199	8 276	997	44	964	76 177
Education	64 527	58 424	34 316	16 974	26 283	2 589	8 310	7 724	219 148
Economics	34 988	58 071	13 626	8 362	13 516	3 234	1 361	31 026	164 184
Commerce, Management, Tourism and Services	80 937	88 102	49 780	14 898	19 362	4 385	1 633	8 690	267 788
Studies in Human Society	77 555	85 546	49 519	24 517	23 977	5 967	5 261	65 585	337 926
Psychology and Cognitive Sciences	103 547	39 903	25 611	9 672	14 451	1 699	257	6 927	202 067
Law and Legal Studies	27 324	26 348	14 529	5 907	3 189	884	128	7 485	85 794
Studies in Creative Arts and Writing	26 834	17 768	13 837	8 671	2 388	1 393	741	12 263	83 896
Language, Communication and Culture	57 552	58 850	18 612	8 744	10 146	832	1 428	14 552	170 716
History and Archaeology	39 200	34 523	7 723	4 626	7 096	1 351	614	24 715	119 848
Philosophy and Religious Studies	25 747	15 021	4 227	1 907	1 651	644	83	4 932	54 211
<b>Total</b>	<b>2 031 069</b>	<b>1 899 778</b>	<b>1 061 473</b>	<b>505 080</b>	<b>662 123</b>	<b>128 652</b>	<b>46 073</b>	<b>509 277</b>	<b>6 843 526</b>

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	%	%	%	%	%	%	%	%	%
2010									
Mathematical Sciences	1.8	1.6	1.6	2.0	1.5	1.8	—	3.5	1.8
Physical Sciences	3.1	2.5	1.8	2.6	2.6	1.8	1.0	10.6	3.2
Chemical Sciences	3.5	3.4	3.8	5.3	2.7	4.2	0.8	3.5	3.6
Earth Sciences	1.9	1.6	2.8	2.6	3.4	9.7	0.2	5.0	2.5
Environmental Sciences	1.6	1.7	6.0	3.9	3.6	8.2	18.9	2.2	3.1
Biological Sciences	7.5	8.7	13.5	7.7	8.9	14.4	5.4	7.8	9.2
Agricultural and Veterinary Sciences	3.2	1.9	5.0	7.7	6.0	15.8	8.0	1.0	3.8
Information and Computing Sciences	5.0	6.1	2.9	2.2	3.4	6.0	0.5	2.6	4.4
Engineering	10.3	9.5	10.2	6.9	12.7	2.1	1.3	5.2	9.4
Technology	1.1	2.5	2.7	3.2	0.8	0.5	—	1.5	1.9
Medical and Health Sciences	31.0	31.7	24.7	37.9	26.2	21.6	40.2	14.3	28.7
Built Environment and Design	0.7	2.3	1.1	1.6	1.9	0.6	0.3	0.1	1.3
Education	3.9	3.5	3.1	3.1	6.7	2.7	9.5	3.5	3.8
Economics	3.2	2.9	1.1	0.9	2.2	1.0	1.2	6.0	2.7
Commerce, Management, Tourism and Services	4.3	4.5	5.8	2.8	3.8	1.3	2.2	2.8	4.3
Studies in Human Society	3.8	5.0	4.6	3.7	5.3	2.4	5.2	14.8	5.3
Psychology and Cognitive Sciences	3.9	2.4	3.1	2.6	2.8	1.7	0.1	1.7	2.9
Law and Legal Studies	1.7	1.6	1.8	0.2	1.0	0.5	1.8	3.7	1.7
Studies in Creative Arts and Writing	1.8	1.4	1.1	0.9	1.0	1.0	1.2	2.5	1.5
Language, Communication and Culture	3.1	2.5	2.4	1.6	2.2	1.9	1.3	3.1	2.6
History and Archaeology	1.6	1.4	0.7	0.3	0.9	0.6	0.8	3.6	1.4
Philosophy and Religious Studies	1.9	1.1	0.4	0.1	0.5	0.3	—	1.1	1.1
<b>Total</b>	<b>100.0</b>								

2008 (a)									
Mathematical Sciences	2.3	1.7	1.6	1.4	1.7	0.8	—	3.7	2.0
Physical Sciences	3.9	2.4	1.9	1.5	2.7	0.7	1.0	10.6	3.3
Chemical Sciences	3.7	3.5	4.5	4.7	2.8	3.6	1.8	3.8	3.8
Earth Sciences	2.1	1.8	2.5	3.3	4.5	10.0	0.6	6.4	2.9
Environmental Sciences	1.9	1.8	4.4	3.6	3.8	8.2	23.2	2.4	2.9
Biological Sciences	7.2	13.3	12.3	6.9	9.5	14.9	9.0	9.0	10.2
Agricultural and Veterinary Sciences	4.3	2.1	4.3	6.2	7.3	16.1	2.4	1.2	4.1
Information and Computing Sciences	3.1	3.8	3.2	3.0	4.3	0.9	0.2	3.1	3.4
Engineering	9.2	9.3	11.3	6.8	8.2	2.5	3.7	3.6	8.7
Technology	2.3	1.8	4.0	4.3	3.3	0.3	0.3	2.1	2.6
Medical and Health Sciences	32.4	31.5	27.3	36.7	32.2	23.5	14.6	17.8	30.3
Built Environment and Design	1.1	1.5	0.9	1.0	1.2	0.8	0.1	0.2	1.1
Education	3.2	3.1	3.2	3.4	4.0	2.0	18.0	1.5	3.2
Economics	1.7	3.1	1.3	1.7	2.0	2.5	3.0	6.1	2.4
Commerce, Management, Tourism and Services	4.0	4.6	4.7	2.9	2.9	3.4	3.5	1.7	3.9
Studies in Human Society	3.8	4.5	4.7	4.9	3.6	4.6	11.4	12.9	4.9
Psychology and Cognitive Sciences	5.1	2.1	2.4	1.9	2.2	1.3	0.6	1.4	3.0
Law and Legal Studies	1.3	1.4	1.4	1.2	0.5	0.7	0.3	1.5	1.3
Studies in Creative Arts and Writing	1.3	0.9	1.3	1.7	0.4	1.1	1.6	2.4	1.2
Language, Communication and Culture	2.8	3.1	1.8	1.7	1.5	0.6	3.1	2.9	2.5
History and Archaeology	1.9	1.8	0.7	0.9	1.1	1.1	1.3	4.9	1.8
Philosophy and Religious Studies	1.3	0.8	0.4	0.4	0.2	0.5	0.2	1.0	0.8
<b>Total</b>	<b>100.0</b>								

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
2010									
<b>Defence</b>	15 240	7 224	10 577	17 471	3 368	149	—	10 076	64 105
<b>Economic development</b>									
Plant Production and Plant Primary Products	35 086	25 474	47 669	39 022	29 578	14 506	435	6 642	198 413
Animal Production and Animal Primary Products	33 242	25 184	32 388	6 814	11 844	9 706	5	1 674	120 858
Mineral Resources (Excl. Energy Resources)	28 899	20 843	46 461	13 278	28 716	7 632	133	2 093	148 054
Energy	66 467	52 188	56 130	11 310	27 632	838	332	14 318	229 214
Manufacturing	95 456	167 352	109 995	19 360	13 618	3 380	13	16 956	426 129
Construction	34 839	39 927	23 699	6 796	7 100	523	179	2 837	115 900
Transport	31 012	36 636	21 667	7 151	5 251	681	—	2 731	105 130
Information and Communication Services	77 190	112 002	45 883	15 327	25 065	4 215	238	22 367	302 287
Commercial Services and Tourism	41 782	46 225	49 474	5 337	19 175	462	710	3 210	166 374
Economic Framework	109 376	116 917	46 901	19 252	23 509	2 009	1 343	49 570	368 878
<i>Total</i>	553 347	642 749	480 266	143 647	191 489	43 953	3 387	122 397	2 181 235
<b>Society</b>									
Health	748 772	849 508	462 328	227 343	200 455	30 966	32 071	106 256	2 657 700
Education and Training	85 033	119 890	49 502	20 804	34 882	4 433	5 512	38 125	358 181
Law, Politics and Community Services	106 151	123 334	88 435	23 303	20 415	5 017	3 778	92 668	463 101
Cultural Understanding	150 002	125 720	62 256	15 617	28 682	4 620	3 456	46 082	436 434
<i>Total</i>	1 089 958	1 218 451	662 522	287 067	284 434	45 037	44 817	283 130	3 915 416
<b>Environment</b>	141 169	179 118	174 905	48 889	67 140	22 192	26 024	74 792	734 229
<b>Expanding Knowledge</b>	589 390	183 832	151 883	47 859	131 456	18 903	1 206	183 485	1 308 014
<b>Total</b>	<b>2 389 104</b>	<b>2 231 374</b>	<b>1 480 154</b>	<b>544 932</b>	<b>677 887</b>	<b>130 234</b>	<b>75 434</b>	<b>673 881</b>	<b>8 202 999</b>
2008 (a)									
<b>Defence</b>	17 709	11 564	1 707	10 149	3 609	279	—	13 698	58 715
<b>Economic development</b>									
Plant Production and Plant Primary Products	49 347	16 766	36 539	33 173	27 370	19 834	1 259	8 415	192 702
Animal Production and Animal Primary Products	40 718	18 495	18 592	8 486	13 778	9 347	20	1 095	110 530
Mineral Resources (Excl. Energy Resources)	11 436	12 116	27 028	13 035	14 378	8 963	159	2 662	89 777
Energy	38 915	32 853	31 908	7 341	16 027	1 144	298	6 802	135 288
Manufacturing	90 330	137 986	56 366	20 107	21 161	2 541	166	13 346	342 002
Construction	56 589	39 493	18 020	4 965	2 841	921	21	2 680	125 530
Transport	12 904	27 400	13 557	7 031	4 023	1 247	—	2 490	68 653
Information and Communication Services	78 139	64 703	36 769	15 966	19 870	923	445	12 659	229 474
Commercial Services and Tourism	31 908	28 813	16 948	5 018	16 940	396	1 676	2 262	103 962
Economic Framework	64 556	87 693	30 135	17 199	7 701	5 240	2 569	32 745	247 838
<i>Total</i>	474 843	466 318	285 861	132 321	144 089	50 555	6 614	85 155	1 645 756
<b>Society</b>									
Health	762 423	715 229	308 505	201 165	219 913	34 006	6 732	112 928	2 360 902
Education and Training	85 446	86 461	43 008	17 913	30 777	3 535	8 154	19 701	294 995
Law, Politics and Community Services	96 211	111 951	44 463	22 080	23 675	3 250	2 583	46 778	350 992
Cultural Understanding	142 319	98 209	40 022	25 942	18 171	5 751	3 004	47 400	380 819
<i>Total</i>	1 086 399	1 011 849	435 999	267 100	292 535	46 543	20 474	226 809	3 387 708
<b>Environment</b>	122 216	112 640	116 145	33 847	78 374	19 064	18 450	37 716	538 451
<b>Expanding Knowledge</b>	329 902	297 406	221 762	61 664	143 516	12 211	534	145 900	1 212 896
<b>Total</b>	<b>2 031 069</b>	<b>1 899 778</b>	<b>1 061 473</b>	<b>505 080</b>	<b>662 123</b>	<b>128 652</b>	<b>46 073</b>	<b>509 277</b>	<b>6 843 526</b>

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	%	%	%	%	%	%	%	%	%
2010									
<b>Defence</b>	0.6	0.3	0.7	3.2	0.5	0.1	—	1.5	0.8
<b>Economic development</b>									
Plant Production and Plant Primary Products	1.5	1.1	3.2	7.2	4.4	11.1	0.6	1.0	2.4
Animal Production and Animal Primary Products	1.4	1.1	2.2	1.3	1.7	7.5	—	0.2	1.5
Mineral Resources (Excl. Energy Resources)	1.2	0.9	3.1	2.4	4.2	5.9	0.2	0.3	1.8
Energy	2.8	2.3	3.8	2.1	4.1	0.6	0.4	2.1	2.8
Manufacturing	4.0	7.5	7.4	3.6	2.0	2.6	—	2.5	5.2
Construction	1.5	1.8	1.6	1.2	1.0	0.4	0.2	0.4	1.4
Transport	1.3	1.6	1.5	1.3	0.8	0.5	—	0.4	1.3
Information and Communication Services	3.2	5.0	3.1	2.8	3.7	3.2	0.3	3.3	3.7
Commercial Services and Tourism	1.7	2.1	3.3	1.0	2.8	0.4	0.9	0.5	2.0
Economic Framework	4.6	5.2	3.2	3.5	3.5	1.5	1.8	7.4	4.5
<i>Total</i>	23.2	28.8	32.4	26.4	28.2	33.7	4.5	18.2	26.6
<b>Society</b>									
Health	31.3	38.1	31.2	41.7	29.6	23.8	42.5	15.8	32.4
Education and Training	3.6	5.4	3.3	3.8	5.1	3.4	7.3	5.7	4.4
Law, Politics and Community Services	4.4	5.5	6.0	4.3	3.0	3.9	5.0	13.8	5.6
Cultural Understanding	6.3	5.6	4.2	2.9	4.2	3.5	4.6	6.8	5.3
<i>Total</i>	45.6	54.6	44.8	52.7	42.0	34.6	59.4	42.0	47.7
<b>Environment</b>	5.9	8.0	11.8	9.0	9.9	17.0	34.5	11.1	9.0
<b>Expanding Knowledge</b>	24.7	8.2	10.3	8.8	19.4	14.5	1.6	27.2	15.9
<b>Total</b>	<b>100.0</b>								
2008 (a)									
<b>Defence</b>	0.9	0.6	0.2	2.0	0.5	0.2	—	2.7	0.9
<b>Economic development</b>									
Plant Production and Plant Primary Products	2.4	0.9	3.4	6.6	4.1	15.4	2.7	1.7	2.8
Animal Production and Animal Primary Products	2.0	1.0	1.8	1.7	2.1	7.3	—	0.2	1.6
Mineral Resources (Excl. Energy Resources)	0.6	0.6	2.5	2.6	2.2	7.0	0.3	0.5	1.3
Energy	1.9	1.7	3.0	1.5	2.4	0.9	0.6	1.3	2.0
Manufacturing	4.4	7.3	5.3	4.0	3.2	2.0	0.4	2.6	5.0
Construction	2.8	2.1	1.7	1.0	0.4	0.7	—	0.5	1.8
Transport	0.6	1.4	1.3	1.4	0.6	1.0	—	0.5	1.0
Information and Communication Services	3.8	3.4	3.5	3.2	3.0	0.7	1.0	2.5	3.4
Commercial Services and Tourism	1.6	1.5	1.6	1.0	2.6	0.3	3.6	0.4	1.5
Economic Framework	3.2	4.6	2.8	3.4	1.2	4.1	5.6	6.4	3.6
<i>Total</i>	23.4	24.5	26.9	26.2	21.8	39.3	14.4	16.7	24.0
<b>Society</b>									
Health	37.5	37.6	29.1	39.8	33.2	26.4	14.6	22.2	34.5
Education and Training	4.2	4.6	4.1	3.5	4.6	2.7	17.7	3.9	4.3
Law, Politics and Community Services	4.7	5.9	4.2	4.4	3.6	2.5	5.6	9.2	5.1
Cultural Understanding	7.0	5.2	3.8	5.1	2.7	4.5	6.5	9.3	5.6
<i>Total</i>	53.5	53.3	41.1	52.9	44.2	36.2	44.4	44.5	49.5
<b>Environment</b>	6.0	5.9	10.9	6.7	11.8	14.8	40.0	7.4	7.9
<b>Expanding Knowledge</b>	16.2	15.7	20.9	12.2	21.7	9.5	1.2	28.6	17.7
<b>Total</b>	<b>100.0</b>								

— nil or rounded to zero (including null cells)

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

# 11

## HIGHER EDUCATION HUMAN RESOURCES DEVOTED TO R&D, by location—by type of resource—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	PYE	PYE	PYE	PYE	PYE	PYE	PYE	PYE	PYE
2010									
Academic Staff	5 915	5 918	3 675	1 946	1 706	570	184	1 325	21 239
Other Staff	2 946	1 902	2 318	243	530	125	69	436	8 568
Postgraduate Students	12 486	10 422	6 538	2 845	3 965	763	157	2 217	39 391
<b>Total</b>	<b>21 346</b>	<b>18 242</b>	<b>12 531</b>	<b>5 034</b>	<b>6 201</b>	<b>1 458</b>	<b>410</b>	<b>3 978</b>	<b>69 199</b>
2008 (a)									
Academic Staff	5 071	5 553	3 324	1 688	1 553	516	146	1 209	19 059
Other Staff	2 917	1 735	1 890	299	648	94	30	569	8 181
Postgraduate Students	10 365	9 348	5 886	2 536	3 601	807	136	1 853	34 533
<b>Total</b>	<b>18 353</b>	<b>16 637</b>	<b>11 099</b>	<b>4 522</b>	<b>5 802</b>	<b>1 417</b>	<b>312</b>	<b>3 631</b>	<b>61 773</b>

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

# 12

## HIGHER EDUCATION HUMAN RESOURCES DEVOTED TO R&D, by location—by type of resource: proportions—2008 and 2010(a)

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust.
	%	%	%	%	%	%	%	%	%
2010									
Academic Staff	27.7	32.4	29.3	38.7	27.5	39.1	44.9	33.3	30.7
Other Staff	13.8	10.4	18.5	4.8	8.6	8.6	16.8	11.0	12.4
Postgraduate Students	58.5	57.1	52.2	56.5	63.9	52.4	38.3	55.7	56.9
<b>Total</b>	<b>100.0</b>								
2008 (a)									
Academic Staff	27.6	33.4	29.9	37.3	26.8	36.4	46.7	33.3	30.9
Other Staff	15.9	10.4	17.0	6.6	11.2	6.6	9.7	15.7	13.2
Postgraduate Students	56.5	56.2	53.0	56.1	62.1	57.0	43.7	51.0	55.9
<b>Total</b>	<b>100.0</b>								

(a) Some 2008 data have been revised. See the Revisions section of the Technical Note for details.

## EXPLANATORY NOTES

### INTRODUCTION

**1** The statistics presented in this release have been compiled from data collected by the Australian Bureau of Statistics (ABS) from Australian higher education institutions in the Survey of Research and Experimental Development (R&D). For the higher education sector, the survey is conducted biennially and based on a single calendar year reference period.

**2** The reference period for statistics presented in this issue is the year ended 31 December 2010.

### DEFINITIONS

**3** R&D as collected by the ABS is defined in accordance with the Organisation for Economic Co-operation and Development (OECD) standard as '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'.

**4** For a more comprehensive interpretation of the definition of R&D activity, see the *Australian and New Zealand Standard Research Classification (ANZSRC), 2008* (cat. no. 1297.0) or refer to the OECD publication *The Measurement of Scientific and Technological Activities: Proposed Standard Practice for Surveys of Research and Experimental Development - Frascati Manual 2002*.

**5** Data providers self-classify R&D expenditure based on their interpretation of OECD/ABS definitions. The ABS makes every effort to ensure correct and consistent interpretation and reporting of these data and applies consistent processing methodologies. See also the Reliability of Statistics and Revisions sections of the Technical Note.

### SCOPE AND COVERAGE

**6** The OECD definition of the higher education sector encompasses universities and other institutions of post-secondary education regardless of their source of finance or legal status. The scope of the ABS R&D survey is based on the OECD definition, but excludes colleges of Technical and Further Education. (For the 2010 survey, 40 Australian higher education institutions were in scope and data collected from each.)

**7** All research activity performed by in-scope institutions during the reference period, irrespective of the source of funds, is included in the survey. This includes research performed by institutions:

- as a participant in unincorporated Cooperative Research Centres (CRCs); and
- on contract for other legal entities (such as private business or incorporated CRCs).

**8** R&D performed on an institution's campus by other legal entities (such as incorporated CRCs or university controlled entities) or employees of other organisations, is excluded from the survey. The R&D performed by these entities and their employees will be in scope of the relevant R&D sector (Business, Government or Private non-profit).

### LOCATION OF R&D

**9** Data shown in this release represent the main campus or head office location of the reporting institution, with the exception of the Australian Defence Force Academy which is part of the University of New South Wales but is shown against the Australian Capital Territory.

### AUSTRALIAN AND NEW ZEALAND STANDARD RESEARCH CLASSIFICATION

**10** Fields of research, Socio-economic objective and Type of activity statistics presented in this release have been collected and compiled based on the *Australian and New Zealand Standard Research Classification (ANZSRC), 2008* (cat. no. 1297.0).

### DERIVED EXPENDITURE ESTIMATES

**11** Total cost of R&D undertaken is equivalent to direct expenditure plus indirect (overhead) expenditure.

**12** In compiling R&D statistics, institutions were asked to provide data on:

- direct staff inputs (i.e. staff directly performing R&D);
- direct expenditure (i.e. expenses directly attributable to R&D); and

## EXPLANATORY NOTES *continued*

### DERIVED EXPENDITURE ESTIMATES *continued*

- other staff and resources supporting, but not directly performing, R&D.

**13** Institutions were also required to indicate whether overheads had been included in reported data. In cases where data did not include overheads, an estimate was calculated by either:

- the institution identifying the value of R&D related overhead costs to be apportioned across relevant projects/schools; or
- the ABS, using a methodology agreed to by institutions and Universities Australia.

### GROSS DOMESTIC AND GROSS STATE PRODUCT

**14** In calculating HERD/Gross Domestic Product (GDP) and HERD/Gross State Product (GSP) ratios presented in this issue, the most recent GDP and GSP values available were used. These values are referenced in the tables below.

#### GROSS DOMESTIC PRODUCT, current prices

	2000-01	2002-03	2004-05	2006-07	2008-09	2010-11
	\$m	\$m	\$m	\$m	\$m	\$m
GDP	706 895	800 911	920 899	1 083 060	1 252 218	1 400 126

Source: *Australian National Accounts: National Income, Expenditure and Product, December 2011* (cat. no. 5206.0), released 7 March 2012

#### GROSS STATE PRODUCT, current prices

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
2010-11	438 456	317 152	266 585	90 172	216 586	24 809	17 082	30 327
2008-09	392 445	282 891	256 942	80 203	175 051	22 103	16 420	26 163

Source: *Australian National Accounts, State Accounts, 2010-11* (cat. no. 5220.0), released 23 November 2011

**15** GDP is estimated by the ABS according to the recently updated international standards *System of National Accounts, 2008* (2008 SNA) and is not directly comparable to GDP for countries where these standards have not been applied.

**16** While statistics presented in this issue relate to the 2010 calendar year, financial year GDP and GSP data are used to ensure consistency with ratios published in other ABS R&D releases which use a financial year as the reporting period.

### CHAIN VOLUME MEASURES

**17** The chain volume measures appearing in this release are annually reweighted chain Laspeyres indexes referenced to the current price values in a chosen reference year (currently 2010). 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: Australian National Accounts, Introduction of Chain Volume Measures and Price Indexes* (cat. no. 5248.0).

**18** Deflators used to calculate the chain volume measure of expenditure on R&D have been revised to: better capture changes in the unit value of labour used in the production of R&D services; and to increase and refine the number of products included in the deflators.

## EXPLANATORY NOTES *continued*

### UPCOMING RELEASES

- 19** Upcoming releases of R&D statistics include:  
*Research and Experimental Development, Businesses, Australia, 2010–11* (cat. no. 8104.0), scheduled for release 11 September 2012. This release will also include the 2010–11 estimate for gross expenditure on R&D (GERD).

### OTHER RELATED RELEASES

- 20** Users may also wish to refer to the following ABS releases:  
*Australian and New Zealand Standard Research Classification (ANZSRC), 2008* (cat. no. 1297.0)  
*Innovation in Australian Business, 2008–09* (cat. no. 8158.0)  
*Microdata: Business Longitudinal Database, Expanded CURF, Australia, 2004–05 to 2009–10* (cat. no. 8168.0.55.001)  
*Selected Characteristics of Australian Businesses, 2009–10* (cat. no. 8167.0)  
*Summary of IT Use and Innovation in Australian Business, 2009–10* (cat. no. 8166.0)
- 21** Relevant OECD publications include:  
*Main Science and Technology Indicators 2011/2*  
*The Measurement of Scientific and Technological Activities: Proposed Standard Practice for Surveys of Research and Experimental Development - Frascati Manual 2002*

### ABS WEBSITE

- 22** Other information, including data cubes in spreadsheet format, relating to R&D and innovation can be found on the ABS website <[www.abs.gov.au](http://www.abs.gov.au)>. See the Innovation, Science and Technology theme page under Topics @ a Glance/Industry.

### ROUNDING

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

## TECHNICAL NOTE DATA QUALITY

### NON-SAMPLING ERROR

**1** Non-sampling errors may arise as a result of errors in the reporting or processing of data. These errors can be introduced through inadequacies in the collection instrument, treatment of non-response, inaccurate reporting by data providers, errors in the application of survey procedures, incorrect recording of answers and errors in data capture and processing.

**2** The extent to which non-sampling error affects the results is difficult to measure. Every effort is made to minimise non-sampling error by careful design and testing of the collection instrument, the use of efficient operating procedures and systems, and the use of appropriate methodologies.

#### *Reliability of statistics*

**3** When interpreting the statistics in this release, the reliability and comparability of the estimates may be affected by the following specific non-sampling errors:

- Many institutions provided estimates due to a lack of separately recorded data on R&D activity.
- Data were self-classified by institutions to Fields of research (FOR), Socio-economic objective (SEO) and Type of activity at the time of reporting. Some institutions may have experienced difficulty in classifying their R&D projects. The ABS makes every effort to ensure correct and consistent interpretation and reporting of these data by applying consistent processing methodologies.
- The estimation method for R&D related overhead costs varied across institutions and reference periods. See Explanatory Notes 11 to 13.

### REVISIONS

**4** Revisions to previous cycle data occur on discovery of errors in the data, typically a result of the specific non-sampling errors outlined in the Reliability of statistics section above.

**5** Revisions are only applied where the impact on:

- R&D expenditure is equal to \$5 million or more; or
- Human resources devoted to R&D is equal to 25 PYE or more.

**6** In processing 2010 data, revisions were applied to 2008 estimates. Revisions impacted three states and territories for expenditure and/or human resource effort devoted to R&D. Most significantly, revisions were applied to source of funds estimates for General university funds; this was primarily a result of data being re-categorised due to misreporting in the 2008 survey.

**7** Users are advised to refer to the most recently released data cubes, as revisions must be taken into consideration when interpreting results, particularly when comparing estimates over time.

### COMPARABILITY OF ESTIMATES OVER TIME

**8** In addition to the non-sampling errors outlined in the Reliability of statistics section, factors which may affect the comparability of 2010 estimates with those of previous cycles are described below:

- Additional reporting requirements for Excellence in Research for Australia initiative have led to improved record keeping within higher education institutions. Since 2008, this resulted in more accurate reporting of data by a number of institutions for some R&D items included in this release.

## GLOSSARY

<b>Applied research</b>	Original work undertaken primarily 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 ways of achieving some specific and predetermined objectives.
<b>Capital expenditure</b>	Expenditure on the acquisition of fixed tangible assets such as land, buildings, vehicles, plant, machinery and equipment which is attributable to R&D activity.
<b>Current expenditure</b>	Expenditure on direct labour costs, scholarships, 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>Donations, bequests and foundations</b>	Research specific donations and bequests from non-profit organisations and Australian individuals.
<b>Experimental development</b>	Systematic work, using existing knowledge gained from research or practical experience, which is directed to producing new materials, products, devices, policies, behaviours or outlooks; to installing new processes, systems and services; or to improving substantially those already produced and installed.
<b>Fields of research (FOR)</b>	The FOR classification allows R&D activity to be categorised according to the methodology used in the R&D, rather than the activity of the unit performing the R&D or the purpose of the R&D. The FOR reflects the field in which the research was undertaken and is based on the processes and techniques used.
<b>General university funds</b>	Funding from: <ul style="list-style-type: none"><li>■ the Commonwealth government (other than targeted research funding), including ANU Institute of Advanced Studies funds; and the portion of other revenue sourced from the Commonwealth spent on R&amp;D but not identified as 'Competitive Research Grants' or 'Other commonwealth government'; and</li><li>■ fees and charges, income relating to HECS liabilities, income from non-research specific donations, bequests and foundations, investment income, reversions from provisions accounts, loans drawn down, income from the institutions commercial operations and from sale of products or assets.</li></ul>
<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>	Expenditure relating to: wages and salaries; overtime earnings; penalty payments; shift allowances; employer contributions into superannuation; fringe benefits and payroll taxes; severance, termination and redundancy payments; workers' compensation premiums/costs; provisions for employee entitlements; salaries and fees of directors and executives; retainers and commissions of persons who received a retainer; bonuses; annual and other types of paid leave.
<b>Other commonwealth government</b>	All other targeted research funding from commonwealth agencies, including: R&D grants such as CRC and MNRF grants (but excluding Australian Competitive Grants Register schemes); and payments for R&D projects carried out on contract for commonwealth government. Other examples of funding included are: <ul style="list-style-type: none"><li>■ Australian Postgraduate Awards</li><li>■ International Postgraduate Research Scholarships</li><li>■ Joint Research Engagement</li><li>■ Research Infrastructure Block Grants</li><li>■ Research Training Scheme</li><li>■ Special Research Assistance (pre-BAF)</li><li>■ Sustainable Research Excellence</li><li>■ Systemic Infrastructure Initiative</li></ul>

## GLOSSARY *continued*

<b>Other current expenditure</b>	All other non-staff expenditures including materials, fuels, water, sewerage, rent and hiring expenses, repairs and maintenance, cleaning services, postage, freight, telephone, academic services purchased from outside and any other current expenses which are not captured by labour costs or scholarships. Payments for patent searches and for purchases of technical know-how are excluded.
<b>Other staff</b>	Technicians, skilled and unskilled craftpersons, secretarial and clerical staff directly associated with R&D activity.
<b>Person years of effort</b>	One person year of effort is equal to a full time employee whose time is wholly devoted to R&D for a whole year.
<b>Pure basic research</b>	Experimental and theoretical work undertaken to acquire new knowledge without looking for long term benefits other than the advancement of knowledge.
<b>R&amp;D activity</b>	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>Scholarships</b>	Comprises expenditure by the university on scholarships for research higher degrees.
<b>Socio-economic objective (SEO)</b>	Reflects the purpose of the R&D as perceived by the data provider. The SEO classification consists of discrete economic, social, technological or scientific domains for identifying the principal purpose of the R&D.
<b>Strategic basic research</b>	Experimental and theoretical work undertaken to acquire new knowledge directed into specified broad areas in the expectation of practical discoveries. It provides the broad base of knowledge necessary for the solution of recognised practical problems.
<b>Type of activity</b>	This classification allows R&D activity to be categorised according to the type of research effort, namely, pure basic research, strategic basic research, applied research and experimental development.

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*PHONE*                      1300 135 070

*EMAIL*                      [client.services@abs.gov.au](mailto:client.services@abs.gov.au)

*FAX*                              1300 135 211

*POST*                          Client Services, ABS, GPO Box 796, Sydney NSW 2001

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