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# Science Statistics

May 2008 edition



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Statistics Canada  
Science, Innovation and Electronic Information Division

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## Symbols

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0<sup>s</sup> value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published

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# Highlights

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## Research and Development Personnel (R&D) - 1996 to 2005

- The growth in the number of people engaged in research and development in Canada, such as researchers, technicians and supporting staff, slowed down considerably in 2005. (Table 1-1)
- A total of 213,930 full-time equivalent researchers, technicians, and other support personnel were engaged in R&D activities in 2005, up 3.8% from the previous year. This was well below the increase of 6.7% in 2003. (Table 3-2)
- The number of these individuals increased by about 48.8% between 1996 and 2005, largely the result of increased employment of researchers in the business enterprise sector. (Table 1-1 and Table 1-4)
- Together, the business enterprise and higher education sectors employed 8 of every 10 new researchers in 2005. (Table 4-2)
- Researchers accounted for 63% of all the personnel engaged in R&D in Canada in 2005. However, only three provinces had higher proportions than the national average: British Columbia, where researchers accounted for 70%, Alberta (66%) and Ontario (64%). (Table 2-1)
- Between 1996 and 2005, the proportion of personnel engaged in R&D in the business enterprise sector increased from 55% in 1996 to 64% in 2005. (Table 1-1)
- On the other hand, during the same period, the share in the higher education sector declined from 32% to 27%. This was a reflection of the more robust increase in the number of R&D personnel in the business enterprise sector. (Table 1-1)

## Analysis

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Intense global competition, the new economy and fast changing technology have made research and development (R&D) a top priority for many countries including Canada. In this light, R&D personnel play a pivotal role in any government strategy to strengthen and expand Canada's R&D capacity. This issue sheds some light on the nature of the evolution of the number of people who perform R&D activities in Canada from 1996 to 2005.

The number of people engaged in R&D in Canada (i.e., researchers, technicians and supporting staff) increased by 3.8% from 2004 to 2005, but this growth rate is relatively sluggish when compared to the 5.3% rate recorded in 2004 or the 9.6% increase posted between 1999 and 2000 (153,350 to 168,130) (table 1-1). In 2005, 8 out of every 10 (83%) new R&D personnel was a researcher (table 3-2).

Between 1996 and 2005, the number of people engaged in R&D posted an impressive growth of 48.8%. This increase was largely precipitated by the swelling of the ranks of researchers (48.4%) and technicians (55.2%) (table 3-2). Increases in the number of natural sciences and engineering researchers (55.6%) accounted for much of the rise in the total number of researchers over this period (table 3-2). During this same time frame, 4 out of every 5 new natural sciences and engineering researchers were employed in the business enterprise sector (table 1-4).<sup>1</sup>

In 2005, the number of personnel engaged in R&D in the business enterprise sector increased by 2.9% (about half of the growth rate of 5.8% chalked between 2003 and 2004) (tables 1-1 and 1-4), while those in the higher education sector (the second largest employer of R&D personnel) experienced a modest growth of 4.1%, a lower rate than what was recorded for this sector from 2003 and 2004 (5.5%) (tables 1-1 and 1-5).

Importantly, between 1996 and 2005, the business enterprise sector witnessed its share of the total number of personnel engaged in R&D increase from 55% in 1996 to 64% in 2005 (tables 1-4 and 3-2). On the other hand, during the same period, the higher education sector experienced a decline in its share of R&D personnel from 32% in 1996 to 27% in 2005 (tables 1-5 and 3-2). Although the number of R&D personnel in higher education institutions has been rising over the years, the business enterprise sector has seen a much larger increase in the number of R&D personnel it has employed.

In 2005, researchers accounted for 63% of all the personnel engaged in R&D in Canada, however, British Columbia (70%) Alberta (66%) and Ontario (64%) were the only provinces to record higher proportions of researchers among their R&D personnel (table 2-1).

The business enterprise sector provided employment to 81,960 researchers in 2005 and almost half (49%) of the 6,460 new researchers (tables 1-4 and 3-2). The higher education sector employed 43,420 researchers in 2005 and almost one-third (32%) of the new researchers (table 1-5). Also, during the period spanning 1996 to 2005, the number of doctoral students engaged in R&D in the higher education sector increased by 7,727 people (33.2%) (table 4-3).

In 2005, Ontario and Quebec employed 3 out of every 4 personnel engaged in R&D (75%) as their researchers amounted to 62,060 and 39,000 respectively. This may be related to the fact that these two provinces host a significant percentage of the R&D performing organizations in Canada (tables 2-2 and 3-2).

Among countries with similar methods of measuring R&D personnel, Canada has an impressive rate of researchers per 1,000 persons in the labour force. For example, in 2004, Canada's rate was 7.7 researchers per 1,000 persons in the labour force, while the United Kingdom and France posted rates of 5.7 and 8.0 respectively (table 4-1).

The natural sciences and engineering sector is the most important field of science in which federal government R&D personnel are active (table 1-2). The number of R&D personnel employed by the federal government

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1. In this analysis, all researchers in the business enterprise sector are engaged in natural sciences and engineering.



fluctuated between 1996 and 2005, however, in 2005 there was an impressive growth of 11.2% in the numbers of such personnel (table 1-1).

## Related products

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### Selected publications from Statistics Canada

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88-202-X	Industrial Research and Development: Intentions
88-204-X	Federal Scientific Activities
88-221-X	Gross Domestic Expenditures on Research and Development in Canada and the Provinces
88-522-X	Science and Technology Activities and Impacts: A Framework for a Statistical Information
88F0006X	Science, Innovation and Electronic Information Division Working Papers
88F0017M	Science, Innovation and Electronic Information Division Research Papers

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### Selected CANSIM tables from Statistics Canada

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358-0001	Gross domestic expenditures on research and development, by science type and by funder and performer sector, annual
358-0024	Business enterprise research and development (BERD) characteristics, by industry group based on the North American Industry Classification System (NAICS), annual
358-0026	Intellectual property management, by federal departments and agencies indicators, annual

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### Selected surveys from Statistics Canada

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4201	Research and Development in Canadian Industry
4204	Research and Development of Canadian Private Non-Profit Organizations
4208	Provincial Research Organizations (PRO)
4209	Provincial Government Activities in the Natural Sciences
4210	Provincial Government Activities in the Social Sciences
4212	Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences
5109	Higher Education Research and Development Estimates

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## **Selected summary tables from Statistics Canada**

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- *Research and development performed by the business enterprise sector*
- *Domestic spending on research and development (GERD), funding sector, by province*
- *Domestic spending on research and development (GERD), performing sector, by province*
- *Domestic spending on research and development (GERD)*

# Statistical tables

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**Table 1-1**  
**Personnel engaged in research and development — Sector of performance**

	1996	1997	1998 <sup>r</sup>	1999 <sup>r</sup>	2000 <sup>r</sup>	2001 <sup>r</sup>	2002 <sup>r</sup>	2003 <sup>r</sup>	2004 <sup>r</sup>	2005
	number									
<b>Total</b>	<b>143,760</b>	<b>145,690</b>	<b>147,860</b>	<b>153,350</b>	<b>168,130</b>	<b>179,360</b>	<b>183,360</b>	<b>195,730</b>	<b>206,180</b>	<b>213,930</b>
Federal government	14,840	13,950	13,730	14,080	14,700	13,740	13,960	13,580	13,720	15,250
Provincial governments <sup>1</sup>	2,880	2,970	2,850	2,520	2,710	2,730	2,820	2,560	2,560	2,620
Business enterprise <sup>2</sup>	79,380	82,640	85,930	91,310	104,720	115,700	118,400	126,430	133,790	137,690
Higher education	45,430	44,920	44,320	44,590	45,150	46,300	47,340	51,880	54,730	56,950
Private non-profit organizations <sup>3</sup>	1,230	1,210	1,030	850	850	890	840	1,280	1,380	1,420
	percentage change									
<b>Total</b>	<b>0.9</b>	<b>1.3</b>	<b>1.5</b>	<b>3.7</b>	<b>9.6</b>	<b>6.7</b>	<b>2.3</b>	<b>6.7</b>	<b>5.3</b>	<b>3.8</b>
Federal government	-7.1	-6.0	-1.6	2.5	4.4	-6.5	1.6	-2.7	1.0	11.2
Provincial governments <sup>1</sup>	-6.4	3.1	-4.0	-11.6	7.5	0.7	3.3	-9.2	0.0	2.3
Business enterprise <sup>2</sup>	4.0	4.1	4.0	6.2	14.7	10.5	2.4	6.8	5.8	2.9
Higher education	-1.0	-1.1	-1.3	0.6	1.3	2.5	2.2	9.6	5.5	4.1
Private non-profit organizations <sup>3</sup>	4.5	-1.6	-14.9	-17.5	0.0	4.7	-5.6	52.4	7.8	2.9

1. Provincial government data includes provincial research organizations data.

2. Natural sciences and engineering only.

3. Private non-profit organization's personnel counts may fluctuate due to these organization's intramural research and development activities.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 1-2**  
**Personnel engaged in research and development — Federal government, by occupational category**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	number									
<b>Total</b>	<b>14,840</b>	<b>13,950</b>	<b>13,730</b>	<b>14,080</b>	<b>14,700</b>	<b>13,740</b>	<b>13,960</b>	<b>13,580</b>	<b>13,720</b>	<b>15,250</b>
Researchers	6,310	5,850	5,850	6,020	6,120	5,610	6,190	6,110	5,990	7,090
Technicians	4,100	3,900	3,820	3,860	3,820	3,780	3,770	3,760	3,730	3,960
Support staff	4,430	4,200	4,060	4,200	4,760	4,350	4,000	3,710	4,010	4,200
<b>Natural sciences and engineering</b>	<b>14,260</b>	<b>13,420</b>	<b>13,220</b>	<b>13,490</b>	<b>14,120</b>	<b>13,040</b>	<b>13,220</b>	<b>12,870</b>	<b>13,000</b>	<b>14,470</b>
Researchers	6,030	5,610	5,620	5,750	5,840	5,250	5,800	5,740	5,620	6,710
Technicians	4,040	3,830	3,760	3,790	3,750	3,700	3,700	3,690	3,640	3,870
Support staff	4,190	3,980	3,840	3,950	4,530	4,090	3,720	3,440	3,740	3,890
<b>Social sciences and humanities</b>	<b>580</b>	<b>530</b>	<b>510</b>	<b>590</b>	<b>580</b>	<b>700</b>	<b>740</b>	<b>710</b>	<b>720</b>	<b>780</b>
Researchers	280	240	230	270	280	360	390	370	360	380
Technicians	60	70	60	70	70	80	70	70	90	90
Support staff	240	220	220	250	230	260	280	270	270	310

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 1-3  
Personnel engaged in research and development — Provincial government, by occupational category**

	1996	1997	1998	1999 <sup>r</sup>	2000 <sup>r</sup>	2001 <sup>r</sup>	2002 <sup>r</sup>	2003 <sup>r</sup>	2004 <sup>r</sup>	2005
	number									
<b>Government departments<sup>1</sup></b>										
<b>Total</b>	<b>2,880</b>	<b>2,970</b>	<b>2,850</b>	<b>2,520</b>	<b>2,710</b>	<b>2,730</b>	<b>2,820</b>	<b>2,560</b>	<b>2,560</b>	<b>2,620</b>
Researchers	1,420	1,490	1,460	1,280	1,380	1,340	1,360	1,260	1,230	1,330
Technicians	890	960	910	830	910	850	920	780	840	830
Support staff	570	520	480	410	420	540	540	520	490	460
<b>Natural sciences and engineering</b>	<b>1,750</b>	<b>1,740</b>	<b>1,690</b>	<b>1,400</b>	<b>1,510</b>	<b>2,020</b>	<b>2,080</b>	<b>1,780</b>	<b>1,770</b>	<b>1,790</b>
Researchers	900	860	890	740	800	960	980	840	820	880
Technicians	580	590	520	450	500	670	700	560	590	580
Support staff	270	290	280	210	210	390	400	380	360	330
<b>Social sciences and humanities</b>	<b>290</b>	<b>260</b>	<b>240</b>	<b>170</b>	<b>250</b>	<b>230</b>	<b>260</b>	<b>320</b>	<b>300</b>	<b>360</b>
Researchers	210	200	180	130	170	180	190	230	220	270
Technicians	30	20	20	20	50	20	40	50	40	40
Support staff	50	40	40	20	30	30	30	40	40	50
<b>Sub-total</b>	<b>2,040</b>	<b>2,000</b>	<b>1,930</b>	<b>1,570</b>	<b>1,760</b>	<b>2,250</b>	<b>2,340</b>	<b>2,100</b>	<b>2,070</b>	<b>2,150</b>
<b>Provincial research organizations<sup>2</sup></b>	<b>840</b>	<b>970</b>	<b>920</b>	<b>950</b>	<b>950</b>	<b>480</b>	<b>480</b>	<b>460</b>	<b>490</b>	<b>470</b>
Researchers	310	430	390	410	410	200	190	190	190	180
Technicians	280	350	370	360	360	160	180	170	210	210
Support staff	250	190	160	180	180	120	110	100	90	80

1. In 2001 the Alberta Research Council Inc. became an agency of the provincial government, and is therefore included in that sector of performance.

2. Provincial research organizations include natural sciences and engineering only.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 1-4  
Personnel engaged in research and development — Business enterprise sector, by occupational category**

	1996	1997	1998	1999 <sup>r</sup>	2000 <sup>r</sup>	2001 <sup>r</sup>	2002 <sup>r</sup>	2003 <sup>r</sup>	2004 <sup>r</sup>	2005
	number									
<b>Total</b>	<b>79,380</b>	<b>82,640</b>	<b>85,930</b>	<b>91,310</b>	<b>104,720</b>	<b>115,700</b>	<b>118,400</b>	<b>126,430</b>	<b>133,790</b>	<b>137,690</b>
Researchers	48,530	51,960	54,680	58,000	66,870	73,120	73,220	75,850	78,790	81,960
Technicians	21,580	21,570	22,010	22,800	26,750	29,660	31,590	34,570	38,480	39,490
Support staff	9,270	9,110	9,240	10,510	11,100	12,920	13,590	16,010	16,520	16,240

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 1-5  
Personnel engaged in research and development — Higher education sector, by occupational category**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	number									
<b>Total</b>	<b>45,430</b>	<b>44,920</b>	<b>44,320</b>	<b>44,590</b>	<b>45,150</b>	<b>46,300</b>	<b>47,340</b>	<b>51,880</b>	<b>54,730</b>	<b>56,950</b>
Researchers	33,790	33,430	32,840	33,020	33,300	34,200	34,910	38,900	41,380	43,420
Technicians	6,090	6,010	6,010	6,060	6,200	5,980	6,140	6,410	6,580	6,670
Support staff	5,550	5,480	5,470	5,510	5,650	6,120	6,290	6,570	6,770	6,860
<b>Natural sciences and engineering</b>	<b>24,790</b>	<b>24,190</b>	<b>23,940</b>	<b>25,130</b>	<b>25,330</b>	<b>26,190</b>	<b>26,820</b>	<b>29,810</b>	<b>31,330</b>	<b>32,670</b>
Researchers	17,010	16,550	16,250	17,400	17,440	18,110	18,530	21,160	22,500	23,720
Technicians	4,420	4,340	4,370	4,400	4,490	4,440	4,560	4,750	4,850	4,920
Support staff	3,360	3,300	3,320	3,330	3,400	3,640	3,730	3,900	3,980	4,030
<b>Social sciences and humanities</b>	<b>20,640</b>	<b>20,730</b>	<b>20,380</b>	<b>19,460</b>	<b>19,820</b>	<b>20,110</b>	<b>20,520</b>	<b>22,070</b>	<b>23,400</b>	<b>24,280</b>
Researchers	16,780	16,880	16,590	15,620	15,860	16,090	16,380	17,740	18,880	19,700
Technicians	1,670	1,670	1,640	1,660	1,710	1,540	1,580	1,660	1,730	1,750
Support staff	2,190	2,180	2,150	2,180	2,250	2,480	2,560	2,670	2,790	2,830

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 2-1**  
**Provincial distribution of personnel engaged in research and development — Sector of performance, by occupational category**

	2005										
	Newfound-land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskat-chewan <sup>1</sup>	Alberta	British Columbia	Canada <sup>2</sup>
	number										
<b>Total<sup>3</sup></b>	<b>1,650</b>	<b>360</b>	<b>3,770</b>	<b>2,310</b>	<b>65,130</b>	<b>96,290</b>	<b>4,350</b>	<b>3,400</b>	<b>14,000</b>	<b>21,160</b>	<b>213,930</b>
Researchers	970	190	2,110	1,330	39,000	62,060	2,350	1,820	9,180	14,710	134,280
Technicians	400	100	1,000	590	17,390	22,040	1,270	980	2,980	4,180	51,550
Other	280	70	660	390	8,740	12,190	730	600	1,840	2,270	28,100
<b>Federal government</b>	<b>200</b>	<b>80</b>	<b>600</b>	<b>230</b>	<b>2,410</b>	<b>2,780</b>	<b>600</b>	<b>530</b>	<b>870</b>	<b>770</b>	<b>9,130</b>
Researchers	100	40	280	140	1,130	1,340	260	240	400	390	4,360
Technicians	60	20	190	50	520	760	210	160	270	230	2,490
Other	40	20	130	40	760	680	130	130	200	150	2,280
<b>Federal government (National Capital Region)</b>	...	...	...	...	<b>580</b>	<b>5,540</b>	...	...	...	...	<b>6,120</b>
Researchers	...	...	...	...	310	2,430	...	...	...	...	2,740
Technicians	...	...	...	...	130	1,340	...	...	...	...	1,470
Other	...	...	...	...	140	1,770	...	...	...	...	1,910
<b>Provincial governments<sup>4</sup></b>	..	..	..	<b>90</b>	<b>930</b>	<b>450</b>	<b>60</b>	<b>210</b>	<b>670</b>	<b>190</b>	<b>2,620</b>
Researchers	..	..	..	40	500	290	40	70	250	120	1,320
Technicians	..	..	..	30	310	90	10	120	220	40	830
Other	..	..	..	20	120	70	10	20	200	30	470
<b>Business enterprise</b>	<b>490</b>	<b>130</b>	<b>1,380</b>	<b>940</b>	<b>45,210</b>	<b>66,070</b>	<b>2,060</b>	<b>1,160</b>	<b>6,600</b>	<b>13,640</b>	<b>137,690</b>
Researchers	250	80	720	470	24,250	41,390	960	550	4,070	9,210	81,960
Technicians	170	40	470	330	14,850	17,490	780	430	1,790	3,140	38,490
Other <sup>5</sup>	70	10	190	140	6,110	7,190	320	180	740	1,290	16,240
<b>Higher education</b>	<b>960</b>	<b>150</b>	<b>1,790</b>	<b>1,050</b>	<b>16,000</b>	<b>21,450</b>	<b>1,630</b>	<b>1,500</b>	<b>5,860</b>	<b>6,560</b>	<b>56,950</b>
Researchers	620	70	1,110	680	12,810	16,610	1,090	960	4,460	4,990	43,400
Technicians	170	40	340	180	1,580	2,360	270	270	700	770	6,680
Other	170	40	340	190	1,610	2,480	270	270	700	800	6,870

- 2005 university degrees, diplomas and certificates granted for University of Regina not available.
  - Includes the Yukon Territories, Northwest Territories and the Nunavut.
  - The data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development, by performing sector include the private non-profit sector.
  - Provincial government data includes provincial research organizations data.
  - No provincial distribution between technicians and other, estimated proportionally according to national total.
- Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 2-2  
Provincial distribution of personnel engaged in research and development — Occupational category**

	Newfound- land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskat- chewan <sup>1</sup>	Alberta	British Columbia	Yukon Territory, Northwest Territories and Nunavut	Canada
	number											
<b>Researchers <sup>2</sup></b>												
2000 r	700	150	1,800	910	32,170	51,670	1,950	1,530	6,830	9,940	20	<b>107,970</b>
2001 r	760	140	1,750	950	33,190	56,000	1,880	1,600	7,270	10,700	20	<b>114,570</b>
2002 r	770	130	1,840	970	34,650	55,920	2,020	1,580	7,640	10,140	20	<b>115,960</b>
2003 r	870	160	1,940	1,130	36,280	57,550	2,120	1,800	8,350	11,890	30	<b>122,550</b>
2004 r	920	170	2,070	1,130	37,500	59,080	2,160	1,860	9,090	13,350	50	<b>127,840</b>
2005	970	190	2,110	1,330	39,000	62,060	2,350	1,820	9,180	14,710	60	<b>134,280</b>
<b>Technicians <sup>2</sup></b>												
2000 r	320	110	830	480	12,400	16,120	930	840	2,460	3,180	20	<b>37,990</b>
2001 r	320	110	790	480	13,860	16,780	1,060	840	2,710	3,310	20	<b>40,570</b>
2002 r	310	80	800	510	14,670	18,060	970	810	2,610	3,590	20	<b>42,690</b>
2003 r	340	100	790	530	15,750	19,910	980	860	2,680	3,550	30	<b>46,060</b>
2004 r	370	100	950	570	17,020	21,660	1,080	960	2,890	4,000	30	<b>50,240</b>
2005	400	100	1,000	590	17,390	22,040	1,270	980	2,980	4,180	30	<b>51,550</b>
<b>Other support staff <sup>2</sup></b>												
2000 r	230	80	630	340	6,520	9,740	600	590	1,440	1,740	10	<b>22,170</b>
2001 r	260	80	650	360	7,540	10,090	670	600	1,810	1,860	10	<b>24,220</b>
2002 r	270	60	610	370	7,750	10,510	610	540	1,660	1,970	10	<b>24,710</b>
2003 r	260	70	600	390	8,680	11,800	630	580	1,750	2,040	10	<b>27,120</b>
2004 r	270	70	670	390	8,770	12,370	670	560	1,830	2,180	10	<b>28,100</b>
2005	280	70	660	390	8,740	12,190	730	600	1,840	2,270	0	<b>28,100</b>

1. 2005 university degrees, diplomas and certificates granted for University of Regina not available.  
 2. The data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development, by performing sector include the private non-profit sector.  
**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).



**Table 3-1**  
**Personnel engaged in research and development — Selected OECD countries and by major sector**

	1996	1997	1998	1999	2000 <sup>r</sup>	2001 <sup>r</sup>	2002 <sup>r</sup>	2003 <sup>r</sup>	2004 <sup>r</sup>	2005
	thousands									
<b>Total research and development personnel</b>										
Japan <sup>1</sup>	892	894	926	919	897	892	857	882	896	921
Germany	454	460	462	480	485	481	480	473	471	481
United Kingdom	..	..	..	..	..	312	322	319	316	323
France	321	306	309	314	327	334	344	346	352	357
Italy	142	..	146	143	150	154	164	162	164	175
<b>Canada</b>	<b>144</b>	<b>146</b>	<b>148</b>	<b>153</b>	<b>168</b>	<b>179</b>	<b>183</b>	<b>190</b>	<b>199</b>	..
Netherlands	81	84	85	87	88	89	87	86	92	90
Sweden	..	65	..	67	..	72	..	73	72	78
<b>Governments</b>										
Japan <sup>1</sup>	56	57	59	59	59	63	64	62	62	63
Germany	75	73	73	71	71	72	73	74	76	76
United Kingdom	27	26	29	30	30	23	21	21	21	20
France	69	53	52	53	53	49	52	51	52	53
Italy	32	31	32	31	31	30	31	31	32	33
<b>Canada</b>	<b>18</b>	<b>17</b>	<b>17</b>	<b>17</b>	<b>17</b>	<b>16</b>	<b>17</b>	<b>16</b>	<b>16</b>	..
Netherlands	16	16	16	17	13	13	13	14	14	13
Sweden	..	3	..	3	..	3	..	3	..	4
<b>Business enterprise</b>										
Japan <sup>1</sup>	589	586	613	605	582	562	556	581	587	610
Germany	277	286	288	307	312	307	303	298	299	305
United Kingdom	142	137	148	153	145	154	158	156	152	147
France	163	166	168	172	178	185	191	193	197	199
Italy	61	61	61	60	64	65	70	68	68	71
<b>Canada</b>	<b>79</b>	<b>83</b>	<b>86</b>	<b>91</b>	<b>105</b>	<b>116</b>	<b>118</b>	<b>120</b>	<b>127</b>	..
Netherlands	39	42	44	45	48	48	47	44	50	48
Sweden	..	44	..	44	..	49	..	48	47	56
<b>Higher education</b>										
Japan <sup>1</sup>	218	222	225	228	228	250	221	224	232	234
Germany	102	101	100	101	101	101	105	101	96	100
United Kingdom	..	..	..	..	..	..	..	..	..	..
France	82	80	82	83	90	92	94	95	97	99
Italy	49	..	53	52	55	59	60	59	61	67
<b>Canada</b>	<b>45</b>	<b>45</b>	<b>44</b>	<b>45</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>52</b>	<b>55</b>	..
Netherlands	24	24	24	24	27	27	27	27	..	..
Sweden	..	18	..	19	..	20	..	21	22	18

1. Overestimated (not in full-time equivalent).

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Source(s):** OECD, Main Science and Technology Indicators, Volume 2007/2.

**Table 3-2**  
**Personnel engaged in research and development — All sectors, by occupational category**

	Researchers			Technicians			Support staff			Total, all sectors
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1996	73,250	17,270	<b>90,520</b>	31,440	1,760	<b>33,200</b>	17,560	2,480	<b>20,040</b>	<b>143,760</b>
1997	75,860	17,320	<b>93,180</b>	31,190	1,760	<b>32,950</b>	17,120	2,440	<b>19,560</b>	<b>145,690</b>
1998 <sup>r</sup>	78,210	17,000	<b>95,210</b>	31,450	1,720	<b>33,170</b>	17,070	2,410	<b>19,480</b>	<b>147,860</b>
1999 <sup>r</sup>	82,620	16,020	<b>98,640</b>	32,150	1,750	<b>33,900</b>	18,360	2,450	<b>20,810</b>	<b>153,350</b>
2000 <sup>r</sup>	91,660	16,310	<b>107,970</b>	36,160	1,830	<b>37,990</b>	19,660	2,510	<b>22,170</b>	<b>168,130</b>
2001 <sup>r</sup>	97,950	16,620	<b>114,570</b>	38,930	1,650	<b>40,580</b>	21,440	2,770	<b>24,210</b>	<b>179,360</b>
2002 <sup>r</sup>	99,000	16,960	<b>115,960</b>	40,990	1,690	<b>42,680</b>	21,850	2,870	<b>24,720</b>	<b>183,360</b>
2003 <sup>r</sup>	104,210	18,340	<b>122,550</b>	44,280	1,780	<b>46,060</b>	24,140	2,980	<b>27,120</b>	<b>195,730</b>
2004 <sup>r</sup>	108,380	19,460	<b>127,840</b>	48,380	1,860	<b>50,240</b>	25,000	3,100	<b>28,100</b>	<b>206,180</b>
2005	113,950	20,350	<b>134,300</b>	49,660	1,880	<b>51,540</b>	24,900	3,190	<b>28,090</b>	<b>213,930</b>

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 3-3**  
**Personnel engaged in research and development — Major field of science and sector of performance**

	Business enterprise			Higher education			Federal government		
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total
	number								
1996	79,380	..	<b>79,380</b>	24,790	20,640	<b>45,430</b>	14,260	580	<b>14,840</b>
1997	82,640	..	<b>82,640</b>	24,190	20,730	<b>44,920</b>	13,420	530	<b>13,950</b>
1998	85,930	..	<b>85,930</b>	23,940	20,380	<b>44,320</b>	13,220	510	<b>13,730</b>
1999 r	91,310	..	<b>91,310</b>	25,130	19,460	<b>44,590</b>	13,490	590	<b>14,080</b>
2000 r	104,720	..	<b>104,720</b>	25,330	19,820	<b>45,150</b>	14,120	580	<b>14,700</b>
2001 r	115,700	..	<b>115,700</b>	26,190	20,110	<b>46,300</b>	13,040	700	<b>13,740</b>
2002 r	118,400	..	<b>118,400</b>	26,820	20,520	<b>47,340</b>	13,220	740	<b>13,960</b>
2003 r	126,430	..	<b>126,430</b>	29,810	22,070	<b>51,880</b>	12,870	710	<b>13,580</b>
2004 r	133,790	..	<b>133,790</b>	31,330	23,400	<b>54,730</b>	13,000	720	<b>13,720</b>
2005	137,690	..	<b>137,690</b>	32,670	24,280	<b>56,950</b>	14,470	780	<b>15,250</b>

  

	Provincial governments <sup>1</sup>			Private non-profit			Canada		
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total
	number								
1996	2,590	290	<b>2,880</b>	1,230	..	<b>1,230</b>	122,210	21,510	<b>143,750</b>
1997	2,710	260	<b>2,970</b>	1,210	..	<b>1,210</b>	124,170	21,520	<b>145,690</b>
1998 r	2,610	240	<b>2,850</b>	1,030	..	<b>1,030</b>	126,730	21,130	<b>147,860</b>
1999 r	2,350	170	<b>2,520</b>	850	..	<b>850</b>	133,130	20,220	<b>153,350</b>
2000 r	2,460	250	<b>2,710</b>	850	..	<b>850</b>	147,480	20,650	<b>168,130</b>
2001 r	2,500	230	<b>2,730</b>	890	..	<b>890</b>	158,320	21,040	<b>179,360</b>
2002 r	2,560	260	<b>2,820</b>	840	..	<b>840</b>	161,840	21,520	<b>183,360</b>
2003 r	2,240	320	<b>2,560</b>	1,280	..	<b>1,280</b>	172,630	23,100	<b>195,730</b>
2004 r	2,260	300	<b>2,560</b>	1,380	..	<b>1,380</b>	181,760	24,420	<b>206,180</b>
2005	2,260	360	<b>2,620</b>	1,420	..	<b>1,420</b>	188,510	25,420	<b>213,930</b>

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.  
**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 3-4**  
**Personnel engaged in research and development — Federal government, occupational category**

	Researchers			Technicians			Support staff			Total
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1996	6,030	280	<b>6,310</b>	4,040	60	<b>4,100</b>	4,190	240	<b>4,430</b>	<b>14,840</b>
1997	5,610	240	<b>5,850</b>	3,830	70	<b>3,900</b>	3,980	220	<b>4,200</b>	<b>13,950</b>
1998	5,620	230	<b>5,850</b>	3,760	60	<b>3,820</b>	3,840	220	<b>4,060</b>	<b>13,730</b>
1999	5,750	270	<b>6,020</b>	3,790	70	<b>3,860</b>	3,950	250	<b>4,200</b>	<b>14,080</b>
2000	5,840	280	<b>6,120</b>	3,750	70	<b>3,820</b>	4,530	230	<b>4,760</b>	<b>14,700</b>
2001	5,250	360	<b>5,610</b>	3,700	80	<b>3,780</b>	4,090	260	<b>4,350</b>	<b>13,740</b>
2002	5,800	390	<b>6,190</b>	3,700	70	<b>3,770</b>	3,720	280	<b>4,000</b>	<b>13,960</b>
2003	5,740	370	<b>6,110</b>	3,690	70	<b>3,760</b>	3,440	270	<b>3,710</b>	<b>13,580</b>
2004	5,620	360	<b>5,980</b>	3,640	90	<b>3,730</b>	3,740	270	<b>4,010</b>	<b>13,720</b>
2005	6,710	380	<b>7,090</b>	3,870	90	<b>3,960</b>	3,890	310	<b>4,200</b>	<b>15,250</b>

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 3-5  
Personnel engaged in research and development — Provincial government sector<sup>1</sup>, by occupational category**

	Researchers			Technicians			Support staff			Total
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1996	1,210	210	<b>1,420</b>	860	30	<b>890</b>	520	50	<b>570</b>	<b>2,880</b>
1997	1,290	200	<b>1,490</b>	940	20	<b>960</b>	480	40	<b>520</b>	<b>2,970</b>
1998	1,280	180	<b>1,460</b>	890	20	<b>910</b>	440	40	<b>480</b>	<b>2,850</b>
1999 r	1,140	130	<b>1,270</b>	820	20	<b>840</b>	390	20	<b>410</b>	<b>2,520</b>
2000 r	1,210	170	<b>1,380</b>	870	50	<b>920</b>	380	30	<b>410</b>	<b>2,710</b>
2001 r	1,160	170	<b>1,330</b>	830	30	<b>860</b>	510	30	<b>540</b>	<b>2,730</b>
2002 r	1,170	190	<b>1,360</b>	880	40	<b>920</b>	510	30	<b>540</b>	<b>2,820</b>
2003 r	1,030	230	<b>1,260</b>	730	50	<b>780</b>	480	40	<b>520</b>	<b>2,560</b>
2004 r	1,010	220	<b>1,230</b>	800	40	<b>840</b>	450	40	<b>490</b>	<b>2,560</b>
2005	1,060	270	<b>1,330</b>	790	40	<b>830</b>	410	50	<b>460</b>	<b>2,620</b>

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.  
**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 3-6  
Personnel engaged in research and development — Business enterprise sector, by occupational category**

	Researchers	Technicians	Support staff	Total
	number			
1996	48,530	21,580	9,270	<b>79,380</b>
1997 r	51,960	21,570	9,110	<b>82,640</b>
1998 r	54,680	22,010	9,240	<b>85,930</b>
1999 r	58,000	22,800	10,510	<b>91,310</b>
2000 r	66,870	26,750	11,100	<b>104,720</b>
2001 r	73,120	29,660	12,920	<b>115,700</b>
2002 r	73,220	31,590	13,590	<b>118,400</b>
2003 r	75,850	34,570	16,010	<b>126,430</b>
2004 r	78,790	38,480	16,520	<b>133,790</b>
2005	81,960	39,490	16,240	<b>137,690</b>

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 3-7**  
**Personnel engaged in research and development — Higher education sector, by occupational category**

	Researchers			Technicians			Support staff			Total
	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	Natural sciences and engineering	Social sciences and humanities	Total	
	number									
1996	17,010	16,780	<b>33,790</b>	4,420	1,670	<b>6,090</b>	3,360	2,190	<b>5,550</b>	<b>45,430</b>
1997	16,550	16,880	<b>33,430</b>	4,340	1,670	<b>6,010</b>	3,300	2,180	<b>5,480</b>	<b>44,920</b>
1998	16,250	16,590	<b>32,840</b>	4,370	1,640	<b>6,010</b>	3,320	2,150	<b>5,470</b>	<b>44,320</b>
1999	17,400	15,620	<b>33,020</b>	4,400	1,660	<b>6,060</b>	3,330	2,180	<b>5,510</b>	<b>44,590</b>
2000	17,440	15,860	<b>33,300</b>	4,490	1,710	<b>6,200</b>	3,400	2,250	<b>5,650</b>	<b>45,150</b>
2001	18,110	16,090	<b>34,200</b>	4,440	1,540	<b>5,980</b>	3,640	2,480	<b>6,120</b>	<b>46,300</b>
2002	18,530	16,380	<b>34,910</b>	4,560	1,580	<b>6,140</b>	3,730	2,560	<b>6,290</b>	<b>47,340</b>
2003	21,160	17,740	<b>38,900</b>	4,750	1,660	<b>6,410</b>	3,900	2,670	<b>6,570</b>	<b>51,880</b>
2004 r	22,500	18,880	<b>41,380</b>	4,850	1,730	<b>6,580</b>	3,980	2,790	<b>6,770</b>	<b>54,730</b>
2005	23,720	19,700	<b>43,420</b>	4,920	1,750	<b>6,670</b>	4,030	2,830	<b>6,860</b>	<b>56,950</b>

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 3-8**  
**Personnel engaged in research and development — Private non-profit sector,<sup>1</sup> by occupational category**

	Researchers	Technicians	Support staff	Total
	number			
1996	470	540	220	<b>1,230</b>
1997	450	510	250	<b>1,210</b>
1998 r	380	420	230	<b>1,030</b>
1999 r	330	340	180	<b>850</b>
2000	300	300	250	<b>850</b>
2001 r	310	300	280	<b>890</b>
2002 r	280	260	300	<b>840</b>
2003 r	430	540	310	<b>1,280</b>
2004 r	460	610	310	<b>1,380</b>
2005	500	590	330	<b>1,420</b>

1. Private non-profit organization's personnel counts may fluctuate due to these organization's intramural research and development activities.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 4-1**  
**Researchers engaged in research and development — Selected OECD countries**

	1996	1997	1998	1999 <sup>r</sup>	2000 <sup>r</sup>	2001 <sup>r</sup>	2002 <sup>r</sup>	2003 <sup>r</sup>	2004 <sup>r</sup>	2005
	thousands									
<b>Researchers</b>										
United States	..	1,160	..	1,261	1,289	1,320	1,340	1,390	1,416	1,395
Japan <sup>1</sup>	617	625	653	659	648	676	647	675	677	705
Germany	230	236	238	255	258	264	266	269	270	278
United Kingdom	145	146	158	..	..	167	174	178	176	180
France	155	155	156	160	172	177	186	193	200	204
Italy	76	66	65	65	66	67	71	70	72	82
<b>Canada</b>	<b>90</b>	<b>93</b>	<b>95</b>	<b>99</b>	<b>108</b>	<b>115</b>	<b>116</b>	<b>119</b>	<b>125</b>	..
Netherlands	36	38	39	40	42	46	38	37	41	40
Sweden	..	37	..	40	..	46	..	48	49	55
	millions									
<b>Total labour force</b>										
United States	129	132	134	136	139	139	139	140	142	144
Japan <sup>1</sup>	67	68	67	67	67	66	64	64	64	64
Germany	37	37	38	38	39	39	39	39	39	39
United Kingdom	28	28	29	29	29	30	30	30	31	31
France	23	23	23	24	24	25	25	25	25	25
Italy	22	22	22	22	23	23	24	24	24	24
<b>Canada</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>
Netherlands	7	8	8	8	8	8	8	8	8	8
Sweden	4	4	4	4	4	4	4	4	4	4
	ratio									
<b>Researchers per 1,000 persons</b> <b>in the labour force</b>										
United States	..	8.8	..	9.3	9.3	9.5	9.7	9.9	10.0	9.7
Japan <sup>1</sup>	9.2	9.2	9.7	9.9	9.7	10.4	10.1	10.6	10.6	11.0
Germany	6.1	6.3	6.3	6.6	6.6	6.7	6.8	6.9	6.9	7.1
United Kingdom	5.2	5.1	5.5	..	..	5.6	5.8	5.9	5.7	5.8
France	6.8	6.8	6.7	6.8	7.1	7.2	7.5	7.7	8.0	8.2
Italy	3.5	3.0	2.9	2.9	2.9	2.9	3.0	2.9	3.0	3.4
<b>Canada</b>	<b>6.5</b>	<b>6.6</b>	<b>6.6</b>	<b>6.7</b>	<b>7.1</b>	<b>7.5</b>	<b>7.4</b>	<b>7.5</b>	<b>7.7</b>	..
Netherlands	4.9	5.0	5.0	5.1	5.2	5.5	4.6	4.5	5.0	4.9
Sweden	..	9.2	..	9.6	..	10.6	..	11.1	11.3	12.7

1. Overestimated (not in full-time equivalent).

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Source(s):** OECD, Main Science and Technology Indicators, Volume 2007/2, Table 08.

**Table 4-2**  
**Researchers engaged in research and development — Major field of science and sector of performance**

	Federal government	Provincial governments <sup>1</sup>	Business enterprise	Higher education	Private non-profit	Total
	number					
<b>All sciences</b>						
1996	6,310	1,420	48,530	33,790	470	90,520
1997	5,850	1,490	51,960	33,430	450	93,180
1998	5,850	1,460	54,680	32,840	380	95,210
1999 <sup>r</sup>	6,020	1,270	58,000	33,020	330	98,640
2000 <sup>r</sup>	6,120	1,380	66,870	33,300	300	107,970
2001 <sup>r</sup>	5,610	1,330	73,120	34,200	310	114,570
2002 <sup>r</sup>	6,190	1,360	73,220	34,910	280	115,960
2003 <sup>r</sup>	6,110	1,260	75,850	38,900	430	122,550
2004 <sup>r</sup>	5,980	1,230	78,790	41,380	460	127,840
2005	7,090	1,330	81,960	43,420	500	134,300
<b>Natural sciences and engineering</b>						
1996	6,030	1,210	48,530	17,010	470	73,250
1997	5,610	1,290	51,960	16,550	450	75,860
1998	5,620	1,280	54,680	16,250	380	78,210
1999 <sup>r</sup>	5,750	1,140	58,000	17,400	330	82,620
2000 <sup>r</sup>	5,840	1,210	66,870	17,440	300	91,660
2001 <sup>r</sup>	5,250	1,160	73,120	18,110	310	97,950
2002 <sup>r</sup>	5,800	1,170	73,220	18,530	280	99,000
2003 <sup>r</sup>	5,740	1,030	75,850	21,160	430	104,210
2004 <sup>r</sup>	5,620	1,010	78,790	22,500	460	108,380
2005	6,710	1,060	81,960	23,720	500	113,950

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.  
**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 4-3**  
**Researchers engaged in research and development — Higher education sector, by occupation**

	Full-time teachers		Part-time teachers		Doctoral students <sup>1</sup>		Postdoctoral fellowships		Total researchers	
	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities	Natural sciences and engineering	Social sciences and humanities
	number									
1996	5,086	3,716	763	483	10,774	12,504	382	74	17,005	16,777
1997	4,990	3,701	749	481	10,423	12,610	391	86	16,553	16,878
1998	5,024	3,640	754	473	10,043	12,409	428	73	16,249	16,595
1999	5,051	3,692	758	480	11,156	11,363	434	89	17,399	15,624
2000	5,156	3,806	773	495	11,092	11,487	422	73	17,443	15,861
2001	5,349	3,942	749	473	11,625	11,614	391	65	18,114	16,094
2002	5,489	4,061	768	487	11,877	11,753	398	81	18,532	16,382
2003	5,731	4,247	802	510	14,148	12,899	478	86	21,159	17,741
2004 <sup>r</sup>	5,849	4,429	819	531	15,366	13,826	471	90	22,505	18,876
2005	5,932	4,491	831	539	16,422	14,583	532	83	23,717	19,696

1. 2005 university degrees, diplomas and certificates granted for University of Regina not available.  
**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 4-4**  
**Researchers engaged in research and development — Sector of performance**

	1996	1997	1998 <sup>r</sup>	1999 <sup>r</sup>	2000 <sup>r</sup>	2001 <sup>r</sup>	2002 <sup>r</sup>	2003 <sup>r</sup>	2004 <sup>r</sup>	2005
	number									
<b>Total</b>	<b>90,520</b>	<b>93,180</b>	<b>95,210</b>	<b>98,640</b>	<b>107,970</b>	<b>114,570</b>	<b>115,960</b>	<b>122,550</b>	<b>127,840</b>	<b>134,300</b>
Federal government	6,310	5,850	5,850	6,020	6,120	5,610	6,190	6,110	5,980	7,090
Provincial governments	1,110	1,060	1,070	870	970	1,140	1,170	1,070	1,040	1,150
Provincial research organizations	310	430	390	400	410	190 <sup>1</sup>	190 <sup>1</sup>	190 <sup>1</sup>	190 <sup>1</sup>	180 <sup>1</sup>
Business enterprise	48,530	51,960	54,680	58,000	66,870	73,120	73,220	75,850	78,790	81,960
Higher education	33,790	33,430	32,840	33,020	33,300	34,200	34,910	38,900	41,380	43,420
Private non-profit organizations	470	450	380	330	300	310	280	430	460	500

1. In 2001, the Alberta Research Council Inc. became an agency of the provincial government, and is therefore included in that sector of performance.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 5-1**  
**Technicians engaged in research and development — Natural sciences and engineering, by sector of performance**

	Federal government	Provincial governments <sup>1</sup>	Business enterprise	Higher education	Private non-profit	Total
	number					
1996	4,040	860	21,580	4,420	540	31,440
1997	3,830	940	21,570	4,340	510	31,190
1998 <sup>r</sup>	3,760	890	22,010	4,370	420	31,450
1999 <sup>r</sup>	3,790	820	22,800	4,400	340	32,150
2000 <sup>r</sup>	3,750	870	26,750	4,490	300	36,160
2001 <sup>r</sup>	3,700	830	29,660	4,440	300	38,930
2002 <sup>r</sup>	3,700	880	31,590	4,560	260	40,990
2003 <sup>r</sup>	3,690	730	34,570	4,750	540	44,280
2004 <sup>r</sup>	3,640	800	38,480	4,850	610	48,380
2005	3,870	790	39,490	4,920	590	49,660

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 5-2**  
**Technicians engaged in research and development — Social sciences and humanities, by sector of performance**

	Federal government	Provincial governments	Business enterprise <sup>1</sup>	Higher education	Private non-profit <sup>1</sup>	Total
	number					
1996	60	30	...	1,670	...	1,760
1997	70	20	...	1,670	...	1,760
1998	60	20	...	1,640	...	1,720
1999	70	20	...	1,660	...	1,750
2000	70	50	...	1,710	...	1,830
2001 <sup>r</sup>	80	30	...	1,540	...	1,650
2002	70	40	...	1,580	...	1,690
2003	70	50	...	1,660	...	1,780
2004	90	40	...	1,730	...	1,860
2005	90	40	...	1,750	...	1,880

1. Research and development surveys of the business enterprise and private non-profit sectors collect only natural science and engineering data.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).



**Table 6**  
**Support staff<sup>1</sup> in research and development, by major field of science and sector of performance**

	Federal government	Provincial governments <sup>1</sup>	Business enterprise	Higher education	Private non-profit organization	Total
	number					
<b>All sciences</b>						
1996	4,430	570	9,270	5,550	220	<b>20,040</b>
1997	4,200	520	9,110	5,480	250	<b>19,560</b>
1998	4,060	480	9,240	5,470	230	<b>19,480</b>
1999 r	4,200	410	10,510	5,510	180	<b>20,810</b>
2000 r	4,760	410	11,100	5,650	250	<b>22,170</b>
2001 r	4,350	540	12,920	6,120	280	<b>24,210</b>
2002 r	4,000	540	13,590	6,290	300	<b>24,720</b>
2003 r	3,710	520	16,010	6,570	310	<b>27,120</b>
2004 r	4,010	490	16,520	6,770	310	<b>28,100</b>
2005	4,200	460	16,240	6,860	330	<b>28,090</b>
<b>Natural sciences and engineering</b>						
1996	4,190	520	9,270	3,360	220	<b>17,560</b>
1997	3,980	480	9,110	3,300	250	<b>17,120</b>
1998	3,840	440	9,240	3,320	230	<b>17,070</b>
1999 r	3,950	390	10,510	3,330	180	<b>18,360</b>
2000 r	4,530	380	11,100	3,400	250	<b>19,660</b>
2001 r	4,090	510	12,920	3,640	280	<b>21,440</b>
2002 r	3,720	510	13,590	3,730	300	<b>21,850</b>
2003 r	3,440	480	16,010	3,900	310	<b>24,140</b>
2004 r	3,740	450	16,520	3,980	310	<b>25,000</b>
2005	3,890	410	16,240	4,030	330	<b>25,400</b>

1. Provincial government data includes provincial research organizations data. Provincial research organizations data are in natural sciences and engineering only.  
**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 7-1**  
**Federal personnel engaged in research and development — Major department or agency**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	number									
<b>Total</b>	<b>14,840</b>	<b>13,950</b>	<b>13,730</b>	<b>14,080</b>	<b>14,700</b>	<b>13,740</b>	<b>13,960</b>	<b>13,580</b>	<b>13,720</b>	<b>15,250</b>
Agriculture and Agri-Food Canada	2,820	2,430	2,430	2,410	2,800	2,660	1,810	1,740	1,650	2,080
Atomic Energy of Canada Limited	1,700	1,460	1,190	1,170	890	950	1,160	1,000	1,250	1,450
Canadian Space Agency	340	310	290	340	370	420	460	480	500	520
Environment Canada	830	770	740	830	840	840	890	910	910	970
Fisheries and Oceans Canada	880	800	770	850	900	890	890	520	510	500
Health Canada	480	540	520	510	520	670	700	620	400	420
Industry Canada	360	350	400	400	450	420	480	360	350	360
National Defence	1,240	1,170	1,300	1,290	1,350	1,300	1,480	1,480	1,560	1,540
National Research Council	2,650	2,730	2,780	2,810	2,930	2,510	2,720	2,970	3,000	3,650
Natural Resources Canada	2,540	2,370	2,280	2,310	2,430	1,690	1,850	1,920	1,660	1,690
Natural Sciences and Engineering Research Council	160	180	180	210	220	230	250	260	270	260
Other departments or agencies	840	850	850	950	1,000	1,160	1,270	1,320	1,660	1,810

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 7-2**  
**Federal personnel engaged in research and development — Natural sciences and engineering and social sciences and humanities, by occupational category and department or agency**

	2005			Total
	Researchers	Technicians	Support staff	
	number			
<b>Natural sciences and engineering</b>	<b>6,710</b>	<b>3,870</b>	<b>3,890</b>	<b>14,470</b>
Agriculture and Agri-Food Canada	940	640	500	2,080
Atomic Energy of Canada Limited	640	370	440	1,450
Canadian Space Agency	260	10	250	520
Environment Canada	590	240	130	960
Fisheries and Oceans Canada	230	220	40	490
Health Canada	190	150	60	400
Industry Canada	260	50	50	360
National Defence	750	380	340	1,470
National Research Council	1,480	1,030	1,150	3,660
Natural Resources Canada	980	540	170	1,690
Other Departments or Agencies	390	240	760	1,390
<b>Social sciences and humanities</b>	<b>380</b>	<b>90</b>	<b>310</b>	<b>780</b>
Bank of Canada	30	30	10	70
Canadian Museum of Civilization	10	20	40	70
International Development Research Centre	70	0	30	100
National Defence	40	10	10	60
National Gallery of Canada	20	10	20	50
Social Sciences and Humanities Research Council	10	0	120	130
Statistics Canada	120	10	50	180
Other departments or agencies	80	10	30	120

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

**Table 8**  
**Proportion of time devoted to research and development, by field of science, by classification of institutions and by personnel**

	Natural sciences and engineering	Social sciences and humanities
	percent	
<b>Large Universities</b>		
Full-time teachers	0.35	0.25
Doctoral students	0.85	0.85
Postdoctoral research fellows	0.80	0.65
<b>Medium Universities</b>		
Full-time teachers	0.30	0.20
Doctoral students	0.85	0.85
Postdoctoral research fellows	0.80	0.65
<b>Small Universities</b>		
Full-time teachers	0.25	0.15
Doctoral students	0.85	0.85
Postdoctoral research fellows	0.80	0.65

**Table 9**  
**Occupational coefficients, by category and field of science<sup>1</sup>**

	Natural sciences and engineering				Social sciences and humanities			
	Full-time university teachers	Part-time university teachers	Technicians	Other support staff	Full-time university teachers	Part-time university teachers	Technicians	Other support staff
	number							
1996	1	0.15	0.87	0.66	1	0.13	0.45	0.59
1997	1	0.15	0.87	0.66	1	0.13	0.45	0.59
1998	1	0.15	0.87	0.66	1	0.13	0.45	0.59
1999	1	0.15	0.87	0.66	1	0.13	0.45	0.59
2000	1	0.15	0.87	0.66	1	0.13	0.45	0.59
2001	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2002	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2003	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2004	1	0.14	0.83	0.68	1	0.12	0.39	0.63
2005	1	0.14	0.83	0.68	1	0.12	0.39	0.63

1. For example, in 2003, in the Natural sciences and engineering, for every 1.0 full-time teacher doing research and development, there was 0.14 part-time teacher, 0.83 technician and 0.68 other support staff.

**Note(s):** Personnel counts are reported as full-time equivalents (rounded to the nearest 10).

# Data quality, concepts and methodology

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## Estimates of research and development personnel in Canada

Canada's economic growth and competitiveness, like that of every other industrialized country, is tied to the development of its scientific and technological base. Of all the factors needed for a country's scientific and industrial development, the supply of suitable human resources is unquestionably one of the most vital. Thus, the formulation of science and technology policy requires reliable information on these human resources, especially those engaged in research and development (R&D). "... unless people with certain training and qualifications are available, organized R&D is almost impossible. Education and training are lengthy processes; personnel data are, therefore, essential to realistic science policy planning".<sup>1</sup>

The number of R&D personnel is also considered a supplementary measure to intramural expenditures on R&D. The *Frascati Manual* states that "... personnel provide concrete measurements for international comparisons of resources devoted to R&D"<sup>2</sup>.

It is important to determine the status of these resources on a regular basis. In this report, we present some statistical estimates and definitions concerning R&D personnel. Data on R&D personnel are derived from surveys conducted by the Science and Technology Surveys Section, Science, Innovation and Electronic Information Division (SIEID) and from estimates based on various data sources.

## Classification by occupation

R&D personnel are drawn from a wide variety of occupations "... from the Nobel prize-winner to the winner's secretary, from the designer of space experiments to the breeder of laboratory animals"<sup>3</sup>. In order to assist analysis on needs and supplies of highly qualified S&T personnel, R&D personnel are classified into three categories. The *International Standard Classification of Occupation* (ISCO) distinguishes three occupational levels: researchers, technicians and equivalent staff, and other support staff.

- **Researchers (scientists and engineers)** are engaged in the conception or creation of new knowledge, products, processes, methods and systems. This level also includes managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work. They are usually equal in rank to the researchers and are often former or part-time researchers themselves. Post-graduate students, in particular those performing significant amounts of R&D, are included in this category.
- **Technicians and equivalent staff** are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences, or social sciences and humanities. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. Equivalent staff performs the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities.
- **Support staff** includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects. Also included are all managers and administrators dealing mainly with financial and personnel matters and general administration given that their activities are directly supporting R&D. Those providing an indirect service, such as canteen and cleaning staff, should be excluded.

1. OECD, *Frascati Manual 1980, Proposed standard practice for surveys on research and experimental development*, (Paris), page 19, paragraph 23.

2. OECD, *Frascati Manual 2002, Proposed standard practice for surveys on research and experimental development*, (Paris), page 20, paragraph 30.

3. OECD, *Frascati Manual 2002, Proposed standard practice for surveys on research and experimental development*, (Paris), page 20, paragraph 32.

## Institutional classification

R&D data are classified into five sectors of performance. This method facilitates the collection of data and also provides information that can be cross referenced between sectors.

The sectors are:

- federal government
- provincial governments (includes provincial research organizations)
- business enterprise
- higher education
- private non-profit organizations

## Measurement and data collection

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

Whenever possible, the data are also classified by major field of science; natural sciences and engineering (NSE) or social sciences and humanities (SSH).

**Natural Sciences and Engineering (NSE):** The NSE consists of disciplines concerned with understanding, exploring, developing or utilizing the natural world. Included are engineering, mathematical, life and physical sciences.

**Social Sciences and Humanities: (SSH):** The SSH embraces all disciplines involving the study of human actions and conditions and the social, economic and institutional mechanisms affecting humans. Included are such disciplines as anthropology, business administration and commerce, information and knowledge management, criminology, demography, economics, geography, history, languages, literature and linguistics, law, library science, philosophy, political science, psychology, religious studies, social work, sociology, and urban and regional studies.

Since most workers do not all spend the same amount of time on R&D, it is necessary to express the number of persons performing R&D in terms of full-time equivalents (FTE). If only those persons employed in pure R&D are counted, the number of R&D personnel will be understated, just as counting every person who spends part of his/her time on R&D will result in an overstatement. On a full-time equivalence basis then, a person devoting a third of his/her time to R&D will be counted as 0.3 of a full-time equivalent.

In Canada with the exception of the higher education sector, each of the sectors mentioned above are surveyed on an annual basis in order to collect R&D data (both expenditures and personnel). Questionnaires used to collect R&D data can be viewed on the *Statistics Canada website* (<http://www.statcan.ca/english/concepts/index.htm>).

The higher education sector R&D activities are estimated by Statistics Canada. Modifications were made to the estimation procedures in 2005. Data were revised back to 1991. A description of the estimation procedure is found in the section on the higher education sector.

## Related information available from Statistics Canada

Information derived from surveys on scientific activities in Canada is available from the Science and Technology Surveys Section, Science Innovation and Electronic Information Division. Catalogue no. 88-001-X presents highlights of each survey once the survey has been completed. Three annual publications, catalogue no.88-202-X, *Industrial Research and Development*, catalogue no.88-204-X, *Federal Scientific Activities* and catalogue no. 88-221-X, *Gross Domestic Expenditures on Research and Development in Canada and the Provinces*

are also available. You may contact Michael Lynch 613-951-2201 [Michael.Lynch@statcan.ca](mailto:Michael.Lynch@statcan.ca) or Louise Earl 613-951-2880 [Louise.Earl@statcan.ca](mailto:Louise.Earl@statcan.ca) to obtain more information or visit our website at [www.statcan.ca](http://www.statcan.ca).

## R&D personnel by sector

### Federal government

This sector comprises all federal departments and organizations. All employees are included (indefinite, temporary and casual status). The data on persons engaged in R&D in the federal government are taken from the annual survey of the federal science expenditures and personnel. These data are classified into three occupational categories: researchers (scientists and engineers), technicians and support staff. The allocation of personnel to these classes is based on their public service classifications. Due to the nature of the work in the social sciences and humanities it is sometimes difficult to distinguish between technicians and other support staff; for convenience, these two categories have been combined and are shown as support staff up until 1990. From 1991 on, technicians involved in social science activities have been identified.

### Provincial governments

The provincial government sector consists of all provincial government departments, ministries and agencies and provincial research organizations.

#### Government departments and agencies

Each year, Science and Technology Surveys Section, SIEID assists provincial governments to carry out surveys of resources devoted to their scientific and technological activities.

The statistics presented are aggregates of the provincial government science surveys conducted by Statistics Canada under contract with the provinces, and cover the period 1979-1980 to 2005-2006. The surveys currently cover four provinces: Ontario, Manitoba, Alberta and British Columbia. Estimates are made for Saskatchewan and for the Eastern provinces. Quebec conducts their own survey and shares the information with Statistics Canada.

### Provincial research organizations

Statistics on the R&D personnel of provincial research organizations are estimated on the basis of an annual survey of the resources of the provincial research foundations and councils.

R&D is only one of the activities of these provincial research organizations. In the survey conducted by SIEID, the organizations are asked to allocate their expenditures by a number of activities, including R&D. The total number of personnel for all organizations is multiplied by the ratio of R&D to total expenditures in order to produce an estimate of R&D personnel. Since the three occupational categories are already specified in the survey, their relative proportions are applied to the R&D full-time equivalence total.

It should be noted that provincial research organizations data pertain to activities in the natural sciences and engineering only.

### Business enterprise

The term "business enterprise" encompasses all commercially oriented enterprises (privately or publicly owned), industrial non-profit organizations and industrial research institutes.

Until 1969, the survey was biennial. From 1970 to 1981, all known performers or funders of industrial R&D were surveyed for odd-numbered years and a sample, including the leading performers, were surveyed for even numbered years. Estimates for the 1980 R&D personnel were computed by averaging data for 1979 and 1981. From 1982 to 1991, a full survey was conducted annually.

Because of reductions in the science and technology program, in the even-years starting with the 1992 reference year, only the top 100 R&D performers (accounting for 64% of all industrial R&D), were surveyed. However, as a result of a cost-sharing agreement with the province of Quebec, the 1992 and 1994 surveys also include firms having R&D activities in the province of Quebec. In 1995 the industrial R&D survey was re-established annually under the new S&T project "An information system for science and technology".

The 1998 data reflects a new methodology for estimating R&D expenditure in the business sector in Canada. The essence of the new approach was the use of administrative data from the Canada Revenue Agency (CRA), in place of survey data, for any firm funding or performing less than \$1 million worth of R&D. Under the current regulations, firms have up to 18 months to submit a claim for R&D tax credits to CRA. This means that when survey data are ready for publication, not all of the CRA data for that year will have been received. At the time this bulletin is released, a portion of the R&D tax credit is still outstanding and their value is estimated. This bulletin provides preliminary estimates of R&D personnel in the business enterprise sector.

It should be noted that business enterprise data pertain to activities in the natural sciences and engineering only. For further information, see *Industrial Research and Development*, catalogue no. 88-202-X.

### Higher education

This sector includes universities, colleges of technology and other institutions of post-secondary education. Since existing surveys of this sector do not provide information on the R&D activities of staff, it is necessary to estimate R&D personnel.

As in other sectors of performance, we are interested in determining the full-time equivalence by three occupational categories (researchers, technicians and support staff) and by science type (NSE and SSH). The first step we take is to determine "researchers".

It is common knowledge that university professors are involved in other activities besides research (teaching and community service work). Doctoral students and postdoctoral research fellows also do research. The level of education held by these persons would qualify them as researchers. But, how much of their time is actually spent doing R&D?

When estimating R&D expenditures in the higher education sector, universities are classified into small, medium and large based on

1. sponsored research expenditures;
2. sponsored research as a percentage of general operating expenditures and
3. the number of doctoral programs. This is based on the assumption that, depending on the size of the university, some universities spend more time on R&D than others. The same size classification is used to estimate R&D personnel.

Also, when estimating R&D expenditures, we use the full-time teachers field of study to determine science type. Science type of R&D personnel is based on the same field of study classification. Crossing the size classification of institutions with the science type and personnel category, we arrive at percentages used to determine how much time is spent on R&D (table 8).

Now, we apply this methodology to full-time teacher, doctoral student and Ph.D. fellows information. The Centre for Education Statistics provides us with full-time teacher and doctoral students data by institution and by field of study. Postdoctoral fellows information is received from the three granting councils, Natural Sciences and Engineering Research Council, Social Sciences and Humanities Research Council and the Canadian Institutes for Health Research. These data are organized by university size and by field of study. To arrive at the amount of time these persons spend doing R&D in FTE's, we multiply the full-time teachers, doctoral students and Ph.D. fellows by the percentages in table 8. As mentioned before, these persons are all considered to be researchers.



In addition to full-time university professors, doctorate students and Ph.D. fellows; there are part-time teachers, technicians and other support staff involved in R&D. Estimates for these classifications of R&D personnel are based on information provided by the Census.

The Census labour market statistics provide data on sector of employment, occupation (based on the *National Occupational Classification for Statistics, 2001 (NOC-S)*, level of education and gender of the employed labour force. The division was able to purchase 1991, 1996 and 2001 Census data with funds made available through our memorandum of understanding (MOU) with Industry Canada. Census data prior to 1991 was not purchased and therefore no revisions to the higher education R&D personnel were made prior to 1991. Estimates previous to 1991 used coefficients based on the older *Standard Occupational Classification, 1980 (SOC)*.

In order to use the Census data, the occupations had to be classified into our three categories – Researchers, Technicians and Other. In order to do this, we have attempted a concordance of NOCS 2001 to the *Frascati Manual's* (2002) categories of R&D personnel by occupation, which are based on the *International Standard Classification of Occupations, 1988 (ISCO)*. Once this concordance was completed, detailed analysis was made on Canada's employed labour force who work in the university industry (SIC 8531) in order to arrive at the Occupational Coefficients listed in table 9. What the coefficients imply are that for every full-time teacher, there is 0.14 part-time teachers, 0.83 technicians and 0.68 other support staff doing R&D.

We have determined that “researchers” constitute the R&D full-time equivalent of full-time teachers, doctoral students and Ph.D. fellows. In addition to these we add part-time teachers using the appropriate occupational coefficient provided by the Census data (table 9). The total of these occupations equal “Researchers”.

Technicians and Other Support staff are determined by applying the coefficient derived from the census data. That coefficient considers both the occupation specified, the highest level of education achieved as well as the field in which the person works (natural sciences and engineering or social sciences and humanities).

As a result of the analysis completed on the Census data, we have been able to identify technicians in the social sciences and humanities back as far as 1991. Previous to that year the distinction between technicians and other support staff is unclear in the social sciences and humanities, these two categories have been combined and are shown as support staff.

The use of large-scale estimates naturally causes data reliability problems. Nevertheless, in the absence of more reliable data, these estimates provide us with a general idea of the situation in this sector, given certain assumptions. Caution should be used when comparing them with other sectors or with expenditure estimates.

### **Private non-profit organizations**

This sector is comprised of private and semipublic organizations and entities for which profit-making is not a primary goal. There are four main types of organizations included: private philanthropic foundations, scientific societies and associations, voluntary health organizations, and research institutes which do not belong to other sectors.

Since 1983, SIEID has been collecting personnel data through its survey of R&D performed by private non-profit organizations in Canada. In this survey, respondents are asked to estimate the number of employees engaged in R&D by occupational category.

Since no statistics on R&D personnel in these organizations for the years prior to 1983 are available, estimates were made on the 1983 relationships of personnel, R&D expenditures and occupational categories. Finally, since R&D in this sector is carried out basically in the health sciences, there are no estimates for personnel engaged in R&D in the social sciences and humanities.

The PNP sector appears in both the performing and funding sector for the GERD for Canada. Commencing with reference year 2000, the data for the PNP sector performing research and development are not distributed by provinces, territories or the national capital region. However, the national totals of research and development by performing sector include the PNP sector. The PNP sector continues to be distributed for the funding sector.