



Catalogue no. 88-001-XIE

Science Statistics

January 2007 edition



Statistics
Canada

Statistique
Canada

Canada

How to obtain more information

Specific inquiries about this product and related statistics or services should be directed to: Science Innovation and Electronic Information Division, Statistics Canada, Ottawa, Ontario, K1A 0T6 (telephone: 1-800-263-1136).

For information on the wide range of data available from Statistics Canada, you can contact us by calling one of our toll free numbers. You can also contact us by e-mail or by visiting our website at www.statcan.ca.

National inquiries line **1-800-263-1136**

National telecommunications device for the hearing impaired **1-800-363-7629**

Depository Services Program inquiries **1-800-700-1033**

Fax line for Depository Services Program **1-800-889-9734**

E-mail inquiries [**infostats@statcan.ca**](mailto:infostats@statcan.ca)

Website [**www.statcan.ca**](http://www.statcan.ca)

Information to access the product

This product, catalogue no. 88-001-XIE, is available for free in electronic format. To obtain a single issue, visit our website at www.statcan.ca and select Publications.

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable, courteous, and fair manner. To this end, the Agency has developed standards of service that its employees observe in serving its clients. To obtain a copy of these service standards, please contact Statistics Canada toll free at 1-800-263-1136. The service standards are also published on www.statcan.ca under About us > Providing services to Canadians.



Statistics Canada
Science Innovation and Electronic Information Division

Science Statistics

January 2007 edition

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2007

All rights reserved. The content of this electronic publication may be reproduced, in whole or in part, and by any means, without further permission from Statistics Canada, subject to the following conditions: that it be done solely for the purposes of private study, research, criticism, review or newspaper summary, and/or for non-commercial purposes; and that Statistics Canada be fully acknowledged as follows: Source (or "Adapted from", if appropriate): Statistics Canada, year of publication, name of product, catalogue number, volume and issue numbers, reference period and page(s). Otherwise, no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, by any means—electronic, mechanical or photocopy—or for any purposes without prior written permission of Licensing Services, Client Services Division, Statistics Canada, Ottawa, Ontario, Canada K1A 0T6.

January 2007

Catalogue no. 88-001-XIE, Vol. 31, No. 1

ISSN 1209-1278

Frequency: Irregular

Ottawa

La version française de cette publication est disponible sur demande (n° 88-001-XIF au catalogue).

Note of appreciation

Canada owes the success of its statistical system to a long standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

User information

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^s 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

Table of contents

Highlights	5
Analysis	6
Research and development (R&D) personnel in Canada, 1995 to 2004	6
Related products	10
Statistical tables	
1 Personnel engaged in research and development (R & D)	14
1-1 Sector of performance	14
1-2 All sectors	14
1-3 Federal government, by occupational category	15
1-4 Provincial government, by occupational category	15
1-5 Business enterprise sector, by occupational category	15
1-6 Higher education sector, by occupational category	16
2 Provincial distribution of personnel engaged in research and development (R & D)	16
2-1 Sector of performance, by occupational category	16
2-2 Occupational category	17
3 Personnel engaged in research and development (R & D)	18
3-1 Selected OECD countries and by major sector	18
3-2 All sectors, by occupational category	19
3-3 Major field of science and sector of performance	20
3-4 Federal government, occupational category	21
3-5 Provincial government sector, by occupational category	22
3-6 Business enterprise sector, by occupational category	23
3-7 Higher education sector, by occupational category	24
3-8 Private non-profit sector, by occupational category	25
4 Researchers engaged in research and development (R & D)	26
4-1 Selected OECD countries	26
4-2 Major field of science and sector of performance	27
4-3 Higher education sector, by occupation	28
4-4 Sector of performance	28

Table of contents – continued

5	Technicians engaged in research and development (R & D)	29
5-1	Natural sciences and engineering, by sector of performance	29
5-2	Social sciences and humanities, by sector of performance	29
6	Support staff in research and development (R & D), by major field of science and sector of performance	30
7	Federal personnel engaged in research and development (R & D)	31
7-1	Major department or agency	31
7-2	Natural sciences and engineering and social sciences and humanities, by occupational category and department or agency	31
8	Proportion of time devoted to research and development (R & D), by field of science, by classification of institutions and by personnel	32
9	Occupational coefficients, by category and field of science	32

Data quality, concepts and methodology

	Estimates of research and development personnel in Canada	33
	R & D personnel by sector	36

Charts

1.	Research and Development (R & D) personnel in Canada by science and by occupational category	7
2.	Governments research and development (R & D) personnel, in selected OECD countries	8
3.	Business enterprise research and development (R & D) personnel, in selected OECD countries	8
4.	Higher education research and development (R & D) personnel, in selected OECD countries	9

Highlights

- In 2004, a total of 199,060 full-time equivalent (F.T.E.) researchers, technicians, and other support personnel were engaged in R&D activities in Canada, representing a 5.0% rise over the figures reported for 2003 (189,520). This growth is more than twice the 2.1% increase experienced in 2002 (from 179,450 in 2001 to 183,240 in 2002) (see table 1-1).
- From 1995 to 2004, the number of R&D personnel in Canada increased by slightly over a third (37.3%) (see table 1-1).
- Importantly, over two-thirds (68%) of the increase in personnel numbers in 2004 was accounted for by the increase in the total number of researchers from 118,860 to 125,330 (+5.4%). Much of this growth can be accounted for by a gradual increase in R&D expenditures by business enterprises (especially service industries), after the slump in 2002. (Table 1-2).
- Overall, researchers accounted for 63% (125,330 F.T.E.) of R&D personnel in Canada, and the overwhelming majority of them (84%) were natural science researchers. Researchers also formed the largest category of R&D personnel in business enterprises, higher education institutions, and federal and provincial governments (see table 1-2).
- Interestingly, 2004, was the first time since 2000 that the increases in the number of researchers (+5.4%) in Canada superseded the growth in the total number of R&D personnel (+5.0%) (see table 1-2).

Analysis

Research and development (R&D) personnel in Canada, 1995 to 2004

Canada's economic competitiveness depends on scientific and technological development and also on the people responsible for this development, especially those engaged in R&D. In an earlier Science Statistics publication, we published the gross domestic expenditures on R&D in Canada (GERD). This issue presents a supplementary measure to the GERD, the number of personnel who perform Canada's R&D activities.

In 2004, the majority, (64% or 126,670) of personnel engaged in R&D were employed in business enterprises, representing a 5.4% growth over figures for 2003 (120,220). This growth was powered by increases in the number of researchers from 72,160 in 2003 to 76,280 in 2004 (+5.7%) and technicians from 32,840 in 2003 to 35,130 (+7.0%) in this sector (see table 1-5).

Also, 28% of all R&D personnel were employed in the higher education sector and 7% in federal government sector (see table 2-1).

Powered by an increase in the number of researchers (from 38,900 in 2003 to 41,380 in 2004) the number of R&D personnel in higher education rose by 5.5% from 51,880 in 2003 to 54,730 in 2004. Although this growth is impressive, it is about half of the 9.6% increase recorded in 2003. Nevertheless, this growth buttresses the importance of higher education institutions in R&D performance (see table 4-4).

Much of the rise in the number of personnel involved in R&D in the higher education sector from 1999 to 2004 stems from increased R&D spending in that sector (from \$5 billion in 1999 to over \$9 billion in 2004). This is the result of strengthening collaboration between universities on the one hand and all levels of governments (especially the federal government) and business enterprises on the other hand. This is evident in the fact that R&D funding for higher education R&D from all levels of government in Canada increased from about \$1.6 billion in 1999 to \$3.4 billion in 2004, while business enterprises increased their support from \$460 million to \$679 million within the same period.

In 2004, the majority of R&D personnel in Newfoundland and Labrador (64%), Nova Scotia (51%), New Brunswick (50%) and Saskatchewan (49%) were employed in the higher education sector and private non-profit sectors. This is related to the dominant role universities in these provinces play in R&D. On the other hand, in Quebec (70%), Ontario (67%) and in British Columbia (62%) the bulk of R&D personnel were employed in the business sector (see table 2-1).

In a pattern that closely mimics expenditures on R&D in Canada, Ontario (45%) and Quebec (31%) were home to the highest number of R&D personnel. British Columbia (10%) and Alberta (7%) placed a distant third and fourth respectively (see table 2-1).

Ontario and Quebec are hosts to the majority of federally employed R&D personnel in Canada. This is related to the fact that the majority of federal research facilities are located in these two provinces (see table 2-1).

The numbers of R&D personnel employed in government R&D organizations appear to be declining gradually or at best fluctuating in Canada and the selected OECD countries (see table 3-1).

Since 2002, the number of R&D personnel in higher education institutions in Canada has grown slightly faster than those of the selected OECD countries (see table 3-1).

The period spanning 1980 and 2004, witnessed a 141.1% increase in the number of R&D personnel in Canada (from 82,550 in 1980 to 199,060 in 2004) (see table 3-2). The figures for 2004 represent a 5.0% rise over those of 2003 (189,520).

Table 3-2 also indicates that over two-thirds (68%) of the increase in personnel numbers from 2003 to 2004 was accounted for by a rise in the total number of researchers from 118,860 to 125,330 (+5.4%). In 2004, researchers accounted for 63% (125,330 F.T.E.) of R&D personnel in Canada, and the overwhelming majority of them (84%) were natural science researchers.

In 2004, the majority (64% or 126,670) of personnel engaged in R&D were employed in business enterprises, representing a 5.4% growth over figures for 2003 (120,220) (see table 3-4). Indeed much (68%) of the growth in total number R&D personnel in Canada from 2003 to 2004 can be accounted for by the increase in the number of R&D personnel in business enterprises (which is due in part to the gradual increase in R&D expenditures by business enterprises, after the downturn in 2002).

Table 3-3 shows that between 1980 and 2004, the number of R&D personnel in business enterprises grew at a faster pace (394%) than those in the private non-profit (74.7%) and higher education sectors (50.3%) over the same period. Importantly, the number of R&D personnel in the federal and provincial government sectors fluctuated between 1980 to 2004, resulting in a net personnel loss of 14.4% in the federal government sector in 2004.

Table 3-3 also indicates that in 1980, 44% of R&D personnel were employed in the higher education sector, compared to only 28% (54,730) in 2004. However, the number of researchers in universities increased by 127.2% from 1980 to 2004 (from 18,210 in 1980 to 41,380 in 2004, see table 4-2). Significantly, among researchers in this sector, doctoral students experienced the most rapid growth in their numbers (+246.6%) during this period (see table 4-3).

Since 1999, the number of personnel involved in R&D in the higher education sector has risen due to increased R&D spending in that sector (from \$5 billion in 1999 to over \$9 billion in 2004). In continuing with an emerging trend, the number of R&D personnel in higher education in 2004 surged by 5.5% over the 2003 figures (from 51,880 in 2003 to 54,730 in 2004) (see table 3-7). Importantly, since 2002, the number of R&D personnel in higher education institutions in Canada has grown slightly faster than those of the selected OECD countries (see table 3-1).

Chart 1
Research and Development (R & D) personnel in Canada by science and by occupational category

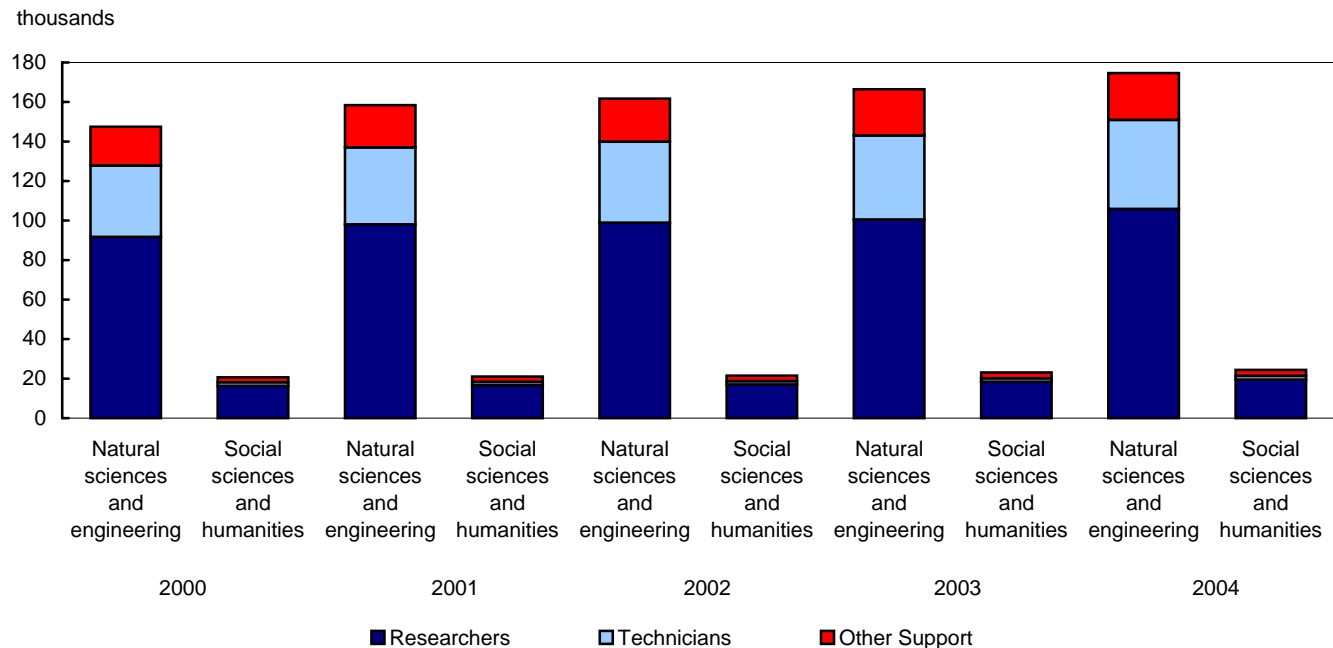


Chart 2
Governments research and development (R & D) personnel, in selected OECD countries

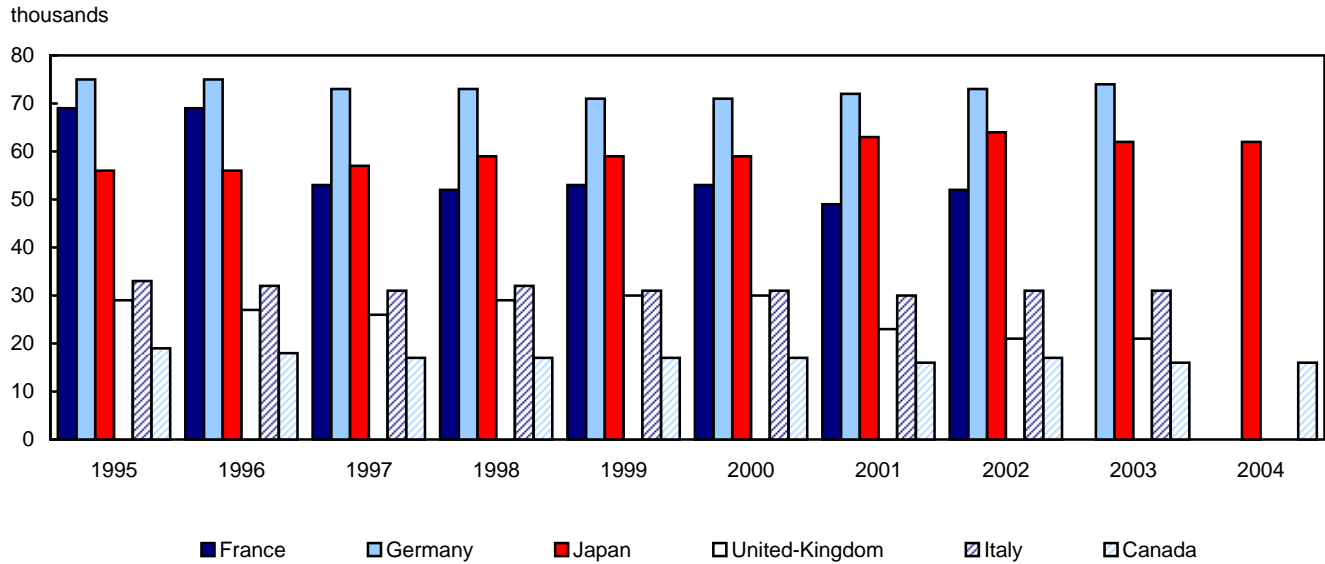


Chart 3
Business enterprise research and development (R & D) personnel, in selected OECD countries

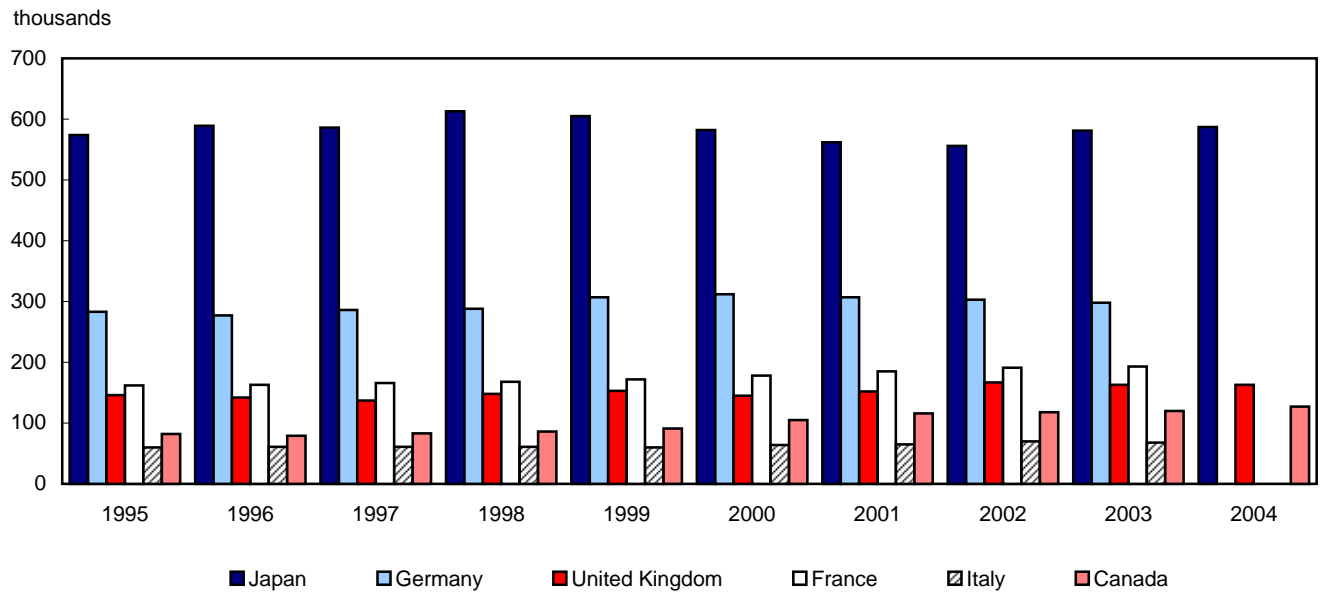
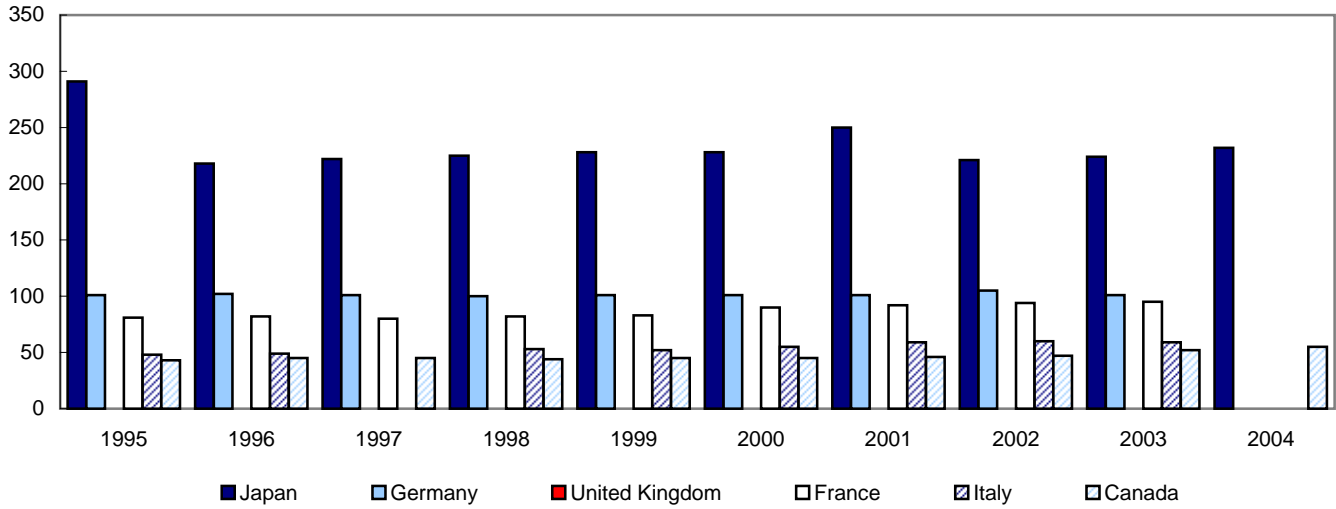


Chart 4
Higher education research and development (R & D) personnel, in selected OECD countries

thousands



Related products

Selected publications from Statistics Canada

88-202-X	Industrial Research and Development...intentions
88-204-X	Federal Scientific Activities
88-522-X	Science and Technology Activities and Impacts: A Framework for a Statistical Information
88F0006X	Science, Innovation and Electronic Information Division Working Papers
88F0006X2001005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1990-91 to 1998-99
88F0006X2002008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1991-92 to 1999-2000
88F0006X2003008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1994-95 to 2000-2001
88F0006X2004005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1995-1996 to 2001-2002
88F0006X2005002	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1996-1997 to 2002-2003
88F0006X2005019	Estimation of Research and Development Expenditures in the Higher Education Sector, 2003-2004
88F0017M	Science, Innovation and Electronic Information Division Research Papers

Selected technical and analytical products from Statistics Canada

- 88F0017M1999006 Diffusion of Biotechnologies in Canada: Results from the Survey of Biotechnology Use in Canadian Industries
- 88F0017M2000008 Explaining Rapid Growth in Canadian Biotechnology Firms
- 88F0017M2001009 Internationally Comparable Indicators on Biotechnology: A Stocktaking, a Proposal for Work and Supporting Material
- 88F0017M2001010 Analysis of the Survey on Innovation, Advanced Technologies and Practices in the Construction and Related Industries, 1999
- 88F0017M2001011 Capacity to Innovate, Innovation and Impact: The Canadian Engineering Services Industry
- 88F0017M2001012 Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998 AMT Survey Results
-

Selected CANSIM tables from Statistics Canada

- | | |
|----------|---|
| 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 |
-

Selected surveys from Statistics Canada

- | | |
|------|--|
| 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 |
| 4212 | Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences |
-

Selected summary tables from Statistics Canada

- *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

**Table 1-1
Personnel engaged in research and development (R & D) — Sector of performance**

	1995	1996	1997	1998 ^r	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^p	2004
	number ¹									
Total	144,970	143,720	145,700	147,870	153,360	168,130	179,450	183,240	189,520	199,060
Federal government	15,550	14,840	13,950	13,730	14,080	14,700	13,740	13,960	13,580	13,720
Provincial governments	3,230	2,880	2,970	2,850	2,520	2,710	2,730	2,820	2,560	2,560
Business enterprise ²	82,010	79,340	82,650	85,940	91,310	104,720	115,790	118,280	120,220	126,670
Higher education	43,020	45,430	44,920	44,320	44,590	45,150	46,300	47,340	51,880	54,730
Private non-profit organizations	1,160	1,230	1,210	1,030	860	850	890	840	1,280	1,380
	percentage change									
Total	0.9	-0.9	1.4	1.5	3.7	9.6	6.7	2.1	3.4	5.0
Federal government	-7.1	-4.6	-6.0	-1.6	2.5	4.4	-6.5	1.6	-2.7	1.0
Provincial governments	-6.4	-10.8	3.1	-4.0	-11.6	7.5	0.7	3.3	-9.2	0.0
Business enterprise ²	4.0	-3.3	4.2	4.0	6.2	14.7	10.6	2.2	1.6	5.4
Higher education	-1.0	5.6	-1.1	-1.3	0.6	1.3	2.5	2.2	9.6	5.5
Private non-profit organizations	4.5	6.0	-1.6	-14.9	-16.5	-1.2	4.7	-5.6	52.4	7.8

1. Full-time equivalent (rounded to the nearest 10).
2. Natural sciences and engineering only.

**Table 1-2
Personnel engaged in research and development (R & D) — All sectors**

	Researchers			Technicians			Support staff			Total, all sectors
	Natural science and engineering	Social sciences and humanities	Total	Natural science and engineering	Social sciences and humanities	Total	Natural science and engineering	Social sciences and humanities	Total	
	number ¹									
1995	72,920	14,460	87,380	34,150	1,850	36,000	19,000	2,590	21,590	144,970
1996	73,220	17,270	90,490	31,440	1,760	33,200	17,550	2,480	20,030	143,720
1997 ^r	75,870	17,320	93,190	31,180	1,760	32,940	17,120	2,450	19,570	145,700
1998 ^r	78,220	17,000	95,220	31,450	1,720	33,170	17,070	2,410	19,480	147,870
1999 ^r	82,640	16,020	98,660	32,150	1,750	33,900	18,340	2,450	20,790	153,350
2000 ^r	91,670	16,310	107,980	36,140	1,830	37,970	19,670	2,510	22,180	168,130
2001 ^r	98,010	16,630	114,640	38,950	1,640	40,590	21,450	2,770	24,220	179,450
2002 ^r	98,900	16,960	115,860	40,970	1,690	42,660	21,850	2,870	24,720	183,240
2003 ^r	100,520	18,340	118,860	42,550	1,780	44,330	23,350	2,980	26,330	189,520
2004	105,870	19,460	125,330	45,030	1,860	46,890	23,740	3,100	26,840	199,060

1. Full-time equivalent (rounded to the nearest 10).

**Table 1-3
Personnel engaged in research and development (R & D) — Federal government, by occupational category**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	number 1									
Total	15,550	14,840	13,950	13,730	14,080	14,700	13,740	13,960	13,580	13,720
Researchers	6,230	6,310	5,850	5,850	6,020	6,120	5,610	6,190	6,110	5,990
Technicians	4,300	4,100	3,900	3,820	3,860	3,820	3,780	3,770	3,760	3,730
Support staff	5,020	4,430	4,200	4,060	4,200	4,760	4,350	4,000	3,710	4,010
Natural sciences and engineering	14,970	14,260	13,420	13,220	13,490	14,120	13,040	13,220	12,870	13,000
Researchers	5,990	6,030	5,610	5,620	5,750	5,840	5,250	5,800	5,740	5,620
Technicians	4,230	4,040	3,830	3,760	3,790	3,750	3,700	3,700	3,690	3,640
Support staff	4,750	4,190	3,980	3,840	3,950	4,530	4,090	3,720	3,440	3,740
Social sciences and humanities	580	580	530	510	590	580	700	740	710	720
Researchers	240	280	240	230	270	280	360	390	370	360
Technicians	70	60	70	60	70	70	80	70	70	90
Support staff	270	240	220	220	250	230	260	280	270	270

1. Full-time equivalent (rounded to the nearest 10).

**Table 1-4
Personnel engaged in research and development (R & D) — Provincial government, by occupational category**

	1995	1996	1997	1998	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004
	number 1									
Government departments²										
Total	3,230	2,880	2,970	2,850	2,520	2,710	2,730	2,820	2,560	2,560
Researchers	1,540	1,420	1,490	1,460	1,280	1,380	1,340	1,360	1,260	1,230
Technicians	1,070	890	960	910	830	910	850	920	780	840
Support staff	620	570	520	480	410	420	540	540	520	490
Natural sciences and engineering	2,170	1,750	1,740	1,690	1,400	1,510	2,020	2,080	1,780	1,770
Researchers	1,000	900	860	890	740	800	960	980	840	820
Technicians	790	580	590	520	450	500	670	700	560	590
Support staff	380	270	290	280	210	210	390	400	380	360
Social sciences and humanities	310	290	260	240	170	250	230	260	320	300
Researchers	230	210	200	180	130	170	180	190	230	220
Technicians	30	30	20	20	20	50	20	40	50	40
Support staff	50	50	40	40	20	30	30	30	40	40
Sub-total	2,480	2,040	2,000	1,930	1,570	1,760	2,250	2,340	2,100	2,070
Provincial research organizations³	750	840	970	920	950	950	480	480	460	490
Researchers	310	310	430	390	410	410	200	190	190	190
Technicians	250	280	350	370	360	360	160	180	170	210
Support staff	190	250	190	160	180	180	120	110	100	90

1. Full-time equivalent (rounded to the nearest 10).

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

3. Provincial research organizations include natural sciences only.

**Table 1-5
Personnel engaged in research and development (R & D) — Business enterprise sector, by occupational category**

	1995	1996	1997	1998	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^p	2004
	number 1									
Total	82,010	79,340	82,650	85,940	91,310	104,720	115,790	118,280	120,220	126,670
Researchers	48,980	48,500	51,970	54,690	58,010	66,880	73,180	73,120	72,160	76,280
Technicians	23,280	21,580	21,560	22,010	22,810	26,740	29,690	31,570	32,840	35,130
Support staff	9,750	9,260	9,120	9,240	10,490	11,100	12,920	13,590	15,220	15,260

1. Full-time equivalent (rounded to the nearest 10).

**Table 1-6
Personnel engaged in research and development (R & D) — Higher education sector, by occupational category**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	number 1									
Total	43,020	45,430	44,920	44,320	44,590	45,150	46,300	47,340	51,880	54,730
Researchers	30,150	33,790	33,430	32,840	33,020	33,300	34,200	34,910	38,900	41,380
Technicians	6,840	6,090	6,010	6,010	6,060	6,200	5,980	6,140	6,410	6,580
Support staff	6,030	5,550	5,480	5,470	5,510	5,650	6,120	6,290	6,570	6,770
Natural sciences and engineering	25,020	24,790	24,190	23,940	25,130	25,330	26,190	26,820	29,810	31,330
Researchers	16,160	17,010	16,550	16,250	17,400	17,440	18,110	18,530	21,160	22,500
Technicians	5,090	4,420	4,340	4,370	4,400	4,490	4,440	4,560	4,750	4,850
Support staff	3,770	3,360	3,300	3,320	3,330	3,400	3,640	3,730	3,900	3,980
Social sciences and humanities	18,000	20,640	20,730	20,380	19,460	19,820	20,110	20,520	22,070	23,400
Researchers	13,990	16,780	16,880	16,590	15,620	15,860	16,090	16,380	17,740	18,880
Technicians	1,750	1,670	1,670	1,640	1,660	1,710	1,540	1,580	1,660	1,730
Support staff	2,260	2,190	2,180	2,150	2,180	2,250	2,480	2,560	2,670	2,790

1. Full-time equivalent (rounded to the nearest 10).

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

	2004										
	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total ¹
	number 2										
Total	1,460	300	3,660	2,090	62,040	89,360	3,860	3,220	13,670	19,320	199,060
Researchers	870	140	2,120	1,160	37,530	57,560	2,190	1,790	8,850	13,080	125,330
Technicians	330	100	900	550	16,070	20,020	1,000	880	2,860	4,140	46,890
Other	260	60	640	380	8,440	11,780	670	550	1,960	2,100	26,840
Federal government	140	70	540	180	1,980	2,340	480	360	770	620	7,520
Researchers	50	20	230	70	880	1,000	170	140	300	270	3,150
Technicians	50	30	170	60	450	680	190	130	270	220	2,270
Other	40	20	140	50	650	660	120	90	200	130	2,100
Federal government (National Capital Region)	...	...	...	...	300	5,900	...	...	...	...	6,200
Researchers	...	...	...	...	170	2,660	...	...	...	...	2,830
Technicians	...	...	...	...	50	1,410	...	...	...	...	1,460
Other	...	...	...	...	80	1,830	...	...	...	...	1,910
Provincial governments	..	..	..	90	890	390	60	260	690	150	2,560
Researchers	..	..	..	40	460	230	40	110	240	100	1,230
Technicians	..	..	..	30	290	90	10	130	240	40	840
Other	..	..	..	20	140	70	10	20	210	10	490
Business enterprise	390	100	1,260	780	43,330	60,170	1,520	1,020	6,200	11,890	126,670
Researchers	230	50	720	380	23,680	37,990	850	500	3,930	7,940	76,280
Technicians	110	40	380	280	13,700	15,460	470	360	1,580	2,750	35,130
Other ³	50	10	160	120	5,950	6,720	200	160	690	1,200	15,260
Higher education and Private non-profit organizations	930	130	1,860	1,040	15,540	20,560	1,800	1,580	6,010	6,660	56,110
Researchers	590	70	1,170	670	12,340	15,680	1,130	1,040	4,380	4,770	41,840
Technicians	170	30	350	180	1,580	2,380	330	270	770	1,130	7,190
Other	170	30	340	190	1,620	2,500	340	270	860	760	7,080

1. Includes the Yukon Territories, Northwest Territories and the Nunavut.

2. Full-time equivalent (rounded to the nearest 10).

3. No provincial distribution between technicians and other, estimated proportionally according to national total.

Table 2-2
Provincial distribution of personnel engaged in research and development (R & D) — Occupational category

	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory, Northwest Territories and Nunavut	Canada
	number ¹											
Researchers												
1999 r	680	120	1,760	780	29,180	46,980	2,020	1,500	6,760	8,860	10	98,650
2000 r	700	140	1,860	910	32,190	51,690	2,030	1,540	6,940	9,960	20	107,980
2001 r	760	140	1,800	1,000	33,230	56,020	1,960	1,590	7,380	10,730	20	114,630
2002 r	770	130	1,900	1,010	34,660	55,800	2,070	1,580	7,750	10,170	20	115,860
2003 r	830	160	1,990	1,110	35,940	55,910	2,090	1,750	7,970	11,080	30	118,860
2004	870	140	2,120	1,160	37,530	57,560	2,190	1,790	8,850	13,080	40	125,330
Technicians												
1999 r	300	80	840	400	10,830	14,690	970	810	2,250	2,720	20	33,910
2000 r	320	110	830	480	12,400	16,150	1,100	840	2,540	3,190	20	37,980
2001 r	320	110	790	490	13,870	16,840	1,210	840	2,790	3,320	20	40,600
2002 r	310	80	800	520	14,670	18,080	1,080	810	2,690	3,610	20	42,670
2003 r	300	100	780	520	15,340	19,220	970	830	2,460	3,780	30	44,330
2004	330	100	900	550	16,070	20,020	1,000	880	2,860	4,140	30	46,890
Other support staff												
1999 r	220	70	660	260	6,210	9,160	600	560	1,430	1,620	0	20,790
2000 r	230	80	630	350	6,530	9,760	640	590	1,610	1,740	10	22,170
2001 r	260	90	660	370	7,540	10,140	710	600	1,980	1,860	10	24,220
2002 r	270	60	630	390	7,770	10,550	700	540	1,830	1,960	10	24,710
2003 r	240	70	590	390	8,500	11,500	650	570	1,790	2,020	10	26,330
2004	260	60	640	380	8,440	11,780	670	550	1,960	2,100	10	26,840

1. Full-time equivalent (rounded to the nearest 10).

**Table 3-1
Personnel engaged in research and development (R & D) — Selected OECD countries and by major sector**

	1995	1996	1997	1998	1999	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004
	thousands ¹									
Total R & D personnel										
Japan ²	948	892	894	926	919	897	892	857	882	896
Germany	459	454	460	462	480	485	481	480	473	..
United Kingdom	..	..	..	..	..	..	..	..	..	..
France	318	321	306	309	314	327	334	344	346	..
Italy	142	142	..	146	143	150	154	164	162	..
Canada	145	144	146	148	153	168	179	183	190	199
Netherlands	79	81	84	85	87	88	89	87	86	92
Sweden	63	..	65	..	67	..	72	..	73	..
Governments										
Japan ²	56	56	57	59	59	59	63	64	62	62
Germany	75	75	73	73	71	71	72	73	74	..
United Kingdom	29	27	26	29	30	30	23	21	21	..
France	69	69	53	52	53	53	49	52	51	..
Italy	33	32	31	32	31	31	30	31	31	..
Canada	19	18	17	17	17	17	16	17	16	16
Netherlands	16	16	16	16	17	13	13	13	14	14
Sweden	4	..	3	..	3	..	3	..	3	..
Business enterprise										
Japan ²	574	589	586	613	605	582	562	556	581	587
Germany	283	277	286	288	307	312	307	303	298	..
United Kingdom	145	142	137	148	153	145	152	167	163	163
France	162	163	166	168	172	178	185	191	193	..
Italy	60	61	61	61	60	64	65	70	68	..
Canada	82	79	83	86	91	105	116	118	120	127
Netherlands	37	39	42	44	45	48	48	47	44	50
Sweden	42	..	44	..	44	..	49	..	48	..
Higher education										
Japan ²	291	218	222	225	228	228	250	221	224	232
Germany	101	102	101	100	101	101	101	105	101	..
United Kingdom	..	..	..	..	..	..	..	..	..	..
France	81	82	80	82	83	90	92	94	95	..
Italy	48	49	..	53	52	55	59	60	59	..
Canada	43	45	45	44	45	45	46	47	52	55
Netherlands	25	24	24	24	24	27	27	27	27	28
Sweden	17	..	18	..	19	..	20	..	21	..

1. Full-time equivalent.

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

Source(s): OECD, Main Science and Technology Indicators, 2006, January.

Table 3-2
Personnel engaged in research and development (R & D) — 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 ¹ sciences and humanities	Total	
	number ²									
1980	28,140	10,010	38,150	23,990	..	23,990	12,960	7,450	20,410	82,550
1981	30,680	9,740	40,420	26,730	..	26,730	14,540	7,650	22,190	89,340
1982	33,950	10,250	44,200	27,100	..	27,100	14,760	7,210	21,970	93,270
1983	35,170	10,520	45,690	26,610	..	26,610	15,900	6,770	22,670	94,970
1984	37,900	10,920	48,820	27,700	..	27,700	15,300	6,440	21,740	98,260
1985	41,330	11,170	52,500	28,240	..	28,240	15,390	5,920	21,310	102,050
1986	45,630	11,690	57,320	29,680	..	29,680	15,890	5,630	21,520	108,520
1987	47,370	11,950	59,320	29,940	..	29,940	15,640	5,640	21,280	110,540
1988	49,910	12,430	62,340	30,410	..	30,410	16,670	5,670	22,340	115,090
1989	51,050	12,650	63,700	30,750	..	30,750	15,300	5,400	20,700	115,150
1990	52,860	13,100	65,960	29,330	..	29,330	15,840	5,270	21,110	116,400
1991	53,900	13,180	67,080	27,100	2,060	29,160	18,600	2,800	21,590	117,650
1992	57,770	13,640	71,410	27,920	2,020	29,940	18,490	2,810	21,420	122,640
1993	61,450	14,040	75,490	28,980	1,980	30,960	18,030	2,760	20,790	127,240
1994	71,580	14,320	85,900	34,060	1,930	35,990	19,040	2,700	21,740	143,630
1995	72,920	14,460	87,380	34,150	1,850	36,000	19,000	2,590	21,590	144,970
1996	73,220	17,270	90,490	31,440	1,760	33,200	17,550	2,480	20,030	143,720
1997	75,870	17,320	93,190	31,180	1,760	32,940	17,120	2,450	19,570	145,700
1998 r	78,220	17,000	95,220	31,450	1,720	33,170	17,070	2,410	19,480	147,870
1999 r	82,640	16,020	98,660	32,150	1,750	33,900	18,340	2,450	20,790	153,350
2000 r	91,670	16,310	107,980	36,140	1,830	37,970	19,670	2,510	22,180	168,130
2001 r	98,010	16,630	114,640	38,950	1,640	40,590	21,450	2,770	24,220	179,450
2002 r	98,900	16,960	115,860	40,970	1,690	42,660	21,850	2,870	24,720	183,240
2003 r	100,520	18,340	118,860	42,550	1,780	44,330	23,350	2,980	26,330	189,520
2004	105,870	19,460	125,330	45,030	1,860	46,890	23,740	3,100	26,840	199,060

1. From 1980 to 1990, includes the few technicians engaged in R & D in the social sciences and humanities.

2. Full-time equivalent (rounded to the nearest 10).

Note(s): Historical revisions have not been made to data prior to 1991

**Table 3-3
Personnel engaged in research and development (R & D) — 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 1								
1980	25,640	..	25,640	20,290	16,130	36,420	15,270	760	16,030
1981	32,400	..	32,400	20,630	16,000	36,630	14,990	790	15,780
1982	34,910	..	34,910	20,730	16,090	36,820	15,600	730	16,330
1983	36,760	..	36,760	20,810	15,940	36,750	15,730	570	16,300
1984	39,610	..	39,610	21,110	16,140	37,250	15,800	580	16,380
1985	44,910	..	44,910	20,350	15,880	36,230	15,250	580	15,830
1986	49,560	..	49,560	20,920	15,950	36,870	16,500	810	17,310
1987	51,770	..	51,770	21,190	16,580	37,770	15,570	740	16,310
1988	54,240	..	54,240	21,560	16,960	38,520	16,450	840	17,290
1989	53,660	..	53,660	22,100	16,940	39,040	16,620	820	17,440
1990	53,920	..	53,920	22,580	17,200	39,780	16,250	710	16,960
1991	53,790	..	53,790	24,410	16,830	41,240	16,500	700	17,200
1992	57,460	..	57,460	25,440	17,450	42,890	16,630	640	17,270
1993	61,530	..	61,530	25,910	17,760	43,670	16,600	640	17,240
1994	78,880	..	78,880	25,490	17,970	43,460	16,110	620	16,730
1995	82,010	..	82,010	25,020	18,000	43,020	14,970	580	15,550
1996	79,340	..	79,340	24,790	20,640	45,430	14,260	580	14,840
1997	82,650	..	82,650	24,190	20,730	44,920	13,420	530	13,950
1998	85,940	..	85,940	23,940	20,380	44,320	13,220	510	13,730
1999 r	91,310	..	91,310	25,130	19,460	44,590	13,490	590	14,080
2000 r	104,720	..	104,720	25,330	19,820	45,150	14,120	580	14,700
2001 r	115,790	..	115,790	26,190	20,110	46,300	13,040	700	13,740
2002 r	118,280	..	118,280	26,820	20,520	47,340	13,220	740	13,960
2003 r	120,220	..	120,220	29,810	22,070	51,880	12,870	710	13,580
2004	126,670	..	126,670	31,330	23,400	54,730	13,000	720	13,720

	Provincial governments			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 1								
1980	3,100	570	3,670	790	..	790	68,090	17,460	82,550
1981	3,060	600	3,660	870	..	870	71,950	17,390	89,340
1982	3,590	640	4,230	980	..	980	75,810	17,460	93,270
1983	3,370	780	4,150	1,010	..	1,010	77,680	17,290	94,970
1984	3,310	640	3,950	1,070	..	1,070	80,900	17,360	98,260
1985	3,290	630	3,920	1,160	..	1,160	84,960	17,090	102,050
1986	3,140	560	3,700	1,080	..	1,080	91,210	17,320	108,520
1987	3,210	270	3,480	1,210	..	1,210	92,950	17,590	110,540
1988	3,330	300	3,630	1,410	..	1,410	96,990	18,100	115,090
1989	3,360	290	3,650	1,360	..	1,360	97,100	18,050	115,150
1990	3,820	460	4,280	1,460	..	1,460	98,030	18,370	116,400
1991	3,680	510	4,190	1,230	..	1,230	99,610	18,040	117,650
1992	3,670	370	4,040	980	..	980	104,180	18,460	122,640
1993	3,330	380	3,710	1,090	..	1,090	108,460	18,780	127,240
1994	3,090	360	3,450	1,110	..	1,110	124,680	18,950	143,630
1995	2,920	310	3,230	1,160	..	1,160	126,080	18,890	144,970
1996	2,590	290	2,880	1,230	..	1,230	122,210	21,510	143,720
1997	2,710	260	2,970	1,210	..	1,210	124,170	21,530	145,700
1998 r	2,610	240	2,850	1,030	..	1,030	126,740	21,130	147,870
1999 r	2,350	170	2,520	850	..	850	133,130	20,220	153,350
2000 r	2,460	250	2,710	850	..	850	147,480	20,650	168,130
2001 r	2,500	230	2,730	890	..	890	158,410	21,040	179,450
2002 r	2,560	260	2,820	840	..	840	161,720	21,520	183,240
2003 r	2,240	320	2,560	1,280	..	1,280	166,420	23,100	189,520
2004	2,260	300	2,560	1,380	..	1,380	174,640	24,420	199,060

1. Full-time equivalent (rounded to the nearest 10).

Table 3-4
Personnel engaged in research and development (R & D) — 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 ¹ sciences and humanities	Total	
	number ²									
1980	5,800	460	6,260	4,680	..	4,680	4,790	300	5,090	16,030
1981	5,010	350	5,360	4,700	..	4,700	5,280	440	5,720	15,780
1982	5,450	370	5,820	4,650	..	4,650	5,500	360	5,860	16,330
1983	5,470	320	5,790	4,500	..	4,500	5,760	250	6,010	16,300
1984	5,570	330	5,900	4,670	..	4,670	5,560	250	5,810	16,380
1985	5,390	330	5,720	4,420	..	4,420	5,440	250	5,690	15,830
1986	6,020	410	6,430	4,660	..	4,660	5,820	400	6,220	17,310
1987	5,590	340	5,930	4,410	..	4,410	5,570	400	5,970	16,310
1988	6,160	330	6,490	4,220	..	4,220	6,070	510	6,580	17,290
1989	6,360	330	6,690	4,730	..	4,730	5,530	490	6,020	17,440
1990	6,160	280	6,440	4,340	..	4,340	5,750	430	6,180	16,960
1991	6,250	290	6,540	4,320	100	4,420	5,930	310	6,240	17,200
1992	6,310	260	6,570	4,410	80	4,490	5,910	300	6,210	17,270
1993	6,380	260	6,640	4,450	80	4,530	5,770	300	6,070	17,240
1994	6,310	260	6,570	4,620	70	4,690	5,180	290	5,470	16,730
1995	5,990	240	6,230	4,230	70	4,300	4,750	270	5,020	15,550
1996	6,030	280	6,310	4,040	60	4,100	4,190	240	4,430	14,840
1997	5,610	240	5,850	3,830	70	3,900	3,980	220	4,200	13,950
1998	5,620	230	5,850	3,760	60	3,820	3,840	220	4,060	13,730
1999	5,750	270	6,020	3,790	70	3,860	3,950	250	4,200	14,080
2000	5,840	280	6,120	3,750	70	3,820	4,530	230	4,760	14,700
2001	5,250	360	5,610	3,700	80	3,780	4,090	260	4,350	13,740
2002	5,800	390	6,190	3,700	70	3,770	3,720	280	4,000	13,960
2003	5,740	370	6,110	3,690	70	3,760	3,440	270	3,710	13,580
2004	5,620	360	5,980	3,640	90	3,730	3,740	270	4,010	13,720

1. From 1980 to 1990, includes the few technicians engaged in R & D in the social sciences and humanities.

2. Full-time equivalent (rounded to the nearest 10).

**Table 3-5
Personnel engaged in research and development (R & D) — Provincial government 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 ¹ sciences and humanities	Total	
	number ²									
1980	1,210	370	1,580	1,130	..	1,130	760	200	960	3,670
1981	1,230	340	1,570	1,100	..	1,100	730	260	990	3,660
1982	1,510	350	1,860	1,280	..	1,280	800	290	1,090	4,230
1983	1,340	410	1,750	1,150	..	1,150	880	370	1,250	4,150
1984	1,330	360	1,690	1,110	..	1,110	870	280	1,150	3,950
1985	1,410	440	1,850	1,080	..	1,080	800	190	990	3,920
1986	1,460	430	1,890	1,080	..	1,080	600	130	730	3,700
1987	1,430	200	1,630	1,120	..	1,120	660	70	730	3,480
1988	1,400	220	1,620	1,180	..	1,180	750	80	830	3,630
1989	1,440	210	1,650	1,170	..	1,170	750	80	830	3,650
1990	1,680	290	1,970	1,250	..	1,250	890	170	1,060	4,280
1991	1,610	340	1,950	1,160	90	1,250	910	80	990	4,190
1992	1,540	270	1,810	1,290	40	1,330	840	60	900	4,040
1993	1,480	280	1,760	1,250	40	1,290	600	60	660	3,710
1994	1,450	260	1,710	1,070	40	1,110	570	60	630	3,450
1995	1,310	230	1,540	1,040	30	1,070	570	50	620	3,230
1996	1,210	210	1,420	860	30	890	520	50	570	2,880
1997	1,290	200	1,490	940	20	960	480	40	520	2,970
1998	1,280	180	1,460	890	20	910	440	40	480	2,850
1999 r	1,140	130	1,270	820	20	840	390	20	410	2,520
2000 r	1,210	170	1,380	870	50	920	380	30	410	2,710
2001 r	1,160	170	1,330	830	30	860	510	30	540	2,730
2002 r	1,170	190	1,360	880	40	920	510	30	540	2,820
2003 r	1,030	230	1,260	730	50	780	480	40	520	2,560
2004	1,010	220	1,230	800	40	840	450	40	490	2,560

1. From 1980 to 1990, includes the few technicians engaged in R & D in the social sciences and humanities.

2. Full-time equivalent (rounded to the nearest 10).

Note(s): Historical revisions have not been made to data prior to 1990.

Table 3-6
Personnel engaged in research and development (R & D) — Business enterprise sector, by occupational category

	Researchers	Technicians	Support staff	Total
	number 1			
1980	11,860	8,350	5,430	25,640
1981	14,880	11,000	6,520	32,400
1982	16,820	11,550	6,540	34,910
1983	17,650	11,600	7,510	36,760
1984	19,560	12,760	7,290	39,610
1985	22,660	14,550	7,700	44,910
1986	25,520	15,950	8,090	49,560
1987	27,120	16,550	8,100	51,770
1988	28,480	17,210	8,550	54,240
1989	28,660	17,190	7,810	53,660
1990	29,670	16,200	8,050	53,920
1991	30,120	15,930	7,740	53,790
1992	33,240	16,540	7,680	57,460
1993	36,310	17,610	7,610	61,530
1994	46,860	22,740	9,280	78,880
1995	48,980	23,280	9,750	82,010
1996	48,500	21,580	9,260	79,340
1997 ^r	51,970	21,560	9,120	82,650
1998 ^r	54,690	22,010	9,240	85,940
1999 ^r	58,010	22,810	10,490	91,310
2000 ^r	66,880	26,740	11,100	104,720
2001 ^r	73,180	29,690	12,920	115,790
2002 ^r	73,120	31,570	13,590	118,280
2003 ^r	72,160	32,840	15,220	120,220
2004	76,280	35,130	15,260	126,670

1. Full-time equivalent (rounded to the nearest 10).

**Table 3-7
Personnel engaged in research and development (R & D) — 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 ¹ sciences and humanities	Total	
	number ²									
1980	9,030	9,180	18,210	9,480	..	9,480	1,780	6,950	8,730	36,420
1981	9,300	9,050	18,350	9,540	..	9,540	1,790	6,950	8,740	36,630
1982	9,880	9,530	19,410	9,180	..	9,180	1,670	6,560	8,230	36,820
1983	10,410	9,790	20,200	8,840	..	8,840	1,560	6,150	7,710	36,750
1984	11,080	10,230	21,310	8,570	..	8,570	1,460	5,910	7,370	37,250
1985	11,480	10,400	21,880	7,550	..	7,550	1,320	5,480	6,800	36,230
1986	12,320	10,850	23,170	7,370	..	7,370	1,230	5,100	6,330	36,870
1987	12,840	11,410	24,250	7,220	..	7,220	1,130	5,170	6,300	37,770
1988	13,440	11,880	25,320	7,080	..	7,080	1,040	5,080	6,120	38,520
1989	14,120	12,110	26,230	6,980	..	6,980	1,000	4,830	5,830	39,040
1990	14,770	12,530	27,300	6,850	..	6,850	960	4,670	5,630	39,780
1991	15,410	12,550	27,960	5,160	1,870	7,030	3,830	2,410	6,240	41,240
1992	16,210	13,110	29,320	5,300	1,900	7,200	3,930	2,450	6,380	42,890
1993	16,730	13,500	30,230	5,270	1,860	7,130	3,910	2,400	6,310	43,670
1994	16,420	13,800	30,220	5,210	1,820	7,030	3,860	2,350	6,210	43,460
1995	16,160	13,990	30,150	5,090	1,750	6,840	3,770	2,260	6,030	43,020
1996	17,010	16,780	33,790	4,420	1,670	6,090	3,360	2,190	5,550	45,430
1997	16,550	16,880	33,430	4,340	1,670	6,010	3,300	2,180	5,480	44,920
1998	16,250	16,590	32,840	4,370	1,640	6,010	3,320	2,150	5,470	44,320
1999	17,400	15,620	33,020	4,400	1,660	6,060	3,330	2,180	5,510	44,590
2000	17,440	15,860	33,300	4,490	1,710	6,200	3,400	2,250	5,650	45,150
2001	18,110	16,090	34,200	4,440	1,540	5,980	3,640	2,480	6,120	46,300
2002	18,530	16,380	34,910	4,560	1,580	6,140	3,730	2,560	6,290	47,340
2003	21,160	17,740	38,900	4,750	1,660	6,410	3,900	2,670	6,570	51,880
2004	22,500	18,880	41,380	4,850	1,730	6,580	3,980	2,790	6,770	54,730

1. From 1980 to 1990, includes the few technicians engaged in R & D in the social sciences and humanities.
 2. Full-time equivalent (rounded to the nearest 10).

Table 3-8
Personnel engaged in research and development (R & D) — Private non-profit sector, by occupational category

	Researchers	Technicians	Support staff	Total
	number 1			
1980	240	350	200	790
1981	260	390	220	870
1982	290	440	250	980
1983	300	520	190	1,010
1984	360	590	120	1,070
1985	390	640	130	1,160
1986	310	620	150	1,080
1987	390	640	180	1,210
1988	430	720	260	1,410
1989	470	680	210	1,360
1990	580	690	190	1,460
1991	510	530	190	1,230
1992	470	380	130	980
1993	550	400	140	1,090
1994	540	420	150	1,110
1995	480	510	170	1,160
1996	470	540	220	1,230
1997	450	510	250	1,210
1998 ^r	380	420	230	1,030
1999 ^r	330	340	180	850
2000	300	300	250	850
2001 ^r	310	290	290	890
2002 ^r	280	260	300	840
2003 ^r	430	540	310	1,280
2004	460	610	310	1,380

1. Full-time equivalent (rounded to the nearest 10).

Table 4-1
Researchers engaged in research and development (R & D) — Selected OECD countries

	1995	1996	1997	1998	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004
	thousands ¹									
Researchers										
United States	1,036	..	1,160	..	1,261	1,289	1,320	1,335	..	..
Japan ²	673	617	625	653	659	648	676	647	675	677
Germany	231	230	236	238	255	258	264	266	269	..
United Kingdom	146	145	146	158	..	..	..	..	..	..
France	151	155	155	156	160	172	177	186	193	..
Italy	76	76	66	65	65	66	67	71	70	..
Canada	87	90	93	95	99	108	115	116	119	125
Netherlands	35	36	38	39	40	42	46	38	37	..
Sweden	34	..	37	..	40	..	46	..	48	..
	millions									
Total labour force										
United States	127	129	132	134	136	139	139	139	140	142
Japan ²	67	67	68	67	67	67	66	65	65	65
Germany	38	37	37	38	38	39	39	39	39	39
United Kingdom	28	28	28	29	29	29	30	30	30	31
France	23	23	23	23	24	24	25	25	25	25
Italy	22	22	22	22	22	23	23	24	24	24
Canada	14	14	14	14	15	15	15	16	16	16
Netherlands	7	7	8	8	8	8	8	8	8	8
Sweden	4	4	4	4	4	4	4	4	4	4
	ratio									
Researchers per 1,000 persons in the labour force										
United States	8.1	..	8.8	..	9.3	9.3	9.5	9.6	..	..
Japan ²	10.1	9.2	9.2	9.7	9.9	9.7	10.2	9.9	10.4	10.4
Germany	6.1	6.1	6.3	6.3	6.6	6.6	6.7	6.8	6.9	..
United Kingdom	5.3	5.2	5.1	5.5	..	..	..	..	..	..
France	6.7	6.8	6.8	6.7	6.8	7.1	7.2	7.5	7.7	..
Italy	3.5	3.5	3.0	2.9	2.9	2.9	2.9	3.0	2.9	..
Canada	6.4	6.5	6.6	6.6	6.7	7.1	7.5	7.2	7.4	7.8
Netherlands	4.9	4.9	5.0	5.0	5.1	5.2	5.5	4.6	4.5	..
Sweden	8.2	..	9.2	..	9.6	..	10.6	..	11.0	..

1. Full-time equivalent.

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

Source(s): OECD, Main Science and Technology Indicators, January, 2006.

Table 4-2
Researchers engaged in research and development (R & D) — Major field of science and sector of performance

	Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit	Total
	number ¹					
All sciences						
1980	6,260	1,580	11,860	18,210	240	38,150
1981	5,360	1,570	14,880	18,350	260	40,420
1982	5,820	1,860	16,820	19,410	290	44,200
1983	5,790	1,750	17,650	20,200	300	45,690
1984	5,900	1,690	19,560	21,310	360	48,820
1985	5,720	1,850	22,660	21,880	390	52,500
1986	6,430	1,890	25,520	23,170	310	57,320
1987	5,930	1,630	27,120	24,250	390	59,320
1988	6,490	1,620	28,480	25,320	430	62,340
1989	6,690	1,650	28,660	26,230	470	63,700
1990	6,440	1,970	29,670	27,300	580	65,960
1991	6,540	1,950	30,120	27,960	510	67,080
1992	6,570	1,810	33,240	29,320	470	71,410
1993	6,640	1,760	36,310	30,230	550	75,490
1994	6,570	1,710	46,860	30,220	540	85,900
1995	6,230	1,540	48,980	30,150	480	87,380
1996	6,310	1,420	48,500	33,790	470	90,490
1997	5,850	1,490	51,970	33,430	450	93,190
1998	5,850	1,460	54,690	32,840	380	95,220
1999 r	6,020	1,280	58,010	33,020	330	98,660
2000 r	6,120	1,380	66,880	33,300	300	107,980
2001 r	5,610	1,340	73,180	34,200	310	114,640
2002 r	6,190	1,360	73,120	34,910	280	115,860
2003 r	6,110	1,260	72,160	38,900	430	118,860
2004	5,980	1,230	76,280	41,380	460	125,330
Natural sciences and engineering						
1980	5,800	1,210	11,860	9,030	240	28,140
1981	5,010	1,230	14,880	9,300	260	30,680
1982	5,450	1,510	16,820	9,880	290	33,950
1983	5,470	1,340	17,650	10,410	300	35,170
1984	5,570	1,330	19,560	11,080	360	37,900
1985	5,390	1,410	22,660	11,480	390	41,330
1986	6,020	1,460	25,520	12,320	310	45,630
1987	5,590	1,430	27,120	12,840	390	47,370
1988	6,160	1,400	28,480	13,440	430	49,910
1989	6,360	1,440	28,660	14,120	470	51,050
1990	6,160	1,680	29,670	14,770	580	52,860
1991	6,250	1,610	30,120	15,410	510	53,900
1992	6,310	1,540	33,240	16,210	470	57,770
1993	6,380	1,480	36,310	16,730	550	61,450
1994	6,310	1,450	46,860	16,420	540	71,580
1995	5,990	1,310	48,980	16,160	480	72,920
1996	6,030	1,210	48,500	17,010	470	73,220
1997	5,610	1,290	51,970	16,550	450	75,880
1998	5,620	1,280	54,690	16,250	380	78,220
1999 r	5,750	1,150	58,010	17,400	330	82,640
2000 r	5,840	1,210	66,880	17,440	300	91,670
2001 r	5,250	1,160	73,180	18,110	310	98,010
2002 r	5,800	1,170	73,120	18,530	280	98,900
2003 r	5,740	1,030	72,160	21,160	430	100,520
2004	5,620	1,010	76,280	22,500	460	105,870

1. Full-time equivalent (rounded to the nearest 10).

Table 4-3
Researchers engaged in research and development (R & D) — Higher education sector, by occupation

	Full-time teachers		Part-time teachers		Doctoral students		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 ¹									
1980	4,670	3,799	607	570	3,635	4,788	0	0	8,913	9,157
1981	4,700	3,797	611	570	3,857	4,661	0	0	9,169	9,027
1982	4,780	3,810	621	572	4,356	5,114	0	0	9,758	9,496
1983	4,883	3,822	635	612	4,768	5,328	0	0	10,285	9,762
1984	5,042	3,935	706	630	5,183	5,636	0	0	10,932	10,201
1985	5,101	3,942	714	670	5,522	5,753	0	0	11,337	10,364
1986	5,117	3,987	716	718	6,071	6,021	420	120	12,324	10,846
1987	5,156	4,165	773	750	6,463	6,367	450	129	12,842	11,410
1988	5,208	4,269	781	768	6,990	6,714	458	131	13,438	11,882
1989	5,287	4,198	793	798	7,556	6,975	487	139	14,122	12,110
1990	5,347	4,245	802	806	8,114	7,339	506	144	14,770	12,534
1991	5,324	4,156	586	333	8,844	7,882	654	176	15,408	12,547
1992	5,460	4,216	601	337	9,461	8,373	692	182	16,213	13,108
1993	5,433	4,130	598	330	10,033	8,854	664	189	16,728	13,503
1994	5,367	4,053	590	324	9,868	9,225	598	193	16,423	13,795
1995	5,243	3,898	577	312	9,845	9,599	497	177	16,162	13,986
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	5,849	4,429	819	531	15,366	13,826	471	90	22,505	18,876

1. Full-time equivalent (rounded to the nearest 10).

Table 4-4
Researchers engaged in research and development (R & D) — Sector of performance

	1995	1996	1997	1998	1999 ^r	2000 ^r	2001 ^r	2002 ^r	2003 ^r	2004
	number ¹									
Total	87,380	90,490	93,190	95,220	98,660	107,980	114,640	115,860	118,860	125,330
Federal government	6,230	6,310	5,850	5,850	6,020	6,120	5,610	6,190	6,110	5,980
Provincial governments	1,230	1,110	1,060	1,070	870	970	1,140	1,170	1,070	1,040
Provincial research organizations	310	310	430	390	410	410	200 ²	190 ²	190 ²	190 ²
Business enterprise	48,980	48,500	51,970	54,690	58,010	66,880	73,180	73,120	72,160	76,280
Higher education	30,150	33,790	33,430	32,840	33,020	33,300	34,200	34,910	38,900	41,380
Private non-profit organizations	480	470	450	380	330	300	310	280	430	460

1. Full-time equivalent (rounded to the nearest 10).

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

Table 5-1
Technicians engaged in research and development (R & D) — Natural sciences and engineering, by sector of performance

	Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit	Total
	number ¹					
1980	4,680	1,130	8,350	9,480	350	23,990
1981	4,700	1,100	11,000	9,540	390	26,730
1982	4,650	1,280	11,550	9,180	440	27,100
1983	4,500	1,150	11,600	8,840	520	26,610
1984	4,670	1,110	12,760	8,570	590	27,700
1985	4,420	1,080	14,550	7,550	640	28,240
1986	4,660	1,080	15,950	7,370	620	29,680
1987	4,410	1,120	16,550	7,220	640	29,940
1988	4,220	1,180	17,210	7,080	720	30,410
1989	4,730	1,170	17,190	6,980	680	30,750
1990	4,340	1,250	16,200	6,850	690	29,330
1991	4,320	1,160	15,930	5,160	530	27,100
1992	4,410	1,290	16,540	5,300	380	27,920
1993	4,450	1,250	17,610	5,270	400	28,980
1994	4,620	1,070	22,740	5,210	420	34,060
1995	4,230	1,040	23,280	5,090	510	34,150
1996	4,040	860	21,580	4,420	540	31,440
1997	3,830	940	21,560	4,340	510	31,180
1998 ^r	3,760	890	22,010	4,370	420	31,450
1999 ^r	3,790	810	22,810	4,400	340	32,150
2000 ^r	3,750	860	26,740	4,490	300	36,140
2001 ^r	3,700	830	29,690	4,440	290	38,950
2002 ^r	3,700	880	31,570	4,560	260	40,970
2003 ^r	3,690	730	32,840	4,750	540	42,550
2004	3,640	800	35,130	4,850	610	45,030

1. Full-time equivalent (rounded to the nearest 10).

Table 5-2
Technicians engaged in research and development (R & D) — Social sciences and humanities, by sector of performance

	Federal government	Provincial governments	Business ¹ enterprise	Higher education	Private ¹ non-profit	Total
	number ²					
1992	80	40	...	1,900	...	2,020
1993	80	40	...	1,860	...	1,980
1994	70	40	...	1,820	...	1,930
1995	70	30	...	1,750	...	1,850
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 ^r	80	20	...	1,540	...	1,640
2002	70	40	...	1,580	...	1,690
2003	70	50	...	1,660	...	1,780
2004	90	40	...	1,730	...	1,860

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

2. Full-time equivalent (rounded to the nearest 10).

Table 6
Support staff¹ in research and development (R & D), by major field of science and sector of performance

	Federal government	Provincial governments	Business enterprise ¹	Higher education	Private non-profit ¹	Total
	number ²					
All sciences						
1980	5,090	960	5,430	8,730	200	20,410
1981	5,720	990	6,520	8,740	220	22,190
1982	5,860	1,090	6,540	8,230	250	21,970
1983	6,010	1,250	7,510	7,710	190	22,670
1984	5,810	1,150	7,290	7,370	120	21,740
1985	5,690	990	7,700	6,800	130	21,310
1986	6,220	730	8,090	6,330	150	21,520
1987	5,970	730	8,100	6,300	180	21,280
1988	6,580	830	8,550	6,120	260	22,340
1989	6,020	830	7,810	5,830	210	20,700
1990	6,180	1,060	8,050	5,630	190	21,110
1991	6,240	990	7,740	6,240	190	21,590
1992	6,210	900	7,680	6,380	130	21,420
1993	6,070	660	7,610	6,310	140	20,790
1994	5,470	630	9,280	6,210	150	21,740
1995	5,020	620	9,750	6,030	170	21,590
1996	4,430	570	9,260	5,550	220	20,030
1997	4,200	520	9,120	5,480	250	19,570
1998	4,060	480	9,240	5,470	230	19,480
1999 r	4,200	410	10,490	5,510	180	20,790
2000 r	4,760	420	11,100	5,650	250	22,180
2001 r	4,350	540	12,920	6,120	290	24,220
2002 r	4,000	540	13,590	6,290	300	24,720
2003 r	3,710	520	15,220	6,570	310	26,330
2004	4,010	490	15,260	6,770	310	26,840
Natural sciences and engineering						
1980	4,790	760	5,430	1,780	200	12,960
1981	5,280	730	6,520	1,790	220	14,540
1982	5,500	800	6,540	1,670	250	14,760
1983	5,760	880	7,510	1,560	190	15,900
1984	5,560	870	7,290	1,460	120	15,300
1985	5,440	800	7,700	1,320	130	15,390
1986	5,820	600	8,090	1,230	150	15,890
1987	5,570	660	8,100	1,130	180	15,640
1988	6,070	750	8,550	1,040	260	16,670
1989	5,530	750	7,810	1,000	210	15,300
1990	5,750	890	8,050	960	190	15,840
1991	5,930	910	7,740	3,830	190	18,600
1992	5,910	840	7,680	3,930	130	18,490
1993	5,770	600	7,610	3,910	140	18,030
1994	5,180	570	9,280	3,860	150	19,040
1995	4,750	570	9,750	3,770	170	19,000
1996	4,190	520	9,260	3,360	220	17,550
1997	3,980	480	9,120	3,300	250	17,120
1998	3,840	440	9,240	3,320	230	17,070
1999 r	3,950	390	10,490	3,330	180	18,340
2000 r	4,530	390	11,100	3,400	250	19,670
2001 r	4,090	510	12,920	3,640	290	21,450
2002 r	3,720	510	13,590	3,730	300	21,850
2003 r	3,440	480	15,220	3,900	310	23,350
2004	3,740	450	15,260	3,980	310	23,740

1. From 1980 to 1990, includes the few technicians engaged in research and development (R & D) in the social sciences and humanities.
2. Full-time equivalent (rounded to the nearest 10).

Table 7-1
Federal personnel engaged in research and development (R & D) — Major department or agency

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	number 1									
Total	15,550	14,840	13,950	13,730	14,080	14,700	13,740	13,960	13,580	13,720
Agriculture and Agri-Food Canada	3,010	2,820	2,430	2,430	2,410	2,800	2,660	1,810	1,740	1,650
Atomic Energy of Canada Limited	2,020	1,700	1,460	1,190	1,170	890	950	1,160	1,000	1,250
Canadian Institutes for Health Research	..	..	..	..	90	140	170	220	270	280
Canadian Space Agency	340	340	310	290	340	370	420	460	480	500
Environment Canada	980	830	770	740	830	840	840	890	910	910
Fisheries and Oceans Canada	900	880	800	770	850	900	890	890	520	510
Health Canada	350	480	540	520	510	520	670	700	620	400
Industry Canada	410	360	350	400	400	450	420	480	360	350
National Defence	1,180	1,240	1,170	1,300	1,290	1,350	1,300	1,480	1,480	1,560
National Museums	180	140	..	..	..	..	..	..	..	..
National Research Council	2,690	2,650	2,730	2,780	2,810	2,930	2,510	2,720	2,970	3,000
Natural Resources Canada	2,650	2,540	2,370	2,280	2,310	2,430	1,690	1,850	1,920	1,660
Natural Sciences and Engineering Research Council	160	160	180	180	210	220	230	250	260	270
Statistics Canada	130	130	140	140	160	170	190	200	200	180
Other departments or agencies	550	570	700	710	700	690	800	850	850	1,200

1. Full-time equivalent (rounded to the nearest 10).

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

	2004			
	Researchers	Technicians	Support staff	Total
	number 1			
Natural sciences and engineering	5,620	3,640	3,740	13,000
Agriculture and Agri-Food Canada	510	660	480	1,650
Atomic Energy of Canada Limited	490	320	440	1,250
Canadian Institutes for Health Research	40	0	240	280
Canadian Space Agency	240	20	240	500
Environment Canada	550	230	120	900
Fisheries and Oceans Canada	240	230	40	510
Health Canada	220	120	50	390
Industry Canada	250	60	40	350
National Defence	780	390	380	1,550
National Research Council	1,070	880	1,050	3,000
Natural Resources Canada	940	540	180	1,660
Natural Sciences and Engineering Research Council	10	0	260	270
Other Departments or Agencies	280	190	220	690
Social sciences and humanities	360	90	270	720
Bank of Canada	30	30	20	80
Canadian Museum of Civilization	10	20	30	60
Canada Mortgage and Housing Corporation	20	0	0	20
Health Canada	0	0	10	10
International Development Research Centre	70	0	30	100
National Defence	10	10	0	20
National Gallery of Canada	20	10	20	50
Social Sciences and Humanities Research Council	10	0	90	100
Statistics Canada	120	10	50	180
Other departments or agencies	70	10	20	100

1. Full-time equivalent (rounded to the nearest 10) : including personnel engaged in the administration of extramural R & D programs

Source(s): Statistics Canada, Science, Innovation and Electronic Information Division.

Table 8
Proportion of time devoted to research and development (R & D), by field of science, by classification of institutions and by personnel

	Natural sciences and engineering	Social sciences and humanities
	percent	
Large Universities		
Full-time teachers	0.35	0.25
Doctoral students	0.85	0.85
Postdoctoral research fellows	0.80	0.65
Medium Universities		
Full-time teachers	0.30	0.20
Doctoral students	0.85	0.85
Postdoctoral research fellows	0.80	0.65
Small Universities		
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 science¹

	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 ²							
1980	1	0.13	2.03	0.38	1	0.15	..	1.83
1981	1	0.13	2.03	0.38	1	0.15	..	1.83
1982	1	0.13	1.92	0.35	1	0.15	..	1.72
1983	1	0.13	1.81	0.32	1	0.16	..	1.61
1984	1	0.14	1.70	0.29	1	0.16	..	1.50
1985	1	0.14	1.48	0.26	1	0.17	..	1.39
1986	1	0.14	1.44	0.24	1	0.18	..	1.28
1987	1	0.15	1.40	0.22	1	0.18	..	1.24
1988	1	0.15	1.36	0.20	1	0.18	..	1.19
1989	1	0.15	1.32	0.19	1	0.19	..	1.15
1990	1	0.15	1.28	0.18	1	0.19	..	1.10
1991	1	0.11	0.97	0.72	1	0.08	0.45	0.58
1992	1	0.11	0.97	0.72	1	0.08	0.45	0.58
1993	1	0.11	0.97	0.72	1	0.08	0.45	0.58
1994	1	0.11	0.97	0.72	1	0.08	0.45	0.58
1995	1	0.11	0.97	0.72	1	0.08	0.45	0.58
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

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.

2. Full-time equivalent (rounded to the nearest 10).

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".¹

The number of R&D personnel are 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" (see footnote number 1).

It is important to determine the status of these resources on a regular basis. In this report, we shall 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." (see footnote number 1). In order that analysis on needs and supplies of highly qualified S&T personnel can be done, 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, perform the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities.
- **Support staff** include 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 (2002). *Proposed standard practice for surveys on research and experimental development, (Frascati Manual)*, OECD, Paris.

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

R&DS:Scientificresearch 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 consist of disciplines concerned with understanding, exploring, developing or utilizing the natural world. Included are the 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 equivalence (FTE)** or **person-years**. 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 person-year.

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 chapter on the Higher education sector.

Related information available from Statistics Canada

Information derived from surveys on scientific activities in Canada are 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. A series of working papers presents more detail available from each survey. Two annual publications, catalogue no. 88-202-X **Industrial Research and Development** and catalogue no. 88-204-X, **Federal Scientific Activities** are also available. You may contact Gisèle Bellefeuille 613-951-7113 Gisele.Bellefeuille@statcan.ca or Louise Earl 613-951-2880 Louise.Earl@statcan.ca to obtain the information or visit our website at www.statcan.ca.

R & D personnel by sector

Federal government sector

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 sector

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 2002-2003. 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 person-year total.

Business enterprise sector

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 as annual 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 working paper is released, a portion of the R&D tax credit is still outstanding and their value is estimated. This working paper provides preliminary estimates of R&D personnel in the business enterprise sector. Estimates will be revised in the next edition of the Service bulletin on the Industrial R&D in Canada.

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 sector

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 equivalent 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 sector

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.¹

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.

1. See "Research and Development (R & D) Expenditures of Private Non-profit Organizations, 2002" Science Statistics, vol. 28, no. 4, Statistics Canada, catalogue no. 88-001-X, April 2004.