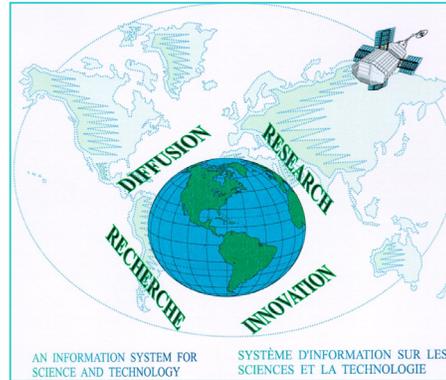




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Estimates of Research and Development Personnel in Canada, 1979 to 1999^e



**ESTIMATES OF RESEARCH AND DEVELOPMENT PERSONNEL
IN CANADA, 1979 to 1999^e**

88F0006XIE No. 9

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Science, Innovation and Electronic Information Division
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SYMBOLS

The following standard symbols are used in Statistics Canada publications:

.. figures not available.

... figures not appropriate or not applicable.

- nil or zero.

-- amount too small to be expressed.

ʳ revised figures.

^e estimates.

ABBREVIATIONS

R&D	Research and Experimental Development
S&T	Science and Technology
OECD	Organization for Economic Co-operation and Development
SOC	Standard Occupational Classification
SIC	Standard Industrial Classification
NSE	Natural Sciences and Engineering
SSH	Social Sciences and Humanities
STC	Statistics Canada
FTE	Full-time equivalence

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."

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 Innovation Survey Section, Science, Innovation and Electronic Information Division and from estimates based on various data sources.

R&D personnel statistics are not always compatible because "a wide variety of persons are needed in the national R&D effort: from the Nobel prize-winner to the winner's secretary, from the designer of space experiments to the breeder of laboratory animals"¹ Consequently, it is essential to separate R&D personnel into categories.

The International Standard Classification of Occupation (ISCO), distinguishes three occupational levels: researchers, technicians and equivalent staff, and other supporting staff.

Canada uses primarily the occupational classification; grouped in the three levels defined below.

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 performed 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. Those providing an indirect service, such as canteen and cleaning staff, should be excluded.

The data are classified into five sectors of the employing institutions:

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

¹ OECD (1997). *Proposed Standard Practice for Surveys of Research and Experimental Development, (Frascati Manual)*, OECD, Paris

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

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.

R&D:

Scientific research and experimental development 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.

Natural Sciences and Engineering: (NSE)

The NSE consists 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.

ALL SECTORS

Between 1979 and 1999, total R&D personnel increased from 80,950 to 140,440, up 73%. In 1999, just over half of R&D personnel, 55%, were employed in business enterprises, compared with 31% in higher education establishments, 10% in the federal government, 2% in provincial governments and 2% in private non-profit organizations. Moreover, the share of R&D personnel employed by business enterprises increased substantially between 1979 and 1999 (212%).

According to the data in Table 1.1, in 1999, 65% of the persons engaged in R&D were researchers, 22% were technicians and 13% were other support staff. The first group also had the highest percentage growth over this twenty-one year period, 144% compared with 36% for the technicians category and a decrease of 12% for support staff. In addition, over 85% of all personnel was concentrated in the NSE field, which means this field was responsible for almost all of the growth. (The technicians category refers to the NSE field only: the few technicians engaged in R&D in the SSH have been included with the other support staff category.)

Table 1.1 Personnel Engaged in R&D, All Sectors, by Occupational Category, 1979 to 1999^e

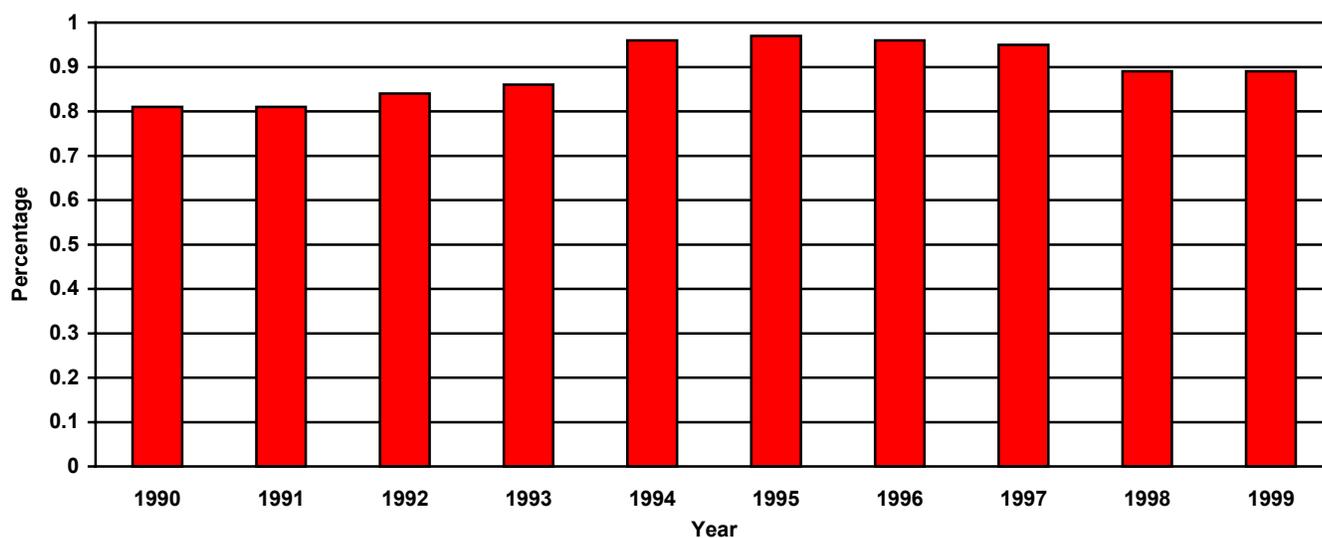
Year	Researchers			Technicians		Support staff			Total
	NSE	SSH	Total	NSE	NSE	SSH ¹	Total		
	FTE's (rounded to the nearest 10)								
1979	27,270	9,940	37,210	23,140	13,150	7,450	20,600	80,950	
1980	29,380	10,010	39,390	25,100	13,620	7,450	21,070	85,560	
1981	30,680	9,740	40,420	26,730	14,540	7,650	22,190	89,340	
1982	33,950	10,250	44,200	27,100	14,750	7,210	21,960	93,260	
1983	35,170	10,520	45,690	26,620	15,900	6,770	22,670	94,980	
1984	37,900	10,920	48,820	27,700	15,300	6,440	21,740	98,260	
1985	41,350	11,170	52,520	28,240	15,390	5,920	21,310	102,070	
1986	45,630	11,690	57,320	29,690	15,890	5,630	21,520	108,530	
1987	47,400	11,950	59,350	29,950	15,640	5,640	21,280	110,580	
1988	49,930	12,430	62,360	30,420	16,670	5,670	22,340	115,120	
1989	51,210	12,650	63,860	31,130	15,300	5,400	20,700	115,690	
1990 ^f	52,670	13,060	65,730	29,340	15,760	5,230	20,990	116,060	
1991 ^f	54,140	13,590	67,730	28,840	15,700	4,960	20,660	117,230	
1992 ^f	58,040	14,030	72,070	29,910	15,530	4,860	20,390	122,370	
1993 ^f	61,840	14,500	76,340	30,960	15,200	4,820	20,020	127,320	
1994 ^f	72,020	14,720	86,740	35,930	16,270	4,700	20,970	143,640	
1995 ^f	73,470	14,860	88,330	36,090	16,310	4,500	20,810	145,230	
1996	74,000	17,600	91,600	34,140	15,290	4,270	19,560	145,300	
1997	75,760	17,680	93,440	33,660	14,840	4,250	19,090	146,190	
1998 ^p	72,920	17,280	90,200	31,380	13,840	4,150	17,990	139,570	
1999 ^e	73,510	17,300	90,810	31,570	13,900	4,160	18,060	140,440	

^f Includes the few technicians engaged in R&D in the Social Sciences and Humanities.

Source: Tables 1.3, 1.4 and 1.5.

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

Chart 1. R&D Personnel in Canada Expressed as a Percent of the Labour Force, 1990 to 1999^e



Source: Tables 1.1 and 7.1

Table 1.2 Personnel Engaged in R&D, by Major Field of Science and Sector, 1979 to 1999^e

FTE's (rounded to the nearest 10)						
Year	Business enterprise			Higher education		
	NSE	SSH	Total	NSE	SSH	Total
1979	24,870	..	24,870	19,680	16,020	35,700
1980	28,650	..	28,650	20,290	16,130	36,420
1981	32,400	..	32,400	20,630	16,000	36,630
1982	34,900	..	34,900	20,730	16,090	36,820
1983	36,770	..	36,770	20,810	15,940	36,750
1984	39,610	..	39,610	21,110	16,140	37,250
1985	44,930	..	44,930	20,350	15,880	36,230
1986	49,570	..	49,570	20,920	15,950	36,870
1987	51,810	..	51,810	21,190	16,580	37,770
1988	54,270	..	54,270	21,560	16,960	38,520
1989	54,200	..	54,200	22,100	16,940	39,040
1990 ^f	53,920	..	53,920	22,580	17,200	39,780
1991 ^f	53,790	..	53,790	23,180	17,410	40,590
1992 ^f	57,460	..	57,460	24,190	18,040	42,230
1993 ^f	61,530	..	61,530	24,660	18,340	43,000
1994 ^f	78,920	..	78,920	24,260	18,540	42,800
1995 ^f	82,290	..	82,290	23,810	18,550	42,360
1996	80,330	..	80,330	24,260	21,090	45,350
1997	82,160	..	82,160	23,740	21,200	44,940
1998 ^p	76,490	..	76,490	23,420	20,740	44,160
1999 ^e	77,530	..	77,530	23,420	20,740	44,160
Year	Federal government			Provincial governments		
	NSE	SSH	Total	NSE	SSH	Total
1979	15,310	870	16,180	2,950	500	3,450
1980	15,270	760	16,030	3,100	570	3,670
1981	14,990	790	15,780	3,060	600	3,660
1982	15,600	730	16,330	3,590	640	4,230
1983	15,730	570	16,300	3,370	780	4,150
1984	15,800	580	16,380	3,310	640	3,950
1985	15,250	580	15,830	3,290	630	3,920
1986	16,500	810	17,310	3,140	560	3,700
1987	15,570	740	16,310	3,210	270	3,480
1988	16,450	840	17,290	3,330	300	3,630
1989	16,620	820	17,440	3,360	290	3,650
1990 ^f	16,250	710	16,960	3,610	380	3,990
1991 ^f	16,500	700	17,200	3,530	440	3,970
1992 ^f	16,590	550	17,140	3,490	300	3,790
1993 ^f	16,560	550	17,110	3,390	430	3,820
1994 ^f	16,070	520	16,590	3,110	360	3,470
1995 ^f	14,920	500	15,420	2,930	310	3,240
1996	14,220	500	14,720	2,600	280	2,880
1997	13,400	470	13,870	2,710	260	2,970
1998 ^p	13,220	460	13,680	2,620	230	2,850
1999 ^e	13,300	480	13,780	2,470	240	2,710
Year	Private non-profit			Total Canada		
	NSE	SSH	Total	NSE	SSH	Total
1979	750	..	750	63,560	17,390	80,950
1980	790	..	790	68,100	17,460	85,560
1981	870	..	870	71,950	17,390	89,340
1982	980	..	980	75,800	17,460	93,260
1983	1,010	..	1,010	77,690	17,290	94,980
1984	1,070	..	1,070	80,900	17,360	98,260
1985	1,160	..	1,160	84,980	17,090	102,070
1986	1,080	..	1,080	91,210	17,320	108,530
1987	1,210	..	1,210	92,990	17,590	110,580
1988	1,410	..	1,410	97,020	18,100	115,120
1989	1,360	..	1,360	97,640	18,050	115,690
1990 ^f	1,410	..	1,410	97,770	18,290	116,060
1991 ^f	1,680	..	1,680	98,680	18,550	117,230
1992 ^f	1,750	..	1,750	103,480	18,890	122,370
1993 ^f	1,860	..	1,860	108,000	19,320	127,320
1994 ^f	1,860	..	1,860	124,220	19,420	143,640
1995 ^f	1,920	..	1,920	125,870	19,360	145,230
1996	2,020	..	2,020	123,430	21,870	145,300
1997	2,250	..	2,250	124,260	21,930	146,190
1998 ^p	2,390	..	2,390	118,140	21,430	139,570
1999 ^e	2,260	..	2,260	118,980	21,460	140,440

Note: Historical revisions have not been made to data prior to 1990

Table 1.3 Researchers Engaged in R&D, by Major Field of Science and Sector, 1979 to 1999^e

Year	Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit	Total
FTE's (rounded to the nearest 10)						
All sciences						
1979	6,310	1,530	11,310	17,840	220	37,210
1980	6,260	1,580	13,100	18,210	240	39,390
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	22,680	21,880	390	52,520
1986	6,430	1,890	25,520	23,170	310	57,320
1987	5,930	1,630	27,150	24,250	390	59,350
1988	6,490	1,620	28,500	25,320	430	62,360
1989	6,690	1,650	28,820	26,230	470	63,860
1990 ^f	6,440	1,810	29,670	27,300	510	65,730
1991 ^f	6,540	1,810	30,120	28,680	580	67,730
1992 ^f	6,530	1,670	33,240	33,060	570	75,070
1993 ^f	6,590	1,840	36,310	30,960	640	76,340
1994 ^f	6,520	1,730	46,880	30,930	680	86,740
1995 ^f	6,180	1,560	49,120	30,840	630	88,330
1996	6,270	1,430	49,050	34,220	630	91,600
1997	5,810	1,490	51,510	33,960	670	93,440
1998 ^p	5,840	1,450	48,980	33,250	680	90,200
1999 ^e	6,010	1,410	49,500	33,250	640	90,810
Natural sciences and engineering						
1979	5,780	1,210	11,310	8,750	220	27,270
1980	5,800	1,210	13,100	9,030	240	29,380
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	22,680	11,480	390	41,350
1986	6,020	1,460	25,520	12,320	310	45,630
1987	5,590	1,430	27,150	12,840	390	47,400
1988	6,160	1,400	28,500	13,440	430	49,930
1989	6,360	1,440	28,820	14,120	470	51,210
1990 ^f	6,160	1,560	29,670	14,770	510	52,670
1991 ^f	6,250	1,510	30,120	15,680	580	54,140
1992 ^f	6,300	1,440	33,240	16,490	570	58,040
1993 ^f	6,370	1,520	36,310	17,000	640	61,840
1994 ^f	6,300	1,470	46,880	16,690	680	72,020
1995 ^f	5,970	1,330	49,120	16,420	630	73,470
1996	6,020	1,230	49,050	17,070	630	74,000
1997	5,600	1,290	51,510	16,690	670	75,760
1998 ^p	5,630	1,280	48,980	16,350	680	72,920
1999 ^e	5,790	1,230	49,500	16,350	640	73,510
Social sciences and humanities						
1979	530	320	...	9,090	...	9,940
1980	460	370	...	9,180	...	10,010
1981	350	340	...	9,050	...	9,740
1982	370	350	...	9,530	...	10,250
1983	320	410	...	9,790	...	10,520
1984	330	360	...	10,230	...	10,920
1985	330	440	...	10,400	...	11,170
1986	410	430	...	10,850	...	11,690
1987	340	200	...	11,410	...	11,950
1988	330	220	...	11,880	...	12,430
1989	330	210	...	12,110	...	12,650
1990 ^f	280	250	...	12,530	...	13,060
1991 ^f	290	300	...	13,000	...	13,590
1992 ^f	230	230	...	13,570	...	14,030
1993 ^f	220	320	...	13,960	...	14,500
1994 ^f	220	260	...	14,240	...	14,720
1995 ^f	210	230	...	14,420	...	14,860
1996	250	200	...	17,150	...	17,600
1997	210	200	...	17,270	...	17,680
1998 ^p	210	170	...	16,900	...	17,280
1999 ^e	220	180	...	16,900	...	17,300

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

Table 1.4 Technicians Engaged in R&D in the Natural Sciences and Engineering, by Sector, 1979 to 1999^e

Year	Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit	Total
FTE's (rounded to the nearest 10)						
1979	4,680	1,000	7,910	9,210	340	23,140
1980	4,680	1,130	9,460	9,480	350	25,100
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	11,610	8,840	520	26,620
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	15,960	7,370	620	29,690
1987	4,410	1,120	16,560	7,220	640	29,950
1988	4,220	1,180	17,220	7,080	720	30,420
1989	4,730	1,170	17,570	6,980	680	31,130
1990 ^r	4,340	1,250	16,200	6,850	700	29,340
1991 ^r	4,320	1,200	15,930	6,600	790	28,840
1992 ^r	4,400	1,310	16,540	6,770	890	29,910
1993 ^r	4,440	1,250	17,610	6,740	920	30,960
1994 ^r	4,610	1,050	22,750	6,660	860	35,930
1995 ^r	4,220	1,040	23,360	6,500	970	36,090
1996	4,030	840	21,940	6,320	1,010	34,140
1997	3,830	940	21,570	6,200	1,120	33,660
1998 ^p	3,760	890	19,310	6,220	1,200	31,380
1999 ^e	3,680	840	19,690	6,220	1,140	31,570

Note: *The distinction between a "technician" and "other support staff" member in the Social Sciences and Humanities is ambiguous and therefore these two categories have been combined in "Other support staff". Historical revisions have not been made to data prior to 1990.*

Table 1.5 Support Staff¹ in R&D, by Major Field of Science and Sector, 1979 to 1999^e

Year	Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit	Total
FTE's (rounded to the nearest 10)						
All Sciences						
1979	5,190	920	5,650	8,650	190	20,600
1980	5,090	960	6,090	8,730	200	21,070
1981	5,720	990	6,520	8,740	220	22,190
1982	5,860	1,090	6,530	8,230	250	21,960
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 ^f	6,180	930	8,050	5,630	200	20,990
1991 ^f	6,340	960	7,740	5,310	310	20,660
1992 ^f	6,210	810	7,680	5,400	290	20,390
1993 ^f	6,080	730	7,610	5,300	300	20,020
1994 ^f	5,460	690	9,290	5,210	320	20,970
1995 ^f	5,020	640	9,810	5,020	320	20,810
1996	4,420	610	9,340	4,810	380	19,560
1997	4,230	540	9,080	4,780	460	19,090
1998 ^p	4,080	510	8,200	4,690	510	17,990
1999 ^e	4,090	460	8,340	4,690	480	18,060
Natural sciences and engineering						
1979	4,850	740	5,650	1,720	190	13,150
1980	4,790	760	6,090	1,780	200	13,620
1981	5,280	730	6,520	1,790	220	14,540
1982	5,500	800	6,530	1,670	250	14,750
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 ^f	5,750	800	8,050	960	200	15,760
1991 ^f	5,930	820	7,740	900	310	15,700
1992 ^f	5,890	740	7,680	930	290	15,530
1993 ^f	5,750	620	7,610	920	300	15,200
1994 ^f	5,160	590	9,290	910	320	16,270
1995 ^f	4,730	560	9,810	890	320	16,310
1996	4,170	530	9,340	870	380	15,290
1997	3,970	480	9,080	850	460	14,840
1998 ^p	3,830	450	8,200	850	510	13,840
1999 ^e	3,830	400	8,340	850	480	13,900
Social sciences and humanities						
1979	340	180	...	6,930	...	7,450
1980	300	200	...	6,950	...	7,450
1981	440	260	...	6,950	...	7,650
1982	360	290	...	6,560	...	7,210
1983	250	370	...	6,150	...	6,770
1984	250	280	...	5,910	...	6,440
1985	250	190	...	5,480	...	5,920
1986	400	130	...	5,100	...	5,630
1987	400	70	...	5,170	...	5,640
1988	510	80	...	5,080	...	5,670
1989	490	80	...	4,830	...	5,400
1990 ^f	430	130	...	4,670	...	5,230
1991 ^f	410	140	...	4,410	...	4,960
1992 ^f	320	70	...	4,470	...	4,860
1993 ^f	330	110	...	4,380	...	4,820
1994 ^f	300	100	...	4,300	...	4,700
1995 ^f	290	80	...	4,130	...	4,500
1996	250	80	...	3,940	...	4,270
1997	260	60	...	3,930	...	4,250
1998 ^p	250	60	...	3,840	...	4,150
1999 ^e	260	60	...	3,840	...	4,160

¹ Includes the few technicians engaged in R&D in the Social Sciences and Humanities.
 Note: Historical revisions have not been made to data prior to 1990.

Table 1.6 Provincial Distribution of Personnel Engaged in R&D, by Sector and by Occupational Category, 1998

Sector of performance	Nfld	P.E.I.	N.S.	N.B.	Qué.	Ont.	Man.	Sask.	Alta	B.C.	Y.T., N.W.T & Nunavut	Total
Occupational Category	FTE's (rounded to the nearest 10)											
Federal government	210	80	660	260	1,770	2,390	440	450	750	690	--	7,700
Researchers	90	20	270	100	760	1,120	170	160	300	320	--	3,310
Technicians	60	30	190	80	480	570	140	150	230	180	--	2,110
Other	60	30	200	80	530	700	130	140	220	190	--	2,280
Federal government (National Capital Region)	...	...	...	...	230	5,750	...	...	...	...	...	5,980
Researchers	...	...	...	...	110	2,420	...	...	...	...	...	2,530
Technicians	...	...	...	...	60	1,590	...	...	...	...	...	1,650
Other	...	...	...	...	60	1,740	...	...	...	...	...	1,800
Provincial governments	-	-	--	100	880	580	60	260	650	300	20	2,850
Researchers	-	-	--	60	360	390	30	120	320	160	10	1,450
Technicians	-	-	--	20	280	110	20	110	260	80	10	890
Other	-	-	--	20	240	80	10	30	70	60	-	510
Business enterprise	200	50	640	380	24,980	38,770	980	730	4,060	5,690	10	76,490
Researchers	120	30	320	190	14,940	26,460	490	320	2,440	3,660	10	48,980
Technicians ¹	60	10	220	130	7,060	8,660	340	290	1,130	1,410	-	19,310
Other ¹	20	10	100	60	2,980	3,650	150	120	490	620	-	8,200
Higher education	720	100	760	760	13,500	16,420	1,480	1,300	4,240	4,880	-	44,160
Researchers	450	50	560	480	10,470	12,420	970	830	3,210	3,810	-	33,250
Technicians	160	30	80	140	1,790	2,210	310	290	610	600	-	6,220
Other	110	20	120	140	1,240	1,790	200	180	420	470	-	4,690
Private non-profit organizations	...	...	20	30	490	1,220	250	...	350	30	-	2,390
Researchers	...	...	-	10	160	340	40	...	110	20	-	680
Technicians	...	...	-	20	260	650	160	...	100	10	-	1,200
Other	...	...	20	--	70	230	50	...	140	--	-	510
TOTAL	1,130	230	2,080	1,530	41,850	65,130	3,210	2,740	10,050	11,590	30	139,570
Researchers	660	100	1,150	840	26,800	43,150	1,700	1,430	6,380	7,970	20	90,200
Technicians	280	70	490	390	9,930	13,790	970	840	2,330	2,280	10	31,380
Other	190	60	440	300	5,120	8,190	540	470	1,340	1,340	-	17,990

¹ No provincial distribution between technicians and other; estimated proportionally according to national total.

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 scientific and technological activities of federal institutions. 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.

In 1998, the majority of R&D was performed by personnel in the natural sciences and engineering (97%). Of the total R&D personnel, researchers accounted for 43%, technicians 27% and support staff 30%.

Table 2.2 shows that the department distribution of R&D personnel is more concentrated in the four major R&D performing departments. In 1998, National Research Council, Agriculture and Agri-Food Canada, Natural Resources Canada and Atomic Energy of Canada Limited accounted for 63% of all R&D personnel.

Table 2.1 Personnel Engaged in R&D in the Federal Government, by Occupational Category, 1979 to 1999^e

Year	Researchers			Technicians	Support staff			Total
	NSE	SSH	Total	NSE	NSE	SSH ¹	Total	
FTE's (rounded to the nearest 10)								
1979	5,780	530	6,310	4,680	4,850	340	5,190	16,180
1980	5,800	460	6,260	4,680	4,790	300	5,090	16,030
1981	5,010	350	5,360	4,700	5,280	440	5,720	15,780
1982	5,450	370	5,820	4,650	5,500	360	5,860	16,330
1983	5,470	320	5,790	4,500	5,760	250	6,010	16,300
1984	5,570	330	5,900	4,670	5,560	250	5,810	16,380
1985	5,390	330	5,720	4,420	5,440	250	5,690	15,830
1986	6,020	410	6,430	4,660	5,820	400	6,220	17,310
1987	5,590	340	5,930	4,410	5,570	400	5,970	16,310
1988	6,160	330	6,490	4,220	6,070	510	6,580	17,290
1989	6,360	330	6,690	4,730	5,530	490	6,020	17,440
1990 ^f	6,160	280	6,440	4,340	5,750	430	6,180	16,960
1991 ^f	6,250	290	6,540	4,320	5,930	410	6,340	17,200
1992 ^f	6,300	230	6,530	4,400	5,890	320	6,210	17,140
1993 ^f	6,370	220	6,590	4,440	5,750	330	6,080	17,110
1994 ^f	6,300	220	6,520	4,610	5,160	300	5,460	16,590
1995 ^f	5,970	210	6,180	4,220	4,730	290	5,020	15,420
1996	6,020	250	6,270	4,030	4,170	250	4,420	14,720
1997	5,600	210	5,810	3,830	3,970	260	4,230	13,870
1998	5,630	210	5,840	3,760	3,830	250	4,080	13,680
1999 ^e	5,790	220	6,010	3,680	3,830	260	4,090	13,780

^f Includes the few technicians engaged in R&D in the Social Sciences and Humanities.
 Note: Historical revisions have not been made to data prior to 1990.

Table 2.2 Federal Employees Engaged in R&D by Major Department or Agency, 1990 to 1999^e

Department or Agency	1990 ^f	1991 ^f	1992 ^f	1993 ^f	1994 ^f	1995 ^f	1996	1997	1998	1999 ^e
FTE's (rounded to the nearest 10)										
Agriculture and Agri-Food Canada	3,450	3,250	3,290	3,330	3,240	3,010	2,820	2,430	2,430	2,420
Atomic Energy of Canada Limited	2,170	2,160	2,240	2,150	2,020	2,020	1,700	1,460	1,190	1,160
Communications	360	360	360	...	...	...	...	...	...	...
Canadian Space Agency	120	280	310	320	320	340	340	310	290	350
Environment	770	800	790	780	820	980	830	770	740	760
Fisheries and Oceans	1,220	1,210	1,100	1,040	1,000	900	880	800	770	830
Health Canada	320	310	340	320	330	350	480	540	520	500
Industry Canada	180	190	190	520	430	410	360	350	400	400
National Defence	1,820	1,770	1,750	1,740	1,600	1,180	1,240	1,170	1,300	1,300
National Museums	190	180	190	180	190	180	140	...	...	...
National Research Council	2,720	2,730	2,800	2,930	2,900	2,690	2,650	2,730	2,780	2,630
Natural Resources - Energy Mines and Resources	1,980	2,260	2,210	...	...	...	...	...	...	...
Natural Resources - Forestry	750	810	810	...	...	...	...	...	...	...
Natural Resources	...	...	...	3,010	2,980	2,650	2,540	2,370	2,280	2,370
Natural Science and Engineering Research Council	170	160	160	160	170	160	160	180	180	210
Statistics Canada	120	130	130	120	120	130	130	140	140	120
Other Departments or Agencies	620	600	470	510	470	420	450	620	660	730
Total	16,960	17,200	17,140	17,110	16,590	15,420	14,720	13,870	13,680	13,780

Table 2.3 Federal Employees Engaged in R&D in the Natural Sciences and Engineering and Social Sciences and Humanities, by Occupational Category and Department or Agency, 1998

Department or Agency	Researchers	Technicians	Support staff	Total
FTE's ¹ (rounded to the nearest 10)				
Natural sciences and engineering				
Agriculture and Agri-Food Canada	720	780	930	2,430
Atomic Energy of Canada Limited	580	390	230	1,200
Canadian Space Agency	130	10	150	290
Environment	440	180	110	730
Fisheries and Oceans	290	300	180	770
Health Canada	220	230	50	500
Industry Canada	160	30	210	400
National Defence	620	300	360	1,280
National Research Council	1,040	830	900	2,770
Natural Resources	1,250	630	400	2,280
Natural Science and Engineering Research Council	10	-	170	180
Other Departments or Agencies	170	80	140	390
TOTAL	5,630	3,760	3,830	13,220
Social sciences and humanities				
Bank of Canada	20	...	20	40
Canadian Museum of Civilization	10	...	--	10
Canada Mortgage and Housing Corporation	10	...	50	60
Health Canada	10	...	--	10
International Development Research Centre	10	...	20	30
National Defence	10	...	--	10
National Gallery of Canada	10	...	40	50
Social Science and Humanities Research Council	--	...	50	50
Solicitor General	30	...	--	30
Statistics Canada	90	...	50	140
Other Departments or Agencies	10	...	20	30
TOTAL	210	...	250	460

¹ Including personnel engaged in the Administration of extramural R&D programs.
Source: Statistics Canada, Science, Innovation and Electronic Information Division.

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 Innovation 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 1999-2000. The surveys currently cover five provinces: Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. For the aggregated national statistics, estimates are made for years not covered, and for the Eastern provinces. Québec 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.

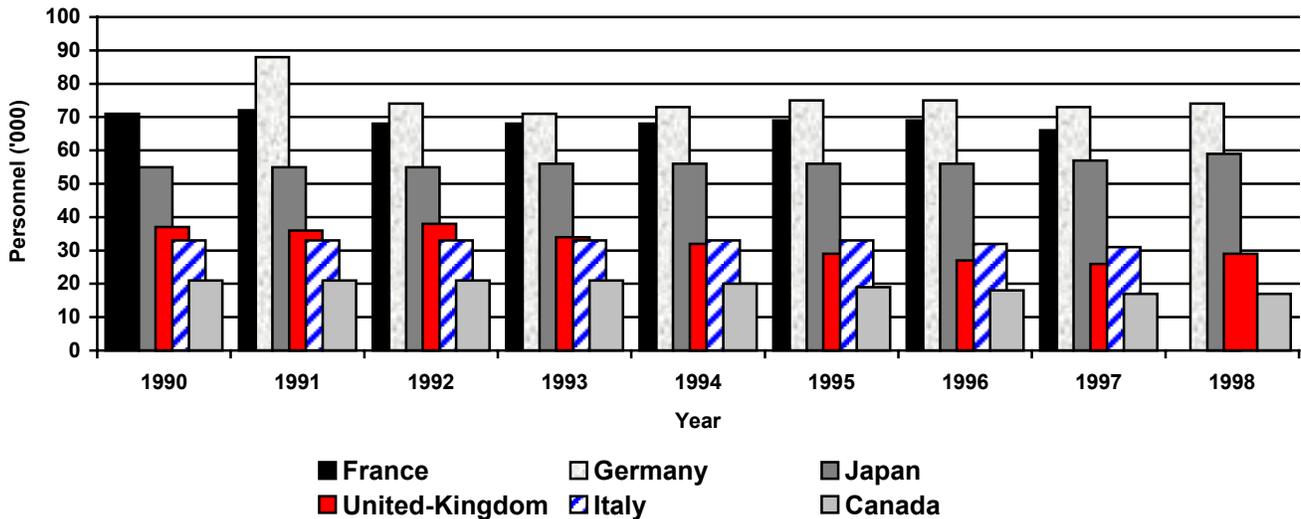
R&D is only one of the activities of these provincial research organizations. In the survey conducted by SIEID, the organizations are asked to allocate their expenditures by a number of activities, including R&D. The total number of personnel for all organizations is multiplied by the ratio of R&D to total expenditures 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.

Table 3.1 Personnel Engaged in R&D in the Provincial Government Sector, by Occupational Category, 1979 to 1999^e

Year	Researchers			Technicians		Support staff			Total
	NSE	SSH	Total	NSE	NSE	SSH ¹	Total		
FTE's (rounded to the nearest 10)									
1979	1,210	320	1,530	1,000	740	180	920	3,450	
1980	1,210	370	1,580	1,130	760	200	960	3,670	
1981	1,230	340	1,570	1,100	730	260	990	3,660	
1982	1,510	350	1,860	1,280	800	290	1,090	4,230	
1983	1,340	410	1,750	1,150	880	370	1,250	4,150	
1984	1,330	360	1,690	1,110	870	280	1,150	3,950	
1985	1,410	440	1,850	1,080	800	190	990	3,920	
1986	1,460	430	1,890	1,080	600	130	730	3,700	
1987	1,430	200	1,630	1,120	660	70	730	3,480	
1988	1,400	220	1,620	1,180	750	80	830	3,630	
1989	1,440	210	1,650	1,170	750	80	830	3,650	
1990 ^f	1,560	250	1,810	1,250	800	130	930	3,990	
1991 ^f	1,510	300	1,810	1,200	820	140	960	3,970	
1992 ^f	1,440	230	1,670	1,310	740	70	810	3,790	
1993 ^f	1,520	320	1,840	1,250	620	110	730	3,820	
1994 ^f	1,470	260	1,730	1,050	590	100	690	3,470	
1995 ^f	1,330	230	1,560	1,040	560	80	640	3,240	
1996	1,230	200	1,430	840	530	80	610	2,880	
1997	1,290	200	1,490	940	480	60	540	2,970	
1998	1,280	170	1,450	890	450	60	510	2,850	
1999 ^e	1,230	180	1,410	840	400	60	460	2,710	

^f Includes the few technicians engaged in R&D in the Social Sciences and Humanities.

Chart 2. Governments R&D Personnel, in Selected OECD Countries, 1990 to 1998



Source: Table 7.2

Business Enterprise

The term "business enterprise" encompasses all commercially oriented enterprises (privately or publicly owned), industrial research institutes and trade associations.

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 65% of all industrial R&D), were to be surveyed. However, as a result of a cost-sharing agreement with the province of Québec, the 1992 and 1994 surveys also include firms having R&D activities in the province of Québec. 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 Customs and Revenue Agency (CCRA), 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 CCRA. Once the claims are submitted, they are processed and forwarded to Statistics Canada. This means that data can arrive up to two years after the expenditure was made. Table values presented in this publication do not reflect any underestimate due to late filing of claims however values will be updated in future survey years.

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**", Statistics Canada, Catalogue No. 88-202.

As in the case of other performing sectors, industrial R&D personnel data are also available by occupational categories. Table 4.1 shows that total R&D personnel more than tripled between 1979 and 1999. In addition, there were notable differences in growth among the three occupational categories: Researchers (scientists and engineers) increased by 338%, technicians grew by 149%, and support staff by only 48%. In 1998, the first category accounted for 64% of total R&D personnel, compared with 25% for technicians and 11% for support staff.

The survey also provides a breakdown of personnel by industry. In 1998, 59% of R&D personnel in this sector were employed in manufacturing. Of this total, 29% were employed in the Telecommunication equipment industry, 12% in the Aircraft and parts, 9% in Other electronic equipment and 7% in the Business machines industry (Table 4.2). These industries employ the largest numbers of scientists and engineers in manufacturing. In the services sector, Computer and related services employ the largest share of researchers (34%).

A breakdown by degree level shows that, in 1998, 76% of R&D personnel in the researchers category (i.e., scientists and engineers) had bachelors degrees, while 16% had masters degrees and 8% doctorates (Table 4.3).

Table 4.1 Personnel Engaged in R&D in the Business Enterprise Sector, by Occupational Category, 1979 to 1999^e

Year	Researchers	Technicians	Support staff	Total
FTE's (rounded to the nearest 10)				
1979	11,310	7,910	5,650	24,870
1980	13,100	9,460	6,090	28,650
1981	14,880	11,000	6,520	32,400
1982	16,820	11,550	6,530	34,900
1983	17,650	11,610	7,510	36,770
1984	19,560	12,760	7,290	39,610
1985	22,680	14,550	7,700	44,930
1986	25,520	15,960	8,090	49,570
1987	27,150	16,560	8,100	51,810
1988	28,500	17,220	8,550	54,270
1989	28,820	17,570	7,810	54,200
1990 ^f	29,670	16,200	8,050	53,920
1991 ^f	30,120	15,930	7,740	53,790
1992 ^f	33,240	16,540	7,680	57,460
1993 ^f	36,310	17,610	7,610	61,530
1994 ^f	46,880	22,750	9,290	78,920
1995 ^f	49,120	23,360	9,810	82,290
1996	49,050	21,940	9,340	80,330
1997	51,510	21,570	9,080	82,160
1998 ^p	48,980	19,310	8,200	76,490
1999 ^e	49,500	19,690	8,340	77,530

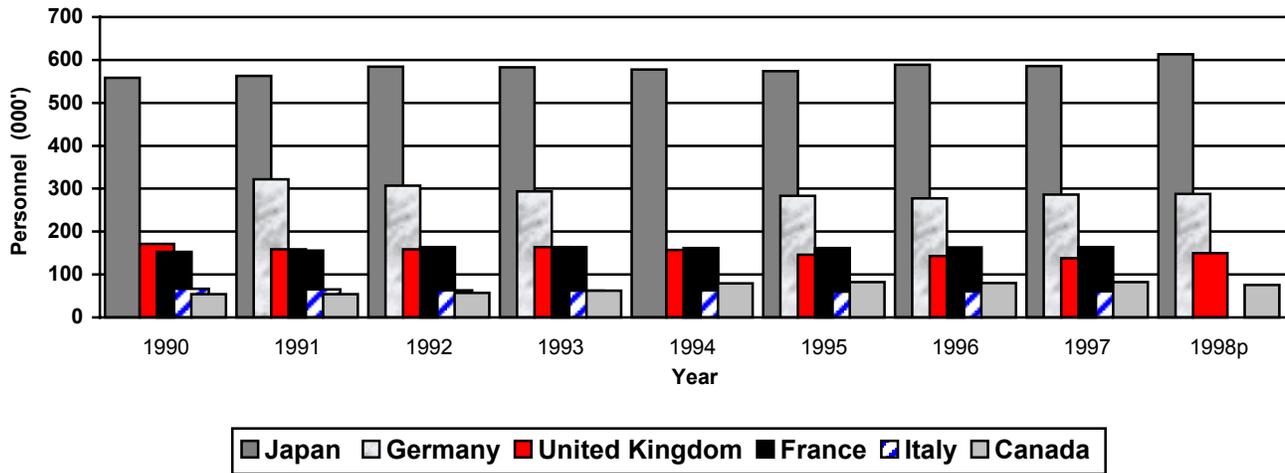
Table 4.2 Personnel Engaged in R&D in the Business Enterprise Sector, by Industry and Occupational Category, 1998^P

Industries	Researchers	Technicians	Support staff	Total
	FTE's			
Agriculture, fishing and logging	274	262	186	722
Agriculture	188	196	161	545
Fishing and trapping	23	31	7	61
Logging and forestry	63	35	18	116
Mining and oil wells	367	266	60	693
Metal mines	146	129	16	291
Other mines	15	14	4	33
Services incidental to mining	36	17	2	55
Crude petroleum and natural gas	170	106	38	314
Manufacturing	29,803	10,388	5,098	45,289
Food	489	292	99	880
Beverages and tobacco	62	55	9	126
Rubber products	81	36	25	142
Plastic products	177	147	54	378
Textiles	193	181	111	485
Wood	145	115	59	319
Furniture and fixture	63	40	25	128
Paper and allied products	345	362	194	901
Printing and publishing	63	51	11	125
Primary metals (ferrous)	121	52	39	212
Primary metals (non-ferrous)	436	358	194	988
Fabricated metal products	651	613	268	1,532
Machinery	1,102	744	291	2,137
Aircraft and parts	2,748	1,495	1,125	5,368
Motor vehicle, parts and accessories	737	459	284	1,480
Other transportation equipment	71	45	29	145
Telecommunication equipment	11,258	927	830	13,015
Electronic parts and components	871	316	77	1,264
Other electronic equipment	3,088	957	186	4,231
Business machines	2,502	623	241	3,366
Other electrical products	597	425	74	1,096
Non-metallic mineral products	67	48	33	148
Refined petroleum and coal products	120	115	17	252
Pharmaceutical and medicine	1,596	719	422	2,737
Other chemical products	768	378	167	1,313
Scientific and professional equipment	1,068	567	148	1,783
Other manufacturing industries	384	268	86	738
Construction	202	108	23	333
Utilities	550	241	121	912
Electrical power	505	229	106	840
Other utilities	45	12	15	72
Services	17,788	8,047	2,709	28,544
Transportation and storage	82	49	33	164
Communication	461	135	53	649
Wholesale trade	3,757	1,831	757	6,345
Retail trade	183	75	50	308
Finance, insurance and real estate	1,093	616	110	1,819
Computer and related services	6,048	2,135	429	8,612
Engineering and scientific services	4,803	2,514	1,078	8,395
Management consulting services	283	124	66	473
Other services	1,078	568	133	1,779
Total all industries	48,984	19,312	8,197	76,493

Table 4.3 Researchers Engaged in R&D, in the Business Enterprise Sector, by Industry and Degree Level, 1998^P

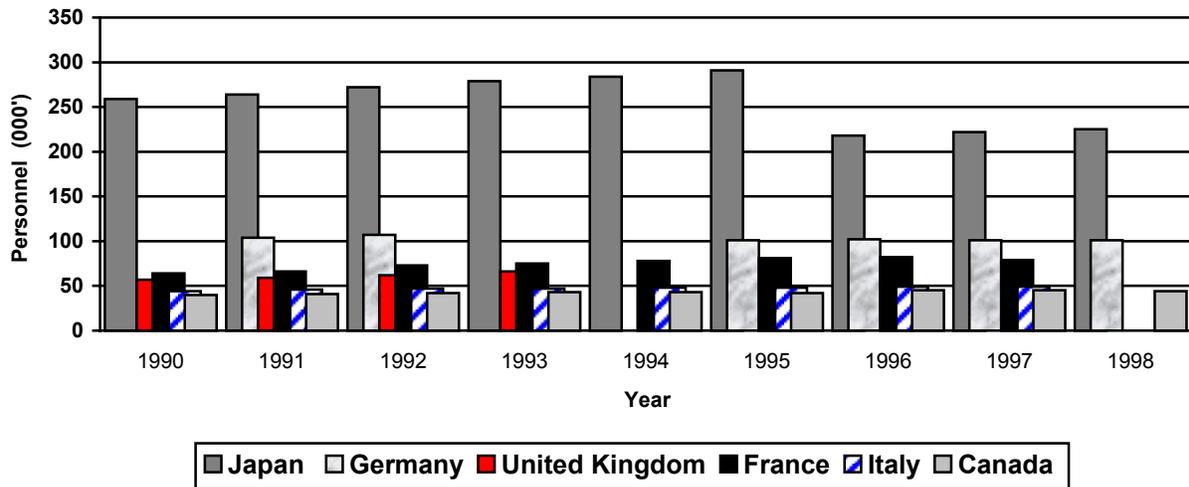
Industry	Bachelors	Masters	Doctorat	Total
	FTE's			
Agriculture, fishing and logging	205	38	31	274
Agriculture	143	18	27	188
Fishing and trapping	21	1	1	23
Logging and forestry	41	19	3	63
Mining and oil wells	242	49	76	367
Metal mines	85	19	42	146
Other mines	12	1	2	15
Services incidental to mining	36	-	-	36
Crude petroleum and natural gas	109	29	32	170
Manufacturing	22,105	5,540	2,158	29,803
Food	388	55	46	489
Beverages and tobacco	51	9	2	62
Rubber products	63	3	15	81
Plastic products	168	5	4	177
Textiles	132	24	37	193
Wood	91	25	29	145
Furniture and fixture	62	1	-	63
Paper and allied products	176	46	123	345
Printing and publishing	59	2	2	63
Primary metals (ferrous)	86	28	7	121
Primary metals (non-ferrous)	198	114	124	436
Fabricated metal products	580	41	30	651
Machinery	958	110	34	1,102
Aircraft and parts	2,065	547	136	2,748
Motor vehicle, parts and accessories	647	73	17	737
Other transportation equipment	71	-	-	71
Telecommunication equipment	7,927	2,770	561	11,258
Electronic parts and components	778	65	28	871
Other electronic equipment	2,453	502	133	3,088
Business machines	1,903	482	117	2,502
Other electrical products	546	36	15	597
Non-metallic mineral products	63	2	2	67
Refined petroleum and coal products	56	15	49	120
Pharmaceutical and medicine	790	359	447	1,596
Other chemical products	609	82	77	768
Scientific and professional equipment	838	122	108	1,068
Other manufacturing industries	347	22	15	384
Construction	197	2	3	202
Utilities	237	149	164	550
Electrical power	194	149	162	505
Other utilities	43	-	2	45
Services	14,198	2,246	1,344	17,788
Transportation and storage	80	1	1	82
Communication	370	80	11	461
Wholesale trade	3,051	481	225	3,757
Retail trade	121	48	14	183
Finance, insurance and real estate	956	111	26	1,093
Computer and related services	5,140	715	193	6,048
Engineering and scientific services	3,415	665	723	4,803
Management consulting services	243	26	14	283
Other services	822	119	137	1,078
Total all industries	37,184	8,024	3,776	48,984

Chart. 3. Business Enterprise R&D Personnel, in Selected OECD Countries, 1990 to 1998p



Source: Table 7.2

Chart. 4. Higher Education R&D Personnel, in Selected OECD Countries, 1990 to 1998



Source: Table 7.2

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.

The full-time equivalence of persons in this sector engaged in R&D was calculated from census occupation data and the results of a survey of full-time teachers, postdoctoral fellows and doctoral students conducted by the Centre for Education Statistics. Personnel are allocated to the NSE and SSH fields and occupational categories using ratios; the final step produces full-time equivalence data by means of coefficients. The procedure used currently to estimate R&D in the higher education sector is quite outdated. Work is underway to develop a new methodological approach to the estimation of HERD personnel. The findings of a "Faculty Time-use Survey", combined with Canadian Association of University Business Officers (CAUBO) and Centre for Education Statistics data will provide the source data for the new methodology. The new method will be used to estimate 1999-2000 HERD personnel, to check coherence with historical data, and to revise the historical data, if necessary, back to 1988.

The results of this estimation process are presented in Table 5.1. Since 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.

Table 5.1 Personnel Engaged in R&D in the Higher Education Sector, by Occupational Category, 1979 to 1999^e

Year	Researchers			Technicians	Support staff			Total
	NSE	SSH	Total	NSE	NSE	SSH ¹	Total	
FTE's (rounded to the nearest 10)								
1979 ^e	8,750	9,090	17,840	9,210	1,720	6,930	8,650	35,700
1980 ^e	9,030	9,180	18,210	9,480	1,780	6,950	8,730	36,420
1981 ^e	9,300	9,050	18,350	9,540	1,790	6,950	8,740	36,630
1982 ^e	9,880	9,530	19,410	9,180	1,670	6,560	8,230	36,820
1983 ^e	10,410	9,790	20,200	8,840	1,560	6,150	7,710	36,750
1984 ^e	11,080	10,230	21,310	8,570	1,460	5,910	7,370	37,250
1985 ^e	11,480	10,400	21,880	7,550	1,320	5,480	6,800	36,230
1986 ^e	12,320	10,850	23,170	7,370	1,230	5,100	6,330	36,870
1987 ^e	12,840	11,410	24,250	7,220	1,130	5,170	6,300	37,770
1988 ^e	13,440	11,880	25,320	7,080	1,040	5,080	6,120	38,520
1989 ^e	14,120	12,110	26,230	6,980	1,000	4,830	5,830	39,040
1990 ^e	14,770	12,530	27,300	6,850	960	4,670	5,630	39,780
1991 ^e	15,680	13,000	28,680	6,600	900	4,410	5,310	40,590
1992 ^e	16,490	13,570	30,060	6,770	930	4,470	5,400	42,230
1993 ^e	17,000	13,960	30,960	6,740	920	4,380	5,300	43,000
1994 ^e	16,690	14,240	30,930	6,660	910	4,300	5,210	42,800
1995 ^e	16,420	14,420	30,840	6,500	890	4,130	5,020	42,360
1996 ^e	17,070	17,150	34,220	6,320	870	3,940	4,810	45,350
1997 ^e	16,690	17,270	33,960	6,200	850	3,930	4,780	44,940
1998 ^e	16,350	16,900	33,250	6,220	850	3,840	4,690	44,160
1999 ^e	16,350	16,900	33,250	6,220	850	3,840	4,690	44,160

² Includes the few technicians engaged in R&D in the Social Sciences and Humanities

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.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.

Table 6.1 Personnel Engaged in R&D in the Private Non-profit Sector, by Occupational Category, 1979 to 1999^e

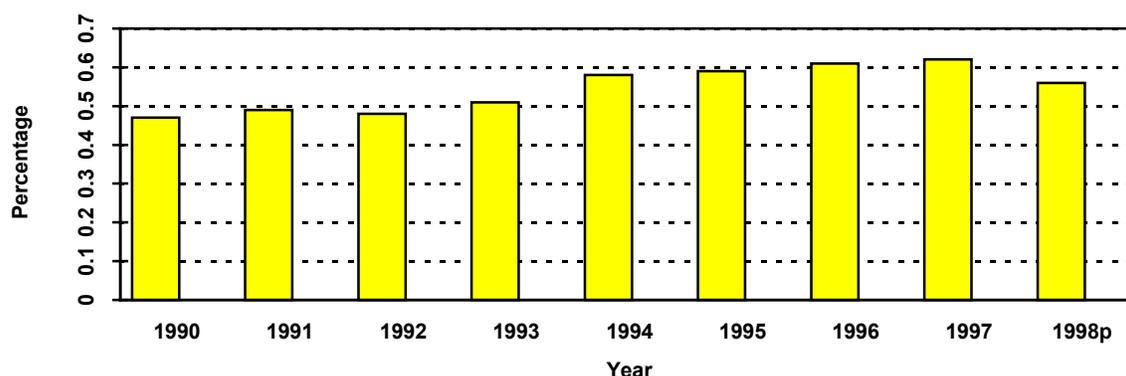
Year	Researchers	Technicians	Support staff	Total
FTE's (rounded to the nearest 10)				
1979	220	340	190	750
1980	240	350	200	790
1981	260	390	220	870
1982	290	440	250	980
1983	300	520	190	1,010
1984	360	590	120	1,070
1985	390	640	130	1,160
1986	310	620	150	1,080
1987	390	640	180	1,210
1988	430	720	260	1,410
1989	470	680	210	1,360
1990	510	700	200	1,410
1991	580	790	310	1,680
1992	570	890	290	1,750
1993	640	920	300	1,860
1994	680	860	320	1,860
1995	630	970	320	1,920
1996	630	1,010	380	2,020
1997	670	1,120	460	2,250
1998	680	1,200	510	2,390
1999 ^e	640	1,140	480	2,260

¹ See "Research and Development (R&D) Expenditures of Private Non-profit Organizations, 1999" *Science Statistics*, Vol. 24, No.8, Statistics Canada, Catalogue No. 88-001-XIB, December 2000

International Comparisons

In 1993 in Canada, there were 5.1 scientists and engineers engaged in R&D for every 1,000 members of the labour force, compared with 9.7 in Japan (over estimated), 7.4 in the United States, 6.8 in Sweden and 5.8 in France.

Chart 5. Canadian Researchers Expressed as a Percent of the Labour Force, 1990 to 1998p



Source: Table 7.1

Table 7.1 Researchers Engaged in R&D in Selected OECD Countries, 1990 to 1998^P

Country	1990 ^f	1991 ^f	1992 ^f	1993 ^f	1994 ^f	1995 ^f	1996	1997	1998 ^P
Researchers ('000 FTE)									
United States	..	961	..	965	..	..	..	..	..
Japan ¹	583	598	622	641	659	673	617	625	653
Germany	..	242	234	..	..	231	230	236	238
United Kingdom	133	131	131	135	142	147	146	147	158
France	124	130	142	146	149	151	155	155	..
Italy	78	75	74	74	76	76	76	76	..
Canada	66	68	72	76	87	88	92	93	90
Netherlands	..	..	..	32	34	34	34	38	..
Sweden	..	27	..	29	..	34	..	37	..
Total Labour Force ('000,000)									
United States	126	127	129	131	132	134	135	138	139
Japan ¹	64	65	66	66	66	67	67	68	68
Germany	30	40	40	41	41	40	40	40	40
United Kingdom	28	28	28	28	28	29	29	29	29
France	25	25	25	25	25	25	26	26	26
Italy	25	25	25	23	23	23	23	23	24
Canada	14	14	15	15	15	15	15	15	16
Netherlands	7	7	7	7	7	7	8	8	8
Sweden	5	5	4	4	4	4	4	4	4
Researchers per 1,000 persons in the labour force ratio									
United States	..	7.5	..	7.4	..	..	..	..	..
Japan ¹	9.1	9.2	9.5	9.7	9.9	10.1	9.2	9.2	9.6
Germany	..	6.1	5.9	..	..	5.9	5.8	5.9	6.0
United Kingdom	4.7	4.5	4.6	4.7	5.0	5.1	5.1	5.1	5.5
France	5.0	5.2	5.6	5.8	5.9	6.0	6.0	6.0	..
Italy	3.2	3.1	3.0	3.2	3.3	3.2	3.3	3.2	..
Canada	4.7	4.9	4.8	5.1	5.8	5.9	6.1	6.2	5.6
Netherlands	..	..	..	4.5	4.8	4.6	4.6	5.0	..
Sweden	..	5.9	..	6.8	..	7.8	..	8.6	..

¹ Overestimated (not in full-time equivalent).

* Source OECD, Main Science and Technology Indicators, 2000.

Table 7.2 Personnel engaged in R&D in Selected OECD Countries, by Major Sector, 1990 to 1998^P

Sector of performance	1990 ^r	1991 ^r	1992 ^r	1993 ^r	1994 ^r	1995 ^r	1996	1997	1998 ^P
FTE's ('000)									
Total R&D Personnel									
Japan ¹	899	910	939	947	946	948	892	894	926
Germany	431	516	488	..	..	459	454	460	463
United Kingdom	280	261	264	270	..	..	..	..	..
France	293	299	311	314	315	318	321	316	..
Italy	145	144	143	142	144	142	142	142	..
Canada	116	117	122	127	144	145	145	146	140
Netherlands	74	72	72	74	79	79	81	84	..
Sweden	..	54	..	57	..	63	..	65	..
Government									
Japan ¹	55	55	55	56	56	56	56	57	59
Germany	..	88	74	71	73	75	75	73	74
United Kingdom	37	36	38	34	32	29	27	26	29
France	71	72	68	68	68	69	69	66	..
Italy	33	33	33	33	33	33	32	31	..
Canada	21	21	21	21	20	19	18	17	17
Netherlands	15	15	15	15	16	16	16	16	..
Sweden	..	3	..	3	..	4	..	3	..
Business Enterprise									
Japan ¹	558	563	584	583	578	574	589	586	613
Germany	..	322	307	294	..	283	277	286	288
United Kingdom	171	159	159	164	157	146	143	138	150
France	153	156	164	164	162	162	163	164	..
Italy	67	65	63	62	63	60	61	61	..
Canada	54	54	57	62	79	82	80	82	76
Netherlands	32	30	29	31	36	37	39	42	..
Sweden	..	34	..	35	..	42	..	44	..
Higher Education									
Japan ¹	259	264	272	279	284	291	218	222	225
Germany	..	104	107	..	..	101	102	101	101
United Kingdom	57	59	62	66	..	..	..	..	..
France	64	66	73	75	78	81	82	79	..
Italy	44	46	47	47	48	48	49	49	..
Canada	40	41	42	43	43	42	45	45	44
Netherlands	25	26	26	27	26	25	24	24	..
Sweden	..	17	..	17	..	17	..	18	..

¹ Overestimated (not in full-time equivalent).

* Source OECD, Main Science and Technology Indicators, 2000.

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