Catalogue 88-001-XIE / ISSN 1209-1278 **Vol. 27, No. 7**

Service Bulletin

Science statistics

Aussi disponible en français

All prices exclude sales tax
Price: CDN, $7.00 per issue, $64.00 for a subscription
A print-on-demand service is also available at a price of CDN $41.00 per issue and CDN $125.00 for a one-year subscription.
To order Statistics Canada publications, please call our National toll-free line 1-800-267-6677 or internet: order@statcan.ca

Research and development (R&D) personnel in Canada, 1991 to 2000

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. The number of R&D personnel is a supplementary measure to the statistics on intramural expenditures on R&D. The Frascati Manual[1] states that "Data on the utilisation of scientific and technical personnel provide concrete measurements for international comparisons of resources devoted to R&D" (P. 20).

Highlights

- In 2000, there were 156,200 R&D personnel in Canada, an increase of 4.4% over 1999. For the same period there was an increase of 12% of total R&D expenditure. The difference between the growth rates is an indication of increased costs of performing R&D.
- Most R&D personnel were employed in the business enterprise sector (59%), followed by the higher education sector with 29%. The federal government employed 9%, the provincial governments 2% and private non-profit organizations 1% of total R&D personnel.
- Researchers make up 102,630 R&D personnel or 66% of the total. This category has shown an average annual growth rate of 4.8% over the last ten years. The share of researchers over total R&D personnel increased steadily over the past ten years, from 58% in 1991 to 66% in 2000. This upskilling of the R&D workforce also contributed to the increase in the costs of performing R&D. The natural sciences and engineering field (NSE) is where 83% of the researchers are found. The remaining 17% are in the social science and humanities (SSH) field.
- Technicians occupy the second largest identifiable category of R&D personnel, with 34,000 full-time equivalents in 2000. Since 1996 this category has remained fairly stable, however, 2000 data is showing a small increase. All technicians are considered to be working in the NSE field.
- Other support staff account for 19,570 (12%) of total R&D personnel. Approximately 78% are working in the NSE and 22% in the SSH. This category has remained fairly stable over the last 10 years.

[1] *OECD (2002), Proposed Standard Practice for Surveys on Research and Experimental Development, (Frascati Manual), OECD, Paris*

November 2003

Statistics Canada Statistique Canada

Canada

► Ontario (46%) and Québec (30%) are the provinces with the highest concentration of R&D personnel. This is due mainly to the greatest concentration of all sectors of employment as well as population in those provinces. British Columbia (9%) has the third largest concentration of R&D personnel and Alberta follows with 6%. Table 7 shows the provincial distribution of personnel engaged in R&D in Canada.

Data on R&D personnel (except for the higher education sector) are derived from surveys conducted by the Science and Innovation Surveys Section, Science, Innovation & Electronic Information Division. Estimates based on various data sources are made for the higher education sector. Data are expressed in full-time equivalents (FTE). For convenience of presentation, the data are grouped into three occupational categories:

- researchers (scientists and engineers);
- technicians;
- support staff;

and classified into five sectors of the employing institutions:

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

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

Business enterprise encompasses all private and public enterprises and industrial research institutes. Information is not collected on activities in the social sciences in this sector; hence, all data refer only to the natural sciences and engineering. Table 5 shows that total R&D personnel in the business enterprise sector increased by 72% over the ten year period. There were notable differences in growth among the three occupational categories. The number of researchers increased by over 101%, technicians by 42% and support staff by 18%. In 2000, researchers accounted for 66% of total R&D personnel, compared with 24% for technicians, and 10% for other support staff.

The higher education sector includes universities, colleges of technology and other institutions of postsecondary education. The estimated number of full-time equivalent persons engaged in R&D in the higher education sector increased by 11% between 1991 and 2000. Growth was approximately the same in the NSE and in the SSH. About 54% of total R&D personnel in this sector were working in the NSE. In 2000, researchers accounted for 75% of total R&D personnel.

The federal government comprises all federal departments and agencies. In 2000, the majority of the research and development was performed by personnel in the natural sciences and engineering (96%). Of the total R&D personnel, researchers accounted for 42%, technicians 25%, and support staff 33%.

Due to the nature of the work in the social sciences and humanities it is sometimes difficult to distinguish between technicians and support staff; accordingly these two categories have been combined.

TABLE 1. Personnel engaged in R&D, by sector, 1991 to 2000

Sector of performance	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
	FTE (rounded to the nearest 10)									
Federal government	17,200	17,270	17,240	16,730	15,550	14,840	13,950	13,730	14,080	14,710
% change		*0.4*	*-0.2*	*-3.0*	*-7.1*	*-4.6*	*-6.0*	*-1.6*	*2.5*	*4.5*
Provincial governments	4,190	4,040	3,710	3,450	3,230	2,880	2,970	2,850	2,780	3,170
% change		*-3.6*	*-8.2*	*-7.0*	*-6.4*	*-10.8*	3.1	*-4.0*	*-2.5*	*14.0*
Business enterprise[1]	53,790	57,460	61,530	78,880	82,020	79,350	82,730	85,850	87,850	92,280
% change		*6.8*	*7.1*	*28.2*	*4.0*	*-3.3*	*4.3*	*3.8*	*2.3*	*5.0*
Higher education	40,590	42,230	43,000	42,800	42,360	45,170	44,660	44,050	44,040	45,190
% change		*4.0*	*1.8*	*-0.5*	*-1.0*	*6.6*	-1.1	*-1.4*	*0.0*	*2.6*
Private non-profit organizations	1,230	980	1,090	1,110	1,160	1,230	1,210	1,030	860	850
% change		*-20.3*	*11.2*	*1.8*	*4.5*	*6.0*	*-1.6*	*-14.9*	*-16.5*	*-1.2*
Total	**117,000**	**121,980**	**126,570**	**142,970**	**144,320**	**143,470**	**145,520**	**147,510**	**149,610**	**156,200**
% change		***4.3***	***3.8***	***13.0***	***0.9***	***-0.6***	***1.4***	**1.4**	**1.4**	***4.4***

[1] *Natural sciences and engineering only.*

TABLE 2. Personnel engaged in R&D, all sectors, by occupational category, 1991 to 2000

Year	Researchers			Technicians	Support Staff			Total
	NSE	SSH	Total	NSE	NSE	SSH[1]	Total	
	FTE (rounded to the nearest 10)							
1991[r]	54,170	13,630	67,800	28,540	15,670	4,990	20,660	117,000
1992[r]	58,050	14,100	72,150	29,390	15,490	4,950	20,440	121,980
1993[r]	61,720	14,500	76,220	30,450	15,040	4,860	19,900	126,570
1994[r]	71,850	14,760	86,610	35,510	16,090	4,760	20,850	142,970
1995[r]	73,180	14,890	88,070	35,560	16,140	4,550	20,690	144,320
1996[r]	73,270	17,490	90,760	33,330	15,060	4,320	19,380	143,470
1997[r]	75,960	17,540	93,500	33,060	14,690	4,270	18,960	145,520
1998[r]	78,200	17,220	95,420	33,300	14,590	4,200	18,790	147,510
1999[r]	80,230	16,800	97,030	33,280	15,030	4,270	19,300	149,610
2000	85,210	17,420	102,630	34,000	15,190	4,380	19,570	156,200

[1] *Includes the few "technicians" engaged in R&D in the social sciences and humanities.*

TABLE 3. Personnel engaged in R&D in the federal government, by occupational category, 1991 to 2000

Occupational category	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
	FTE (rounded to the nearest 10)									
Natural sciences and engineering	**16,500**	**16,630**	**16,600**	**16,110**	**14,970**	**14,260**	**13,420**	**13,220**	**13,490**	**14,120**
Researchers	6,250	6,310	6,380	6,310	5,990	6,030	5,610	5,620	5,750	5,840
Technicians	4,320	4,410	4,450	4,620	4,230	4,040	3,830	3,760	3,790	3,750
Support staff	5,930	5,910	5,770	5,180	4,750	4,190	3,980	3,840	3,950	4,530
Social sciences and humanities	**700**	**640**	**640**	**620**	**580**	**580**	**530**	**510**	**590**	**590**
Researchers	290	260	260	260	240	280	240	230	270	290
Support staff[1]	410	380	380	360	340	300	290	280	320	300
Total	**17,200**	**17,270**	**17,240**	**16,730**	**15,550**	**14,840**	**13,950**	**13,730**	**14,080**	**14,710**

[1] *Includes the few "technicians" engaged in R&D in the social sciences and humanities.*

TABLE 4. Personnel engaged in R&D in the provincial government sector, by occupational category, 1991 to 2000

Occupational category	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
	FTE (rounded to the nearest 10)									
Government departments										
Natural sciences and engineering	**2,590**	**2,710**	**2,500**	**2,440**	**2,170**	**1,750**	**1,740**	**1,690**	**1,660**	**1,970**
Researchers	1,120	1,140	1,090	1,150	1,000	900	860	890	880	1,050
Technicians	810	970	980	850	790	580	590	520	550	680
Support staff	660	600	430	440	380	270	290	280	230	240
Social sciences and humanities	**510**	**370**	**380**	**360**	**310**	**290**	**260**	**240**	**170**	**250**
Researchers	340	270	280	260	230	210	200	180	130	170
Support staff	170	100	100	100	80	80	60	60	40	80
Sub Total	**3,100**	**3,080**	**2,880**	**2,800**	**2,480**	**2,040**	**2,000**	**1,930**	**1,830**	**2,220**
Provincial research organizations[1]										
Researchers	490	400	390	300	310	310	430	390	410	410
Technicians	350	320	270	220	250	280	350	370	360	360
Support staff	250	240	170	130	190	250	190	160	180	180
Sub Total	**1,090**	**960**	**830**	**650**	**750**	**840**	**970**	**920**	**950**	**950**
Total	**4,190**	**4,040**	**3,710**	**3,450**	**3,230**	**2,880**	**2,970**	**2,850**	**2,780**	**3,170**

[1] *Provincial research organizations include natural sciences only.*

TABLE 5. Personnel engaged in R&D in the business enterprise sector, by occupational category, 1991 to 2000

Occupational category	1991	1992	1993	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
	FTE (rounded to the nearest 10)									
Researchers	30,120	33,240	36,310	46,860	48,980	48,500	52,010	54,620	56,250	60,530
Technicians	15,930	16,540	17,610	22,740	23,280	21,580	21,590	22,000	21,980	22,620
Support staff	7,740	7,680	7,610	9,280	9,760	9,270	9,130	9,230	9,620	9,130
Total	**53,790**	**57,460**	**61,530**	**78,880**	**82,020**	**79,350**	**82,730**	**85,850**	**87,850**	**92,280**

TABLE 6. Personnel engaged in R&D in the higher education sector, by occupational category, 1991 to 2000

Occupational category	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
	FTE (rounded to the nearest 10)									
Natural sciences and engineering	23,180	24,190	24,660	24,260	23,810	24,230	23,640	23,380	23,730	24,230
Researchers	15,680	16,490	17,000	16,690	16,420	17,060	16,600	16,300	16,610	17,080
Technicians	6,600	6,770	6,740	6,660	6,500	6,310	6,190	6,230	6,260	6,290
Support staff	900	930	920	910	890	860	850	850	860	860
Social sciences and humanities	**17,410**	**18,040**	**18,340**	**18,540**	**18,550**	**20,940**	**21,020**	**20,670**	**20,310**	**20,960**
Researchers	13,000	13,570	13,960	14,240	14,420	17,000	17,100	16,810	16,400	16,960
Support staff	4,410	4,470	4,380	4,300	4,130	3,940	3,920	3,860	3,910	4,000
Total	**40,590**	**42,230**	**43,000**	**42,800**	**42,360**	**45,170**	**44,660**	**44,050**	**44,040**	**45,190**

TABLE 7. Provincial distribution of personnel engaged in R&D, by sector, by occupational category, 2000

Sector of performance	N.L.	P.E.I	N.S.	N.B.	Qué.	Ont.	Man.	Sask.	Alta.	B.C.	**Total[2]**
						FTE (rounded to the nearest 10)					
Federal government	**220**	**140**	**680**	**240**	**2,040**	**2,300**	**570**	**550**	**870**	**820**	**8,460**
Researchers	90	40	280	90	870	1,090	230	180	330	370	**3,580**
Technicians	70	50	190	70	460	710	180	180	250	240	**2,410**
Others	60	50	210	80	710	500	160	190	290	210	**2,470**
Federal government (National Capital Region)	**…**	**…**	**…**	**…**	**280**	**5,970**	**…**	**…**	**…**	**…**	**6,250**
Researchers	…	…	…	…	150	2,400	…	…	…	…	**2,550**
Technicians	…	…	…	…	40	1,300	…	…	…	…	**1,340**
Others	…	…	…	…	90	2,270	…	…	…	…	**2,360**
Provincial governments	**0**	**0**	**0**	**90**	**820**	**900**	**40**	**220**	**750**	**330**	**3,170**
Researchers	0	0	0	50	420	510	30	120	320	170	**1,630**
Technicians	0	0	0	20	220	250	0	70	350	120	**1,040**
Others	0	0	0	20	180	140	10	30	80	40	**500**
Business enterprise	**220**	**90**	**810**	**460**	**31,620**	**45,430**	**1,290**	**830**	**3,620**	**7,900**	**92,280**
Researchers	120	50	500	220	19,040	32,070	710	390	2,320	5,100	**60,530**
Technicians[1]	70	30	220	170	8,960	9,520	420	310	930	1,990	**22,620**
Others[1]	30	10	90	70	3,620	3,840	160	130	370	810	**9,130**
Higher education	**740**	**110**	**1,550**	**780**	**12,780**	**16,760**	**1,450**	**1,280**	**4,530**	**5,210**	**45,190**
Researchers	460	60	950	490	10,030	12,760	940	830	3,420	4,100	**34,040**
Technicians	170	30	360	150	1,570	2,150	310	280	650	620	**6,290**
Others	110	20	240	140	1,180	1,850	200	170	460	490	**4,860**
Private non-profit organizations	**…**	**…**	**50**	**10**	**30**	**80**	**300**	**…**	**350**	**30**	**850**
Researchers	…	…	50	10	20	20	80	…	100	20	**300**
Technicians	…	…	0	0	0	40	170	…	80	10	**300**
Others	…	…	0	0	10	20	50	…	170	0	**250**
Total	**1,180**	**340**	**3,090**	**1,580**	**47,570**	**71,440**	**3,650**	**2,880**	**10,120**	**14,290**	**156,200**
Researchers	670	150	1,780	860	30,530	48,850	1,990	1,520	6,490	9,760	**102,630**
Technicians	310	110	770	410	11,250	13,970	1,080	840	2,260	2,980	**34,000**
Others	200	80	540	310	5,790	8,620	580	520	1,370	1,550	**19,570**

[1] No provincial distribution between technicians and other; estimated proportionally according to national total.
[2] Includes the Yukon, Northwest Territories and Nunavut.

TABLE 8. Researchers engaged in R&D, by sector, 1991 to 2000

Sector of performance	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
	FTE (rounded to the nearest 10)									
Federal government	6,540	6,570	6,640	6,570	6,230	6,310	5,850	5,850	6,020	6,130
Provincial governments	1,460	1,410	1,370	1,410	1,230	1,110	1,060	1,070	1,010	1,220
Provincial research organizations	490	400	390	300	310	310	430	390	410	410
Business enterprise	30,120	33,240	36,310	46,860	48,980	48,500	52,010	54,620	56,250	60,530
Higher education	28,680	30,060	30,960	30,930	30,840	34,060	33,700	33,110	33,010	34,040
Private non-profit organizations	510	470	550	540	480	470	450	380	330	300
Total	**67,800**	**72,150**	**76,220**	**86,610**	**88,070**	**90,760**	**93,500**	**95,420**	**97,030**	**102,630**

TABLE 9. Personnel engaged in R&D, in selected OECD countries, by major sector, 1991 to 2000

Sector of performance	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
					('000 FTE)					
Total R&D Personnel:										
Japan[1]	910	939	947	946	948	892	894	926	919	897
Germany	516	488	..	..	459	454	460	462	480	485
United Kingdom	261	264	270	..	..	..	..	..	..	..
France	299	311	314	315	318	321	306	309	314	327
Italy	144	143	142	144	142	142	..	146	143	150
Canada*	**117**	**122**	**127**	**143**	**144**	**143**	**146**	**148**	**150**	**156**
Netherlands	72	72	74	79	79	81	84	85	87	90
Sweden	54	..	57	..	63	..	65	..	67	..
Governments:										
Japan[1]	55	55	56	56	56	56	57	59	59	59
Germany	88	74	71	73	75	75	73	73	71	71
United Kingdom	36	38	34	32	29	27	26	29	30	30
France	72	68	68	68	69	69	53	52	53	53
Italy	33	33	33	33	33	32	31	32	31	31
Canada*	**21**	**21**	**21**	**20**	**19**	**18**	**17**	**17**	**17**	**18**
Netherlands	15	15	15	16	16	16	16	16	17	13
Sweden	3	..	3	..	4	..	3	..	3	..
Business Enterprise:										
Japan[1]	563	584	583	578	574	589	586	613	605	582
Germany	322	307	294	..	283	277	286	288	307	312
United Kingdom	159	159	164	157	146	142	137	148	153	145
France	156	164	164	162	162	163	166	168	172	178
Italy	65	63	62	63	60	61	61	61	60	64
Canada*	**54**	**57**	**62**	**79**	**82**	**79**	**83**	**86**	**88**	**92**
Netherlands	30	29	31	36	37	39	42	44	45	49
Sweden	34	..	35	..	42	..	44	..	44	..
Higher Education:										
Japan[1]	264	272	279	284	291	218	222	225	228	228
Germany	104	107	..	..	101	102	101	100	101	101
United Kingdom	59	62	66	..	..	..	..	..	..	..
France	66	73	75	78	81	82	80	82	83	90
Italy	46	47	47	48	48	49	..	53	52	55
Canada*	**41**	**42**	**43**	**43**	**42**	**45**	**45**	**44**	**44**	**45**
Netherlands	26	26	27	26	25	24	24	24	24	27
Sweden	17	..	17	..	17	..	18	..	19	..

[1] *Overestimated (not in full-time equivalent).*
** Table 1.*
Source: OECD, Main Science and Technology Indicators, 2002/2.

TABLE 10. Researchers engaged in R&D in selected OECD countries, 1991 to 2000

Country	1991[r]	1992[r]	1993[r]	1994[r]	1995[r]	1996[r]	1997[r]	1998[r]	1999[r]	2000
					('000 FTE)					
Researchers:										
United States	982	..	965	..	988	..	1,160	..	1,261	..
Japan[1]	598	622	641	659	673	617	625	653	659	648
Germany	242	234	..	..	231	230	236	238	255	258
United Kingdom	128	131	135	142	147	145	146	158	..	..
France	130	142	146	149	151	155	155	156	160	172
Italy	75	74	74	76	76	76	66	65	65	66
Canada*	**68**	**72**	**76**	**87**	**88**	**91**	**94**	**95**	**97**	**103**
Netherlands	..	..	32	34	34	34	38	39	40	..
Sweden	27	..	29	..	34	..	37	..	40	..
Total labour force:					('000,000)					
United States	127	129	131	133	134	138	141	144	147	150
Japan[1]	66	66	66	66	67	67	68	67	67	67
Germany	38	40	40	40	39	37	37	38	38	39
United Kingdom	28	28	28	28	29	28	28	29	29	29
France	23	25	25	25	25	23	23	23	24	24
Italy	23	25	23	23	23	22	22	22	23	23
Canada	**13**	**15**	**15**	**15**	**15**	**14**	**14**	**14**	**15**	**15**
Netherlands	7	7	7	7	7	7	8	8	8	8
Sweden	5	4	4	4	4	4	4	4	4	4
Researchers per 1,000 persons in the labour force:					ratio					
United States	7.7	..	7.4	..	7.4	..	8.2	..	8.6	..
Japan[1]	9.1	9.5	9.7	9.9	10.1	9.2	9.2	9.7	9.9	9.7
Germany	6.3	5.9	..	..	5.9	6.2	6.3	6.3	6.7	6.7
United Kingdom	4.6	4.6	4.7	5.0	5.1	5.2	5.2	5.5	..	..
France	5.7	5.6	5.8	5.9	6.0	6.8	6.8	6.7	6.8	7.1
Italy	3.3	3.0	3.2	3.3	3.3	3.5	3.0	2.9	2.9	2.9
Canada	**5.2**	**4.8**	**5.1**	**5.8**	**5.9**	**6.5**	**6.7**	**6.8**	**6.5**	**6.9**
Netherlands	..	..	4.5	4.8	4.6	4.7	5.0	5.0	5.1	..
Sweden	5.9	..	6.7	..	7.7	..	9.2	..	9.6	..

[1] *Overestimated (not in full-time equivalent).*
** Table 2.*
Source: OECD, Main Science and Technology Indicators, 2002/2.

Note of Appreciation

Canada owes the success of its statistical system to a long-standing cooperation involving 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.

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner and in the official language of their choice. To this end, the agency has developed standards of service which 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.

Symbols

.. figures not available
… figures not appropriate or not applicable
r revised figures
0 amount too small to be expressed, nil or zero

This publication was prepared by **Janet Thompson** with the assistance of **Yvonne Tremblay**, Science and Innovation Surveys Section, Science, Innovation and Electronic Information Division.

For more detail on R&D personnel, see the Working Paper No. ST-03-11E, “Estimates of Research and Development Personnel in Canada, 1979 to 2000”, available from the Science and Innovation Survey Section, Science, Innovation and Electronic Information Division.

Current publications of the Science and Innovation Surveys Section include:

Industrial Research and Development, 2003 Intentions, (with 2002 preliminary estimates and 2001 actual expenditures), Catalogue No. 88-202-XIE, annual (to be released in November, 2003). It presents statistics on research and development (R&D) activities performed and funded by Canadian business enterprises. The report covers current and capital expenditures on R&D, R&D as a percent of performing company revenues, R&D expenditures by province, country of control of company, personnel engaged in R&D and payments for technological services.
http://www.statcan.ca/english/IPS/Data/88-202-XIE.htm

Federal Scientific Activities, 2002-2003, Catalogue No. 88-204-XIE, annual. It presents statistics on the federal government's activities in science and technology (S&T). It covers expenditures and person-years by type of science, performing sectors, provinces, Federal departments and agencies.

http://www.statcan.ca/english/IPS/Data/88-204-XIE.htm