

Scientific research and innovation can improve our lives and make Canada a more competitive country. Countries with a well-supported science sector can get ahead economically by being the first to reap the benefits of new scientific discoveries and new technologies. Science and technology also employs hundreds of thousands of talented Canadians in private firms, government laboratories and university research programs.

How science is funded

How much a country spends on scientific research and development (R&D) is a good indicator—probably the best available—of how much research and innovation is taking place.

This indicator, gross expenditures on research and development (GERD), refers to all money spent on R&D in a given year. GERD is a key benchmark, not unlike gross domestic product (GDP) for

the whole economy: like GDP, GERD is used for making national and international comparisons of R&D activity.

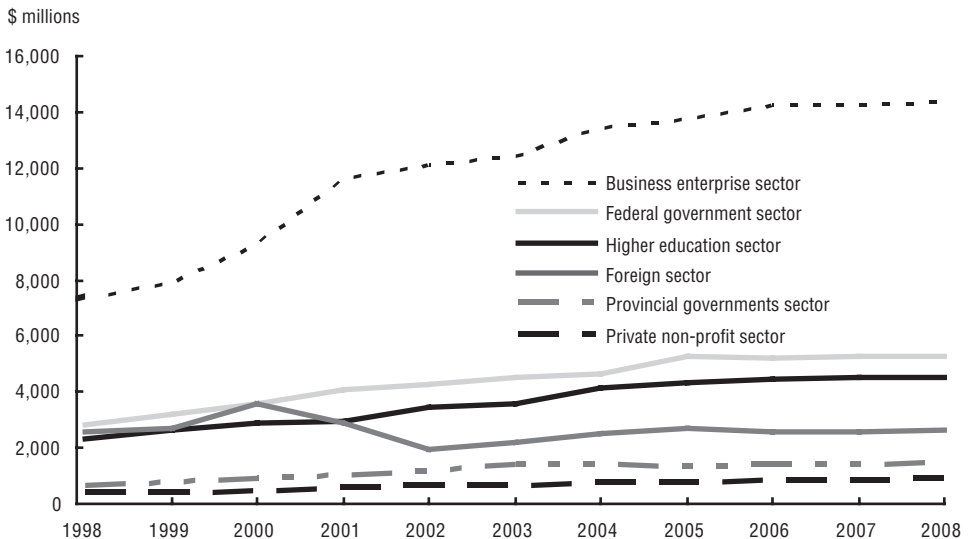
Canada's anticipated domestic spending on R&D totalled \$29.1 billion in 2008, compared with \$16.1 billion in 1998.

Businesses were expected to fund \$14.4 billion; the federal government, \$5.3 billion; and the higher education sector, \$4.5 billion. Provincial governments, the private non-profit sector and the foreign sector funded smaller amounts.

Where the funding is spent

R&D performance is a measure of which sector did the work, as opposed to the source of funding for the work. Business enterprises were expected to account for \$16.3 billion worth of work, more than half of total R&D performance. The higher education sector was expected to account for \$9.8 billion, or one-third.

Chart 27.1
Gross domestic expenditures on R&D, by funding sector



Source: Statistics Canada, CANSIM table 358-0001.

Combined, these two sectors were expected to perform 90% of Canada's R&D work in 2008, as they have since 2003.

Ontario (excluding the Ottawa region) accounted for 44% of GERD spending among the provinces in 2006, and Quebec (excluding Gatineau), 26%.

How we rank in the world

Canada's 2006 GERD spending comprised 1.9% of GDP, compared with the average among G7 nations of 2.5%. The United States spent 2.7% of GDP on GERD, the United Kingdom, 1.8%, Germany, 2.5%, and France, 2.1%. Sweden, at 3.7%, led all nations of the Organisation for Economic Co-operation and Development (OECD). Canada ranked twelfth among the 30 member nations.

Another indicator of the intensity of research and innovation is employment: according to OECD data, Canada employed 140,000 researchers in 2006, or 8.0 per 1,000 workers in the labour force.

Table 27.a
Personnel engaged in research and development, by sector

	1997	2006
	number	
Total	145,690	226,250
Federal government	13,950	15,140
Provincial governments ¹	2,970	2,820
Business enterprises ²	82,640	148,810
Higher education	44,920	57,270
Private non-profit organizations ³	1,210	2,210

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

1. Includes provincial research organizations.

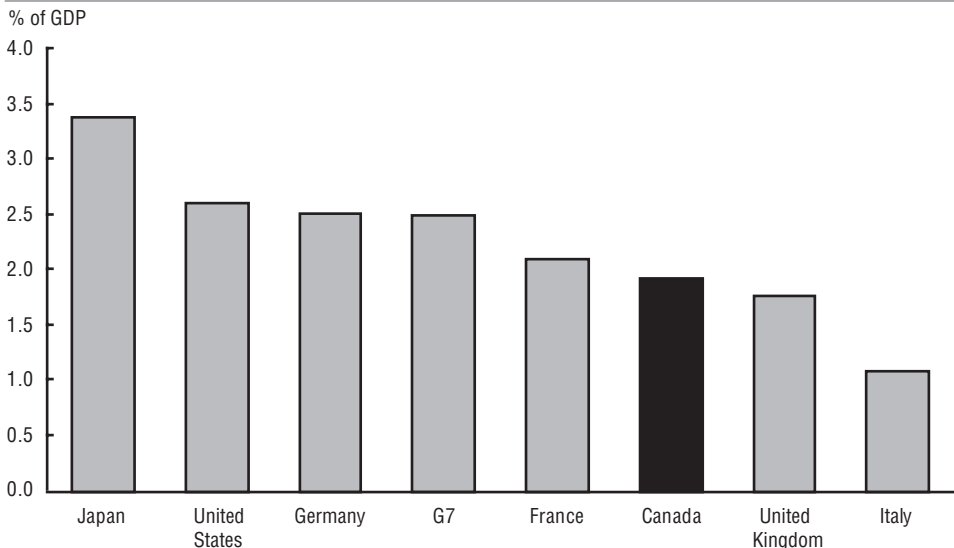
2. Natural sciences and engineering only.

3. Counts may fluctuate because of intramural research and development activities.

Source: Statistics Canada, Catalogue no. 88-001-X.

By comparison, Sweden employed 12.6 researchers per 1,000 workers in 2006; Japan, 11.1 in 2006; and the United States, 9.6 in 2005.

Chart 27.2
Gross domestic expenditure on R&D for G7 countries, 2006



Source: OECD in figures, 2008.

Research and development workers in demand

The R&D that will bring tomorrow's scientific and technical advances is done by highly trained, talented people.

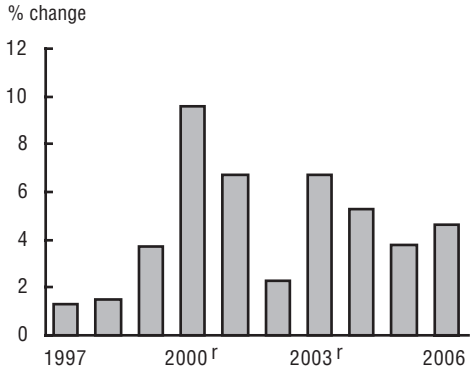
In 2006, 226,250 researchers, technicians and support staff worked on R&D activities in Canada, up 4.2% from 2005, and up 55% from 1997.

Researchers in natural sciences and engineering accounted for a large share of the growth over that period. Their numbers swelled 57% from 1997 to 2006: 73% of them worked in business enterprises in 2006.

The business enterprise sector employed a growing share of all R&D personnel, from 57% in 1997 to 66% in 2006.

The higher education sector gained 27% more R&D personnel from 1997 to 2006, but its share of R&D personnel shrank 6 points from 31% in 1997 to 25% in 2006.

Chart 27.3
Personnel engaged in R&D, all sectors



Source: Statistics Canada, Catalogue no. 88-001-X.

Three-quarters of total R&D personnel worked in Ontario and Quebec in 2006. These provinces host a significant share of the organizations that perform R&D in Canada.

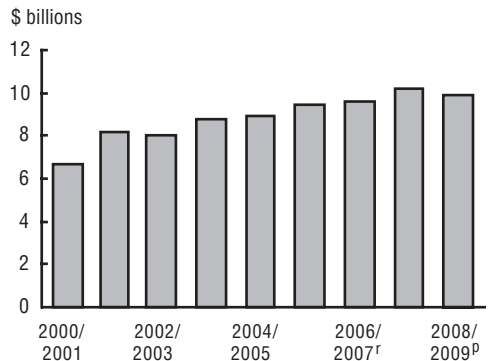
Federal science and technology spending

The federal government intended to spend \$9.9 billion on science and technology in the fiscal year 2008/2009. Spending intentions were down a slight 3% from the previous year, an anticipated decline after five years of growth. This activity, including R&D, takes place in the government's own laboratories and other facilities, as well as in those of companies, universities and colleges, and non-profit agencies.

Natural sciences and engineering research will receive an anticipated \$7.5 billion of the total; social sciences and humanities research will receive an anticipated \$2.4 billion.

Fields that are studied using federal funding include astronomy, climatology, meteorology, hydrology, geology,

Chart 27.4
Federal expenditures on science and technology



Source: Statistics Canada, Catalogue no. 88-001-X.

oceanography, energy conservation, building construction, and measurement and control of pollution.

Table 27.1 Gross domestic expenditures on research and development, by performing sector and funding sector, 1994 to 2008

	Total	Federal government	Provincial governments	Provincial research organizations	Business enterprises	Higher education	Private non-profit	Foreign sources
\$ millions								
Performing sector								
1994	13,341	1,753	197	63	7,567	3,675	86	...
1995	13,754	1,727	186	68	7,991	3,691	91	...
1996	13,817	1,792	163	79	7,997	3,697	89	...
1997	14,635	1,720	156	58	8,739	3,879	82	...
1998	16,088	1,743	155	61	9,682	4,370	77	...
1999	17,638	1,859	173	60	10,399	5,082	63	...
2000	20,556	2,080	164	66	12,395	5,793	58	...
2001	23,132	2,103	253	23	14,266	6,424	63	...
2002	23,531	2,190	256	26	13,540	7,455	63	...
2003	24,719	2,083	254	24	14,123	8,143	92	...
2004	26,833	2,084	265	25	15,299	9,058	103	...
2005	28,142	2,414	280	23	15,791	9,518	117	...
2006	28,715	2,496	311	22	16,137	9,624	125	...
2007 ^P	28,881	2,535	294	25	16,159	9,740	128	...
2008 ^P	29,071	2,467	294	25	16,316	9,837	132	...
Funding sector								
1994	13,341	3,094	663	0	5,874	1,914	298	1,498
1995	13,754	2,989	652	0	6,288	1,926	309	1,590
1996	13,817	2,814	629	0	6,395	1,905	358	1,714
1997	14,635	2,813	656	1	7,030	1,971	367	1,795
1998	16,088	2,830	640	0	7,355	2,339	372	2,552
1999	17,638	3,216	767	3	7,917	2,649	380	2,705
2000	20,556	3,560	853	1	9,223	2,892	445	3,582
2001	23,132	4,095	1,023	0	11,636	2,928	536	2,915
2002	23,531	4,251	1,152	0	12,112	3,462	628	1,925
2003	24,719	4,526	1,354	0	12,447	3,589	637	2,167
2004	26,833	4,651	1,370	0	13,404	4,147	735	2,526
2005	28,142	5,248	1,341	0	13,756	4,341	777	2,676
2006	28,715	5,225	1,407	0	14,234	4,434	830	2,585
2007 ^P	28,881	5,291	1,404	0	14,267	4,487	835	2,596
2008 ^P	29,071	5,272	1,414	0	14,386	4,532	850	2,616

Source: Statistics Canada, CANSIM table 358-0001.

Table 27.2 Gross domestic expenditures on research and development, by province and territory, 1994, 1998, 2002 and 2006

	1994	1998	2002	2006
	\$ millions			
Canada	13,341	16,088	23,531	28,715
National Capital Region	789	811	1,015	1,098
Newfoundland and Labrador	108	119	153	262
Prince Edward Island	17	24	31	70
Nova Scotia	265	311	400	502
New Brunswick	134	155	211	271
Quebec ¹	3,495	4,325	6,681	7,595
Ontario ¹	5,940	7,421	10,426	12,685
Manitoba	311	283	454	558
Saskatchewan	239	279	435	465
Alberta	966	1,174	1,709	2,412
British Columbia	1,067	1,107	1,949	2,644
Yukon, Northwest Territories and Nunavut	10	5	4	28

1. Excludes federal government expenditures for work done in the National Capital Region.

Source: Statistics Canada, CANSIM table 358-0001.

Table 27.3 Gross domestic expenditures on research and development, health sector compared with all sectors, 1988 to 2008

	All sectors		Health sector	
	\$ millions	\$ millions	% of all sectors	\$ per capita
1988	9,045	1,221	13.5	46
1989	9,517	1,365	14.3	50
1990	10,260	1,551	15.1	56
1991	10,767	1,665	15.5	59
1992	11,338	1,783	15.7	63
1993	12,184	2,006	16.5	70
1994	13,341	2,105	15.8	73
1995	13,754	2,196	16.0	75
1996	13,817	2,316	16.8	78
1997	14,635	2,644	18.1	88
1998	16,088	2,930	18.2	97
1999	17,638	3,246	18.4	107
2000	20,556	3,696	18.0	120
2001	23,132	4,383	18.9	141
2002	23,531	5,273	22.4	168
2003	24,719	5,361	21.7	169
2004	26,833	6,127 ^r	22.8	192
2005	28,142	6,298 ^r	22.4	195
2006	28,715	6,022 ^r	21.0	185
2007	28,881^p	6,109 ¹	21.2	186
2008	29,071^p	6,162 ¹	21.2	185

1. Estimate.

Source: Statistics Canada, CANSIM table 358-0001 and Catalogue no. 88-001-X.

Table 27.4 Federal expenditures on research and development, by performing province and territory and funding province and territory, 1992 to 2006

	Canada	National Capital Region	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick
	\$ millions					
Performing province						
1992	1,716	753	35	9	73	36
1993	1,757	774	36	11	75	33
1994	1,753	789	33	11	84	28
1995	1,727	805	27	9	77	29
1996	1,792	771	25	10	79	32
1997	1,720	757	23	10	71	29
1998	1,743	811	26	10	77	32
1999	1,859	808	26	12	72	32
2000	2,080	889	30	16	88	27
2001	2,103	926	27	16	70	26
2002	2,190	1,015	32	8	76	46
2003	2,083	999	23	12	66	30
2004	2,084	960	23	10	81	26
2005	2,414	1,123	28	28	66	26
2006	2,496	1,098	27	26	73	30
Funding province						
1992	3,109	748	62	10	125	54
1993	3,156	767	59	12	120	63
1994	3,094	784	52	12	127	60
1995	2,989	796	42	11	113	60
1996	2,814	755	42	12	112	44
1997	2,813	741	40	11	108	42
1998	2,830	798	45	12	113	44
1999	3,216	795	48	13	113	49
2000	3,560	872	54	19	129	42
2001	4,095	907	53	19	121	45
2002	4,251	994	63	13	131	68
2003	4,526	983	61	20	131	61
2004	4,651	945	61	18	157	57
2005	5,248	1,103	80	37	150	63
2006	5,225	1,080	75	35	158	65

1. Quebec and Ontario figures exclude federal government expenditures for work done in the National Capital Region.

Source: Statistics Canada, CANSIM table 358-0001.

Quebec ¹	Ontario ¹	Manitoba	Saskatchewan	Alberta	British Columbia	Territories
\$ millions						
234	274	81	56	78	86	1
250	276	83	54	75	88	2
225	253	79	48	93	103	7
218	259	71	52	98	81	1
226	348	77	47	94	77	5
211	302	59	74	96	83	5
227	276	49	54	94	84	4
250	322	58	60	108	106	7
350	314	69	62	116	111	9
372	328	77	63	98	97	3
370	324	72	53	92	99	3
314	351	63	54	87	80	5
320	329	73	54	110	91	6
368	395	83	68	130	91	9
371	494	81	67	133	91	5
634	848	119	89	167	252	1
660	849	121	87	164	251	2
592	799	119	82	190	270	7
580	756	108	81	207	234	1
546	714	106	74	191	204	5
546	738	85	97	194	200	5
541	732	74	78	182	198	4
665	866	92	103	218	238	7
806	899	111	120	234	262	8
999	1,126	124	123	282	290	3
993	1,114	130	113	282	338	3
1,053	1,286	131	121	321	340	5
1,067	1,323	146	123	328	409	5
1,164	1,497	157	126	405	417	9
1,146	1,563	150	122	372	419	4

Table 27.5 Federal expenditures on science and technology, by province and territory, 1999/2000 to 2005/2006

	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
	\$ millions						
Canada	5,640	6,084	7,476	7,300	7,976	8,156	8,682
National Capital Region ¹	1,981	2,130	2,603	2,608	2,642	2,708	2,912
Newfoundland and Labrador	87	101	95	117	121	137	128
Prince Edward Island	20	29	26	24	33	39	47
Nova Scotia	197	220	225	247	257	294	261
New Brunswick	72	68	82	102	100	122	93
Quebec ²	833	1,017	1,381	1,243	1,328	1,352	1,485
Ontario ²	1,309	1,347	1,653	1,582	2,038	1,967	2,101
Manitoba	161	190	211	214	194	226	254
Saskatchewan	131	148	165	151	159	157	193
Alberta	301	327	476	395	469	474	484
British Columbia	528	479	525	582	588	645	673
Yukon, Northwest Territories and Nunavut	20	28	34	35	46	35	51

1. Federal intramural expenditures only.

2. Includes extramural expenditures made in the National Capital Region and executed within the province.

Source: Statistics Canada, Catalogue no. 88-001-X.

Table 27.6 Federal expenditures on research and development, by activity, 2003/2004 to 2008/2009

	2003/2004	2004/2005	2005/2006	2006/2007 ^r	2007/2008 ^p	2008/2009 ^p
	\$ millions					
Research and development and related scientific activities	8,765	8,934	9,449	9,633	10,164	9,863
Research and development	5,462	5,454	6,042	6,073	6,481	6,222
Current expenditures	5,033	5,033	5,611	5,642	6,058	5,804
Administration of extramural programs	257	269	285	279	287	302
Capital expenditures	172	152	146	152	136	116
Related scientific activities	3,303	3,480	3,407	3,560	3,683	3,641
Data collection	1,618	1,702	1,715	1,870	1,756	1,786
Information services	663	679	676	669	707	698
Special services and studies	615	666	627	576	743	665
Education support	206	230	259	298	314	326
Administration of extramural programs	56	58	59	64	66	69
Capital expenditures	145	146	70	83	96	97

Source: Statistics Canada, Catalogue no. 88-001-X.

Table 27.7 Research and development performed by the business enterprise sector, 2004 to 2008

	2004 ^a	2005 ^a	2006 ^a	2007 ^a	2008 ^a
	All industries				
	\$ millions				
Total research and development expenditures	15,299	15,791	16,137	16,159	16,316^E
Current expenditures	14,220	14,696	15,028	15,159	15,349 ^E
Wages and salaries	8,106	8,558	8,885	9,008	9,103 ^E
Other current expenditures	6,115	6,138	6,143	6,151	6,245 ^E
Capital expenditures	1,078	1,095	1,109	1,000	968 ^E
	number of full-time equivalents				
Total research and development personnel	138,113	140,610	148,813	..	..
Professionals	81,295	83,689	87,577	..	..
Technicians	39,828	39,796	44,284	..	..
Other support staff	16,990	17,125	16,952	..	..

Note: Business enterprise research and development refers to research and development activities performed in Canada by the industrial (business enterprise) sector.

Source: Statistics Canada, CANSIM table 358-0024 and Catalogue no. 88-202-X.

Table 27.8 Intellectual property management at universities and research hospitals, 1999 to 2006

	1999	2001	2003	2004	2005	2006
	%					
Institutions engaged in intellectual property management	61	66	72	76	80	82
	number					
Full-time equivalent employees engaged in intellectual property management	178	221	255	280	292	323
Research contracts	5,748	8,247	11,432	14,324	15,877	13,996
Invention disclosures	893	1,105	1,133	1,432	1,452	1,356
Inventions protected ¹	549	682	527	629	761	707
Inventions declined by the institution	..	..	256	355	322	353
Patent applications	656	932	1,252	1,264	1,410	1,442
Patents issued	349	381	347	397	376	339
Patents held	1,915	2,133	3,047	3,827	3,961	4,784
New licences and options	232	354	422	494	621	437
Active licences and options	1,165	1,424	1,756	2,022	2,836	2,038
	\$ thousands					
Total operational expenditures for intellectual property management	22,018	28,505	36,419	36,927	41,544	42,492
Value of research contracts	393,358	527,051	810,431	940,993	1,001,270	1,154,268
Income from intellectual property	24,745	52,510	55,525	51,210	55,173	59,689
Value of remaining equity held by the institution in publicly traded spin-offs	54,560	45,120	52,351	49,872	41,336	41,524
Investment in spin-offs raised with the assistance of the institution	..	..	54,640	56,421	23,002	x

Note: Data were not collected for 2000 and 2002.

1. Resulted in protection activity.

Source: Statistics Canada, CANSIM table 358-0025.

Table 27.9 University enrolment in natural and applied science and technology programs, by sex, 2002/2003 to 2006/2007

	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007
	number				
All instructional programs					
Both sexes ¹	936,390	993,768	1,019,775	1,047,690	1,057,272
Men	398,070	419,640	431,544	442,368	445,329
Women	538,257	573,876	587,994	604,956	611,688
Physical and life sciences and technologies					
Both sexes ¹	81,804	87,261	92,199	94,497	93,564
Men	36,372	38,388	40,686	42,357	42,027
Women	45,429	48,864	51,513	52,134	51,531
Mathematics, computer and information sciences					
Both sexes ¹	45,837	43,977	40,764	36,600	33,900
Men	33,120	32,121	29,751	26,652	24,636
Women	12,714	11,832	10,971	9,945	9,255
Architecture, engineering and related technologies					
Both sexes ¹	81,096	85,785	86,529	85,503	85,755
Men	62,388	66,543	67,422	67,533	67,563
Women	18,702	19,233	19,104	17,970	18,174
Agriculture, natural resources and conservation					
Both sexes ¹	14,592	14,769	14,925	15,264	15,501
Men	6,720	6,654	6,696	6,774	6,786
Women	7,869	8,112	8,223	8,490	8,709

Notes: All counts are randomly rounded to a multiple of 3.

Historical data coded with the University Student Information System classification have been converted to the Classification of Instructional Programs 2000.

1. Figures may not add to totals because of the exclusion of the 'sex unknown' category in the table or because of rounding.

Source: Statistics Canada, CANSIM table 477-0013.