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## Estimates of research and development personnel in Canada, 1979 to 2000

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# **Estimates of research and development personnel in Canada, 1979 to 2000**

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**SYMBOLS**

The following standard symbols are used in Statistics Canada publications:

- .. figures not available.
- ... figures not appropriate or not applicable.
- † revised figures.

**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

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## Estimates of research and development personnel in Canada

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

The number of R&D personnel 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 personnel 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"<sup>1</sup> Consequently, it is essential to classify 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

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<sup>1</sup> OECD (2002). *Proposed standard practice for surveys on 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 2000, total R&D personnel increased from 80,950 to 156,200, up 93%. In 2000, just over half of R&D personnel, 59%, were employed in business enterprises, compared with 29% in higher education establishments, 9% in the federal government, 2% in provincial governments and 1% in private non-profit organizations. Moreover, the share of R&D personnel employed by business enterprises increased substantially between 1979 and 2000 (253%).

According to the data in Table 1.1, in 2000, 66% of the persons engaged in R&D were researchers, 22% were technicians and 12% were other support staff. The first group also had the highest percentage growth over this twenty-two year period, 176% compared with 47% for the technicians' category and a decrease of 5% for support staff. In addition, over 86% of all personnel were 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.)

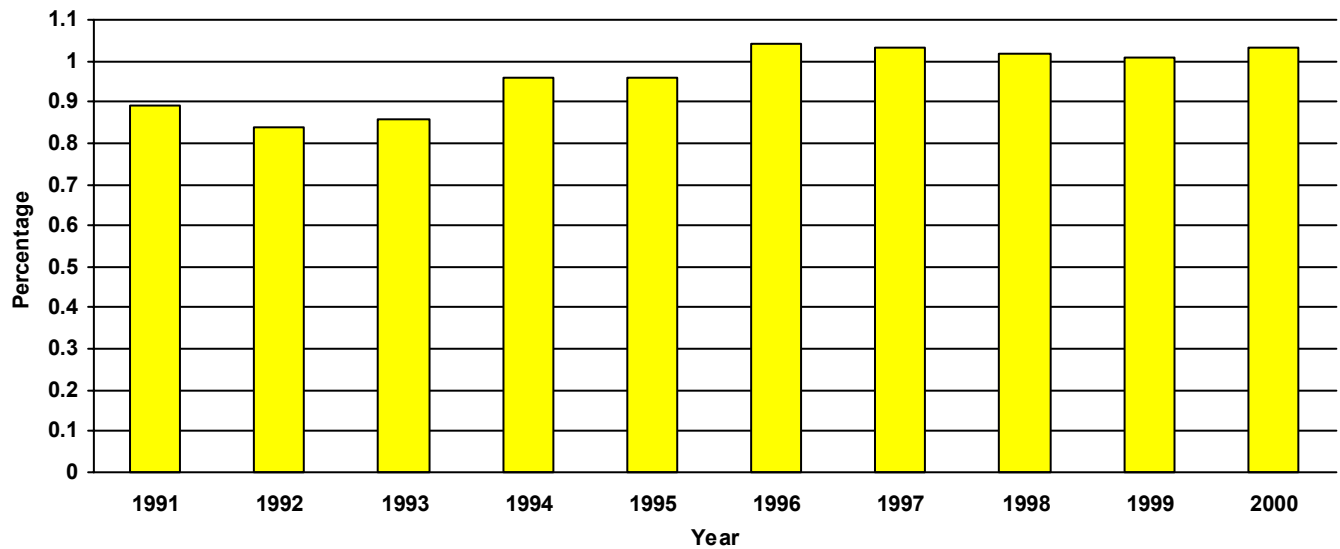
**Table 1.1 Personnel engaged in R&D, all sectors, by occupational category, 1979 to 2000**

| Year              | Researchers                       |        |                | Technicians   |  | Support staff |                  |               | Total          |
|-------------------|-----------------------------------|--------|----------------|---------------|--|---------------|------------------|---------------|----------------|
|                   | NSE                               | SSH    | Total          | NSE           |  | NSE           | SSH <sup>1</sup> | Total         |                |
|                   | FTE's (rounded to the nearest 10) |        |                |               |  |               |                  |               |                |
| 1979              | 27,270                            | 9,940  | <b>37,210</b>  | <b>23,140</b> |  | 13,150        | 7,450            | <b>20,600</b> | <b>80,950</b>  |
| 1980              | 29,380                            | 10,010 | <b>39,390</b>  | <b>25,100</b> |  | 13,620        | 7,450            | <b>21,070</b> | <b>85,560</b>  |
| 1981              | 30,680                            | 9,740  | <b>40,420</b>  | <b>26,730</b> |  | 14,540        | 7,650            | <b>22,190</b> | <b>89,340</b>  |
| 1982              | 33,950                            | 10,250 | <b>44,200</b>  | <b>27,100</b> |  | 14,750        | 7,210            | <b>21,960</b> | <b>93,260</b>  |
| 1983              | 35,170                            | 10,520 | <b>45,690</b>  | <b>26,620</b> |  | 15,900        | 6,770            | <b>22,670</b> | <b>94,980</b>  |
| 1984              | 37,900                            | 10,920 | <b>48,820</b>  | <b>27,700</b> |  | 15,300        | 6,440            | <b>21,740</b> | <b>98,260</b>  |
| 1985              | 41,350                            | 11,170 | <b>52,520</b>  | <b>28,240</b> |  | 15,390        | 5,920            | <b>21,310</b> | <b>102,070</b> |
| 1986              | 45,630                            | 11,690 | <b>57,320</b>  | <b>29,690</b> |  | 15,890        | 5,630            | <b>21,520</b> | <b>108,530</b> |
| 1987              | 47,400                            | 11,950 | <b>59,350</b>  | <b>29,950</b> |  | 15,640        | 5,640            | <b>21,280</b> | <b>110,580</b> |
| 1988              | 49,930                            | 12,430 | <b>62,360</b>  | <b>30,420</b> |  | 16,670        | 5,670            | <b>22,340</b> | <b>115,120</b> |
| 1989              | 51,210                            | 12,650 | <b>63,860</b>  | <b>31,130</b> |  | 15,300        | 5,400            | <b>20,700</b> | <b>115,690</b> |
| 1990 <sup>f</sup> | 52,860                            | 13,100 | <b>65,960</b>  | <b>29,330</b> |  | 15,840        | 5,270            | <b>21,110</b> | <b>116,400</b> |
| 1991 <sup>f</sup> | 54,170                            | 13,630 | <b>67,800</b>  | <b>28,540</b> |  | 15,670        | 4,990            | <b>20,660</b> | <b>117,000</b> |
| 1992 <sup>f</sup> | 58,050                            | 14,100 | <b>72,150</b>  | <b>29,390</b> |  | 15,490        | 4,950            | <b>20,440</b> | <b>121,980</b> |
| 1993 <sup>f</sup> | 61,720                            | 14,500 | <b>76,220</b>  | <b>30,450</b> |  | 15,040        | 4,860            | <b>19,900</b> | <b>126,570</b> |
| 1994 <sup>f</sup> | 71,850                            | 14,760 | <b>86,610</b>  | <b>35,510</b> |  | 16,090        | 4,760            | <b>20,850</b> | <b>142,970</b> |
| 1995 <sup>f</sup> | 73,180                            | 14,890 | <b>88,070</b>  | <b>35,560</b> |  | 16,140        | 4,550            | <b>20,690</b> | <b>144,320</b> |
| 1996 <sup>f</sup> | 73,270                            | 17,490 | <b>90,760</b>  | <b>33,330</b> |  | 15,060        | 4,320            | <b>19,380</b> | <b>143,470</b> |
| 1997 <sup>f</sup> | 75,960                            | 17,540 | <b>93,500</b>  | <b>33,060</b> |  | 14,690        | 4,270            | <b>18,960</b> | <b>145,520</b> |
| 1998 <sup>f</sup> | 78,200                            | 17,220 | <b>95,420</b>  | <b>33,300</b> |  | 14,590        | 4,200            | <b>18,790</b> | <b>147,510</b> |
| 1999 <sup>f</sup> | 80,230                            | 16,800 | <b>97,030</b>  | <b>33,280</b> |  | 15,030        | 4,270            | <b>19,300</b> | <b>149,610</b> |
| 2000              | 85,210                            | 17,420 | <b>102,630</b> | <b>34,000</b> |  | 15,190        | 4,380            | <b>19,570</b> | <b>156,200</b> |

<sup>1</sup> 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, 1991 to 2000**



Source: Tables 1.1 and 7.1

**Table 1.2 Personnel engaged in R&D, by major field of science and sector, 1979 to 2000**

| 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 <sup>f</sup>                 | 53,920              | ..  | 53,920 | 22,580                 | 17,200 | 39,780  |
| 1991 <sup>f</sup>                 | 53,790              | ..  | 53,790 | 23,180                 | 17,410 | 40,590  |
| 1992 <sup>f</sup>                 | 57,460              | ..  | 57,460 | 24,190                 | 18,040 | 42,230  |
| 1993 <sup>f</sup>                 | 61,530              | ..  | 61,530 | 24,660                 | 18,340 | 43,000  |
| 1994 <sup>f</sup>                 | 78,880              | ..  | 78,880 | 24,260                 | 18,540 | 42,800  |
| 1995 <sup>f</sup>                 | 82,020              | ..  | 82,020 | 23,810                 | 18,550 | 42,360  |
| 1996 <sup>f</sup>                 | 79,350              | ..  | 79,350 | 24,230                 | 20,940 | 45,170  |
| 1997 <sup>f</sup>                 | 82,730              | ..  | 82,730 | 23,640                 | 21,020 | 44,660  |
| 1998 <sup>f</sup>                 | 85,850              | ..  | 85,850 | 23,380                 | 20,670 | 44,050  |
| 1999 <sup>f</sup>                 | 87,850              | ..  | 87,850 | 23,730                 | 20,310 | 44,040  |
| 2000                              | 92,280              | ..  | 92,280 | 24,230                 | 20,960 | 45,190  |
| 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 <sup>f</sup>                 | 16,250              | 710 | 16,960 | 3,820                  | 460    | 4,280   |
| 1991 <sup>f</sup>                 | 16,500              | 700 | 17,200 | 3,680                  | 510    | 4,190   |
| 1992 <sup>f</sup>                 | 16,630              | 640 | 17,270 | 3,670                  | 370    | 4,040   |
| 1993 <sup>f</sup>                 | 16,600              | 640 | 17,240 | 3,330                  | 380    | 3,710   |
| 1994 <sup>f</sup>                 | 16,110              | 620 | 16,730 | 3,090                  | 360    | 3,450   |
| 1995 <sup>f</sup>                 | 14,970              | 580 | 15,550 | 2,920                  | 310    | 3,230   |
| 1996 <sup>f</sup>                 | 14,260              | 580 | 14,840 | 2,590                  | 290    | 2,880   |
| 1997 <sup>f</sup>                 | 13,420              | 530 | 13,950 | 2,710                  | 260    | 2,970   |
| 1998 <sup>f</sup>                 | 13,220              | 510 | 13,730 | 2,610                  | 240    | 2,850   |
| 1999 <sup>f</sup>                 | 13,490              | 590 | 14,080 | 2,610                  | 170    | 2,780   |
| 2000                              | 14,120              | 590 | 14,710 | 2,920                  | 250    | 3,170   |
| 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 <sup>f</sup>                 | 1,460               | ..  | 1,460  | 98,030                 | 18,370 | 116,400 |
| 1991 <sup>f</sup>                 | 1,230               | ..  | 1,230  | 98,380                 | 18,620 | 117,000 |
| 1992 <sup>f</sup>                 | 980                 | ..  | 980    | 102,930                | 19,050 | 121,980 |
| 1993 <sup>f</sup>                 | 1,090               | ..  | 1,090  | 107,210                | 19,360 | 126,570 |
| 1994 <sup>f</sup>                 | 1,110               | ..  | 1,110  | 123,450                | 19,520 | 142,970 |
| 1995 <sup>f</sup>                 | 1,160               | ..  | 1,160  | 124,880                | 19,440 | 144,320 |
| 1996 <sup>f</sup>                 | 1,230               | ..  | 1,230  | 121,660                | 21,810 | 143,470 |
| 1997 <sup>f</sup>                 | 1,210               | ..  | 1,210  | 123,710                | 21,810 | 145,520 |
| 1998 <sup>f</sup>                 | 1,030               | ..  | 1,030  | 126,090                | 21,420 | 147,510 |
| 1999 <sup>f</sup>                 | 860                 | ..  | 860    | 128,540                | 21,070 | 149,610 |
| 2000                              | 850                 | ..  | 850    | 134,400                | 21,800 | 156,200 |

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 2000**

| Year                                    | Federal government | Provincial governments | Business enterprise | Higher education | Private non-profit | Total   |
|---|--------------------|------------------------|---------------------|------------------|--------------------|---------|
| FTE's (rounded to the nearest 10)       |                    |                        |                     |                  |                    |         |
| <b>All sciences</b>                     |                    |                        |                     |                  |                    |         |
| 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 <sup>f</sup>                       | 6,440              | 1,970                  | 29,670              | 27,300           | 580                | 65,960  |
| 1991 <sup>f</sup>                       | 6,540              | 1,950                  | 30,120              | 28,680           | 510                | 67,800  |
| 1992 <sup>f</sup>                       | 6,570              | 1,810                  | 33,240              | 30,060           | 470                | 72,150  |
| 1993 <sup>f</sup>                       | 6,640              | 1,760                  | 36,310              | 30,960           | 550                | 76,220  |
| 1994 <sup>f</sup>                       | 6,570              | 1,710                  | 46,860              | 30,930           | 540                | 86,610  |
| 1995 <sup>f</sup>                       | 6,230              | 1,540                  | 48,980              | 30,840           | 480                | 88,070  |
| 1996 <sup>f</sup>                       | 6,310              | 1,420                  | 48,500              | 34,060           | 470                | 90,760  |
| 1997 <sup>f</sup>                       | 5,850              | 1,490                  | 52,010              | 33,700           | 450                | 93,500  |
| 1998 <sup>f</sup>                       | 5,850              | 1,460                  | 54,620              | 33,110           | 380                | 95,420  |
| 1999 <sup>f</sup>                       | 6,020              | 1,420                  | 56,250              | 33,010           | 330                | 97,030  |
| 2000                                    | 6,130              | 1,630                  | 60,530              | 34,040           | 300                | 102,630 |
| <b>Natural sciences and engineering</b> |                    |                        |                     |                  |                    |         |
| 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 <sup>f</sup>                       | 6,160              | 1,680                  | 29,670              | 14,770           | 580                | 52,860  |
| 1991 <sup>f</sup>                       | 6,250              | 1,610                  | 30,120              | 15,680           | 510                | 54,170  |
| 1992 <sup>f</sup>                       | 6,310              | 1,540                  | 33,240              | 16,490           | 470                | 58,050  |
| 1993 <sup>f</sup>                       | 6,380              | 1,480                  | 36,310              | 17,000           | 550                | 61,720  |
| 1994 <sup>f</sup>                       | 6,310              | 1,450                  | 46,860              | 16,690           | 540                | 71,850  |
| 1995 <sup>f</sup>                       | 5,990              | 1,310                  | 48,980              | 16,420           | 480                | 73,180  |
| 1996 <sup>f</sup>                       | 6,030              | 1,210                  | 48,500              | 17,060           | 470                | 73,270  |
| 1997 <sup>f</sup>                       | 5,610              | 1,290                  | 52,010              | 16,600           | 450                | 75,960  |
| 1998 <sup>f</sup>                       | 5,620              | 1,280                  | 54,620              | 16,300           | 380                | 78,200  |
| 1999 <sup>f</sup>                       | 5,750              | 1,290                  | 56,250              | 16,610           | 330                | 80,230  |
| 2000                                    | 5,840              | 1,460                  | 60,530              | 17,080           | 300                | 85,210  |
| <b>Social sciences and humanities</b>   |                    |                        |                     |                  |                    |         |
| 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 <sup>f</sup>                       | 280                | 290                    | ...                 | 12,530           | ...                | 13,100  |
| 1991 <sup>f</sup>                       | 290                | 340                    | ...                 | 13,000           | ...                | 13,630  |
| 1992 <sup>f</sup>                       | 260                | 270                    | ...                 | 13,570           | ...                | 14,100  |
| 1993 <sup>f</sup>                       | 260                | 280                    | ...                 | 13,960           | ...                | 14,500  |
| 1994 <sup>f</sup>                       | 260                | 260                    | ...                 | 14,240           | ...                | 14,760  |
| 1995 <sup>f</sup>                       | 240                | 230                    | ...                 | 14,420           | ...                | 14,890  |
| 1996 <sup>f</sup>                       | 280                | 210                    | ...                 | 17,000           | ...                | 17,490  |
| 1997 <sup>f</sup>                       | 240                | 200                    | ...                 | 17,100           | ...                | 17,540  |
| 1998 <sup>f</sup>                       | 230                | 180                    | ...                 | 16,810           | ...                | 17,220  |
| 1999 <sup>f</sup>                       | 270                | 130                    | ...                 | 16,400           | ...                | 16,800  |
| 2000                                    | 290                | 170                    | ...                 | 16,960           | ...                | 17,420  |

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 2000**

| 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                | <b>23,140</b> |
| 1980              | 4,680                             | 1,130                  | 9,460               | 9,480            | 350                | <b>25,100</b> |
| 1981              | 4,700                             | 1,100                  | 11,000              | 9,540            | 390                | <b>26,730</b> |
| 1982              | 4,650                             | 1,280                  | 11,550              | 9,180            | 440                | <b>27,100</b> |
| 1983              | 4,500                             | 1,150                  | 11,610              | 8,840            | 520                | <b>26,620</b> |
| 1984              | 4,670                             | 1,110                  | 12,760              | 8,570            | 590                | <b>27,700</b> |
| 1985              | 4,420                             | 1,080                  | 14,550              | 7,550            | 640                | <b>28,240</b> |
| 1986              | 4,660                             | 1,080                  | 15,960              | 7,370            | 620                | <b>29,690</b> |
| 1987              | 4,410                             | 1,120                  | 16,560              | 7,220            | 640                | <b>29,950</b> |
| 1988              | 4,220                             | 1,180                  | 17,220              | 7,080            | 720                | <b>30,420</b> |
| 1989              | 4,730                             | 1,170                  | 17,570              | 6,980            | 680                | <b>31,130</b> |
| 1990 <sup>r</sup> | 4,340                             | 1,250                  | 16,200              | 6,850            | 690                | <b>29,330</b> |
| 1991 <sup>r</sup> | 4,320                             | 1,160                  | 15,930              | 6,600            | 530                | <b>28,540</b> |
| 1992 <sup>r</sup> | 4,410                             | 1,290                  | 16,540              | 6,770            | 380                | <b>29,390</b> |
| 1993 <sup>r</sup> | 4,450                             | 1,250                  | 17,610              | 6,740            | 400                | <b>30,450</b> |
| 1994 <sup>r</sup> | 4,620                             | 1,070                  | 22,740              | 6,660            | 420                | <b>35,510</b> |
| 1995 <sup>r</sup> | 4,230                             | 1,040                  | 23,280              | 6,500            | 510                | <b>35,560</b> |
| 1996 <sup>r</sup> | 4,040                             | 860                    | 21,580              | 6,310            | 540                | <b>33,330</b> |
| 1997 <sup>r</sup> | 3,830                             | 940                    | 21,590              | 6,190            | 510                | <b>33,060</b> |
| 1998 <sup>r</sup> | 3,760                             | 890                    | 22,000              | 6,230            | 420                | <b>33,300</b> |
| 1999 <sup>r</sup> | 3,790                             | 910                    | 21,980              | 6,260            | 340                | <b>33,280</b> |
| 2000              | 3,750                             | 1,040                  | 22,620              | 6,290            | 300                | <b>34,000</b> |

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 staff<sup>1</sup> in R&D, by major field of science and sector, 1979 to 2000**

| Year                                    | Federal government | Provincial governments | Business enterprise | Higher education | Private non-profit | Total  |
|---|--------------------|------------------------|---------------------|------------------|--------------------|--------|
| FTE's (rounded to the nearest 10)       |                    |                        |                     |                  |                    |        |
| <b>All sciences</b>                     |                    |                        |                     |                  |                    |        |
| 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 <sup>f</sup>                       | 6,180              | 1,060                  | 8,050               | 5,630            | 190                | 21,110 |
| 1991 <sup>f</sup>                       | 6,340              | 1,080                  | 7,740               | 5,310            | 190                | 20,660 |
| 1992 <sup>f</sup>                       | 6,290              | 940                    | 7,680               | 5,400            | 130                | 20,440 |
| 1993 <sup>f</sup>                       | 6,150              | 700                    | 7,610               | 5,300            | 140                | 19,900 |
| 1994 <sup>f</sup>                       | 5,540              | 670                    | 9,280               | 5,210            | 150                | 20,850 |
| 1995 <sup>f</sup>                       | 5,090              | 650                    | 9,760               | 5,020            | 170                | 20,690 |
| 1996 <sup>f</sup>                       | 4,490              | 600                    | 9,270               | 4,800            | 220                | 19,380 |
| 1997 <sup>f</sup>                       | 4,270              | 540                    | 9,130               | 4,770            | 250                | 18,960 |
| 1998 <sup>f</sup>                       | 4,120              | 500                    | 9,230               | 4,710            | 230                | 18,790 |
| 1999 <sup>f</sup>                       | 4,270              | 450                    | 9,620               | 4,770            | 190                | 19,300 |
| 2000                                    | 4,830              | 500                    | 9,130               | 4,860            | 250                | 19,570 |
| <b>Natural sciences and engineering</b> |                    |                        |                     |                  |                    |        |
| 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 <sup>f</sup>                       | 5,750              | 890                    | 8,050               | 960              | 190                | 15,840 |
| 1991 <sup>f</sup>                       | 5,930              | 910                    | 7,740               | 900              | 190                | 15,670 |
| 1992 <sup>f</sup>                       | 5,910              | 840                    | 7,680               | 930              | 130                | 15,490 |
| 1993 <sup>f</sup>                       | 5,770              | 600                    | 7,610               | 920              | 140                | 15,040 |
| 1994 <sup>f</sup>                       | 5,180              | 570                    | 9,280               | 910              | 150                | 16,090 |
| 1995 <sup>f</sup>                       | 4,750              | 570                    | 9,760               | 890              | 170                | 16,140 |
| 1996 <sup>f</sup>                       | 4,190              | 520                    | 9,270               | 860              | 220                | 15,060 |
| 1997 <sup>f</sup>                       | 3,980              | 480                    | 9,130               | 850              | 250                | 14,690 |
| 1998 <sup>f</sup>                       | 3,840              | 440                    | 9,230               | 850              | 230                | 14,590 |
| 1999 <sup>f</sup>                       | 3,950              | 410                    | 9,620               | 860              | 190                | 15,030 |
| 2000                                    | 4,530              | 420                    | 9,130               | 860              | 250                | 15,190 |
| <b>Social sciences and humanities</b>   |                    |                        |                     |                  |                    |        |
| 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 <sup>f</sup>                       | 430                | 170                    | ...                 | 4,670            | ...                | 5,270  |
| 1991 <sup>f</sup>                       | 410                | 170                    | ...                 | 4,410            | ...                | 4,990  |
| 1992 <sup>f</sup>                       | 380                | 100                    | ...                 | 4,470            | ...                | 4,950  |
| 1993 <sup>f</sup>                       | 380                | 100                    | ...                 | 4,380            | ...                | 4,860  |
| 1994 <sup>f</sup>                       | 360                | 100                    | ...                 | 4,300            | ...                | 4,760  |
| 1995 <sup>f</sup>                       | 340                | 80                     | ...                 | 4,130            | ...                | 4,550  |
| 1996 <sup>f</sup>                       | 300                | 80                     | ...                 | 3,940            | ...                | 4,320  |
| 1997 <sup>f</sup>                       | 290                | 60                     | ...                 | 3,920            | ...                | 4,270  |
| 1998 <sup>f</sup>                       | 280                | 60                     | ...                 | 3,860            | ...                | 4,200  |
| 1999 <sup>f</sup>                       | 320                | 40                     | ...                 | 3,910            | ...                | 4,270  |
| 2000                                    | 300                | 80                     | ...                 | 4,000            | ...                | 4,380  |

<sup>f</sup> 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, 2000**

| Sector of performance                                       | N.L.                              | P.E.I.     | N.S.         | N.B.         | Qué.          | Ont.          | Man.         | Sask.        | Alta          | B.C.          | Yukon,<br>N.W.T &<br>Nvt | Total          |
|---|-----------------------------------|------------|--------------|--------------|---------------|---------------|--------------|--------------|---------------|---------------|--------------------------|----------------|
| Occupational category                                       | FTE's (rounded to the nearest 10) |            |              |              |               |               |              |              |               |               |                          |                |
| <b>Federal government</b>                                   | <b>220</b>                        | <b>140</b> | <b>680</b>   | <b>240</b>   | <b>2,040</b>  | <b>2,300</b>  | <b>570</b>   | <b>550</b>   | <b>870</b>    | <b>820</b>    | <b>30</b>                | <b>8,460</b>   |
| Researchers   | 90                                | 40         | 280          | 90           | 870           | 1,090         | 230          | 180          | 330           | 370           | 10                       | 3,580          |
| Technicians   | 70                                | 50         | 190          | 70           | 460           | 710           | 180          | 180          | 250           | 240           | 10                       | 2,410          |
| Other   | 60                                | 50         | 210          | 80           | 710           | 500           | 160          | 190          | 290           | 210           | 10                       | 2,470          |
| <b>Federal government<br/>(National Capital<br/>Region)</b> | <b>...</b>                        | <b>...</b> | <b>...</b>   | <b>...</b>   | <b>280</b>    | <b>5,970</b>  | <b>...</b>   | <b>...</b>   | <b>...</b>    | <b>...</b>    | <b>...</b>               | <b>6,250</b>   |
| Researchers   | ...                               | ...        | ...          | ...          | 150           | 2,400         | ...          | ...          | ...           | ...           | ...                      | 2,550          |
| Technicians   | ...                               | ...        | ...          | ...          | 40            | 1,300         | ...          | ...          | ...           | ...           | ...                      | 1,340          |
| Other   | ...                               | ...        | ...          | ...          | 90            | 2,270         | ...          | ...          | ...           | ...           | ...                      | 2,360          |
| <b>Provincial governments</b>                               | <b>0</b>                          | <b>0</b>   | <b>0</b>     | <b>90</b>    | <b>820</b>    | <b>900</b>    | <b>40</b>    | <b>220</b>   | <b>750</b>    | <b>330</b>    | <b>20</b>                | <b>3,170</b>   |
| Researchers   | 0                                 | 0          | 0            | 50           | 420           | 510           | 30           | 120          | 320           | 170           | 10                       | 1,630          |
| Technicians   | 0                                 | 0          | 0            | 20           | 220           | 250           | 0            | 70           | 350           | 120           | 10                       | 1,040          |
| Other   | 0                                 | 0          | 0            | 20           | 180           | 140           | 10           | 30           | 80            | 40            | 0                        | 500            |
| <b>Business enterprise</b>                                  | <b>220</b>                        | <b>90</b>  | <b>810</b>   | <b>460</b>   | <b>31,620</b> | <b>45,430</b> | <b>1,290</b> | <b>830</b>   | <b>3,620</b>  | <b>7,900</b>  | <b>10</b>                | <b>92,280</b>  |
| Researchers   | 120                               | 50         | 500          | 220          | 19,040        | 32,070        | 710          | 390          | 2,320         | 5,100         | 10                       | 60,530         |
| Technicians <sup>1</sup>                                    | 70                                | 30         | 220          | 170          | 8,960         | 9,520         | 420          | 310          | 930           | 1,990         | 0                        | 22,620         |
| Other <sup>1</sup>  | 30                                | 10         | 90           | 70           | 3,620         | 3,840         | 160          | 130          | 370           | 810           | 0                        | 9,130          |
| <b>Higher education</b>                                     | <b>740</b>                        | <b>110</b> | <b>1,550</b> | <b>780</b>   | <b>12,780</b> | <b>16,760</b> | <b>1,450</b> | <b>1,280</b> | <b>4,530</b>  | <b>5,210</b>  | <b>0</b>                 | <b>45,190</b>  |
| Researchers   | 460                               | 60         | 950          | 490          | 10,030        | 12,760        | 940          | 830          | 3,420         | 4,100         | 0                        | 34,040         |
| Technicians   | 170                               | 30         | 360          | 150          | 1,570         | 2,150         | 310          | 280          | 650           | 620           | 0                        | 6,290          |
| Other   | 110                               | 20         | 240          | 140          | 1,180         | 1,850         | 200          | 170          | 460           | 490           | 0                        | 4,860          |
| <b>Private non-profit<br/>organizations</b>                 | <b>...</b>                        | <b>...</b> | <b>50</b>    | <b>10</b>    | <b>30</b>     | <b>80</b>     | <b>300</b>   | <b>...</b>   | <b>350</b>    | <b>30</b>     | <b>0</b>                 | <b>850</b>     |
| Researchers   | ...                               | ...        | 50           | 10           | 20            | 20            | 80           | ...          | 100           | 20            | 0                        | 300            |
| Technicians   | ...                               | ...        | 0            | 0            | 0             | 40            | 170          | ...          | 80            | 10            | 0                        | 300            |
| Other   | ...                               | ...        | 0            | 0            | 10            | 20            | 50           | ...          | 170           | 0             | 0                        | 250            |
| <b>TOTAL</b>  | <b>1,180</b>                      | <b>340</b> | <b>3,090</b> | <b>1,580</b> | <b>47,570</b> | <b>71,440</b> | <b>3,650</b> | <b>2,880</b> | <b>10,120</b> | <b>14,290</b> | <b>60</b>                | <b>156,200</b> |
| Researchers   | 670                               | 150        | 1,780        | 860          | 30,530        | 48,850        | 1,990        | 1,520        | 6,490         | 9,760         | 30                       | 102,630        |
| Technicians   | 310                               | 110        | 770          | 410          | 11,250        | 13,970        | 1,080        | 840          | 2,260         | 2,980         | 20                       | 34,000         |
| Other   | 200                               | 80         | 540          | 310          | 5,790         | 8,620         | 580          | 520          | 1,370         | 1,550         | 10                       | 19,570         |

<sup>1</sup> 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 2000, the majority of R&D 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%.

Table 2.2 shows that the department distribution of R&D personnel is more concentrated in the four major R&D performing departments. In 2000, National Research Council, Agriculture and Agri-Food Canada, Natural Resources Canada and National Defence accounted for 65% of all R&D personnel.

**Table 2.1 Personnel engaged in R&D in the federal government, by occupational category, 1979 to 2000**

| Year                              | Researchers |     |              | Technicians  |       | Support staff    |              |               | Total |
|-----------------------------------|-------------|-----|--------------|--------------|-------|------------------|--------------|---------------|-------|
|                                   | NSE         | SSH | Total        | NSE          | NSE   | SSH <sup>1</sup> | Total        |               |       |
| FTE's (rounded to the nearest 10) |             |     |              |              |       |                  |              |               |       |
| 1979                              | 5,780       | 530 | <b>6,310</b> | <b>4,680</b> | 4,850 | 340              | <b>5,190</b> | <b>16,180</b> |       |
| 1980                              | 5,800       | 460 | <b>6,260</b> | <b>4,680</b> | 4,790 | 300              | <b>5,090</b> | <b>16,030</b> |       |
| 1981                              | 5,010       | 350 | <b>5,360</b> | <b>4,700</b> | 5,280 | 440              | <b>5,720</b> | <b>15,780</b> |       |
| 1982                              | 5,450       | 370 | <b>5,820</b> | <b>4,650</b> | 5,500 | 360              | <b>5,860</b> | <b>16,330</b> |       |
| 1983                              | 5,470       | 320 | <b>5,790</b> | <b>4,500</b> | 5,760 | 250              | <b>6,010</b> | <b>16,300</b> |       |
| 1984                              | 5,570       | 330 | <b>5,900</b> | <b>4,670</b> | 5,560 | 250              | <b>5,810</b> | <b>16,380</b> |       |
| 1985                              | 5,390       | 330 | <b>5,720</b> | <b>4,420</b> | 5,440 | 250              | <b>5,690</b> | <b>15,830</b> |       |
| 1986                              | 6,020       | 410 | <b>6,430</b> | <b>4,660</b> | 5,820 | 400              | <b>6,220</b> | <b>17,310</b> |       |
| 1987                              | 5,590       | 340 | <b>5,930</b> | <b>4,410</b> | 5,570 | 400              | <b>5,970</b> | <b>16,310</b> |       |
| 1988                              | 6,160       | 330 | <b>6,490</b> | <b>4,220</b> | 6,070 | 510              | <b>6,580</b> | <b>17,290</b> |       |
| 1989                              | 6,360       | 330 | <b>6,690</b> | <b>4,730</b> | 5,530 | 490              | <b>6,020</b> | <b>17,440</b> |       |
| 1990                              | 6,160       | 280 | <b>6,440</b> | <b>4,340</b> | 5,750 | 430              | <b>6,180</b> | <b>16,960</b> |       |
| 1991                              | 6,250       | 290 | <b>6,540</b> | <b>4,320</b> | 5,930 | 410              | <b>6,340</b> | <b>17,200</b> |       |
| 1992 <sup>f</sup>                 | 6,310       | 260 | <b>6,570</b> | <b>4,410</b> | 5,910 | 380              | <b>6,290</b> | <b>17,270</b> |       |
| 1993 <sup>f</sup>                 | 6,380       | 260 | <b>6,640</b> | <b>4,450</b> | 5,770 | 380              | <b>6,150</b> | <b>17,240</b> |       |
| 1994 <sup>f</sup>                 | 6,310       | 260 | <b>6,570</b> | <b>4,620</b> | 5,180 | 360              | <b>5,540</b> | <b>16,730</b> |       |
| 1995 <sup>f</sup>                 | 5,990       | 240 | <b>6,230</b> | <b>4,230</b> | 4,750 | 340              | <b>5,090</b> | <b>15,550</b> |       |
| 1996 <sup>f</sup>                 | 6,030       | 280 | <b>6,310</b> | <b>4,040</b> | 4,190 | 300              | <b>4,490</b> | <b>14,840</b> |       |
| 1997 <sup>f</sup>                 | 5,610       | 240 | <b>5,850</b> | <b>3,830</b> | 3,980 | 290              | <b>4,270</b> | <b>13,950</b> |       |
| 1998 <sup>f</sup>                 | 5,620       | 230 | <b>5,850</b> | <b>3,760</b> | 3,840 | 280              | <b>4,120</b> | <b>13,730</b> |       |
| 1999 <sup>f</sup>                 | 5,750       | 270 | <b>6,020</b> | <b>3,790</b> | 3,950 | 320              | <b>4,270</b> | <b>14,080</b> |       |
| 2000                              | 5,840       | 290 | <b>6,130</b> | <b>3,750</b> | 4,530 | 300              | <b>4,830</b> | <b>14,710</b> |       |

<sup>f</sup> 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 personnel engaged in R&D by major department or agency, 1992 to 2000**

| Department or agency                             | 1992 <sup>f</sup> | 1993 <sup>f</sup> | 1994 <sup>f</sup> | 1995 <sup>f</sup> | 1996 <sup>f</sup> | 1997 <sup>f</sup> | 1998 <sup>f</sup> | 1999 <sup>f</sup> | 2000          |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------|
| FTE's (rounded to the nearest 10)                |                   |                   |                   |                   |                   |                   |                   |                   |               |
| Agriculture and Agri-Food Canada                 | 3,290             | 3,330             | 3,240             | 3,010             | 2,820             | 2,430             | 2,430             | 2,410             | 2,800         |
| Atomic Energy of Canada Limited                  | 2,240             | 2,150             | 2,020             | 2,020             | 1,700             | 1,460             | 1,190             | 1,170             | 890           |
| Communications                                   | 360               | ...               | ...               | ...               | ...               | ...               | ...               | ...               | ...           |
| Canadian Space Agency                            | 310               | 320               | 320               | 340               | 340               | 310               | 290               | 340               | 370           |
| Environment                                      | 790               | 780               | 820               | 980               | 830               | 770               | 740               | 830               | 840           |
| Fisheries and Oceans                             | 1,100             | 1,040             | 1,000             | 900               | 880               | 800               | 770               | 850               | 900           |
| Health Canada                                    | 340               | 320               | 330               | 350               | 480               | 540               | 520               | 520               | 520           |
| Industry Canada                                  | 190               | 520               | 430               | 410               | 360               | 350               | 400               | 400               | 450           |
| National Defence                                 | 1,750             | 1,740             | 1,600             | 1,180             | 1,240             | 1,170             | 1,300             | 1,290             | 1,350         |
| National Museums                                 | 190               | 180               | 190               | 180               | 140               | ...               | ...               | ...               | ...           |
| National Research Council                        | 2,800             | 2,930             | 2,900             | 2,690             | 2,650             | 2,730             | 2,780             | 2,810             | 2,930         |
| Natural Resources - Energy Mines and Resources   | 2,210             | ...               | ...               | ...               | ...               | ...               | ...               | ...               | ...           |
| Natural Resources - Forestry                     | 810               | ...               | ...               | ...               | ...               | ...               | ...               | ...               | ...           |
| Natural Resources                                | ...               | 3,010             | 2,980             | 2,650             | 2,540             | 2,370             | 2,280             | 2,310             | 2,430         |
| Natural Science and Engineering Research Council | 160               | 160               | 170               | 160               | 160               | 180               | 180               | 210               | 220           |
| Statistics Canada                                | 130               | 120               | 120               | 130               | 130               | 140               | 140               | 160               | 170           |
| Other departments or agencies                    | 600               | 640               | 610               | 550               | 570               | 700               | 710               | 780               | 840           |
| <b>Total</b>                                     | <b>17,270</b>     | <b>17,240</b>     | <b>16,730</b>     | <b>15,550</b>     | <b>14,840</b>     | <b>13,950</b>     | <b>13,730</b>     | <b>14,080</b>     | <b>14,710</b> |

**Table 2.3 Federal personnel engaged in R&D in the natural sciences and engineering and social sciences and humanities, by occupational category and department or agency, 2000**

| Department or agency                             | Researchers  | Technicians  | Support staff | Total         |
|--|--------------|--------------|---------------|---------------|
| FTE's <sup>1</sup> (rounded to the nearest 10)   |              |              |               |               |
| <b>Natural sciences and engineering</b>          |              |              |               |               |
| Agriculture and Agri-Food Canada                 | 720          | 960          | 1,120         | <b>2,800</b>  |
| Atomic Energy of Canada Limited                  | 470          | 310          | 110           | <b>890</b>    |
| Canadian Space Agency                            | 170          | 10           | 190           | <b>370</b>    |
| Environment                                      | 510          | 210          | 120           | <b>840</b>    |
| Fisheries and Oceans                             | 350          | 350          | 200           | <b>900</b>    |
| Health Canada                                    | 310          | 140          | 50            | <b>500</b>    |
| Industry Canada                                  | 180          | 30           | 230           | <b>440</b>    |
| National Defence                                 | 630          | 280          | 420           | <b>1,330</b>  |
| National Research Council                        | 1,080        | 800          | 1,050         | <b>2,930</b>  |
| Natural Resources                                | 1,210        | 580          | 640           | <b>2,430</b>  |
| Natural Science and Engineering Research Council | 10           | 0            | 210           | <b>220</b>    |
| Other Departments or Agencies                    | 200          | 80           | 190           | <b>470</b>    |
| <b>TOTAL</b>                                     | <b>5,840</b> | <b>3,750</b> | <b>4,530</b>  | <b>14,120</b> |
| <b>Social sciences and humanities</b>            |              |              |               |               |
| Bank of Canada                                   | 20           | 30           | 10            | <b>60</b>     |
| Canadian Museum of Civilization                  | 10           | 10           | 30            | <b>50</b>     |
| Canada Mortgage and Housing Corporation          | 10           | 0            | 0             | <b>10</b>     |
| Health Canada                                    | 20           | 0            | 0             | <b>20</b>     |
| International Development Research Centre        | 50           | 0            | 30            | <b>80</b>     |
| National Defence                                 | 10           | 0            | 10            | <b>20</b>     |
| National Gallery of Canada                       | 10           | 10           | 20            | <b>40</b>     |
| Social Science and Humanities Research Council   | 10           | 0            | 60            | <b>70</b>     |
| Solicitor General                                | 20           | 0            | 10            | <b>30</b>     |
| Statistics Canada                                | 110          | 20           | 40            | <b>170</b>    |
| Other departments or agencies                    | 20           | 0            | 20            | <b>40</b>     |
| <b>TOTAL</b>                                     | <b>290</b>   | <b>70</b>    | <b>230</b>    | <b>590</b>    |

<sup>1</sup> 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 2000-2001. 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.

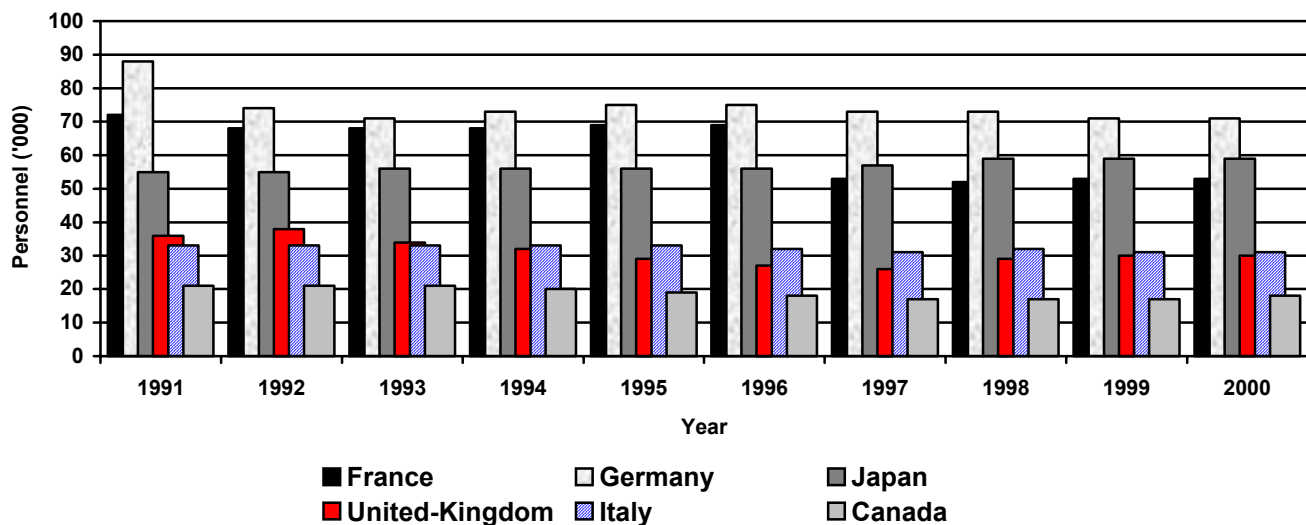
R&D is only one of the activities of these provincial research organizations. In the survey conducted by SIEID, the organizations are asked to allocate their expenditures by a number of activities, including R&D. The total number of personnel for all organizations is multiplied by the ratio of R&D to 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 2000**

| Year                              | Researchers |     |       | Technicians |     | Support staff    |       |       | Total |
|-----------------------------------|-------------|-----|-------|-------------|-----|------------------|-------|-------|-------|
|                                   | NSE         | SSH | Total | NSE         | NSE | SSH <sup>1</sup> | 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 <sup>r</sup>                 | 1,680       | 290 | 1,970 | 1,250       | 890 | 170              | 1,060 | 4,280 |       |
| 1991 <sup>r</sup>                 | 1,610       | 340 | 1,950 | 1,160       | 910 | 170              | 1,080 | 4,190 |       |
| 1992 <sup>r</sup>                 | 1,540       | 270 | 1,810 | 1,290       | 840 | 100              | 940   | 4,040 |       |
| 1993 <sup>r</sup>                 | 1,480       | 280 | 1,760 | 1,250       | 600 | 100              | 700   | 3,710 |       |
| 1994 <sup>r</sup>                 | 1,450       | 260 | 1,710 | 1,070       | 570 | 100              | 670   | 3,450 |       |
| 1995 <sup>r</sup>                 | 1,310       | 230 | 1,540 | 1,040       | 570 | 80               | 650   | 3,230 |       |
| 1996 <sup>r</sup>                 | 1,210       | 210 | 1,420 | 860         | 520 | 80               | 600   | 2,880 |       |
| 1997 <sup>r</sup>                 | 1,290       | 200 | 1,490 | 940         | 480 | 60               | 540   | 2,970 |       |
| 1998 <sup>r</sup>                 | 1,280       | 180 | 1,460 | 890         | 440 | 60               | 500   | 2,850 |       |
| 1999 <sup>r</sup>                 | 1,290       | 130 | 1,420 | 910         | 410 | 40               | 450   | 2,780 |       |
| 2000                              | 1,460       | 170 | 1,630 | 1,040       | 420 | 80               | 500   | 3,170 |       |

<sup>r</sup> Includes the few technicians engaged in R&D in the social sciences and humanities.

**Chart 2. Governments R&D personnel, in selected OECD countries, 1991 to 2000**



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 2000. In addition, there were notable differences in growth among the three occupational categories: Researchers (scientists and engineers) increased by 435%, technicians grew by 186%, and support staff by only 62%. In 2000, the first category accounted for 66% of total R&D personnel, compared with 24% for technicians and 10% for support staff.



The survey also provides a breakdown of personnel by industry. In 2000, 61% of R&D personnel in this sector were employed in manufacturing. Of this total, 28% were employed in the Communication equipment industry, 11% in the Aerospace products and parts and 9% in Semiconductor and other electronic components (Table 4.2). These industries employ the largest numbers of scientists and engineers in manufacturing. In the services sector, Computer, System design and related services employ the largest share of researchers (29%).

A breakdown by degree level shows that, in 2000, 80% of R&D personnel in the researcher category (i.e., scientists and engineers) had bachelor degrees, while 13% had master degrees and 7% doctorates (Table 4.3).

**Table 4.1 Personnel engaged in R&D in the business enterprise sector, by occupational category, 1979 to 2000**

| Year                              | Researchers | Technicians | Support staff | Total         |
|-----------------------------------|-------------|-------------|---------------|---------------|
| FTE's (rounded to the nearest 10) |             |             |               |               |
| 1979                              | 11,310      | 7,910       | 5,650         | <b>24,870</b> |
| 1980                              | 13,100      | 9,460       | 6,090         | <b>28,650</b> |
| 1981                              | 14,880      | 11,000      | 6,520         | <b>32,400</b> |
| 1982                              | 16,820      | 11,550      | 6,530         | <b>34,900</b> |
| 1983                              | 17,650      | 11,610      | 7,510         | <b>36,770</b> |
| 1984                              | 19,560      | 12,760      | 7,290         | <b>39,610</b> |
| 1985                              | 22,680      | 14,550      | 7,700         | <b>44,930</b> |
| 1986                              | 25,520      | 15,960      | 8,090         | <b>49,570</b> |
| 1987                              | 27,150      | 16,560      | 8,100         | <b>51,810</b> |
| 1988                              | 28,500      | 17,220      | 8,550         | <b>54,270</b> |
| 1989                              | 28,820      | 17,570      | 7,810         | <b>54,200</b> |
| 1990                              | 29,670      | 16,200      | 8,050         | <b>53,920</b> |
| 1991                              | 30,120      | 15,930      | 7,740         | <b>53,790</b> |
| 1992                              | 33,240      | 16,540      | 7,680         | <b>57,460</b> |
| 1993 <sup>f</sup>                 | 36,310      | 17,610      | 7,610         | <b>61,530</b> |
| 1994 <sup>f</sup>                 | 46,860      | 22,740      | 9,280         | <b>78,880</b> |
| 1995 <sup>f</sup>                 | 48,980      | 23,280      | 9,760         | <b>82,020</b> |
| 1996 <sup>f</sup>                 | 48,500      | 21,580      | 9,270         | <b>79,350</b> |
| 1997 <sup>f</sup>                 | 52,010      | 21,590      | 9,130         | <b>82,730</b> |
| 1998 <sup>f</sup>                 | 54,620      | 22,000      | 9,230         | <b>85,850</b> |
| 1999 <sup>f</sup>                 | 56,250      | 21,980      | 9,620         | <b>87,850</b> |
| 2000                              | 60,530      | 22,620      | 9,130         | <b>92,280</b> |

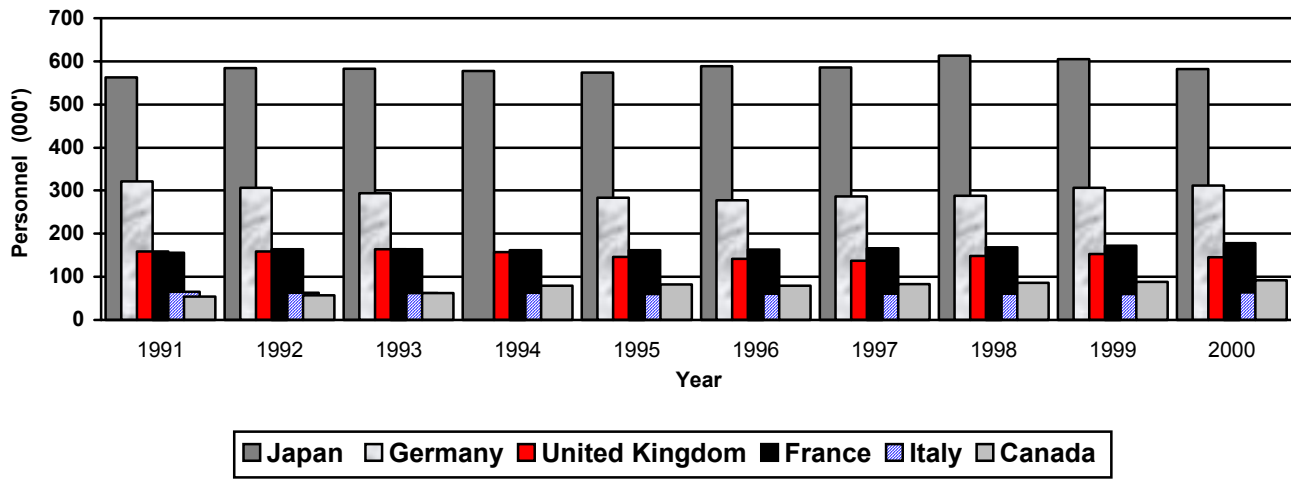
**Table 4.2 Personnel engaged in R&D in the business enterprise sector, by industry and occupational category, 2000**

| Industries  | Researchers   | Technicians   | Support staff | Total         |
|---|---------------|---------------|---------------|---------------|
|   | FTE's         |               |               |               |
| <b>Agriculture, Forestry, Fishing and Hunting</b> | <b>308</b>    | <b>263</b>    | <b>101</b>    | <b>672</b>    |
| Agriculture                                       | 203           | 172           | 67            | 442           |
| Forestry and Logging                              | 84            | 56            | 27            | 167           |
| Fishing, Hunting and Trapping                     | 21            | 35            | 7             | 63            |
| <b>Mining and Oil and Gas Extraction</b>          | <b>244</b>    | <b>143</b>    | <b>59</b>     | <b>446</b>    |
| Oil and Gas Extraction                            | 144           | 83            | 47            | 274           |
| Mining  | 100           | 60            | 12            | 172           |
| <b>Utilities</b>                                  | <b>550</b>    | <b>224</b>    | <b>161</b>    | <b>935</b>    |
| Electric Power                                    | 480           | 203           | 141           | 824           |
| Other Utilities                                   | 70            | 21            | 20            | 111           |
| <b>Construction</b>                               | <b>368</b>    | <b>135</b>    | <b>64</b>     | <b>567</b>    |
| <b>Manufacturing</b>                              | <b>37,338</b> | <b>12,719</b> | <b>5,844</b>  | <b>55,901</b> |
| Food  | 424           | 254           | 92            | 770           |
| Beverages and Tobacco                             | 33            | 32            | 7             | 72            |
| Textiles  | 123           | 192           | 92            | 407           |
| Wood Products                                     | 200           | 138           | 81            | 419           |
| Paper   | 362           | 286           | 167           | 815           |
| Printing  | 58            | 68            | 19            | 145           |
| Petroleum and Coal Products                       | 110           | 78            | 12            | 200           |
| Pharmaceutical and Medicine                       | 2,115         | 799           | 666           | 3,580         |
| Other Chemicals                                   | 1,109         | 756           | 268           | 2,133         |
| Plastic Products                                  | 278           | 277           | 76            | 631           |
| Rubber products                                   | 151           | 95            | 75            | 321           |
| Non-Metallic Mineral Products                     | 106           | 66            | 33            | 205           |
| Primary Metals (Ferrous)                          | 108           | 51            | 30            | 189           |
| Primary Metals (Non-Ferrous)                      | 479           | 478           | 139           | 1,096         |
| Fabricated Metal Products                         | 421           | 426           | 163           | 1,010         |
| Machinery   | 1,650         | 1,244         | 583           | 3,477         |
| Computer and Peripheral Equipment                 | 1,625         | 266           | 74            | 1,965         |
| Communication Equipment                           | 13,803        | 1,311         | 593           | 15,707        |
| Semiconductor and Other Electronic Components     | 3,791         | 898           | 294           | 4,983         |
| Navig., Measuring, Medical & Control Instruments  | 3,777         | 1,308         | 243           | 5,328         |
| Other Computer and Electronic Products            | 139           | 52            | 32            | 223           |
| Electrical Equipment, Appliance and Components    | 1,296         | 669           | 237           | 2,202         |
| Motor Vehicle and Parts                           | 1,298         | 682           | 312           | 2,292         |
| Aerospace Products and Parts                      | 3,137         | 1,680         | 1,306         | 6,123         |
| All Other Transportation Equipment                | 124           | 98            | 63            | 285           |
| Furniture and Related Products                    | 42            | 55            | 32            | 129           |
| Other Manufacturing Industries                    | 579           | 460           | 155           | 1,194         |
| <b>Services</b>                                   | <b>21,720</b> | <b>9,140</b>  | <b>2,900</b>  | <b>33,760</b> |
| Wholesale Trade                                   | 2,345         | 876           | 453           | 3,674         |
| Retail Trade                                      | 277           | 178           | 51            | 506           |
| Transportation and Warehousing                    | 206           | 116           | 29            | 351           |
| Information and Cultural Industries               | 3,241         | 1,448         | 325           | 5,014         |
| Finance, Insurance and Real Estate                | 449           | 510           | 83            | 1,042         |
| Architectural, Engineering and Related Services   | 3,303         | 721           | 431           | 4,455         |
| Computer, System Design and Related Services      | 6,758         | 2,457         | 503           | 9,718         |
| Management, Scientific and Technical Consulting   | 499           | 220           | 61            | 780           |
| Scientific Research and Development               | 2,063         | 946           | 268           | 3,277         |
| Health Care and Social Assistance                 | 1,298         | 1,096         | 506           | 2,900         |
| All Other Services                                | 1,281         | 572           | 190           | 2,043         |
| <b>Total all industries</b>                       | <b>60,528</b> | <b>22,624</b> | <b>9,129</b>  | <b>92,281</b> |

**Table 4.3 Researchers engaged in R&D, in the business enterprise sector, by industry and degree level, 2000**

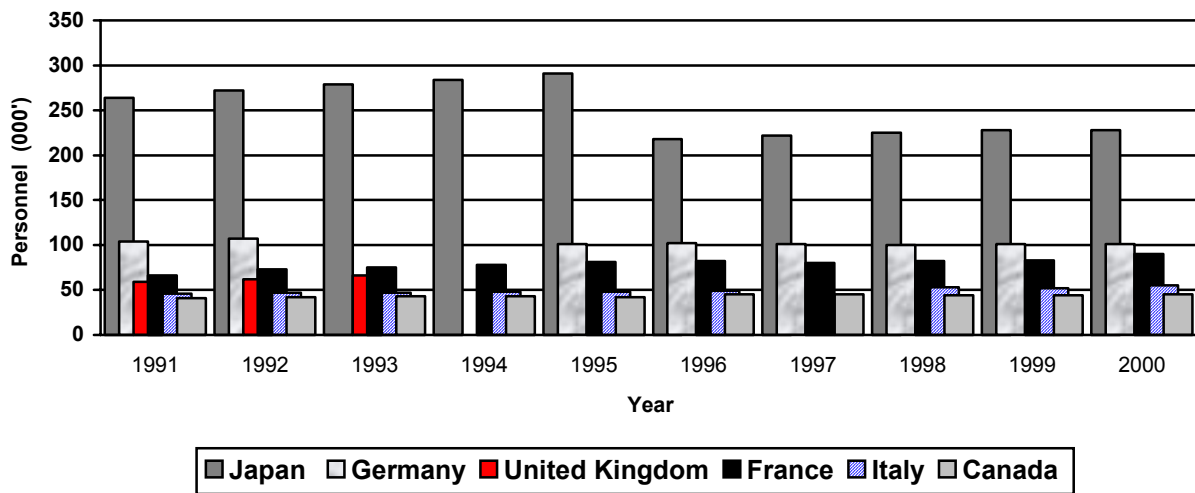
| Industries  | Bachelors     | Masters      | Doctorate    | Total         |
|---|---------------|--------------|--------------|---------------|
|   | FTE's         |              |              |               |
| <b>Agriculture, Forestry, Fishing and Hunting</b> | <b>212</b>    | <b>42</b>    | <b>54</b>    | <b>308</b>    |
| Agriculture                                       | 137           | 21           | 45           | 203           |
| Forestry and Logging                              | 57            | 20           | 7            | 84            |
| Fishing, Hunting and Trapping                     | 18            | 1            | 2            | 21            |
| <b>Mining and Oil and Gas Extraction</b>          | <b>175</b>    | <b>34</b>    | <b>35</b>    | <b>244</b>    |
| Oil and Gas Extraction                            | 104           | 21           | 19           | 144           |
| Mining  | 71            | 13           | 16           | 100           |
| <b>Utilities</b>                                  | <b>247</b>    | <b>144</b>   | <b>159</b>   | <b>550</b>    |
| Electric Power                                    | 184           | 142          | 154          | 480           |
| Other Utilities                                   | 63            | 2            | 5            | 70            |
| <b>Construction</b>                               | <b>360</b>    | <b>5</b>     | <b>3</b>     | <b>368</b>    |
| <b>Manufacturing</b>                              | <b>29,298</b> | <b>5,688</b> | <b>2,352</b> | <b>37,338</b> |
| Food  | 346           | 44           | 34           | 424           |
| Beverages and Tobacco                             | 19            | 2            | 12           | 33            |
| Textiles  | 113           | 7            | 3            | 123           |
| Wood Products                                     | 146           | 25           | 29           | 200           |
| Paper   | 213           | 48           | 101          | 362           |
| Printing  | 54            | 2            | 2            | 58            |
| Petroleum and Coal Products                       | 61            | 11           | 38           | 110           |
| Pharmaceutical and Medicine                       | 1,269         | 393          | 453          | 2,115         |
| Other Chemicals                                   | 812           | 143          | 154          | 1,109         |
| Plastic Products                                  | 254           | 14           | 10           | 278           |
| Rubber products                                   | 109           | 19           | 23           | 151           |
| Non-Metallic Mineral Products                     | 104           | 1            | 1            | 106           |
| Primary Metals (Ferrous)                          | 74            | 25           | 9            | 108           |
| Primary Metals (Non-Ferrous)                      | 241           | 101          | 137          | 479           |
| Fabricated Metal Products                         | 397           | 20           | 4            | 421           |
| Machinery   | 1,462         | 136          | 52           | 1,650         |
| Computer and Peripheral Equipment                 | 1,357         | 175          | 93           | 1,625         |
| Communication Equipment                           | 10,807        | 2,417        | 579          | 13,803        |
| Semiconductor and Other Electronic Components     | 3,018         | 680          | 93           | 3,791         |
| Navig., Measuring, Medical & Control Instruments  | 3,085         | 500          | 192          | 3,777         |
| Other Computer and Electronic Products            | 108           | 17           | 14           | 139           |
| Electrical Equipment, Appliance and Components    | 1,049         | 148          | 99           | 1,296         |
| Motor Vehicle and Parts                           | 1,103         | 149          | 46           | 1,298         |
| Aerospace Products and Parts                      | 2,510         | 528          | 99           | 3,137         |
| All Other Transportation Equipment                | 119           | 2            | 3            | 124           |
| Furniture and Related Products                    | 42            | 0            | 0            | 42            |
| Other Manufacturing Industries                    | 426           | 81           | 72           | 579           |
| <b>Services</b>                                   | <b>18,083</b> | <b>2,258</b> | <b>1,379</b> | <b>21,720</b> |
| Wholesale Trade                                   | 1,662         | 333          | 350          | 2,345         |
| Retail Trade                                      | 268           | 7            | 2            | 277           |
| Transportation and Warehousing                    | 161           | 32           | 13           | 206           |
| Information and Cultural Industries               | 2,826         | 314          | 101          | 3,241         |
| Finance, Insurance and Real Estate                | 384           | 47           | 18           | 449           |
| Architectural, Engineering and Related Services   | 2,938         | 201          | 164          | 3,303         |
| Computer, System Design and Related Services      | 5,931         | 649          | 178          | 6,758         |
| Management, Scientific and Technical Consulting   | 443           | 43           | 13           | 499           |
| Scientific Research and Development               | 1,544         | 261          | 258          | 2,063         |
| Health Care and Social Assistance                 | 920           | 204          | 174          | 1,298         |
| All Other Services                                | 1,006         | 167          | 108          | 1,281         |
| <b>Total all industries</b>                       | <b>48,375</b> | <b>8,171</b> | <b>3,982</b> | <b>60,528</b> |

**Chart. 3. Business enterprise R&D personnel, in selected OECD countries, 1991 to 2000**



Source: Table 7.2

**Chart. 4. Higher education R&D personnel, in selected OECD countries, 1991 to 2000**



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 2001-2002 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 2000**

| Year                              | Researchers |        |               | Technicians  | Support staff |                  |              | Total         |
|-----------------------------------|-------------|--------|---------------|--------------|---------------|------------------|--------------|---------------|
|                                   | NSE         | SSH    | Total         | NSE          | NSE           | SSH <sup>†</sup> | Total        |               |
| FTE's (rounded to the nearest 10) |             |        |               |              |               |                  |              |               |
| 1979                              | 8,750       | 9,090  | <b>17,840</b> | <b>9,210</b> | 1,720         | 6,930            | <b>8,650</b> | <b>35,700</b> |
| 1980                              | 9,030       | 9,180  | <b>18,210</b> | <b>9,480</b> | 1,780         | 6,950            | <b>8,730</b> | <b>36,420</b> |
| 1981                              | 9,300       | 9,050  | <b>18,350</b> | <b>9,540</b> | 1,790         | 6,950            | <b>8,740</b> | <b>36,630</b> |
| 1982                              | 9,880       | 9,530  | <b>19,410</b> | <b>9,180</b> | 1,670         | 6,560            | <b>8,230</b> | <b>36,820</b> |
| 1983                              | 10,410      | 9,790  | <b>20,200</b> | <b>8,840</b> | 1,560         | 6,150            | <b>7,710</b> | <b>36,750</b> |
| 1984                              | 11,080      | 10,230 | <b>21,310</b> | <b>8,570</b> | 1,460         | 5,910            | <b>7,370</b> | <b>37,250</b> |
| 1985                              | 11,480      | 10,400 | <b>21,880</b> | <b>7,550</b> | 1,320         | 5,480            | <b>6,800</b> | <b>36,230</b> |
| 1986                              | 12,320      | 10,850 | <b>23,170</b> | <b>7,370</b> | 1,230         | 5,100            | <b>6,330</b> | <b>36,870</b> |
| 1987                              | 12,840      | 11,410 | <b>24,250</b> | <b>7,220</b> | 1,130         | 5,170            | <b>6,300</b> | <b>37,770</b> |
| 1988                              | 13,440      | 11,880 | <b>25,320</b> | <b>7,080</b> | 1,040         | 5,080            | <b>6,120</b> | <b>38,520</b> |
| 1989                              | 14,120      | 12,110 | <b>26,230</b> | <b>6,980</b> | 1,000         | 4,830            | <b>5,830</b> | <b>39,040</b> |
| 1990 <sup>f</sup>                 | 14,770      | 12,530 | <b>27,300</b> | <b>6,850</b> | 960           | 4,670            | <b>5,630</b> | <b>39,780</b> |
| 1991 <sup>f</sup>                 | 15,680      | 13,000 | <b>28,680</b> | <b>6,600</b> | 900           | 4,410            | <b>5,310</b> | <b>40,590</b> |
| 1992 <sup>f</sup>                 | 16,490      | 13,570 | <b>30,060</b> | <b>6,770</b> | 930           | 4,470            | <b>5,400</b> | <b>42,230</b> |
| 1993 <sup>f</sup>                 | 17,000      | 13,960 | <b>30,960</b> | <b>6,740</b> | 920           | 4,380            | <b>5,300</b> | <b>43,000</b> |
| 1994 <sup>f</sup>                 | 16,690      | 14,240 | <b>30,930</b> | <b>6,660</b> | 910           | 4,300            | <b>5,210</b> | <b>42,800</b> |
| 1995 <sup>f</sup>                 | 16,420      | 14,420 | <b>30,840</b> | <b>6,500</b> | 890           | 4,130            | <b>5,020</b> | <b>42,360</b> |
| 1996 <sup>f</sup>                 | 17,060      | 17,000 | <b>34,060</b> | <b>6,310</b> | 860           | 3,940            | <b>4,800</b> | <b>45,170</b> |
| 1997 <sup>f</sup>                 | 16,600      | 17,100 | <b>33,700</b> | <b>6,190</b> | 850           | 3,920            | <b>4,770</b> | <b>44,660</b> |
| 1998 <sup>f</sup>                 | 16,300      | 16,810 | <b>33,110</b> | <b>6,230</b> | 850           | 3,860            | <b>4,710</b> | <b>44,050</b> |
| 1999 <sup>f</sup>                 | 16,610      | 16,400 | <b>33,010</b> | <b>6,260</b> | 860           | 3,910            | <b>4,770</b> | <b>44,040</b> |
| 2000                              | 17,080      | 16,960 | <b>34,040</b> | <b>6,290</b> | 860           | 4,000            | <b>4,860</b> | <b>45,190</b> |

<sup>†</sup> 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.<sup>1</sup>

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.

In a continued effort to improve the quality of our statistics, R&D expenditures in the Private Non-Profit (PNP) sector have been revised for the period 1992 to 2000. When taking into account the close relationship between the PNP sector, Hospitals and the Higher Education sector, several Research Institutes have been identified as belonging to the Higher Education sector.

**Table 6.1 Personnel engaged in R&D in the private non-profit sector, by occupational category, 1979 to 2000**

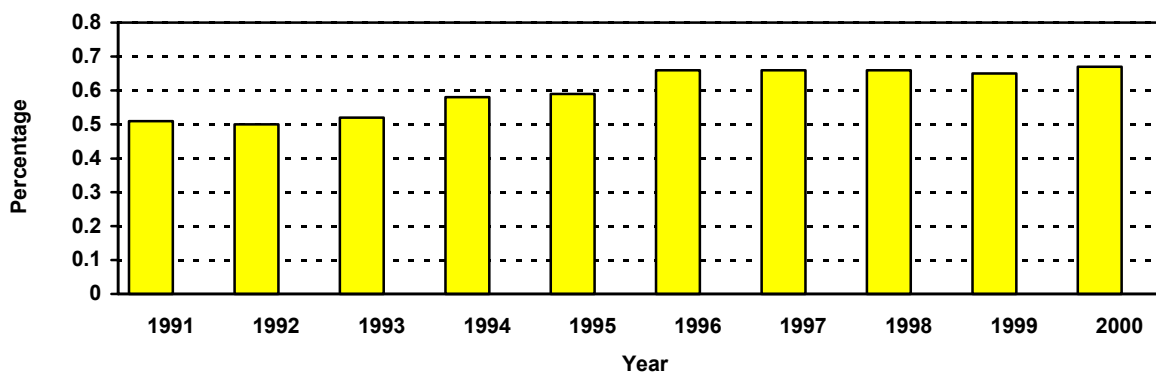
| Year                              | Researchers | Technicians | Support staff | Total |
|-----------------------------------|-------------|-------------|---------------|-------|
| FTE's (rounded to the nearest 10) |             |             |               |       |
| 1979                              | 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 <sup>f</sup>                 | 580         | 690         | 190           | 1,460 |
| 1991 <sup>f</sup>                 | 510         | 530         | 190           | 1,230 |
| 1992 <sup>f</sup>                 | 470         | 380         | 130           | 980   |
| 1993 <sup>f</sup>                 | 550         | 400         | 140           | 1,090 |
| 1994 <sup>f</sup>                 | 540         | 420         | 150           | 1,110 |
| 1995 <sup>f</sup>                 | 480         | 510         | 170           | 1,160 |
| 1996 <sup>f</sup>                 | 470         | 540         | 220           | 1,230 |
| 1997 <sup>f</sup>                 | 450         | 510         | 250           | 1,210 |
| 1998 <sup>f</sup>                 | 380         | 420         | 230           | 1,030 |
| 1999 <sup>f</sup>                 | 330         | 340         | 190           | 860   |
| 2000                              | 300         | 300         | 250           | 850   |

<sup>1</sup> See "Research and Development (R&D) Expenditures of Private Non-profit Organizations, 2001" **Science Statistics**, Vol. 26, No.9, Statistics Canada, Catalogue No. 88-001-XIB, December 2002

## International comparisons

In 1999 in Canada, there were 6.5 scientists and engineers engaged in R&D for every 1,000 members of the labour force, compared with 9.9 in Japan (over estimated), 8.6 in the United States, 9.6 in Sweden and 6.8 in France.

**Chart 5. Canadian researchers expressed as a percent of the labour force, 1991 to 2000**



Source: Table 7.1

**Table 7.1 Researchers engaged in R&D in selected OECD countries, 1991 to 2000**

| Country  | 1991 <sup>r</sup> | 1992 <sup>r</sup> | 1993 <sup>r</sup> | 1994 <sup>r</sup> | 1995 <sup>r</sup> | 1996 <sup>r</sup> | 1997 <sup>r</sup> | 1998 <sup>r</sup> | 1999 <sup>r</sup> | 2000       |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|
| <b>Researchers</b> ('000 FTE)                                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| United States  | 982               | ..                | 965               | ..                | 988               | ..                | 1,160             | ..                | 1,261             | ..         |
| Japan <sup>1</sup>   | 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         |
| <b>Canada*</b>   | <b>68</b>         | <b>72</b>         | <b>76</b>         | <b>87</b>         | <b>88</b>         | <b>91</b>         | <b>94</b>         | <b>95</b>         | <b>97</b>         | <b>103</b> |
| Netherlands  | ..                | ..                | 32                | 34                | 34                | 34                | 38                | 39                | 40                | ..         |
| Sweden   | 27                | ..                | 29                | ..                | 34                | ..                | 37                | ..                | 40                | ..         |
| <b>Total Labour Force</b> ('000,000)                           |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| United States  | 127               | 129               | 131               | 133               | 134               | 138               | 141               | 144               | 147               | 150        |
| Japan <sup>1</sup>   | 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         |
| <b>Canada*</b>   | <b>13</b>         | <b>15</b>         | <b>15</b>         | <b>15</b>         | <b>15</b>         | <b>14</b>         | <b>14</b>         | <b>14</b>         | <b>15</b>         | <b>15</b>  |
| Netherlands  | 7                 | 7                 | 7                 | 7                 | 7                 | 7                 | 8                 | 8                 | 8                 | 8          |
| Sweden   | 5                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4                 | 4          |
| <b>Researchers per 1,000 persons in the labour force</b> ratio |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| United States  | 7.7               | ..                | 7.4               | ..                | 7.4               | ..                | 8.2               | ..                | 8.6               | ..         |
| Japan <sup>1</sup>   | 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        |
| <b>Canada</b>  | <b>5.2</b>        | <b>4.8</b>        | <b>5.1</b>        | <b>5.8</b>        | <b>5.9</b>        | <b>6.5</b>        | <b>6.7</b>        | <b>6.8</b>        | <b>6.5</b>        | <b>6.9</b> |
| 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               | ..         |

<sup>1</sup> Overestimated (not in full-time equivalent).

\* Source OECD, Main Science and Technology Indicators, 2002/2.

**Table 7.2 Personnel engaged in R&D in selected OECD countries, by major sector, 1991 to 2000**

| Sector of performance          | 1991 <sup>f</sup> | 1992 <sup>f</sup> | 1993 <sup>f</sup> | 1994 <sup>f</sup> | 1995 <sup>f</sup> | 1996 <sup>f</sup> | 1997 <sup>f</sup> | 1998 <sup>f</sup> | 1999 <sup>f</sup> | 2000       |
|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------|
|                                | FTE's ('000)      |                   |                   |                   |                   |                   |                   |                   |                   |            |
| <b>Total R&amp;D Personnel</b> |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| Japan <sup>1</sup>             |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| Germany                        | 910               | 939               | 947               | 946               | 948               | 892               | 894               | 926               | 919               | 897        |
| United Kingdom                 | 516               | 488               | ..                | ..                | 459               | 454               | 460               | 462               | 480               | 485        |
| France                         | 261               | 264               | 270               | ..                | ..                | ..                | ..                | ..                | ..                | ..         |
| Italy                          | 299               | 311               | 314               | 315               | 318               | 321               | 306               | 309               | 314               | 327        |
| <b>Canada</b>                  | <b>144</b>        | <b>143</b>        | <b>142</b>        | <b>144</b>        | <b>142</b>        | <b>142</b>        | <b>..</b>         | <b>146</b>        | <b>143</b>        | <b>150</b> |
| Netherlands                    | <b>117</b>        | <b>122</b>        | <b>127</b>        | <b>143</b>        | <b>144</b>        | <b>143</b>        | <b>146</b>        | <b>148</b>        | <b>150</b>        | <b>156</b> |
| Sweden                         | 72                | 72                | 74                | 79                | 79                | 81                | 84                | 85                | 87                | 90         |
|                                | 54                | ..                | 57                | ..                | 63                | ..                | 65                | ..                | 67                | ..         |
| <b>Government</b>              |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| Japan <sup>1</sup>             | 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         |
| <b>Canada</b>                  | <b>21</b>         | <b>21</b>         | <b>21</b>         | <b>20</b>         | <b>19</b>         | <b>18</b>         | <b>17</b>         | <b>17</b>         | <b>17</b>         | <b>18</b>  |
| Netherlands                    | 15                | 15                | 15                | 16                | 16                | 16                | 16                | 16                | 17                | 13         |
| Sweden                         | 3                 | ..                | 3                 | ..                | 4                 | ..                | 3                 | ..                | 3                 | ..         |
| <b>Business Enterprise</b>     |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| Japan <sup>1</sup>             | 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         |
| <b>Canada</b>                  | <b>54</b>         | <b>57</b>         | <b>62</b>         | <b>79</b>         | <b>82</b>         | <b>79</b>         | <b>83</b>         | <b>86</b>         | <b>88</b>         | <b>92</b>  |
| Netherlands                    | 30                | 29                | 31                | 36                | 37                | 39                | 42                | 44                | 45                | 49         |
| Sweden                         | 34                | ..                | 35                | ..                | 42                | ..                | 44                | ..                | 44                | ..         |
| <b>Higher Education</b>        |                   |                   |                   |                   |                   |                   |                   |                   |                   |            |
| Japan <sup>1</sup>             | 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         |
| <b>Canada</b>                  | <b>41</b>         | <b>42</b>         | <b>43</b>         | <b>43</b>         | <b>42</b>         | <b>45</b>         | <b>45</b>         | <b>44</b>         | <b>44</b>         | <b>45</b>  |
| Netherlands                    | 26                | 26                | 27                | 26                | 25                | 24                | 24                | 24                | 24                | 27         |
| Sweden                         | 17                | ..                | 17                | ..                | 17                | ..                | 18                | ..                | 19                | ..         |

<sup>1</sup> Overestimated (not in full-time equivalent).



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