NOTE D'
INFORMATION
ISSN 1286-9392

Traduction de la Note d'Information 00.31, parue en septembre 2000

Women in Sciences in France

In 1997, 23,0% of researchers were women versus 21,6% five years earlier. Growth in the number of researchers has marginally benefited women in public and industrial R&D. However their numbers are higher in public research. The proportion of women involved in the research field varies to a considerable extent according to discipline. The similar position of women in public civil research – where medical and life sciences predominate – and in pharmaceutical industry is a good example. The proportion of women also differs according to their position : growth in numbers is inverse to the position they hold in the hierarchical order of their institution. Women's participation grows faster in upper secondary and higher education or in engineering schools than on the labour market.

There are as many men in industrial research and development (R&D) as in public civil R&D *(Table I)*. In contrast, women holding researcher's jobs are twice as numerous in public civil research. Thus, one out of two male researchers works in the public sector against two-third of female researchers. Finally women's participation in civil R&D has increased most between 1992 and 1997. All these developments took place in a context where researchers' employment grew faster than in R&D staff employment.

The number of researchers grew from 89500 in 1992 to 97300 in 1997. Taking into account the necessary corrections, job growth reached 18,3% (or 10,2% on a FTE basis) but the employment of researchers and research engineers (not including doctorate grantholders) has grown faster than that of support staff as a result of additional full and associate professor jobs in universities.

Table I – Researchers in 1992 and 1997 (head counts)

	1992		1997	
	Public civilian	Industry	Public civilian	Industry
Number of researchers*	84 900	73 700	91 800	78 300
Men	62 500	61 800	66 200	64 800
Women	22 400	11 900	25 600	13 500
Percentage of women	*26.4*	*16.1*	*27.9*	*17.3*

Source: MEN DPD C3
** Population for which the breakdown between men and women is known. See box on page 6.*

WOMEN'S SHARE TREND IN PUBLIC CIVIL R&D

Researchers jobs grow faster than support staff jobs

Individuals participating in R&D activities rose from 165000 in 1992 to 184000 in 1997 (+11,5%). Changes in employment reached + 12% representing 19800 additional jobs in five years. Seventy five percent of this rise is due to additional academic researcher and support staff jobs in universities but its impact on R&D activities is less significant : in terms of FTE *(full time equivalent)* and given the plurality of activities of many research actors, growth in number only reached 6,8%.

Women's share in public civil R&D has risen by one point within 5 years

Women represented 36,8% of total R&D personnel in 1992 and 38,0% in 1997 *(Table II)* so to say 63200 individuals *(in the population for which this information is available)*. Within the population of researchers, women's share rises a little faster than that of the whole of R&D personnel. However this new trend is not significant of a favourable or sustained increase over a longer period *(that we are*

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unable to measure) and hides a more contrasted evolution of women's position at the highest hierarchical levels. For instance, looking at CNRS, women's share has remained unchanged (around 30%) since the fifties but for CNRS research directors it varies according to the department they belong to : 21% of female research directors in Life Sciences and only 7% in Engineering Sciences. Women's share may have been higher in the past than today.

Women's share also differs depending on the type of institution : a sharp change has been seen more in universities than in other research institutions even though the general trend is clear.

As in other fields, women's share varies according to their job and hierarchical position and decreases in the reverse order of their hierarchical position *(Table III)*. Thus women represent 28% of academic research staff, only 14% of full professors and 35% of assistant professors. Women's share as a whole is higher in public scientific and technological research establishments (EPST) than in universities.

Not only disciplines but also special factors such as availability for expatriation are highly correlated with women's share in each research institution (*Graph 1*). The highest rates can be seen where medical sciences, life sciences, chemistry, humanities or social sciences disciplines are to be found in such institutions as INSERM [1], Institut Pasteur *(both in medical research)*, INED *(demographic research)*, INRA *(agrofoods research)*, INRETS *(transport research)*. Multidisciplinary institutions such as CNRS or even CEA hold an intermediate position. Institutions like IRD *(Research for development)* and CIRAD *(Agrofood research for development)* show a similar profile in terms of both disciplines being studied and research staff being sent to developing countries where working conditions are definitely more difficult to adapt with what is socially expected from women.

EVOLUTION OF WOMEN'S REPRESENTATION AMONG INDUSTRIAL RESEARCHERS

Industrial researchers include all engineers and technical managers involved in R&D activities.

Table II – Proportion of women in public civil research in 1992 and in 1997 (%)

	Total population		Researchers	
	1992	1997	1992	1997
EPST*	44	44	30	31
EPIC*	28	30	16	18
EPA*	42	37	31	24
ISBL*	62	61	44	47
Universities	35	37	26	28
Total specified*	36.8	38.0	26.4	27.9
Number of women	**56 500**	**63 200**	**22 400**	**25 600**
Total reference populations	**165 000**	**184 000**	**84 900**	**91 800**

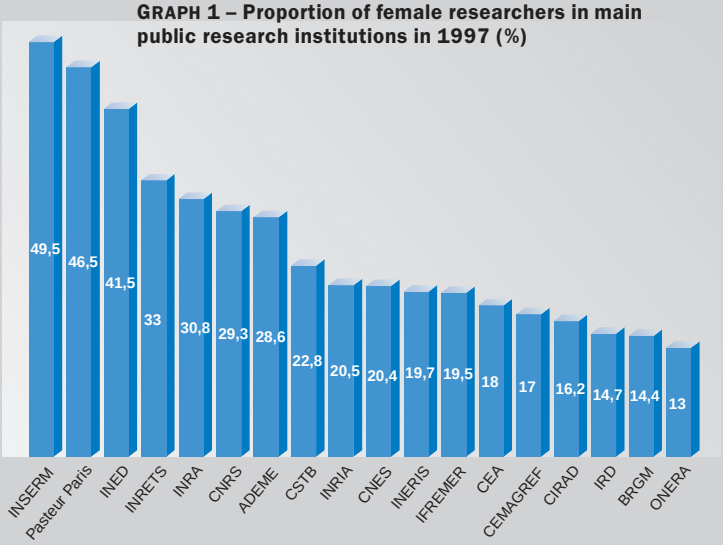
Source: MEN DPD C3
** See definitions on page 6.*

Table III – Proportion of women according to their type of job and hierarchical position in 1997 (%)

	Research and research engineers	Doctorate grant-holders	Project engineers and technicians	Other
EPST*	31	39	51	67
EPIC*	18	38	22	60
Universities	28	39	41	64

Source: MEN DPD C3
** See definitions on page 6.*

GRAPH 1 – Proportion of female researchers in main public research institutions in 1997 (%)



Industrial researchers' profiles are noticeably different from public researchers' ones : as in public civil research, a distinction is made between researchers and research support staff *(the distribution by gender is only available for the number of researchers)*.

Women's representation in industrial R&D is much lower than in public R&D reaching 17,3% in 1997 : although it rose more slowly than in public civil research over the period 1992-1997, employment growth benefited women *(Table IV)*.

Feminisation ratio varies according to Industry in 1997

Research women's share in businesses may highly vary by industries *(from 7 to 47%)*.

Ten industries are above the average ratio of 17 ,3% *(Table V)* representing half of female researchers employed versus only one fourth of men. Given the high concentration by industry in business R&D, the ten leading industries employing over 75% of researchers are actually at a ratio of 17,4% *(which is the average)*. Among them, leaders in terms of jobs such as automobile industry, professional and scientific instruments and aeronautics show low ratios between 10 - 14%.

Industries with the highest proportion of women (pharmaceuticals, agrofoods, chemicals, energy and textile) correspond to the specialised disciplines found in public R&D.

1. For acronyms, see Definitions on page 5.

Since 1992 research employment growth has benefited women

Excepting four industries, the number of researchers has increased between 1992 and 1997 *(Graph 2 p. 4)*. Women employment grew more rapidly in the same period. In five industries men employment has even decreased. A particularly contrasted situation can be seen in professional and scientific instruments and medical equipment industries : plus 11% for women and minus 2% for men.

Among industries which contribute the most to employment growth, the number of women grew even faster : the pharmaceutical industry has thus improved its score with plus 27% for women versus only 17% for men.

Between 1992 and 1997 four industries recorded a fall in employment (between 14 to 28%, even greater for female employment) : aeronautics, computer services, office machine & computer equipment. In the office machine & computer equipment industry, researchers employment in terms of head count decreased but grew on a FTE basis. This is due to changes in organisation of research in this sector with a higher concentration of R&D work carried out by those who are employed in this function.

Various training profiles

The prevailing training model among industrial researchers is that of engineers with somehow a significantly growing resort to those holding a doctorate (several diplomas may be cumulated) [2].

This trend could be linked with the growing proportion of women in R&D between 1992 and 1997.

The training profiles of female researchers differ from those of men *(Table VI)*. While the latter mostly hold an engineering diploma for 61% of them in 1997, women training profiles are diversified with 48% having an engineering diploma and 20% a doctorate. Such a noticeable difference may be also seen in the training of medical doctors which explains the major role played by women in the pharmaceutical industry.

Table IV – Evolution of the proportion of women amongst industrial researchers

	1984	1992	1997
Number of researchers	**45 400**	**73 700**	**78 300**
Men	40 700	61 800	64 800
Women	4 700	11 900	13 500
Percentage of women	*10.3*	*16.1*	*17.3*

Source: MEN DPD C3

Table V – Leaders in parity in 1997

Sectors of activity	Researchers		Proportion of women (%)
	Women	Men	
Pharmaceuticals	3 039	3 407	47
Agrofood	535	1 023	34
Chemicals	1 167	2 949	28
Textiles, clothing	150	486	23
Energy (including extraction)	782	2 588	23
Agriculture	177	678	21
Glass	80	357	18
Transport and communications	557	2 504	18
Wood, paper, card	83	394	17
Engineering services	413	1 989	17
The leading ten sectors	**6 934**	**16 374**	**29.9**
Total	**13 508**	**64 792**	**17.3**
Importance of leading ten sectors (%)	*52*	*25*	

Source: MEN DPD C3

Table VI – Evolution of the educational attainments of industrial researchers (%)

Level of education	1984		1992		1997	
	Men	Women	Men	Women	Men	Women
Diploma two years after baccalauréat	17,6	10.9	15.5	8.3	15.7	9.3
Degree, Master's degree	8.8	22.9	12.2	22.9	12.2	20.4
Engineering diploma	63.9	47.1	61.0	46.9	60.8	47.7
Doctorate (not medicine)	5.7	8.6	6.1	9.9	6.5	10.8
Doctorate of Medicine	2.1	9.2	2.3	10.8	2.0	9.5
Foreign diploma	1.9	1.3	2.9	2.1	2.7	2.3
Total	100	100	100	100	100	100

Source: MEN DPD C3

Table VII – Evolution of the proportion of women in different professions

	Percentage of women			Percentage of total population 1997
	1982 Census (1)	1990 Census (1)	1997 Jobs survey (2)	
Civil service managers	24.0	28.1	31.4	0.6
Teachers, scientific professions*	45.4	50.4	52.0	1.5
Engineers, technical managers in industry	6.2	11.2	11.9	1.5
Administrative and commercial managers in industry	20.5	30.2	32.9	1.8

Source: TEF 1998-1999
**The percentages in this category are strongly influenced by the number of women amongst secondary teachers (56% in 1997).*
(1) General Population Census.
(2) Employment survey.

Female researcher share varies greatly according to the level of educational attainment : more women hold a doctorate or a doctorate of medicine while more men have obtained an engineering diploma. However, their importance is now becoming clear at all levels of training. Thus in 1997, women represented 13,7% of those holding an engineering diploma versus 7,7% in 1984.

2. Industrial Researchers – Development over a long period and situation in 1997. Information Sheet *No. 00-10, MEN-Programming and Development Division, March 2000.*

DISCIPLINES APPEAR TO BE A DETERMINING FACTOR

Women's share in public and industrial R&D *(Graph 3)* delineates three groups of research organisations and industries. Institutions involved in health and life sciences have similar rates to those found in the pharmaceutical industry, while a second set groups the chemicals, agriculture and agrofoods sectors together with the institutions involved in the same disciplines (INRA). At the other end of the spectrum, ONERA *(aerospace research)* and aeronautics have similar profiles.

ACTUAL RESEARCH TRENDS MIRROR THE LABOUR FORCE...

Women's share rise may be seen throughout the labour force with 44,9% in 1997 (versus 44,1% in 1992) also in professions close to R&D *(Table VII p.3)*.

For a same level of diploma and status, the position of women employed as researchers appears to be less favourable than that of women in the civil service. On the other hand, in some industrial sectors the proportion of women is higher among researchers than among engineers and managers.

... AND ALSO HIGHER EDUCATION

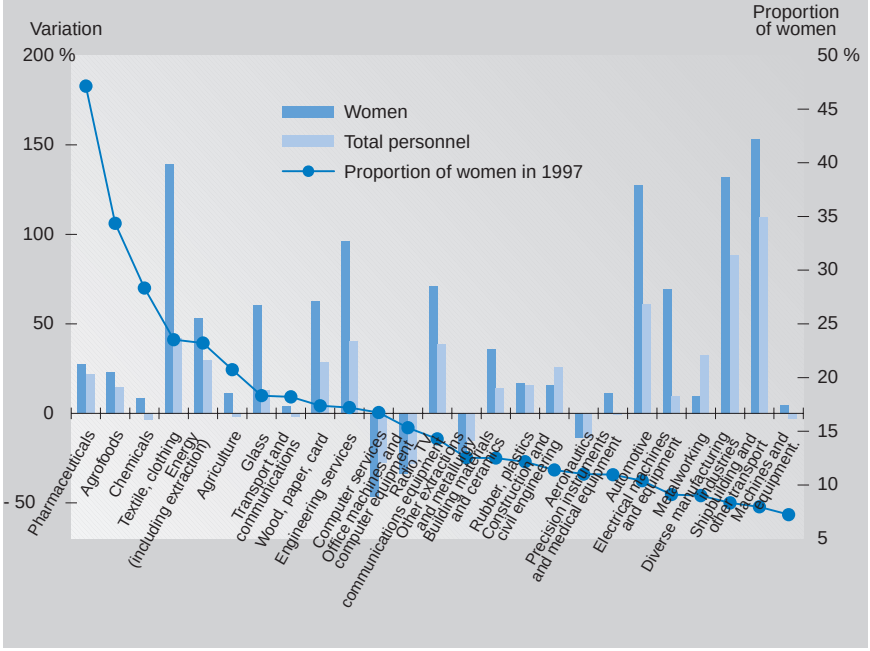
The increases that have been noticed result from a widen access of women to education and particularly to higher education. Thus women's share in postgraduate education has gained over 10 points in twenty five years. On the other hand they represented only 22% of the enrolment in engineering schools in 1997 and their proportion grew less rapidly between 1982 and 1997, close to stagnation since 1992 *(Table VIII p.5)*.

Furthermore, noticeable differences can be seen according to discipline both among students and degree holders *(Table IX p.5)*, with more women in Humanities, medicine, dentistry and pharmacy. However these differences have tended to diminish over the past twenty years.

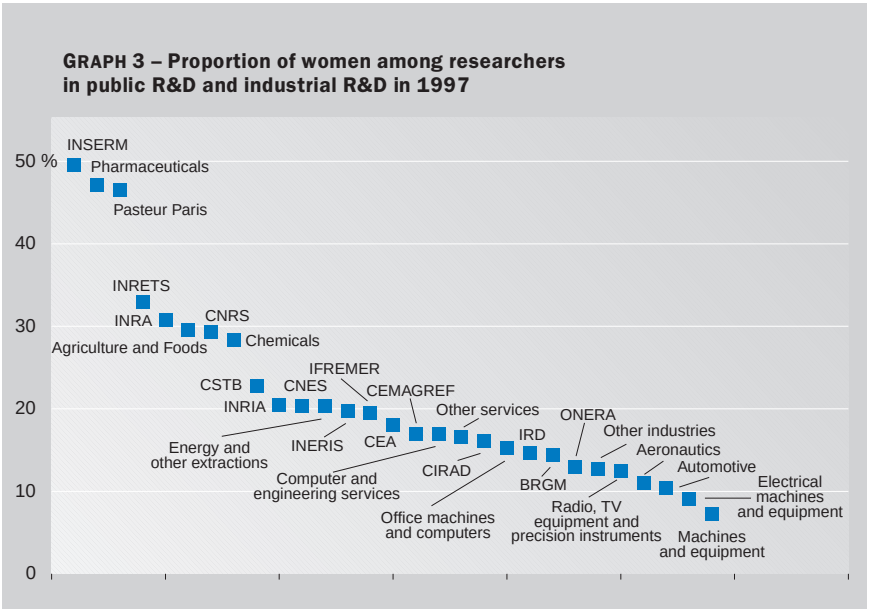
The comparative shares of men and women amongst pupils, students, degree holders and people in employment are combined in the same graph *(Graph 4)* for the same year. The situations observed in the workplace appear to result from a mechanism which gradually takes hold in schools by way of selection procedures and disciplines chosen and then goes on in higher education and employment.

Applied to a theoretical career starting from the scientific sections of the *baccalauréat*, moving through engineering schools and leading to jobs in industrial R&D, the comparison is even more striking *(Graph 5)*.

GRAPH 2 – Evolution of research jobs in industries between 1992 and 1997, and proportion of women in 1997



GRAPH 3 – Proportion of women among researchers in public R&D and industrial R&D in 1997



Monique Bonneau, DPD C3
(Traduction Laura Luzzatto)

TABLE VIII – Proportion of women among postgraduate students and in engineering schools (Mainland France)

	1982-1983		1992-1993		1997-1998	
	Total	Women (%)	Total	Women (%)	Total	Women (%)
Engineering schools	**39 000**	***16.2***	**67 072**	***21.5***	**79 098**	***22.2***
Postgraduate university courses	**135 366**	***38.1***	**186 999**	***43.4***	**204 465**	***49.7***
of sciences	8 165	*27.0*	15 161	*32.4*	16 165	*35.6*
of humanities	14 104	*49.1*	23 388	*55.8*	28 027	*59.5*
of economics and law	9 593	*33.5*	16 915	*45.2*	25 442	*51.9*
of medicine, dentistry and pharmacy	19 455	*41.4*	25 387	*42.2*	31 667	*50.7*

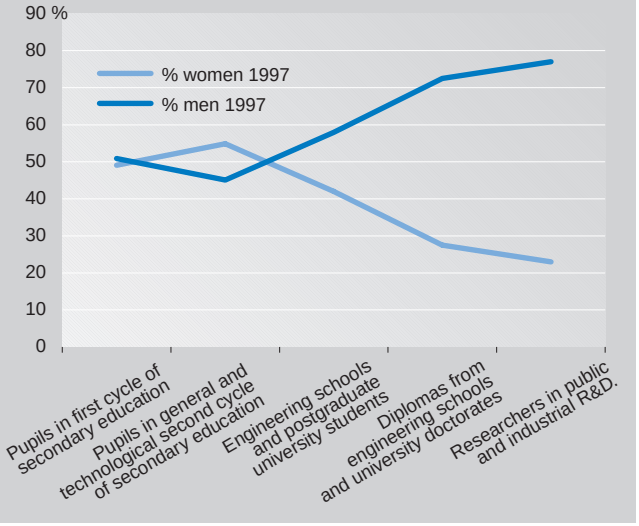
Source: MEN DPD C3

TABLE IX – Proportion of women among degree holders: doctors and engineers

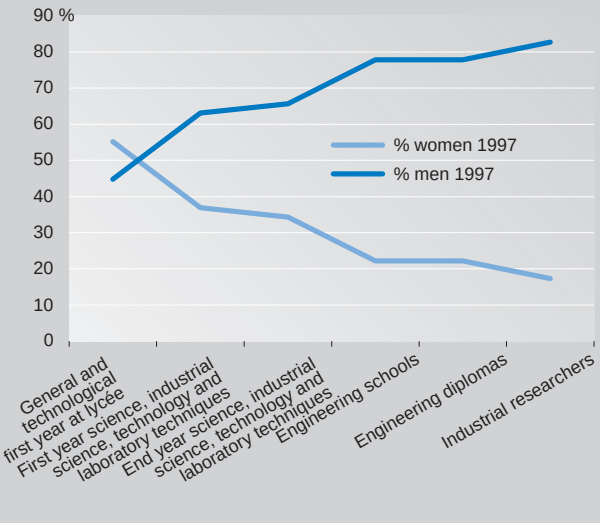
	1982-1983		1992-1993		1997-1998	
	Total	Women (%)	Total	Women (%)	Total	Women (%)
Engineering diplomas	**12 156**	***12.6***	**17 847**	***19.6***	**23 068**	***22.5***
Doctors	**7 358**	***28.6***	**8 328**	***34.1***	**10 840**	***39.4***
of sciences	3 916	*25.1*	5 224	*29.9*	6 683	*35.5*
of letters	2 099	*37.4*	1 816	*42.6*	2 393	*49.6*
of economics and law	1 037	*20.6*	747	*31.6*	1 107	*36.0*
of medicine, dentistry and pharmacy	306	*40.8*	541	*49.7*	657	*47.3*

Source: MED DPD C3

GRAPH 4 – Educational career by gender for entire population



GRAPH 5 – Educational career by gender for industrial researchers



Acronyms and abbreviations

ADEME: Agency for the Environment and the Control of Energy Use
BRGM: Geological and Mining Research Bureau
CEA: Atomic Energy Authority
CEMAGREF: National Centre for Agricultural Machinery, Rural Engineering, Water and Forestry
CIRAD: Centre for International Cooperation in Agricultural Research for Development.
CNES: National Centre for Space Studies
CNRS: National Centre for Scientific Research
CSTB: Centre for Sciences and Techniques in Construction
EPA: Public Administrative Establishment
EPST: Public Scientific and Technological Establishment
EPIC: Public Establishment for Industry and Commerce
IFREMER: French Institute for Exploitation of the Sea
INSERM: National Institute for Health and Medical Research
INED: National Institute for Demographic Studies
INERIS: National Institute for the Industrial Environment and Risks
INRA: National Institute for Agricultural Research
INRETS: National Institute for Research in Transport and Safety
INRIA: National Institute for Research in Informatics and Automatism
IRD: Research Institute for Development
ISBL: Non-profit-making organisation
ONERA: National Office for Aerospace Studies and Research

An aid to understanding the calculations

● The amount of information available on public research personnel has increased over time.
– In 1994: broadening to University Hospital Centres (CHU) and then to Cancer Centres (CLCC) (in 1995) of surveys on the means devoted to research and development;
– in 1997: improvement in the methods used to measure the employment of research personnel in universities [1].

● The rates of growth are calculated on the basis of a constant reference domain. Thus the number of individuals rose from 89,500 in 1992 to 97,300 in 1997, or an 18.3% increase based on this constant domain, while this percentage was 10.2% in full-time equivalents (FTE).

● Distribution by gender is not available for the entire field of the survey (information not requested from non-profit-making organisations (ISBL), which were only the subject of sampling, except, in particular, for Institut Pasteur, Institut Curie and the CHU-CLCC). This non-distributed population represented 6.9% in 1992 and 9.7% in 1997, because of integration into the survey of CHU and CLCC. These data do not include the Defence sector. Furthermore, the records used to estimate research personnel in universities do not indicate any distribution by gender; estimates using other sources have thus been made.

● Individuals and full-time equivalents (FTE). The distribution of men and women is established on an individual basis. Thus, in universities, a person with a combined teaching and research post is counted as one unit. However, to ensure a correct measurement of R&D personnel (because this person only makes a partial contribution to R&D work), he will only be counted, for example, as 50%. This share is close to 100% in EPST. Calculations in FTE make it possible to take account of the multiplicity of tasks performed. It is probable that the level of participation of women estimated in FTE is, on average, different from that calculated on an individual basis, but this information is not available.

1. Research and Development in France, Dossier N° 114, MENRT-Programming and Development Division, March 2000.

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Direction de la programmation et du développement

Directeur de la publication
Jean-Richard CYTERMANN
Rédactrice en chef
Francine LE NEVEU
Maquette et impression
DPD édition & diffusion

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France : **42,69 euros (280 F)**
Étranger : **45,73 euros (300 F)**