

Young people, scientific interests and girls' quiet revolution

Elisabeth Lage
Ecole des Hautes Etudes en Sciences
Sociales
Paris

Proposition for this discussion

- Part I : Gender differences - Hegemonic SR until sixties
- Part II: Data of educational statistic evaluation : girls' quiet revolution
- Part III : Questioning social and economical conditions of these changes

Part I : Gender differences

Hegemonic SR until sixties

(and one of more important themata in social Thinking)

Girls/women :

- Social role: domestic life
- Intellectual skills: sensitivity
- Personality : submissive
- Interests in others, empathy

Boys/men :

- Social role: public life
- Intellectual skills: rationality
- Personality: aggressive, competitive
- Interests in objects, domination

Sources of this SR of gender

- Social division of roles between men and women during centuries
- Religion contribution to this construction
- Differences in boys and girls education during centuries
- changes in France : equal secondary education since 1924; engineer schools accept women since :
 - Ponts et chaussées 1962
 - Mines 1969
 - Ecole polytechnique 1972
 - Ecole de l'Air 1978
 - Saint Cyr 1983

Science as virile value

- Science as value in French educational hierarchy since sixties (Latin before)
- SR: boys skilled in sciences, girls in language, literature.

Scientific women seen as exception
(Sofya Kowalewskaya, Marie Curie, Emmy Noether, Barbara McClintock,)

Women and Science : an exception

Maria Agnesi (1718 - 1799) philosopher and mathematician,
Sophie Germain (Monsieur Leblanc) (1776- 1831), mathematician,
Sofia Kovalevskaya (1850 - 1891), mathematician,
Marie Curie Sklodowska (1867 – 1934), physicist and chemist,
Emmy Nøther (1882-1935), mathématicienne,
Barbara McClintock (1902-1992), geneticist



Educational consequences of this SR

- Different family choices for boys and girls
- Different teachers educational practice
(see M. Duru-Bellat, remember D. Jodelet work)
- Different professional orientation
- Labour market : jobs for men and jobs for women

Scientific contribution to this essentialist SR of gender (consensus between common sense and scientists)

- Differential psychology and aptitudes, ex. Zazzo, 1972
- Genetics contribution (spatial figures rotation and boys superiority, Bock and Kolakowski, 1973)
- neurosciences contribution : brain, hemispheres specialisation and gender differences

Part II: sociological approach, surprising data of educational statistic evaluation in France

- National evaluation of pupils 8, 11 and 14 year old, on maths and French since 1989. First data, 1990, girls are as good as boys are in maths and French, or even best.
- Secondary education : girls and boys attempt the same results but show different interests, according to stereotypes
- Nevertheless social background remain the first explanatory factor (Baudelot and Establet, 1992)
- Tertiary education : first degree, women and men achieve the same results but women attend less PhD level (glass-ceiling)

Women achievement at the world scale

- Girls' amount at the university in progress over the world. In industrialized countries girls are as many as boys (Unesco, 1989, see Baudelot and Establet)
- Canadian exemple of rapid change: most traditional occidental country in 1960, less differences between men and women in academic achievement and orientation today.

PERCENT OF GIRLS AND BOYS AT THE UNIVERSITY

Statistics from the World Bank and Unesco, 1989
(extract from Baudelot, 1992, p. 47)

Europe

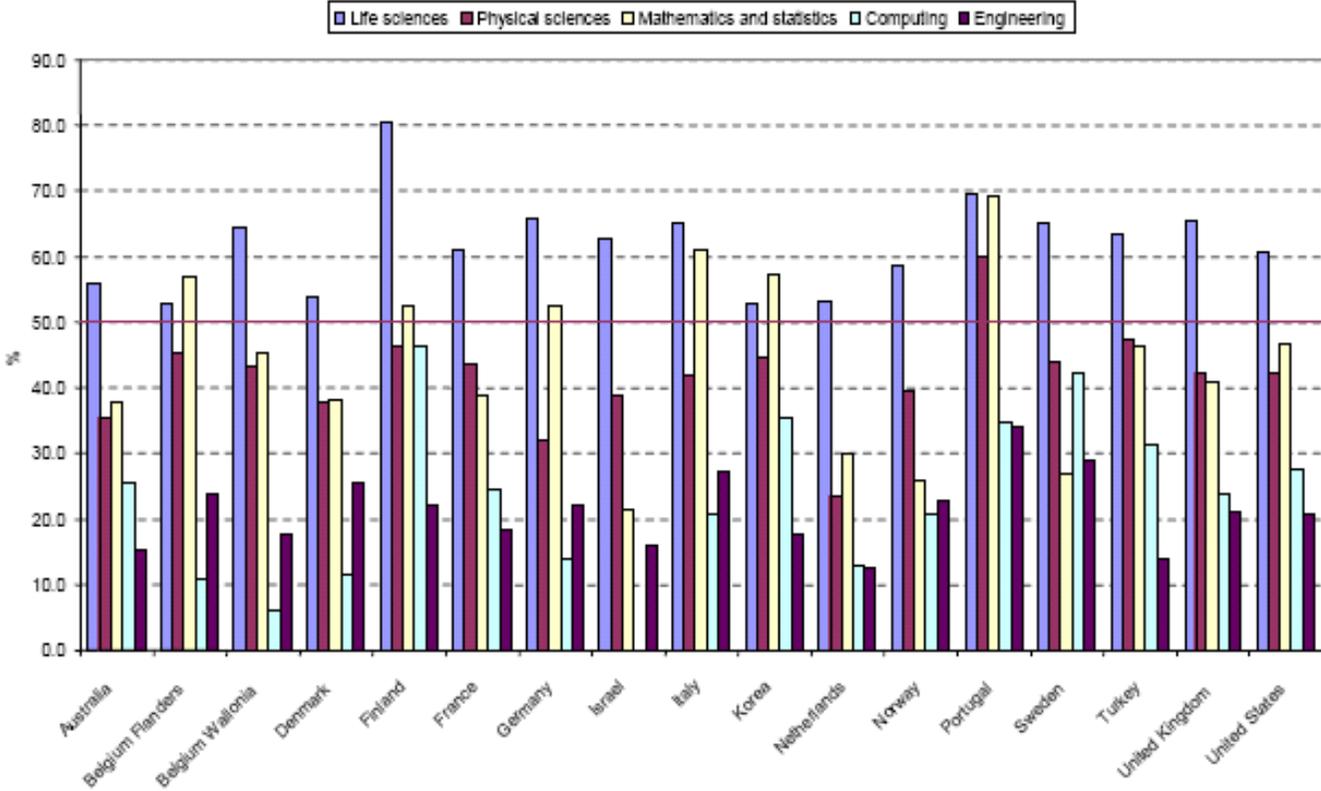
COUNTRY	GIRLS	BOYS	COUNTRY	GIRLS	BOYS
Austria	24.9	31.1	Netherlands	26.4	37.6
Belgium	30.1	33.9	Norway	29.1	26.9
Bulgaria	26.1	24.1	Poland	19.0	15.0
Danemark	28.6	29.4	Portugal	13.8	12.2
Finland	34.8	35.2	Spain	31.4	32..6
France	30.5	29.5	Sweden	34.8	39.1
Germany	25.0	35.0	Switzerland	14.8	31.2
Greece	23.2	24.8	Tchecoslov	16.0	19.0
Hungry	16.1	13.9	U. Kingdom	19.7	24.3
Italia	23.4	26.6			

PERCENT OF GIRLS AND BOYS AT THE UNIVERSITY

Statistics from the World Bank and Unesco, 1989
(extract from Baudelot, 1992, p. 47)
OTHER COUNTRIES AS REFERENCE

COUNTRY	GIRLS	BOYS
United States	68.1	60.7
Canada	58.4	51.5
Corea	19.9	46.1
Japan	20.8	37.2
URSS	24.2	23.2

Percentage of female graduates by Science and Technology disciplines – 2003 or latest year available (OECD, Amsterdam, 2006, p. 16)



How explain this quite revolution?

- Socio-cultural explanation more than psychologists work on aptitudes or genetic and neurosciences approach (Baudelot and Establet)
- Minority movement promoting women role in society
- Role of the practice in SR changes: new model for girls since seventies

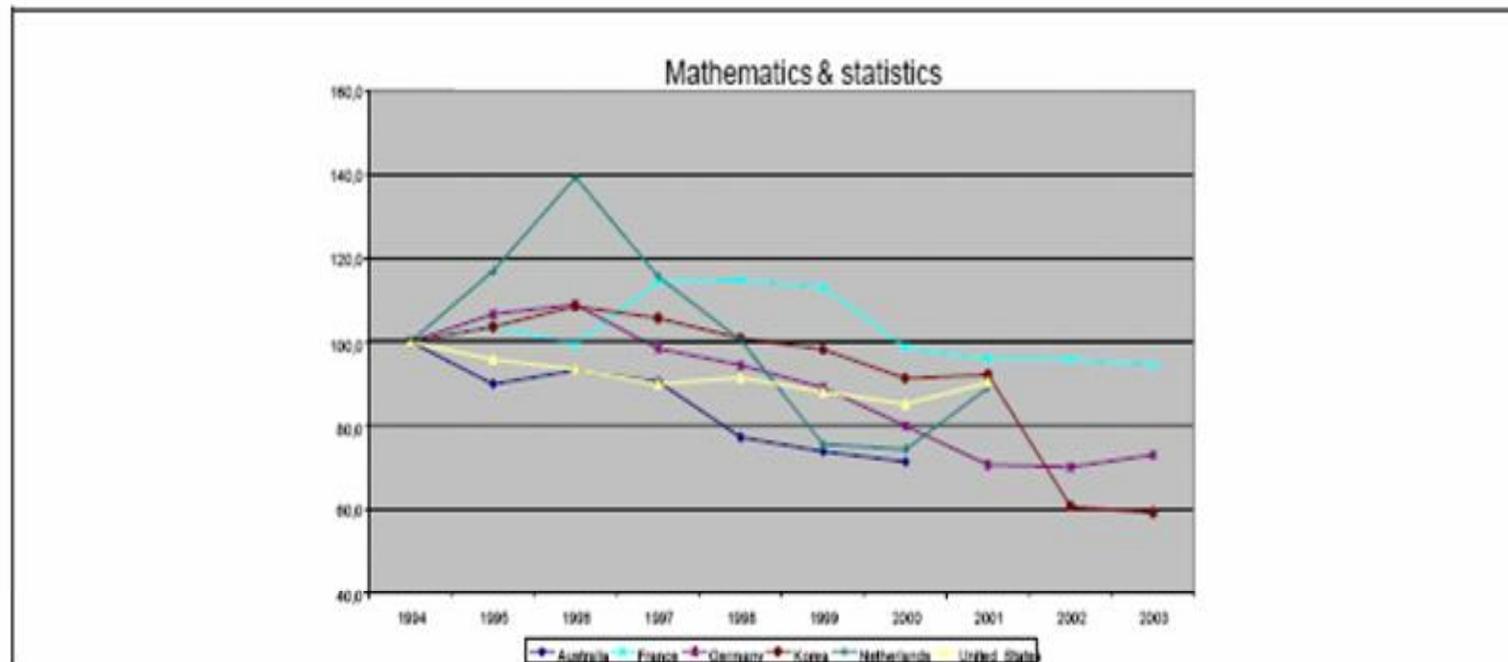
Changes in SR from the top

- EU attempt to improve scientific women position
(European Commission, *Science policies in the European Union. Promoting excellence through mainstreaming gender equality*, ETAN group, Expert Working Group on Women and Science, 2000.)
- The aim of 40% of women in leading positions at the university and EU administration
- First changes in Labour Market : experience of work conditions adapted to family life at Siemens firm in Munich (child care center, part-time of work, telework, etc.) see Collinet conference at CNRS, 21.10. 2006.

Part III : Questioning social and economical conditions of these changes

New trend - decline in scientific
enrolment since 1995, specifically in
mathematics and physics (OECD report
Global Science Forum, 2005, Amsterdam 2006)

Total number of tertiary graduates in mathematics,
statistics. Index 100: 1994
OECD, Amsterdam, 2006, p. 14



Total number of tertiary graduates in physical sciences. Index 100: 1994

OECD, Amsterdam, 2006, p. 14

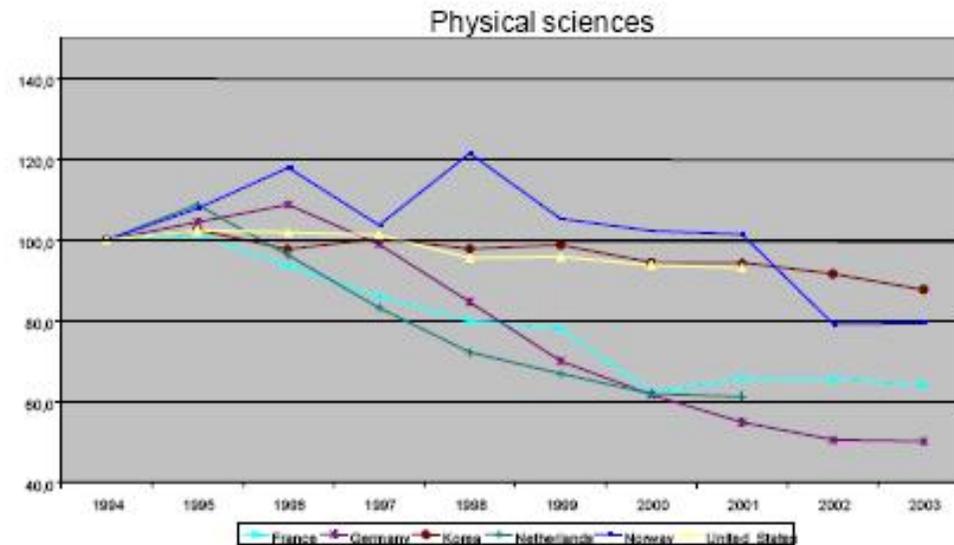


Figure 4. Total number of tertiary graduates in mathematics & statistics and physical sciences. Index 100: 1994

Heterogeneity between countries, OECD, Amsterdam, 2006, p. 13

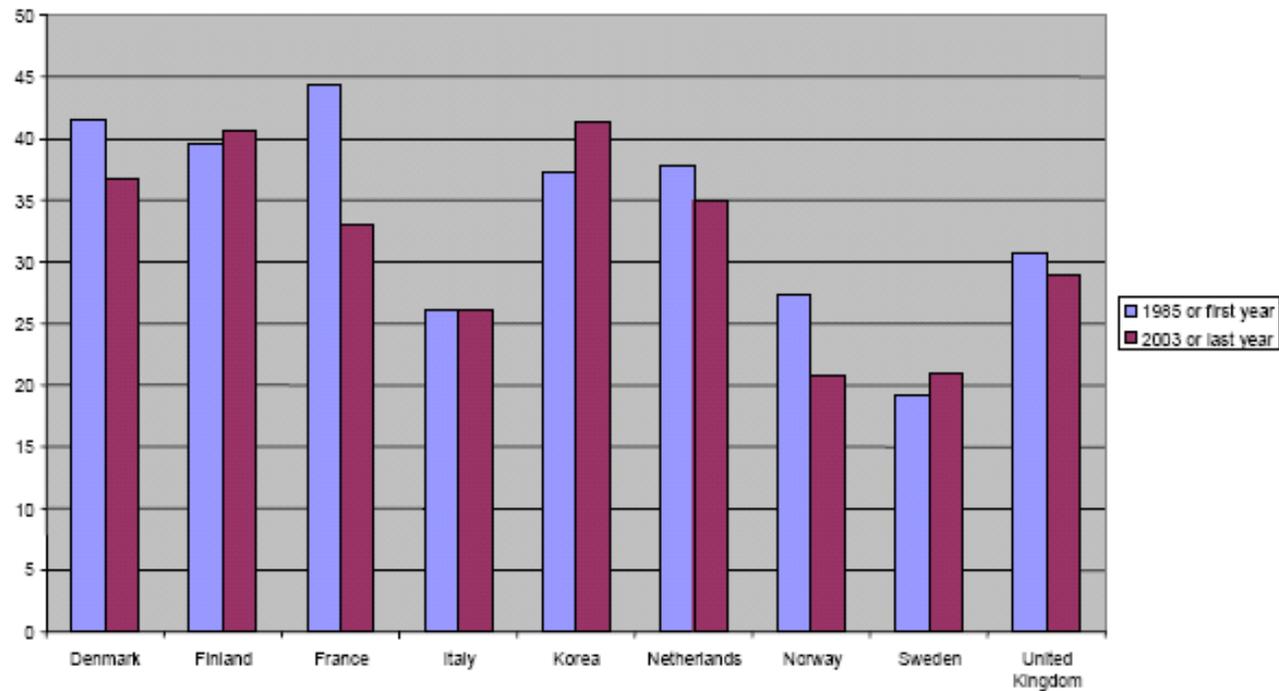


Figure 3. Percentage of upper secondary graduates with an S&T orientation

How explain this decline?

- **SR of scientific professions**

The perception that young people have of these careers and of scientists' or engineers' lifestyles is not attractive to them.

Incomes in Science and Technology careers are often perceived as too low relative to the amount of work and difficulty of the studies required.

- **What boys prefer?**

Science has become the second choice,

The first choice being: the world of finance, business, computer sciences and communication

one of the remedy to the lack of scientists consist to promote scientific education and jobs for women and ethnic minorities (OECD)

Conclusion

- Science as condition to power accession more than knowledge acquisition in France (Bourdieu and Saint Martin, 1971) :
Two levels in sciences formation:
 - university for popular background (executive jobs perspective)
 - « grandes écoles » for bourgeoisie (power execution perspective in industry and administration)
- Women have to struggle for power or for scientific competence ?

Bibliography

- Baudelot, Ch., Establet, R. *Allez les filles*. Paris, Seuil, 1992.
- Bock, R., D., Kolakowski, D. Further evidence of sex. Linked major gene influence on human spatial visualizing ability. *American Journal of Human Genetics*, 1973, 25, pp. 1-14
- CNRS Articulation de la vie professionnelle et de la vie personnelle dans les métiers scientifiques, 21.10.2006.
- Colloque Femmes et Sciences 2006, Mission pour la place des femmes au CNRS. « Articulation de la vie professionnelle et de la vie personnelle dans les métiers scientifiques », Strasbourg, 21 octobre 2006.
- Duru-Bellat, M. *L'école des filles*. Quelle formation pour quels rôles sociaux?, 1992.
- European Commission, *Science policies in the European Union. Promoting excellence through mainstreaming gender equality*, Rapport du groupe ETAN, Expert Working Group on Women and Science, 2000.
- OECD Global Science Forum, 2.11.2005:
http://www.oecd.org/department/0,2688,fr_2649_34319_1_1_1_1_1,00.html
- Saint Martin, M. Les fonctions sociales de l'enseignement scientifique. Paris, Mouton, 1971
- Thomas, H., Familial correlational analysis, sex differences and x-linked gene hypothesis. *Psychological Bulletin*, 1983, 93, 427-440.
- Witelson, S. Les différences sexuelles dans la neurologie de la cognition: implications psychologiques, sociales, éducatives et cliniques. In: E. Sullerot (Ed.) *Le fait féminin*, Paris, Fayard, 1978, pp. 287-303.
- Zazzo, B. *Psychologie différentielle de l'adolescence*. Paris, P.U.F., 1972.