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“Equality/Equity between women & men” is one of the founding principles of the European Union

*Title of a book by Danielle Nierenberg, 2002

Sheisanasatronomer Meeting, London April 22-23 2010
A wealth of documents!

- Rapport de la Commission EU: Sur l’égalité entre hommes et femmes, 2009
- L’Europe une chance pour la femme, P.Joannin, 2004, Fondation R.Schuman
- Rapports de la « Mission pour la place des femmes au CNRS »
- Etat des lieux sur les chercheurs en astronomie en France en 2002, F.Durret; Addendum: Le plafond de verre en temps de pénurie, D.Alloin, F.Durret
- Status of women at ESO: a pilot study, F.Primas, 2007
- PhD and careers in astronomy, RAS, 2005; Physics and Astronomy in UK, OST, 2000
- EPWS Newsletters: www.epws.org
- Equity now: Pasadena recommendations for gender equality in astronomy, 2005
- Les femmes et la science, au-delà des idées reçues, 2006… etc
A word of caution before starting!

Mix of different analysis:
- not always covering same period of time
- not always having identical topical contours
- not always same context (analysis goals)
- inter-comparisons: figures to be taken at 10% uncertainty
- statistical uncertainty on small numbers
• Europe in the XXIst century: development of society based upon knowledge, promote innovation & diversity

• Barcelona objectives: 3% BIP to be invested in research in 2010 (not met!) & women make the vivarium 2010

• Work towards gender parity and equity at all levels, up to decision-making level

• Women: 56% of Europeans with university degree, only 25% in science → horizontal bias

• Percentage of women in research decreases in top positions → vertical bias
Correcting Gender Myopia

Actions to fight the two major biases

1. **Shortage of women in science**: campaigns to attract young female students throughout Europe, leaflets, conferences, figures of great women in research (models for children’s identification)…

1. **Shortage of women in decision-making positions**: EU instructions for building up parity and equity, implemented by many countries across Europe
• EU action plan “Women in Sciences” 1999
• Helsinki group: monitor, build synergies (national & EU politics)
• Action plan “Science & Society” 2001 (gender equity, indicators...)
• Representation of 40% women in EU programs
• Sets of rules for hiring (2005): att. to flexible working conditions, child care support, gender-balanced representation at all levels
• Women in industrial research (experts group for monitoring)
• European platform of women scientists EPWS: net of networks
• Women scientists in central-E/oriental-E/baltic-E, ENWIRE
• Statistics: SHE figures, 2003 ---- 2009
Women representatives in national parliaments:
Sweden, Denmark, Finland, Netherlands: \(~45\%\) to \(37\%\)
Belgium, Spain, Austria, Germany: \(~35\%\) to \(32\%\)
Poland, Portugal, Balt’s, UK, Luxembourg: \(~20\%\) to \(17\%\)
France, Greece, Italy: \(~12\%\) to \(10\%\)
\{France: low chamber \(12\%\), high chamber \(4\%\}\}

Women representatives in European parliament:
Finland, France, Sweden, Belgium, Germany: \(~44\%\) to \(38\%\)
Greece, Italy: \(~16\%\) to \(11\%\) \quad \text{Mean:} \ 31\%
What about sciences?

Around 29% of scientists/engineers are women (« natural sciences »). In SU: situation varies from country to country & some persistent patterns

Indicators used:
→ Percentages of women at different career levels (A-top to B-medium and to C-start)
→ Percentage in decision-making positions & committees
→ Recognition through honorific rewards & prizes & academies & invited speakers in international conferences… etc…

Gender advantage: % of men grade A / % of women grade A (% with respect to same gender); Parity index; Glass ceiling index; Gender advantage for promotion
EU analysis for natural sciences (maths, physics, chemistry, biology...)

Figure 3.2: Proportions of men and women in a typical academic career in science and engineering, students and academic staff, EU-25, 1999-2003

Definition of grades:
A: The single highest grade/post at which research is normally conducted
B: Researchers working in positions not as senior as top position (A) but more senior than newly qualified PhD holders
C: The first grade/post into which a newly qualified PhD (ISCED6) graduate would normally be recruited

ISCED SA: Tertiary programmes to provide sufficient qualifications to enter into advanced research programmes & professions with high skills requirements
ISCED 6: Tertiary programmes which lead to an advanced research qualification (PhD)

SET fields of education = 400 Science, maths and computing + 500 Engineering, manufacturing and construction
SET fields of science = Engineering and Technology + Natural Sciences
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**Source:** Education Statistics (EuroStat); WIS database (DG Research)


*Data unavailable:* ISCED 6 students 2002: DE, FR, LU, NL, SI (Women); WIS: 2006: BG, EE, EL, FR, LV, LU, HU, RO, IE (Grade A); 2002: BG, EE, EL, HU, RO, IE (Grade A)

*Break in series:* CZ (2005)

*Provisional data:* ES

*Data estimated:* EL, IT (by DG Research) for WIS, ISCED 6 students, SI.
Proportion female grade A in natural science [EU: 2009]:

$\langle(\text{IT}+\text{FR}+\text{ES}+\text{BE})\rangle : 14.5\%$

$\langle(\text{DK}+\text{SE}+\text{FI}+\text{NO})\rangle : 11.2\%$

$\langle(\text{DE}+\text{NL}+\text{UK}+\text{AT})\rangle : 7.5\%$

Gender advantage for promotion [2006]:

$>1$ means benefit to male scientists

$\rightarrow \text{AT, FI, GE, NL, UK} : 2.1 \text{ to } 1.9$

$\rightarrow \text{DK, NO} : 1.8 \text{ to } 1.6$

$\rightarrow \text{FR} : 1.3$

$\rightarrow \text{BE, IT, SE} : 1.2 \text{ to } 1.0$
EU analysis for natural sciences

The formula for the Glass Ceiling Index is:

\[ GCI = \frac{P}{P_a} \]

where:
\[ P = \text{Proportion of women in grade A+B+C} \]
\[ P_a = \text{Proportion of women in grade A} \]

The value runs from 0 to infinity. A GCI of 1 indicates that there is no difference between women and men being promoted. A score of less than 1 means that women are over-represented and a GCI score of more than 1 indicates a glass ceiling effect showing that women are under-represented in grade A positions. In other words, the interpretation of the GCI is that the higher the value the thicker the glass ceiling and the more difficult it is for women to move into a higher position.
Following the EU incentives in 1998:

→ Group of *proactive* countries:
  1. gender equality leaders: FI, NO, SE, DK & IS
  2. low female representation: AT, DE, CH, NL
  3. UK, IE, ES

→ Group of relatively inactive countries (on the subject)
  All the others in EU
What about research in « Sciences of Universe »?

France: CNRS [2008]
21% female in MPPU (change in the contours, includes maths, physics)
  [20% female in AA 2008 (among SU, the lowest)]

   Grade A (top: DR1+DRCE) : female ~20%
   Grade B (middle: DR2) : female ~21%
   Grade C (starting: CR2+CR1) : female ~25%

Gender advantage for promotion : 1.5 benefit to male

Female proportion in laboratory heads: 10% {pool of 20%}
Female proportion in Hiring/Evaluating Committee: 24%

France: University

Grade A (professor) : female ~16%  EU mean: 11%
Grade B/C : female ~38%  EU mean: 28% to 32%
What about research in « Sciences of Universe »?

Glass ceiling turned ON: when number of promotions gets very low, ie pressure factor increases

How? Large number of applications → limited time for examining/discussing → biases in the peer-review system: gender bias, nepotism & friendship bias, & other unconscious biases

→ Study by C. Wenneras and A. Wold, 1997, Nature 387, 341
(Swedish Medical Research Council)
  * a female applicant had to be 2.5 times more productive to receive same competence score as a male applicant
  * friendship bonus (independant of gender) is of same magnitude

→ The hiring of musicians through a blind procedure → +50%
What about research in « Sciences of Universe »?

Italy (figures 2006 by M. Tosi)

24.4% female proportion in the field
Grade A (merged system): female ~17% U.{2%}
Grade B (merged system): female ~18% U.{12%}
Grade C (merged system): female ~29.5% U.{20%}

Gender advantage for promotion: 1.6 benefit to male

Female percentage among laboratory heads: ?% {pool 17%}
Female percentage in hiring/evaluating committee: ?%
What about research in « Sciences of Universe »?

**UK (analysis of the RAS 2006 and figures by P.Murdin):**

Female proportion **22%** (age slot 20-24) to **12%** (slot 40-50)
Grade A (professor perm.): female ~**4%**
Grade B (snr reader perm.) : female ~**10%**
Grade C (lecturer perm.) : female ~**10%**

Gender advantage for promotion : ?

Female percentage among laboratory heads: ~**0%**  {pool 4%}
Female percentage in hiring/evaluating committee: ?%  

*Positive trends, difficulty at postdoc (delayed tenure-track position)*
Extracted from the RAS-commissioned review of physics of astronomy to the UK Science Minister in 2006:

« …The lack of progress, since the previous review in 2000, in providing a proper career development environment for postdoctoral scientists. This is increasingly recognised as a major deficiency of the UK scientific environment when compared to our scientific competitors. Its resolution will contribute to efforts to attract talented young people into science and to ensuring that women can contribute fully at higher levels in the scientific community. As an illustration of this last point, the Report challenges the UK to have two female academic members of staff in each university physics and astronomy department by the end of the decade (2010). »

Question to our UK colleagues: has this goal been met?
What about research in « Sciences of Universe »?

Spain (figures of the Spanish astronomical society; C. Gallart for the IAC; J. Mesagosa & I. Marquez for the IAA)

Female proportion 32% in the field (SEA figures).

Care using websites (updated?) and astronomical societies
Varies from institute to institute:
Female percentage tenure position ➔ IAC: 12%, IAA: 22%
Female percentage postdoc level ➔ IAC: 26%, IAA: 26%

Head of institute: at least one
What about research in « Sciences of Universe »?

**Greece (figures from greek astronomical society, V.Charmandaris)**

Female proportion at face-value [2006]: 21% (N=165)

Care using astronomical society figures (emeritus included)

According to level:

- Permanent staff → female proportion 18%
- Postdoc → female proportion 28%
- PhD students → female proportion 23%

Members of the GNCF: female proportion 10%
What about research in « Sciences of Universe »?

**Austria** *(from institutes’ websites, and by S. Schindler Innsbrück)*

Female proportion at face-value [2010]: 32%  (N=88)

*Care using website (except for Innsbrück)*

According to level:

- Permanent staff → female proportion 12.5%
- Postdoc → female proportion 45%
- PhD students → female proportion 41%

**Germany, Netherlands** *(pending: difficult to get figures)*
What about research in « Sciences of Universe »?

Switzerland (figures by D.Schaerer, president of the CH-AS)

Female proportion of staff with permanent position: 12%
Female proportion among postdocs: 30%
Female proportion among PhD students: 25%

Notice: a vigorous programme (all fields) for gender repartition improvement was implemented by the federal government in 1999, with quantified goals & funding support. Monitored with great care. Goal for 2007 (14% female professors, doubling the 1999 figure) has been reached. Goal for 2012 is 25%: let’s see
What about research at CERN?

CERN (figures by CERN HR department 2008)

Distribution of female population (all work types included)
(1) Scientific work and research physicists: 1.2%
(2) Engineering: 22.7%;  (3) Technical: 10.7%
(4) Manual, crafts, trade: 1.6%;  (5) Administrative: 63.8%

Female proportion in (1): 7.7%  (N=78)
Female proportion in (2): 11.9%  (N=969)

Staff: 19.9%  (N=2544)
Fellows: 17.4%  (N=276)
Paid associates: 14.8%  (N=371)
What about research in « Sciences of Universe »?

ESO (Faculty) (Messenger by F.Primas 2006). See Primas’ talk

Female proportion: 18.7%
Grade A (full): ~3.4%
Grade B (associate): ~16%
Grade C (assistant): ~32%
Grade scientist (80:20): ~28%
Fellows (postdocs): ~26.3%

Gender advantage promotion: 6.4 – 1.2 benefit to male

Female proportion among division heads: one division head

Percentage of women in ESO Committee [2008):
~6% STC, ~21% UC and FC, ~35% OPC
What about the IAU & other international events?

Presidents and vice-presidents of Divisions & Commissions
[as of 2010]:
Female percentage among presidents: 35%
Female percentage among vice-presidents: 29%

JENAM conference [2007]:
Invited reviewers & SOC (N=72): 10% female astronomers

IYA2009:
Activities in Switzerland: conferences (N=17) → 0% female
The 100 conferences in France: → 29% female speakers
Work recognition

CNRS gold medal [1954-2009] 60 → female 3% {pool 20%}
CNRS gold medal SU [1954-2009] 3 → female 0% {pool 20%}
CNRS silver medal SU [2000-2009] 19 → female 16% {pool 22%}
CNRS bronze medal SU [2000-2006] 38 → female 18% {pool 24%}

Academy of Sciences [2006]:
31 members → female 2% {pool 20%}
15 foreign associate members → female 13%
16 corresponding-members → female 12.5%

Academy prizes, all fields [2009]
81 nominees → female 17% {pool 15% to 20%}
Recognizing female-researcher work

Invited female speakers for seminars at SDU institutes (pool ~25%):
- Paris Observatory [2002-2007]: 12.5%
- Marseille Observatory [2005-2007]: 17.5%
- SAp/CEA [2006-2007]: 11.5%
- IAP Paris [2004-2007]: 13%

Invited female speakers at ESO [1999-2005]:
- Lunch-talk: 17%
- JAC: 10%

Symposia in honor of female astronomer? Very few.

Public media: France-Inter, daily science broadcast « La tête au carré »:
proportion of invited female scientists
2006 → 20% (N=104); 2007 → 22% (N=207); 2008 → 27% (N=326)
2009 → 21% (N=338); 2010 so far → 13% (N=117)
Female-researchers in french decision-making instances

-- **Research grant allocation (F):** ANR (budget 825 MEuros)
   Council, 6 members appointed (& 3 minister representatives):
   >20% women

-- **Advisory Committe for Science &Technology (F):**
   20 appointed members by government: 25% women

-- **Academy of Technologies** (founded 2000), (F), *co-optation:*
   235 members: 4% women

-- **CNRS Committee for hiring/evaluation**, SU: 24% women
   {elected members 30%, appointed members}

-- Percentage of women in **various ESO Committee** [2004]:
   ~0% Science Technical C., ~8% Council, 40% Users C., 40%
   Finance C., ~30% Observing Program C.
In the USA, Canada, Australia, India…

- Great activity on the subject
- *Networks & actions* to promote female researchers: see e.g. the *Wisenet journal* ([www.wisenet-australia.org](http://www.wisenet-australia.org))
- Set of *recommendations*: EQUITY NOW: The *Pasadena* Recommendations for Gender Equality in Astronomy
- Regular Meetings to discuss the issue
- Several analyses published in *Canada*
- **India**: (a) professor level A+B: 4%, (b) fellowship to help returning to research after a child-care break, (c) boost the image of female scientist: « Lilavati’s daughters », etc…
Improving the situation

- **Attract** young female scientists:
  1. Publicize *models*: better recognition of female scientists
  2. Value *differences* in behaviour and give credit to *diversity of approaches*

- **Retain** female scientists: implement *equity* in work recognition and career progression
  1. Develop *mentorship* towards young women scientists
  2. Provide more *flexibility* in mother- & father-leaves
  3. Increase the offer for *childcare centers*, beneficial to both genders
  4. Impulse evolution in *work climates*
- **Stemming in childhood:**

  1. Test in India about drawing a scientist:

     *On 1654 kids:*

     820 girls and 699 boys picture a male scientist

     129 girls and 6 boys picture a female scientist

  2. About a pair of genius-twins in London

     *Asked about how they see your future:*

     - The boy: « president of the country »

     - The girl: « teacher »
Improving the situation

- Maintain awareness:
  1. *Indicators* rather than impressions or feelings
  2. *Monitor* the indicators’ evolution
  3. *Publicize* the output of the monitoring

Unconscious bias can be compensated for by awareness
(cf. *Gender-masqued experience in musicians hiring...* +50%)

- Unveil subtle discriminations
  Work by female researchers suffers from systematic depreciation: peer-reviewers underestimate female performance
(cf. *Diminished by discrimination we scarcely see, M. Urry, Washington Post 2005, February*)
Improving the situation

- Request all top-positions advertized widely & openly
cf. Search committees, male-dominated & under time pressure, often fail into the old-boys networking

- Encourage women-applications to top-positions
cf. Importance of mentorship

- Center of Excellence Women and Science (CEWS), has launched the EU-project for women scientists:
« Encouragement to advance, training seminars for women scientists »: 16 seminars from April 2007 to January 2008

*Europe: an opportunity to make progress on parity and gender equality*
1. Be 100% professional
2. Don’t hesitate to speak up on your work achievements
3. Stay in alert, **fight** for your rights if you feel frustration
4. Look for advice & **mentorship** (a common practice in old-boy networks)
5. Have a five-year career **plan**
7. Pay **attention** to female scientists around you (the « rule » of more than 3)
8. All of us: analysis of **hidden biases**, as becoming aware is necessary (but not sufficient) to apply correction.