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***“WHY DO WOMEN HOLD ONLY 7 PERCENT OF THE LEAD
POSITIONS IN SCIENCE?”***

Gapp survey of the six national reports of the interviews with opinion leaders

[BELGIUM, DENMARK, ITALY, THE NETHERLANDS, POLAND, PORTUGAL]

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Interviews and interviewees

In order to draw a general picture of scientific and technological careers in a gender-oriented perspective, we have decided to carry out in-depth interviews with some privileged witnesses working in the field of research and technological applications in Italy.

This method was chosen because it allows to gather relevant personal information provided by professional figures who are highly involved in science and technology, such as researchers, scholars, businessmen and the likes.

In the seven countries, 58 interviews were carried out on the basis of a well-structured interview model which was accurately followed by the interviewers. The interviews were carried out in May-October 2007 and the sample included 22 men and 36 women. We had set, and subsequently accomplished, the goal of learning and understanding their personal stories, their scientific, cultural and social background and the difficulties they had to face in their career. As the interviewees were chosen within a circle of privileged witnesses – in some cases they are real opinion leaders –, interviewing was also aimed at learning their vision on the future career opportunities for young people of both genders in their field of research or activity. Finally, our witnesses were required to suggest any possible action aimed at reducing the gender gap.

From a methodological point of view, the in-depth interview is a suitable instrument to investigate this reference group, since it provides the interviewer with high flexibility, to be tailored on the interviewee – yet still within a well-structured interview model. Furthermore, it allows to carry out the interview both in person (two cases in our research) and on the phone (nearly all of our cases: nine).

The people interviewed were selected according to some criteria set in order to obtain a balance within the sample as regards: gender, age, scientific discipline, geographical distribution. Their profiles have been drawn up on the basis of their official professional curricula, but also from the answers to their interviews.

They are:

1. **Anonymous-1 (female, Belgium)**, female physicist and professor, working at the Vrije Universiteit Brussel.
2. **Anonymous-2 (female, Belgium)**, female statistician and professor, working at the University of Ghent and the University of Harvard.
3. **Anonymous-3 (female, Belgium)**, female physicist and computer scientist, post-doc researcher at the Vrije Universiteit Brussel.
4. **Anonymous-4 (female, Belgium)**, female doctoral researcher, working at the Vrije Universiteit Brussel on a PhD about the ambitions of women in optics.
5. **Anonymous-5 (male, Belgium)**, male physicist and professor, working at the Université Libre de Bruxelles and initiator of a project about the motivations of girls to study sciences.
6. **Anonymous-6 (female, Belgium)**, female engineer and professor, working at the Katholieke Universiteit Leuven.
7. **Anonymous-7 (female, Belgium)**, female sociologist, working on a European project 'Woman and engineer' at the Katholieke Universiteit Leuven.
8. **Anonymous-8 (male, Belgium)**, male anthropologist, working at the Royal Belgian Institute of Natural Sciences.
9. **Anonymous-9 (female, Belgium)**, female biologist, working at the Belgian Nuclear Research Centre.
10. **Anonymous-10 (male, Belgium)**, male professor in computer sciences, working at the Vrije Universiteit Brussel.

11. **Anonymous-11 (male, Belgium)**, male paleontologist, working at the Royal Belgian Institute of Natural Sciences.
12. **Asger Høeg (male, Denmark)**, MSc in Engineering and BA in Business Administration. Executive Director for Experimentarium. President of ECSITE.
13. **Martin Keller (Denmark)**, Bachelor of pedagogy (kindergarten teacher). UNICEF ambassador. Inventor and host of children's television programs focusing on science and nature: "The nature patrol".
14. **Jannick Johansen (male, Denmark)**, Cand.scient in physics and mathematics and lic.scient PhD. Rector of Frederiksberg Gymnasium. Chairman of the board for Experimentarium, since 1986.
15. **Michael Linden-Vørnle (male, Denmark)**, Cand.scient. and PhD. in astrophysics from the Niels Bohr Institute. Astro-physicist at Tycho Brahe Planetarium in Copenhagen and also at Denmark's Centre for Space Technology, Danish University of Technology.
16. **Anja Andersen (female, Denmark)**, Cand.scient. in Physics and Astronomy and PhD. in astrophysics from University of Copenhagen. Associate professor at Dark Cosmology Centre, Niels Bohr Institute, University of Copenhagen. Member of *Women in Physics* and chairperson 1996 – 2004.
17. **Helene Sørensen (female, Denmark)**, Associate professor. Head of Research group for mathematics and science education at The Danish School of Education at University of Århus. Area of expertise: Gender and Science.
18. **Anne-Mette Geertinger (female, Denmark)**, Chemistry Engineer. Senior consultant at Force Technology (Institute for Technology consulting and development – knowledge and technology-based service provider).
19. **Louise Vignæs (female, Denmark)**, Ph.D.-student. Bio-chemistry Engineer.
20. **Vincenzo Balzani (male, Italy)**, professor of chemistry, he is the coordinator of the doctoral degree course in Chemical Sciences, at the University of Bologna. He is a member of the *Accademia Nazionale dei Lincei*; of the American Association for the Advancement of Science; of the Royal Society of Chemistry; of the *Accademia Nazionale delle Scienze* (also known as the Academy of the Forty).
21. **Sandra Dal Linz (female, Italy)**, Civil Engineer Graduated. Ph.D. in Structural Engineering, she works at Continental AG since July 2000, first doing numerical simulations of tires, afterwards as Tire Development Engineer and Automotive Engineer for the customer BMW MINI.
22. **Stefano Fantoni (male, Italy)**, physicist, director of SISSA, Trieste, since the academic year 2004/05.
23. **Fabiola Gianotti (female, Italy)**, physicist, PhD in Experimental Sub-nuclear Physics. She has worked as a researcher physicist at the CERN Physics Department since 1994. She is vice-manager of the Atlas experiment. She is a current member of the Scientific Council of the CNRS in France and of the Physics Advisory Committee of the Fermilab in Chicago.
24. **Umberto Guidoni (male, Italy)**, astrophysicist and researcher, in April 1998, he was the first Italian astronaut to date to achieve the "Mission Specialist" qualification, being able to fly aboard of the Space Shuttle and of the Space Station. In July 2004 he was elected member of the European Parliament in the group of the European United Left. As a member of parliament, he has dealt especially with European policies in the field of research.
25. **Margherita Hack (female, Italy)**, astronomer, she was full professor of Astronomy from 1964 to 1997 at the University of Trieste, where she also was director of the Astronomy Department. She was director of the Astronomic Observatory of. She is a member of the *Accademia Nazionale dei Lincei*. She was a member of the ESA and NASA work groups for many years. Now, together with Corrado Lamberti, she is director of *Le Stelle*, a science communication journal on astronomic culture.

26. **Rossella Palomba (female, Italy)**, graduated in Statistical and Actuarial Science, Palomba is a research manager at the *Consiglio Nazionale delle Ricerche* (CNR). From 1999 to 2000 she worked as a specialist of the ISTAT (Italian Institute of Statistics) Commission for research on births. From 1999 to 2003 she was chairman of the CNR Study Committee for the Enhancement of the female component in scientific research.
27. **Maria Cristina Pedicchio (female, Italy)**, mathematician, she is a full professor of algebra at the University of Trieste. She is a former president of AREA Science Park of Trieste (2001-2005). She has been president of the Consortium for the Molecular Biomedicine Centre and to the Coordination of the national and international research centres of Trieste and Friuli Venezia Giulia (forty scientific institutions throughout the region) since 2004.
28. **Santi Rizzo (male, Italy)**, Civil Engineer, is a full professor of building technology science, having worked first in Catania, then in Palermo. From 1994 to 1999 he was dean of the Faculty of Engineering at the University of Palermo.
29. **Vittorio Silvestrini (male, Italy)**, professor of General Physics at the Faculty of Engineering of the University "Federico II" of Naples. He has founded the science centre "*Città della Scienza*" in Bagnoli (Naples) and is president of the IDIS Foundation (Institute for Scientific Culture Spreading and Enhancement). In 2006 he was awarded the European Descartes Prize for Science Communication.
30. **Flavia Zucco (female, Italy)**, biologist and researcher, she is a first researcher at the Institute of Neurobiology and Molecular Medicine of Rome. She is a former member of the Scientific Council of the Institute of Biomedical Technologies of CNR and of the Management Board of the University of Rome "Tor Vergata". Since 1988 she has been active in the "Women and Science" field. In 1998 she was appointed as a member of the "Study Committee for the enhancement of the female component in the field of scientific and technological research" of CNR.
31. **Hester Bijl (female, Netherlands)**, Antoni van Leeuwenhoek Professor at the Faculty of Aerospace Technology at the Delft University of Technology, Chair in Aerodynamics. She is member of the Young Academy of the Royal Netherlands Academy of Arts and Sciences, the KNAW. In that capacity, she is involved in the Jongste Akademie: a website for elementary school children in grades 4-6, where children can learn to do research. In addition, she is a member of the scientific panel of the television programme 'Hoe?Zo!'.
32. **Robbert Dijkgraaf (male, Netherlands)**, university professor of Mathematical Physics at the University of Amsterdam. In 2003, he was accepted into the Royal Netherlands Academy of Arts and Sciences, and won the NOW/Spinoza Prize, the most important Dutch award in the sciences. Starting in May 2008, he will be the new president of the Royal Netherlands Academy of Arts and Sciences. He is a member of the Commissie Vernieuwing Natuurkundeonderwijs HAVO/VWO. He writes for newspapers and periodicals, including the *NRC Handelsblad* and the *Groene Amsterdammer*, and is a frequent guest on television programmes.
33. **Ewine van Dishoeck (female, Netherlands)**, professor of astronomy (molecular astrophysics), Faculty of Science at the Leiden University. She is involved in the construction of a gigantic radio telescope park (the Atacama Large Millimeter Array, ALMA) on a tableland in Chili, which should be complete in 2012. This is an enormous project, with a budget of over 1 billion euros, and participants from Europe (European Southern Observatory, ESO), America and Japan. She is a member of the Royal Netherlands Academy of Arts and Sciences, and won the NWO/Spinoza Prize, the most important Dutch award in the sciences, in 2000. She had already received a pioneer subsidy from NWO (Netherlands Organisation for Scientific Research) and the Marie Goeppert-Mayer Award from the American Physical Society.
34. **David Reinhoudt (male, Netherlands)**, professor of supramolecular chemistry at the University of Twente, soon to be retired. Until 1 January 2007, he was the scientific director of the MESA+

institute, a large scientific institute in the field of nanotechnology. He is also the chairman of the board of Nanoned, a consortium of nine Dutch research groups in the field of nanotechnology that is financed by the national government. He is also a member of the Royal Netherlands Academy of Arts and Sciences. He has received a number of awards, including Knight in the Order of the Dutch Lion in 2002.

35. **Arie Kraaijeveld (male, Netherlands)**, former chairman and general director of FME-CWM, the business organisation for the technology-industrial sector. He is the chairman of the Platform Bèta Techniek, which has been commissioned by the government to increase the numbers of students graduating from the exact sciences and technology studies by 15% before 2010, compared to the 2000 levels. He is also chairman of the Netherlands Water Partnership (NWP), which includes Crown Prince Willem-Alexander among its members.
36. **Yvonne Schaap (and Paulion van Hof) (female, Netherlands)**, senior policy employee at the Department of Research and Scientific Policy (OWB) of the Ministry of Education, Culture and Science. Within the department of OWB, she is the point of contact for the exact sciences and technology. The Secretary of the Platform Bèta Techniek is the Higher Education Department. She is also a member of the programme committees for the European programmes 'Science in Society' and 'People', as well as the so-called Helsinki group that was set up by the European Commission to stimulate women in science.
37. **Leo Schoonderwoerd (male, Netherlands)**, Policy worker, Department of Secondary Education, Ministry of Education, Culture and Science. He works for the Education Quality department, where he is primarily active with Upper General Secondary Education and pre-university secondary education. In recent years he has been involved in subjects such as the 'Studiehuis' didactic approach and the Second Phase. He is currently active working on profiles. Within the Department of Secondary Education, he is the point of contact for the exact sciences and technology.
38. **Pim Schippers (male, Netherlands)**, member of the board of the organisation for school deans and student counsellors (NVS-NVL). Within the organisation, he is the chairman of the Upper General Secondary Education and pre-university secondary education deans in the Netherlands. He is also the dean of the Minkema College in Woerden. As school dean, he is active in helping the students in Upper General Secondary Education and pre-university secondary education to choose their profiles, their higher education study and to a lesser degree their choice of profession. His task as dean is to supervise the mentors who provide the actual student counselling.
39. **Cocky Booy (female, Netherlands)**, director of the VHTO (Women and Higher Technical Education), the national expertise bureau for girls/women and the exact sciences/technology. She is a member of the board of the Technasium foundation, which provides extra emphasis on teaching the exact sciences. She is also member (and former chair) of the European Association for Women in Science, Engineering and Technology (WiTEC), as well as a member of the audit committee of the Universum programme by the Bèta Techniek Platform.
40. **Katarzyna Niemirowicz –Szczytt (female, Poland)**, PhD and professor, biologist, genetics, breed and plant biotechnology, deputy dean of SGGW (Warsaw University of Life Sciences)
41. **Barbara Popielowska (female, Poland)**, PhD, geophysics and atmospherical physics, deputy head in charge of science in the Space Research Centre in the Polish Academy of Science
42. **Teresa Regińska (female, Poland)**, Ph.D., mathematician, numerical analysis, deputy director in charge of general matters in the Institute of Mathematics in the Polish Academy of Science.
43. **Anna Romanowska (female, Poland)**, Ph.D., Division of Algebra and Combinatorics in the Faculty of Mathematics and Information Science in the Warsaw University of Technology. Algebra, esp. Abstract algebra and modules theory (abelian and entropic algebras)
44. **Krystyna Czarnecka (female, Poland)**, Ph.D. and professor, geologist, tectonics, dean of the faculty of Geodesy and Cartography in the Warsaw University of Technology

45. **Irmina Herburt (female, Poland)**, professor, mathematician specialising in geometry, dean of the Faculty of Mathematics and Information Science in the Warsaw University of Technology
46. **Magdalena Fikus (female, Poland)**, professor at Institute of Biochemistry i Biophysics in the Polish Academy of Science, Head of the Warsaw Scientific Festival
47. **Jolanta Lipszyc (female, Poland)**, physicist, head of the Bureau of Education in the Capital City Warsaw
48. **Katarzyna Józefa Chałasińska – Macukow (female, Poland)**, physicist and professor, Information Optics, provost of the University of Warsaw
49. **Isabel Ribeiro (female, Portugal)**, engineer and professor at the Instituto Superior Técnico (IST). She specialised in control and robotics, as one of the first Portuguese researchers in this domain. She has led the Mobile Robotics Laboratory of the Institute for Systems and Robotics since its foundation. During the year 2006 she was the director of this institute.
50. **Lídia Ferreira (female, Portugal)**, a physicist, is also a professor at the Instituto Superior Técnico (IST). She completed her doctorate in Oxford (UK) and carried out post-PhD work in Denmark, both in theoretical physics. Since then she has been teaching nuclear physics at IST, with responsibility for a number of courses. Currently, she is also the vice-president of AMONET, the Portuguese Association for Women in Science.
51. **Alexandre Quintanilha (male, Portugal)**, a biologist and theoretical physicist, is one of the most well-known Portuguese scientists on account of his impressive curriculum, his regular collaboration in popularization events and his occasional presence in public debates. He was invited to teach at the Instituto de Ciências Biomédicas Abel Salazar, one of the most prestigious Portuguese universities in the life sciences field, and he became the coordinator of the Instituto de Biologia Molecular e Cellular, a high-quality research unit (at national and international level).
52. **Jorge Buesco (male, Portugal)**, a physics graduate, has a Phd in mathematics. Currently, he is a professor at the Science Faculty (University of Lisbon), a post taken up after teaching linear algebra and mathematical analysis at the Instituto Superior Técnico (IST) over a period of 20 years. He is best known for his active participation in popularisation events and public debates on science, mathematics and education issues. He has written a number of well-known popularisation books, in which he tries to stimulate public interest in mathematics, exploring quite curious mathematical applications and challenges.
53. **Conceição Zagalo (female, Portugal)**, director of the Communication and External Programs Division of IBM Portugal, is in charge of the company's corporate responsibility projects and she has been particularly active in the development of new programs concerning women and education issues within IBM, both at a national and international level. She is now the only woman on the IBM Portugal board of directors.
54. **Ana Cristina Guimarães (female, Portugal)** is an economist with an MBA and a post-graduate diploma in European studies. After about 20 years in the public service – working in the field of foreign business and innovation policy – she became Chief Operating Officer at Critical Software, a young Portuguese software company that has been quite successful at an international level.
55. **Teresa Mendes (female, Portugal)**, an engineer, gained her first degree in electronics, after which she specialised in IT. Following her PhD in the UK, she returned to the University of Coimbra (Portugal) to teach and to participate in several R&D projects. Currently, besides teaching, she is the president of the Instituto Pedro Nunes, an interface institution that aims to link the University of Coimbra and private hi-tech companies, promoting technology transfer and supporting spin-off projects.
56. **Manuel Heitor (male, Portugal)**, an engineer, has been the Secretary of State for Science, Technology and Higher Education for the Portuguese Government since March 2005.

57. **Lígia Amâncio (female, Portugal)**, a social psychologist, is currently vice-president of the Portuguese Science and Technology Foundation, the main national organism for S&T public funding. After finishing her first academic degrees in Paris, she returned to Lisbon to teach and do research in the Instituto Superior das Ciências do Trabalho e da Empresa, one of the most prestigious Portuguese academic institutions in the social sciences domain.
58. **José Azevedo (male, Portugal)**, a psychologist with a doctorate from the University of Wales, is currently teaching and carrying out research at the University of Porto (Portugal) in the field of sociology. He is specialised in communication theories, knowledge issues, the public understanding of science, and identity and gender. Among other national and international projects, he was responsible for Portuguese participation in the ROSE Project (a project on science education and students' motivation regarding S&T).

Obstacles in the life stories

In most of the biographies the issue of gender does not turn up and is not a matter mentioned by itself. The interviewees perceive this discrepancy as natural, enrooted in cultural and sometimes biological differences.

(female, Poland): *"for a long time it wasn't a problem for me. I mean that I didn't know that it was a problem, that being a woman means a problem. Actually in the Warsaw University of Technology so few people approached mathematics in a creative way, that I did not see any differences between men and women. Of course, when you read handbooks or theses, they were mostly written by men, but it was obvious, because up to some point women mostly stayed home and didn't deal with science. So they couldn't have been authors, so it wasn't a problem at all for me".*

All of the interviewees – men as much as women – highlight some aspects in which their gender has always played an active role for their career. Not in all cases they are negative highlights – on the contrary, some advantages provided by gender are frequently mentioned. It is possible to identify some lead threads to describe the different levels of the issue.

On the top level, the deepest one as it involves the entire society: sexist prejudices emerge very soon and concern girls in particular.

(female, Poland): *I think that feminine brains work in a different way than masculine*

This is something that keeps them away from a basic scientific education and later, at university or in the first stages of their academic career, this is a major obstacle.

(female, Italy): *"Experience shows that a good deal of the difficulties girls have in scientific studies depend on a widespread prejudice that wants girls less apt to scientific subjects and more willing to carry out literary studies. I think this is a prejudice dating back to the early 20th century, when frequently girls weren't even admitted to 'Liceo' secondary schools, nor to college. If you have some aptitude for writing, or for literary subjects, even though you don't have a deep basic education, you can succeed. Whereas in scientific studies, especially in hard sciences, without a basic education it's quite difficult to succeed in your career. So, without the chance of accessing a 'Liceo', you cannot succeed at university. Maybe it has created this*

prejudice that says girls are less apt to scientific studies. This prejudice has been apparently disproved because in faculties the number of female students is now quite high: I believe they account for 50 percent of the maths students, perhaps a little less in physics and chemistry – and in engineering, where they were just a small minority, their number is increasing.”

(female, Poland): *“All these divisions, both in natural sciences and technology, well, it is natural that boys take more interest in them”.*

Men recognize that their gender has had an influence on their career.

(male, Netherlands) thinks that he would probably never have become the chairman of the FME if he had been a woman: *“The technical field in our country is a completely male-dominated world. I was lucky, but I can imagine that if I had done the exact same work as a woman, that I would never have become the chairman of the FME”.*

As regards the gender issue, it is impossible to talk about any significant differences between the careers path of Portuguese male and female interviewees. Many of the women we contacted are identified in the Portuguese S&T community as “success cases”, and a number of them have achieved high office in their institutions. Nevertheless, it is interesting to note that, despite their similar careers, men and women register slightly different perceptions of the obstacles they might have faced.

Having started their careers in fields of work traditionally dominated by males (the number of women in S&T in Portugal was even more limited then than it is now), some female interviewees mention the feeling that they have always had to give greater proof of their competency, and that they have to work even harder than men in order to succeed.

(female, Portugal): *I had always had the feeling that I was continuously being judged... that I always needed to prove my quality, (...) I was often the only woman. I think men never feel this*

Sexist prejudices also interfere in ordinary social interaction.

(male, Italy): *“There’s no doubt that being a man facilitates some choices, and the way you are received certainly is not biased. You don’t have problems in introducing yourself, while this is less frequent for women.”*

Yet prejudices are even more evident when responsibilities must be shared and distribution of power is concerned, because historically men are in control.

(female, Italy): *“Italy is very male chauvinist, I have to say. When we met president Bianco a few years ago as CNR staff, he had appointed a male-only committee to assist the new management of the organisation. We were enraged, so I and other three CNR staff wrote him a letter saying, what have you done. He then accepted to meet us and told us: ‘what do you want from me, in this job I need to be supported by some friends.’ And his friends were all males. These two concepts don’t need any comment at all. In any case, there isn’t any sensibility on the fact that even women can provide their contribution. If you claim it, you’re seen as an old-style feminist: ‘oh, here come the old-style feminists’, someone shouted at me at an assembly*

of lecturers, all of them. It's a question of cultural backwardness, and a question of power too, they don't want to hand over the leadership."

(male, Denmark): *"there are some things that are defined by culture - things which everyone drinks in with their mother's milk and I'm certain that it's easier to get by in scientific studies if you are a man, because women sort of have to prove themselves a little more. This need to prove themselves may also be for their own benefit – they want to prove to themselves that they are just as good etc, whereas the rest of us can sort of 'wing it' just because we're men. I mean, there are definitely some gender-specific problems in the process, but if you talk about making the actual choice, I think that cultural obstacles are a factor when you decide which way to go, study-wise. It's something that's established much earlier, maybe even before you start school, but it definitely changes during the years in school because of the way teaching is handled".*

A female researcher is first seen as a woman and then as a researcher. It is not always easy to steer clear of this mechanism and to focus the attention on the professional and research level.

(female, Italy): *"Well, I have to say that personal relations sometimes are, or were, strongly affected by this feeling that that first comes the woman, then the researcher, and you can tell by other people's attitudes. Being my family of origin a sort of matriarchate – there were only a few men, alas! who even died very young – we are used to fight these things, and to get our way for what we are. I have to say that this sort of things have annoyed me, yet never hindered me."*

Interviewer: "What do you mean when you say that first comes the woman, then the researcher? That she's taken less seriously?"

(female, Italy): *"Precisely. A dialogue starts like 'wow, that blouse really suits you.' Which obviously is a way to wrongfoot you, although in a friendly way, because this kind of things would never happen to a male colleague. If someone starts a dialogue like that, it's clearly a way to wrongfoot you, but I've never taken a false step."*

Quite a typical and rooted sexist prejudice derives from the alleged belief that girls are not good at maths, which is obviously groundless.

The amount of obstacles or the perception about it varies a lot within the group of interviewees. Obstacles were sometimes perceived as soon as secondary school but only by female interviewees: the choice of the amount of hours in maths and science at school is an important factor that is often influenced by the parents who think

(female, Belgium): *"They thought it wasn't a girl's thing",*

by peers

(male, Belgium): *"My daughter chose 8 hours of maths but there were only boys in her class and she tried to convince other girls to do it too because she didn't want to be in a class with only boys"*

or environment (e.g. studying at a girl's school with few maths).

Having parents who have studied or worked in exact sciences has, on the other hand, a positive influence on choosing to study exact sciences. Having supportive teachers can help too.

(female, Italy): *"This belief does exist, I remember when I was at school, at middle school, they used to tell us 'you girls shouldn't go to college to study maths, or engineering.' As a teacher, I've never noticed any difference between boys and girls, absolutely."*

However, in the final analysis, the scientific milieu probably is one of the less prejudiced within the academia.

(male, Italy): *"It's true that scientific disciplines most probably are the less prejudiced, yet some difficulties are there all the same. I get the feeling that even if there were more services, much more subsidies than the present ones for your children's education, etc., it would be a problem all the same."*

Another important issue in S&T careers is the competitiveness one. Competitiveness, when it is concrete and influences your everyday life, concerns especially your time management.

(male, Italy): *"I've had several female colleagues since the very start. I'd say that there aren't real obstacles for women in the university milieu I have seen. On the other hand, obstacles do exist in the way our society is organised and consequently, because of the more limited amount of time a woman can devote to research."*

(female, Belgium): *"I abhor self-promotion. I think women in general have more that kind of engagement and want to care about people, whereas men make use of people"*.

(male, Belgium): *"Making career comes in the second place and I notice that it is so with a lot of women: They just don't think about asking promotion. I asked promotion by coincidence, if this hadn't happen, I wouldn't be where I am now..."*.

Then, competitiveness needs training and education. In Italy, this is not always tackled properly, with teaching not yielding the expected results.

(female, Italy): *"In very competitive sectors, education is fundamental, yet perhaps competitiveness is less boosted in girls than in boys. One may have a competitive character, yet the trend is, or was... – I am not informed on the present situation – to spur more competitiveness or aggressiveness in boys than in girls. If you want to make a career, you must be competitive. Yet feminists themselves, if I remember well, used to say that being competitive and fighting was a disvalue to women. Which is an absurd supposition. Because... [research] is competition. And I also believe that practising a sport is fundamental. Sport helps you to learn how to be competitive. Yet once again, girls are only a minority in sport practice. Yet it is fundamental. I've always believed sport is fundamental. They say I have a passion for astronomy, well not quite so... I've had a passion for sport. And I still have it. Sport thrills me, science is a little different. Science is something that may deeply involve you, but passion is something else."*

In the end, in a researcher's everyday life, competition with one's colleagues plays an important role and if one is not used to compete, one risks being excluded and not being able to work at ease with the necessary instruments and resources.

(female, Italy): *"Surely among my colleagues there was competition for resources, which were not plentiful. By resources I mean space, staff, equipment."*

Political correctness is one of the thorny issues that can be interpreted and implemented in two even opposite ways. Some Italian interviewees stress that political correctness can become a barrier when one has to select staff for managerial positions.

(female, Italy): *"When I applied for the position as the director ..."*

Interviewer: "So, there was an open recruitment for the position as the director..."

(female, Italy): *"Precisely, there was an open recruitment process for that position and I ended up ranking second, of course. And guess what the... the management board, let's say, told me: on this occasion, being a woman does not count. Which meant: we don't apply an equal opportunity policy to an executive position. Yet it's exactly what needs to be implemented there [...] Being a woman counts in a politically correct perspective, only as a smoke screen to the outside, but when one has to choose between two candidates who achieved equal results in the assessment, then being a woman doesn't count any longer."*

On the second and probably more specific level of research, there are: movements and transfers as necessary professional procedures in the life of a researcher; the dynamics of young people recruitment and stabilisation; the distribution and allocation of resources – financial but also infrastructural ones.

Most of the interviewees started their professional careers in academia – though some of them are currently in politics or management. After finishing their first degrees in science or engineering, most of them went abroad in order to continue their studies and obtain their doctoral and, in some cases, post-doctoral degrees. Many of them stress those experiences abroad as one of the most important aspects of their professional careers.

(female, Portugal): *"After the PhD, it was enthusiasm all the way! It was the best period – the setting-up of a team, the European projects, the projects with industry, the creation of the institute... After that period, we began to have no time to develop our ideas, to participate directly in projects; we are essentially guiding others. This is the usual path in these careers, but I started early... to be invited to do so many different things, to supervise, to do science management... It is not the same".*

In fact, research requires freedom of movement and support when "hard" choices are to be made. In this regard, a family that follows and supports, or that hinders and holds back can make a difference. Males, in contrast to females, usually report stories of a supporting family.

(male, Italy): *“Certainly as a man I’ve had much more freedom. I was lucky as my wife followed me. It’s difficult to have a career as successful as I consider mine without support from your family. I couldn’t do without. It’s true in a dual sense: firstly, because as a man you’re freer and there are less prejudices, it’s easier; secondly, because my family has strongly supported me.”*

Recruitment emerges as an issue from many Italian interviews. It will suffice to quote one for all, as it clearly represents the conflict between willingness to work and sacrifice yourself (“hard work”) on the one hand, and not very clean personnel management on the other.

(female, Italy): *“In order to become a professor you need to work hard. Especially if you don’t pull strings or exploit your family!”*

Furthermore, recruitment is founded on a pre-selection in which women reveal all the prejudices, stereotypes and the self-exclusion mechanisms they interiorise. At the top levels, dynamics are driven by the power relations an organisation is inevitably involved in.

(female, Italy): *“Within CNR the women committed to scientific research account for 30 percent of the total staff. Not half the personnel, just 30 percent and at managerial level they account for 7 percent.”*

Interviewer: “Right. Why are they 70-30? Why do you believe there is this gap?”

(female, Italy): *“Well, there are two reasons, I suppose: the first is that to enter a scientific career, to get started with it, let’s say, you need to receive support; nobody starts a career for a merit. So, this is the first element. Everybody knows that when you apply for a position, the first thing you are asked is “Who sent you here?”, which means who supports you, not how good you are. So, this is the first difference. The second one is that – at least within the structure of my organisation – there are many disciplines in which women are poorly represented, also as regards the number of graduates: engineering, chemistry, physics and so on.”*

Interviewer: “Why do women hold only 7 percent of the lead positions?”

(female, Italy): *“If vacancies were continually announced, and therefore if careers were constantly open, probably there would be more women at the top levels. Instead, there are vacancies in state jobs once in a blue moon, and chances are very limited. This is the first issue. Then again this meritocracy issue and, last but not least, the issue of stereotypes. Women do interiorise very well the mechanisms of self-exclusion from open recruitment: firstly, women usually already have a family, haven’t they? And research is an all-encompassing job, requiring time, commitment, etc., colliding with other aspects of life... This is very clear to women, so they say: as a researcher I do my decent job as an employee, and if I aspire to executive positions, I need a greater investment in time, commitment, etc. so I’d rather give it up.”*

Quite interestingly, the same percentages at the bottom level (30-70 percent) and at managerial level (10-90 percent) are to be found in a German private organisation such as Continental.

Interviewer: "Within your company, what's the staff distribution between males and females?"

(female, Italy): *"As a whole, I'd say about 70-30."*

Interviewer: "This is in general, what about the managerial positions?"

(female, Italy): *"Probably 90-10".*

Interviewer: "So, as we speak, the situation can compare to the Italian one, for example."

(female, Italy): *"Yes, it is my belief that women have started to enter or to hold some positions, even at a bottom level, I mean technical positions, only very recently, much more recently than men. Only lately at Continental do young people occupy managerial position, so I believe that with time this gap will be filled, but it takes time. Up to recently they were all men of age, let's say over 50, those who held certain positions, whereas now there are also younger people aged 30-35-40."*

This remark may lead to a reference to the long wave of repercussions of the seventies that are still in place.

Finally, the most relevant issues concern family and personal life. At this level there are: the role played by a married partner – often, the positive role played by wives; the education you get from your origin family; the obstacles at psychological level that a woman inflicts on herself.

But, on the contrary, in the personal sphere there are also the opportunities that a woman gets from being more visible in a group of young researchers.

Obviously, the role of a married partner is particularly relevant when there are also children to bring up.

(female, Italy): *"Of course! It needs a support from... well, because a family, you see, requires that one or the other or both partners sacrifice themselves for a certain period of their lives, if they want to bring up some children. This is why some subsidies from the state are very much needed."*

Interviewer: "There. In that sense, what do you... Do you believe that Italy is somewhat lacking anything?"

(female, Italy): *"Yes, I suppose. For example, France provides much more assistance. In other words, much more day nurseries are needed in universities... In short: where there are women at work, where there are*

young families, there's more need for day nurseries, kindergartens and full-time schools, so that your children's growth can be followed until they are more independent."

A small disadvantage of being a woman involves having children and care giving.

(female, Netherlands): *"Women tend to value children and family more than men".*

International experience is very important for gaining prestige in the scientific world.

(female, Netherlands): *"I've been abroad a lot, but it's a lot of work to take children with you to the United States. It's not as easy as going alone for a short period".*

There is a social pressure different on wives and husbands, male and female scientists, male and female workers:

(female, Denmark) finds it interesting that she would have gained several levels of acceptance if she had decided to give up her research career, as opposed to if a man had made a similar decision: *"if I had said 'really, I think it's too hard and takes up too much of my time and I'd rather spend more time with my children, so I've decided to become a teacher at a gymnasium or do something different, altogether', employees at the kindergarten would have clapped their hands - my mother-in-law, my mother and my friends would have, too. I would have gotten bonus points all around. But if my husband had made that decision, it would have been regarded as a failure. I'm fairly certain that we shouldn't envy the men this tiny bit of extra, external pressure, because it's not at all desirable not to have the freedom of choice, if you really want something different. It makes it easier for women to decide against something or to go in a different direction, which is both good and bad, because when it comes to applying for jobs, there aren't as many applicants. On the other hand, applying the same pressure to women might not be all great, even though men would have the same opportunity to decide against something, without it being deemed a failure. I think it's very complicated – it's difficult to pinpoint an exact solution".*

Men's words reveal the sacrifice his wife had to make, by leaving her university career; but also the opportunities this sacrifice of hers has opened for themselves.

(male, Italy): *"In the early seventies, certainly [as men] we were favoured, given the way society was structured back then. For example, my wife, a graduate in natural science and an assistant professor at university... when we had babies, she had to move from university to secondary schools to devote more time to household work. Surely this was a career downscaling that she chose in order to favour my career."*

(male, Italy): *"Thereafter, I got a university chair, but in Pisa they couldn't employ me [...] I had to go to Lecce, from where I had to commute to Pisa, as my family was still living there. My plan was to spend five years in Lecce to subsequently go back to Pisa. This is what I thought, at least at the beginning. Then in Lecce I actually developed a different line. Maybe I grew more in terms of management. In short, I developed more managerial prospects than I had before. There, for example, I assisted INFN in establishing*

the INFN department of Lecce, I tried to put together a group of nuclear astrophysicists. It wasn't all I wanted, but I managed to implement something. Up to the point when maybe I'd have liked to stay, because I had set up some things and then because Lecce is a lovely, wonderful place and I'd got to know it. But my family saw Lecce as an extreme end of the world and I didn't manage to convince them to move there. Nevertheless, I was weary of being a commuter and I had to make an ultimate decision for my headquarters. Pisa wasn't within reach and I didn't even take it as an option because it wasn't the ideal place for my ambitions. If I had gone to Pisa, I'd have done substantially what I did before and I wasn't enjoying it any longer. So, I had to look elsewhere and two opportunities came up: Milan or Trieste. My wife already knew Trieste, we had visited it a few times when she was pregnant. In short, I liked Trieste, whereas I didn't like Milano at all."

(male, Netherlands) emphasises that a job like his is very difficult to perform successfully in a situation in which every family has two working partners. One of the partners has to sacrifice his or her career to make the other person's possible: "*In order to make it to the international top, you have to work at least 70 hours per week. You're away from home at least 10 weeks per year, otherwise you can't earn international esteem. You're never home in the evening, so if you both want to have a job like that you either have to forget having children, or you have to find another solution. Some women in my immediate surroundings don't have partners. Others are professors who have a partner willing to sacrifice his career for her's. That happens more and more often. You just can't do our job in 35 hours per week"*.

Some interviewees attach an important role to the educational choices received from one's origin family and, even before that, to the role models a family passes on.

(female, Italy): "*In a family, people often tend to attach a role to children already when they're very young, imposing on them certain toys and certain games instead of others and I believe this is extremely harmful. It's a disadvantage I didn't have, because back at home mother and father were perfectly on a equal footing, they equally shared all the household chores and I was free to choose my games, to choose the games I wanted. And therefore to feed my aptitudes."*

The family of origin, obviously after having provided an upbringing, guarantees also the maintenance of the children during their studies and, more and more frequently, even during the first phases of their inclusion into the work force and research. When living on your family becomes too heavy, then excellent brains get lost as they change path, forced to choose less risky and costly careers. This is a problem that invests all the young people, but probably it hits women slightly more, as they have a biological time within which they need to be independent and to create their own new family.

(female, Italy): "*In Italy there are many brilliant young people and there aren't many jobs, but it's not an obstacle, it's a problem I only considered when I had got my degree. Shall I carry on with this activity or not? I've carried it on because I fixed a deadline, two years later I got my doctoral degree, I was married, I had a family who could support me. I can see that there are young people who still have a family that cannot afford to wait. Now times have stretched, today a young graduate in physics, before getting a stable job*

must wait until they're forty; and the young people who have a family or that don't want to live in uncertainty, well, they change their path. This way many brains get lost."

For most of our interviewees the time of primary and secondary school is a distant past. All the undertaken choices and decisions dealing with educational careers and their causes are vaguely remembered. Preferences in natural sciences occur in different periods of life and are not recognised as dominant in the preliminary phase of educational career.

(female, Poland): *"school always influences somehow, that's true, but it's hard to say, to what extent. Well, I have always been quite independent, so I didn't give up easily at school. I was an average good student and mathematicians liked me, right (laughter), because it was relatively easy for me, all that at school. I was independent because simultaneously I attended a musical school and some teachers didn't like me because of that, but I didn't give up to that influences. A teacher once told me, listen Ann, you are too intelligent to play second violins for a life time, so look for other studies, so I childishly thought that mathematics would be best because it was easiest for me".*

This vocation appeared early (during childhood or adolescence) – in some cases resulting from contact with a role model or science popularization books, in others due to the excellence of certain teachers and the learning opportunities provided by certain secondary schools (e.g. learning through laboratory experiments). The enthusiasm felt during those first years of studying remained relatively constant.

(male, Portugal): *"My interest in physics started early, during adolescence. At the time, we did not have all the resources that are now available, but I started to read all the popular science magazines I could find! When I was about 14-15 years old, it became clear to me I would like to understand the universe! It was a passion that ended up in marriage!"*.

(female, Portugal): *"This area has always fascinated me. I remember I was reading popular science books all the time. (...) And I also had very good secondary school teachers, with very good laboratories. Otherwise, I think I would not have chosen this profession".*

Almost all of them stress the importance, for the emergence of a scientific vocation, of early contact with science and with practices that could raise the youngsters' curiosity about the world. Some also point to the importance of having positive role models and to the critical role of family, mainly in creating the conditions for a free and secure career choice.

(male, Portugal): *"[My family] gave me the feeling that I could be whatever I would like to be, whether others liked it or not; it gave me great independence in my own life project. (...) I think that I was very lucky. Many young people do not benefit from this kind of environment. (...) My father was working in the science field, and I think that my interest in science has pleased him; but, for my mother, the most important thing was my happiness. (...) This is a great lesson. It gave me a sense of security and optimism that allowed me to become whatever I wanted. (...) I also had a very good biology teacher (...) who took us to the countryside, who gave us lab experiments to do (...)".*

There is a particular aspect in the self-inflicted obstacles: a female researcher runs the risk of identifying herself first with a researcher and then with a woman, and therefore she may limit her femininity not to

hinder her professional choices: this is a problem complementary to the one previously outlined in this chapter, the other people's attitude in seeing you first as a woman and then as a colleague of theirs. This problem is frequently reported by our interviewees and it is likely to be a reason that keeps young women away from research.

(female, Denmark) says that *"what goes up, most definitely comes back down, when you're a woman in an environment like this. There is no doubt that everyone pays extra attention to what you say and do as a woman in an environment consisting mostly of men"*.

She says that this also has a positive side to it: *"[...] but also in a good way – I'm offered more chances. But these extra chances make mistakes all the more disastrous and I think women tend to be more affected by mistakes. I've participated in meetings where we had to prepare presentations and I hadn't quite found the time to prepare properly. So I'm sitting there with an ache in my stomach and then it turns out that the others might not have had the time either, because 'there was a football game on TV' or something like that. My expectations of myself and promising to have something done are much higher"*.

(male, Italy): *"Surely, if I had to evaluate the constraints I had comparing to the constraints my wife had, I must say that I could enjoy a freedom of movement impossible to achieve if I were a woman, a woman that wanted to be a woman, to have children and settle down."*

Take as an example the statements of the young interviewee who says that she was self-influenced when she refused a promotion to a managerial level position, owing to her pregnancy.

(female, Italy): *"I have to say that I hadn't encountered any obstacles up to that point, then it was me who created them more than any other thing. On second thought, probably going back I wouldn't do it anymore and I'd act in more realistic way by saying, ok, I'll accept this position for now, then we'll see..."*

In conclusion, the words quoted below highlight that, in a framework of scientific competition based on high-level international standards (and not on local micro-dynamics), being a woman can also be a further opportunity, because it undoubtedly favours visibility. When the benchmark is given by one's ability and merit, on the same level, being visible is an advantage.

(female, Italy): *"The issue of equal opportunities has been much debated especially in Canada, where I spent a long time. When I started to travel abroad, especially to Canada, everybody asked me "how did you do it?", "how did you manage to get here?" The first time I didn't even realise what they were talking about, so they would tell me "you, as a young woman, how did you manage to become an associate professor?" Because, you see, they have only a few women there. If you ask me, being a woman in the world of research... I've never seen it as a discriminating or negative factor; it has always been a very positive factor. Even because I was in this group of experts, fifty international specialists, my discipline there was*

represented by three women, me included. Therefore, for the fact of being a woman, people remembered me more easily, in an environment totally based on a scientific evaluation."

(female, Netherlands) thinks that in her case it was an advantage that she works as a woman in a man's world: *"One advantage of being a woman is that people remember you easier. If I had been a man, I might not have been on television and I would have been much less visible"*.

(female, Netherlands)'s personal experience was also that she only benefited from being a woman. *"I was always the only woman in the class, especially in physics courses. I always arrested the attention. If you do well, the lecturer or professor learns your name quickly. What I also noticed is that everyone realises exactly how few women there are in the exact sciences. ... Everyone was looking for female candidates. I think that I definitely profited from that wave. It wasn't positive discrimination, but an active recruiting policy to look for female candidates who for one reason or another don't get noticed as easily. Recruitment committees play a very important role in the process"*.

(female, Italy): *"Both at AREA and here at CBM we have more women than men, also because biology involves so many female researchers. Biology is a sector we are strongly supporting, it has boomed in the past few years. Yet here, at our centre, there isn't a pre-established job division between a number of women and men; what we are trying to apply very strictly is a meritocracy criterion; and through meritocracy criteria women did come up, sometimes even more numerous than men. On the other hand, I'd like to mention the European statistics everybody now talks about in Italy and in Europe: graduated women prevail on men, they get their degree sooner and with better marks. Well, this trend is now reaching the doctor's degree level: today, this group of women is involved also in doctor's degrees, there are more women in quantitative terms, but also in terms of better qualitative performances. [...] Women are also more mobile because they are more curious, culturally more interested in making this kind of experiences. In any case, we all know the famous scissors diagram, where you see a peak – many women at the bottom levels –but then you see a decrease as you further advance in a career."*

Every Portuguese woman underlines her motivation and competence as the major keys to her success. Some prefer to state that gender was never felt as a significant obstacle or that they have never even thought about it. Others, however, tend to be more critical concerning gender issues at work. They point out several discrimination situations, which they think do not necessarily result from a deliberate exclusion policy, but from the fact that most of their colleagues tend to be male, and most of the organisations are still ruled by a male culture. In that sense, they mention their difficulty in joining sociability networks or lobby groups in their field of work, a fact that has been a disadvantage at some point in their careers. Actually, the gender and science experts interviewed also highlight these problems, which will be a point of focus in the next section.

(female, Portugal): *"I believe I did not face significant obstacles. I think there are no additional problems related to being a woman. Just perhaps the fact that we sometimes feel a little lonely! Often I am the only woman at the international meetings, on the scientific committees, etc. (...) I think that my current position is explained, most of all, by my motivation. Of course it is tiring, it is difficult to balance work and family... but the key to success is being interested, being enthusiastic and, of course, being competent. (...) And, sometimes, being a woman is an advantage, we tend to be more organised, people tend to listen to us..."*.

(female, Portugal): *"In personal terms, I have never felt that being a woman could be an obstacle in my research career... Sometimes, I have felt a strange sort of reaction... but it stops when people understand that we really know what are talking about. (...) In my whole career, I have never felt discriminated against. (...) In the selection process for my position, there were 4 female and 9 male candidates. And I won the place!"*

(female, Portugal): *"I remember feeling that my colleagues, and even my supervisor, did not understand what I was doing there, being woman [doing a PhD in Oxford]. (...) I got used to hearing "but she does not seem like a physicist!" And they have never called me to talk about scientific subjects"*

(female, Portugal): *"I could make the usual statement: "I have never been discriminated against". But I would not say it because that is not the right way of thinking about it. The truth is that I belong to a generation that was somehow privileged, because the country could not do without us. (...) But I have witnessed some situations that were clearly discriminatory, both as an academic and as a researcher on these topics"*

Workplace conditions with regard to gender

Within exact sciences, there are differences amongst the several disciplines when it comes to the number of female students or researchers. Anyway, women have entered the playing field. For instance, in Denmark, the gender distribution workplace is roughly fifty-fifty.

This goes for every department but management, where **(male, Denmark)** would prefer to have more women. He thinks that *"they have finally made it to the playing field that used to be occupied by men only"*.

Let's clear the way from a possible and banal misunderstanding: certainly for those who make science now there are not differences between men and women. A researcher may or may not be a good researcher, totally irrespective of their gender.

(male, Italy): *"It's not only my belief, but I think that there aren't absolutely gender differences in the capability of making a career or of becoming a good researcher. On the contrary, there are some qualities I can detect more in the female gender, which are relevant to research. Like curiosity, propensity to risk – not meant as a real risk, but in the sense of attempting at some enterprises that may also not achieve their goal from an intellectual point of view. I have to say that in the scientific field, prejudice has dropped from past levels. Maybe it's still there, but has decreased very much."*

The clear words of **(male, Italy)** also open up a scenario for the possible "female qualities" useful to research. Among them, undoubtedly there is motivation. Perhaps for historical or cultural reasons, today women are positively pushed by a desire for an intellectual compensation.

(female, Italy): *"Women are also more determined... a passion to carry on things which is superior to the one of men, especially because a woman has a certain desire for compensation also from a historical and cultural viewpoint. If a woman chooses to commit herself to a high level job, she does it with her mind and heart and then she has this ability to manage her time. However, I believe that today also the male attitude has changed in a couple relationship. A woman who chose a career had also to carry the heavy burden of the family on her shoulder, today the concept of family has quite changed. I believe that behind every*

successful man, or successful woman, there has to be a husband, a wife that supports them. Also from a psychological point of view, for a psychological, moral support. So I believe that a woman today finds it easier to match family and career, because men are more available to care for their children."

Yet probably **(female, Italy)** sounds a little too optimistic on men and their children's care. Some of the interviewees see the management of maternity (not maternity in itself) as a task completely on the shoulders of women, very costly especially in terms of the pace of research. A career in research has some phases that must be rightly given regard, otherwise the result is waste of time, delays, postponements that therefore make female careers heavier than male ones.

Physics, engineering and computer sciences have very few female students (respectively 20%, 13% and < 10%) and this results logically in very few researchers or professors. One of the reasons mentioned by several interviewees is that those studies are perceived as too theoretical. There are more female students and researchers in biology and maths, but a reason for it is that they can easily become teachers afterwards.

(male, Netherlands) thinks that the field that he works in (the string theory) probably has the lowest number of women of all other areas of physics: "*When I go to international conferences and see how many women speak, it might be three or four out of a few hundred attendees, so maybe 1%.*" His own research group, however, is completely different: "*Our own research group has always been very woman-friendly, in the sense that we have always had between 30% and 40% doctoral candidates and post-docs. Then you start to notice a kind of reinforcing effect: when women know that there are a few other women there, they feel more comfortable. ... When you look at the permanent positions, however, only 1% or 2% are held by women. ... At the real top of the field, women are very rare*".

(female, Netherlands): "*The number of female students within the department of Aerospace Technology fluctuates between 5 and 7%; I don't remember the exact numbers. The number of female doctoral students is also not that bad. ... But the higher you get, the scarcer they become. Only a small percentage of the professors are women. ... Some time ago, the Board of Governors commissioned a comparison of the number of female professors in universities in Switzerland, Germany and Great Britain. It turned out that we were dramatically lagging behind. Then we decided to take action. The Board of Governors set a target for the number of female professors in 2006. Beside of that we began making sure that there was always at least one woman in the selection committee. Within just a few years we had gone from having eight to having sixteen female professors. ... That is still just a few percent, but the number has doubled in a very short time. Among the department heads, there are even fewer women. The deans, the heads of the faculties, are all men, and the members of the Board of Governors are also all men*".

In Portugal, there is a certain consensus regarding the reasons for this. These numbers are a direct mirror of the university students' gender structure in a range of S&T fields – in particular, a mirror of the well-known lack of girls in engineering courses, a situation that does not occur in other science faculties.

(female, Portugal): "*Yes, there is a huge disparity, but that has nothing to do with any sort of recruitment or management policies implemented by the company (...). It is connected with the labour market, it reflects the small number of qualified women in this field. (...) Sex is far from being a recruitment criterion; it is irrelevant for us*".

Why do so few people (especially girls/women) choose the exact sciences and technology? Five answers are listed below.

1. The image of (people in) the exact sciences and technology

(female, Netherlands): *"Although I didn't experience that myself, I have the impression that girls are told constantly from the beginning of elementary school that exact sciences are not for them. It's also how the teachers deal with the girls at secondary school. I think that teachers should not accept it when someone who is good at mathematics chooses a non-exact sciences profile. ... In the Netherlands, we don't stimulate people enough to choose for the exact sciences. It's clearly something you don't do in Dutch culture".*

The experts on gender issues stress precisely the same processes: on one hand, the youngsters' career choices still reproduce stereotypes (particularly concerning the engineering field), but on the other hand, some science fields have been benefiting from a deep feminisation process. They even mention that nowadays it might be more important to stress the deficit in S&T vocations among Portuguese males, on account of the recent high school failure and school-leaving rates registered among boys, and also because in Portugal girls are apparently being given more guidance than boys, by families and the school system, to succeed and to invest in their qualifications.

(female, Portugal): *"The current science vocation deficit seems to be more a result of the boys' lack of interest in some sciences than a deficit among the girls. (...) the problem is that families are not socialising their boys towards a sort of success based on effort and performance at school".*

Society, culture, globalisation take the gender issue to the level of the imagery. In the common imagery, the representation of a researcher is very much a male one.

When **(female, Netherlands)** wanted to study in Delft, many people asked her: *"Why do you want to go to Delft with all of those nerds? That can't be fun".*

And when doctors, researchers and scientists are portrayed in TV series, for example, men are always the positive characters, the protagonists and the heroes. There is a force of inertia in the imagery that drags the professional and social images of the past few decades up to today.

Interviewer: "For how engineering is seen in the common imagery, an engineer is a man. Why do you think there is this image?"

(male, Italy): *"I think it is a myth. It's a cultural perception that should be demolished, because in reality there isn't a reason for it, wouldn't it be for tradition."*

(female, Netherlands): *"I think that girls have more distance between them and technology than boys do. Boys often have a football coach or a brother or someone who is in that world. Girls have fewer experiences, few links, no context for technology in their lives. Our vision is that you have to provide a broad overview of what the opportunities are, what different sectors and jobs there are. That's easier if there are role models: women who work in those sectors, but who also lead interesting lives".*

(female, Italy): *"The image of science that is conveyed at school, in films, in books, on TV always is the image of a male scientist, very probably wearing a white coat, using up-to-date technology, and they need to be specialists in everything, for example I am also thinking about films where people fix a spaceship with a screwdriver, and women think: 'Alright then, this is not for me! At most I can study, being good at it, but*

that is not surely a job for me.' There is not a female image of science. Well, this is what I wanted to tell you. And therefore there are not strong role models, except the renowned Margherita Hack. Yet, given her age, she could be my grandma! This is one of the problems. What is needed is young faces, that is young girls, motivated, happy, surrounded by one or two children of theirs and that may work also with a electron microscope. This is life – one doesn't have to give up everything, even her good looks."

(male, Netherlands) states that his field is very competitive, and everything revolves around how smart you are. This fits in with the nerd stereotype, and that determines the image of the field to a significant degree: *"They live with their mother in an apartment in St. Petersburg and do math all day. ... People like that do something amazing and it's in all the papers, so everyone thinks that to be a mathematician you have to be that crazy. But 99,999% of the men in mathematics are neither able nor willing to be like that"* **(male, Netherlands)** states that this stereotype is often reinforced by recruitment campaigns that emphasise that if you are a girl and intelligent, you have to study science.

2. The different characteristics of girls/women and boys/men

When questioned about the factors that could explain the girls' and boys' (different) options, everyone rejects explanations based on any supposedly "natural" male and female missions, different abilities for each S&T area, or an association between gender and various ways of reasoning.

(female, Netherlands): *"Women graduate earlier and have higher grades. There must be plenty of smart women around. ... Why would you put a less-qualified man in a position when a better woman was available?"*

(female, Netherlands): *"International surveys have shown that girls are typical 'high achievers'. They do things better and are very serious in how they approach things".*

On the contrary, in accordance with their own experience as students and teachers, they tend to stress that gender-differentiated vocational choices are, first and foremost, the result of cultural factors that have been incorporated into the youngsters' education since the first years and end up profoundly determining their life projects. It is, they say, a matter of reproduction of the gender stereotypes connected with various occupations – in particular, the association between engineering and masculinity or between life/natural sciences and a woman's sense of caring. It is significant that the interviewees highlighted the following possible explanation of the smaller presence of women in the natural sciences

(female, Poland): *"I think that some things are embedded in the biology of gender, if I may say so, I mean giving birth and bringing up children, motherhood, these things are a natural course of being. If a woman doesn't do that because of the career or other professional factors, if she doesn't take to motherhood and doesn't decide to have children, she harms herself. I mean that she harms herself because she doesn't realise her biological potential".*

(female, Netherlands) thinks that both nature and nurture are important, and that there is surely a 'nature' aspect: *"I don't know many girls who enjoy taking cars apart or working on cars".* She also noticed some surprising things about her own children: *"Neither my partner nor I have any interest in motorcycles, but the first word of one of my children was 'motorcycle' and of the other one it was 'bus'".*

(female, Netherlands): "For some reason, women can't put their good qualities in the limelight very well. They are more conservative, thinking 'can I really do that?' Men tend to bluff about what they can do more often."

Holding managerial posts is also connected with different type of personality, which is rare among women. It requires features which in social consciousness are attributed to men.

(female, Poland): *"I have done almost everything, including changes in the structure of my faculty. Including notorious acts, but I'm tough, I just don't care for being elected next time".*

Furthermore, **(male, Denmark)** thinks that the basic job structure needs to be changed to make leading positions more appealing to women: *"it's just too hard and too cold at the top etc. You really have to be firm to make it work. You can't just take a break whenever you want. [...] Relatively few women take that final step, but there are different ways of changing that. You can change the women. Educate and motivate them, but really – I think it's the jobs that need changing".*

(female, Poland): *"You know what, I really don't like it, cause it's a women, just like that, not a woman, not a man, simply a human. There are personal predispositions, which are not necessarily connected with gender, as I think, which result in some particular consequences, that you are severe with yourself; I will tell you that I am severe with myself. When I want to achieve something, I do it with my own expense".*

Several interviewees (both men and women) also point the expectation patterns towards girls and women. Girls are expected to study something not too theoretical or to work in a caring profession. Or during their scientific career, women are expected to work less after giving birth.

(male, Denmark) points to maternity leave as the reason for the lopsided gender representations: *"when I look at female colleagues of my own age who were having children, everyone expected them to stay at home with for at least a year [...] This gives them an obvious disadvantage career-wise. That's just how it is. This can have dire consequences, because things in this field evolve so fast that suddenly, you're not needed as a lecturer and you're not up to date with current events and getting back in the know is hard work. Those periods of absence from work, have a profound effect on women and their careers. I'm full of admiration of the women who manage to work around it and get right 'back in'. A lot of them do".*

The result is that they often have to work more, or more efficiently, to prove they can still handle the job. One interviewee said: *"I had to prove that my brain wasn't damaged by giving birth!"*.

In conclusion, these problems obviously are all intertwined: there are cultural issues, limitations imposed by a family, the pace of life, mobility and so on:

(male, Italy): *"Females matriculate less than males, but I don't know whether it is for a question of culture, that drives men towards these types of disciplines and women towards other types. In a scientific career, women have more constrains also because of their family, research requires a lot of time, there are problems in moving from a country to another. These are all things that you can do better if you don't have household work to do. Honestly, children slow down your career. And then I believe that there is a perception among those who have to make these choices that leads to favouring a man, just because it has always been so. Often, it is a behavioural attitude meant to reproduce the past. This is certain: I've seen with my own eyes that gender-wise there are no difference in their skills. It's not that women do less than men, absolutely. It's more a problem of perception rather than actual facts."*

(female, Netherlands): *"Women are often more insecure than men. They think it's normal to have done something well. They don't have the tendency to run to their boss to show them what they have"*

accomplished. A man is more likely to do that. Sometimes for things that make me think: is that such a big deal?". According to **(female, Netherlands)**, women are less visible than men. She thinks that that is the reason they are offered fewer jobs.

Justification of the gender discrepancy among the scientific workers takes a significant space. It is mostly perceived in view of different predispositions of men and women. These interpretations, however, aimed at explanation of the phenomenon and were not personal.

(female, Poland): *"But they must take such an interest, actually I think that this is a case, that it is more social thing, that women are more interested in particular things, more succinct, tangible".*

The second biological obstacle results in an emotional approach to the world in case of women and a distance in case of men. According to the interviewees it does not come from cultural differences or stereotypes, but from a different performance of a feminine body in the first place.

(female, Poland): *"When I look at my friends, I really don't see any obstacles of that sort, that something is better for a girl. I think that in our families, let's call them intellectual ones, there is a huge willingness to develop interests of children, so we don't suppress them if we are aware of them. But they choose themselves what they are interested in. I think that there is much more urge in women to do what you do in life... More of emotional attitude. Additionally, if we do a thing, let it serve something; make use... well an apparent usage. I don't necessarily think of huge things, but we want to know that someone is happy with it and has some benefits. Such an attitude is more motherhood like. And as a result, I think, women do better at social works, because, as I see it, people they contact with, in a more motherhood way. And this instinct..."*

As it may be seen, emotions do not forbid women to work in science, but they make their attitude towards knowledge more pragmatic, especially if it is connected with people.

(female, Poland): *"There isn't anything about emotions. To become a doctor, this is being in emotions. But when you research nature, biology for example, as I see it, if I were interested in it, this is something...But it moves emotions. I think that this emotional side is very important".*

It is also connected with brain performance rather than with feminine dysfunctions.

(female, Poland): *"Intellectual predispositions, like with abstract thinking, may be equal. May be. But apart from these intellectual predispositions there are hormones. I think that both of them are poorly researched in which way in the human development hormone states influence choices and thinking".*

(female, Netherlands): *"Men concentrate on one thing: they want to save up for a car or be promoted to boss. Men are ambitious in one area and they concentrate on that. Women also want a family, friends and a social life. They have broader interests and divide their attention accordingly".*

(male, Netherlands): *"Girls are less likely to concentrate on just one small subject and completely immerse themselves in it. Girls want to have balanced, social lives and consider creativity important. This is not only true for girls, though; 99% of the boys want the same things".*

The case with technical predispositions is different, where cultural obstacles play major role. There is a dominant conviction that an engineer is male.

(female, Poland): *"You know what, I can't really tell you what is the reason for it. I don't think that the cause are some predispositions differing women and men, it's hard to say. It may be easier to explain it in*

case of technical sciences, because in the consciousness of older generation an engineer must be a male, so there is a social obstacle. If it comes to mathematics, physics, IT, it's hard for me to say. I remember one doctor summarising the proportion of women and men on medical studies, where there were more women, and someone said, that if there were introduced an exam on physics, statistics would endorse man".

(female, Netherlands): "Most girls have a different approach to technology. They start solving problems differently. When boys are around, they set the norm. We noticed that when you let the girls orient themselves in a separate group, that they look at the problem in another way and ask different questions. They dare to ask questions without looking dumb".

Women are convinced that they do really well in technical sciences. In these areas they perceive inequality caused by stereotypes on the image and role of an engineer in society. But on the other hand, the women performing managerial duties have not noted discrimination practices.

(female, Poland): "I don't think so, well, I don't see how it could interfere, it's even easier for women to adjust to these... there are rules, that's true, so if you want to do one thing, you have to do first this, and then that, and it's not a burden for women, and the fact that there are degrees, that's good... if you equalised everything...".

The interviewees perceive the problem of underrepresentation of women in technology in the educational system, which not only does not encourage girls to take interests in these areas, but also preserves existing stereotypes.

(female, Poland): "my girlfriends had simply problems with mathematics. I don't know. You know what, I don't know whether mathematics is well taught. Or maybe they assume in advance that they would never learn it".

(female, Poland): "I ask myself such a question, for example how to explain such a phenomenon that in a poor private school with domination of girls, when you introduce an IT class, there are only boys. There were about forty five boys and three girls. Poor school, learning IT on the required level wasn't really hard".

3. Girls and women working in a man's world

(female, Netherlands): "My field is a truly male chauvinist world, because it is very hard and it's primarily about how smart you are. The women who work in the field have somewhat overcompensated. ... They work ten times harder than their immediate colleagues, and have earned their positions with complete intellectual dominance".

Opinions tend to be slightly more divergent when it comes to discussing the effective conditions for woman to progress in their S&T careers. There are rather few women in top positions, a fact that could be explained, according to the majority of our interviewees, by the limited number of women who have acceded to these professions in the past. The current gender distribution in top positions, they say, just reflects the former recruitment base and has nothing to do with any other organisational processes. In that case, a change can be expected soon; and, in fact, it has already happened in some institutions where woman form the majority, even at the top of the hierarchy (for instance, in biology).

(male, Portugal): "Frankly, I think that we can hardly talk about gender prejudice in the Portuguese mathematics community, considering both the access to it and the opportunities to reach leadership

positions. (...) There are several mathematics departments in academia that are, or have been, directed by a woman".

(female, Portugal): "We are fewer in number than men, so there are fewer of us who reach those positions. I think it is far from being a discrimination phenomenon".

(female, Netherlands) thinks that girls in the Netherlands choose easy profiles because they have low self-confidence: "Studies on the self-image of fifteen-year-olds regarding mathematics show that girls and boys have almost the same results, but that girls think that they aren't that good. That is typically Dutch. If you aren't very confident about a subject, of course you choose not to do it. ... I think that another problem is that girls in the first few years of secondary school are reasonably good in languages. Boys are usually less proficient, so they have to choose one of the Science profiles. Girls have the option of really choosing, and they choose the easier profiles".

(female, Netherlands): "During physics and chemistry labs, girls are insecure and hesitant. Boys take the initiative and girls get the feeling that they can't do it".

Girls find it more difficult to deal with getting unsatisfactory grades than boys, and therefore choose profiles where they are sure that they can pass without too much trouble. **(female, Netherlands):** "When mathematics gets more difficult, and they end up with a 4 (out of 10), they have problems dealing with it. ... That lowers their grade point average. That's why they choose the Science & Health profile so often. It's also part of Dutch culture. Mom and dad say that they don't like it when you pass with such low grades. The average girl tries to avoid that".

(male, Netherlands) thinks that fear of failure is an important reason that girls in the upper classes of secondary education do not choose a career in mathematics or physics: "Girls have the idea that you start on a career path where you have to jump over all sorts of hurdles. At some point you might fail, and then what?". He also argues that there is something wrong in the interaction between boys and girls and mentions that Women's Colleges in the United States work well in this context: "When you remove the interaction, girls are much freer to follow their interests".

(female, Netherlands): "After your PhD, you have the choice between science, with its fighting, publishing and competition, or you do something else. At that moment most women choose to do something else".

In the Netherlands, relatively large proportion of women work at the Ministry, but there are far fewer women in top positions. Some of the department heads are women, but the assistant directors and directors are primarily men. Only one of the five General Directors is a woman. **(female, Netherlands):** "The old boys' network is a problem for women, especially in science. Professors are usually men. In order to get rid of the image of the "old boys' network" the acquisition and selection of professors should become more transparent".

Another damaging element is provided by the necessity of mobility. Mobility is in contrast with family management, because it basically is a sort of sedentary community.

(male, Italy): "Mobility and family. A huge problem to many people. In Italy, everything is frozen, if you get a job in Cagliari, but you have your family and home in Bologna, how do you cope with it? You can do it for one, two, three, maybe four years, always hoping to be transferred to Bologna. It's quite unlikely that a wife and her husband can be transferred together. In the academic world it's hard to find two jobs in the same

centre. In America it's easier as there are many people who change their job quite frequently, therefore it's easier to get in, to get out, to be received".

The issue of mobility is closely related to the issue of the persistently creeping male chauvinism. Between a wife and a husband, the trend is to follow, to favour the husband's career. Male chauvinism is historically interwoven with power. This is another side of this issue.

(female, Italy): *"Two points: firstly, men are not willing to give up their power. Secondly, men are not yet able to manage the private side of their life, so it falls on women and they inevitably endure some delays."*

In the Polish descriptions of the courses of life, as well as work and institutional environment there reveals the picture of community without major processes or singular phenomena of gender discrimination. In most of the interviews there reveals a picture of a good cross gender relationship and even gratefulness of women for getting help at work.

(female, Poland): *"I don't have any negative experiences, actually it has always helped me, that I am a woman, but it doesn't mean that it is always like so. I was lucky to come across people who could help me; I don't deny that a scientific career is an easy one both for women and men. You must have someone who will help you"*.

The differences occur when thinking of the scope of discrimination practices in particular work relationships. As for science itself there are not any of such problems – these relations are not connected with gender. In science, according to the interviewees what counts is what is done, not by whom.

(female, Poland): *"in the Institute it is more about essential side of your activity, what one is able to do, what can; a fact of being a women is insignificant"*.

4. Combination of work and care giving

Working in S&T is hard for women also in combining family and research. You can't really work part-time in science. **(female, Netherlands):** *"It's difficult to make a successful career while working at half power"*. But the advantage is that the work is flexible. *"I work a lot, but I still try to eat dinner with my children, or at least to tuck them in at night. After that, I'm free to continue working at home"*.

(female, Netherlands): *"A scientific job is not a nine-to-five job. You really have to work day and night. I don't think that that's a good thing. ... It's difficult to work part-time when you choose a scientific field, and I think that full-time should only be full-time and not more. Women who have a family are often asked: 'can you combine that with your family?' Nobody ever asks men that"*.

Motherhood is one case which does not allow women to fully engage in a scientific work. In such a case longer brakes are unavoidable, which are not advisable in natural sciences. Another case is connected with institutional relationships, which discriminate women in applying for managerial posts. It is worth mentioning that all the interviewees have children and perceive their personal experience as natural.

(female, Poland): *"The biological changes in my body, for example the facts of motherhood or giving birth do not influence thinking. On the other hand a necessity of breeding, waking up in the middle of the night and initially spending a lot of time disables other activities. That's true that you have to wait some time until a child and a mother achieve some kind safe state, when physiology does not play such a role"*.

(female, Poland): *“Dealing with mathematics, I think that in physics it is in a similar way, although physics is a bit different, well, it necessitates... you live with it, one has it always on his mind, right, when you work on a problem, you cannot turn it off and work on it only on Saturdays from five to eight p.m. It is insufficient. So it requires a lot of concentration. And in our case, it is harder for women to achieve such a concentration for a longer time. And the social demands are different.... it's harder for a woman... Well, I can't say to my children, don't disturb me for two hours, play with yourself because I have to work on a problem”.*

(female, Poland): *“I will tell you something, it may be connected with the fact that natural sciences are such, that they don't allow some brakes, or something. There aren't half measures; you have to go for it”.*

(female, Poland): *“It is a professional work and hobby at one time, so there is a problem what you want to do and to what extent you want to commit yourself to a scientific career. There were hardly any women who achieved a scientific success and simultaneously had families, children... it doesn't come along, you need help from your nearest”.*

(male, Italy): *“[Maternity] means to slow it down, to work less... it means to have less publications, and therefore less work on your CV when you apply for a position. Yet, if a woman is good, she advances anyway, even though a little more slowly.”*

(female, Italy): *“Another issue, although it has been adjusted by new behavioural rules, it's the one of publications. Indeed, women publish more or less as men do, yet probably with a higher impact, but the problem is that they publish later. Why? The productivity peak for a man is around thirty-five years of age, whereas curiously enough the one of a married woman is later in life. We all know what women do when they are around, let's say, thirty, thirty-five.”*

Pregnancy in itself makes you fall out of pace with the world of science, which is a very competitive world. Therefore the woman who retires for a year to care about her family is a researcher that has a one-year delay.

Another aspect often mentioned relates to the work and family balance, a concern that tends to be more challenging for women, given the traditional inequality in the sharing of family responsibilities between men and women. For this reason, even if in Portugal most women keep on working, their career progression may be slower. Therefore, they may often face additional problems because they end up competing with younger – and thus apparently more promising – men with similar curricula. It could be the case, for instance, in academic careers, which are dependent on post-graduate degrees and scientific papers that require extra time to prepare.

(female, Portugal): *“Most of the women with young children had to assume those family responsibilities, so they ended up delaying their careers. These are very demanding careers. When they are about 40, and they finally begin to succeed, there are a set of bright young men competing with them. (...) Men always find someone who supports them, taking care of the family and making up for their absences”.*

(male, Portugal): *“There are no Nobel prizes in mathematics, just the Fields medals. A total of 78 medals have already been granted, and none of them went to a woman. (...) There are several possible theories about this... one of them tries to base the argument on the cerebrum hemispheres and on the idea that men are better prepared to understand mathematical reasoning... I think it is a simplistic explanation. What I know is that there are various couples consisting of famous mathematicians that probably decided that the*

woman would stay at home, taking care of children, while her husband continued to shine in his career. Of course, she can return after some years... but he will always be a step ahead. (...) And those medals are awarded up to the age of forty! (...) This is really a problem in other, more developed, countries. In Portugal, things are slightly different, because women have to keep on working... It is a positive effect of our low living standards!"

Women, in the 21st century, are still the linchpin to a family's life ("men are not yet able to manage the private side of their life").

(male, Italy): "The issue regards the time women have to devote to household work. If a woman is married and has babies, she can devote less time to research, and consequently her career progresses more slowly. Having grandparents nearby, an availability of nursery schools and a collaborative husband obviously are important factors to devote more time to research."

Women seem to explicitly attach to family a greater importance. This contrasts the evidence illustrated in the previous chapter about scientists who are successful when they have a happy family experience that supports them.

(female, Italy): "Much depends on women and also on their partners. Why should the entire burden of a family, of children fall on a woman? There are no rules establishing that. Therefore, if chores were equally shared... Often women leave or retire from research for a few years when they have babies, so the family burden falls mainly on them. Then, there are some incentives that may have negative consequences, i.e. prolonged maternity leaves, both before and after the childbirth, which may be damaging also for the employers – I am referring to companies, that limited number of firms that make research; but also in scientific institutions, one is happier to employ a boy rather than a girl – given their equal merits – if they think that the girl's going to spend one, two, three years on a maternity leave. Therefore what a state should really do is to provide much more assistance... more services, kindergartens, assistance, nursery schools, full-time schools. Over the entire children's growth process, they should try to provide substantial assistance, not relying always on women."

Thus many women work part-time, and that that is a barrier to their careers in science; **(male, Netherlands):** "It's difficult to work part-time in science, you really have to work full-time".

Still on the topic of the work and family balance, it is interesting to note that in the companies with which we have contact, due to the competitiveness of the market in which they are working and the need to provide their personnel with high quality working conditions (whether male or female), there is considerable concern about the creation of fair mechanisms to promote flexible working hours or work at home.

Some women, however, mention other cultural and organisational factors that may still be present in the processes of career progression – factors that are omitted or even rejected by those who prefer to assume that there is gender equality in S&T in Portugal.

(female, Portugal): "There are few women in top positions, although they might have been better at school. (...) When girls come out of the school system (a system ruled by meritocratic mechanisms) and enter the labour market, they do not have the cognitive and emotional instruments to face, or even recognise, discrimination. They have grown up believing that those things are no longer happening!".

(female, Portugal): *"Nobody tells us that their decisions are based on stereotypes. That is the power of ideology; people take it as something natural!"*

Indeed, not all the protection measures have positive consequences. "Prolonged maternity leaves" may end up driving women away from research and are a deterrent to employers. Action should be therefore taken to remove these side effects from those measures. For example, forcing their implementation on men as much as on women.

Interviewer: "At a certain stage, women have to face a crossroads... they have to choose between family and research."

(female, Italy): *"But it shouldn't really exist: that crossroads! Because a family is built on two people, therefore the time needed for children's care should be equally split in two. And then there should be effective assistance provided by the state, i.e. kindergartens, nursery schools and full-time schools."*

As a result, there is an emerging concern on having more services at one's disposal. These services should not necessarily be provided solely by the state but may have a private participation. This kind of paths should be followed with creativity and without a rigid scheme, because one of the strong points of the research in the Anglo-Saxon world is to have many structures at the service of researchers open 24 hours a day. Because a researcher lives and works 24 hours a day.

(female, Italy): *"On the other hand, another element which is probably missing in Italy, in which I tried to strongly invest at AREA, is to provide a complete range of services; this does exist abroad, to put men and women in the conditions to work at their best, building a kindergarten, for example. At AREA, we created a kindergarten and I have to say it was a hard struggle because, despite many words spent (everybody wanted it!), when it was about to be implemented people were like "we cannot do this, we cannot do that." It is my belief that Italy is lacking this kind of services that concern women – kindergartens and a series of opportunities – that should favour social inclusion, such as meeting points, libraries open all day long. Abroad, one of the strong points of research is to offer a very stimulating place, like an American campus, taking into account all the positive and negative aspects, libraries open 24 hours a day, on Saturdays and Sundays, lounges, a number of cafeterias, club faculties... this allows to have a relational exchange which I believe is the cradle to innovation, scientific progress, rather than a purely academic milieu. Italy surely isn't doing that much."*

On the other hand, the access to leadership responsibilities – usually more demanding and less flexible in terms of schedules – may be less appealing to those women who have strong family commitments. On the contrary, some lower positions in academic or research careers may benefit from greater flexibility as regards working hours (at least compared with other professions). As a matter of fact, almost everyone mentioned this as an advantage of those jobs.

(male, Portugal): *"In academia, there are no differences, even because it is quite an open and flexible domain as regards the working hours, or the possibility of arranging schedules among colleagues (...). Flexibility is, in fact, one of the advantages of our career"*

5. Social context

Leaving the specific case of research aside and considering Italy over all, **(male, Italy)** sees the Italian society as one resistant to change. This is having repercussions also on research and on the employment of women therein.

(male, Italy): *“In the US it’s different, I believe this is specifically Italian, owing to culture and a society that is quite resistant to change. Apparently we have a modern society, yet if you go below the surface, you’ll find things that are somewhat difficult to change. Partly it depends on our culture, and partly on the cultural model centred on the head of the family and a marginal role by women which is difficult to eradicate also in previous generations... then there are other issues – grown-up children still living at home with their parents – there are many factors. I can’t say whether they all point to the same direction, however they make this society more resistant to change than others. Sometimes this is positive, sometimes it’s a shortcoming.”*

On the other hand, this uneven distribution is seemingly not only an Italian issue, but also pertaining to other countries. **(female, Italy)** even thinks that in Mediterranean countries the situation is slightly better than elsewhere.

Interviewer: “So, in our country this problem does exist.”

(female, Italy): *“Not only in our country. For example I know that in France there were many female researchers. It was 1953 and I was still young, but I know there were several female researchers, whereas in the Anglo-Saxon countries, in the Netherlands, there were none of them. In the US, the ones who were there would carry out more practical tasks than research in itself. So, from what I could see, probably the more male chauvinist countries actually were the Anglo-Saxon countries, not the Latin ones. Because in France, Spain and even in Turkey, there were much more women in universities; Turkey has even many women deans of faculties, and many women hold university chairs.”*

Or it is even a global problem, inherent to the academic world and its dynamics.

(female, Italy): *“It’s a fact... if you analyse the European statistics, the countries which provide much more advanced social services, or where the women members of parliament account for 34 percent, as in Finland, where women hold positions as the Minister of Defence, when you count the women working as full professors, then you’ll see that they are roughly as many as in Italy. This tells much about the fact that the academic world has its own universal and self-regulated internal discriminatory system. If you consider America, it’s exactly the same thing... this is quite surprising.”*

One of our interviewees – with political responsibilities in the S&T field – also adds that there is a general leadership crisis currently affecting the whole of Europe and both sexes. This might be due to a lack of interest among highly qualified people in assuming leading positions in public science organisations.

(male, Portugal): *“When we analyse women in leading positions in science, the panorama is somehow different. We are still facing a deficit, mainly in public institutions. (...) But, most of all, we are facing a leadership crisis in the whole of Europe. (...) We notice that men are also avoiding these functions. (...) This is a critical feature: to guarantee that the institutions have suitable incentives to attract the best to the leading positions”.*

Among other factors, they emphasize the fact that, being a minority in many S&T organisations, women tend to be rather loosely integrated into sociability networks, so that they end up in a weak position within lobby groups. Besides isolating women from science information interchange channels, this may make access to top positions even more difficult. Taking the results of some of her research into account, **(female, Portugal)** mentions that many women tend to neglect the relational dimension of their work, since it is often a very demanding and frustrating feature for them, and also because they opt to build a career strategy based mostly on the demonstration of their technical skills.

(female, Portugal): *"As regards networks, in science as in other domains traditionally dominated by men, women are quite disadvantaged. When they enter these fields, they face sociability networks that are already functioning and are ruled by males. They tend to delay getting into them or forming their own networks. Thus, they build a strategy that is often based exclusively on focusing their work on formal technical tasks. It is more comfortable from the psychological point of view, and it also seems to be more suitable in a context where evaluation is supposed to be based on merit. But it could have self-defeating effects!"*.

(female, Portugal): *"They never talked to me about science matters. Of course, this was not good for me, because I could not benefit from those information interchange opportunities. When a woman is invited to join a management board, people often think that she is going to take care of the administrative tasks, she will organize the meetings, buy Christmas gifts for the staff..."*.

In this context it is also mentioned that, even in formal calls for applications, evaluation criteria always involve some subjective components, which make them more susceptible not only to the (unintentional) favouring of those candidates that have some kind of connection with the evaluator, but also to the unconscious influence of gender stereotypes (for instance, to the idea that careers are more important for men or that leadership is more difficult for women).

(female, Netherlands) thinks that Dutch women have a lower level of ambition, and that it is culturally determined: *"I always state that it's because we've had so many years of Christian politics. In my mother's generation, female government workers had to stop working when they got married. That mindset still continues today. We're fairly well-off, so women don't necessarily have to work for the money. The whole idea that women have to take care of the children, and that it's not good for them to be in day care is absurd. It's not supported by research. It's programmed in our thinking. ... There's a big difference between having to work for the money or being able to choose. The standard of living is important. You can see it in Southern European countries, where it's normal to work in a full-time job after finishing your studies"*.

(female, Portugal): *"Sometimes, the reasons why somebody does not reach the top have nothing to do with the curriculum or with their personal qualities. In a school like this, where most of the colleagues at the top are men, and if nobody knows us... it is not easy to progress. (...) Often, when I look at the selection results, it is impossible not to think that there are certain procedures that are not totally clear. There is such ambiguity – and this does not just concern gender issues – that it is often very difficult to identify which factor ended up being the most relevant"*.

To sum up, while many of the persons we interviewed – including some women, especially those in private companies – tried to argue that S&T careers are essentially ruled by the demonstration and peer recognition of specialised technical skills (so potential gender prejudices become even less probable than in

other labour domains), others – mostly women – preferred to stress that, despite the specificities of the S&T field, there is some space for subjectivity within organizations, which allows the reproduction, even if not conscious or intentional, of gender stereotypes (among others). In other words, they argue that these cultural factors might be critical not only when it comes to generating science and technology vocations among the youngsters but also in the configuration of the conditions for success within organisations. This is a minority perspective, though the experts on science and gender issues are also likely to share it.

For this reason, a small group of our interviewees considers that the introduction of certain positive discrimination measures in favour of women could possibly have a positive effect for some time, as a way of speeding up the ongoing process of change. This policy, however, is far from the point of having the support of most people.

Nowadays, girls find in themselves the opportunities and the reasons for studying and working in S&T, because **(male, Netherlands)**: *"The social prestige related to a study is more important for girls than for boys. That is why studies such as medicine and law have become so feminised recently. Medicine has been almost taken over by girls".*

Possible action to bridge the gender gap

In general, people expect the gender differences within science and technology to gradually decrease, especially as concerns the total proportion of women working in the field and interested in it. This optimism results mainly from the fact that the number of women interested in these careers has already been increasing in recent decades; girls often perform better at school than boys; many women are increasingly focused on their working life; and equality in the gender distribution of family responsibilities is also rising.

(female, Portugal): *"I have no doubts that things are going to change. Women themselves will force those changes ... I think it is inevitable that things will change. Of course, some barriers will have to come down and that takes time. But I see no reason for things not to change".*

Nevertheless, some people also admit that there are a number of significant obstacles to be faced in this change process, especially regarding the conditions for women to progress in these (as in other) careers – indeed, it is precisely in this latter domain that recent changes are even less evident. These difficulties involve, among other things: the persistence of certain gender stereotypes within the society and, in particular, within work organisations, which are not changing easily or rapidly; the increase in competitiveness in these sectors, which may make progress even harder for those who have to deal with heavy family responsibilities; or a rise in the social pressure on women with regard to motherhood, on account of the crisis in the birth-rate and the growing difficulties in finding family support services.

(female, Portugal): *"Things are becoming even more difficult, especially for those women who live in big cities and no longer benefit from family support. (...) It is not easy to find someone to take care of children for long periods. Besides, as in other countries, these services are becoming more and more expensive. So I think we are going to be dealing with the same problems that have already been faced by other countries".*

(male, Portugal): *“There is a message – and it is not even a very subtle message – according to which the only way women can really find personal fulfillment is through motherhood. It is a very strong message. (...) It is a huge pressure for young women (...), and I suspect that it is going to increase even more”.*

Given this frame, what can be done (what is necessary) to get more girls/women in the exact sciences and technology? A number of highlights from the interviews are listed below.

1. Elementary and secondary education

Several interviewees say that the interest for science should be aroused in primary school by giving an elementary course of science or using illustration kits. At that age there are as a matter of fact already strong stereotypes about scientists that are enhanced by several media (e.g. comic books).

A few interviewees also suggested that there should be more attention for languages in scientific training. They meant as well the second language as English, for publishing.

(female, Netherlands) thinks that elementary schools should do more to interest the students in the exact sciences. *“That’s what you see in other countries, that people concentrate more on the elementary schools than on secondary schools. By that time they have other things on their minds”.*

Perhaps, we should begin early teaching science and technology, even for two- or three-year-olds.

Generally, everyone points to the school system as one of the most – if not the most – important spaces for the promotion of S&T vocations among the young. In this context, it is argued that the schools: reinforce experimental learning and create ever more activities focused on increasing the young people's curiosity and critical capacities with regard to the world around them; improve the opportunities for the students to have contact with the new challenges of science and the applications of scientific knowledge to daily life; and implement new measures to combat failure at school and disseminate the idea that the understanding of some subjects (e.g. in the field of mathematics and physics) is not as difficult as many students think, i.e. it is not a matter for the better ones alone. In almost all cases people highlight the importance of directing this kind of measure to the whole student body without exception, and especially for the younger ones who are now starting their schooling process.

(male, Portugal): *“Obviously, the first space to motivate and promote learning is the school. The family also has an important role, but it has many other functions beside. (...) Of course, there are also other spaces for informal learning: museums, conferences, books, the internet... nowadays there are so many things we can give to the youngsters to awaken their interests”.*

(female, Denmark) thinks that the biggest obstacle in science getting the place it ought to hold in the public consciousness, can be found in schools: *“I am not under the impression that parents are equipped to talk about technology unless being taught or guided. I think that primary and lower secondary schools could be the solution and means to making it work. Consider the teaching materials – old cupboards full of instruments and stuff like that. There are so many means at their disposal outside the classroom – in the real world. I think we have to concentrate our efforts in the schools. It has to be an integral part of the teachings. Furthermore, I think that mathematics/physics has an image problem. It’s dusty, geeky and*

decidedly un-sexy. If you decide to become a doctor, you are a prestigious person. If you decide to become a physics teacher, you are bordering on being autistic".

(male, Denmark) *thinks that "a lot more work should be put into teaching children to network. It's the means to survival in the end, more than an education is. The ability to think 'socially' and think in networks and to get new thoughts and ideas. Teach discussion in school and then go outside the classroom for a couple of hours every day and do something in a different environment, where you use nature resorts and forests or the like. Move some of the classes outside, to change the environment, so that not everything has to take place inside the classroom. I think that's very important. And then hire some people who live to teach like that. Characters that may not necessarily come from teachers' colleges or universities but have a different approach. I remember from my teachers' college that people were brought in from the real world to teach us about things that were really interesting. Everyone showed up for those lectures, you know? Everyone was concentrated on trying to suck in as much information as possible, you know? In Italy, workers made their own schools because their children didn't get to go to school otherwise. They hired architects and artists and biologists etc to teach their children things about their respective fields of work. This way, the children received a qualified education, despite the fact that no teachers were involved, you know? Alternative teachers were hired and taught children by passing on their personal interest. The most important thing is to get a hold of some qualified people who actually work with the subjects that they teach. It's just so much more engaging. If you are educated at a teachers' college and are qualified to teach five or six different subjects, you'll invariably be forced into teaching subjects that are more important to you than others. You have to teach a certain subject, but you end up doing the children a disservice because the classes become boring. I find that I often see this with people teaching a lot of subjects".*

In the Netherlands, secondary education is already active with a large operation that could lead to more students choosing the exact sciences and technology in the future.

(male, Netherlands): *"We want to bring the science courses back into direct relation to the contexts in which phenomena occur and where there are problems that can be solved with exact science knowledge. The whole professional experience and environment in which science courses can be applied. The whole concept/context approach is an extension of that programme. We do it in the traditional single-subject courses, and we also have a new integrated course called Nature, Life and Technology that will be introduced next year. These movements all lead to the same goal: make it more clear what science really is. In which environment should you imagine that science plays a role? How do the business and research worlds work at the moment? Create ties to higher education and the business world, like the Jet-Net programme has been doing for a few years. And order the test material around those contexts. ... One of the thoughts behind that is that we want to make the courses more interesting for everyone, also for girls, but it's also an improvement for the boys. At the moment there are many students who find science and technology a little sterile, a little laboratory and too little oriented towards other people and working together with other people. Hopefully, they'll discover that the exact sciences are a different world than they had thought."*

Students should first be allowed to become enthusiastic for the subject before they are 'bothered' with other things. **(male, Netherlands):** *"Every subject has aspects that you have to grit your teeth and struggle through, but if you can first make people enthusiastic about the subject, then they'll be willing to do it because they really want to learn. That's a real art, and I don't think we're taking enough advantage of it".*

(male, Netherlands) states that although everyone says that the exact science courses are so important because they play a role in everything, that it is connected to everything and that it is a creative subject, but that doesn't show in education. He pleads for another approach to education, especially secondary education: "You have to create room for diversity. ... There are some developments in that direction at the moment. We're developing a number of new courses (Nature, Life and Technology and Mathematics D), that are modularly organised, enabling us to insert diversity more easily. ... It will enable you to present a broad spectrum: You can do something with those boys who want to win the mathematics Olympics and study higher number theory, but you can also do something with climate change, or (to get the girls more interested), health and care giving, anything that is good for something or helps society. ... The natural sciences are an organic whole: you can easily shift from biology to physics. The common thread is the natural sciences approach".

(female, Denmark) thinks that it is important to have a proper guidance counsellor who *"[...] takes a seat in those 8th and 9th grade classes and says 'what do you really want to do? What are you thinking about?' But another important point would be to encourage. I was nervous about choosing the mathematical line in gymnasium and I wish someone had said 'but why are you afraid of that?' It would present a great chance to really talk things through and to remove some of the tension and provide proper guidance. I don't know if I'd have made the same choices anyway, but I felt a little lost. It would have been nice"*.

(male, Denmark) thinks that if the choice of education is culturally defined, then action has to be taken early: *"If we take action with younger children then the option of choosing a scientific education is something that the children are aware of from a very young age. It's not something that can be altered during primary and lower secondary school and it's even more unlikely to be altered in the gymnasium"*. Furthermore, **(female, Denmark)** thinks that – starting from the top at the teachers' colleges and universities – more attention has to be paid to marketing science so as to change a trend: *"I think that a lot of people perceive a career in science as something very difficult and obscure, because you don't know what it entails and consists of and because it's very hard to imagine 'where you'll be in 10 or 20 years from now, if you choose a career in science' – you know, supposing for the sake of argument. I think the universities need to become better at marketing what a scientific education might actually lead to. They try by having open house events and printing up recruitment flyers and papers and by allying themselves with people who have made these choices and have real experiences, you know? But the examples are so detached from each other and I think they have to work on becoming better at coming up with common descriptions of 'what can this lead to and what are the opportunities?' Maybe take it all the way up to the political level so that you can make sure that there are opportunities for certain sensible career ideas and structural changes, so as to say 'if I want to be a research scientist, I'll have to use my resources on research'. Teaching can be a part of this, but I think that a lot of people are under the impression that research scientists have to teach a lot and have to manage their own time and affairs and that this makes them think 'oh dear – this is far too complicated and the salary is terrible'. With the gymnasium reform, a lot of people seem to be thinking that the science subjects have taken a hit because arts and social sciences have 'won' if you look at the distribution of subjects and classes. I think that a lot hinges on how you approach things and the gymnasiums are in for a difficult time of having to adapt to this, because the idea of a scientific basis course – i.e. the idea that everyone has to take a certain amount of science classes – is fundamentally good, in my opinion, but it creates an enormous challenge for the gymnasiums. This is where I think alternative institutions like science centres can play a big role in helping and supporting while working with the gymnasiums and offering meaningful alternatives that help the common cause, because I'm not a staunch supporter of recruitment. It's not so much about career choices, be that for men or women, but more about making sure that everyone has a basic knowledge. All the way from primary and lower secondary schools and upward, I think there has to be a better connection with regard to giving the student an overall idea of how things work. We need to pass on this healthy and responsible relation to*

nature and we need to strengthen and help legitimise and establish a curiosity in the children. From there we can add on and that leads to having extremely attentive and interested children standing here, ready to take the different subjects on head first. All of this will help them build up and interest and it will make it easier to follow through on it, you know?”.

2. Higher education and teacher training

(male, Portugal): *“Regarding the number of researchers, we will only be able to achieve international levels if we create greater trust between science and the public. (...) That is why we need to keep on investing in scientific culture, both among the youngsters (especially through school) and the general population. (...) The effects will only be felt in future; but it is important to keep investing”.*

(female, Portugal): *“The strategy must be the same for the boys and the girls; it cannot be otherwise... we have to show that this is fun, that they are going to like it, that it has so many features that they can enjoy and work on in the future. Then some will be interested in it; others will not. But the jobs we are presenting are the same for men and woman, science is just one!”.*

About higher education, **(male, Netherlands)** thinks that there should be no selection at admissions: *“We should say: if you're enthusiastic and think that you can do it, come try it. It doesn't matter to me what you've done before. ... We could help the motivated students catch up in mathematics, physics and chemistry in 6 months”.*

On the other hand, most people also stress the decisive role that the scientific community, the research/higher education institutions, and private companies can play in improving people's interest and trust in S&T. Special mention is made of the importance of providing the public, especially the young people, with the opportunity to have direct contact with those who are really working in S&T and their daily working activities. Having contact with actual examples of men and women working in these fields might have a positive effect, not only on the young people's interest in these careers, but also on public opinion regarding S&T activities, making it realistic and better informed. A number of (already tested) examples were mentioned and positively evaluated – open days in R&D units or companies, exchange programmes between those institutions and schools, etc.

(male, Portugal): *“Scientists have to play an active role; they are the best ones to explain these things and to show what they really do”.*

(female, Portugal): *“We have already implemented various initiatives in order to make contact with schools (...). Some of us have gone into schools, talked to the students, and performed minor experiment-based learning activities (...). The point is to get people to see that technology is not such a big and complicated thing; it is something everybody deals with (...), and it is a field where the Portuguese can be as good as everybody else (...). At this time, our company's Christmas card is being designed by children in a number of schools, with space as the theme”.*

These initiatives involve the reinforcement of a policy of openness on the part of the science institutions towards society, and a growing sensitivity to their social responsibilities. Some of the interviewees even stress the point that these activities – that have hitherto essentially been carried out on the basis of the

personal engagement and enthusiasm of individual agents – should count on progressively more support from experts on communication and public relations issues.

In this context, the respondents also often mention the importance of museums and science centres in the popularisation and promotion of a closer and perhaps more fun-oriented and motivating connection between science (and its experts) and its public(s). The role of these institutions is highly valued by most people, even if some of them also alert us to the fact that science exhibitions, despite their informal character, should avoid communication strategies excessively based on “show and entertainment”, which could end up having perverse effects (e.g. failing to promote a real understanding of what science is, or reinforcing certain stereotypes). These dangers are, in fact, also mentioned in connection with the experiment-based learning of science in schools.

(male, Portugal): *“I think that, in Portugal, Ciência Viva/Living Science is of terrific importance; the Knowledge Pavilion, for instance, is a pearl, even at international level, it is a fabulous thing (...); they have been doing a terrific job with the kids, they have lots of innovative activities. They are a model for what should be implemented everywhere; they are contributing decisively to a highly necessary “cultural revolution” around science”.*

(female, Portugal): *“The science centres do not operate in the same space as the schools. Exhibits are an excellent – lighter and funnier - way of making people reflects on scientific issues, raising an interest in science and the understanding that it is not as difficult as they may have thought. It is very important to debunk the myth that these things are not accessible to everyone”.*

To the interviewees, it seems that teachers in secondary school are not bringing over the passion for science enough. They should be more involved with the scientific world (e.g. universities). They should also be more trained in bringing the passion over and being aware of social influences on girl’s study choices. Someone suggests that teachers already have a heavy workload without doing the study choice accompaniment.

(female, Netherlands) emphasised the importance of good, inspiring teachers. She would like to see the teachers actively stimulate the girls. *“If girls have a talent for science, you have to stimulate them to choose the hardest profile possible”.* She also thinks that the number of hours for mathematics, physics and chemistry should at least be kept at current levels, since she already has to provide extra tutoring lessons at the university. She doesn't approve that the current teacher training programmes are separated from research. She is more in favour of the old situation in which students could get their teaching certificate with little extra effort next to their masters. *“I think that the most inspiring teachers have done research themselves and know how exciting it is. ... Let them hold on to that enthusiasm for science, and education will reap the fruits”.*

According to **(female, Denmark)**, the amount of time where concentration is kept in school classes differs widely: *“Girls tend to say that ‘this is really interesting right here and now, but if the teacher is boring or we can't figure this out, we lose interest’. Conversely, boys will say ‘stupid teacher, dumb book, the equipment isn't good enough, but it's really interesting’. The approaches are very different. This is also the reason behind studies showing that boys are generally interested in the technical fields. For them it's sort of an inner interest, where the girls have it as a situational interest, which might disappear at the drop of a hat. This means that teaching and classes will have much more influence on the girls' interest than it has on the*

boys'. Bad teaching will have a very a very troublesome effect on girls' interest, regardless of whether we're talking about nature and technology, biology, physics or chemistry and regardless of whether the subject is taught in lower secondary school, the gymnasium or even in the universities. The situation is 'kept up' so to speak'. 'To me, it's very important that both girls and boys leave school, thinking 'I could work this out if I just sat down and tried'. And lots of girls say that they can't figure it out. It's the attitude that matters. I think there should be differences between women and men, but I also think it's important to convince women to take on the scientific and technological educations, because it's such a vast field and it has such a great influence on our day to day lives and the way society develops. If these educations only attract geeks, that's a problem".

3. Image and role models

This emphasis on the school system does not mean that other spaces, agents and publics are not also indicated as important. Many of our interviewees also bring up the mass media (particularly television) as a decisive instrument for popularising S&T and reinforcing the trust of the public(s) in it. More specifically, through the media young people can encounter role models and create an "emotional connection" with the science world.

(female, Netherlands): "A girl friend of mine is an operator at Corus. She is the boss of a factory. When people see that, they think: hey, that's possible too! If the role models are people that they can identify with, then they are more likely to think that the work might suit them as well".

The media are also pointed out as a precious instrument in the changing of gender stereotypes (regarding the careers, skills or roles of men and woman in present-day society). These tasks could be carried out not only within the spaces for popularizing science but also in many other programmes, in particular entertainment programmes with vast audiences (as one of the experts emphasizes).

(male, Netherlands): "The magazine should include stories about women with fantastic careers, like Karien van Gennip, who is now State Secretary, but studied physics". The students should learn that you don't have to study public administration or business administration in order to have a successful career".

(male, Portugal): "I think that it is fundamental that young people have the opportunity to have contact with a number of role models through the mass media, so they can find their identify and so they can look at science and those jobs and see other dimensions of scientists' lives that are not presented in school. It is important that they feel some kind of connection with scientific knowledge, and that it happens through people who are a point of reference for them, with whom they have an emotional link. (...) Old students could be also used for this purpose; they could come to their old school to present what they are doing, their real experience, so that others can take them as role models. It is very important that young people have real models".

(male, Netherlands) also emphasises the importance of role models: "Two professors came to talk about choosing the exact sciences. That year we had substantially more girls who chose the Science & Health and Science & Technology profiles".

It should be important to increase the number of role models to encompass others that Marie Curie, **(female, Denmark)**: *"who was absolutely fantastic. She was a sort of supernova, you know, not that she had an easy life or anything. But if you could find some perfectly ordinary women, who live ordinary lives without being superwomen. Within physics we have Dorte Dahl Jensen, who works with ice cores. She's a huge role model, but she has this extraordinary capacity for work – she has four children and a fantastic career and has an obvious strength, right? So on one hand, she is a great role model, but on the other hand you can't help but think 'phew'. It's almost too much and it's really hard to live up to. If this is what it takes to be able to have a career, I give up. And then you think 'well okay, maybe I should look for something a little less demanding". 'But I don't think there's anything wrong with having male role models too. Loads of women decide to study Danish and there aren't many male associate professors either, are there. So I don't think that you choose the education based on the number of female role models, but I do believe that when you progress with your education, it will probably have an effect on the belief in being able to have a career in research. But I think that research is a difficult area because there is no set outline and that goes for both men and women. There's no manual telling you to do this and that and you'll be guaranteed a career in research. In many ways I have made the wrong decisions but I've succeeded anyway, somehow".*

Pupils often have a wrong image about 'the scientist' as being a nerd or some old professor in a white laboratory coat so actions need to be undertaken about the image of scientist, e.g. show more female scientists on television in soaps, let real scientists talk about what they do, show role models, do good PR, etc.

(male, Portugal): *"It is crucial that people understand that scientists are normal people, like any other citizen. For that, those who are practicing science need to make themselves known to people. (...) And we also need people to understand that scientific activities are contributing more and more to their daily lives, it is something that concerns everyone".*

(male, Denmark) thinks that *"instead of presenting scientists as slightly crazy individuals, focus should be on the fact that a lot of scientists are young, charming and eloquent people. In continuation of this, female scientists could be presented as prospective role models 'these women are successful and have lead extremely interesting lives. They have three children and are married etc. It's all going very well. Of course they've had to spend time away from work because of the children, but they've had successful careers nonetheless".* According to **(male, Denmark)**, these role models could then be presented in a series of television programmes for instance, as *"six interesting, Danish, female scientists. Just like that. Interview them, show what they've done and researched. Tell the stories of their lives and you know, the thing is that research scientists lead extremely interesting lives. You go to work and have free reign. You learn by researching'. Furthermore, they could tell about 'what a scientist actually does at work. They go to conferences [...]'". '[...] show how interesting it is to be employed as a research scientist. Show that it's really not that difficult. You don't have to sit there from 8 am until midnight every day etc. It has to do with conferences and travelling abroad etc. A lot of travelling actually, because the people you need to talk to are situated all over the world".*

A deeper analysis focuses on the role models and the imagery that many interviewees frequently express. More positive role models are needed, both quantitatively – Hack and Levi Montalcini are not enough – and qualitatively – they should be "less high" role models, to be closer to the everyday female researcher with her problems and her achievements, with her weak and strong points, and all the limitations of a normal life.

(female, Italy): *“On the other hand, as regards the civil society, you have to work in order to change, as I was saying, the image of science and of a scientific career, because one cannot expect that a girl who rightfully has other aspirations and desires, just like men have, yet girls express them less explicitly, to go to the hairdresser, to have a stroll, to have some children, to marry, etc. should think of the image of Margherita Hack, who is a very nice person but looks like Madam Mim, right? Am I wrong, you’re laughing, but it’s true.”*

Interviewer: “You’re right, it’s like that.”

(female, Italy): *“And there aren’t any other role models, are there? That’s it, the media are very important to this purpose, the TV series. There you see all of those doctors: Dr House, Dr this... women always are either overshadowed or annoying.”*

Interviewer: “Precisely.”

(female, Italy): *“So, the media should... the civil society should get a different image of science and of scientists, a more realistic one.”*

Interviewer: “Think about renowned scientists that are role models for teenagers in Italy... the names that come up to my mind are: Margherita Hack, maybe Umberto Veronesi who’s famous for that breast treatment, Zichichi because he appears on Sunday TV shows, that’s it...”

(female, Italy): *“Wait, but why? Why? They are those who appear on the media, aren’t they? They go on air, don’t they? Actually there are some wonderful ladies: there’s this woman who has studied the avian flu genome, who’s an amazing piece of stuff, and she’s the sister of Miss Italia: Ms Capua. She’s a stunning woman: tall, dark-haired, and she’s done remarkable things. She’s never in the limelight. Who else? Well, Ms Antony, visually she’s not that special... not that much, ‘cause she’s reached a certain age. Girls need young ladies, don’t they? To believe in this stuff. That’s it. Oh, there’s Ms Bianco who’s a marvellous volcanologist that also was the director of the Vesuvius observatory, just to mention another, right? Then there’s that one who compiles the data bank of all the European cows, this means there are some things that may have an impact and also feature women. Certainly, they need to be ‘discovered’, we all know that there are less women than men, right?”*

This point falls within the more general discussion on how to communicate positive experiences. And within the obligation the scientific community has to inform all citizens, young people in particular. It is about what is now called the “third mission” of university. Aside from research and higher education, information, communication, dialogue and the debate with the rest of society.

(female, Italy): *“At political level, many things are to be done. Within the seventh framework programme the European Commission set the goal of reaching a 40 percent share of women in its specialist staff. They have promoted a selection-recruitment policy sending out questionnaires to be filled in by female researchers. A real promotional campaign, because many women are afraid of being excluded: ‘In the end they won’t even hire me, so filling in this whole questionnaire is rather useless.’ But the Commission decided to tackle all of those things and the number of women has increased indeed. In Italy, we held a conference and told them ‘look, you can be leaders too’, and we asked Italian women who held positions as project leaders to speak about their experience. It*

certainly had a positive impact. Fears were overcome. In short, people felt prompted to act, being presented with role models."

Interviewer: "Is it the general public that has some wrong ideas on research, on the chances women might get, or is it the scientific community itself that spreads wrong ideas?"

(female, Italy): *"Well, I don't think the general public has... it's the scientific community that has to inform... this is something we tried to implement at AREA through the 'open days' and the information events devoted to the public. When we opened the laboratories' door, a good deal of the researchers who explained the laboratory activities were women, and frequently foreign ones. It's true, this has a positive effect. If the average family identifies research with a woman, then everything comes easily. Clearly, if a little boy or a little girl sees a man and a woman, then everything's easier; if one has a scientific aptitude, then they feed it more easily."*

Another element that should be exploited is the exceptionality of the job of a researcher. The fact that it is an elitist job should be more stressed.

(female, Italy): *"Let's be clear on this: out of a thousand workers, in Italy there are roughly 3 scientists, 3 out of one thousand. And if I am not mistaken, at European level they account approximately for 5 per thousand, so when I happen to visit schools I say: 'Don't get on a bus and expect to find a volcanologist because there are only very few of them, right? But those who are have an intellectually privileged position if compared to lawyers, for example, because if you get on a bus, half the passengers are lawyers'. So, when I meet final-year students, I always tell them, consider what you'd like to do in life as a job, don't consider the faculty. A faculty doesn't say much about what you do, it's a means to get to a job. So, the job I would suggest to you is a job where there are only a few women, not a job where they account for 80 percent."*

A good argument for recruiting young people is that an education in the exact sciences is a good starting point for something else. Many of the top functions in the Netherlands are filled by people from the exact sciences. **(male, Netherlands)** also argued that we should better utilise alumni and people who do important work to advertise the exact sciences and technology. *"I have asked the Platform to recruit a pool of 10,000 well-known Dutch celebrities who have science or technology backgrounds, but who don't use it in their daily lives. A lot of people still have the image of the white lab coat, or the stereotype of the nerdy engineer. We have to fight against that".*

This "exclusiveness" of the research club should be further highlighted, since the prospect of an elitist job typically strikes the students' imagination. However, further action should be taken to disprove some myths that at least part of the scientific community contributes to create. While it is still true that there are only a few researchers, today they are not alone any more: a genius working on their own, achieving a breakthrough with sensational results does not really exist. Today the work of a scientist is a team work, frequently a multidisciplinary one. And therefore it is culturally stimulating.

(female, Italy): *"The scientific community is hallucinating, made of prima donnas, and they hardly understand that the solitary genius doesn't exist anymore. Maybe in its past structure, the solitary genius was successful, now they don't exist anymore. Now there are multidisciplinary teams with different skills. Here, our Italian scientific community doesn't have these skills, so they get lost, I have to say that my experience leads to this conclusion, we waste energies and money in endless debates, whereas the rest of the world... we talk and are always late; we're not credible and reliable, from the outside, the image the other countries have of Italy is that it's unreliable."*

In contrast, **(male, Denmark)** thinks that the prestige has gone out of being a scientist. According to **(male, Denmark)**, this will lead to science becoming a career choice for women rather than men, just as was the case with for example teaching and dentistry. According to **(male, Denmark)**, this happens because men are more oriented toward prestige than women are: “[...] men fight. They are from Mars and women are from Venus. Men want to fight and want to be number one and prestige invariably factors into this. They need recognition where women are more likely to just follow suit and say ‘ah well, let’s not forget to make families and stay happy etc.’ [...] in reality, you might say that ‘perhaps there is so little prestige in becoming a scientist or an engineer that they will become women’s jobs.’ – and maybe that’s an advantage. Because women are extremely good at solving the problems that need to be solved within the field of science”.

4. Contacts between education and business

In conclusion, a suggestion coming from some interviewees regards the creation of occasions, contexts for young women to express themselves, talk and listen to one another and debate. Without any male presence. In fact, in activities including both women and men, the latter fatally monopolise the debate, as both genders are influenced – positively and negatively – by the stereotypes that depict science as a male business.

(female, Italy): *“I’m a European ambassador for equal opportunities in science. With the help of this Diva project I visited secondary schools throughout Italy to meet final-year students [...] We showed students this video with four successful women and then started a debate among boys and girls. The boys were predominant during the discussion, they asked also foolish questions, such as: is the salary good, what’s this female issue got to do with it, all you need is to be good at it... well, the same old story. Then, at the end of the debate, girls came to me and told me ‘actually I had considered enrolling in the school of Nuclear Physics, but my parents don’t want me to, what should I do?’ However, all of them were too shy to speak in public about a topic that was essentially deemed as male-oriented, despite the video featuring four women. When in the audience there were only women – I happened to visit female-only institutions – then on those occasions the real issues came up in the debate, namely the points concerned some problems as matching work and family, the chances of a career, other things. But, in my experience when you meet students either you speak to girls only or the discussion risks to remain very general.”*

(male, Netherlands) thinks that companies should develop closer ties to education. *“We have a programme like Jet-Net now, but that costs big bucks. The Netherlands is resting on its laurels. We’ve closed the company schools, thinking ‘the education system can take care of it’. That gives everyone a nice position. On one side of the river, companies can yell ‘Hey, train more technicians!’”, and on the other side they ask ‘What do you need?’ In between there’s a river full of committees. Nothing ever gets done, because everyone just keeps talking about the problem. If you ask me, get rid of the middlemen. It should be much easier for students to get training in companies.*

(male, Denmark) points out that it is important to set a goal for yourself very early in your education: *“if you can get to them early and convince them – in our case by means of internships of longer durations – then there is light at the end of the tunnel. You’ll have a goal then and I think that’s very important. Within the educational system today, there is a lot of focus on drawing up so-called ‘educational plans’ which really function as a sort of reporting tool, following students all the way through their education. That’s the grand idea, anyway”.* According to **(male, Denmark)**, it does not work quite as intended, though *“as many of the educational plans that are produced have not been designed by actual experts. No teachers have had a say in their production or a chance to comment, guide or criticise the contents. The plans are drawn up by the*

students themselves. If this project was more goal-directed, a basis consisting of the students' own ideas could then be developed further and might help young women plan their careers more carefully. That's what I think it's all about. It's typical human behaviour to want to picture yourself as a first-year student, before deciding on which education you want. Very few people can imagine what it's like to be involved in the latter half of any given study or what it's like to actually have a finished education. This is the perspective I think we need to focus on and we have to work on getting better at it".

(male, Denmark) talks about the idea of education as a central in the formation of a basic knowledge among the public, which "[...] lacks some sort of general standpoints, enabling them to relate to this complicated world and to make decisions on topics like genetic manipulation climate changes etc. It's important that we all have a firm basic knowledge. Furthermore, there is a lack of general overviews of educational possibilities and a need for 'selling points' for careers within science. It's just not good enough for a manager of some random company to state that 'we need more engineers'. It just doesn't work like that. It's too abstract and too impersonal. I need to be able to relate this to myself as a person. What could I gain from this? There is a group firmly planted in between those who are convinced and those who lack the basic knowledge that everyone should have. This group needs to hear - in very convincing words - 'this is what it implies'. Perhaps a more organised and sensible approach to marketing would also help spread the message that 'this leads to this and this and this and this is your guideline to the entire process'".

And finally, initiatives and promotional events addressed to girls only may help to highlight more effectively that some typically female qualities do exist and are functional to research and should be exploited by girls as the strong points in their career. Avoiding to fall into the trap of adopting a male mentality and to turn their existence into a male-like one.

Interviewer: "Earlier in this conversation, you said that men and women have two different mentalities, what do you mean by that?"

(male, Italy): "Generalisations don't apply to this. Perhaps I trust more a woman as a collaborator because she's more attentive and careful; sometimes men are more superficial, but also more independent."

(female, Italy): "Girls think it's not exactly a woman's job. When I meet them, I tell them: look, I've got two daughters, a cat, a lot of hobbies, many friends, ideas usually come up to my mind when I am at the supermarket or when I'm driving, because your brain is free and keeps moving on; this is a job suitable for women because it's a job you carry with you all day long. If you work in a bank, you obviously have to sit at a counter. So, this is a job that gives you freedom, the chance to travel, gives you... Therefore I somewhat show another side of this job, that doesn't concern only a scientist wearing his specs, sitting all day long at the lab counter."

5. Continuous attention for the gender gap at universities and research institutes

Before dealing with the future prospects, it is worthwhile to take a look at the past to contextualise the gender gap issue in scientific-technological careers in the framework of the employment dynamics of the 20th century. It was a century of changes and improvements, also (or even especially?) in the condition of women.

(female, Italy): "Yes, but times have already changed. They've changed quite a good deal. I believe they had already changed a good deal. If you look at the family as it was a century ago, 90 percent of women would

stay at home and hadn't a job. Today nearly all of them have a job, so times have changed. And also the family law has hugely changed. Yes, the family law too, it once was a medieval thing. Great strides have been made. Alright, you might say: it is not enough, but the situation was stuck to centuries earlier, virtually no woman could study, only in a few cases women would go to college."

This does not mean that "modern times" are not hard times; young people and their families should have clear in mind that investments – in resources, commitment, time, studies – are needed to achieve longer-term results. And suitable means, especially cultural and mental ones, should be adopted to tackle short-term and casual work.

(female, Italy): *"Well, this is precisely how I see it. Let's say, it takes a long time before a family is fully accomplished, I mean, before a young man or woman finds his or her stable position, he or she has settled down, etc. When I visit secondary schools, I always tell them: 'Please consider that everything takes its time.' It's not that if you matriculate in physics it takes more time to find a job than it takes now as you are. Because what has changed is the very structure of the labour market, and this is not clear to all families – especially in the lower classes –, they still think of a stable job. A stable job won't exist anymore. So, you'd better invest in professional skills and expertise. Obviously, we need to find out how to make this message get through. If I tell it like this, nobody would understand me, apart from you. But very likely, in the near future, one should not expect his son or daughter to settle down definitely; they will go on signing these short-term contracts, possibly."*

Obviously, the 20th century was also the century of science, the century in which research became collective, leaving behind the ivory towers, the academia and all those single contexts in which a scientist did suffice by (more or less) himself. Big science was born and the relation with society has become a daily one. Present trends suggest that this enlargement process will not stop and in the next decades it will further transform the dynamics within the scientific community, including also employment and the female work force in particular.

(male, Italy): *"In my opinion, as regards the career of scientists, we are about to witness a future great expansion, because science has become a strong precondition for economy and therefore also for the wealth production system and therefore it will expand, the attention paid to research will increase and probably this will open up opportunities for both genders."*

(male, Italy): *"I am a civil engineer, so for a personal interest I am inclined to look at architecture. The work of an architect is very close to some engineering fields and I'd say that in architecture there is a large female presence. I think that engineering and architecture are interwoven. Also, one needs to think of the figure of the engineer in the next century, traditionally an engineer was seen as a reality modifier, or a designer or engineer that deals with the functioning of machines, making a complex productive system work perfectly. They are seen as someone that have to work with materials. On the other hand, today the trend is to see them as someone who designs systems, who works on immaterial things. I believe there could be an increase in the level of interest for these forms of engineering. It is not by coincidence that managerial engineering sees a considerable female presence."*

This will inevitably lead to a readjustment between genders, in research as much as in management. Apparently this is a readjustment the scientific community is ready for, as demonstrated in the previous chapters, whereas society as a whole has still to realise and accept it.

Interviewer: "So, you're suggesting that in the next future this gender gap...?"

(male, Italy): *"I believe it will keep on narrowing down. To this day, in Germany it's quite unlikely to find a woman professor."*

The critical point seems to be society that, according to our witnesses, has changed only slightly or has not evolved at all and therefore finds it difficult to be compatible with the novelties the new science will need. There are many possible risks: society may remain a step behind, young people may not have scientific professions in their vision, policy-makers and politicians may not plan and implement the services needed for a mobile community such as the one of researchers.

(male, Italy): *"As regards the future, I don't foresee a situation that can be easily changed because, while I see changes, even very fast, in the sociology of scientists, I don't see equally fast changes in sociology tout court. Within society. In the end, this is the clash. I personally believe that if I had some daughters they would find it difficult in the future to follow this career and match it with a normal life, which would be fair. Despite being a very optimistic person, I can't see any short-term prospect for all those things that should happen to implement an easy inclusion into the work force. Which is much needed. I would call it a rejuvenation of science. There are many girls who are making science, yet there are only a few of them at the executive level. I think this is a demonstration of the difficulty I am talking about. If it could be translated into reality, everybody would benefit from it; yet I believe these difficulties are not levelled, society has not been changing that much. It's true that family is not what it was once, but children are there all the same and the issue cannot be simply disregarded. This is why I don't foresee any positive development along this path."*

Interviewer: "What action should be implemented to spur girls to matriculate and undertake a scientific career?"

(male, Italy): *"Honestly, I don't think any action is required. Scientific faculties now see a large presence of girls. Perhaps what is required now is an availability of more efficient social services; nursery schools with vacancies are hard to find in the vicinity of your home."*

All of this may result in a huge waste of resources. The female gender would be wasted if kept away from research; and also those people who do not accept the frustration of selections not always based on merit would be wasted. These two groups are widely overlapping.

This is a long-term and deeply rooted phenomenon that requires long-term solutions. In particular, action should be strongly implemented in the education field.

(female, Italy): *"[I can see that] a lot of energies and very good, creative people are wasted... in a certain sense they are wasted and also discouraged because when you see unworthy people getting ahead of you, it creates a sense of frustration so at times you give up. To bridge this gap in scientific careers, education is fundamental. I mean, family upbringing first and foremost. Imprinting does take place when you're a child. And therefore future parents should be educated to... I believe this, because now it's a matter of a long tradition. And overcoming century-old traditions takes time."*

(male, Netherlands) argues that universities should pay constant attention to the gender gap. He thinks that universities in the Netherlands do not do enough, comparing them to those in the United States,

where: *"Institutes and universities are constantly subject to restrictions if they don't. I don't think it's an accident that many universities there now have female presidents. ... Here they're all men. It's not a question of positive discrimination with quotas; I don't think that works. It's more that you keep it on your mind, constantly asking what more can be done. Here you see that when someone asks 'How is it going with the position of women in the field?' that people don't take it too seriously. They act like it has to come about on its own, but it won't happen on its own. It's just like integration; you have to constantly work at it, investing time in it and putting it high on the agenda".*

(female, Netherlands) recently heard of an initiative in the United States that can put the problem of the gender gap on the agenda: *"The National Science Foundation has announced a prize for the most woman-friendly university or research institution, so that women can easily combine work and care giving".*

A much controversial solution envisages the establishment of "female quotas", i.e. a minimum guarantee threshold for the number of women to be employed. Obviously, this is an instrument that can be used only in association with the meritocracy principle, which cannot be disregarded in the selection of people who carry out research. Rather, one should wonder whether meritocracy is actually the principle adopted or is only a smoke screen that frequently hides other choices. Hence, the first action to be taken is to guarantee that merit is the criterion to select those who are to carry out research.

(female, Italy): *"I am really convinced that a policy strongly founded on meritocracy should be implemented, so that the best men and women can advance in their career; to the scientific community, their gender doesn't make any difference. Then, if women are good at it, they should get the same opportunities men get. This is the only crucial point, not just because they are women."*

(female, Italy): *"I am not a very strong supporter [of female quotas], everywhere in the world the best should be selected. Clearly, by applying balanced criteria: when, in a situation of applicant equality the male or the female component is too high, you have to strike a balance, just as you always do in geographical terms. You shouldn't be supporting the female issue too much, not to make it a boomerang and counterproductive subject matter; if in order to hire women you have to hire staff not up to their tasks, this is counterproductive for the entire category. But I am in favour of raising awareness among the employers."*

(female, Italy) makes a distinction to this regard: on one hand, she excludes the implementation of such a measure on proper research jobs, for which women have all the features to be competitive. On the other hand, she suggests to use it as an instrument for managerial positions, for which the "circles of power should be broken." **(female, Italy):** *"So, I'd rather act on a strong political level: in order to break the circles of power and of the strong lobbies there is no other means than female quotas. This doesn't mean that for every open recruitment there should be a share reserved to women because this doesn't make any sense at all, it collides with the meritocracy principle. I don't mean that. But I do mean that in every management board, in any presidency, in any organism that is appointed and that manages both recruitment and resources, there should be a significant share of women that I deem fair to be 50 percent. This as a first measure. At policy-making level, right? Thus, it's also a scientific and research policy. Obviously this should also guarantee the compliance with the meritocracy principle in recruitment processes, but this is another story, right?"*

(male, Italy): *"Instruments are a very complicated issue, I'm not familiar with them. Ideally, I'd like to see a scientific environment where you can choose the management, the roles, the projects in both a male and female range. I wouldn't want to favour nobody but the best. But the best are to be found everywhere, only presently the choice is not equal in both genders, I believe. How to change that, I don't know. I think that in the first phase, which I don't consider as philosophically correct, I would favour the inclusion of women also through some simple rules. Obviously this should not last very long, just in order to favour an increase in the*

number of women. Perhaps this should be done, even though I am against such sort of measure: people are efficient because they are efficient, not because it's a man or a woman. However, presently there is a difficulty, so why don't we put things that way and see what happens?"

It may not be a question of establishing female quotas, rather of sweeping away male quotas, in order to clear positions that are occupied only for power reasons.

(female, Italy): *"First: promotion and support to women; second: make them aware of the roles they can play also at managerial level and get rid of male quotas."*

Interviewer: "Rather than female quotas, male quotas."

(female, Italy): *"Sweep away male quotas. Evidently there is a number of positions that cannot be given up, power cannot be given up. It's not only us aspiring to positions, it's the situation that isn't fair anymore; the female gender is more represented among biologists, yet if you take a close look at the executive level, there's always a majority of men. How come? Is it that men are always better and smarter? It's surreal and, on top of that, data demonstrate that women graduate earlier than men and with higher marks."*

6. Programmes geared towards women who have recently earned their master's or doctoral degrees

Finally, as regards, more particularly, the creation of better conditions for women to progress in their careers, the interviewees who were more aware of this issue pointed out the importance, among other suggestions, of making the evaluation systems less ambiguous and more transparent; changing the organisational culture of many institutions, promoting greater awareness of gender problems and unconscious prejudice-based practices; equipping institutions with new mechanisms that allow them to deal better with the diversity of current careers paths in these fields (e.g. the reintegration of staff who have temporarily interrupted their careers for family reasons or for work experience abroad or in other companies/sectors); and developing further studies on this matter and disseminating their results in order to promote a greater debate on gender and science issues.

(male, Portugal): *"These institutions – which are still predominantly male-oriented – have a form of conduct that is often quite insensible to gender issues. There is still important work to do, at a cultural level, in order to increase institutions' awareness of these processes. (...) These acts may not be conscious, but they show that there are still differences in the way of dealing with men and women".*

(male, Portugal): *"The scientific institutions need to adapt their procedures to integrate people that will certainly have very different careers. Some will go out to work in other firms; some will occasionally return. (...) This is also fundamental if they want to attract talent from around the world. (...) Not everybody has to be an academic lecturer, with a single career path".*

(female, Netherland) has noticed that many women leave the exact sciences world after graduation or earning their PhD. She believes that they then go on to find less scientific jobs. Her advice is to find out why

those women go into other fields, and if there is something that can be done about it. *"Maybe it has to do with women's lack of ambition, but why should you only have ambitious people in the exact sciences and technology?"*. It might also have something to do with women's self-image: *"We could show a doctoral candidate that we think that she is a good scientist. ... We should also emphasise the flexibility of the job, because that is a big advantage. ... We should also actively recruit female researchers, since it apparently works with professors. The problem might also be that female doctoral candidates are less likely to bring attention to themselves, causing everyone to forget about them"*.

(female, Netherland) has noticed the same thing: *"I think it's important that women are encouraged to continue working after earning their PhD. They do o.k. until after they earn their doctorate, or even during their post-doc, but then they need a little push to take the next step. ... There are a number of programmes, like the Veni, Vidi, Vici programmes, that provide personal support. I think that they work very well in these situations. ... Some of the programmes have been developed specifically for women. ... Personal support means that you have the opportunity to build up your own research group somewhere, with one or two doctoral candidates under you to gain leadership experience. That builds self-confidence"*.

7. Child care

Child care is poorly organised, **(female, Netherland)**: *"There is just a shortage of capacity. You are lucky to be able to find help for three days a week, but if you have a full-time job, you need child care for five days a week. The times are also difficult: you often have to pick up your child before five o'clock, but work usually ends after that"*.

The expectations are not connected with revolutionary changes, because they come from the observation of evolving reality. This evolution, according to interviewees, is actually succeeding very fast. Civilizational changes give more and more opportunities for equality most of all through perfecting technologies lessening most of the women's duties. Such cultural changes enable changes of the roles in a marriage.

(female, Poland): *"Nowadays it is commonly said that a child can be looked after by a woman and by a man. Actually they both should look after their child. This patriarchy possibly ceased to exist. Generally marriages are based on partnership and such they should be. Well, you know, I look at looking after my small children, grandson, both of their parents take care of him similarly, my son-in-law goes with him to a pool, baths him everyday, he has a son, but women are there daytime. If we have money, if we are able to earn money, we may hire someone to look after a child, and so it should be. A mother is necessary, she must be everyday, but she doesn't have to be there around the clock. For a few hours she may be stood in for. There should be a professional education how to deal with children"*.

The expectations for the change of quantity and role of women are first of all connected with civilizational changes. Much hope is connected with the growth of economic condition, population and more expenses for science. As for practical solutions, they deal with the reforms in educational systems, however not in structure but in substance. There was also an agreement on policy based changes, which should target at equalisation of the proportion of gender in science. The idea of parity was especially criticised. In all the interviews there could be seen revealing consciousness of a cultural change effecting in two ways. Positive one is about the increasing equality of women, differentiation and exchange of social roles. The negative one centred on the decrease of interest in difficult sciences by young people, not only girls.

(female, Denmark) considers it problematic if maternity leave becomes a problem only women suffer from: *"[...] I've considered having children, but what will happen to me when I enter the labour market? I'm 29 years old now and am not in a hurry to have children, but when I decide to begin a family, will it affect my career? Will I be given the same chances and opportunities if I suddenly proclaim that I'm going on leave for a number of months? I keep hearing that it's a problem and I've thought about it quite a bit. It scares me and I can't help thinking that 'this can't be right. Does this mean that I will never have the opportunity to take on a managing position if I have children?'"*.

Furthermore, **(female, Denmark)** thinks that you have to tone down your good manners when you enter the labour market: *"you need to be sort of tough. But what good will that do, if pregnancy and children pull in the other direction? These are things that I sometimes think about. I remember a friend telling me that 'what good does a high education do if women are still not considered equal etc?' and I have to admit that it scared me a little to hear her say that because she's the same age as me. And then I think that it can't be true. But I won't know until I'm actually out there and can find out for myself. The only information I have is from the media and from women who have careers themselves – I don't know from experience"*.

Appendix: Authors of the national reports

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