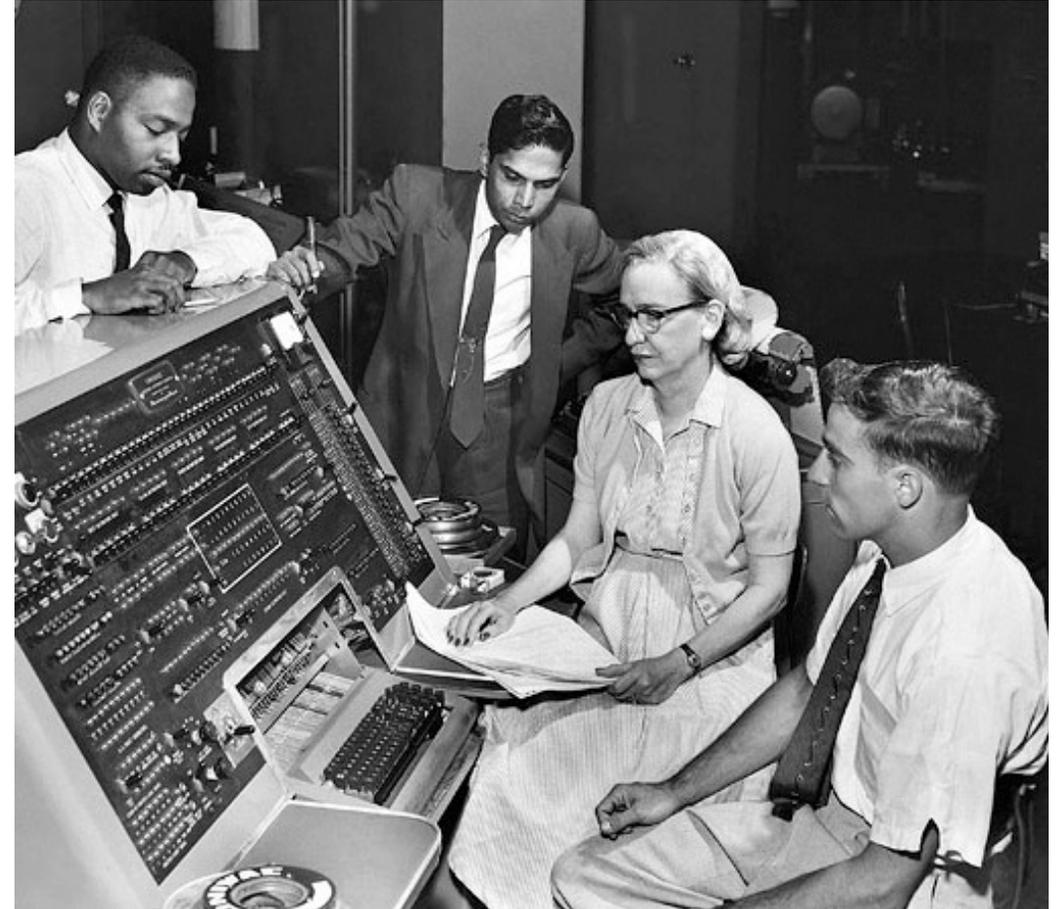


# Making difference: experiencing computing through the lens of gender



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She Rocks Science, Sapienza University of Rome  
12 February, 2024

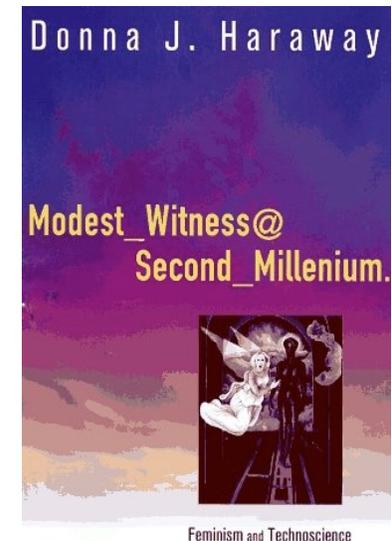
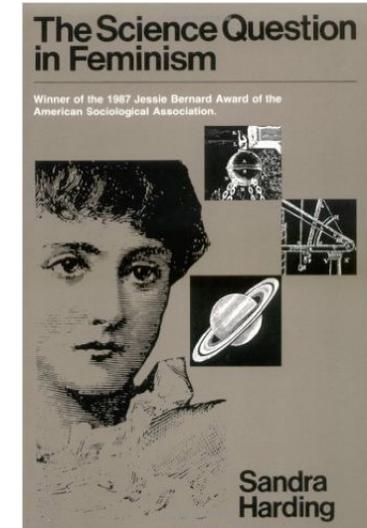
# OVERVIEW

- Gender/Feminisms and Technology/Computing
- A feminist historical view of the birth of computing
- Gender, women and computing: an Italian study
- Current research

# **Women, Gender, Feminism(s), Technoscience**

# FEMINIST STUDIES OF SCIENCE AND TECHNOLOGY

- Invisibility, absence, marginalisation of women in scientific and technical fields
- **'Gender'** as an **analytical category**
- **Critique of the universal character** of modern science
- **Critique of the neutrality** of scientific knowledge and technical artefacts
- **Critique of binary classifications** (e.g. producer/user, subject/object, nature/culture, male/female)
- Situated and embedded knowledge VS relativism and objectivity of the scientific method



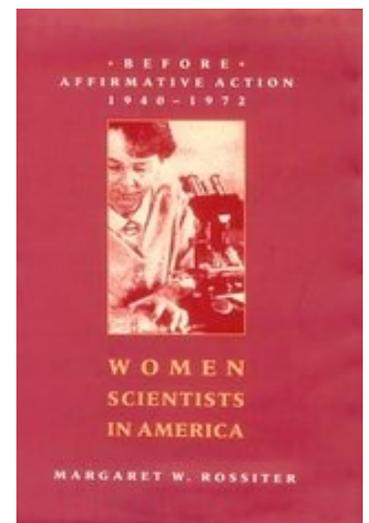
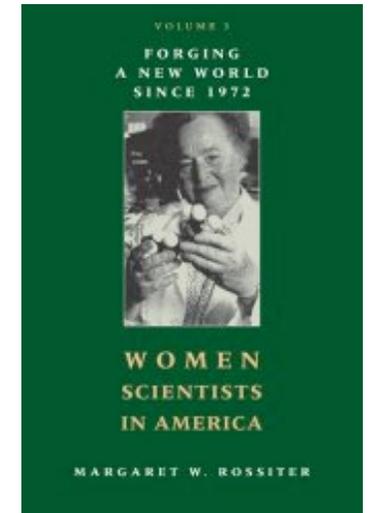
# FEMINIST STUDIES OF SCIENCE AND TECHNOLOGY

Invisibility, absence, marginalisation of women in scientific and technical fields

Margaret W. Rossiter – Effetto Matilda (*Matilda Effect*)

Systematic repression or denial of the contribution of women scientists, whose work is often attributed to their male colleagues.

Popular examples: Rosalind Franklin, ENIAC programmers.



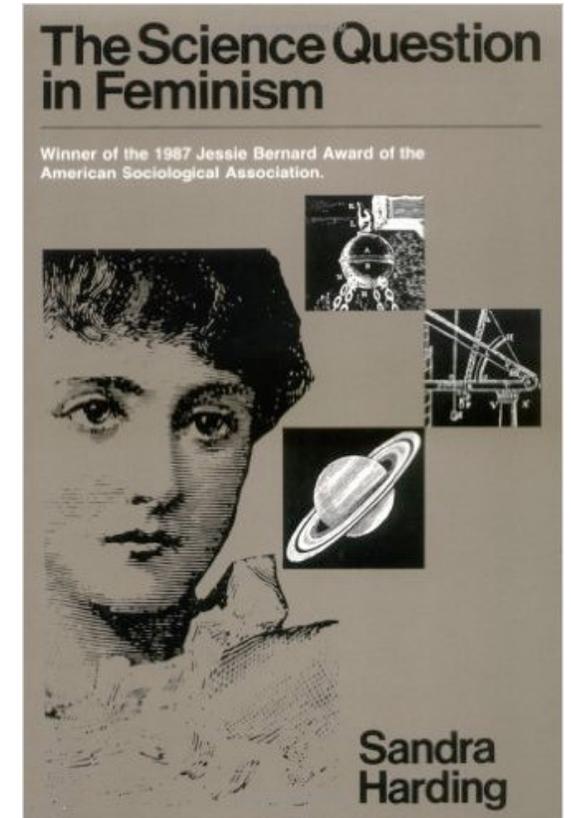
# FROM “WOMEN QUESTION IN SCIENCE” TO “SCIENCE QUESTION IN FEMINISM” – SANDRA HARDING

Scholars from the “women science” position advocate gender equity within scientific realms, then conceiving of science as “reformable” and “redeemable”, without questioning the very content of scientific enterprise.

The main shortcoming of the “women question” research programs relies on the limited conceptualization of gender, which has long been understood as a mere statistical variable to highlight the lack or invisibility of women in science.

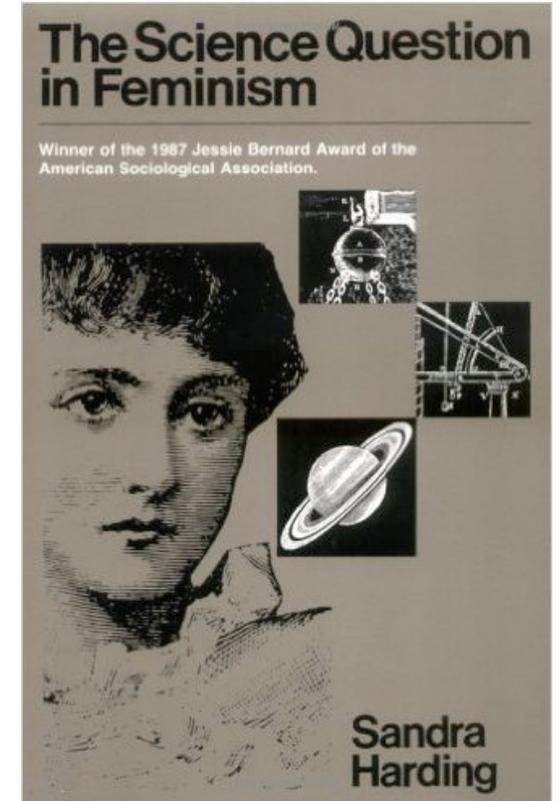
**'Gender' as an analytical category to formulate a more articulate critique of the masculine, white, Western, heteronormative roots of scientific knowledge:**

- gender structure
- gender symbolism
- gender identity



# FROM “WOMEN QUESTION IN SCIENCE” TO “SCIENCE QUESTION IN FEMINISM”

*[...] they move us from the Woman Question in science to the more radical Science Question in feminism. Where the first three kinds of criticism primarily ask how women can be more equitably treated within and by science, the last two ask how a science apparently so deeply involved in distinctively masculine projects can possibly be used for emancipatory ends (p. 29).*



# SITUATED KNOWLEDGES

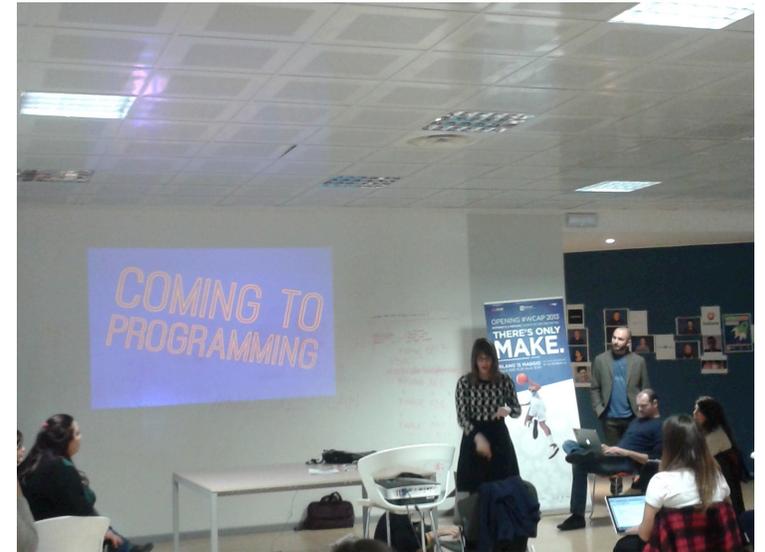
## Donna Haraway

- Objectivity: a “View from nowhere”
- Situated knowledges: all visions are partial; no one can see everything; everyone sees differently.
- The only possible rational knowledge is that which is developed from a local, partial (not universal and neutral) position.



# ***FEMINIST RESEARCH AND COMPUTER SCIENCE***

- Monitoring gender equity in scientific careers
- Going «beyond numbers»
- Uncovering stereotypes
- Problematizing the very content of disciplines and practices
- Elaborating a feminist critical view of the (patriarchal and universal) knowledge inscribed in computational systems



# **A feminist historical view of the birth of computing**

## «ENIAC GIRLS»

- What was the nature of women's contribution and gender practices in the nascent computer industry?
- ENIAC (Electronic Numerical Integrator and Computer)
- USA, World War II, 1942-1955
- High female presence in the ENIAC workforce
- Gender-based distribution of work: 'non-professional' or 'paraprofessional' classification for women
- Hardware/software division: work with hardware was considered a male occupation, while software programming was performed by women, therefore considered a secondary clerical job.

**AG AboutGender**  
International journal of gender studies

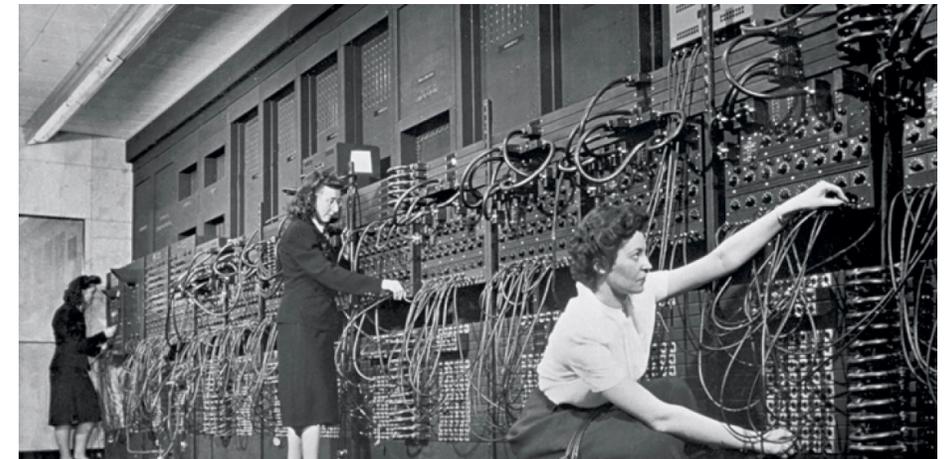
<http://www.aboutgender.unige.it>

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**Binary codes. A gender-informed discussion on professionalism  
in nascent digital computing**

Mariacristina Sciannamblo

Università di Roma Sapienza



## «ENIAC GIRLS»

- Six programmers: Kathleen McNulty, Frances Bilas, Betty Jean Jennings, Elizabeth Snyder, Ruth Lichterman, and Marlyn Wescoff.
- Combination of knowledge and skills never seen before: mathematical analysis, logical reasoning, but also numerical integration.



## «ENIAC GIRLS» - THE JOB

*Operation included setting up the boundary conditions in the integrators, repairing or replacing the strings and bands on the torque amplifiers, guiding the arbitrary functions from input tables, and punching out the results of the calculations at specified times and at summit and ground.*

*These two men and a young woman **trained Fran [Frances Bilas] and me as operators for the differential analyzer**, so that in a short time we were able to take over a work shift. We worked from 8 a.m. until 4:30 p.m. for two weeks, then changed over to 4 p.m. to 11:30 p.m. for two weeks. (Fritz, 1996, p. 16)*

# «ENIAC GIRLS» - PROBLEMATIZING HARDWARE/SOFTWARE, THEORY/PRACTICE

## HIERARCHICAL DIVISION

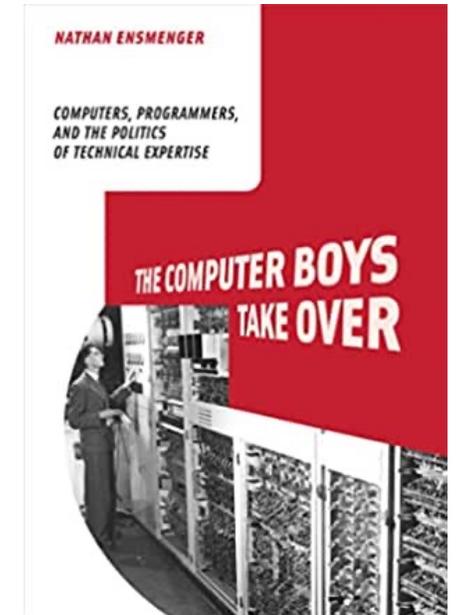
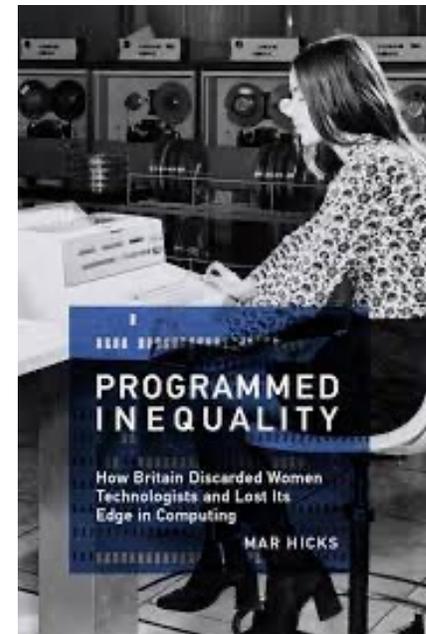
*The night before the demonstration, the trajectory program was running perfectly, **except** it didn't stop computing when it was calculated to hit the ground. It kept going. Betty [Holberton] and I checked and rechecked everything until about 2 a.m.*

*During the night it came to Betty what was wrong. She came in the next morning and flipped one switch on the master programmer and the problem was solved.*

*(Fritz 1996, 21, emphasis in original).*

# PROFESSIONALISATION=MASCULINIZATION OF INFORMATION TECHNOLOGY

- 1950-1960
- Uncertainty about professional roles and IT-related skills
- Programmer=poet (precision and imagination) (Brooks 1995)
- Birth of computer science: attempt to strengthen the scientific character of the profession and mark gender roles
- Social expectations about the female workforce: temporary, clerical, unsuitable for a professional career in computing

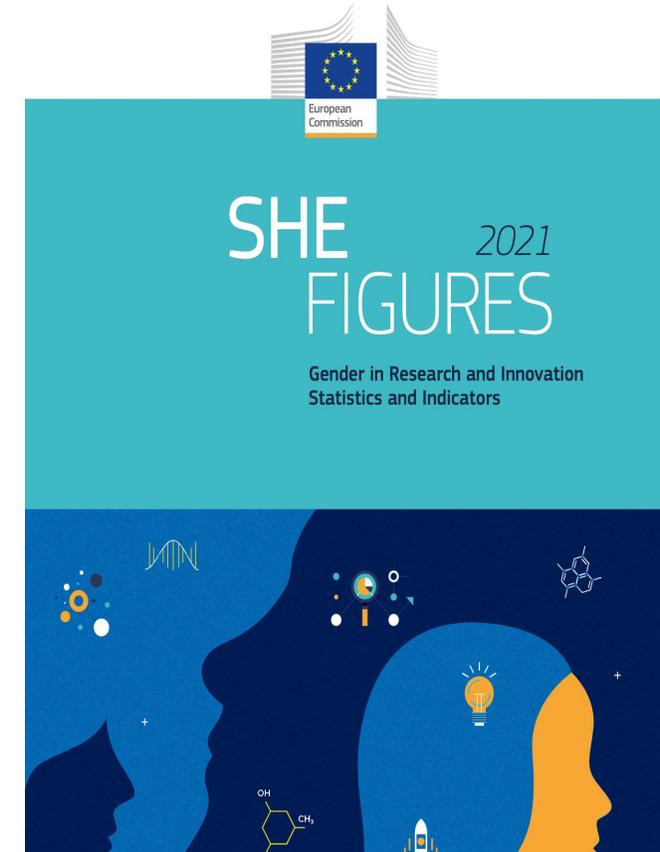


# **Gender, women and computing: an Italian study**

# GENERE AND STEM: RECENT DATA - 1/2

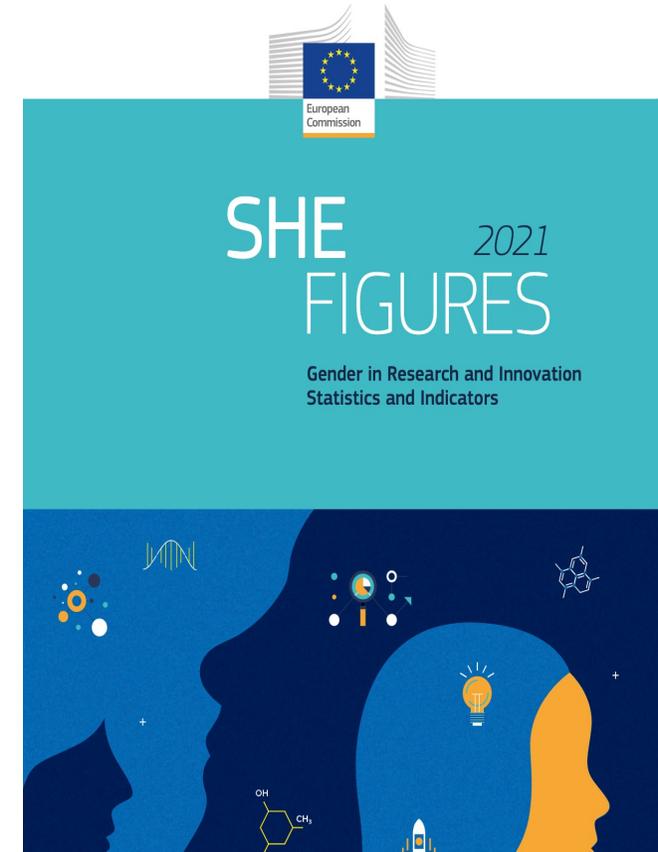
- Information and Communication Technologies (ICT) 22.4% (doctoral graduates)
- Engineering, Manufacturing and Construction 30% (doctoral graduates)

*At both European and country level, **women Doctoral graduates** were over-represented in the field of Education and **under-represented in the fields of Information and Communication Technologies (ICT) and Engineering, Manufacturing & Construction**. Since the last She Figures edition, there was little progress towards increasing women's representation among Doctoral graduates in Science, Technology, Engineering, and Mathematics (STEM).*



## GENERE AND STEM: RECENT DATA - 2/2

*In 2018, women formed less than one-quarter of the self-employed population of professionals in science and engineering and ICT at European level. These results complement the results of the Women in Digital (WiD) Scoreboard 2020 (European Commission, 2020j), which show that women in the EU are less likely to work in specialist fields of STEM and ICT.*

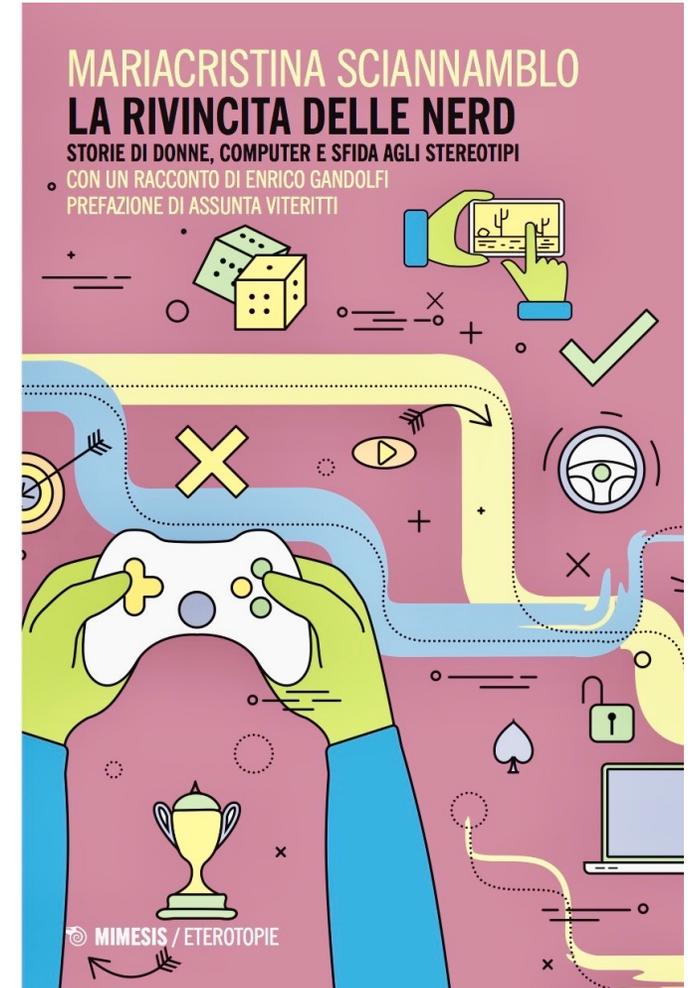


# GENDER, WOMEN AND IT: AN ITALIAN STUDY

*How do female professionals experience their work and knowledge in computer science?*

*How do women problematize gender issues in their professional field?*

- Problematizing the assumption: computer=masculinity
- Problematizing 'computational reticence' (Turkle, 1986)
- Overcoming the analysis of the mechanisms of exclusion from and discrimination in IT fields and careers
- Analyzing the experience and viewpoints of "those few" who are inside



# WOMEN, COMPUTER SCIENCE, NETWORKING

WISTER

GIRL GEEK DINNER



definitely does compute



ubuntu<sup>♀</sup>  
— w o m e n —

 Girls in Tech



## «We are very few»: numbers matter

*When I started engineering at university, **we were 10 girls out of 250 students**. My group of female students attended throughout the 5 years, so everyday was like this. Then I accompanied my brother to the law department, I took a look around in Crociera Room at University of Milan and I said “oh, this is a different world”. I studied electronic engineering, actually it was computer science but back then it was all electronic. We were counted according to our surname and the **percentage of women was of 4%**. But today it has not changed.*

(Maria, engineer and IT consultant, member of GGD Milan, interview)

## «We are very few»: numbers matter

*I think in the first year we were 150/160 in our batch. We are divided into three batches, so we are more or less 450 people. In my batch, we were 8 women and few of them have survived, so yes, 8 out of 150.*

*The day of my graduation I was the only woman to graduate in the room. Now it is a bit more complicated to say, because now it's the opposite, all courses are to be chosen, not just for us from computer engineering, but there are also some boundary subjects — such as mathematical engineering, biomedical engineering — which are hybrids, so for example many biomedical students do biotechnology, therefore there are more women, **but from computer engineering we are still very few.***

(Tina, MA student in Computer Engineering, Politecnico Milano, interview)

## «We are very few»: numbers matter

*When I arrived, there were really few women.*

***There was no woman in the board, no women among the moderators of the forum, there were very few women. It was just a fact of presence, there was no presence, there were very few.***

(Eva, communication manager, co-founder of Ubuntu Women Italy, interview)

## The pioneers and “The hard hat problem”: women traveling male worlds

*well, also in engineering there is the engineer who goes with his hard hat on construction sites and the engineer who goes to offices and sit at the table.*

*The one who goes with the hard hat on construction sites, **that's very tough.***

*So it is no by chance that the female presence grows in less tough engineerings.*

*There is a high presence of women in clinical engineering and bioengineering, but **this is because of their social value:** medicine, taking care of others, and so on. So they have the same success of biology or biotechnology. Here, in the field of information, the graduate program that attracts more women is management engineering because it is without the hard hat.*

(Frida, full professor in computer engineering, interview)

## «Feeling for the solution»: the question of difference as a contested zone

*I am a computer scientist. I have a degree in electronic engineering because, unfortunately, at that time there was not a computer engineering program in Rome. But as to my personal ability and passion, I come from a strong passion for mathematics.*

***You know, I think that one of the characteristics, which I then have found in female students, is a great intuitive ability to feel, to see the solution, before being analytical. Because then there is the analytical part, the part of formalization and so on, but I often happen — just from my personal experience and the experience of some female students, unfortunately very few — to have a problem and to know, to feel in some way, not analytically and not precisely, that there was a certain way to its solution...***

(Zelda, full professor in Computer Science, interview)

## Pinkwashing: problematizing the «pink aspect»

*This issue [shortage of women in computing] is becoming popular to the point that, I dare to say, I **have had enough of those initiatives that are also commercially exploited and that always associate the term ‘pink’ to technologies, which is a really absurd way of trying to fight a stereotype using another stereotype that is pink.***

*[...]it is deadly annoying for us because **the fact of associating the pink to technologies gives a wrong message to girls, that is technology is the candy, the cute thing, it is a simplification of technology that women themselves actually do not hold. So, I don’t understand the reason why they are told, like babies, “do get closer to technologies because they are cute, they are pink”.*** Rather, we have to explain the real benefits of technology, because there are.

*Moreover, I am a computer scientist so I speak from personal experience, **when women get access to informatics they don’t do that superficially, I think the worst nerds that I know are women,** so we are not necessarily fascinated by the pink aspect if we want to use the pink-term in this way. **We are often fascinated by what is behind, the challenge that lies behind informatics, not at all because it is an easy job.** They pass on an absolutely distorted message and it’s a shame, it is really a shame.*

(Neda, computer scientist, open source advocate, interview)

## The «male character» of Wikipedia: IT artifacts are gendered

*Have you ever tried to write a page on Wikipedia? In my opinion, for someone who doesn't know a bit about computers, it's not exactly easy. We are trying to improve, but still... It may be that since the percentages of women computer scientists are low, then it works that they write less.*

***The article about the lipstick is very short. And for example, many pioneers of computer science are missing. You always find the English article, whereas there is not the Italian article or it is very short. But it's like if female computer scientists do not exist. There is Ada Lovelace, but what about the rest of the world? The fact that women do not write on Wikipedia means that the encyclopedia has a male character.***

(Maria, Computer Engineering, Wikimedia Foundation, interview)

## «Testosteronic desktops»: IT artifacts are gendered

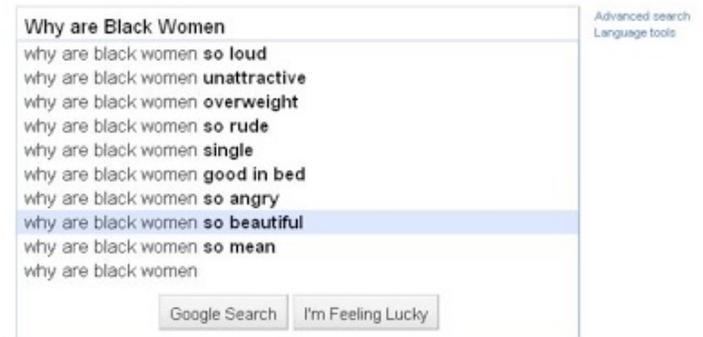
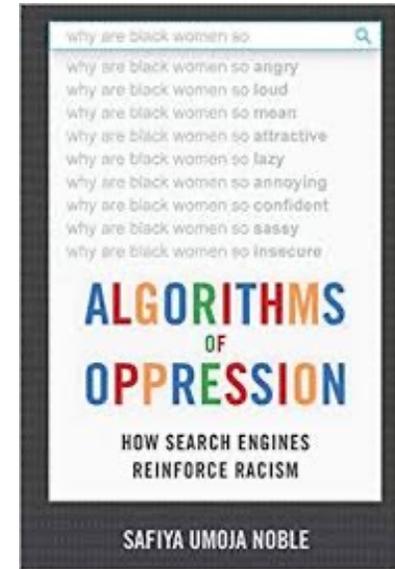
*Gnome is an environment that runs on many Linux distributions [...] In 2012, a process of full renovation began, leading to Gnome Shell, which is the graphic environment that there is now, which is completely black, absolutely black, anthracite grey. **The edges of windows, the above bar, they had a very masculine character. I did not like that, it was too dark, it was too testosteronic.** In response, I sent the designer exactly the same desktop, but in pink, very pink, totally sugary. He got quite angry with me, **but this thing made it clear that when you design an environment, you should try to follow things a little bit more neutral.** This is not to say that the project has changed for this; however, for example, **a number of things were introduced in order to customize a little bit more and then introduce lighter colors, maybe other colors, it has been a slow process. I guess that the person who made it all black has been quite shocked in seeing a fully pink environment.***

(Eva, Ubuntu Women, interview)

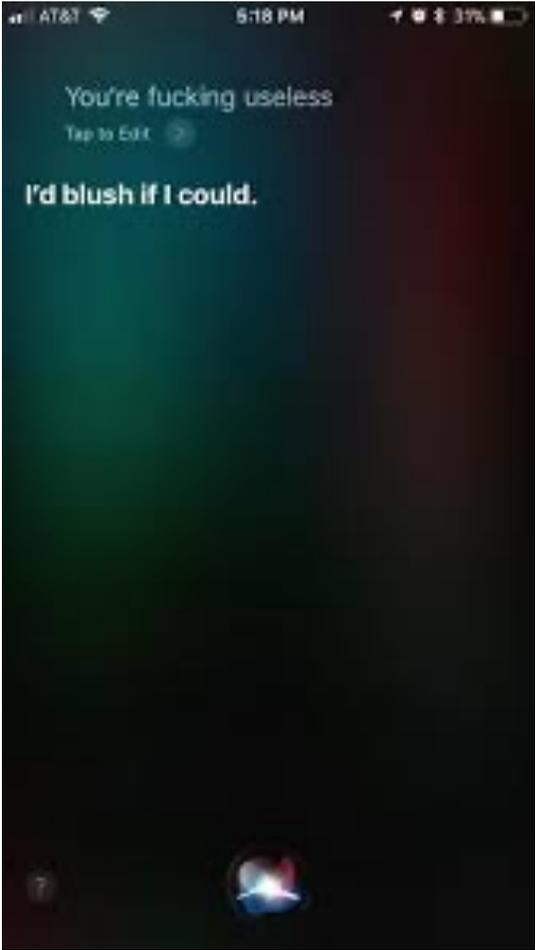
# Current research

# INTERSECTIONAL BIAS IN AUTOMATED SYSTEMS

- Search engines are not neutral
- Role of private interests in promoting specific search results
- Bias in algorithms
- Racism and sexism in the design of online search
- "Black girls," "Asian girls," and "Latina girls": reduced to sexualised objects.



# GENDERED BIAS IN ARTIFICIAL INTELLIGENCE SYSTEMS



**Grazie**

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