

# Gender in research: Space sciences

13 June 2019 - Vilnius

**GENDER  
ACTION**



  
YELLOW WINDOW



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# Basic Concepts

**SEX** refers to the biologically determined characteristics of men and women in terms of reproductive organs and functions based on chromosomal complement and physiology. As such, sex is globally understood as the classification of living things as male or female.

**GENDER** refers to the social construction of women and men, of femininity and masculinity, which varies in time and place, and between cultures.



# Natural or constructed competences?

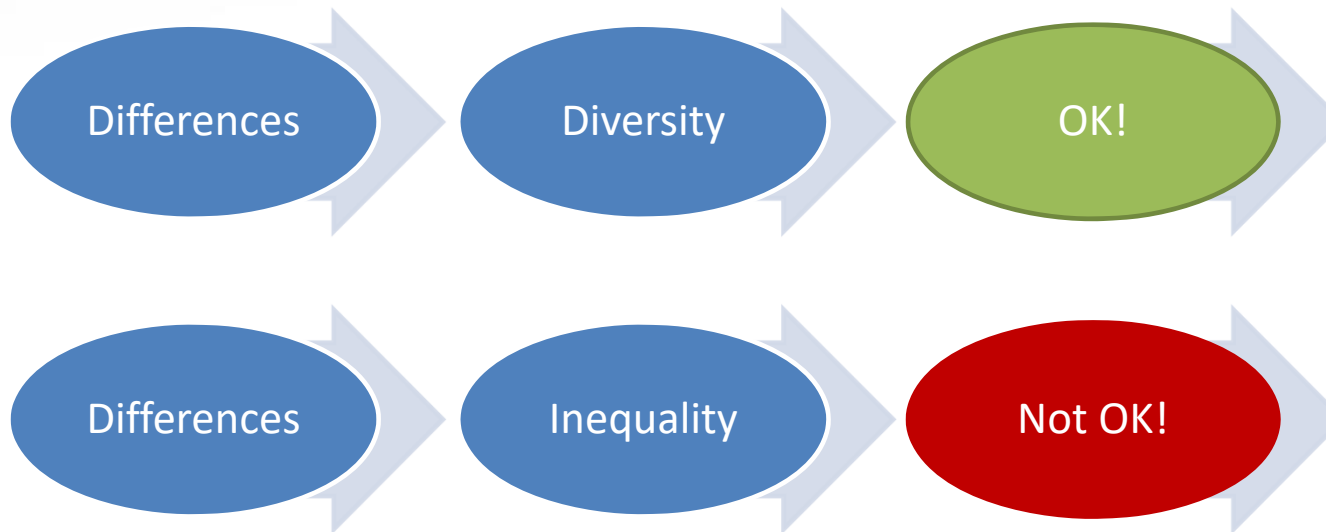


A colorful promotional flyer for 'Queenie Home' toys. The flyer features several images of children playing with toy household appliances. At the top left, it says 'Queenie Home' and 'Kwaliteitsartikelen waarmee kinderen de sfeer van het huishouden authentiek kunnen beleven en ervaren.' Below this, there are several product listings with prices and promotional tags like 'ALLES BIJ BART SMIT' and 'WERKT ECHT'. The central text reads 'Zo goed zijn als mama, dat wil je ook!'. Products include a vacuum cleaner (24.99), a mop (24.99), an iron (7.99), and a steam mop (19.99). The 'bart smit' logo is at the bottom right.



## NOTE THAT:

- The problem is not the difference between men and women as such, but the difference in how they are valued
- Certain aspects associated with 'masculinity' still tend to be valued more highly
- The result is inequality of opportunities, segregation & discrimination



## GENDER EQUALITY

A situation where individuals of both sexes are free to develop their personal abilities and make choices without the limitations imposed by strict gender roles. The (possibly) different behaviours, aspirations and needs of women and men are considered, valued and favoured equally.



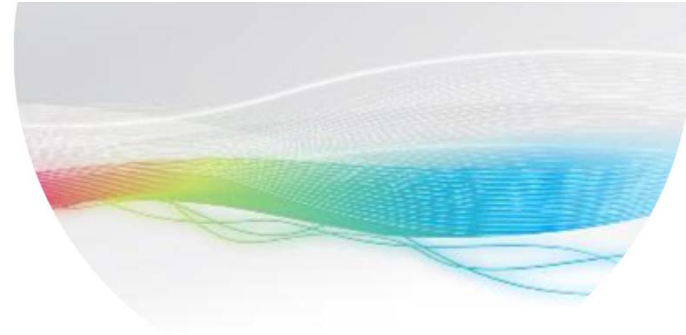


European  
Commission



# HORIZON 2020

# European Commission



Three objectives underpin the European Commission's strategy on gender equality in research and innovation policy:

- *Fostering equality in scientific careers*
- *Ensuring gender balance in decision-making processes and bodies*
- *Integrating the gender dimension in research and innovation content, i.e. taking into account the biological characteristics and the social features of women and men*





Equal  
Opportunities  
in research at  
all levels



Gender and  
sex variable in  
the research  
content

Gender  
in  
research

Equal  
Opportunities  
in research at  
all levels



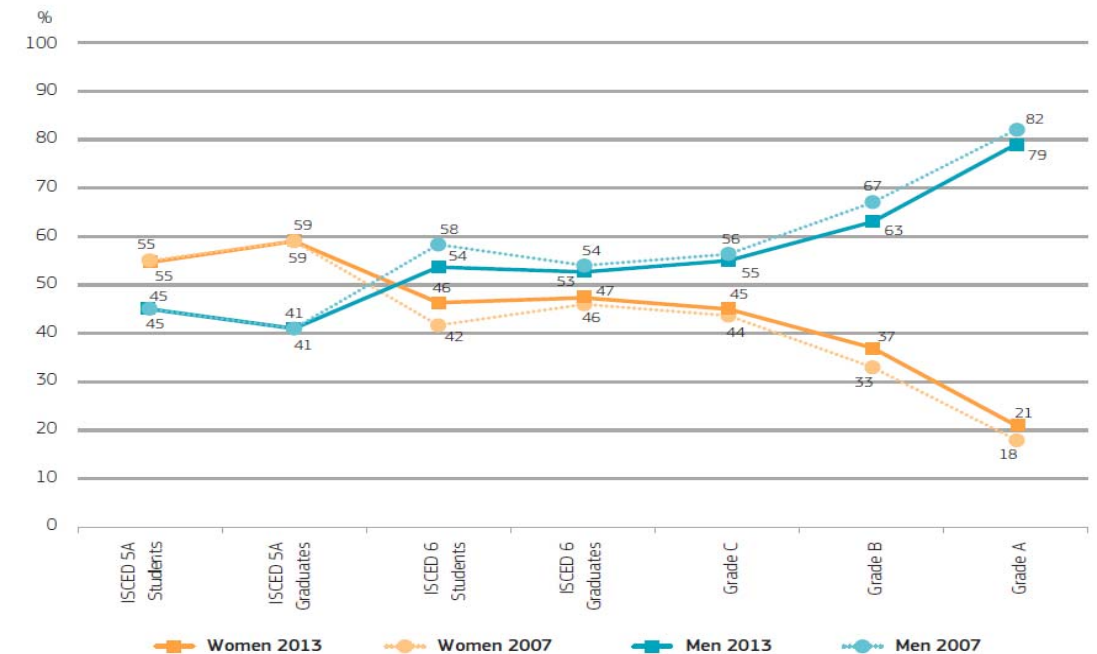
Gender and  
sex variable in  
the research  
content

Gender in  
research

# SHE – figures – 2015: The scissors - diagram

- In only eight out of 28 EU Member States did women account for more than 40 % of researchers.
- Women in the EU have a stronger presence amongst researchers in the higher education and government sectors. In the business enterprise sector, they make up close to one in five researchers (2011).”

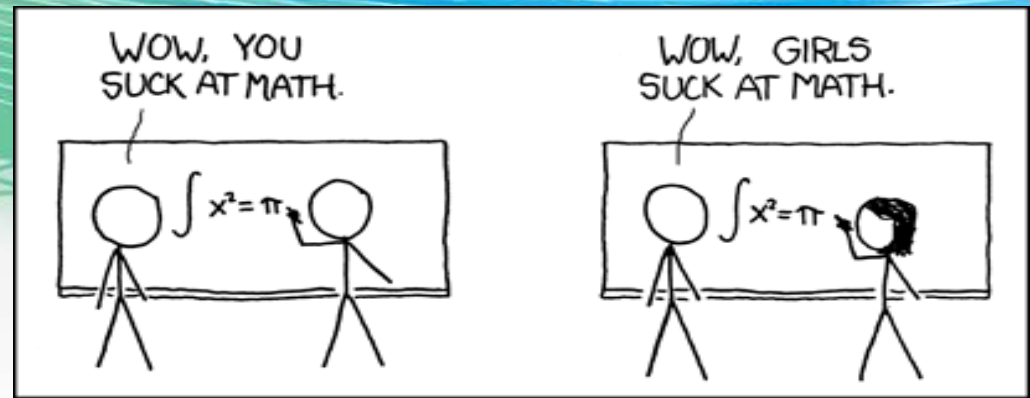
**Figure 6.1.** Proportion of women and men in a typical academic career, students and academic staff, EU-28, 2007–2013



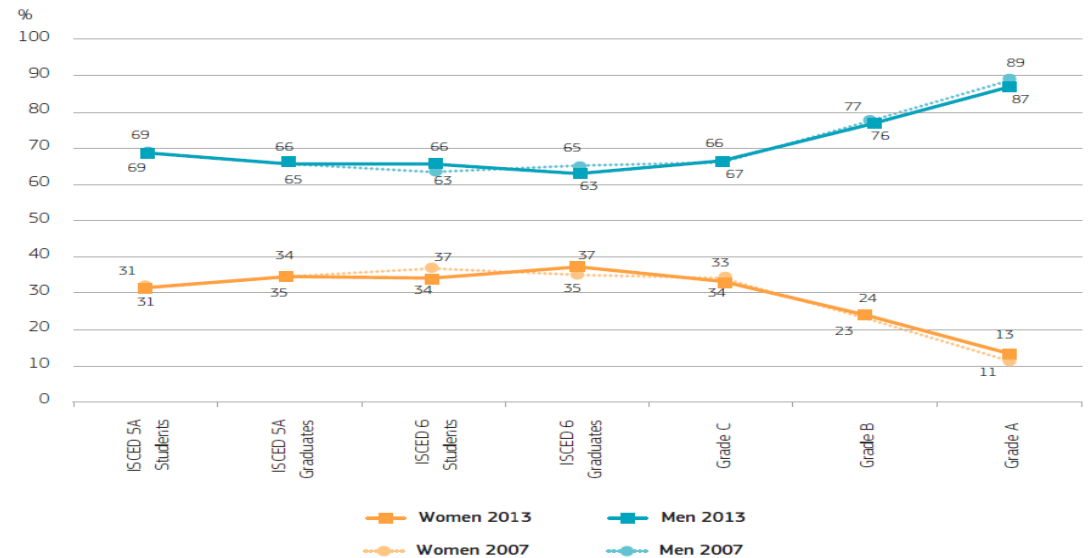
Notes: Reference years Eurostat data: 2007–2012; Reference years for Women in Science (WIS) data: 2007–2013; Exceptions to the reference years (WIS): AT: 2007–2011; BE (FR), LV, RO: 2010–2013; CY, PT: 2007–2012; DK, LU (Grade A and B, C not available): 2009–2013; ES, IE: 2008–2012; BE (FL), NL, FI: 2011–2013; PL, SK: 2012–2013; FR: 2012; HR: 2014; MT: 2015; EE: 2004 (She Figures 2012); LT: 2007 (She Figures 2012); UK: 2006 (She Figures 2012); Data unavailable for: (Eurostat) ISCED 5A Students: LU (2007); ISCED 5A Graduates: FR (2012), LU (2007); ISCED 6 Students: DE (2007), LU (2007); ISCED 6 Graduates: FR (2012), LU (2007).

Source: Women in Science database, DG Research and Innovation and Eurostat – Education Statistics (online data code: educ\_grad5)

The gap is even bigger if we look at the proportion of women and men in the areas of science and engineering.



**Figure 6.2.** Proportions of women and men in a typical academic career in science and engineering, students and academic staff, EU-28, 2007–2013



Notes: Reference year for Eurostat data: 2007–2012; Reference year for WIS data: 2007–2013; Exceptions to the reference years (WIS): AT: 2007–2011; BE (FR): 2010–2013; BE (FL), NL, FI: 2011–2013; CZ: 2007–2008; DK: 2009–2013; IE: 2008–2012; CY, PT: 2007–2012; EL, MK: 2012; PL, SK: 2012–2013; BA, SI: 2013; HR: 2014; LT: 2007 (She Figures 2012); UK: 2006 (She Figures 2012); Data unavailable for: WIS Grade A, B and C: AT, BG, EE, FR, HU, LU, LV, RO; Eurostat: ISCED 5A Students: LU (2007), ISCED 5A Graduates: FR (2012), LU (2007), ISCED 6 Students: DE (2007), LU (2007), NL (2007), ISCED 6 Graduates: FR (2012), IT (2007), LU (2007), PL (2012); Others: SET fields of education = Science, maths and computing + Engineering, manufacturing and construction; SET fields of science = Engineering and technology + Natural sciences.

Source: Women in Science database, DG Research and Innovation and Eurostat – Education Statistics (online data code: educ\_grad5)



# (Un)conscious biases influence job segregation

Ada Lovelace: British mathematician: laid foundation for software programming



Margaret Hamilton wrote entire software package that sent Apollo rockets to the moon



Female 'computers' doing astronomy research and making groundbreaking discoveries

# Gender Equality Plan

As defined by the European Commission, a gender equality plan consists of a set of actions aiming at:

- Conducting impact assessment / audits of procedures and practices to identify gender bias.
- Identifying and implementing innovative strategies to correct any bias.
- Setting targets and monitoring progress via indicators.



European Commission Communication  
on 'A Reinforced European Research Area  
Partnership for Excellence and Growth' (COM(2012) 392 final)

## Good practice examples - Areas of intervention:

- Organisational culture:
  - ✓ Organise gender training
- Reconciliation of work and private life:
  - ✓ Measures to facilitate return to work after parental leave
- Recruitment, selection and career progression:
  - ✓ Organise unconscious bias awareness sessions
- Leadership and decision-making:
  - ✓ Gender quota in all decision making bodies
- Sexual and gender-based harassment:
  - ✓ 'Special Contact Person' for sexual harassment



→ See GEAR tool:  
<http://eige.europa.eu/gender-mainstreaming/toolkits/gear>

Equal  
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Gender and  
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Gender  
in  
research



# Dominance of male norm

Seat belts are designed for people with the average height of a man



Despite being statistically less likely to be involved in a car crash, women are 47 percent more likely to be seriously injured if they are and 17 percent more likely to die than men. That's because so-called female crash test dummies—which are effectively scaled-down male dummies—were not used in the United States until 2011 and ignore crucial anatomical distinctions—such as weight, muscle distribution, and skeletal differences, which could save women's lives

Algorithms that dictate temperature regulation in many office buildings were designed in the 1960s for the average man of 70 kg.

The [default human form](#) is assumed by designers and inventors across industries to be male. Because work environments are set up to accommodate an average male body, women operate to a constant disadvantage. Women wear safety gear designed for men, handle machinery built for men, use man-sized surgical tools, work in offices set to temperatures that suit men—and which can cause illness for women—suffer greater exposure to harmful chemicals, and use gadgets (such as phones) designed to fit men's hands. These gadgets also carry male-biased software such as voice recognition, which is more likely to register male speech.



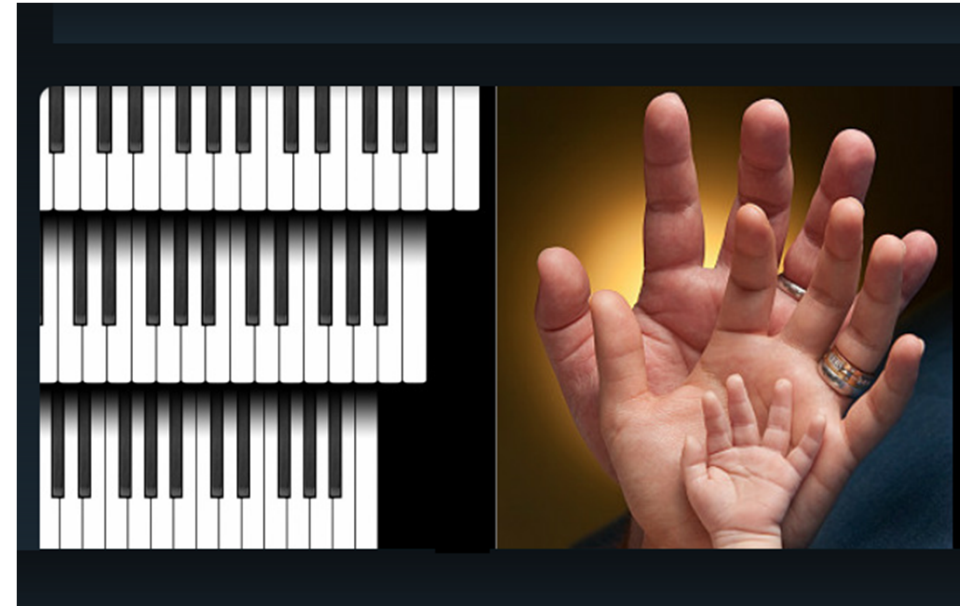
# Dominance of male norm

Another example: the size of piano keys.

The universal piano keyboard size was standardized at a time when pianists were predominantly males of European descent.

This size is too large for many pianists.

This may explain why there are so few women at the highest levels of piano performance competitions, even though there are more women than men studying piano.



<http://smallpianokeyboards.org/index.html>

LEGO used to be unisex ....



But now has distinct boxes for girls and boys



# Google image search: 'famous scientists'

famous scientists - Google Search

https://www.google.be/search?biw=1920&bih=938&tbm=isch&sa=1&ei=pt-w-XVM462kww227GIag&q=famous+scientists&oq=famous+scientists&gs\_l=img.3.010.21995.25605.0.26168.17.10.0.7.7.0.86.599.10.10.0...0...1c.1.64.img.0.17.641...0167k1.0.H...

Google famous scientists

All Images Videos News Books More Settings Tools

top 10 top 5 biology science history physics chemistry math 21st century cartoon quote note popular icon

**ALBERT EINSTEIN**  
Born 1879-1955  
Born in Germany  
Won the Nobel Prize for Physics in 1921  
He developed the theory of relativity  
He developed the formula  $E=mc^2$ , maybe the world's most famous equation!

**MARIE CURIE**  
Born 1867-1934  
Lived in France  
Won the Nobel Prize with her husband in 1903 and again in 1911 for Chemistry  
Was the first woman to win a Nobel Prize  
Known for her research and work on radioactivity

**Albert Einstein**

- Albert Einstein (born 14 March 1879 – 18 April 1955) was a German-born theoretical physicist. He developed the general theory of relativity, one of the two pillars of modern physics alongside quantum mechanics.
- Einstein is regarded as one of the most influential scientists in popular culture for his mass-energy equivalence formula,  $E=mc^2$ , and his work on quantum mechanics.
- Einstein's intellectual achievements and originality have made the word "Einsteinian" synonymous with "genius".

**Mario Curie**

- Marie Skłodowska-Curie (7 November 1867 – 4 July 1935), born Maria Salomea Skłodowska, was a Polish and naturalized-french physicist and chemist who conducted pioneering research on radioactivity. She was the first woman to win a Nobel Prize, the first person and only woman to win twice, the only person whose achievements included the development of an entirely new branch of science (radioactivity), and the discovery of two elements, polonium and radium.

**Stephen Hawking**

- Stephen William Hawking (8 January 1942) is an English theoretical physicist, cosmologist, author and Director of Research at the Centre for Theoretical Cosmology within the University of Cambridge.
- His scientific works include a collaboration with Roger Penrose

10:52  
1/10/2018

# Google image search: gender stereotypes

Google image query: "Doctor"



Page 1



Google image query: "Nurse"



Page 2




M. Kay, C. Matuszek, S. Munson (2015): [Unequal Representation and Gender Stereotypes in Image Search Results for Occupations](#). CHI'15.

# Google: 'Astronauts'


← → ↻ 🔒 https://www.google.com/search?rlz=1C1SQJL\_nlBE812FR814&biw=1156&bih=691&tbm=isch&sa=1&ei=4J\_SXOypJKeBi... 📄 🗺️ ⭐ 📁 🗑️ 👤

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27 Insane Things Astronauts Have to Do | B...  
bestlifeonline.com




Alumni turned astronauts: from St...  
stanforddaily.com




50 years ago, NASA astronauts prepared to ret...  
sciencenews.org




Astronauts May Get Space Fever  
seasonsmedical.com




How gene therapy could help astronauts surv...  
geneticliteracyproject.org







Nasa tells prospective astronauts wh...  
independent.co.uk



NASA introduces America's first astronauts - H...  
history.com



Astronauts work on ISS power upgrade...  
upi.com



🔍 📄 🗺️ 🗑️ 👤 78%

Female and male astronauts have different challenges and advantages



### FEMALE ASTRONAUT



Women suffer less from hearing loss with advancing age, and do not display a bias towards loss of hearing in the left ear



Women demonstrate a slight bias towards accuracy versus speed in response to an alertness test



Women mount more potent immune responses



Struvite kidney stones more common in women



Female astronauts, (to date) do not exhibit clinically significant visual impairment



Female astronauts are more susceptible to orthostatic intolerance



Urinary tract infections are more common in female astronauts



Large individual variability to muscle and bone loss in women



Health effect observed on Earth



### MALE ASTRONAUT



Men suffer more from hearing loss with advancing age, and display a bias towards loss of hearing in the left ear



Men demonstrate a slight bias towards speed versus accuracy in response to an alertness test



Men mount less potent immune responses



Calcium oxalate kidney stones more common in men



Some male astronauts exhibit clinically significant visual impairment



Male astronauts less susceptible to orthostatic intolerance



Urinary tract infections less common in male astronauts



Large individual variability to muscle and bone loss in men



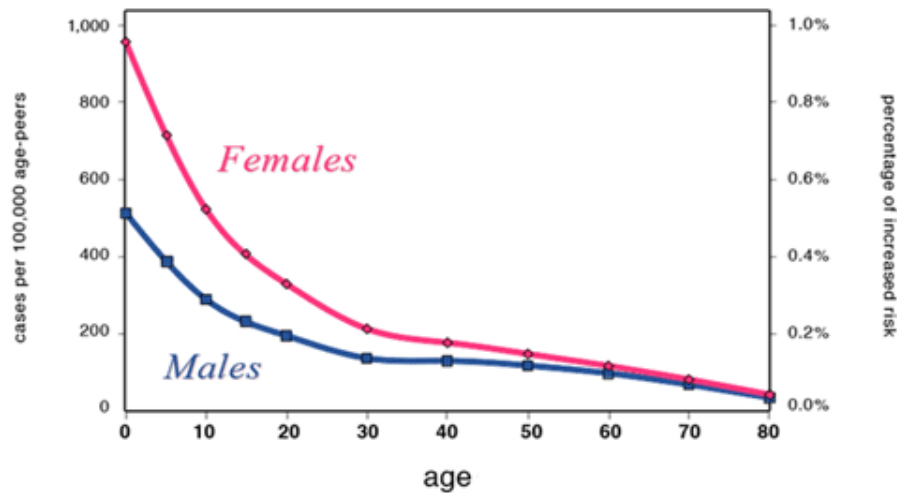
Health effect observed in space

# Sex and gender variables are relevant for radiation levels

**Table 1**

Example career effective dose limits in units of Sieverts as calculated for one-year ISS missions. The radiation exposure-induced average life-loss per death for carcinogenesis is shown in parenthesis [41].

**Increased Cancer Risk by Age at Exposure to 20mSv Radiation**



U.S. National Academy of Sciences BEIR VII Phase 2 Risk Model

Age in Years	Dose Limit-Male Astronauts (Average Life-Loss Per Death in Years)	Dose Limit-Female Astronauts (Average Life-Loss Per Death in Years)
25	520 mSv (15.7)	370 mSv (15.9)
30	620 mSv (15.4)	470 mSv (15.7)
35	720 mSv (15.0)	550 mSv (15.3)
40	800 mSv (14.2)	620 mSv (14.7)
45	950 mSv (13.5)	750 mSv (14.0)
50	1150 mSv (12.5)	920 mSv (13.2)
55	1470 mSv (11.5)	1120 mSv (12.2)



ARGUMENT: A Place for Women in Space

# A Place for Women in Space

A lack of medium-sized spacesuits highlights women's needs in the workplace.

BY HOLLY THOMAS | APRIL 8, 2019, 10:31 AM



On March 25, 2019 NASA announced that a historic all-female spacewalk on the International Space Station was cancelled, not for lack of personnel but for lack of clothing. Only one medium-sized spacesuit was available at the station. The astronaut Anne McClain was thus swapped for her colleague Nick Hague, who joined Christina Koch on the mission. The decision, though taken at McClain's [own recommendation](#) as a safety precaution, highlighted a broader, pervasive issue: As long as that world remains built for men, women remain at a constant disadvantage. This bias has deep roots. In 1962, commenting on whether women should be allowed in the space program, the German-American aerospace engineer Wernher von Braun, a former Nazi, joked: "The male astronauts are all for it. And as my friend Bob Gilruth says, 'We're reserving 110 pounds of payload for recreational equipment.'"



“I had a rotation as an analog astronaut at the Mars Desert Research Station in Utah—real life on fake Mars, as it were,” Pandya said. “Anytime we exited our habitat, we had to suit up in a simulated spacesuit with a standard backpack to house our life support systems. Standard-issue meant that backpacks were designed for men, and the straps of the backpack kept slipping off my shoulders. We often covered [4 to 7 miles] by foot in a day, and there was potential for the straps to evolve beyond merely a nuisance factor to a performance hindrance.”

# Space - Earth observation

- Identify
- Monitor
- Classify
- Measure
- Forecast

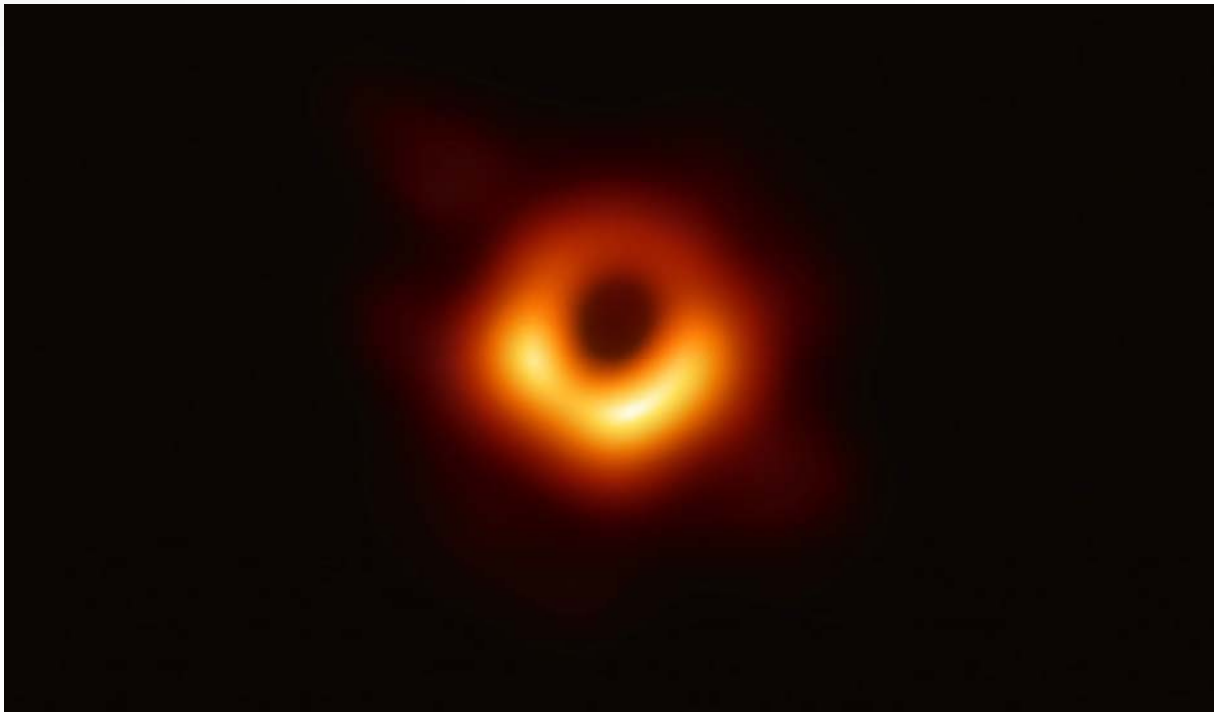
Women are among the most vulnerable parts of populations (due to poverty, etc,...)

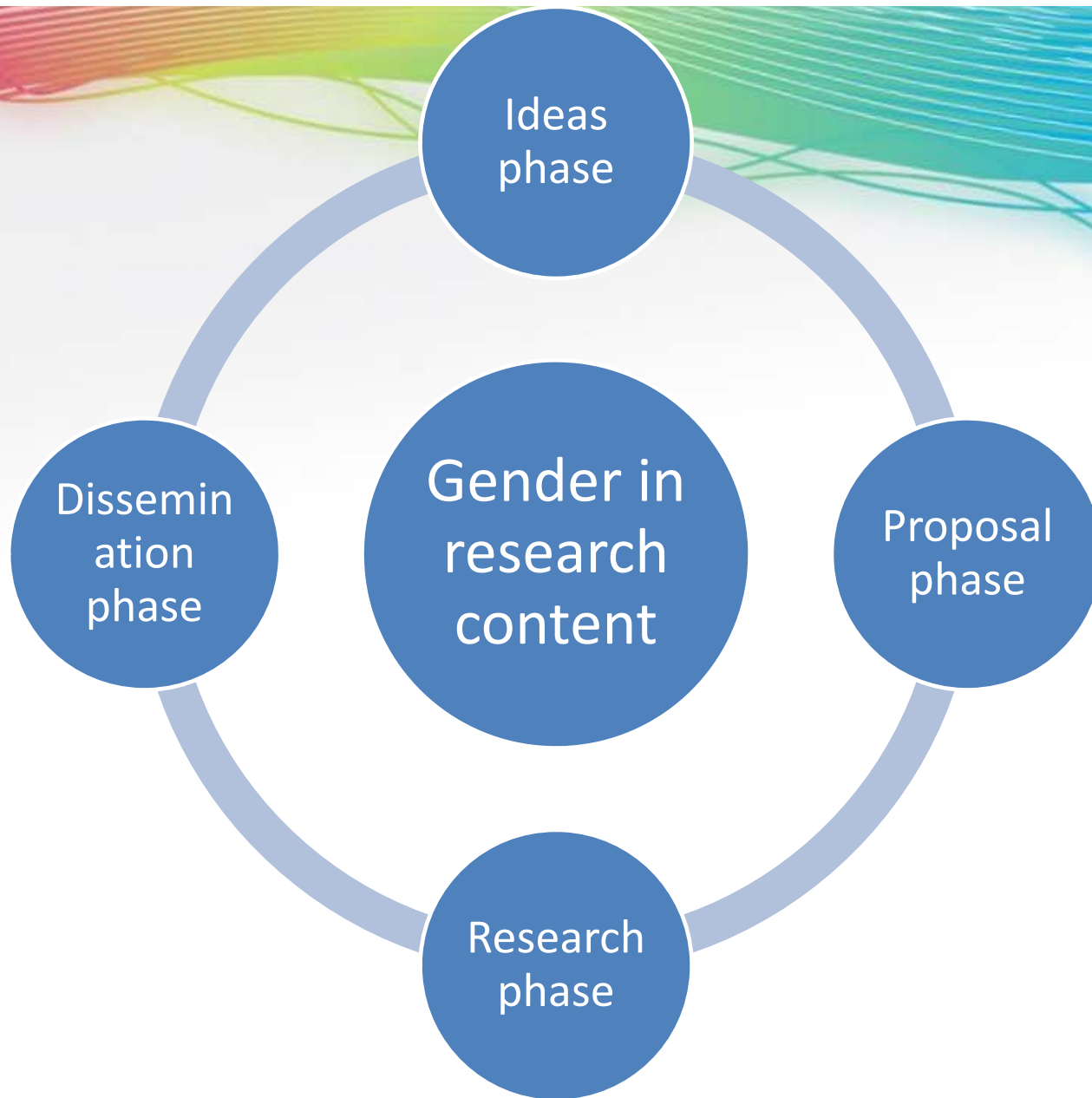


Conceptual architecture of the Global Earth Observation System of Systems (GEOSS)



No, gender is NOT relevant when studying black holes.  
However, gender equality in the research team remains relevant.  
Example: bullying of Katie Bouman and her picture of a black hole.





**Remember:  
Both the variables  
sex AND gender can  
be relevant**

# Integrating sex / gender in a H2020 proposal

- Make 'gender' visible straight away (e.g. in abstract, key words)
- Budget: foresee resources; remember gender training is an eligible cost (budget for training under 'other direct costs')
- Keep 'gender' in mind throughout the proposal preparation and drafting (gender balance in team; management structures; expertise in the consortium; research activities;...)

→ *No 'magic formula' or couple of paragraphs*

→ *No 'excellence' without gender equality!*

→ *Mobilise expertise*

# Integrating sex / gender in a H2020 proposal

## Technical part of the proposal:

### 1. Excellence:

1.1: Objectives: point out relevance; include analysis of sex / gender in relation to the main research topic as objective; explain which knowledge exists already and which are the gaps the research will fill

1.2 Relation to the Work Programme: especially when gender is flagged → explain how furthering gender knowledge will help advance the WP objectives

### 1.3 Concept and Method:

a) Explain / show the gender expertise in the consortium (interdisciplinary research!), and if missing, say how this will be solved. Refer to existing research on sex/gender in relation to the topic and explain how the project will build on the existing research (if relevant)

b) Explain the project's approach to sex / gender throughout the research cycle

1.4 Ambition: include also a reflection on what the ambition of the project is in relation to gender knowledge

# Integrating sex / gender in a H2020 proposal

## Technical part of the proposal:

### 2. Impact:

2.1 Expected impacts: include gender! Point out any obstacles or barriers, e.g. missing sex-disaggregated data → explain how the project will contribute to solving this obstacle

### 2.2 Maximise impact

- a) dissemination and exploitation: be consistent and integrate also sex/gender findings in how exploitation is planned; show what the added value will be; how including sex/gender variable will raise the quality of the research
- b) communication: communicate findings! (conference papers; posters; research articles); show how results will be disseminated in a way that makes the sex/gender variable visible



# Integrating sex / gender in a H2020 proposal

## Technical part of the proposal:

### 3. Implementation

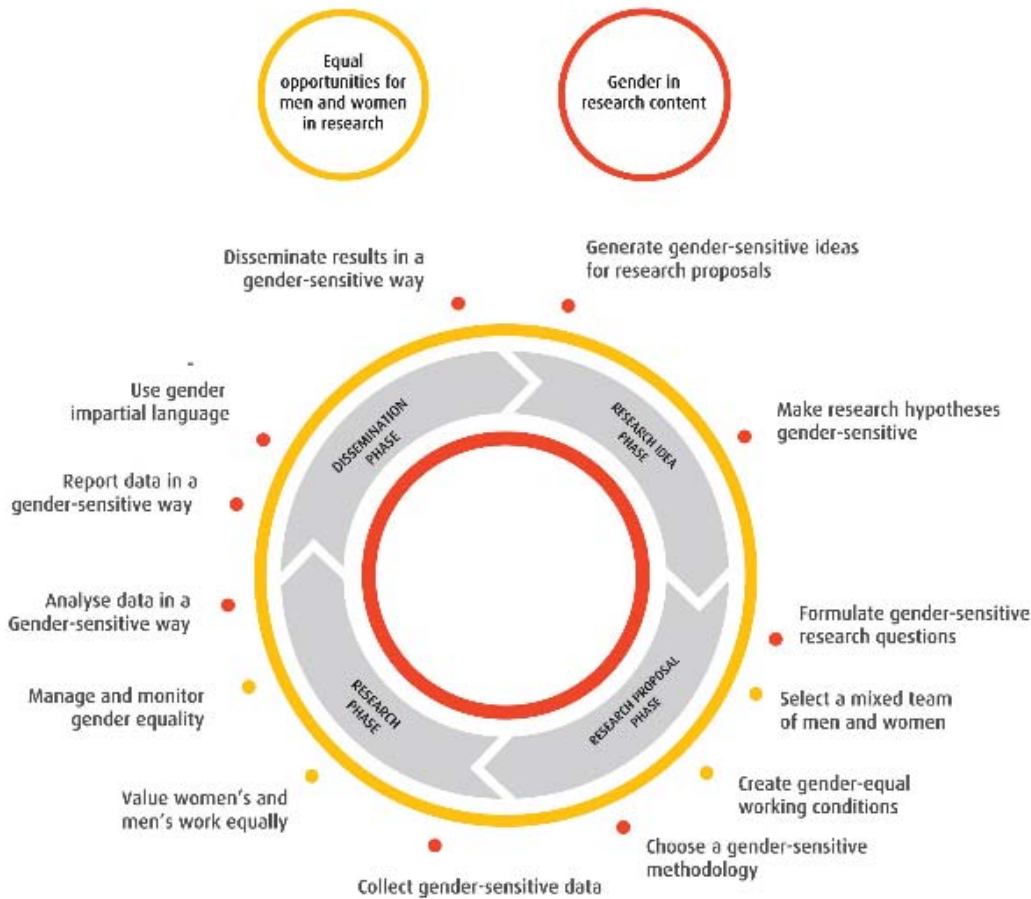
3.1: Work Plan: WP's and deliverables: integrate sex / gender throughout; show how the variables sex and/or gender will be taken on board; involve/consult relevant stakeholder groups and experts; consider separate deliverable on gender issues; present Gender Equality Plan in Management work package

3.2 Management structures: ensure gender balance in management structures!

3.3 Consortium as a whole: ensure and point out gender balance and gender expertise

3.4 Resources: gender training to be foreseen; sufficient resources for gender issues in the work plan

# Tool: checklist, in <https://www.yellowwindow.com/genderinresearch>



4

## How to make research gender-sensitive

### CHECKLIST FOR GENDER IN RESEARCH

#### Equal opportunities for women and men in research

- Is there a gender balance in the project consortium and team, at all levels and in decision-making positions?
- Do working conditions allow all members of staff to combine work and family life in a satisfactory manner?
- Are there mechanisms in place to manage and monitor gender equality aspects, e.g. workforce statistics, as required by FP7?

#### Gender in research content

##### Research ideas phase:

- If the research involves humans as research objects, has the relevance of gender to the research topic been analysed?
- If the research does not directly involve humans, are the possibly differentiated relations of men and women to the research subject sufficiently clear?
- Have you reviewed literature and other sources relating to gender differences in the research field?

##### Proposal phase:

- Does the methodology ensure that (possible) gender differences will be investigated: that sex/gender-differentiated data will be collected and analysed throughout the research cycle and will be part of the final publication?
- Does the proposal explicitly and comprehensively explain how gender issues will be handled (e.g. in a specific work package)?
- Have possibly differentiated outcomes and impacts of the research on women and men been considered?

##### Research phase:

- Are questionnaires, surveys, focus groups, etc. designed to unravel potentially relevant sex and/or gender differences in your data?
- Are the groups involved in the project (e.g. samples, testing groups) gender-balanced? Is data analysed according to the sex variable? Are other relevant variables analysed with respect to sex?

##### Dissemination phase:

- Do analyses present statistics, tables, figures and descriptions that focus on the relevant gender differences that came up in the course of the project?
- Are institutions, departments and journals that focus on gender included among the target outlets for dissemination, along with mainstream research magazines?



**ANY QUESTIONS?**