

Women in Japanese STEM field



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Introduction

Who am I?

- A member of the Physical Society of Japan (JPS)
 - Yes, I am a physicist (at least I hope)
 - I presented and chaired the annual JPS conference last week
(Division 11: Fundamental Theory of Condensed Matter Physics, Statistical Mechanics, Fluid Dynamics, Applied Mathematics, **Socio- and Econophysics**)
- Specialized in interdisciplinary field:
 - Complex systems, Socio- and Econophysics, Network science
 - Information spreading on social media
 - Collective memory, attention, emotion etc.

We develop new method to detect fakes based on the network structure.

$$\text{Heterogeneity} = \frac{\sqrt{\langle k^2 \rangle}}{\langle k \rangle}$$

$$H_s(N) = \frac{N}{2\sqrt{N-1}}$$

$$h = \log(H_s(N)) - \log(H_r(N))$$

Zhao, Z., Zhao, J., YS., Levy, O., Takayasu, H., Takayasu, M., Li, D., & Havlin, S. (2020). Fake news propagate differently from real news even at early stages of spreading. *EPJ Data Sci.*, 9, 7.

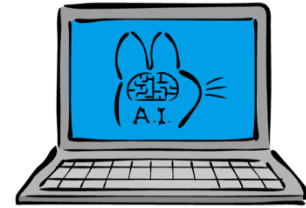


My figure appeared the cover of JPS membership journal "Butsuri" on July in 2022.

Today, I talk about women in STEM.



Ask Artificial Intelligence!



What is the current situation of Japanese STEM field?

GPT-4o



Here's an overview of the current situation in Japan's STEM (Science, Technology, Engineering, and Mathematics) field:

1. Education System and Talent Development

Japan's education system emphasizes a strong foundation in STEM subjects from elementary to higher education. However, there is a declining trend in the number of students pursuing STEM fields compared to other developed countries. There is also a notable gender gap, with relatively low participation rates of women and minorities in STEM fields.

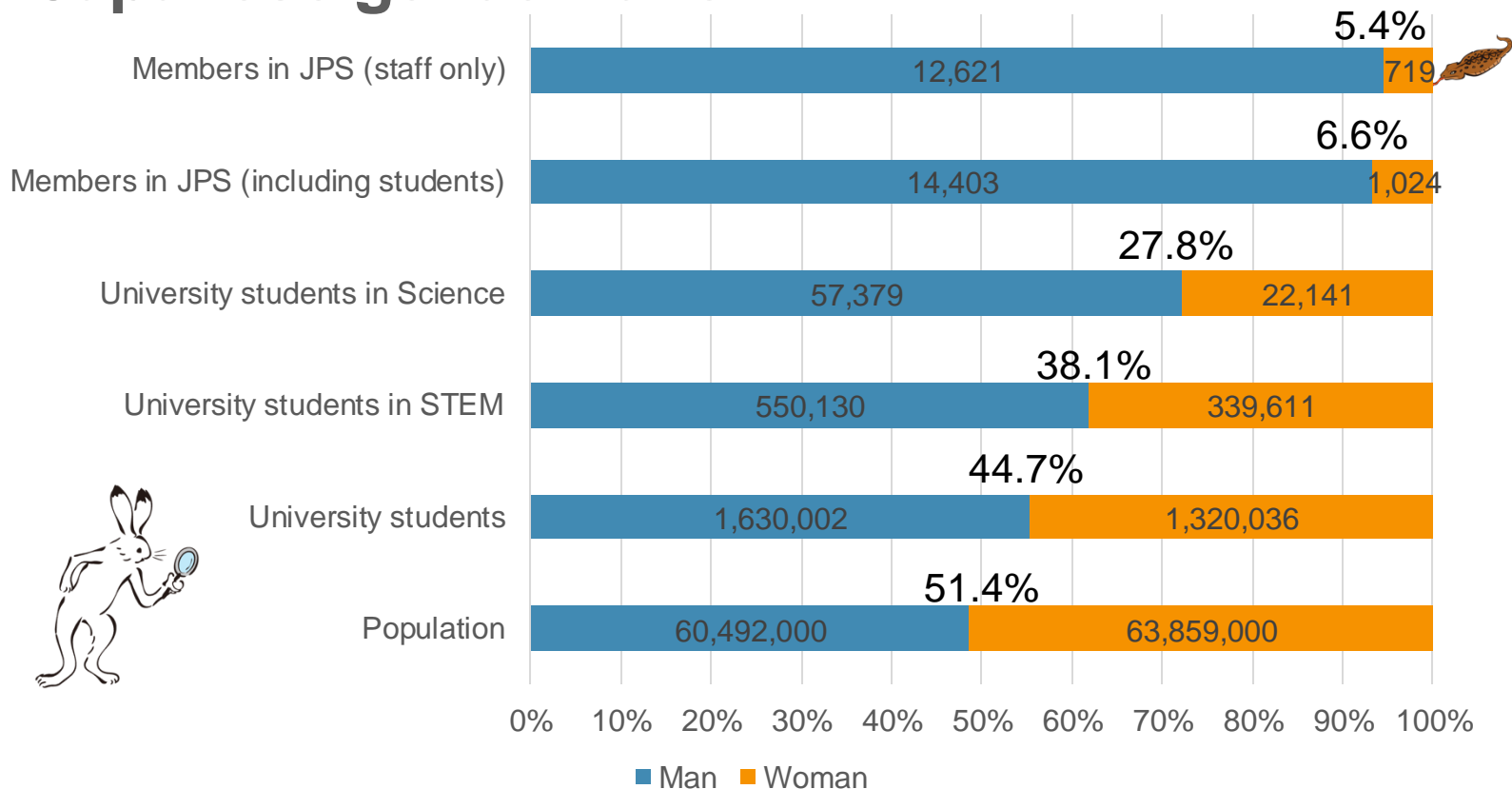
Yes, AI knows.

“low participation rates of women and minorities in STEM”



Japanese gender ratio

JPS: Physical Society of Japan





Gender equality activity in Japanese STEM field



Home About Us - What We Do - Additional Resources -

I call "Liasion Association" in this talk



We promote gender equality for the science and technology of today and tomorrow.

I am a former committee member of the association (2017~2021)

The Japan Inter-Society Liaison Association Committee for Promoting **E**qual **P**articipation of **M**en and **W**omen in **S**cience and **E**ngineering (EPMWSE)

Japan is well-qualified as a country that promotes scientific advancement. However, the ratio of female professionals in Science including humanities, social science and natural science is only 15.7% in 2017*, which is far behind other developed countries. The low female ratio is observed especially in STEM field (Natural Science, Technology, Engineering and Mathematics). In order to overcome these gender gaps in Japan over a long period of time, we established "The Japan Inter-Society Liaison Association Committee for Promoting Equal Participation of Men and Women in Science and Engineering (EPMWSE)" in 2002. At present, EPMWSE is the association of about 100 academic societies in STEM field in Japan, actively working for gender equality in Japan.

* ref. Japan Gender Equality Bureau Cabinet Office HP

https://www.gender.go.jp/english_contents/pr_act/pub/pamphlet/women-and-men17/pdf/1-8.pdf





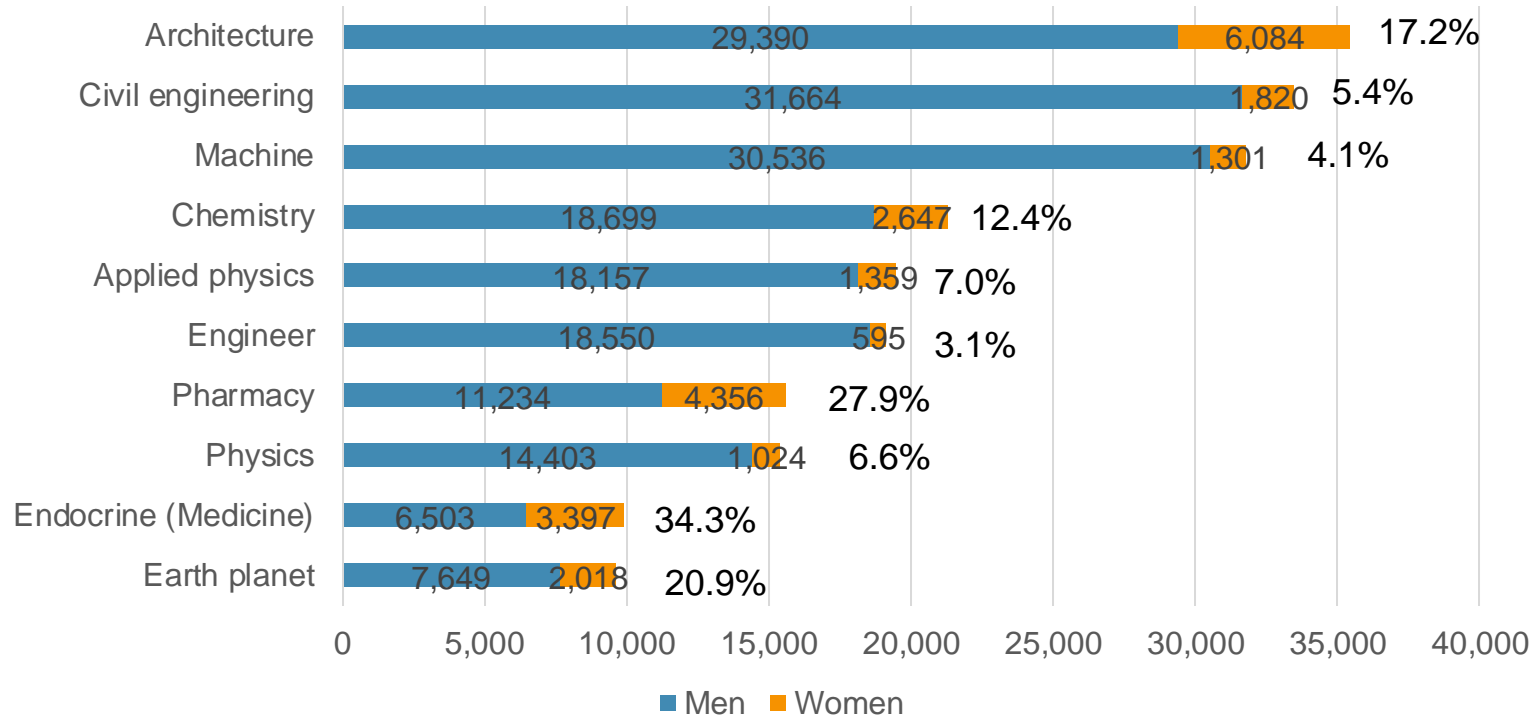
What is the “Liason association” ?

- Liason association (EPMWSE):
 - Consists of 108 academic societies in STEM field in Japan as of 2023
 - Architecture society of Japan: 35,474 members (women: 6084)
 - Japan society of civil engineers 33484 members (women: 1820)
 - The physics society of Japan: 15,427 mebmers (women: 1024)etc.
 - Makes proposals and requests to Japanese government
 - Proposals based on basic survey <https://djrenrakukai.org/en/studies.html>
 - Provide basic statistics of gender equality in Japanese STEM field
 - Gender ratio survery conducted every two years
 - Large-scale questionnaire survey conducted every four years



Basic statistics conducted by the Liason association

Gender ratio of major academic societies

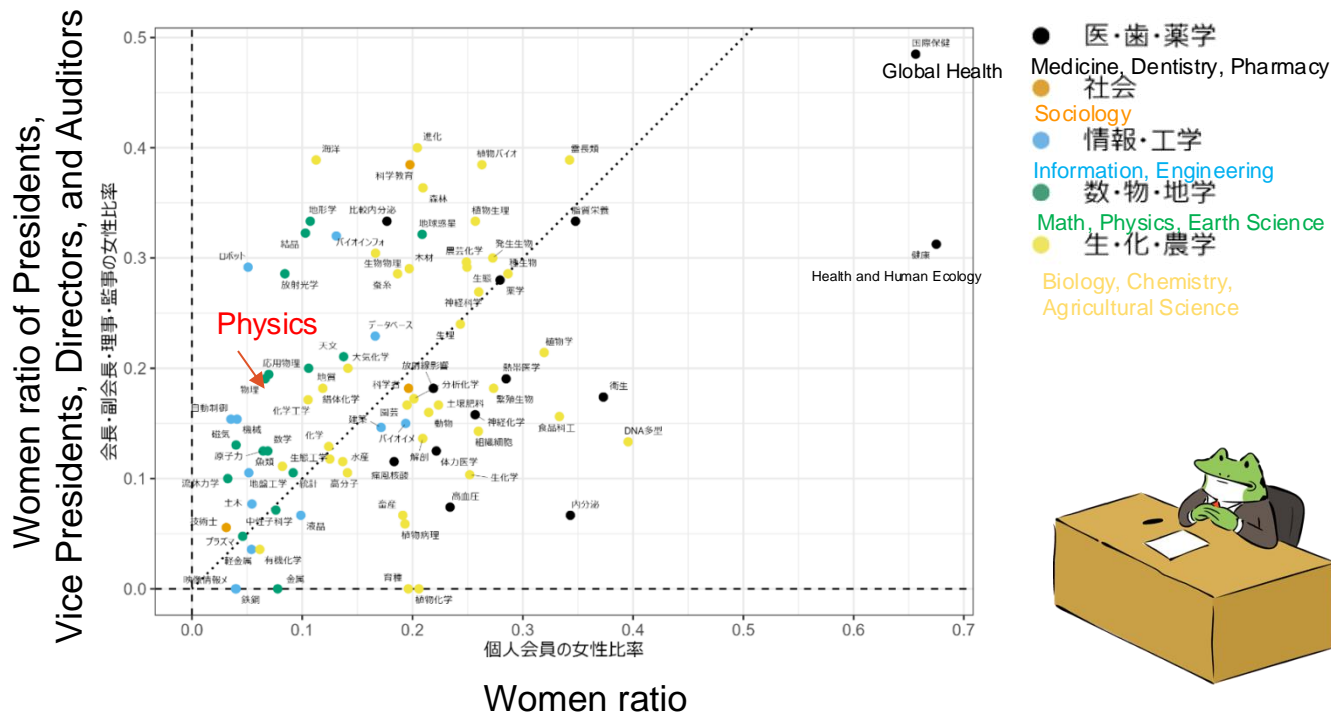




Basic statistics conducted by the Liason association

Gender ratio of senior executives

The proportion of women in senior executives is **almost equal** to the percentage of female members



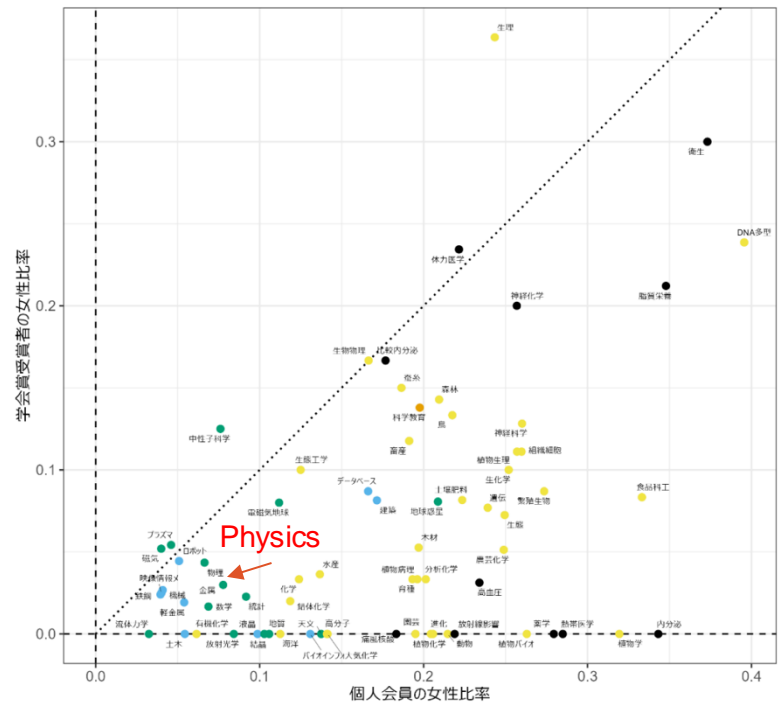


Basic statistics conducted by the Liason association

Gender ratio of award recipients

The proportion of women receiving academic awards is **lower** than the percentage of female members.

Women ratio of academic award recipients



- 医・歯・薬学
Medicine, Dentistry, Pharmacy
- 社会
Sociology
- 情報・工学
Information, Engineering
- 数・物・地学
Math, Physics, Earth Science
- 生・化・農学
Biology, Chemistry, Agricultural Science

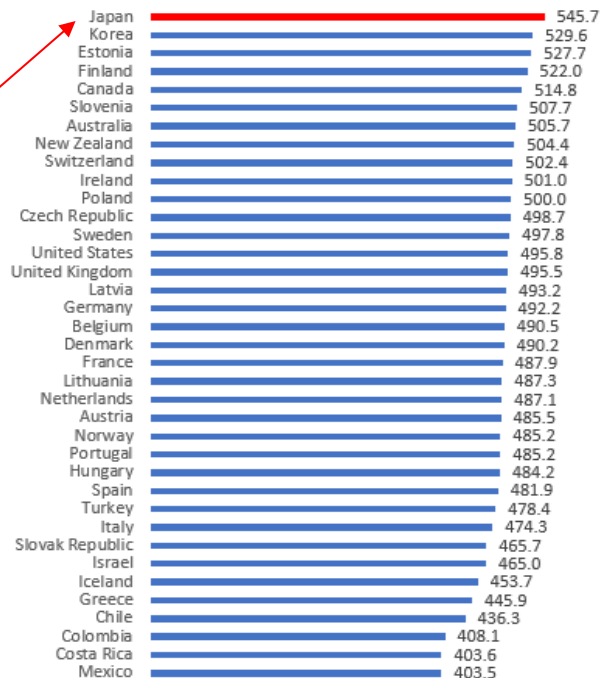




Japanese women are not good at STEM?

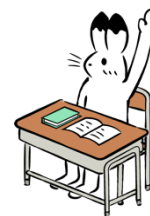
Mean performance in science for 15-year-old girls

15歳女子の理科平均点



NO

- At age of 15, female students in Japan demonstrate **top-level performance** in science on a global scale





Why fewer Japanese women in STEM?

- Cultural expectations and gender stereotypes
 - “Unconscious bias” : stereotyping that is often unintentional, automatic, and outside our awareness
 - Firefighter = man, Nurse = woman
- Lack of role models and mentorship
 - Fewer women in STEM leads to fewer girls pursuing STEM
- Parental influence and educational guidance
 - Many parents in Japan still believe that STEM is more suitable for men
- Workplace environment and career barriers
 - Japan’s overworking culture, difficult to take parental leave etc.

Many complicated reasons



One small example:

A short story about my sister

Me (12-year-old)
I like astronomy and space.

My sister (10-year-old)
She likes rockets.



1990

Our mother tended to give us similar clothes.

Me (40s)
Physicist
Mother of 1 boy

My sister (40s)
Aerospace engineer
Mother of 3 boys



2024

We accidentally wore similar clothes.



A Japanese high school in 1998, parent-teacher conversation about my sister's university application



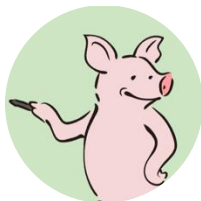
High school teacher

So, which **medical** department will she be applying to?

What? She wants to study aerospace engineering, so she's hoping for an **engineering** department in Kyushu or Nagoya.



My mother



What?? Engineering?
Are you serious?

Yes, serious. She wants to go to engineering department.





Background of the conversation

- What did the teacher think?



Since she has good grades in math and science, she could go to medical department and become a **medial doctor**. That way, she could enjoy a **happy life** with a stable high income.

- Would this conversation have even occurred if it were a “**brother**” instead of a “**sister**”?

In my sister's case, she might have remained in the STEM field as medical department, but she would have been steered away from what she truly wanted. Would that really have brought her happiness?



Summary

Think diversity, Maximize ability

Power of mind and body

Oneself and others

精力善用・自他共栄

Use effectively for good

Mutual success



Jirogo Kano (1860-1938)

The **founder of Judo**.

The former president of the Tokyo Norm School (now University of Tsukuba).



- ✓ Japanese women are not fully using their abilities for the moment
- ✓ Japanese women have significant potential for growth in STEM field

Mottainai

Take-home message

Beyond diversity, individuals are respected as they are and use their potential to maximum extent.
This brings about the bright future!

Maximize own ability is the way to mutual success.

精力善用・自他共栄

Thank you for your kind attention.

My research activities:

<https://scholar.google.com/citations?user=e8NTAgcAAAAJ>

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The statue of Jigoro Kano is located on the campus of the University of Tsukuba.







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Mr. Yuta KAWAKAMI won
the 41st ORSI Student Thesis Award

Mr. Yuta KAWAKAMI (Doctoral Program in Policy and Planning Sciences) won the 41st Student Thesis Award from the Operations Research Society of Japan.

The Thesis Title is "Formulations and efficient solutions for collaboration function optimization problems in the data collaboration analysis."

Supervisor: Yujin IMAHIGI (Lecturer, Post-Doctoral Fellow) / Department of Policy and Planning Sciences
https://www.tsukuba.ac.jp/~yuta-kawakami/



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