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The Situation of Gender Equality in Mathematics in Japan (Women in Mathematics)

AUTHOR(S):

Sasada, Makiko; Bannai, Kenichi

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The Situation of Gender Equality in Mathematics in Japan

Makiko Sasada (U. Tokyo)
Kenichi Bannai (Keio U./RIKEN)

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(English Version)

This is an English translation of the report created for the inauguration ceremony of the “Women of Mathematics: A Gallery of Portraits” exhibit held October 9, 2019 at the Delegation of the European Union to Japan. In the same month, the report was submitted by the authors to the President of the Mathematical Society of Japan.

1

Introduction

The promotion of gender equality is now an important issue, especially in Japan with its declining birthrate. Even in mathematics, a variety of gender-related activities have been conducted. However, gender equality does not seem to have been widely discussed as a **central issue in mathematics** among the leaders of the Mathematical Society or various graduate schools of mathematics in Japan. We speculate that the reason for this is that there has not been sufficient discussion on the **goal of gender equality**.

We believe the goal of gender equality is to create an environment in which **all people who aspire to study mathematics are equally welcomed and receive the same expectations and evaluations**, in which **roles are not fixed by gender**, and in which **minorities can study and conduct research without disadvantage or anxiety**. Gender equality is not about increasing the number of female mathematicians. It is about respecting both women and men equally as people who explore mathematics.

Countries around the world, which are ahead of Japan in terms of gender equality, have accumulated various statistics and have created effective programs for gender equality based on such statistics. In a document on initiatives for gender equality published by the Mathematical Society of London, it is pointed out that ([1]) “Good practice isn’t about how many women are in the department, it’s about processes that are fair, flexible, accessible and transparent to all.”. These efforts have also been described as having a **positive impact on the environment for faculty, students, men, women and everyone in the community** ([1]), and it has been verified that these efforts have lead to an increase in the proportion of women. In other words, one indicator of the realization of such a positive environment is the proportion of female researchers and female students.

In the wake of a shortage of mathematicians, every person who aspires to study mathematics is a contributor to “the development of mathematics”. We believe everyone in the field of mathematics, especially **the leaders who have influence over organizations**, should eliminate as quickly as possible obstacles that make people of certain attributes disadvantageous.

2

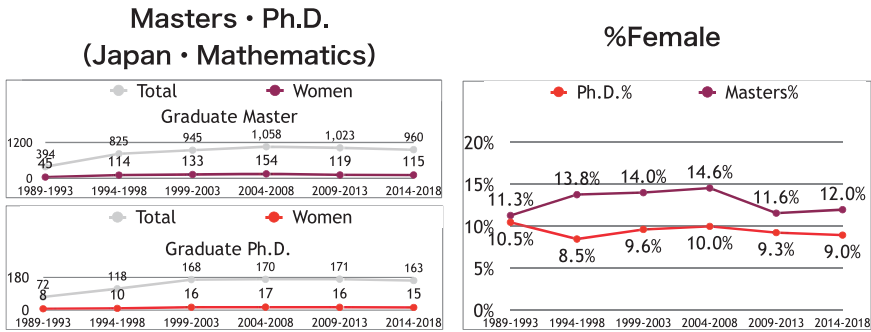
As shown in this current report, the percentage of women in mathematics in Japan is low compared both with other countries in the world and with other research areas in Japan. In particular, **unlike other fields in Japan, gender equality appears to be receding**. The decline in the percentage of female students in graduate school is **particularly alarming, especially for the long-term prospect for the field of mathematics**.

This indicates that the field of mathematics in Japan has a problem. While outreach program for girls and support for balancing work and family are increasing, it is plausible that compared with other countries, **the obstacles that female students and female researchers in mathematics face, particularly gender bias and sexual harassment, may have been overlooked** in Japan. It is well known that unconscious bias negatively affects the self-evaluation of female students and affects their career paths and career choices. It is also a factor that hinders the recruitment and promotion of women ([1,2,3,4,5]). **Several studies and proposals have been made, including training to measure the degree of individual bias and to remove as much of the impact as possible** ([1,4,5]). It has been found that sexual harassment has a serious impact on the short-term and long-term careers of the victims and witnesses, who may leave the field ([6]). Studies also show that **there are environments where sexual harassment "is likely to occur" and that it is possible by organizational effort to create an environment where it is "unlikely to occur."** Details proposals for specific initiatives have also been documented ([6], References [16]).

It is also necessary to review the current "Initiatives for Gender Equality". The previous document points out that "Good practice benefits all, staff and students, men and women. However, bad practice adversely affects women's careers more than men's," ([1]). **Gender Equality initiatives need to be monitored by the community to ensure that they do not seek more "special" roles for women or increase the bias against women's abilities.**

In this document, **we propose certain action for gender equality in the field of mathematics in Japan, based on statistical data on the current situation and initiatives in and outside of Japan.**

Graduate Degrees in Mathematics



Data obtained from www.e-stat.go.jp※ Average over 5 year period

From 1989 to 2004, the number of graduate degrees awarded in Mathematics greatly increased. Although the percentage of women increased slightly for the Masters degree, no increase was observed for the Ph.D., and the percentage of women have been slowly but steadily decreasing for the past 10 years. In particular, the percentage of women obtaining a Ph.D. in mathematics in 2018 was 6% (9 out of 150)*, which was the lowest in the past 20 years.

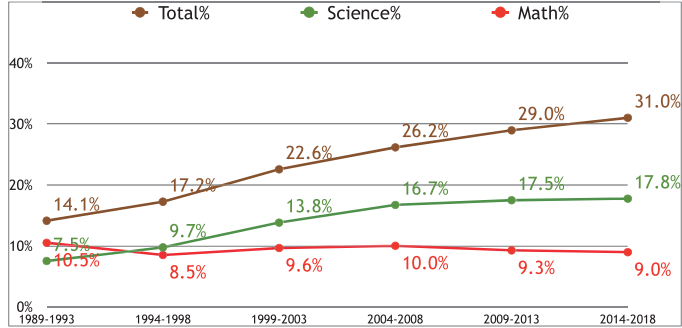
If the same proportion of women advanced to the Ph.D. program after a Masters degree as that of men, then the percentage of women for Ph.D. should be about 12%. It may be important to analyze why a larger proportion of women decide not to enter the Ph.D. program

※Mathematics includes such fields as Pure and Applied Mathematics, Statistics, Informatics and Data Science. Science consists of Mathematics, Physics, Chemistry, Biology, Geology and Nuclear Science

*Data from www.e-stat.go.jp. See Reference [1] Graduate Degrees in Mathematics

Comparison with Other Fields

Ph.D. Recipients (Japan, Comparison with Other Fields)



Data obtained from www.e-stat.go.jp※ Average over 5 year period

30 years ago, the proportion of female recipients of a Ph.D. in Mathematics was higher than that of Ph.D.s in science in general. In the 30 years, the percentage of female recipients of a Ph.D. has increased in other fields, but no major increase was observed in mathematics, and the percentage has been slowly declining in the last 10 years. There may be some obstruction which prevents women from deciding to obtain a Ph.D. in mathematics.

※Science includes Mathematics, Physics, Chemistry, Biology, Geology, Nuclear Science, and Others.

For Masters Degree 2014-2018: Total 29.7%, Science 21.9%, Math 12.0%.

For Bachelors Degree 2014-2018: Total 45.6%, Science 27.7%, Math 20.0%.

(Source: www.e-stat.go.jp)

Ph.D. in Math, Comparison with the US

Ph.D. Recipients (US, Math)

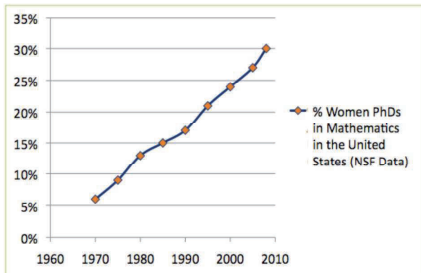
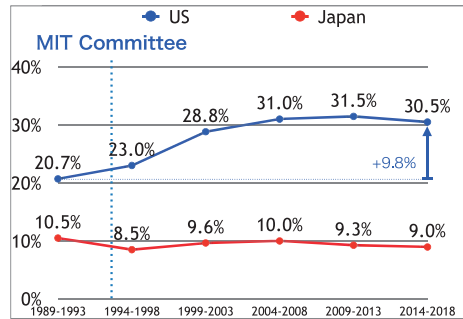


Fig. 1 Growth in women's participation. Percentage of Ph.D.s in mathematics granted to women in the United States 1966-2008 in intervals of 5-year averages.

Source: Alice B. Popejoy and Phoebe S. Leboy, Is Math Still Just a Man's World? *Journal of Mathematics and System Science* 2 (2012) 292-298.

The percentage of female Ph.D. recipients in mathematics in the United States has steadily been increasing from the 1970s until the early 2000s. Since 1989, the percentage has stagnated in Japan, while the percentage has increased by about 10% in the United States. After the MIT committee was formed in 1994, training to prevent gender bias in hiring, selection committees for academic prizes, review committees for research expenses, and organizers of conferences has been promoted at universities in the United States. ([3, 5])

%Female (Math, US-Japan)

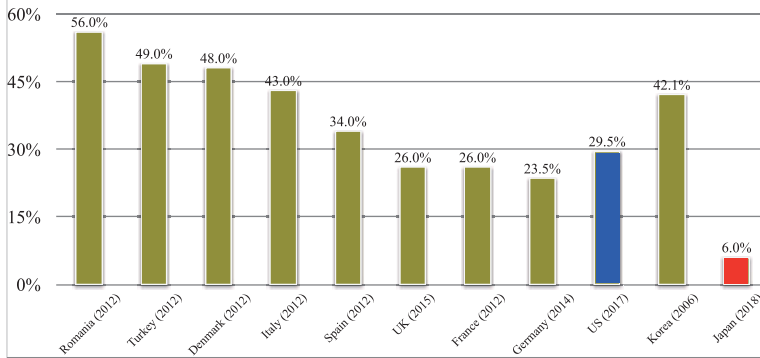


Data for US from AMS Annual Survey of the Mathematical Sciences, Data for Japan from www.e-stat.go.jp
Average over 5-years

Ph.D. Recipients of Various Countries

%Female of Ph.D. recipients (Various Countries, Math)

*Korean data %female in the Ph.D. program

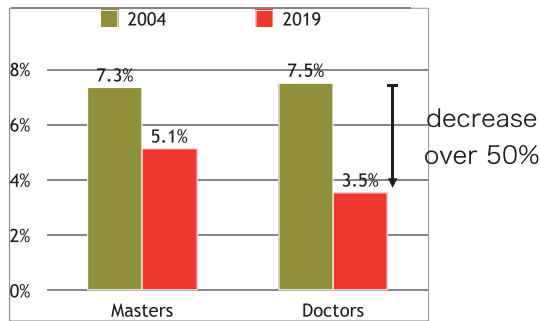


European data for 2012 from <https://ec.europa.eu/eurostat/>. All countries w/ 100 Ph.D. in Mathematics per year. German Data obtained from IWOTA 2016 presentation by M. Infusino. UK data obtained from Benchmarking Data Updated (April 2016) for years 2011-2015. US data obtained from AMS. Korean Data (enrollment in Ph.D. program) obtained from KWMS presentation by Wansoon Kim. Japanese data obtained from www.e-stat.go.jp.

The most recent data available on the web shows that the percentage of female Ph.D. recipients in European countries is about 30%. Compared with doctoral students in Korea, the percentage of female students in mathematics in Japan is remarkably low. A more systematic comparative study would be necessary for a more accurate analysis.

Graduate Students, 10 National University

Percentage of Female Graduate Students (10 National University • Mathematics)



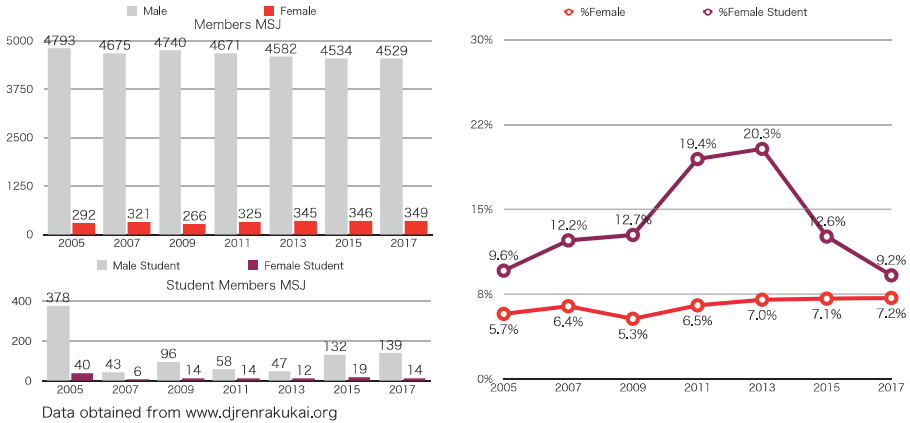
Data for 2004 provided by the MSJ. Data for 2019 obtained by web/phone/email from respective institution

In 2004, the Committee for the Promotion of Gender Equality of the Japanese Mathematical Society conducted a survey on the percentage of female graduate students in mathematics graduate schools at 10 national universities (7 Former Imperial Universities, Tokyo Institute of Technology, Tsukuba University, and Hiroshima University). The percentage of female graduate students in both master's and doctoral programs has decreased since 2004, and the percentage of female graduate students in the doctoral program has decreased by more than 50%.

The total number of doctoral students enrolled at 10 universities in 2019 was 367, and it is estimated that these 10 universities account for more than 70% of the total number of doctoral students in mathematics in Japan. The situation of graduate students in these universities will greatly affect the future of mathematics in Japan both in the medium and long term, hence an immediate and positive change is hoped for.

Members of the MSJ

2005~2017* Male/Female Members and %Female

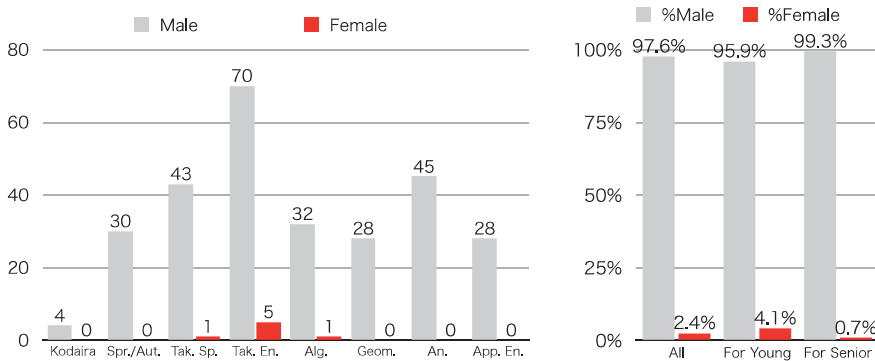


The survey on the number of female members of the Mathematical Society of Japan (MSJ) started in 2005. For the entire period, **the average percentage of female members was 6.2%**, and **the percentage of female members in the most recent 2017 survey was 7.2%**. Among student members, **the average percentage of female members in the entire period was 11.8%**, and **the percentage of female students in the most recent 2017 survey was 9.2%**.

*Based on survey by the Liaison Committee of Academic Societies. The definition of a member is either a general member or a student member.

Percentage of Women for MSJ Prize Winners

2005~2019 Male/Female Recipients of MSJ prizes



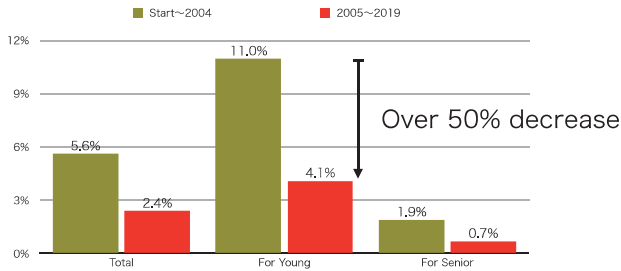
From webpage of the MSJ (Gender deduced from name. Ambiguous names were searched via personal or departmental webpage.) Prizes of the MSJ listed on <https://mathsoc.jp/prize/> which are relevant to mathematical research.

During the 15 year period from 2005 to 2019, when the percentage of female members of the Mathematical Society of Japan was surveyed, **7 women in total were awarded a prize from the Mathematical Society**, which is 2.4% of the total 287 awardees. The percentage of women in the **prize for young mathematicians consisting of the Takebe Special and Encouragement Prizes as well as the Applied Mathematics Encouragement Prize was 4.1%**, and **the percentage of female in the prize of senior mathematicians was 0.7%**. All of these percentages were **below the average percentage 6.5%** of women members of the Mathematical Society during this period.

Since the average percentage of female student members is 11.8%, it is estimated that the percentage of female members among young members who are eligible for the prize for young mathematicians is higher than 6.5%.

Percentage of Women for MSJ Prize Winners

Comparison with before 2004



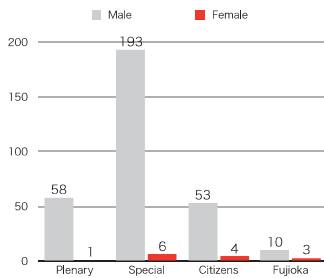
From webpage of the MSJ (Gender deduced from name. Ambiguous names were searched via personal or departmental webpage.) Prizes of the MSJ listed on <https://mathsoc.jp/prize/> which are relevant to mathematical research.

Compared with the period from the start to 2005, the percentage of women who received awards from the Mathematical Society of Japan decreased for the period from 2014 to 2019. Overall, **the number of women who received awards for senior mathematicians from the Mathematical Society of Japan was 2 (1994: Iyanaga Prize, 2001: Geometry Prize) before 2004, and 1 (2011 Algebra Prize) after 2005.**

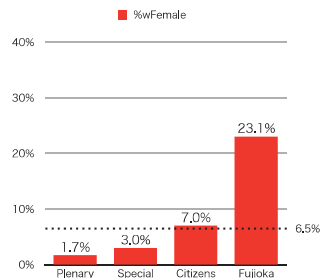
Before 2004, there are no data on the percentage of female members of the MSJ, but from the percentage of doctoral graduates, it is estimated that there has not been significant change from the data in 2005 (All members 5.7%, student members 9.6%). Before 2005, the percentage of women among the winners was close to this percentage, but **since 2004, the percentage of women among the winners has declined significantly**, even though the percentage of women among the members of MSJ and the percentage of women among the students members of the MSJ have both increased slightly. From the start through 2019, women accounted for 6.4% of winners of prizes for young mathematicians and 1.2% for prizes for senior mathematicians.

MSJ Invited Talks

2005~2019 Male/Female Speakers at the MSJ



Number of Male/Female Speakers



Percentage of Female

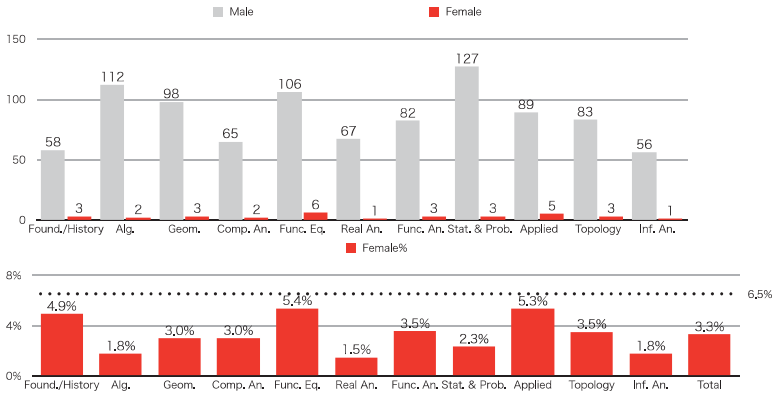
From webpage of the MSJ (Gender deduced from name. Ambiguous names were searched via personal or departmental webpage.) Prizes of the MSJ listed on <https://mathsoc.jp/prize/> which are relevant to mathematical research.

During the 15 years from 2005 to 2019, **the percentage of female plenary and special lecturer at the meetings of the Mathematical Society of Japan was less than the average 6.5% of female members of the Mathematical Society** during the same period. On the other hand, the percentage of female lecturers at the Citizens' Seminar and Fujioka Mathematical Classroom, which have strong outreach elements, exceeded the average of 6.5% of female members of the Mathematical Society of the same period.

According to research outside Japan, "Women are often asked to do 'human' work, not 'research' work" ([2]). This may have a negative impact on performance and research evaluation. It is important to have the same expectations and opportunities regardless of gender.

MSJ Special Lectures

2005~2019 Male/Female Speakers at Special Lectures

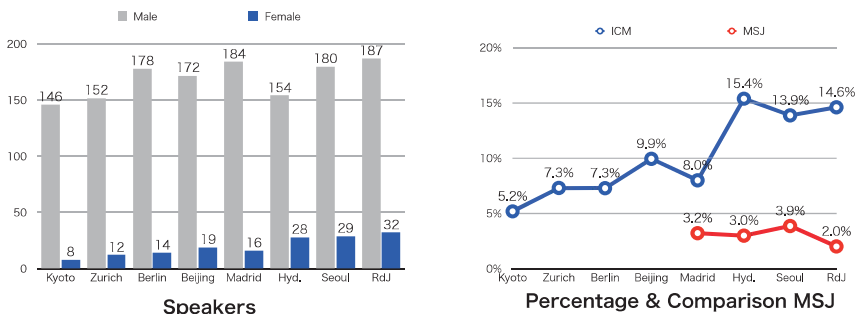


From webpage of the MSJ (Gender deduced from name. Ambiguous names searched via personal or departmental webpage)

During the period from 2005 to 2019, a total of 975 speakers gave special lectures for one of the sections of the MSJ. The total number of female speakers was 32, and the percentage of female speakers was 3.3%. The percentage of female speakers for the contributed talk after Autumn 2018 (the only period where gender data for contributed lectures collected by MSJ) was 6.3% (Autumn 2018 @ Okayama University 6.5%, Spring 2019 @ Tokyo Institute of Technology 7.6%, Autumn 2019 @ Kanazawa University 4.7%), which is relatively high compared with the percentage of female speakers for invited talks.

Comparison to ICM and other Mathematical Societies Abroad

Percentage of Women Plenary and Invited Speakers at the ICM



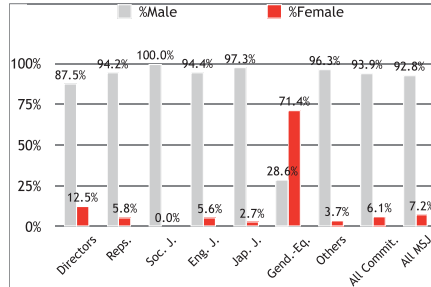
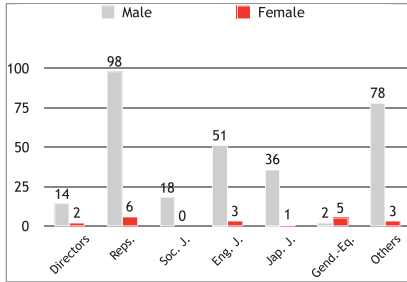
ICM Data obtained from <https://zenodo.org/record/1976747#XXed9i2KXQQ>. MSJ represents Female% of Invited Talks at MSJ conferences in the corresponding 4 year period

The percentage of women invited to speak at ICM is higher than in the past, as shown in the upper right graph in comparison with the percentage of women invited to speak at the Mathematical Society of Japan during the same period (every four years).

Looking at the percentage of female speakers at invited lectures by Mathematical Societies of the United Kingdom and the United States, the ratio of Invited Hour Address from the American Mathematical Society (AMS) from FY 2007 to FY 2016 was 20% (82 of 415), and the ratio of Special Session from FY 2012 to FY 2016 was 21% (3774 of 17718). The percentage of invited speakers for the British Mathematical Colloquium from FY 2018 to FY 2019 was 38% (43 of 113). See References [8] and [11].

MSJ Committee Members

Male/Female Members of Committees of the MSJ (2017)

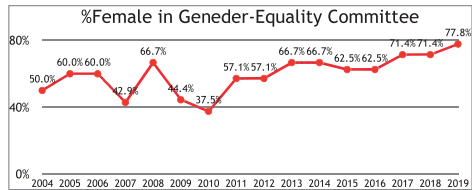


www.djrenrakukai.org Committee Members

%Female

Many women participate in the Committee for the Promotion of a Gender-equal Society. In 2017, there were no women in 11 of the 20 committees established by the MSJ.

The percentage of women in the Committee for the Promotion of Gender Equality Society has been increasing in recent years, and there is a possibility that the division of roles by gender has increased. For the problem of bias and harassment, effort by the whole mathematics community is indispensable.

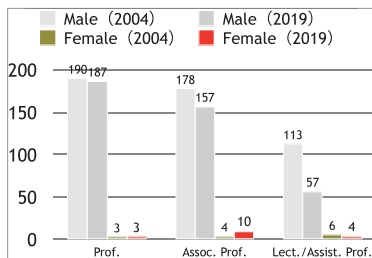


From the webpage of the MSJ

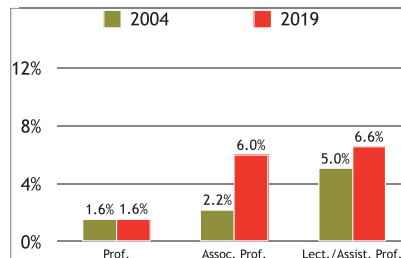
15

Female Faculty at 10 National U.

Male/Female Faculty



%Female



※Only permanent faculty
Does not include members of affiliated departments

Data for 2004 provided by the MSJ. Data for 2019 obtained by web/phone/email from respective institution

In comparison with the 2004 survey, the percentage of permanent female faculty members in mathematics graduate schools of the 10 national universities (7 Former Imperial Universities, Tokyo Institute of Technology, Tsukuba University, and Hiroshima University) in 2019 remained almost the same for professors (The total number, 3, was the same), while the percentage of permanent female faculty for Associate Professors and Lecturers/Assistant Professors increased. When the number of female faculty members in affiliated departments listed on the website of each graduate school is included, then the number of female professors increases from 3 to 6, and the ratio then becomes about 2.9%.

The percentage of female professors in mathematics in the 6 universities Fudan, Zhejiang, Peking, Tsinghua, Jilin, and Shandong in China in 2016 was 11.4% (30 of 264), it was 13.0% (396 out of 3035) in the U.S. as a whole in 2012, it was 8.5% (60 of 750) in the U.K as a whole, its was 14.8% (185 of 1247) in Germany as a whole in 2014, and it was 6.2% (33 of 530) in pure mathematics in France in 2016. The percentage of female professors in mathematics in Japan is very low compared with these results.

See References [9], [10], [12]

16

London Mathematical Society

- In 2008, the Board of Directors issued a statement expressing concern that "the loss of women from mathematics" is "a disadvantage and opportunity loss in the development of mathematics". A revised edition was published in 2018 (References [13]). The following causes were pointed out:
 - i. The fact that there are fewer women in the mathematics community means that **they are often overlooked when names are sought, for speakers or for prizes**, for instance.
 - ii. Those few women who reach the higher levels are disproportionately called on to sit on committees etc., to the detriment of their own careers.
 - iii. Women are often called on to take part in **'people-based' activities rather than 'research-based' activities**, to the detriment of their own careers.
 - iv. Compared with men, women may be **disadvantaged by societal norms and unconscious bias**.
- This paper collects and analyzes how each university and graduate school in the mathematics field tackles these problems, and introduces good measures to be referred to ([1]). In it, the importance of:
 - **Continue to collect data and keep an eye on trends.**
 - **Strong involvement of the top management of the organization.**
- Providing concrete advice to the facilitators of workshops and seminars to ensure diversity (References [14]). In it, he pointed out the following:
 - **Explicitly reject the "No good women" claim.**

17

Analysis of the Statistics

Statistical data indicate that (1) the proportion of women is low compared to other countries and areas of the world, (2) the proportion of female winners and invited speakers is lower than the proportion of women in the community, and (3) the percentage of female graduate students is declining.

In countries around the world, lower proportion of female in research is understood to be caused by problems in the research environment for women, such as gender bias (prejudice) and harassment. Various measures are being taken to ensure that the proportion of women is rising. It would be unreasonable to believe that Japan does not have such problems..

(1) In Japan, both mathematicians and the general public seem to think that the reason for this difference from other fields is that "Women don't like (or not suited for) math.". However, in some countries around the world, the percentage of women in mathematics is higher than that of men ([8]), and in other countries, the number of women majoring in mathematics is steadily increasing by combatting issues such as bias, harassment, and compatibility with family life. Therefore, it is itself biased to think that the reason of (1) is that "Women don't like (or not suited for) math," and the fact that parents, teachers, and researchers around them have such bias itself hinders women's interest in mathematics. It is unreasonable to think that "Japanese women" is special, and we believe the reason why there are so few women majoring in mathematics is not a problem concerning "Japanese women," but a problem of "Japanese society" and "Mathematics in Japan".

(2) is known as an indicator of bias." ([2] [3] [4]) Is it possible to think of the reason for (2) is that "women indeed perform badly"? For strict analysis, we will have to look at the performance of each individual nominee for the award, but there's already a clear bias in the assumption that "Women generally perform less.". It is also necessary to verify whether women are nominated for a certain percentage and are evaluated for their performance. It is also important to increase the diversity of the selection committee in evaluating performance, under the assumption that everyone holds biases. Research on the background of the scarcity of female Nobel laureates is discussed in [9]. As a result of ongoing data collection, training on bias, and addressing bias such as gender bias in the selection committee, the percentage of women in each community at AMS and LMS invitations is no different from the percentage of women in each community, and ICM invitations are certainly moving in that direction

"In addition to awards and invitations, data such as allocation of research funds (gender composition of applicants and admissions officers), recruitment and promotion data (gender composition of applicants and that of those newly hired or promoted), and gender age distribution at promotion are used to examine gender bias. This time, we asked the Japan Society for the Promotion of Science about the gender composition of Kakenhi grants, and they said that there was no data for each field, and we could not verify the data on applicants for recruitment and promotion because it is not available in Japan.

*As for the gender composition of the selection committee of prizes for the MSJ, we could only confirm the members only for the Algebra, Analysis, and Application Mathematics Incentive Awards. In all, there was only one woman, in the committee for the Analysis Award.

18

Analysis of the 「Decrease of Percentage of Women in Graduate School」

Despite a slight increase in the percentage of female members of the Mathematical Society of Japan, the percentage of women in awards and invited lectures has significantly decreased. This may indicate that gender bias is becoming more influential in mathematics in Japan.

The effects of gender bias and harassment are more serious in the early stages of a career, such as in graduate school, when the aspiring mathematician has less achievement or support. For example, if people say things like, "Women will be fine if they get married," women will feel "not properly appreciated in this field" and their motivation for research will decrease. Such decrease in motivation may be mistaken that "women have low motivation" or "she was not serious from the start". In order to eliminate such biases and harassment that discourage women's motivation from the daily speech and behavior of researchers (include graduate students), it is necessary for each and every one to continue to learn through training, etc. what will hinder a fair research environment.

The fact that there have only been three female winners of the Mathematical Society's non-young awards since the foundation of the Mathematical Society, and that there have been a total of three female professors at the 10 top national universities in 2004 and 2019 meaning that there are very few female mathematicians who may be regarded as role models for young women. In mathematics, it is assumed that this is a factor that makes people feel that there is a "glass ceiling" and that there has been no sign of change. In terms of compatibility with family life, the lack of role models is thought to increase anxiety about the future.

The impact of harassment on careers in areas such as science and engineering in the United States has been studied in detail in [6]. The situation in Japan cannot be read from this data, but as far as I know from experience, many women in the field of mathematics have had unpleasant experiences due to the words and deeds of researchers (include graduate students) around them concerning their appearance, love, marriage, childbirth, etc. It is easy to surmise from the results of the survey [6] that this makes it difficult for students to participate in seminars and research meetings, makes it uncomfortable for students in graduate schools and universities, has a negative impact on their studies and research achievements, and even leads them to quit math. It is very important to create an environment where it is difficult for harassment to occur, and to prepare on a daily basis what to do when harassment occurs in you or in your immediate surroundings. Specific methods for investigating the actual situation and implementing measures are described in detail in [6], and it is hoped that these measures will be carried out in an organized manner by Universities and the Mathematical Society of Japan.

Being an overwhelmingly minority in a community already has its own disadvantages, such as being easily isolated and losing confidence that you are suitable for the occasion. It is also important for young researchers such as graduate students to meet diverse researchers and actively provide them with opportunities to learn about the wider world. As a place to meet many role models, workshops for female mathematicians are held all over the world (References [17]). It is also important for the entire field to support the participation of graduate students in these fields and the researchers who host research meetings.

19

Proposal for Future Gender Equality

- Rather than focusing only on the percentage of women, it is vital to give top priority to "Creating an environment in which anyone with an interest in mathematics will be able to do research without feeling hesitant about studying mathematics because of being a woman and without giving up on studying mathematics because of being a woman"
- Gender equality led by leaders of each organization, involving the mathematical world and the entire graduate school. Various documents from around the world point out that the involvement of organizational leaders is a very important factor. Gender bias and harassment require a systematic response. "Time alone does not change things - deliver action by powerful administrators change institutions" Nancy Hopkins [3]
- Formulation of specific strategies based on statistical data and prior domestic and overseas results, surveys and research. The world has had great success stories, accumulated research, and specific proposals on what kind of data should be collected and what efforts have been effective ([1, 2, 3, 4, 6, 7, 9], reference materials [16]). For example, when choosing invited speakers for seminars or workshops, it is recommended to create "The too long long list" for candidates (References [14]). There is also a warning that "Do not always invite the same senior women" (References [14]). To combat gender bias, many research institutions require training for personnel committee members, evaluators of research funds, and conference organizers.
- In Japan, the mathematics department at Nara Women's University supports young female researchers, especially those who give birth and raise children. The Chairs article published in the Mathematics Correspondence ([10]) made a number of important points, such as "(maternity). Harassment is more likely to occur in workplaces with limited staff" "importance of workplace atmosphere" and "(parenting) Support for teachers also serves as an education for students watching them." "(Child rearing support) is useful for men as well as women". A number of concrete and effective practices are introduced.

Please join us to create an environment in which
diverse people can enjoy mathematical research.
Let's do our best, together!

20

Acknowledgement

We received cooperation and advice from the following individuals and organizations. We deeply appreciate their contributions.

David Croydon, Shihoko Ishii, Tetsushi Ito, Yukari Ito, Keiko Imanari, Yuri Imamura, Reimi Irokawa, Kenji Kashiwabara, Tomoki Kawahira, Junko Sasada, Sawako Shinoda, Asuka Takatsu, Tomoko Takemura, Noriko Tanaka, Takashi Tsuboi, Negami Haru, Megumi Harada, Hiroko Bannai, Emiko Minato, Maki Morimoto, Yusuke Morimoto, Marika Yamagishi

10 National Universities in Japan, Newton Institute, Mary Ann Liebert, Inc., AMS Survey, Keio University, Committee for Gender-Equality of the MSJ

21

References

- [1] Advancing Women in Mathematics - Good Practice in UK University Departments, <https://www.ims.ac.uk/sites/ims.ac.uk/files/LMS-BTL-17Report.pdf>
- [2] LMS Council Statement on Women in Mathematics (参考資料 [13])
- [3] Nancy Hopkins, Reflecting on Fifty Years of Progress for Women in Science, *DNA and Cell Biology*, Volume 34, Number 3, 2015 pp. 159-161
- [4] 「無意識のバイアス - Unconscious Bias - を知っていますか？」リーフレット、男女共同参画学協会連絡 (2017)
- [5] 潜在的バイアスと女性参画推進 沖縄科学技術大学院大学 (OIST) の取組 内閣府沖縄振興局 (内閣府編集「共同参画」2016年1月号)
- [6] Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine by the National Academies of Sciences, Engineering, and Medicine in the US (参考資料 [16])
- [7] Planning for Success - Good Practice in University Science Departments, Royal Society of Chemistry, London, 2008 (www.rsc.org/diversity); Women in University Physics Departments, Institute of Physics, London, 2006 (www.iop.org/diversity) (参考資料 [15])
- [8] 日本数学会男女共同参画社会推進委員会「外国の女性数学者の活躍ぶりについて」, <https://mathsoc.jp/publication/tushin/1103/gender-equal.pdf>
- [9] Nobel Nominations in Science: Constraints of the Fairer Sex, *Ann Neurosci*, 2018 Jul; 25(2): 63-78,
- [10] 数学通信 第22巻 第3号 2017年11月「若手女性研究者支援の実践」

Additional Resources

- | | | |
|-----------------------------------|--|--|
| [1] Graduate Students | [8] AMS/Invited Speakers | [15] Planning for Success: Good Practice in University Science Departments |
| [2] Faculty at 10 National Univ. | [9] Faculty US | [16] Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine by the National Academies of Sciences, Engineering, and Medicine in the US |
| [3] Prof. at 10 National Univ. | [10] Faculty UK/China | |
| [4] Students at 10 National Univ. | [11] UK Invited Speakers/Prizes/Council | |
| [5] Speakers at the MSJ | [12] Faculty Germany/France | |
| [6] Speakers at the MSJ | [13] London Mathematical Society Statement | |
| [7] Prizes/Invited Speakers | [14] LMS Advice on Diversity at Conferences and Seminars | |

22

[3] Professors at 10 National U.

Professors Listed on Departmental Webpage

		Professors			
		Male	Female	Total	%Female
Hokkaido	GS of Science, Dept. of Math.				5,6%
Tohoku	GS of Science, Dept. of Math.				5,9%
Ibukuba	GS of P&A Sci, Dept. of Math.				0,0%
Tokyo	Grad. School of Math				6,9%
Tokyo Tech	GS of Science, Dept. of Math.				0,0%
Nagoya	Grad. School of Math				0,0%
Kyoto	GS of Science, Dept. of Math.				0,0%
	RIMS				0,0%
Hiroshima	GS of Science, Dept. of Math.				4,5%
Osaka	GS of Science, Dept. of Math.				0,0%
Kyushu	Grad. School of Math/ Math for Industry				3,0%
Total		203	6	209	2,9%

Information collected from departmental webpage, September 2019. On the websites of many of the departments, members of affiliate departments are also shown. If we include affiliate members, then the number of female professors at Tohoku University, Osaka University, and Tokyo University each increase by one. If we include such data then the total number of female professors become 6, and the percentage of female professors become 2.9% (see next page).

Detailed data from individual universities are not shown on current version for privacy reasons

25

[4] Students at 10 National U.

		Masters Student				Ph.D. Students				Total			
		M	F	Total	%F	M	F	Total	%F	M	F	Total	%F
Hokkaido	GS of Science, Dept. of Math.												
Tohoku	GS of Science, Dept. of Math.												
Ibukuba	GS of Science, Dept. of Math.												
Tokyo	Grad. School of Math												
Tokyo Tech	GS of Science, Dept. of Math.												
Nagoya	Grad. School of Math												
Kyoto	GS of Science, Dept. of Math.												
	RIMS												
Hiroshima	GS of Science, Dept. of Math.												
Osaka	GS of Science, Dept. of Math.												
Kyushu	Grad. School of Math												
Total		739	40	779	5,1%	354	13	367	3,5%	1093	53	1146	4,6%

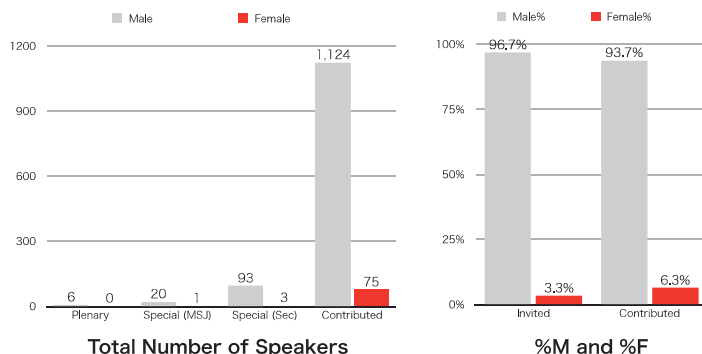
Information of Nagoya University obtained from statistics given online by Nagoya University
Other Information obtained via direct contact with each department, September 2019

Detailed data from individual universities are not shown on current version for privacy reasons

26

【5】 Talks at the MSJ

Total Fall 2018~Spring 2019



Provided by the Committee for Gender-Equality of the MSJ

The percentage of women giving invited lectures (by recommendation) for the Fall 2018, Spring 2019 and Fall 2019 conferences was 3.3% (4 people). However, the percentage of women giving contributed lectures (by application) was 6.3% (Fall 2018 @ Okayama University 6.5%, Spring 2019 @ Tokyo Institute of Technology 7.6%, Fall 2019 @ Kanazawa University 4.7%), which is closer to the percentage of women 7.2% in the MSJ. More recent data has not yet been compiled by the MSJ

27

【6】 Speakers at the MSJ

Fall 2018 Okayama

	Plenary	Special (MSJ)	Special (Sections)	Citizens	Total Invited	Contributed	Total
Male	2	7	31	2	42	362	404
Female	0	0	1	0	1	25	26
Total	2	7	32	2	43	387	430
Male%	100%	100%	97%	100%	98%	94%	94%
Female%	0.0%	0.0%	3.1%	0.0%	2.3%	6.5%	6.0%

Spring 2019 Tokyo Tech

	Plenary	Special (MSJ)	Special (Sections)	Citizens	Total Invited	Contributed	Total
Male	2	6	31	2	41	378	419
Female	0	1	1	0	2	31	33
Total	2	7	32	2	43	409	452
Male%	100%	86%	97%	100%	95%	92%	93%
Female%	0.0%	14.3%	3.1%	0.0%	4.7%	7.6%	7.3%

Fall 2019 Kanazawa

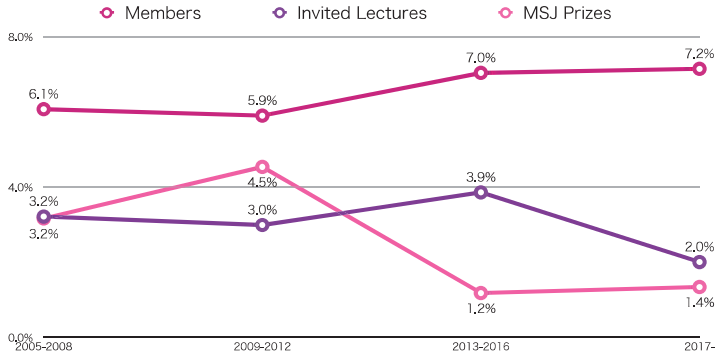
	Plenary	Special (MSJ)	Special (Sections)	Citizens	Total Invited	Contributed	Total
Male	2	7	31	2	42	384	426
Female	0	0	1	0	1	19	20
Total	2	7	32	2	43	403	446
Male%	100%	100%	97%	100%	98%	95%	96%
Female%	0.0%	0.0%	3.1%	0.0%	2.3%	4.7%	4.5%

Provided by the Committee for Gender-Equality of the MSJ

28

[7] MSJ Prizes/Invited Speakers

Change in %Female



Gender deduced from name. Ambiguous names were searched via personal or departmental webpage. Average for every four years.

If we look at %Female in Prizes and Invited Lectures, there is a decrease in a period after 2005. If we look at the four year average, then the percentage of women for both prizes and invited lectures are less than the %Female Members in each period.

[8] AMS Invited Speakers

FROM THE AMS SECRETARY

Statistics on Women Mathematicians

Compiled by the AMS

At its August 1985 meeting the Council of the AMS approved a motion to regularly assemble and report in the Notices information on the relative numbers of men versus women in at least the following categories: membership in the AMS, invited hour addresses at AMS meetings, speakers at Special Sessions at AMS meetings, percentage of women speakers in AMS Special Sessions by gender of organizers, and members of editorial boards of AMS journals.

It was subsequently decided that this information would be gathered by determining the gender of the individuals in the above categories based on name identification if no other means was available and that additional information on the number of PhDs granted to women would also be collected using the AMS-ASA-HSS-MAA-SIAM Annual Survey. Since name identification was used, the information for some categories necessitated the use of three classifications:

- Male: names that were obviously male.
- Female: names that were obviously female.
- Unknown: names that could not be identified as clearly male or female (e.g., only initials given, non-gender-specific names, etc.)

The following is the thirty-first reporting of this information. Updated reports will appear annually in the Notices.

Trustees and Council Members					2016 Members of the AMS Residing in the US				
	2016	2015	2014	2013		2016	2015	2014	2013
Male	26	42%	23	55%	23	68%	23	68%	23
Female	16	38%	19	45%	18	44%	14	38%	14
Total	42		42		41		37		37

Members of AMS Editorial Committees										
	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Male	161	80%	173	80%	179	81%	182	82%	178	83%
Female	41	20%	43	20%	41	19%	40	18%	37	17%
Total	202		216		222		222		215	

PhDs Granted to US Citizens										
	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Male	683	73%	636	72%	664	72%	627	73%	627	72%
Female	249	27%	244	28%	256	28%	230	27%	242	28%
Total	934		880		920		857		869	

[9] Faculty, U.S.A.

Annual Survey of the Mathematical Sciences
Sponsored by AMS, ASA, DSI, MAA, SIAM
www.ams.org/mathsci

2016 DEPARTMENTAL PROFILE REPORT
FACULTY SIZE SUMMARY

Note: All figures on projected values.

Math Public Large - 28 Departments
25 (inc. 8 reported/25 projected)

	Full 2016				
	with PhD			no PhD	
	Male	Female	Other	Male	Female
Full-time (includes visitors)	1777	845	8	32	16
Tenured Full Prof	865	104	0	0	0
Tenured Other	188	32	0	0	0
Untenured, tenure-eligible	119	45	0	0	0
Non-tenure-track	185	218	0	13	0
Postdoc appointments	169	111	0	0	0
Research	107	107	0	47	0
Fixed-Term	16	0	0	2	0
Other	3	0	0	0	0
Visitors	49	14	0	1	0
Part-time	75	37	0	42	0
With Benefits	49	25	0	46	0
Other Part-time	26	12	0	0	0
Phased Retirements	0	1	0	0	0
Full-time teaching courses	Total only				
Math Sci	23				
Comp Sci Only	2				

Math Public Medium - 48 Departments
40 (inc. 3 reported/40 projected)

	Full 2016				
	with PhD			no PhD	
	Male	Female	Other	Male	Female
Full-time (includes visitors)	1590	407	0	81	133
Tenured Full Prof	764	76	0	0	0
Tenured Other	231	44	0	0	0
Untenured, tenure-eligible	119	37	0	0	0
Non-tenure-track	375	199	0	0	0
Postdoc appointments	191	51	0	0	0
Research	124	110	0	64	112
Fixed-Term	47	26	0	13	20
Other	3	0	0	0	0
Visitors	24	14	0	0	0
Part-time	89	45	0	135	132
With Benefits	31	18	0	34	40
Other Part-time	47	27	0	70	72
Phased Retirements	11	2	0	0	0
Full-time teaching courses	Total only				
Math Sci	72				
Comp Sci Only	1				

Math Public Small - 68 Departments
38 (inc. 9 reported/68 projected)

	Full 2016				
	with PhD			no PhD	
	Male	Female	Other	Male	Female
Full-time (includes visitors)	1334	494	0	134	239
Tenured Full Prof	489	113	0	3	0
Tenured Other	101	13	0	1	0
Untenured, tenure-eligible	249	91	0	0	0
Non-tenure-track	155	146	0	10	0
Postdoc appointments	84	20	0	0	0
Research	119	109	0	114	209
Fixed-Term	23	0	0	0	0
Other	0	0	0	11	0
Visitors	30	9	0	0	0
Part-time	106	49	0	152	152
With Benefits	77	14	0	76	21
Other Part-time	69	33	0	101	101
Phased Retirements	10	0	0	0	0
Full-time teaching courses	Total only				
Math Sci	41				
Comp Sci Only	13				

Math Private Large - 24 Departments
21 (inc. 1 reported/21 projected)

	Full 2016				
	with PhD			no PhD	
	Male	Female	Other	Male	Female
Full-time (includes visitors)	662	205	0	0	110
Tenured Full Prof	437	2	0	0	0
Tenured Other	47	9	0	0	0
Untenured, tenure-eligible	76	11	0	0	0
Non-tenure-track	70	24	0	0	0
Postdoc appointments	276	47	0	0	0
Research	71	29	0	2	0
Fixed-Term	40	14	0	1	0
Other	2	3	0	0	0
Visitors	25	14	0	2	0
Part-time	206	32	0	124	124
With Benefits	9	0	0	0	0
Other Part-time	33	11	0	0	0
Phased Retirements	8	0	0	0	0
Full-time teaching courses	Total only				
Math Sci	17				
Comp Sci Only	1				

Math Private Small - 29 Departments
26 (inc. 1 reported/29 projected)

	Full 2016				
	with PhD			no PhD	
	Male	Female	Other	Male	Female
Full-time (includes visitors)	601	160	0	0	104
Tenured Full Prof	320	34	0	0	0
Tenured Other	44	10	0	0	0
Untenured, tenure-eligible	14	27	0	0	0
Non-tenure-track	113	109	0	0	0
Postdoc appointments	54	11	0	0	0
Research	30	16	0	20	23
Fixed-Term	28	13	0	1	0
Other	0	0	0	0	0
Visitors	31	3	0	0	0
Part-time	58	20	0	151	151
With Benefits	20	0	0	2	0
Other Part-time	30	16	0	15	24
Phased Retirements	8	0	0	0	0
Full-time teaching courses	Total only				
Math Sci	31				
Comp Sci Only	9				

[10] Faculty Great Britain/China



This data pack was produced by TBR to help the London Mathematical Society update the analysis in their February 2013 report, *Advancing Women in Mathematics: Good Practice in UK University Departments*.



Gender in Mathematics data update
January 2015

Code Centre	Type of Academic Contract	2013/12			2012/11			2011/10			2010/09		
		Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Mathematics	Professors	50	530	720	50	622	695	60	645	710	60	645	702
	Senior Lecturers/Lecturers	191	1,265	1,760	490	1,545	1,995	460	1,645	1,415	149	1,250	1,225
	Researches	145	550	695	145	605	750	195	660	855	195	660	855
	Other grades	0	0	0	0	0	0	0	0	0	0	0	0
	Not applicable/Not required (Default rate)	35	70	100	35	70	100	35	70	100	35	70	100
Total		421	2,015	2,280	620	2,292	2,470	730	2,315	2,320	730	2,315	2,320

https://www.lms.ac.uk/sites/lms.ac.uk/files/Benchmarking%20Data%20Updated%20for%202011-2015%20April%202016_0.pdf

In Chinese universities, the female teachers engaged in teaching and researches are about 45.5% of the total, but the proportions are variable from one university to the other. Among them, the **professors (senior) account for 28.4%, the associate professors (sub-senior) 43.6%, and the lecturers (middle) 51.9%**. The female teachers who work on Mathematical research are fewer. We did a survey about the number of teaching and research faculty of the **department of mathematics in Fudan University, Zhejiang University, Peking University, Tsinghua University, Jilin University and Shandong University**. The total number of teaching and research staff in this survey is 651, among which there are 139 women, which takes 21.35% of the total. **There are 264 professors (senior), 30 are female, this number account for 11.36% of the total; the number of associate professors (sub-senior) is 230, including 57 female members, accounting for 24.78%, the number of lecturers (middle) is 157, including 52 female members, accounting for 33.12%.**

The 2012 situation in China is reported by the "Working Committee for Women in Mathematics of the Chinese Mathematical Society" in the IMU email newsletter that appears here:
https://www.mathunion.org/fileadmin/CWM/Ry%20country/IMU-Net%2061_%20September%202013.htm

【11】 Great Britain Colloquium/Prizes/Council

British Mathematical Colloquium 2019 invited speakers (female/total):

Plenary (inc Public): 3/7
 Morning: 5/9
 Algebra: 3/7
 Geometry: 3/7
 Analysis: 2/7
 Probability: 1/4
 Combinatorics: 3/7
 Mathematics Education: 1/6

 TOTAL: 21/54=39%

Data collated from: <https://www.lancaster.ac.uk/math/bmc2019/>

LMS Prize Winners (female/total):

2019: 1/11
 2018: 4/11
 2017: 2/11
 2016: 2/9
 2015: 2/17

 TOTAL: 11/59=19%

Data collated from :
<https://www.lms.ac.uk/prizes/2019-nominations-lms-prizes>
<https://www.lms.ac.uk/news-entry/29062018-1745/2018-lms-prize-winners>
<https://www.lms.ac.uk/news-entry/30062017-1833/lms-prizes-2017>
<https://www.lms.ac.uk/prizes/2016-nominations-lms-prizes>
<https://www.lms.ac.uk/prizes/citations-lms-prize-winners>

British Mathematical Colloquium 2018 invited speakers (female/total):

Plenary (inc Public): 4/7
 Morning: 3/12
 Algebra: 4/8
 Analysis/Probability: 2/8
 Combinatorics: 3/8
 Dynamics: 2/8
 History of mathematics: 4/8

 TOTAL: 22/59=37%

Data collated from: <http://www.mcs.st-and.ac.uk/~bmc2018/>

Current membership of the LMS council (which is the most important governance body of the LMS, female/total):

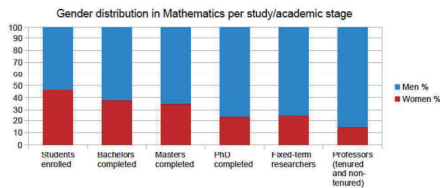
LMS Council Officers: 2/8
 LMS Council Members-at-Large (i.e. other members): 6/12
 TOTAL: 8/20=40%

 Data collated from :
<https://www.lms.ac.uk/about/council>

【12】 Germany/France

Distribution of Women in Maths in 2014 per study/academic career stage

	Total	Women	Percentage
Students enrolled	33728	72391	46.6
Bachelors completed	2665	1020	38.2
Masters completed	1117	395	35.4
PhD completed	562	132	23.5
Fixed-term researchers (e.g. postdocs, fixed-term lecturer)	3697	905	24.5
Professors (tenured and non)	1247	185	14.8



German Data obtained from IWOTA 2016 presentation by M. Infusino

EVOLUTION IN TIME in fundamental mathematics (or pure mathematics) FRANCE

1996	MEN	WOMEN	TOTAL	% WOMEN
Assistant Prof.	529	205	734	28%
Full Prof.	523	59	582	10%

2016	MEN	WOMEN	TOTAL	% WOMEN
Assistant Prof.	701	156	857	18%
Full Prof.	497	23	520	4%

French Data obtained from IWOTA 2016 presentation by I. Chalendar

[13] London Mathematical Society Statement



Council Statement on Women in Mathematics

1. The London Mathematical Society is concerned about the loss of women from mathematics, particularly at the higher levels of research and teaching, and at the disadvantages and missed opportunities that this represents for the advancement of mathematics. This can occur for several reasons:
 - i. Women are more likely to have had broken career patterns or worked part time on account of child-rearing and family responsibilities.
 - ii. The fact that there are fewer women in the mathematics community means that they are often overlooked when names are sought, for speakers or for prizes, for instance.
 - iii. Those few women who reach the higher levels are disproportionately called on to sit on committees etc., to the detriment of their own careers.
 - iv. Women are often called on to take part in 'people-based' activities rather than 'research-based' activities, to the detriment of their own careers.
 - v. Compared with men, women may be disadvantaged by societal norms and unconscious bias.
2. The Society recognises the need to give active consideration to ensuring that everybody is treated equally in their prospects, recognition and progression. The formulation and regulation of procedures should give adequate attention to the needs of all.

Data obtained from

<https://www.lms.ac.uk/sites/lms.ac.uk/files/files/Council%20Statment%20on%20Women%20in%20Mathematics.pdf>

35

[13] London Mathematical Society Statement

3. Accordingly, the Society will:
 - a. be aware of and seek to ensure an appropriate gender balance on its committees and working groups, and encourage the Nominating Committee to give similar attention in its proposals for election;
 - b. keep under review the regulations governing its membership, prizes, awards and grants to ensure that they do not inadvertently deter or fail to recognize people with non-standard career patterns;
 - c. actively encourage and facilitate the nomination of women for its prizes and awards, and ensure that it considers women when it is proposing nominees for external prizes and positions;
 - d. actively seek to include women speakers in its meetings and workshops;
 - e. expect that the conferences and activities funded by the Society will have an appropriate gender balance among speakers. Consideration should be given to mechanisms to enable participation by people with children or family responsibilities;
 - f. collect data and thereby monitor trends in the above.

Approved by Council, 20 March 2008

Revisions approved by Council 19 October 2018

Data obtained from

<https://www.lms.ac.uk/sites/lms.ac.uk/files/files/Council%20Statment%20on%20Women%20in%20Mathematics.pdf>

36

[14] LMS Advice on Diversity at Conferences and Seminars



LMS ADVICE ON DIVERSITY AT CONFERENCES AND SEMINARS

Philosophy. Diversity has many forms. These include, but are not limited to, gender, race and ethnicity, age, geographic location, and mathematical school. The health of mathematics relies on most conferences/seminars/workshops allowing mathematicians with different mathematical perspectives to mingle.

Best practices in considering diversity will deal with all of these at once. Measurable attributes such as gender or age often serve as the “canary in the coal mine” for less obvious forms of insularity that may have an even more immediate negative impact on the mathematics of the conference. For brevity, we will often refer to women below, but the guidelines apply to other underrepresented groups.

Data obtained from
<https://www.lms.ac.uk/adviceondiversityatconferencesandseminars>

37

[14] LMS Advice on Diversity at Conferences and Seminars

Specific suggestions.

- **The too long long list.** Come up with a list in the usual way, whatever that means in the context of your event. If the list isn't representative of the full diversity of mathematicians, then ask each member of the organising committee to come up with some mathematicians in the underrepresented group(s). The result will be a long and diverse list of suitable invitees. Choose your short list from this long list. You may find this process results in an “over-representation” of the underrepresented group. That is okay.
- **Broaden your base.** Think more broadly about the field from which you're recruiting: are there mathematicians working in other fields with overlapping interests? Also, young mathematicians are often a good source for finding a diverse group of speakers (with a caveat; see next bullet point).
- **Do not always invite the same senior women.** Conversely, don't have a list of eighteen senior men and two young women.
- **Question reasonable-sounding assumptions.** This can over-determine the situation. For example, if you say “we had a pure speaker last year, so they must be applied, and they were from the US last year, so they must be European” then you've cut your pool to a quarter of its original size, which may be less representative.
- **Look at the big picture.** Look at data for the last N years, or look at conferences your target audience has been to recently, for a one-off event. For example, if for each of the last five years, the keynote speaker for your general audience event was a pure mathematician, then applied mathematicians become one of the underrepresented groups for the “too long list”.
- **Explicitly reject the “no good women” claim.** See the bullet points above for ways of generating lists of suitable women. If the specific suggestions in this document have not been helpful, there are many other resources available, and it is worth searching online for further guidelines and suggestions.

Data obtained from
<https://www.lms.ac.uk/adviceondiversityatconferencesandseminars>

Approved by Council, 10 November 2017

38

【15】 Planning for Success: Good Practice in University Science Departments

Key Findings

1. Good practice benefits all, staff and students, men and women. However, bad practice adversely affects women's careers more than men's.
2. The best departments don't target measures specifically at women because improved working conditions benefit all and make for a happy department: good practice isn't about how many women are in the department, it's about processes that are fair, flexible, accessible and transparent to all.
3. Good practice departments appear able to attract and retain women far better than other departments.
4. There is no evidence that the introduction of good practices adversely affects the excellence of the science carried out. Good practice equates with good science. In contrast the detrimental effects of bad practice build up incrementally over the course of a career resulting in a smaller proportion of women than men reaching their full potential.
5. Leadership from the top, with the Head of Department acting as champion, is critical to changing culture, to making the changes stick, and to changing behaviour. Simple changes to processes, which deliver clear benefits to staff, can start to change policy and behaviour, but without a Head of Department prepared to introduce changes and monitor adherence, little will be different in the medium and longer term.
6. The age profile of the department, and the diversity of its staff, makes a difference. Young men and women with families have different expectations and needs from their older colleagues. The careers of younger staff (and their science) cannot thrive unless the working culture of the department reflects the reality of dual career partnerships.
7. Successful action is based on good planning, which takes account of the department's academic plan and which is based on evidence.

Data obtained from

https://www.rsc.org/globalassets/02-about-us/our-strategy/diversity-community-hub/2008-planning-for-success_good-practice-in-university-science-departments.pdf

Advancing Women in Mathematics : Good Practice in UK University Departments [1] に同じ内容が引用されている

39

【16】 SEXUAL HARASSMENT OF WOMEN: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine

RECOMMENDATION 1: Create diverse, inclusive, and respectful environments.

RECOMMENDATION 2: Address the most common form of sexual harassment: gender harassment.

RECOMMENDATION 3: Move beyond legal compliance to address culture and climate.

RECOMMENDATION 4: Improve transparency and accountability.

RECOMMENDATION 5: Diffuse the hierarchical and dependent relationship between trainees and faculty.

RECOMMENDATION 6: Provide support for the target.

RECOMMENDATION 7: Strive for strong and diverse leadership.

RECOMMENDATION 8: Measure progress.

RECOMMENDATION 9: Incentivize change.

RECOMMENDATION 10: Encourage involvement of professional societies and other organizations.

RECOMMENDATION 11: Initiate legislative action.

RECOMMENDATION 12: Address the failures to meaningfully enforce Title VII's prohibition on sex discrimination.

RECOMMENDATION 13: Increase federal agency action and collaboration.

RECOMMENDATION 14: Conduct necessary research.

RECOMMENDATION 15: Make the entire academic community responsible for reducing and preventing sexual harassment.

参考文献[6]の summary の中のタイトルの抜粋

40