

Has the spirit of gender equality successfully increased the percentage of female researchers?

—Obstacles to achieving a higher percentage of female faculty members—

Maki KAWAI

Professor at Graduate School of Frontier Sciences, The University of Tokyo
Executive Director at RIKEN, Editorial writer at the Chemical Society of Japan

Various efforts have been made, such as setting up a child care center on campus, encouraging female faculty members to take maternity leave or child-raising leave, and promoting the introduction of the female faculty members' tenured track system to be financed by the Special Coordination Funds for Promoting Science and Technology. Supported by these measures, the environment has been improving. Nevertheless, when compared to other countries, the percentage of female researchers does not seem to have improved as much as expected.

Chronological change in the percentage of female faculty members to university teaching staff

In Japan, the percentage of female faculty members to university teaching staff has been steadily growing. **Table 1** shows the chronological change over 25 years from 1985 to last year (2009). In this period, the percentage of female lecturers or higher ranks has increased 2.65 times from 6.3% to 16.7%. Looking at the change over the last nine years from 2000, or the year after the establishment of the Basic Act for a Gender-Equal Society (hereafter "the Basic Act") in 1999, the total number of lecturers or higher ranks (the sum of the corresponding males and females) increased by 17,288, of which 9,011 was attributed to the increase in the number of females. This means that females accounted for as much as 52% of the increase. Meanwhile, looking at the change over the 15 years from 1985 to 2000, or, in other words, the period before the Basic Act, the total number increased by 34,157, of which only 7,820 or 23% was attributed to the increase in the number of females. This comparison indicates that the momentum of promoting women has been building since the establishment of the Basic Act.

If we assume that it takes about 10 years for an average faculty member to be promoted from the position of Lecturer to Associate Professor and then to Professor, it is conceivable that the number of females who were promoted during the period from 2000 to 2009 at least rivaled the number of the corresponding males for the same period in light of the following chronological change: The percentage of female lecturers was 18.8% in 2000 while the percentage of female professors was 12.0% in 2009. We can say that the percentage of female faculty members to university teaching staff has been steadily growing.

Global trends

The American Institute of Physics has a female physicists' sectional committee called "Women in Physics" to implement various programs which are designed to encourage females aspiring to become physicists or professional females in the field of physics. Articles on women's social advancement also appear on an

Table 1 Percentage of female faculty members to higher education (University) teaching staff¹⁾

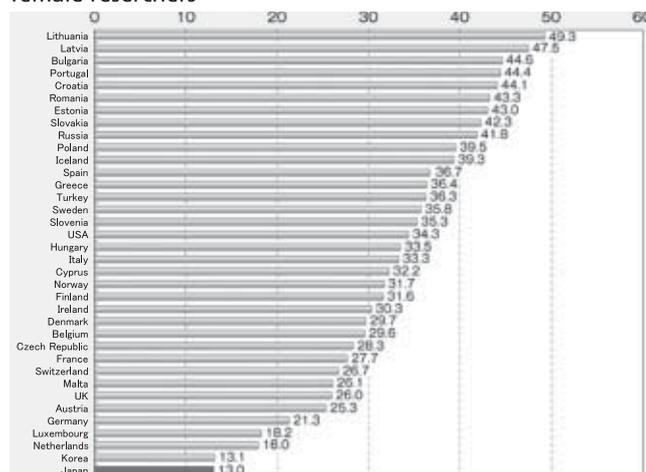
| | | University | | | | | | The entire teaching staff |
|------|---------|-------------------------|----------------|---------------|---|------------------|------------------|---------------------------|
| | | Lecturer or higher rank | | | | | | |
| | | President | Vice-president | Professor | Assistant Professor (Associate Professor) | Lecturer | | |
| 1985 | Total | 78,947 | 446 | 133 | 37,503 | 26,148 | 14,717 | 112,249 |
| | Females | 5,005 (6.3) | 18 (4.0) | 2 (1.5) | 1,615 (4.3) | 1,846 (7.1) | 1,524 (10.4) | 9,582 (8.5) |
| | Males | 73,942 (93.7) | 428 (96.0) | 131 (98.5) | 35,888 (95.7) | 24,302 (92.9) | 13,193 (89.6) | 102,667 (91.5) |
| 1990 | Total | 89,730 | 497 | 158 | 44,037 | 28,738 | 16,300 | 123,838 |
| | Females | 6,458 (7.2) | 20 (4.0) | 2 (1.3) | 2,208 (5.0) | 2,311 (8.0) | 1,917 (11.8) | 11,399 (9.2) |
| | Males | 83,272 (92.8) | 477 (96.0) | 156 (98.7) | 41,829 (95.0) | 26,427 (92.0) | 14,383 (88.2) | 112,439 (90.8) |
| 1995 | Total | 101,346 | 551 | 203 | 51,551 | 31,507 | 17,534 | 137,464 |
| | Females | 8,820 (8.7) | 25 (4.5) | 5 (2.5) | 3,133 (6.1) | 3,201 (10.2) | 2,456 (14.0) | 14,752 (10.7) |
| | Males | 92,526 (91.3) | 526 (95.5) | 198 (97.5) | 48,418 (93.9) | 28,306 (89.8) | 15,078 (86.0) | 122,712 (89.3) |
| 2000 | Total | 113,104 | 639 | 344 | 58,137 | 34,872 | 19,112 | 150,563 |
| | Females | 12,825 (11.3) | 47 (7.4) | 14 (4.1) | 4,595 (7.9) | 4,575 (13.1) | 3,594 (18.8) | 20,314 (13.5) |
| | Males | 100,279 (88.7) | 592 (92.6) | 330 (95.9) | 53,542 (92.1) | 30,297 (86.9) | 15,518 (81.2) | 130,249 (86.5) |
| 2005 | Total | 124,786 | 699 | 620 | 64,940 | 38,076 | 20,451 | 161,690 |
| | Females | 18,037 (14.5) | 53 (7.6) | 32 (5.2) | 6,559 (10.1) | 6,466 (17.0) | 4,927 (24.1) | 26,950 (16.7) |
| | Males | 106,749 (85.5) | 646 (92.4) | 588 (94.8) | 58,381 (89.9) | 31,610 (83.0) | 15,524 (75.9) | 134,740 (83.3) |
| 2008 | Total | 129,339 | 720 | 749 | 67,699 | 40,352 | 19,819 | 169,914 |
| | Females | 20,928 (16.2) | 58 (8.1) | 42 (5.6) | 7,840 (11.6) | 7,618 (18.9) | 5,370 (27.1) | 32,052 (18.9) |
| | Males | 108,411 (83.8) | 662 (91.9) | 707 (94.4) | 59,859 (88.4) | 32,734 (81.1) | 14,449 (72.9) | 137,862 (81.1) |
| 2009 | Total | 130,392 | 737 | 847 | 68,289 | 40,807 | 19,712 | 172,026 |
| | Females | 21,836 (16.7) | 63 (8.5) | 64 (7.6) | 8,218 (12.0) | 8,063 (19.8) | 5,428 (27.5) | 33,530 (19.5) |
| | Males | 108,556 (83.3) | 674 (91.5) | 783 (92.4) | 60,071 (88.0) | 32,744 (80.2) | 14,284 (72.5) | 138,496 (80.5) |

ongoing basis in their in-house journal "Physics Today." Naturally, their activity aims to enhance the percentage of female physicists as one of their goals, but an interesting article appeared in the above-mentioned journal a few years ago. It was an article written by a female researcher, raising the following questions: Why do we need to increase the percentage of females? Will the higher percentage of females contribute to higher quality physics? She pointed out that the obsession with a mere figure of the higher percentage might result in a deterioration of the quality of academics. The point to keep in mind here may be that it matters whether opportunities for recruitment and advancement as faculty members or researchers are equal irrespective of race or gender. If advancement opportunities are not the same, then this is a big problem that needs to be addressed immediately.

As shown in **Table 1**, the percentage of female scientists has been steadily growing in Japan. When compared to other countries, however, the percentage is surprisingly low (**Table 2**).

It has been long known that the percentage of female scientists is high in Latin countries, but the percentage in Japan is quite low, even compared to UK (Anglo-Saxon) or Germany (Ger-

Table 2 International comparison of the percentage of female researchers²⁾



manic). Actually, in terms of such female participation, Japan stands at the lowest level among developed countries. The percentage of female researchers has more than doubled over the past 20 years in Japan, but it might still be considered as abnormally low.

Obstacles to achieving a higher percentage of female researchers in Japan

Doctoral course students are potential researchers, and in this sense they can be regarded as research resources. Therefore, a clue as to how to increase the percentage of female researchers should be found in association with the percentage of female

Table 3 Doctoral course graduates by major³⁾

| Classification | Total | | | Percentage of females |
|--|-------|-------|---------|-----------------------|
| | Total | Males | Females | |
| March 2009 | | | | |
| Science | 1,386 | 1,192 | 194 | 14.0% |
| Mathematics | 183 | 166 | 17 | 9.3% |
| Physics | 286 | 259 | 27 | 9.4% |
| Chemistry | 188 | 170 | 18 | 9.6% |
| Biology | 214 | 162 | 52 | 24.3% |
| Geoscience | 137 | 110 | 27 | 19.7% |
| Nuclear science | - | - | - | - |
| Others | 378 | 325 | 53 | 14.0% |
| Engineering | 3,692 | 3,238 | 454 | 12.3% |
| Mechanical engineering | 245 | 235 | 10 | 4.1% |
| Telecommunications engineering | 775 | 696 | 79 | 10.2% |
| Civil engineering and construction engineering | 335 | 266 | 69 | 20.6% |
| Applied chemistry | 283 | 249 | 34 | 12.0% |
| Applied science | 37 | 34 | 3 | 8.1% |
| Nuclear engineering | 49 | 43 | 6 | 12.2% |
| Mining engineering | - | - | - | - |
| Metal engineering | 11 | 10 | 1 | 9.1% |
| Textile engineering | - | - | - | - |
| Marine engineering | 1 | 1 | - | 0.0% |
| Aeronautical engineering | 35 | 32 | 3 | 8.6% |
| Management engineering | 33 | 25 | 8 | 24.2% |
| Technics | - | - | - | - |
| Others | 1,888 | 1,647 | 241 | 12.8% |
| Agriculture | 981 | 722 | 259 | 26.4% |
| Agriculture | 28 | 16 | 12 | 42.9% |
| Agricultural chemistry | 38 | 27 | 11 | 28.9% |
| Agricultural engineering | 24 | 22 | 2 | 8.3% |
| Agricultural economics | 31 | 18 | 13 | 41.9% |
| Forestry science | 29 | 19 | 10 | 34.5% |
| Forestry products science | - | - | - | - |
| Veterinary science/ Zootechnical science | 11 | 7 | 4 | 36.4% |
| Fisheries science | 63 | 51 | 12 | 19.0% |
| Others | 757 | 562 | 195 | 25.8% |
| Health | 820 | 473 | 347 | 42.3% |
| Medical science | 42 | 34 | 8 | 19.0% |
| Dentistry | - | - | - | - |
| Pharmaceutical science | 359 | 263 | 96 | 26.7% |
| Others | 419 | 176 | 243 | 58.0% |

postdoctorals. **Table 3** shows the percentage of female doctoral course graduates by major, each calculated on the basis of data about all doctoral course graduates released in December 2009. This table indicates the tendency of doctoral course graduates. Specifically, we can see a clear polarization of life science majors (biology & medical fields) versus other majors, as each percentage of female graduates is generally high, ranging from about 25% to as much as 40%, in life science majors, a sharp contrast to the approximate 10% in the other majors. As seen in **Table 3**, the percentage of female graduates to total graduates is 18.2%. So we can say it is a matter of time before each percentage of female graduates by major increases to this level. From the viewpoint of an international comparison, the percentage in Japan will be able to reach the same level as Luxembourg. In order to raise the percentage beyond this level, it is essential to increase the number of female graduates across doctoral courses, but especially in engineering and related majors, of which graduates account for half of all doctoral course graduates. It seems that the overall low percentage of female graduates is due to the extremely low percentage of female graduates in each of the physics, chemistry, telecommunications and machinery-related majors.

According to the questionnaire survey conducted jointly by the Physical Society of Japan and the Japan Society of Applied Physics in 2000, teaching staff members in the field of physics have been promoted on an equal footing with no gender discrimination. If such an equal opportunity is also ensured in other research fields, it seems possible to raise the percentage of female researchers in Japan to a world-class level in several years by increasing the percentage of female graduates in each field where the percentage of female professionals is extremely low. I think it is important that we keep encouraging female students so that more of them choose mechanical engineering, physics and chemistry and aspire to become professionals in these fields without concern about gender prejudice.

I would like to ask all male members the following question: Are you ready to let your wife work outside of the home right now? I think whether we can solve the issue of increasing the percentage of female researchers will depend on the answer to this question.

- 1) Excerpted from *Heisei 21-nendo Josei no Seisaku/Houshin Kettei Sankaku Jyukyoku Shirabe* (FY 2009 Survey on Women's Participation in Decision-making about Policies/Principles), Gender Information Site at the following URL of the Gender Equality Bureau, Cabinet Office: <http://www.gender.go.jp/research/sankakujokyo/2009/index.html>
- 2) Excerpted from *Heisei 22-nendoban Danjyo Kyoudo Sankaku Hakusho* (White Paper on Gender Equality 2010), Gender Information Site at the following URL of the Gender Equality Bureau, Cabinet Office: <http://www.gender.go.jp/whitepaper/h22/zentai/top.html>
- 3) Edited version of "Hakushi Katei no Senko Bunya-betsu Nyugaku Nendo-betsu Sotsugyosha-suu," *Gakko Kihon Chousa* ("The Number of Doctoral Course Graduates by Major and by Year of Admission," School Basic Survey).

© 2010 The Chemical Society of Japan

The commentary shown here is written by one of the members of the Commentary Committee of the Society, and the author is basically responsible for the contents. The Society acknowledges that this is important and worth publishing. Opinions and comments of the readers are highly appreciated. E-mail: ronsetu@chemistry.or.jp

The *Kagaku to Kogyo* (Chemistry & Chemical Industry) Editorial is responsible for the English-translated article.