

National situation of Women in SET in Hungary

I will examine three areas in my report:

1. First, I would like to introduce technical high education from the aspect of how the University of Technology was opened to women. I will take an overview on how the share of men and women among teachers and students of the University developed in the 20th century and how this share relates to the country average in the high education of technical sciences.
2. Then I will analyze in what proportion women with higher education degrees could/can enter university departments, research institutes, whether they had/have the chance for becoming managers, or not and what their share was/is in scientific societies, in advisory boards of organisations providing professional scholarships, or among winners of those scholarships. I would also provide some examples of research institutes, university departments where women had/have a significant role in achieving considerable scientific results.
3. At the end I show the situation of women engineers.

Hungarian Women in technical higher education

As one of the results of civil movements, the first University of Technology opened its gates to women in Switzerland in 1817. This milestone changed career possibilities of women, as all the universities and higher education institutions of European cities followed it, permitting the admission of female students in technology studies.

Due to a royal decree, women could study at universities in Hungary since 1895, but the University of Technology remained closed to them as the Emperor, Francis Joseph stood against women studying at universities, regardless of their intentions of what they wanted to study: he only approved the Arts, Medicine and Chemistry for women¹. This meant that legal and engineering careers were still closed to women in Hungary, while more and more countries in Europe's technical universities opened their doors before them.

Fundamental change in this issue did not occur until 1945 and women were forbidden to study at the departments of law, engineering, veterinary medicine and economics. The democratic wave after 1945 brought a turning point in the situation: in August 1946, the democratic Hungarian parliament issued a law, creating equal opportunities for women to study at universities and colleges. As a result, with the exception of the military and theological colleges, all institutions of the higher education opened their doors to female students.

Using the opportunity of studying, more and more women entered departments of the Technical University at the end of the 40s. At university level, the breakthrough occurred in 1954-55 when 16% of total students were women. In the history of the university, the proportion of female students was the highest in school year 1968-69 as they represented 22.7% of all students. The outstanding proportion of women among university students was always due to political conceptions. It was related to the extensive industrialisation wave in

¹ See Nagyné, Szegvári Katalin – Ladányi, Andor: A nők az egyetemeken I. Küzdelmek a nők egyetemi tanulmányaiért. Budapest, 1996. Felsőoktatástörténeti tanulmányok. [Nagyné, Szegvári Katalin- Ladányi, Andor: Women on universities I. Fight for women's university studies. Budapest, 1996. Studies in history of higher education. p. 27. In Hungarian]

the 50s, then later it depended upon the so-called 'new economic mechanism' introduced in 1968. Both political economic decisions prioritised women's studies and work in the industry, or, better to say, in engineering fields. As a result of this economic conception, newer and newer technical universities were opened: the University for Heavy Industry in Miskolc was opened in 1949, while the University of Chemistry in Veszprém was opened in 1951. From 1951, evening and correspondent sections of regular teaching of technical universities were organized for workers. Furthermore, several technical colleges also started to operate from 1967². It is also worth mentioning that most female students are found on chemistry classes, their proportion exceeds the number of male students from 1995. It is highly probable that due to this fact most female experts can be found in the field of chemistry, in addition, women could take chemistry studies at classes of art from 1895, so they could get closer to scientific research, as well.

After the change of the political regime in 1990, a transitional reduction can be seen in the number of female students, which can be partly explained by the uncertainty caused by the elimination of engineering workplaces at large state-owned companies. Parents preferred traditional intellectual careers for their children – for their daughters. By the middle of the 90s, it had become evident that this tendency proved to be transitional, engineering profession and expertise had re-earned value and governmental policy had met social needs.

A revolutionary change has occurred during the last few decades: between 1990 and 2001, the number of students in higher education increased by more than two and a half, the number of female students has grown by more than three times, and their proportion relative to male students reached 55.0%, the highest than ever. In the same time it means that the former schooling disadvantage of women ceased. In 1994, only 10.1% of men between 60-64 had higher education degree, and the same value at women was 4.5%, however, considering the age group of 30-34, women have more higher education degrees, their share is 13.5%, while men's share is 12.1%³. As a parallel process, the total number of engineering students also increased, but the framework of the traditional structure between male and female students did not change significantly. One must mention here that the absolute number of women in technical higher education has been the highest since 2001, and that since 1966 – apart from the decline of 14.6% in 1989 – the share of female students compared to male students has increased over 24% by now.

One should also consider the gender share of teachers in higher education. Within the total number of university and college teachers, the share of women corresponds to the share of women among higher education students in 2001. 33% of teachers in higher education were women in 1990, while 37.7% were women in 1999. However, this share is not reflected in statuses: in 1999, women represented only 13.4% of professors, 29.5% of associate professors, 40.9% of lecturers, 46.6% of professor's assistants. (The number of full time teachers in the higher education in 2001 is: men=15 649; women=5821 –37,2%.)

² The following technical colleges were founded at this time: Bánki Donát Mechanical Engineering College (Budapest), Food Industry College (Szeged), Mechanical Engineering and Automation College (Kecskemét), Kandó Kálmán Technical College (Budapest), Light Industry Technical College (Budapest), Transportation and Telecommunication College (Győr), and Ybl Miklós Architecture Technical College (Budapest).

³ *A tudományos fokozattal rendelkezők anyagi viszonyai, családi háttere és mobilitása, 1997.* [Material relations, family background and mobility of persons with academic degrees, 1997.] Prepared by: Angelusz, Róbert – Bukodi, Erzsébet and others. KSH, Bp., 1998. p. 6.

Female students at the Budapest University of Technology (1920–1950)⁴

| School year | Number of female students | Share of women in % |
|-----------------|---------------------------|---------------------|
| 1920/21–1929/30 | 4 | 0,2 |
| 1930/31–1939/40 | 97 ⁵ | 4,4 |
| 1940/41–1949/50 | 346 | 9,9 |

Gender share of graduate students at the Budapest University of Technology and Economics (1975–1995)⁶

| Department | 1975 total students/ women | 1980 total students/ women | 1985 total students/ women | 1990 total students/ women | 1995 total students/ women |
|----------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Civil Engineering | 258/67 | 305/51 | 259/45 | 222/46 | 133/28 |
| Mechanical Engineering | 400/47 | 275/33 | 238/26 | 224/23 | 183/12 |
| Architecture | 147/26 | 157/64 | 116/38 | 103/24 | 109/23 |
| Chemical Engineering | 168/66 | 145/66 | 102/49 | 90/40 | 97/49 |
| Electric Engineering | 542/42 | 520/36 | 404/23 | 408/9 | 424/6 |
| Transportation Engineering | 185/6 | 169/10 | 169/12 | 123/6 | 145/6 |

Regular students on technical universities (1958-2001)⁷

| Year | Men | Women | Total | Share of women in % |
|------|--------|-------|--------|---------------------|
| 1958 | 5 476 | 746 | 6 222 | 11,9 |
| 1966 | 8 703 | 2 187 | 10 890 | 25,1 |
| 1970 | 8 241 | 2 082 | 10 323 | 20,1 |
| 1974 | 8 399 | 2 041 | 10 440 | 19,5 |
| 1979 | 7 941 | 1 658 | 9 599 | 17,2 |
| 1984 | 6 943 | 1 434 | 8 377 | 17,1 |
| 1989 | 7 482 | 1 288 | 8 770 | 14,6 |
| 1994 | 9 410 | 2 299 | 11 709 | 19,6 |
| 1999 | 13 933 | 4 348 | 18 281 | 23,7 |
| 2001 | 16 480 | 5 298 | 21 778 | 24,3 |

⁴ Source of statistical data: Héberger, Károly (ed.): *A Műegyetem története 1782–1967*. [The History of the University of Technology 1782-1967] Budapest, 1979, VIII: 1745.

⁵ 7 female students, excluding students in Classes of Economics.

⁶ Source of statistical data: *A Budapesti Műszaki Egyetem élete a számok tükrében, 1945–1975*. [The life of Budapest University of Technology in view of numbers, 1945-1975.] BME Műszaki Főigazgatóság, 1976; Héberger 1979: VIII: 1756–1757. o.; *A Budapesti Műszaki Egyetem Évkönyve, 1975–1996* [Annuary of Budapest University of Technology, 1975-96]; *Statisztikai Tájékoztató. Felsőoktatás (1959–2001)*, [Statistical Information. Higher education (1959-2001)] Központi Statisztikai Hivatal–Central Statistical Office, Budapest.

⁷ *Statisztikai Tájékoztató. Felsőfokú oktatás (1959–2001)*. [Statistical Information. High education (1959-2001)]

**The total number of students in all higher education institutions (1958-2001)
(Regular, evening and corresponding students altogether)⁸**

| Year | Men | Women | Total | Share of women in % |
|-------------|----------------|----------------|----------------|--------------------------------|
| 1937 | 10 048 | 1 699 | 11 747 | 14,2 |
| 1950 | 24 778 | 7 723 | 32 501 | 23,8 |
| 1955 | 37 199 | 8 232 | 45 431 | 18,1 |
| 1960 | 29 867 | 14 718 | 44 585 | 33,0 |
| 1965 | 57 234 | 36 723 | 93 957 | 39,1 |
| 1970 | 46 104 | 34 432 | 80 536 | 42,7 |
| 1975 | 55 603 | 51 952 | 107 555 | 48,3 |
| 1980 | 50 852 | 50 314 | 101 166 | 49,7 |
| 1985 | 46 156 | 53 188 | 99 344 | 53,5 |
| 1990 | 50 880 | 51 507 | 102 387 | 50,3 |
| 1995 | 82 215 | 97 350 | 179 565 | 54,2 |
| 1999 | 118 019 | 140 296 | 258 315 | 54,3 |
| 2001 | 132 756 | 162 284 | 295 040 | 55,0 |

⁸ See above.

Gender share of teachers at the Budapest University of Technology and Economics (1966–2002)⁹

| Year | Total | Men | Women | Proportion of percentage |
|-------------|--------------|-------------|--------------|---------------------------------|
| 1966 | 1399 | 1199 | 201 | 14,40 |
| 1970 | 1547 | 1298 | 249 | 16,10 |
| 1975 | 1669 | 1370 | 299 | 18,00 |
| 1980 | 1689 | 1497 | 192 | 11,30 |
| 1985 | 1590 | 1304 | 286 | 18,00 |
| 1990 | 1565 | 1263 | 302 | 19,30 |
| 1995 | 1403 | 1143 | 260 | 18,20 |
| 2000 | 1196 | 963 | 233 | 19,48 |
| 2002 | 1567 | 1269 | 298 | 19,0 |

The number of teachers has radically reduced between 1995–2000. The reduction in the numbers of teachers can be due to efficiency reasons. After 1990 policy of employment of the communist period was replaced by an effective system, i. e. now 1 person does the work of 3 persons because of the growing number of students, too. But for the end of 20th century the number of student has grown by more than two times.

⁹ A small remark would make it clear that statistical data do not separate technical subjects from other, non-technical subjects. Therefore, the statistical picture is less optimistic as teachers of P.E., languages, social sciences, economics, etc. are also included, having a larger share of women than in other subjects.

A Budapesti Műszaki Egyetem élete a számok tükrében, 1945–1975; [The life of Budapest University of Technology in view of numbers, 1945-1975.]; *A Budapesti Műszaki Egyetem Évkönyve, 1975–1996* [Annuary of Budapest University of Technology, 1975-96]; *A Budapesti Műszaki és Gazdaságtudományi Egyetem Információs Központjának adatszolgáltatása, 2000, 2002*. [Data service of Information Center of Budapest University of Technology and Economics, 2000, 2002.]

Gender share of full time teachers in technical higher education (1966–2001)¹⁰

| Year | Men | Women | Total | Share of women in % |
|------|------|-------|-------|---------------------|
| 1966 | 1616 | 271 | 1887 | 14,4 |
| 1970 | 2106 | 430 | 2536 | 16,9 |
| 1975 | 2712 | 676 | 3388 | 20,0 |
| 1980 | 2691 | 810 | 3501 | 23,1 |
| 1985 | 2672 | 888 | 3560 | 24,9 |
| 1990 | 3591 | 863 | 4454 | 19,3 |
| 1995 | 2455 | 729 | 3184 | 22,8 |
| 1999 | 1872 | 602 | 2474 | 24,3 |
| 2001 | 1995 | 584 | 2579 | 22,6 |

Women in Technical Sciences

Hungarian researchers can perform their research either in university departments or in scientific research institutions. The latter group can be divided into two subgroups: those that are connected to the Hungarian Academy of Sciences or those that are connected to private company sphere. This research system was established after 1949. New institutions of the 50s spread very quickly, and available researchers were predominantly men. The first groups of students graduated in technical universities and colleges, including a significant share of women are about to enter the job market at that time. One must also mention that though from the 50s, the share of female students in higher education, including technical sciences has increased continuously (apart from one-two school years), women participate in the work of scientific research institutions to a lesser extent than expected, based on their share among professionals. Women represented 205 of researchers in the middle of the 60s, while the same values in the next years were the following: 22% in 1970, 26% in 1975, 27% in 1980,¹¹ and 33% in 1998. Of course, their participation share is disperse, according to the disciplines, the highest is in the area of social sciences: 42% in 1982, 40% in 1998, while in technical sciences it was 23% in 1982 (though it includes the 44%-rated chemical area, as well) and this value was only 24% even in 1998¹². One must also mention that concerning absolute numbers, technical research ensured the most jobs for women, simply due to the fact that they represented 60-70% of all research workplaces.

Examining the overall number of researchers, it has decreased significantly: from 37230 persons in 1982, it has reduced to 23547 in 1998, while the number of women decreased from 10350 persons to 5400 persons¹³. Thus, between 1982 and 1998, proportional numbers show a slight increase to the advantage for women, but absolute numbers show a

¹⁰ *Statistikai Tájékoztató. Felsőfokú oktatás (1959-2001)*. [Statistical Information. Higher education. (1959-2001)]

¹¹ Tamás, Pál: *Kutatónők a magyar tudományban*. [Women researchers in Hungarian sciences] Magyar Tudomány, 1984/1–2. p. 148.

¹² Researchers work in university, academic and private spheres. 1982 data: Tamás, Pál see above; 1998 date: *Women in scientific careers*. Report on the activities connected with the question „Women and Science” (ed. Ildikó Hrubos), p. 3.

¹³ This means that at the end of the 90s hardly more women worked in scientific research than in 1970, when their number was 5161, according to statistics. 2048 among them worked in the technical sciences. *Tudományos kutatás, 1970*. [Scientific research, 1970] Központi Statisztikai Hivatal– Central Statistical Office, 1972, pp. 21., 58.

dramatic decrease in all areas, including technical sciences. These data represent a change of gender share, i.e. the number of men working in scientific research has decreased considerably. Several reasons could cause this dramatic decrease in the number of researchers. On one side, a large number of employment reductions have been performed both in the university and academic spheres, furthermore, the majority of research institutes connected to state owned large companies have been shut down. On the other side, salaries of researchers remain low, and better payment conditions of the private sphere attract men from “holy castles” of science. Mainly men, because women find the work period and intensity required here less harmonizable with family and household duties, i.e. traditional women roles. It is a quite new tendency that the electric and telecommunications industries provide new research workplaces. Of course, women also work here, but no exact surveys have been presented in this issue so far.¹⁴

The new system of academic grades and was introduced in Hungary after 1949. It means that the right of assignment of academic grades was taken away from universities and it was given to the Hungarian Academy of Sciences. As a new qualification principle, the Soviet system was imitated, which was different from the European system, i.e. the grades of doctor of sciences (D.Sc.) and candidate of sciences (C.Sc.) (equal to Ph.D. in the European system) were introduced. After 1993, the democratic system gave universities back the right to assign Ph.D. grades.

In 2000, 10 women can be found among the 310 regular members of the Hungarian Academy of Sciences, but they do not work on the field of technical sciences. The highest title of female engineers was earned by Mrs. Szepesváry, born Klára Tóth professor of Chemistry of the Budapest University of Technology, who was elected as correspondent member of the Academy in 1995.

In 1999, one sixth of persons earning the grade of candidacy of sciences was women, while the same value among doctors of science was less than one tenth. These values prove to be worse in the field of technical sciences.

Analyzing absolute numbers concerning data of the past 40 years, one can state that among people earning academic degrees, the number of women in the field of technical sciences has been less than in all scientific areas every year. Between 1962 and 1991 there were only 2 female doctors altogether, the number of candidacies was between 6 and 57, while the number of men earning academic degrees raised significantly in the same period. A During the ten year of the post-communist era, signs of change can be experienced: a slow increase has started. The number of women earning technical degrees has slightly grown from 1991 to 2000: the share of women among technical doctors changed from 1% to 5.2%, while the same value among technical candidacies changed from 5.3% to 7.1%¹⁵. An important factor needs to be remarked, namely, in all sciences, in the last ten years the rate of increase is the least and it stays well below the rate with what men earn degrees. Though a little hope of improvement raises as in 2000, as many women earned the degree of doctor of technical sciences as men (2-2).

Analyzing age differences among persons with technical academic degrees, one can state that in both genders most candidates can be found within the age group of 50-59 years. Performing a comparison at the two genders per age groups, it is conspicuous that under the age of 60, men possessing the grade of candidacy of sciences are twice as many in numbers than women. However, this rate in the 60-69 years age group is 12-fold, while above 70 years it is 24-fold. As a conclusion, one may say that women also tend to earn academic degrees in younger and younger age, compared to the earlier generations. The average age of earning the degree of candidacy of sciences is appr. 50 years.

¹⁴ The development team of Kapsch is led by Andrea Nagy, for example.

¹⁵ Data of 31 December 2000. Provided by the Information Center of the Hungarian Academy of Sciences.

Gender share of persons possessing the grades of doctor of sciences and candidate of sciences (1962–2000)¹⁶

| | Doctors of Sciences | | | Candidates of Sciences | | |
|------|---------------------|-------|-------|------------------------|-------|-------|
| | Men | Women | Total | Men | Women | Total |
| 1962 | 58 | 1 | 59 | 328 | 6 | 334 |
| 1967 | 76 | 2 | 78 | 467 | 7 | 474 |
| 1973 | 102 | 2 | 104 | 616 | 16 | 632 |
| 1980 | 157 | 2 | 159 | 777 | 28 | 805 |
| 1985 | 181 | 1 | 182 | 892 | 49 | 941 |
| 1991 | 207 | 2 | 209 | 1008 | 57 | 1065 |
| 2000 | 290 | 16 | 306 | 1342 | 103 | 1445 |

Gender share and scientific area share of persons possessing academic grades in absolute numbers in 1999¹⁷

| Scientific Area Share | Doctors of Sciences | | | Candidates of Sciences | | |
|-----------------------|---------------------|------------|--------------|------------------------|--------------|---------------|
| | Men | Women | Total | Men | Women | Total |
| Natural Sciences | 792 | 76 | 868 | 2 504 | 554 | 3 058 |
| Technical Sciences | 288 | 14 | 302 | 1349 | 106 | 1455 |
| Medical Sciences | 465 | 57 | 522 | 1 965 | 429 | 2 394 |
| Agricultural Sciences | 158 | 6 | 164 | 902 | 183 | 1 085 |
| Social Sciences | 590 | 80 | 670 | 3 566 | 937 | 4503 |
| Total | 2 293 | 233 | 2 526 | 10 286 | 2 209 | 12 495 |

Gender share and scientific area share of persons possessing academic grades in percentage in 1999

| Scientific Area Share | Doctors of Sciences | | | Candidates of Sciences | | |
|-----------------------|---------------------|-------|-------------------|------------------------|-------|-------------------|
| | Men | Women | Total 100% (N) | Men | Women | Total 100% (N) |
| Natural Sciences | 91,3 | 8,7 | 100% N=868 | 81,9 | 18,1 | 100% N=3058 |
| Technical Sciences | 95,4 | 4,6 | 100% N=302 | 92,8 | 7,2 | 100% N=1455 |
| Medical Sciences | | | 100% | | | 100% |

¹⁶ *MTA Almanach, 1962–1985*. [Almanach of the Hungarian Academy of Sciences, 1962-1985]

¹⁷ Haraszthy, Ágnes provided me her research results. See Haraszthy, Ágnes: *Equal Opportunities for Women? Women in Science in Hungary*. In: Veronica-Stolte Heiskanen (ed.): *Women in Science: Token women or gender equality*. Berg, Oxford, 1993, pp. 193–198.

| | | | | | | |
|------------------------------|--------------|-------------|------------------------|--------------|--------------|-------------------------|
| | 89,1 | 10,9 | N=522 | 82,1 | 17,9 | N=2394 |
| Agricultural Sciences | 96,4 | 3,6 | 100% N=164 | 83,2 | 16,8 | 100% N=1085 |
| Social Sciences | 88,1 | 11,9 | 100% N=670 | 79,2 | 20,8 | 100% N=4503 |
| Total | 90,78 | 9,22 | 100% N=2526 | 82,33 | 17,67 | 100% N=12495 |

Gender and age share of persons possessing academic grades in 1999¹⁸

| | Under 39 | | | | 40–49 | | | | 50–59 | | | | 60–69 | | | | Above 70 | | | |
|----------------------|----------|----------|-----------|----------|-----------|----------|------------|-----------|-----------|----------|------------|-----------|-----------|----------|------------|-----------|------------|----------|------------|-----------|
| | DSc. | | CSc | | DSc | | CSc | | DSc | | CSc | | DSc | | CSc | | DSc | | CSc | |
| | m | w | m | w | m | w | m | w | m | w | m | w | m | w | m | w | m | w | m | w |
| Technical Sc. | 2 | 0 | 84 | 8 | 13 | 1 | 177 | 16 | 68 | 2 | 412 | 40 | 74 | 7 | 338 | 28 | 130 | 4 | 338 | 14 |

From the early 60s, almost no women director has been working as leader of technical research institutes. No academic institutions had woman director,¹⁹ while some women managed industrial research and development institutions. In the 70s, Mrs. Kurucz was manager in chief of the Research Institute of Plant Oil and Detergent Company, Erika Takács was manager in chief of the Research Institute of Electric Equipment and Machine Company, while Mrs. Szenes then Mrs. Sós were the directors of Research Institute of Tin and Paprika Company. Apart from them, no woman director could be found in technical research institutes in Hungary.

The rate of women among managers was not better even in the OMFB, the chief organ for co-ordination of technical research and development. Between 1962 and 1973, no woman could be found at its board of 50 managers. Three women could enter its board of 58 managers in 1980: Mrs. Kardos, director of Békéscsaba Tin Factory, Mrs. Weissböck, director of Sopron Carpet Factory and Mrs. Nyitrai, president of KSH, the Central Bureau of Statistics, however, this body was homogeneous from 1985²⁰.

Several professional organizations operate in the area of technical sciences. The most prominent is MTESZ, Federation of Technical and Scientific Associations, founded in 1984, integrating 40 member organizations and almost 100 000 members. Analysing these members from the aspect of gender share, one can state that 12-17% of the members were women between 1985 and 1995. Considering every member organization, this rate fluctuates heavily. Representation rates of women in these organizations are the following: 46% at the Hungarian Society for Chemistry, 45% at the Hungarian Society for Biochemistry, 37% for the Hungarian Society for Electrotechnics, 42% at the Society of Meteorology, 59% at the Hungarian Society of Textile Industry and Science, 38% at the Hungarian Society of Food Industry and Science, and 31% at the Society of Telecommunications and Science. Apart from these exceptions, the average representation rates of women are only 3-6%²¹.

The OTKA, the Hungarian Scientific Research Fund is one of the most prominent foundations that support Hungarian scientific research. It was established in 1986. Examining

¹⁸ Based on data provided by Haraszthy, Ágnes, m=men, w=women.

¹⁹ One can find an example in the area of natural sciences: both the Biophysical Research Laboratory of the Hungarian Academy of Sciences and the Ecologic and Botanical Research Institute (Vácrátót) had women managers for more than a decade. The former is Györgyi Rontó, university professor, doctor of biology, the latter is Mrs. Kovács, born Edit Láng, candidate of biology.

²⁰ *MTA Almanach, 1962–1985*. [Almanach of the Hungarian Academy of Sciences, 1962-1985]

²¹ *Women in scientific careers*. Report on the activities connected with the question „Women and Science” (ed. Ildikó Hrubos), p. 5. and research of Vámos, Éva chief director of the Hungarian Technical Museum.

research applications between 1990 and 2000, one can see that 20-25% of the applicants were women. Science areas show a serious fluctuation of these rates: 26-38% of the applications provided by women arrived at the Section of Social Sciences, 20-26% of them arrived at the Section of Life Sciences, while only 13-18% of applications arrived at the Section of Natural Sciences. This latter groups includes technical sciences, and the rate of women among winning applicants are the following: 58 women were among 713 winners in 1991, 93 of 707 in 1995, 33 of 303 in 2000.

Women are also under-represented in OTKA committees deciding on the applications. In the section of natural and technical sciences important from our analysis only 2 of the 30-membered board were women in 1991, while the same rates were 1 of 34 in 1995, and 1 of 30 in 2000, namely Klára Tóth, president of the committee. Thus, the representation rate of women in the deciding body does not reach the rate of women among applicants or among winning applicants.²²

Let's raise the question why so few women can be found among technical scientists. First, because technical universities opened to women relatively late, so only 50 years were available for women to conquer this area. I think the real situation is not so desperate as it seems to be. The share of women in technical research is almost the same as their share among engineers. So if a woman has decided to enter and graduate at a technical university, then she has chosen research as her profession, this seems to be a smooth career, a feasible aim. New questions need to concern why women can not be promoted the same rate as men. Why can not they keep their share they represent in the scientific area among institution directors, applicants, winning applicants, members of decision bodies? Why do they advance in career building slower than men? Are they less ambitious? Or are social effects still strong in the issue that professional success is the duty of men? Yes, presumably this is all true. The view of society is basically men-oriented. Women can work, research, publish, even perform a thesis, but this all depend on their personal ambitions, as circumstances do not really favour women careers and men are also reluctant to accept women managers. However, I think the main reason should be something else.

As the latest statistical and sociologic surveys show, scientific career of women are mainly restricted by traditional female roles: maternity, household duties and realted obligations, that can not be pushed to the other members of the family to the extent that men do. In case of men, the family background seems to be stronger than in the case of women. Keeping the family together has always been women's duty, and the management of the household is also a challenging task. Furthermore, salaries of researchers and teachers do not permit the buying of services that would ease household duties, the supply of families.

Analysing family conditions of persons with scientific degrees, the most characteristics mark is the fact that 90% of scientists live in marriage, and very few are divorced or bachelors. The family as secure background seems to be an indispensable condition for creation, for scientific work. 15% of women in scientific areas are not married, and this rate is worse in younger generations: almost one quarter of women under 40 have not been married, yet. This rate within the overall population is 5 and 9%, so this fact is evidently due to the scientific career. Female researchers give life to less babies: 34.5% of women with academic degrees do not have any children, while in the case of female researchers it is 40.6%²³. In the same time, marriages of female scientists are bearing more conflicts: above 50, more of them chose to divorce than average women. Therefore women with scientific ambitions have two ways: either they start their career young and denounce from traditional

²² *Women in scientific careers*. Report on the activities connected with the question „Women and Science”, see above p. 5. and data of Gilyén, Zsuzsa (OTKA).

²³ Tamás, Pál: see above p. 150.

female roles, giving life to children, bringing them up and getting married, or they wait until their children become older and they start their scientific career at the age of 40²⁴.

Taking a look at the research places in Hungary in the 20th century, female researchers can be found at the birth of scientific programs that consider basic and/or applied research. The presence of female researchers was relatively weak in the 50s, while from the 60s, they can be found in most places. In order to mention some examples, I would like to enumerate the most successful ones:²⁵

György Békésy, Nobel-prize winner in 1961, started his electric-acoustical research, the examination of reasons for hearing damages and the elaboration of curing them in the Experience Laboratory of the Hungarian Post. When Békésy left Hungary in 1946, and many members of the research group left Hungary in 1956, one of the members, namely Judit Brebovszky took leadership of the group, that later became an institution. It gave place to another group of young researchers for the research of light technology, the development of light transmission systems. Edit Márkus was one of these researchers. The institute is one of the most important Hungarian center of modern light technology-based information services.

In the Research Laboratory of Crystal Physics of the Hungarian Academy of Sciences, founded in the 70'ies, Katalin Polgár managed to create a crystal (LiNbO₃), that offers many applications (transmitter of surface waves, duplicator of frequency, acoustic-optical transformer, etc.). A series of laboratory level semi-conductors of KFKI, Central Physical Research Institute were developed by Jenő Gyimesi and Mrs. Schiller, researchers delegated from the Tungstam Factory in the 80'ies. Mrs. Rónainé, born Judit Pfeiffer was member of a research group that achieved considerable international results concerning semi-conducting materials and tools in the Technical Physical Research Institute of the Hungarian Academy of Sciences. Besides state-owned research institutes and laboratories, one can mention Mikrovákuum Ltd. in the area of semi-conductor research. Under the direction of István Szendrő and Katalin Erdélyi, this company has significant international cooperation background, and it works primarily with nuclear and biosensors.

Among industry-related results and inventions, the iron-oxide mask of Magdolna Pauer developed in the Egyesült Izzó Factory and the polishing procedure developed by Mrs. Rózsa, born Magdolna Mühlrad need to be mentioned.

Participation of women in research at university departments also needs to be remembered of. At the General Analytic Department of Budapest University of Technology, managed by Ernő Pungor, Klára Tóth and her colleagues developed wide spectrum of ion-selective electrodes. The research group also had a pioneer's role in the research of analytical measurement techniques of transferring solutions. One can find female researchers among the employees of the Nuclear Technology Institute of the University: the most important results were achieved by Nóra Vajda, Zsuzsa Molnár and Márta Balla in the field of neutron-activation analytics. One of the most prominent persons in the mechanical research of the 80'ies and 90'ies is Mrs. Kurutz, dr. Márta Kovács professor. The results of Mrs. Filemon, born Erzsébet Kocsis are considered to be important within the area of machine elements and machine structure, and Klára Gerőfy is famous of the development of the procedure correcting colour-blindness. They are all elder or younger teachers of Budapest University of Technology.

²⁴ *A tudományos fokozattal rendelkezők anyagi viszonyai, családi háttere és mobilitása, 1997.* [Material relations, family background and mobility of persons with academic degrees, 1997.] Prepared by: Angelusz, Róbert – Bukodi, Erzsébet and others. KSH, Bp., 1998. p. 7.

²⁵ Introduction of research places based on the following work: *Magyarország a 20. században.* IV/1. [Hungary in the 20th century] Ed. in chief: Kollega Tarsoly, István. Szekszárd, 1999.

Turning back to my institution (Budapest University of Technology and Economics) women engineers had a more difficult task to promote their scientific or academic career. The first woman was assigned to professor relatively late, only in 1967: she was Jolán Zemplén, the first professor of physics in Hungary. The first leader of department was nominated in 1951, at the Department of Industrial Economics, which was part of the Faculty of Economics. Until the beginning of the 1990s, women could manage departments only in the areas of pedagogy, ideology or philosophy. The only exception to this “rule” was Jolán Zemplén, who managed the Department of Applied Physics between 1967 and 1974. (She was the daughter of Győző Zemplén, famous professor of physics of the University of Technology.) I may put a small remark here, that women who had men relatives in the university had more chance to earn a degree or build a career here, than for other women. Women leader manages the Department of Transportation Systems from 1992 (namely Mrs. Köves, Dr. Éva Gilicze), the Department of Transportation Economics from 1994 (namely Dr. Mrs. Tánczos, dr. Katalin Jankura), the Department of Architecture Delivery from 1995 (Dr. Judit Gyulai) and the Department of Truss Mechanics from 1996 (Dr. Mrs. Kurutz, dr. Márta Kovács). Only one woman dean worked in the history of the university, the woman professor Mrs. Köves, Dr. Éva Gilicze, who has been leading the Department of Transportation Engineering since 1997.

In the communist regime, the highest award for the recognition of scientific research and technical development was the Állami Díj (State Award). This was replaced by the Széchenyi Award in 1990. Three of the women professors of the Budapest University of Technology won the Széchenyi Award: Dr. Mrs. Tánczos and Mrs. Köves, Dr. Éva Gilicze in 1998, and Dr. Klára Tóth mentioned earlier in 2000.

Women in engineering

Until the end of the 40s, so few female engineers existed in Hungary, that their chances to find jobs could not be analyzed seriously. In 1926 there were four of them, while in 1927 there were only three of them in Budapest.²⁶ By the mid-50s, the number of admitted females students and graduated female students at the Budapest University of Technology and Economics had increased significantly. As a result of that, the share of female workers in the industry with a higher education degree raised to less than 5%, precisely to 1306 persons.²⁷ By the mid-50s, the number of admitted female students and graduated female students at the Budapest University of Technology had increased significantly. As a result of that, the share of female workers in the industry with a higher education degree raised to less than 5%, precisely to 1306 persons. Their main group was in the chemical industry, with 280 persons. The appearance of women in heavy industries can be explained by the extensive industrialization process mentioned earlier. This tendency in numbers is the following: mining (53 persons), iron and steel industry (71 persons), construction (54 persons). The machine

²⁶ Illyefalvi I. Lajos: *A kenyérkereső nő Budapesten*. [The breadwinner woman in Budapest.] Székesfővárosi Statisztikai Hivatal, 1930, IV. kiadás, pp. 166., 170.

²⁷ *A nők helyzete régen és most*. [The situation women long ago and now.] Központi Statisztikai Hivatal– Central Statistical Office, Budapest, 1960/3.

industry and the electric machine industry gave the most jobs for female engineers (namely 171 jobs and 177 jobs). The proportion of people with higher education degree was conspicuously low in certain branches of the light industry: the wood industry (12 persons), the press industry (2 persons), the paper industry (6 persons) and the clothing industry (51 persons). This is also due to the industry politics of the period: no new investments occurred in these industries, so no increase in number of employees were foreseen.

Both the grade of positions occupied by women engineers and their salaries were under those of men in all industries, i.e. most of them earned 30% less than men engineers in the same position. These facts can partly be explained with the argument that women engineers were young and had 'fresh' degrees. Another argument should be added that lower salaries were partly due to prejudice against women. Namely, women engineers starting their first year of work received a lower salary than their male counterparts.

This structure of employment remained greatly unchanged until approximately at the end of the last decade of the 20th century. However, a tendency occurred where the proportion of employed women engineers reduced in the heavy industry while increased in the light industry. The large breakthrough in the number of female engineers occurred between 1970 and 1980 when it increased to more than two and a half within the layer of people with a higher education degree. It is also worth mentioning that only ten thousands industrial and construction engineers were retired in 1980, one quarter of them were women.

Active engineers with higher education degree in industry and construction (1930-1996)²⁸

| Year | Total | Men | Women | Share of women in % |
|-------------|--------------|------------|--------------|----------------------------|
| 1930 | 10503 | 10464 | 39 | 0,37 |
| 1941 | 11825 | 11719 | 106 | 0,90 |
| 1949 | 11096 | 10962 | 134 | 1,20 |
| 1960 | 34293 | 31977 | 2316 | 6,75 |
| 1970 | 76006 | 67119 | 8887 | 11,70 |
| 1980 | 143924 | 121031 | 22893 | 15,90 |
| 1996 | 54307 | 45549 | 8758 | 16,1 |

Number of active engineers in the state industry (Oct 1963)²⁹

| Qualification | Total number of engineers | Of them: women |
|--------------------------------|----------------------------------|-----------------------|
| Mechanical engineers | 11332 | 450 |
| Heavy power engineers | 1849 | 95 |
| Light power engineers | 1291 | 132 |
| Mining engineers | 1574 | 92 |
| Metallurgical engineers | 1212 | 57 |
| Chemical engineers | 4865 | 1370 |
| Architects | 4605 | 540 |
| Civil engineers | 2869 | 138 |
| Transportation engineers | 510 | 34 |
| Timber engineers | 48 | 6 |
| Agricultural machine engineers | 923 | 60 |
| Other industrial engineers | 1087 | 137 |
| Engineers total | 31078 | 2974 |

Women engineers became definitely worse off after the change of the regime in 1990. Problems of disappearing state-owned large industries and dismissals of workforce concerned mainly middle-aged women amongst engineers. Their job opportunities worsened, as well: new companies seek young employees and often avoid hiring women over 40 even if they have shown considerable professional or management success.

Another reason for this reduction tendency can be named, the grow of the number of people in the retirement age. The first graduate students of the period of mass education in engineering reached retirement age at the beginning of the 90s, and their proportion has been raising continuously since then, exceeding the number of active male and female engineers.

²⁸ *Az 1980. évi népszámlálás. 34. A felsőfokú végzettséggel rendelkezők adatai.* [National census, 1980. Data of people with higher degree.] Központi Statisztikai Hivatal– Central Statistical Office, 1980.

²⁹ *Mérnökök, technikusok, egyéb felső- és középfokú végzettségű szakemberek foglalkoztatása.* [Employment of engineers, technician.] Központi Statisztikai Hivatal– Central Statistical Office, 1964/6, p. 49.

Data of active engineers by profession on the basis of 2% microcensus in 1996³⁰

| Category | Total | Men | Women | |
|----------------------------------|--------------|--------------|-------------|------|
| Age group (year) | 8625 | 7215 | 1410 | |
| 22–29 | 13366 | 11803 | 1563 | |
| 30–39 | 19545 | 15437 | 4108 | |
| 40–49 | 8869 | 7423 | 1446 | |
| 50–54 | 3461 | 3257 | 204 | |
| 60–X | 441 | 414 | 27 | |
| Total | 54307 | 45549 | 8758 | |
| <i>Employer's property type:</i> | | | | |
| state, other public, church | } tulajdonú | 16969 | 13837 | 3132 |
| cooperative | | 2388 | 2259 | 129 |
| private | | 23238 | 19798 | 3440 |
| mixed | | 10047 | 8365 | 1682 |
| does not know | | 1665 | 1290 | 375 |

As the above table shows, due to the property change in the 1990s, the private sphere became the largest employer, providing the most jobs for male and female engineers, as well.

³⁰ *Mikrocensus, 1996. A foglalkoztatottság alakulása, 1980–1996.* [Mikrocensus, 1996. Changes of employment.] Központi Statisztikai Hivatal– Central Statistical Office, 1997.