ORGANIZATIONS, CONFERENCES, AND PUBLICATIONS FOR WOMEN IN ENGINEERING: A HISTORIC REVIEW

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Individual achievements of women engineers have been evident since the 19th century, however, organizations and activities for women in engineering have only been in existence for the last 40 years. This paper will describe organizations which focus on women in engineering; conferences held for or about women in engineering; important publications pertaining to women in engineering; and major sources of funding for women in engineering activities.

Organizations

The earliest documented evidence indicating an interest in the formation of a organization for women in engineering occurred in 1919 when Lou Alta Melton, then an engineering student at the University of Colorado wrote to Engineering Deans throughout the United States. Ms. Melton wrote:

> "The women students in the engineering department at the University of Colorado wish to know the names and addresses of the women who are, or have been, registered in your engineering school. We desire this information for the purpose of organizing women students into a society auxiliary to the men's organizations."

One of the few responses she got came from a professor in Mechanical Engineering at the Georgia School of Technology, who replied in this manner:

> "Dear Lady,
> Up to the present, women students have not been admitted to Ga. Tech. Yesterday, the City of Atlanta conferred suffrage on women in City affairs, so no knowing what may happen!"

The Society of Women Engineers (SWE):

It was not until the late 1940s that groups of women engineers in Boston, New York, Philadelphia, and Washington, DC, together with groups of women students at Drexel University and the Cooper Union and City College of New York began meeting together and ultimately organized the Society of Women Engineers (1949). This organization, with approximately 6200 professional members in 70 local sections and 7800 student members at 243 colleges and universities, continues to provide an important network for their members.

The goals of SWE are: (1) to inform young women, their parents, counselors, and the general public of the qualifications and achievements of women engineers and the opportunities open to them; (2) to assist women engineers in readying themselves for a return to active work after temporary retirement; (3) to serve as a center of information on women in engineering; and (4) to encourage women engineers to attain high levels of education and professional achievement.

Both the student and professional members of SWE have made tremendous contributions in the area of career guidance. Activities of SWE sections include but are not limited to: career Days for high school women, visits to middle schools and high schools to demonstrate engineering projects, essay contests for middle school students, girl Scout badge work, special mall exhibits, campus programs for high school girls including day long "shadowing" and week long programs, student mentorship for science fair projects, slide and video programs, computer literacy projects with inner city middle schools, programs for high school counselors

In 1985 the Board of Directors of the Society of Women Engineers developed the following mission statement:

The Society of Women Engineers stimulates women to achieve full potential in careers as engineers and leaders, expands the image of the engineering profession as a positive force in improving the quality of life, and demonstrates the value of diversity.

The American Society for Engineering Education (ASEE)

In 1974, following sporadic attention by individual divisions of ASEE, the Board of Directors constituted its Task Force on Women charged with action in the areas of recruitment, retention, and retraining of women in engineering and with the coordination of these efforts with the various committees and divisions of the Society. The Task Force was led by Helen Plants, professor at University of West Virginia. It was later renamed the Committee on Women in Engineering and charged to report directly to the ASEE Board. In 198? the committee applied for and was granted divisional status. In addition to the original charges, the division has provided a network for women faculty and a sponsor for sessions at every annual conference on issues related to women in engineering.

At the same time, an ad hoc task force of the Relations with Industry (now College Industry Partnerships) Division's Affirmative Action Guidance Project was asked to survey current national efforts to encourage young women to consider engineering as a career and to recommend how RWI members and ASEE Industrial Members could enhance those efforts. Six very dedicated individuals comprised this original Task Force: Nancy L. Tafel, General Electric Co. - chair; Dr. Janis P. Church, IIT Research Institute; Assoc. Prof. Yvonne Y. Clark, Tennessee State University; Asst. Prof. Donna S. Frohreich, Purdue University; Dr. Lois B. Greefield, University of Wisconsin; and Dr. Sandra E. Hutchins, TRW Inc.

This ad-hoc committee provided two extremely important publications during their first years of existence. One was the Directory of College/University Programs for Women in Engineering which was published every 4 years until 1991 when the project was taken over by the Women in Engineering Program Advocates Network (WEPAN). The second was the Directory of Company/Government Contacts for Female Engineer Role Model Speakers. WAG continues to organize sessions for the College Industry Education Conference (CIEC) and has won several awards over the last 10 years for best session.

The Women in Engineering Program Advocates Network (WEPAN)

In the late 1980s it became evident that many individuals involved with Women in Engineering Programs were not attending SWE or ASEE meetings and yet desired to network with one another. With funding from the National Science Foundation, Jane Daniels at Purdue University, Susan Metz at Stevens Institute of Technology, and Suzanne Brainard at the University of Washington collaborated to organize a Women in Engineering Conference in Washington, DC in June, 1990. From this meeting attended by more than 200 individuals from engineering schools, government agencies, corporations, and professional organizations, emerged the Women in Engineering Program Advocates Network (WEPAN).

WEPAN now exists as a non-profit, tax-exempt corporation with a membership of about 500 individuals, including almost 70 corporate and institutional members. Three regional centers have been developed with the responsibility for producing organization products (see publications section), providing technical assistance, and conducting training seminars for institutions desiring to initiate or significantly expand Women in Engineering Programs.

> *The organization intends to increase the number of young women who pursue careers in engineering by encouraging the initiation and expansion of Women in Engineering Programs at colleges and universities throughout the United States.*

The organization has three objectives: (1) to support the study, analysis, and enhancement of pre-college and college recruitment, admission, retention, and graduation of women engineering students at all degree levels; (2) to provide technical and programmatic assistance to institutions desiring to initiate, replicate, or expand Women in Engineering Programs in a cost-effective manner; and (3) to maintain a central source of research, information, and resource materials about women in engineering and to disseminate such information nationally.

Other Organizations of interest to women in engineering include: GASAT (Gender and Science and Technology), an international organization, and AWIS (Association of Women in Science). In addition most of the professional societies have a special committee or task force on women.

National Conferences

Women in the Professions: Science, Social Science, Engineering. Held March 20-21, 1981 at Purdue University, this conference intended to examine career opportunities and the status of women professionals; to present women's views of scientific views of women; and to draw on historical and contemporary experiences of women for ideas of ways to increase the participation, visibility, influence, and general success of women in the scientific community.

Recent Studies and New Directions in Research Concerning Women in Science and Engineering. Convened by the National Research Council and Sponsored by the Ford Foundation this conference was held in Washington, D.C. on May 5, 1981. Sessions focused on: Determinants of Career Entry, Determinants of Career Outcome, Other Possible New Directions in Research Concerning Women in Science and Engineering.

Science and Engineering Intervention Programs: On Target for Women? This conference was held in November, 1991 sponsored by the Committee on Women in Science and Engineering of the National Academy of Sciences/National Research Council. The purpose of the conference was to review a range of post secondary programs supported by the federal

government and the private sector; delineate components of recruitment and retention activities that increase the number and qualify of U.S. scientists and engineers; and develop models that can be duplicated by participants.

Women Scientists and Engineers in Industry: Why So Few? In January, 1993 this conference was held in order to focus on effective company programs for women in industry; to explore working conditions of different groups of women in industry; and to achieve insight into why there are not more women scientists and engineers employed in industry.

Alfred P. Sloan Conference on Women in Science, Mathematics, and Engineering. Sponsored by CURIES (Cross University Research in Engineering and Science) this conference was held at Wellesley College in May, 1994. It was a working conference to establish a knowledge base on factors affecting the participation of women of all races in science, mathematics, and engineering. The conference plans two outcomes: (1) an edited book of commissioned articles that is intended to be a standard reference work for the next five to eight years that includes (2) a research agenda and related practice recommendations for the next decade.

Science, Technology, and Gender. Sponsored by the National Women's Studies Association and Iowa State University, this international symposium will be held in conjunction with the National Women's Studies Association annual conference in June, 1994.

SWE Annual Convention and Student Conference. Held every summer in various locations, these conferences include technical presentations, professional development sessions, technical tours, awards, and a large exhibition area.

WEPAN Annual Conference. Held every year in late spring in Washington, DC this conference focuses on strategies to increase the representation of women in engineering. In addition to workshops, presentations, and keynote speeches, the conference hosts a large resource room and book display.

GASAT International Conferences: These international forums on women in science, engineering, and mathematics began in 1981 with a conference held in the Netherlands. Since then conferences have been held every two years in Denmark, England, the United States, Israel, Australia, and Canada. The 1995 conference is being planned to be held in India.

Publications

Publications dealing specifically with women in engineering include biographies, activities for pre-college students, books, brochures, catalogues, directories, guides, newsletters, magazines, conference proceedings, journal articles, and project reports. A complete list of publications is part of *Women in Engineering Catalogue of Resource Materials.* (Wadsworth, 1992) A few of the more comprehensive and relevant publications are referenced here.

A new journal whose first issue was published in June, 1994. The purpose of the journal is to publish original, peer-reviewed papers that report innovative ideas and programs, scientific studies, and formulation of concepts related to the education, recruitment, and retention of under represented groups in science and engineering.

Berger, C. (ed.) (1994) *Journal of Women and Minorities in Science and Engineering.* New York, NY: Begell House, Inc.

Publications available through WEPAN Member Services office at Purdue University include conference proceedings from the all 4 national meetings; a catalogue of resource materials which includes information about program funding, program offerings, professional networks, publications, and prevalent issues; a directory of Women in Engineering Programs which includes a contact person and program activities of 187 schools; two working papers; and a booklet of hands-on activities and demonstrations for women in engineering:

Daniels, J. Z. (ed.) (1990, 1991) *WEPAN Conference Proceedings.*

Deno, C. M. (ed.) (1992, 1993) *WEPAN Conference Proceedings.*

Brainard, S. G., Kelley, J. and Wahl, P. W. (1993) *National Evaluation of Existing Women in Engineering Programs.* Working Paper 93-2

Wadsworth, E. M. (ed.) (1992) *Women in Engineering Catalogue of Resource Materials.*

Wadsworth, E. M. (ed.) (1991) *Women in Engineering Directory of College/University Programs.*

Wadsworth, E. M. & LeBold, W. K. (1993) *Final Report The 1991 National Survey of Women in Engineering Programs.* Working Paper 93-1

Metz, S. S. (1993) *What Do Engineers Do?*

In the past 5 years several reports have been written on surveys and studies of women engineers and women engineering students, they include:

Baum, E. (1989) *The Cooper Union 1989 National Survey of Undergraduate Women Engineering Students.* New York, NY: The Cooper Union

Baum, E. (1989) *The Cooper Union 1989 National Survey of Women Engineers .* New York, NY: The Cooper Union

Catalyst (1992) *Women in Engineering: An Untapped Resource.* New York, NY: Catalyst.

Society of Women Engineers (1993) *A National Survey of Women and Men Engineers.* New York, NY: Society of Women Engineers.

Two data books are available which include statistical information about women in engineering:

Commission on Professionals in Science and Technology (Annual Series) *Professional Women and Minorities.* Washington, DC: CPST.

National Science Foundation (!992, 1990, etc.) *Women and Minorities in Science and Engineering.* Washington, DC: National Science Foundation.

The Society of Women Engineers publishes a monthly magazine and proceedings from their national convention. Both of the these are available from the SWE National office in New York City.

The Committee on Women in Science and Engineering, formed by the National Research Council of the National Academies of Science and Engineering have sponsored two conferences in the last two years--one on university programs, the other on workplace issues.

Most recently the Committee has published a comprehensive directory of organizations which encourage women to pursue scientific or technological careers.

Committee on Women in Science and Engineering, National Research Council (1991) *Women in Science and Engineering: Increasing Their Numbers in the 1990s: A Statement of Policy and Strategy.* Washington, DC: National Academy Press.

Committee on Women in Science and Engineering, National Research Council (1993) *Women Scientists and Engineers Employed in Industry, Why So Few.* Washington, DC: National Academy Press.

Davidson, G. and Skidmore, L.C. (1993) *Organizations Encouraging Women in Science and Engineering.* Washington, DC: National Research Council

References not Listed Under "Publications" Section

American Association of University Women (1992). *How Schools Shortchange Girls.* Washington, DC: AAUW Educational Foundation.

Commission on Professionals in Science and Technology. (various) Occasional Papers. Washington, DC: CPST.

Daniels, J. Z., Landis R. B., McGee, M. M., and Parker, P. C. (1990) *Realizing the Potential of Women and Minorities in Engineering: Four Perspectives from the Field.* Washington, DC: National Governors Association

Dix, L. S. (ed.) (1987) *Women: Their Under representation and Career Differentials in Science and Engineering.* Washington, DC: National Academy Press.

Haas, V. B. and Perrucci, C. C. (eds.) *Women in Scientific and Engineering Professions.* Ann Arbor, MI: The University of Michigan Press.

Hewitt, N. & Seymour, E. (1991) *Talking About Leaving - Factors Contributing to High Attrition Rates Among Science, Mathematics, and Engineering Undergraduate Majors: An Ethnographic Inquiry at Seven Institutions.* Boulder, CO: Bureau of Sociological Research, University of Colorado.

Matyas, M. L. & Dix, L. S. (eds.) (1992) *Science and Engineering Programs: On Target for Women?* Washington, DC: National Academy Press.

Matyas, M. L. & Malcom, S. M. (1991) *Investing in Human Potential: Science and Engineering at the Crossroads.* Washington, DC: American Association for the Advancement of Science.

McDonald, J., Clarke, M., & Dobson, E. (1990) *Increasing the Supply of Women and Minority Engineers: An Agenda for State Action.* Washington, DC: National Governor's Association

Task Force on Women Minorities and the Handicapped in Science and Technology (1989) *Changing America: The New Face of Science and Engineering.* Washington, DC: U.S. Government