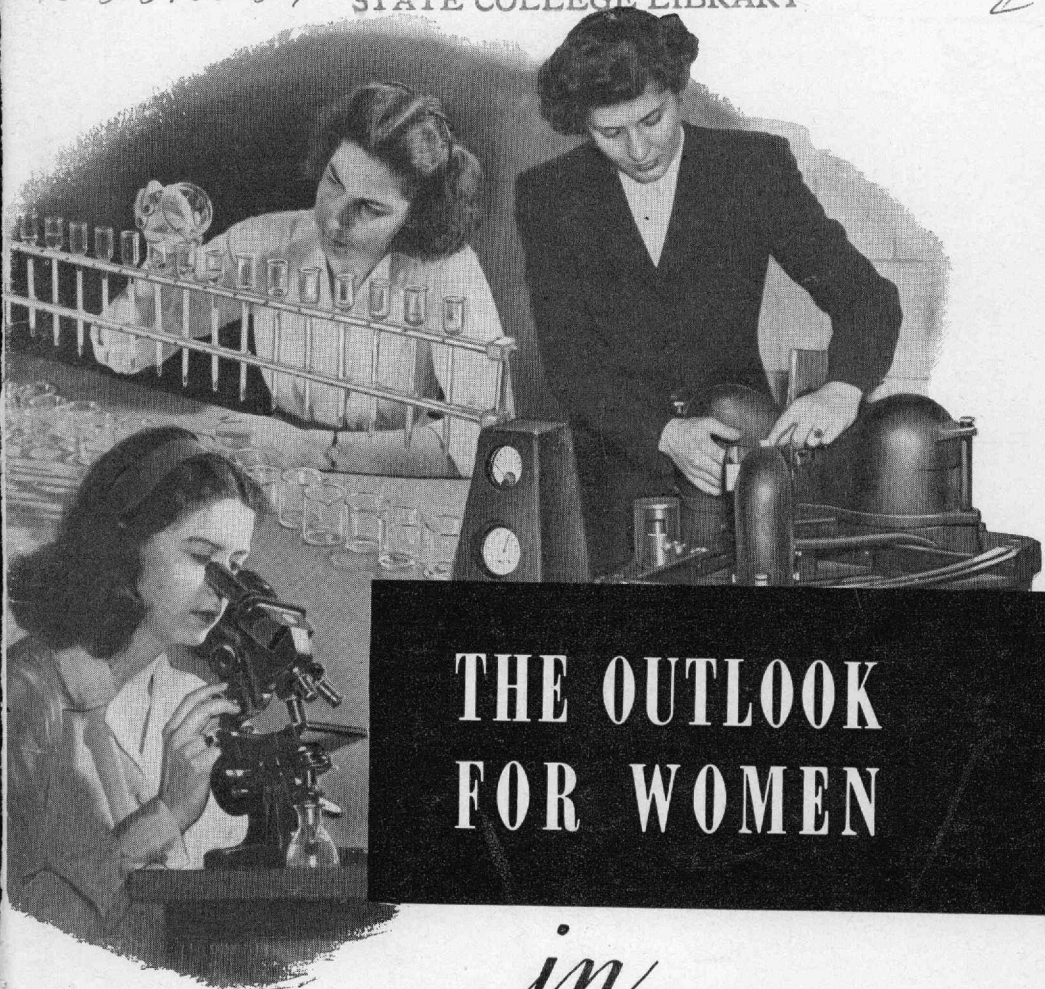


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THE OUTLOOK FOR WOMEN

in

GEOLOGY, GEOGRAPHY AND METEOROLOGY

Bulletin No. 223-7

U. S. DEPARTMENT OF LABOR

WOMEN'S BUREAU

UNITED STATES DEPARTMENT OF LABOR
L. B. SCHWELLENBACH, SECRETARY
WOMEN'S BUREAU
FRIEDA S. MILLER, DIRECTOR

*The Outlook for Women
in
Geology, Geography
and
Meteorology*

Bulletin of the Women's Bureau No. 223-7

U. S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1948

*For sale by the Superintendent of Documents, U. S. Government
Printing Office, Washington 25, D. C. Price 15 cents*

This bulletin is No. 233-7 in the following series on—

THE OUTLOOK FOR WOMEN IN SCIENCE

- No. 223-1 *The Outlook for Women in Science*
- No. 223-2 *The Outlook for Women in Chemistry*
- No. 223-3 *The Outlook for Women in the Biological Sciences*
- No. 223-4 *The Outlook for Women in Mathematics and Statistics*
- No. 223-5 *The Outlook for Women in Architecture and Engineering*
- No. 223-6 *The Outlook for Women in Physics and Astronomy*
- No. 223-7 *The Outlook for Women in Geology, Geography, and
Meteorology*
- No. 223-8 *The Outlook for Women in Occupations Related to Science*

Note on Pagination.—Throughout the series, page numbers show both the volume number and the page number in that volume. For example, page 24 in volume 3 is shown as 3-24; in volume 6, as 6-24.

LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
WOMEN'S BUREAU,
Washington, December 22, 1947.

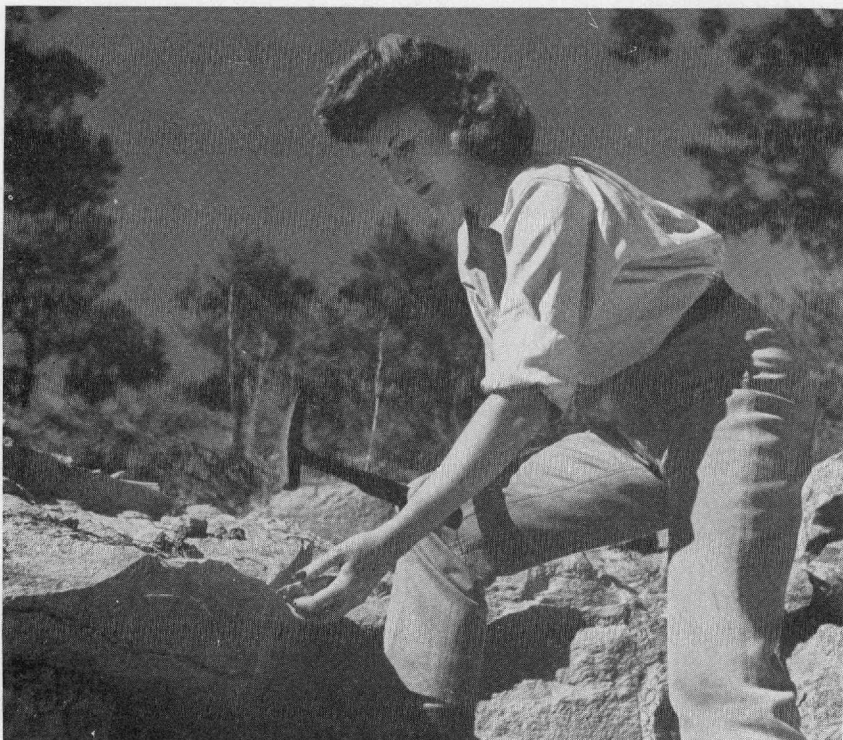
SIR: I have the honor of transmitting a description of the outlook for women in geology, geography, and meteorology which has been prepared as a part of a study on the outlook for women in science. The extraordinary demand for women with scientific training during World War II and the resulting questions which came to the Women's Bureau prompted us to undertake this study. The paucity of published information on women in science and the encouragement of the scientists and educators who were consulted in the course of this study confirmed the need for the information here assembled and synthesized. The study was planned and directed by Marguerite Wykoff Zapoleon and completed with the assistance of Elsie Katcher Goodman and Mary H. Brilla of the Employment Opportunities Section of the Bureau's Research Division. Other members of the Bureau staff who helped to broaden the coverage of this study through interviews in the field were regional representatives Margaret Kay Anderson, Martha J. Ziegler, Rebecca G. Smaltz, and another member of the research staff, Jennie Mohr. Corinne La Barre, Research Assistant of the Western Personnel Institute, Pasadena, Calif., furnished the information obtained from western colleges.

The part of the study here transmitted was written by Elsie Katcher Goodman.

Respectfully submitted.

FRIEDA S. MILLER, *Director.*

HON. L. B. SCHWELLENBACH,
Secretary of Labor.



Courtesy Standard Oil Co. (N. J.)

Figure 1.—A geologist examining a sandstone outcrop in Mississippi where she is employed by an oil company.

7-IV

FOREWORD

Much has been written about science and scientists, but little has been told about the work women trained in science have done and can do in the future.

Although these women are few in number when compared to men in science or to women in such occupations as teaching and nursing, their contribution to the national welfare, so strikingly demonstrated in World War II, goes forward daily in the laboratories, classrooms, offices, and plants in which they work.

The every-day story of where these women work, of what kind of work they are doing, and of what other young women who join their ranks in the future may do has been the subject of this report on the outlook for women in science. Unlike the usual monograph which describes an occupation in detail at a particular point in time, this study, like the Women's Bureau series on occupations in the medical and health services which preceded it, is concerned primarily with changes and trends.

Although more than 800 books, articles, or pamphlets were culled for background information, the principal raw material for the entire study of which this bulletin is a part came from such primary sources as scientific organizations, employers and trainers of women scientists, and men and women scientists themselves. Principal sources were as follows:

Scientific organizations: The National Research Council supplied useful directories of scientific laboratories and organizations. Helpful criticism and direction to other authorities were obtained from its Office of Scientific Personnel. Sixty separate organizations of scientists supplied information on their women members, by interview or correspondence.

Federal agencies: Unpublished information on personnel in scientific fields was supplied by:

The United States Bureau of Labor Statistics,
The National Roster of Scientific and Specialized Personnel,
The United States Office of Education,
The United States Civil Service Commission, and
The United States Public Health Service.

In addition, 52 separate bureaus, offices, or other operating units of the Federal Government known to employ scientists were solicited for information regarding the number of women employed on jobs requiring scientific training and the type of work they were doing. Detailed statistics over a period of years were available from some agencies, while only fragmentary data were obtained from others. The women's military services likewise supplied information on the wartime use of women trained in science in the WAC, WAVES, and the Marine Corps.

Private industry: One hundred industrial firms were visited in 1945 and 1946 to obtain information, usually by interview with the director of research or the personnel director, on the women employed by any part of the organization in any capacity requiring scientific training of college level. Prewar, wartime, and postwar statistics were obtained where available, as well as suggestions and comments. In many instances, some of the women in scientific work were interviewed on the job. The firms visited included:

Seventy-eight firms listed in the National Research Council's 1946 directory of 2,443 firms having research laboratories. The firms visited are listed in the directory as employing 24,816 persons as scientific or technical personnel in their laboratories. This number represented 28 percent of the total personnel of this type estimated as employed in all the laboratories listed. In addition to this numerical coverage, an attempt was made to include among the 78 firms visited small as well as large firms, plants in all parts of the United States, and a variety of industries. However, the intricate industrial organization, inter-relationships, and variety of research revealed in the directory, added to the fact that some firms did not report personnel statistics and none reported women separately, made the selection of a true sample complicated beyond its value for this purpose. The firms visited were chosen rather as a clue to industrial firms most likely to be engaged in the type of work in which women trained in science are used. In all firms, information was requested for the entire organization rather than for the research laboratory only.

Eighteen commercial testing laboratories which offer testing services to industry and individuals and which employed women were also visited. Seven others contacted did not employ women. These 25 laboratories represented 10 percent of the 244 commercial testing laboratories listed in the National Bureau of Standard's 1942 Directory of Com-

mercial Testing and College Research Laboratories. Since personnel is not reported in the Directory, there is no clue to the coverage of workers.

Three large additional industrial firms which employed women in laboratory work but were not listed as having research laboratories were visited, as was one biological supply house.

Research institutions: Eight research institutions or centers, some of them identified with a particular college or university, also supplied information on women members of the scientific staff.

Colleges and universities: Statistical information on the number of women graduated with degrees in science, mathematics, and engineering over a period of years from 1939-40 to 1946 was obtained from 30 colleges and universities and from 9 engineering schools. Again an attempt was made to obtain wide geographical coverage and to cover different types of institutions, such as women's colleges, State universities, and small liberal arts colleges. The information available from these sources, too, varied. Placement bureaus and heads of science departments as well as deans of women at these institutions and at 6 other colleges contributed reports on the demand for women trained in the sciences. The Western Personnel Institute made possible the inclusion of data which it collected for the Bureau from its affiliated colleges and universities in the far West.

Since no recent data were available on the number of women teaching science in the colleges, a count was made in 1947 of the women identifiable by name who were listed on science faculties in the catalogs of 330 institutions of higher learning which were then available in the United States Office of Education Library. These institutions were selected because they are believed by the United States Office of Education to be representative in their enrollments of the 1,749 institutions of higher education in the United States and, therefore, are likely to have faculties equally representative.

Other sources: In addition, 97 individuals not included in the afore-mentioned sources, most of them women scientists, contributed information, suggestions, or helpful criticisms of the preliminary manuscripts circulated before revision for publication.

While every effort has been made to obtain wide coverage, there remain some dark corners still unexplored because of the range and variety of these fields and the difficulty of obtaining information from widely scattered sources. Perhaps this beginning will result in further additions to our so-little knowledge.

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Geologist as Defined by the National Roster of Scientific and Specialized Personnel (62)

“Geologists study the constitution, structure, and history of the earth as it is disclosed by the sequence of formations and deformations of rock layers, and by the fossil or mineral content of such layers. Geologists may specialize in some phase of economic geology, or in an aspect of historical or physical geology. The economic geologist deals with the exploration, exploitation, and study of useful mineral deposits, and the study of sites for dams and foundations.

“Geologists who specialize in physical or dynamic geology deal with the formation and arrangement of rocks and with the agencies and processes of geological change, especially great pressures and temperatures. The specialties of mineralogy, petrology, structural, and surficial geology are included here.

“Geologists who specialize in historical geology study the successive development of rock formations and the fossil remains of animal and plant life in their relation to rock formations. The specialties of stratigraphy and paleontology are included here.”

THE OUTLOOK FOR WOMEN IN GEOLOGY

Geology is a science in which relatively few persons are employed. During the past few decades, the period of the greatest development and application of geological knowledge, some women have entered this field. They are, however, a very small minority of those active in the profession, about 3 percent (61) of the 10,000–12,000 geologists estimated as employed in the United States in 1946. This is less than half the proportion women form in all the physical sciences combined; one-fourth the proportion they form in mathematics. Only in meteorology and in the applied fields of engineering and architecture is there a smaller proportion of women in relation to the total number employed in each of these fields.

Prewar Distribution

The prewar demand for women trained in geology was very small, apparently even less than the small supply of women graduating with a degree in geology. One large eastern college for women reported 16 graduates with the bachelor's degree in geology during 1939–1941, of whom only 5 were placed in positions in which they were able to utilize their professional training. Another college for women reported only occasional museum jobs.

Before the war, the greatest number of geologists were in the petroleum and mining industries (24). Included among them were the 3,250 geologists who were members of the American Association of Petroleum Geologists in 1940 (2).

Although some women with geological training were engaged in industrial work before the war, they were largely limited to office and laboratory jobs with petroleum and mining companies. There they were engaged almost exclusively in such desk work as cataloging, maintaining exploration maps, analyzing field data, or assisting in research (24). A few women with specialized training in paleontology or mineralogy were given the chance to engage in self-directed research in industry, but such women were scarce and such opportunities even more rare.

Before the war, there were about 650 instructors in geology in colleges and universities, among whom were some women, their exact number not known (61). Among the 650 were almost 200 men and

women who had secured their doctorates in geology in the decade preceding the war. Forty percent of all those receiving their doctorate in geology in this period went into teaching or combined teaching with research or administrative duties, while about half were engaged in full-time research (23), primarily in industry or the Federal and State geological surveys.

A few women were employed in the United States Geological Survey in Washington, D. C., before the war, most of whom had been there for many years. Some women were also with State geological surveys. At least seven eastern States were known to have employed women geologists, both in active and in office capacity.

Writing and editing offered only limited opportunity for women trained in geology, but one woman geologist was editing a technical journal, and another collaborated with her husband, also a geologist, in the writing of popular books on geology.

Annual Addition to the Supply

In 1941, according to the National Roster of Scientific and Specialized Personnel, senior college students majoring in geology numbered 1,300. Graduate students totaled 750 (61). From 1935 to 1940 only an average of 55 persons annually secured their Ph. D. in geology and 11 in paleontology (71). Women were about 3 percent of those receiving the doctorate degree in geology during the decade 1931-40 (39)—approximately the same proportion as that women comprised among all geologists.

The number of those leaving the profession each year was believed to be very small. Most of the geologists who had ever worked in the petroleum industry, for example, remained in the profession, since both the applications of the science and those employed were young (15).

Wartime Changes

During the war the number of students majoring in geology declined sharply. By 1944, senior classes throughout the country had reached a low of 170. Although women represented 60 percent of that group, they too had actually decreased in number to 102. Women graduate students, too, were fewer, although they represented 45 percent of the 89 graduate students enrolled in 1944 (67).

The reduction in the number of potential male geologists was due, of course, to their entering military service either before or after graduation. Women, on the other hand, were attracted to war industry.

A special effort to provide emergency wartime training for women was begun at the University of Michigan. In 1943 a concentrated one-year course in petroleum geology was planned to train women with a science background for jobs in the petroleum industry. But the total capacity of this class was only 20-30 women (46).

In some measure the war years were a testing period for women geologists, for they were given opportunity to secure responsible positions where they could prove their effectiveness.

During the war, the demand for women graduates in geology was very active, as about 2,000 men with geological training were serving in the armed forces, for the most part, on nongeological work (37). Women who were willing to move to locations in which jobs existed could secure work as research assistants, junior geologists, and laboratory technologists. At 1 large eastern college for women, of the 14 girls who were graduated in 1942-45, 9 were placed in positions connected with their field, and 2 went on to graduate studies. Even women trained before the war who had taken clerical jobs in the intervening period were able to secure professional appointments in industry or government.

Opportunities were greatest in government, according to an analysis by Prof. Caroline E. Heminway of the women registered in geology with the National Roster of Scientific and Specialized Personnel. Near the end of the war, almost 40 percent of the women actively engaged in geology were employed by Federal or State geological surveys (19).

In the Federal Government, the work of the United States Geological Survey expanded after Pearl Harbor. Wartime assignments included the preparation of military maps, technical reports on foreign terrain, and estimates of the Nation's reserves of strategic mineral resources. As many as 50 women trained in geology found employment here during the war.

A few additional women geologists were hired by other Federal agencies such as the Engineer Corps in the War Department, the Bureau of Reclamation in the Department of Interior, and the Division of Metals and Minerals in the Foreign Economic Administration. But during the war the Geological Survey was the principal Federal agency in which a woman could use her training in geology.

Young women employed by the Geological Survey had at least a bachelor's degree in geology and were hired at the beginning professional level of junior geologist. They were assigned to jobs assisting staff members (usually men) who were analyzing field data and preparing reports. Women were also drafting maps and cross-sections.

tions from field data and preparing diagrams and charts. Due to the general shortage of clerical help in the Government, they generally performed clerical as well as professional functions. Others were engaged in the microscopic examination of minerals and the analysis of metals. One or two women spent brief periods in field service engaged in such work as the mapping of mineral deposits.

But the general policy of the Geological Survey of not sending women into the field continued. Consequently, women geologists have come to be thought of as "office geologists," whose functions are limited, and whose professional development is retarded by lack of field experience. Nevertheless, the work that women did in office geology during the war has created greater recognition of women's abilities in this growing field of geological work.

During the war opportunities in office geology and in cartography also became available to women in the military services. The Navy, for example, trained women with a background in geology or geography for cartographic work in its Hydrographic Office. One woman, with a bachelor's degree in geology and experience in teaching, who completed this training became a WAVE officer engaged in the compilation and revision of hydrographic charts.

After 1942, when the oil and mining companies began to face the depletion of their technically trained men, most of whom were of draft age, they began to place women in jobs where they had formerly employed men. For the first time oil companies, which employed more than half of all geologists during the war (61), informed the colleges that they had openings on their staffs for which women could apply. For the most part these were jobs involving drafting, cartography, assisting senior geologists in the preparation of technical reports, and laboratory work in research departments. Some women were employed as junior geologists, however, even in outlying district offices, but they were not given duties which were likely to include field exploration. Although one-third of the geologists were engaged in field exploration during the war, this type of work remained almost completely closed to women (61). This barrier has always represented the greatest handicap women geologists face in employment or advancement in industry. Toward the end of the war, however, about one-third of the women actively engaged in geology were employed in industry, according to the analysis by Professor Heminway of women registered in geology with the National Roster (19).

In 1942, 46 women represented 7 percent of the college teachers of geology (60). Teaching appointments for women were found mainly in women's colleges and in some coeducational institutions. The dearth of men graduate students made more teaching fellowships available to women for continuing their graduate training toward

the Ph. D. In spite of this, fewer women than before the war were enrolled as candidates for that degree.

It is doubtful whether there was much increase in opportunity for women in full-time teaching posts in this field during the war, in view of the drop in student enrollments in geology, although there is no adequate estimate of the extent to which women teachers replaced men in these years.

Universities and other research agencies that accepted war contracts with the Government, however, increased their staffs many times over. This demand was reflected in college placement bureaus which received calls for women with bachelor's degrees in geology for work as research assistants to prepare technical reports for military use. Experience in the compilation, writing, and editing of data was gained by the women who accepted these temporary war jobs. Indications are that about one-fourth of the active women geologists were in teaching and research jobs of this sort toward the end of the war period (19).

Earnings, Hours, and Advancement

Before the war, entering jobs in industry paid from \$1,200 to \$1,800 a year, according to the National Roster (61). The salary paid to women was probably lower than that paid to men, since women were forced to compete for jobs at a lower level. At the same time teaching positions at the college level began at about \$125 a month (\$1,250 for a 10-month school year) (63). Highest beginning salaries were paid by the Federal Government, which, in 1940 started junior geologists at \$2,000 a year.

With the general increase in earnings during the war, salaries paid by industry ranged from \$1,680 to \$2,400 a year for beginning jobs. College teaching began at about \$150 a month (\$1,500 for a 10-month school year), and State government jobs started at about \$1,500 to \$1,800 (61). In 1947 basic salaries remained at the war level and in teaching are believed to have increased. In 1947 junior geologists in Federal service received \$2,644 a year. (See p. 7-41 for requirements for entrance.)

The woman geologist who works in an office or laboratory is likely to have regular hours, although she may frequently work overtime. Hours of the college teacher may be longer but can be more easily arranged to suit personal convenience. Only in field work are hours certain to be irregular, and few women desire or have the opportunity for such work.

The road to advancement for the woman geologist appears to lie in the field of laboratory research. Here and in teaching, too, field work is sometimes necessary, but the college training in field work, supple-

mented by brief periods of work in the field, are usually sufficient for fundamental background experience. In many of the geological positions in the oil industry, work in the field is not an important part of the geologist's duties, and in some positions it is not required.

Graduate training will give a woman better foundation for research as well as for teaching than will entrance jobs in industry as clerical or laboratory assistants. The disadvantage of being almost completely barred from field exploration must be overcome by other qualifications. That this can be done has been proved by a few women who even before the war occupied such positions as chief geologist and executive geologist with oil companies. Ability as business executive also aided these women to secure top jobs.

In professional recognition, too, a few women have reached high levels. Early in 1946, a woman served as chairman of a geological research committee in the National Research Council. A woman paleontologist, with the United States Geological Survey for many years, has received high recognition and is considered to be the foremost authority on her particular specialty in the United States. The Geological Survey also employs a woman mineralogist recognized as outstanding in her field. In the past, the Survey had had on its staff two women eminent in petrology and structural geology respectively. But, by and large, most women find themselves at a disadvantage in attaining advancement in this field, where only the exceptional woman is likely to gain distinction.

Organizations

The Geological Society of America, Inc., organized in 1888 (18), in 1947 had 1,056 Fellows, including 23 women, about 2 percent of the total, who have demonstrated outstanding ability in research or in contributions to the literature of geology. In 1947, the newly created classification of "member" was expected to increase the proportion of women participants. (See p. 7-41 for requirements for membership.) The Society serves as a coordinating group for the 6 specialized geological societies that are members of its council, which include: The Paleontological Society, Mineralogical Society of America, Society of Economic Geologists, Society of Vertebrate Paleontology, Seismological Society of America, and Section E (Geology and Geography) of the American Association for the Advancement of Science. In 1946, members of these organizations totaled 6,000, although there was undoubtedly some overlapping of membership.

The American Association of Petroleum Geologists was the largest and fastest growing organization of economic geologists in 1940 (2),

and by 1947 the Association had over 5,000 members including 118 women, who again formed 2 percent of the total. (See p. 7-42 for requirements for membership.)

Another society to which many geologists belong is the American Geophysical Union, which also includes a number of women in its membership. (See p. 7-42 for requirements for membership.)

The Outlook

The over-all demand for geologists is an expanding one. Our dependence on natural resources and the wartime reduction in the supply of many strategic minerals require the advancement of geological field exploration and research by industry and government in the coming years. Besides the gradual increase in popular interest in geology, its study is an essential part of the preparation of such scientists as meteorologists and civil, mining, and metallurgical engineers (75).

In 1946 the Geological Society of America, Inc., estimated that there were between 10,000 and 12,000 geologists in the United States. These were too few to fill the existing demand. The deficit was serious at the doctorate level, where advancement in this science usually originates. In 1944 there were only 17 doctorate degrees awarded in geology, compared to the average of 55 awarded annually before the war (20). It has been estimated that the deficit of persons trained at the doctorate level totaled 113 in 1945 and would reach 430 by 1955 (71).

Although enrollments in geology in 1946 had doubled over 1945, they were still far below peacetime levels (27), and it was impossible to gauge how many veterans taking elementary courses in geology would continue in the field. It is possible that the supply of geologists will continue to be inadequate for several years. In this event the women geologists, especially those with graduate training, will continue to enjoy relatively better opportunity than they did in the days before the war. However, with men geologists returning from military service, and with the drop-off in demand peculiar to the war, women geologists already faced much greater competition in 1947 than during the war. However, since the supply of women students majoring in geology dropped during the war, it is unlikely that there will be an oversupply of women (67).

Actually, women geologists remain few in number. The 1946 list of American Women of Geology, compiled by the Geological Society of America, contained 271 names, representing less than 3 percent of the total number of men and women in the profession. The type of employment of 203 of these was evident from the list (17). Their

distribution by type of employment in 1946 indicates marked differences from that of all geologists in 1945. (See table 1.)

In 1946 the largest proportion of women geologists were employed by institutions of higher education and research, which during the war had ranked third among the employers of women geologists, according to Professor Heminway. More than a third were teaching as compared with less than a fifth in 1944 (19). Next in importance in the employment of women, as it had been during the war, was industry. About one-fourth of the women geologists worked in the petroleum industry, where more than half of the men were employed. Federal and State geological surveys provided an outlet for another quarter of the employed women geologists (17), a considerable reduction from the 40 percent employed in Government during the war (19). This distribution of women geologists in 1946 may be taken as some measure of the distribution of future employment opportunities for women in each of these fields.



Courtesy Standard Oil Co. (N. J.)

Figure 2.—A geologist at work on a map in the Mississippi office of an oil company.

Table 1. *Type of Employment of 203 Women Geologists in 1946 Compared With That of 6,000 Men and Women Geologists in 1945*

| Type of employment, | Percent distribution of 203 women geologists 1946 | Percent distribution of 6,000 men and women geologists 1945, |
|--|---|--|
| Total..... | 100 | 100 |
| Institutions of higher education and research..... | 41 | 8 |
| Colleges, universities, and other schools..... | 35 | 6 |
| Museums, research organizations, and institutions..... | 6 | 2 |
| Industry..... | 30 | 74 |
| Petroleum..... | 25 | 55 |
| Other..... | 5 | 19 |
| Government..... | 26 | 13 |
| Federal..... | 20 | 10 |
| State and other..... | 6 | 3 |
| Self-employed..... | 1 | 5 |
| Other employment..... | 2 | ----- |

Sources: The Geological Society of America's list of American Women of Geology (17) which contained 271 names, including the place of employment of 203 women actively engaged in geology. National Roster of Scientific and Specialized Personnel (61) for percent distribution of 6,000 geologists (not separated by sex).

Teaching at the college level, for example, will probably continue to be the most favorable field for women trained in geology. In many schools, however, women trained in geology also teach geography or other sciences. Opportunities for research are also available in institutions of higher education. Evidence of this as well as of the marked increase in the number of women geology teachers was brought out in a count made in 1947 of women faculty members in geology listed in 330 college catalogs (included in a sample of all types of institutions of higher education selected on the basis of enrollments by the United States Office of Education). Of the 40 women teaching geology, only 25 taught geology exclusively. Some of the women, such as those classified as petroleum technologist, consulting geologist, or graduate assistant, may devote more of their time to research than to teaching. However, 9 of the 40 women held professional appointments, and of the 9 there were 6 who held the Ph. D.

If these schools included in the sample are representative of all institutions of higher education, there were about 188 women teaching geology in colleges and universities, half of whom taught geology only, and half combined instruction in geology with that in geography or another subject. Although in the past it was easier for women to secure teaching appointments in women's colleges than in coeducational institutions, the count of women geology teachers made in 1947 indicated that more women teachers were employed in publicly and privately controlled universities than in colleges of liberal arts and science, among which the women's colleges are usually classified. Of

the estimated 188 women teaching geology, 91 were employed by universities and 84 by colleges; the remainder were in teacher-training institutions and junior colleges.

Most of the Government-financed university and private research projects which employed women trained in geology during the war terminated their war activities with the cessation of hostilities. Practically all women were released after VJ-day when these research agencies began to return to their peacetime size. Few women could meet the highly specialized requirements set for permanent staff members. However, with the revival of some of the normal research activities interrupted by the war, there is some opportunity for women as research assistants and as library and editorial assistants in research agencies and publishing houses. Popular geological writing for travel agencies, nature clubs, magazines, and children's books offers another outlet for women trained in geology who have writing ability.

A year after VJ-day, women seeking jobs in the petroleum industry found that the attitudes of industrial employers had definitely been tempered by the war. There was greater recognition of the ability of women laboratory technologists in research departments, but by and large the opportunities open to women were those which had been open (in fewer numbers) before the war. Women with backgrounds in geology were encouraged to take clerical or drafting jobs, where they might be especially valuable in assisting staff members in their work.

However, most of the women with graduate training in geology who were working in the oil industry in 1947 were engaged in the microscopic examination of rock cuttings and cores from well borings, studying the lithology and faunal and floral contents of the rocks. Women employed in this work are often micropaleontologists. Many companies have found that women are well suited for this work not only in routine analysis but also in research. Other positions in industry for which women have been found to be well qualified are those of petrographers, stratigraphers, and geophysicists, all of which require graduate training. Women who can prove their abilities in these specialities are sometimes sent into the field when their work requires it. In 1946, there were two women geologists from the United States employed by oil companies in South America, and a woman micropaleontologist was working for an oil company in Cuba (17).

There were 25 women geologists in the United States Geological Survey, including 2 women geologists who were assigned to work in Japan early in 1947. Twice this number were employed by the Survey during the war. Many of those employed were war service appointees, who would be certified as permanent employees only if they passed the

civil service examination for geologists given in 1946. The register established from this examination was not expected to be large enough to fill all the vacancies that existed. Under civil service regulations, however, preference is given to veterans and to former Government employees with civil service status.

Both the Federal and State geological surveys expect to return to their peacetime tasks of reporting upon the geology and mineral and water resources of the country, with renewed attention to the field data upon which they were unable to concentrate during the war. Undoubtedly, the preference for men in these positions will continue, but the woman geologist who is as good as or better than a competing male geologist will have some opportunity for employment.

Women trained in geology will find that employment is concentrated geographically in the oil-producing areas of the South, in the District of Columbia, and in the university centers of the East. Mobility therefore is more important in this field than in such occupations as teaching and nursing, which are practiced in most communities.

Industrial opportunities are most available in the oil-producing States of Texas, California, Oklahoma, Louisiana, Kansas, and Illinois. Before and during the war, nine-tenths of the oil produced in the United States came from these States (49).

Forty percent of the 197 women listed in *American Women of Geology* and employed in the United States in 1946 were located in Texas, Oklahoma, and the District of Columbia which accounts for those employed by the Federal Government. About one-quarter of the employed women geologists were in the North Eastern States, many in New York and Massachusetts, where they were teaching in women's and coeducational colleges (17).

Those in the North Central and Western States were widely dispersed, a few with State geological surveys, others teaching or in research centers, and still others employed by mining and petroleum companies. Women geologists in the West are found largely in California, the second largest oil-producing State in the country in 1944 (49).

Suggestions to Women Considering Geology as an Occupation

Women geologists advise only girls possessing good health and physical stamina to enter their field. They also suggest that girls studying geology acquire some skill in drafting, typing, and stenography, as well as the ability to use bibliographies and write well-organized reports. Such skills plus proficiency in one or two foreign languages such as German, French, or Spanish are recommended as

auxiliary tools useful as entering wedges. These, of course, are in addition to and not a substitute for basic preparation not only in geology but in mathematics, physics, and chemistry. Courses in biology and botany are especially important for women interested in paleontology. Although the undergraduate training of the woman geology student should be broad rather than specialized, she would do well to become acquainted with the content of such fields as micro-paleontology, economic geology, stratigraphy, petroleum geology and sedimentation, before selecting a specialized field for graduate study (19).

Further suggestions on training as well as a full discussion of geological occupations, conditions of employment, and qualifications for geologists may be found in the pamphlet prepared by the National Roster of Scientific and Specialized Personnel, "Geology as a Profession" (61). As in many of the sciences, there is a growing preference for the geologist who has completed a 5-year rather than a 4-year college course in geology (28).

There is no list of approved schools awarding degrees in geology, but in 1946 there were 40 institutions of higher education which granted the doctor's degree in geology listed in the "Directory of Colleges and Universities Offering Graduate Degrees" compiled by the National Roster (58). The American Geophysical Union has also prepared a list of specialized courses in geophysics offered in colleges and universities in the United States (3).

In 1946, over half the men and the women registered in geology with the National Roster had only the bachelor's degree. A larger proportion of the women than of the men had their master's degree, but at the doctorate level, there was a larger proportion of the men than of the women. (See table 2.) One author, writing about postwar trends in geology, stated: "Initial employment and subsequent advance in geology will go more and more to the man with the Ph. D" (75). This statement is doubly significant for women.

Table 2. Distribution by Highest Academic Degree Held of Geologists Registered With the National Roster of Scientific and Specialized Personnel, 1946

| Highest academic degree held | Number | | | Percent | | |
|------------------------------|--------|-------|-------|---------|-----|-------|
| | Total | Men | Women | Total | Men | Women |
| Total | 6,189 | 5,938 | 251 | 100 | 100 | 100 |
| Doctorate | 1,073 | 1,039 | 34 | 17 | 17 | 13 |
| Master's | 1,481 | 1,404 | 77 | 24 | 24 | 31 |
| Bachelor's | 3,238 | 3,107 | 131 | 52 | 52 | 52 |
| Other | 397 | 388 | 9 | 7 | 7 | 4 |

Source: National Roster of Scientific and Specialized Personnel (59).

Occupational Summary of the Profession of the Geographer by the National Roster of Scientific and Specialized Personnel (68)

“The geographer studies the nature and use of areas and is trained to interpret the distributions, interrelationships, and interactions of physical and cultural phenomena on the earth’s surface. He is concerned, for example, not only with the nature of the land surface, vegetation, climate, mineral resources, soils, and water supplies, but also with the people and the ways in which they live together and utilize land and other resources. Geography, therefore, is considered both a physical and a social science.”



Courtesy Dr. Helen Strong

Figure 3.—Prof. Ellen Churchill Semple (1863–1932) in her office at Clark University. She was the first woman to receive the Cullom Gold Medal of the American Geographical Society for her pioneer services in the field of anthropo-geography.

THE OUTLOOK FOR WOMEN IN GEOGRAPHY

The modern concept of geography as a physical and a social science has evolved through many centuries. Over the years, the emphasis in research and in instruction in geography has shifted a number of times. In the middle of the last century, for example, geography was usually closely allied to history, but later, emphasis was placed upon physiography, which deals with the form, structure, and distribution of land surface features.

During the past 40 years, however, recognition of the dual role of geography has led to research which analyzes the relation between the natural environment and such human activities as national and international politics; commerce and manufacturing; crop and animal agriculture; mining; and naval, air, and land warfare. This is reflected in such specializations as: political geography, economic geography, military geography, historical geography, or social geography. Another type of specialization is that of regional geography in which the relationship of human activities to the natural or physical environment of land form, soil, climate, water resources, mineral resources, area or size, location, vegetation, and coast line of a given region is studied.

In 1946, there were about 800 professional geographers in the United States, about 140 or 17 percent of whom were women, according to a study made by a subcommittee of the Division of Geology and Geography of the National Research Council (35).

Prewar Distribution

Before the war, most professional geographers in the United States were teaching in colleges and universities. The total number was then estimated at 500, although some authorities consider this estimate too low (26). A small number were engaged in research or were doing cartographic work (map making) in the Federal Government or in research institutions like the American Geographical Society and the National Geographic Society (29). A few held research and writing positions in firms publishing geography textbooks and journals, and a few others were working as map librarians in government and college libraries. Recognition was very limited in industry,

where only a few persons trained both in geography and economics were employed by firms engaged in foreign trade.

Outside the colleges and universities, instruction in geography was given little attention. In the elementary schools, teachers with little or no training in the subject matter were teaching geography, usually with little comprehension of its broad outlook (33). Only a few high schools in the larger cities offered instruction in geography, and this was sometimes limited to physiography or given as part of the social science curriculum. Even the colleges offered little, for courses in geography were often confined to those given in departments of earth science or geology. In 1943-44, only 15 institutions of higher education offered the Ph. D. in geography (23). This limited instruction at the college level not only diminished the number of teaching positions open to geographers but made it necessary for many of them to teach other subjects, such as geology or economics. Nevertheless, college teaching was the major outlet for professional geographers. In 1940, 88 percent of the 131 persons who had received a Ph. D. in geography in the previous decade were teaching or combining teaching with research or administrative functions in institutions of higher education (23). Women geographers secured positions in teacher-training institutions and women's colleges with greater ease than in the universities, where men were usually preferred. More than a third of the geography instructors in teachers' colleges were women, about twice the proportion that women formed of all geographers. Women teaching cartography were even more unusual, since few courses were offered in the subject, and they were usually given in schools of engineering rather than in liberal arts colleges (10).

Annual Addition to the Supply

The number of professional geographers produced by the colleges and universities at the beginning of the war was very small. About 1,000 undergraduate students were enrolled as geography majors in 1942 (the first year for which figures are available), more than half of whom were women. Approximately 140 students were enrolled in graduate courses in geography (60). From 1936 through 1940 an average of only about 14 persons annually secured the Ph. D. in geography, among whom seldom more than one was a woman (47).

Wartime Changes

Warfare on an international scale requiring detailed knowledge of the physical, economic, social, and political characteristics of many foreign countries brought new responsibilities and new opportunities

to geographers. During the war, more than 200 professional geographers were called to Washington by the Federal Government for research studies covering such diversified projects as the analysis of munitions industries in enemy countries; the problems arising in the wartime control of our own economy; and the compilation of topographical data of foreign and domestic areas for purposes of military strategy.

Many of the positions to which women were appointed were directly related to military planning. In the Office of the Quartermaster General of the War Department, for example, women trained in physical geography were doing research on the different topographical, climatological, and soil conditions to be met in foreign terrain, to develop data useful in planning the clothing, food supplies, and packaging for the military forces in the different theaters of war. In the Foreign Economic Administration, women economic geographers compiled information on the supply lines of food and military equipment for Army landings, studied the fishing industry of Japan, determined areas of the world where additional supplies of durable goods could be produced and exported, and surveyed relief and rehabilitation requirements in liberated areas. The Office of Strategic Services also employed women geographers for research needed in the planning of military strategy, and others for work in photogrammetry (the making of maps from aerial photographs).

The wartime expansion of peacetime government agencies also created opportunity for women geographers. Before the war, the United States Board on Geographical Names in the United States Department of Interior had employed only 1 person trained in geography, but in 1944, there were 18 women of this type employed there, comprising one-third of the professional staff. Other Federal agencies which employed women geographers during the war were the State Department, the War Department, the National Archives, the Library of Congress, the Weather Bureau, and the United States Forest Service in the Department of Agriculture. A few women economic geographers were also employed on economic analysis in such wartime agencies as the Office of Price Administration and the War Production Board (14).

In 1943, the Federal Civil Service Commission reported that while the need for geographers in general was not critical, as it was in many other fields, the demand substantially exceeded the supply in cartography. Women who were specialists in this field were urged to apply for civil service positions. Actually, however, the number of women employed as professional cartographers in the Federal Government was very small. There were only 2 women employed as cartographic engineers at the United States Coast and Geodetic Survey and a few

at the United States Geological Survey as cartographers and photogrammetric engineers. The Tennessee Valley Authority also employed 10 women as photogrammetrists. At the subprofessional level, however, there were hundreds of women employed as topographical draftsmen and engineering aids engaged in the compilation of maps for military and civilian use. (See Bull. 223-5, section on drafting.)

During the war, women trained in geography were also recruited by the military forces for cartographic work. The Navy offered special training in cartography to WAVE officers, and although women with college majors in geology or geography were preferred for this work, those with a background in science, art, or architecture were also used as chart revisers, draftsmen, and cartographers. The work of some of the women employed in the Navy Department's Hydrographic Office varied from the revision and compilation of hydrographic charts to the selection and editing of information and material for naval air publications and charts. One WAVE officer, for example, with an M. A. in geography and previous experience in geography teaching, research, and editorial work, was doing work as a research analyst in air navigation and was analyzing and selecting information and material for Navy air publications and charts. Another WAVE officer with an M. A. in geography was the assistant officer in charge of the map desk at the Hydrographic Office, where she aided in the selection, evaluation, procurement, and distribution of maps and material for the Navy, the Marine Corps, and the Coast Guard. Before the war, she had had several years' experience in teaching geography. A few other WAVE officers were given a 10-week course at the Naval School of Photographic Interpretation and were doing naval intelligence work in aerial photo-interpretation.

Geographers were also sought to teach new courses in geography included in the Army Specialized Training Program (41), to organize Engineering, Science, and Management War Training courses in photogrammetry and topographic drafting, and to instruct prospective weather officers (14). The critical need for new maps of military areas for specialized purposes created an urgent demand for those with even a minimum of training in geography, especially in cartography, for service in Federal agencies and the armed forces.

However, teaching remained the major outlet for professional geographers. In December 1942, there were 488 full-time faculty members teaching geography in colleges and universities, about one-third of whom were women, according to a report of the National Roster of Scientific and Specialized Personnel (60). Public interest in geography increased as American service men and women were sent to tiny islands in the Pacific, to Asia and to Africa, and their families followed battles in far-away parts of the world. To meet the demand, although

confronted with a shortage of geography instructors, many colleges and universities offered new courses in geography. Such institutions as Northwestern University and the universities of Indiana, Illinois, and Iowa were among those which expanded their programs and established separate departments of geography. At Syracuse University and Washington (St. Louis) University, geography, which formerly had been combined with geology in a single department, was made into a separate department. In many other universities, geographers were appointed on a full-time continuing basis, apparently for the first time (13). The increased demand for geographers to teach in colleges and universities, coupled with the diversion of young men into the military services and of older geographers into government war work, made opportunities for women in geography especially favorable.

Outside of the Federal Government and teaching, however, there was little opportunity for women cartographers or geographers. Although the popularization of war maps in newspapers and magazines and the need for geographic research by journalists writing war stories created a few positions for geographers, the paper shortage limited expansion in this direction. The publication of maps, geography textbooks, and journals was also curtailed, and war priorities prevented the expansion of activities by private research institutes (76).

Although opportunities for geographers increased during the war, the number of civilian students preparing for this field by majoring in geography in colleges and universities dropped sharply. In 1944, less than 225 undergraduate students were majoring in geography as compared with 1,057 in 1942. Although the proportion of women increased from about 55 percent to 70 percent, the number of women declined. At the graduate level, where professional geographers are produced, the number of students also decreased from a total of 143 in 1942 to only 18 in 1944, and the number of women declined from 64 to 12 (60) (67). Consequently, the number of Ph. D.'s awarded in geography also decreased; in 1945 only 7 such degrees were reported, about half the number that was customary before the war (47).

The decrease in the number of regular college students majoring in geography was accompanied by an enormous increase in specialized, applied wartime courses in the field of cartography. Under the Engineering, Science, and Management War Training program, courses in topographic drafting, photogrammetry, cartography, military map making, and aerial photo map making were offered in colleges and universities in many parts of the country (69). The proportion of women taking courses in cartography and topographic drafting was greater than that of men, and by 1944, thousands of women had be-

come trained in cartographic drafting. (See Bull. 223-5, section on drafting.) But in photogrammetry, which required some mathematics as a prerequisite, women were only about a fourth of the student body (76).

Earnings and Advancement

The earnings of college teachers vary with the income and type of institution in which the teacher is employed, as well as with the rank and qualifications of the individual. Before the war, the median salaries of professors in different types of publicly controlled institutions ranged from \$2,900 to \$5,000; and in privately controlled institutions, from \$1,800 to \$5,000. However, associate and assistant professors, instructors, and lecturers, who form the majority of college faculties, received less (70). In 1947, these salaries were undoubtedly higher, but there were no adequate statistics available to indicate what increases had taken place.

The entrance salary for geographers in the Federal Government in 1947 was \$2,644 a year, as compared with \$2,000 a year before the war. Persons doing subprofessional work in cartography as draftsmen or engineering aids in 1947 began at \$1,954 or \$2,168 a year; before the war the same positions paid \$1,440 or \$1,620 a year.

Advancement for women in geography, as in many of the other sciences in which college teaching plays a predominant role and in which there is a high degree of graduate specialization, depends to a great extent on their opportunity for advanced training. A bachelor's degree is usually insufficient for the attainment of full professional status. The doctorate is a virtual necessity for advancement in college teaching.

Women geography instructors have better opportunities for advancement in women's colleges and in teachers' colleges than they have in some of the larger universities, where men are ordinarily given preference. Nevertheless, women have held assistant professorships in a few of the large universities with outstanding departments of geography, and one woman now is associate professor of geography in a leading university.

In the field of research and editing, women of ability have found few handicaps in achieving advancement. The editorial staffs of two of the major journals in the field of geography are composed primarily of women, and the editor of one is an outstanding woman geographer. Women trained in geography are also employed by such publishers as the National Geographic Society, the American Geographical Society, and the Encyclopedia Britannica.

In the Federal Government, a few women have advanced to positions of responsibility. A woman, recently retired, was Chief of the Compilation Office of the United States Forest Service. One of the foremost women geographers in the country, who was formerly geographer for the United States Bureau of Foreign and Domestic Commerce and who did geographic research in the Military Intelligence Division of the War Department and the Foreign Economic Administration during the war, is now employed in the War Department as a civilian research geographer.

A very few women with some professional training in geography have started in as cartographic or topographic draftsmen in the United States Geological Survey and have later advanced to professional positions as cartographers or map editors.

Organizations

Women are to be found in varying proportions in each of the professional societies of geographers. In the Association of American Geographers, in which membership is limited to persons who have done original research work beyond the doctorate in some branch of geography, there were 10 women in 1946, less than 4 percent of the 261 members. Of these 10 outstanding women in geography, 5 were engaged in college teaching, 4 were employed by the Federal Government, and 1 was engaged in editorial work. (For requirements for membership, see p. 7-42.)

In 1946, the American Society for Professional Geographers had about 600 members, almost one-third of whom were women (8). This relatively new organization, which includes college and high school teachers, government and private business employees, and graduate students, has grown rapidly from a membership of 300 in 1945 to almost 800 in 1947. (For requirements for membership, see p. 7-43.)

The proportion women form of the total membership in this association, while much higher than that in other scientific organizations, was less than that in the National Council of Geography Teachers. There in 1946, 60 percent of the approximately 1,000 members were women. Some of these women taught geography in teachers' colleges, and about 8 percent were secondary school teachers, but the majority were elementary school teachers who taught geography in addition to other subjects. (For requirements for membership, see p. 7-43.)

Women trained in geography who have become librarians, some of them specializing as map librarians, are also members of the Geography and Map Group of the Special Libraries Association, which in 1947 had 184 members, mainly in Washington, D. C., and New York City.

The Outlook

The interest developed in geography during World War II, the continuation of Government and private mapping programs, and the recognition of the value of geographical knowledge in international relations and economic planning are given by authorities in this field as reasons for expecting that the demand for persons professionally trained in geography and cartography will continue to be greater than it was before the war. The expansion in many specialized fields of geography combined with the fact that few persons secured professional training in geography during the war have increased the opportunities for women geographers, especially for those with a master's or doctor's degree.

The increased number of geography courses and the growth of departments of geography have already increased the demand for geography teachers in colleges and universities (16) (32). Geography courses introduced for the first time into many colleges through the Army Specialized Training Program have been continued, to satisfy the interest of veteran and civilian students. In 1946, two-thirds of the 149 women members of the American Society for Professional Geographers whose employment was known were teaching—42 percent were teaching in colleges and universities and an additional 26 percent were engaged in other types of teaching (8). (See table 3.) However, the decided preference for men teachers in most coeducational universities coupled with the return of veterans to faculty staffs have made it difficult for women geographers to secure teaching appointments in such institutions, unless they offer definite superiority in ability and training. Women's colleges and teacher-training institutions offer somewhat better opportunities.

Table 3. Type of Employment of 149 Women Members of the American Society for Professional Geographers Reporting Employment, November 1946

| Type of employment | Number | Percent |
|--|--------|---------|
| Total..... | 149 | 100 |
| Educational institutions..... | 102 | 68 |
| Colleges and universities..... | 63 | 42 |
| High schools..... | 18 | 12 |
| Junior high schools..... | 12 | 8 |
| Elementary schools..... | 9 | 6 |
| Federal Government..... | 33 | 22 |
| Research institutions..... | 7 | 5 |
| Publishing institutions and independent writing..... | 4 | 3 |
| Graduate work..... | 3 | 2 |

Source: American Society for Professional Geographers (8).

This fact is borne out by a count made in 1947 of women geography instructors listed in 330 college catalogs, comprising a sample of all

types of institutions of higher education selected on the basis of enrollments by the United States Office of Education. Of the 31 women who were listed as instructing in geography only, almost 60 percent were in teachers' colleges and normal schools. Another 22 women, however, were teaching both geography and geology, or geography and one of the social sciences, mostly in universities and colleges of liberal arts and science. If these schools are representative of all institutions of higher education, there were about 115 women teaching geography in colleges and universities and about 125 who combined instruction in geography with the teaching of geology or one of the social sciences.

The growing criticism of the inadequacy of geography teaching in elementary schools is expected to result in the introduction of more courses in the science of geography in teachers' colleges, creating more opportunities for men and women geography instructors. The increased recognition of the value of geography in the understanding of foreign peoples has also resulted in the reinstatement of geography in many high schools, usually as an elective subject, for which the demand has been growing. In some places, North Dakota for example, it has become a required subject; all ninth grade students in that State must complete a course in world geography. Men and women trained in geography are being sought for such teaching. However, the geography teacher in secondary schools must also be prepared to teach other subjects in the social studies curriculum, usually history, economics, and civics.

Instruction in the specialized branch of cartography has also advanced rapidly, with scores of universities continuing to offer courses as compared with only a few before the war. Encouragement is offered through the distribution of surplus maps by the Army Map Service to 190 libraries designated by the Library of Congress. A somewhat smaller distribution is also being made by the Navy, Army Air Forces, and the Department of State (38). These extensive map collections in turn create opportunities for a few additional women geographers to serve as map librarians in colleges, universities, and research institutions.

Although opportunities for research in the Federal Government were reduced after the war, in 1946 approximately a fourth of the employed women members of the American Society for Professional Geographers were working for the Government. They were employed in such agencies as the Department of Agriculture, the Commerce Department, the United States Board on Geographical Names, the State Department, and the War and Navy Departments (8).

The State Department in 1946 probably employed the largest number of women geographers, many of whom were transferred to its Map Division from the wartime Office of Strategic Services. The produc-

tion of maps by the United States Government continued at a high level after the war, and the demand for professional cartographers was still large (38). In agencies like the Army Map Service, the United States Geological Survey, and the United States Coast and Geodetic Survey, which continued their mapping programs as peacetime functions, qualified women who had served as cartographers during the war were retained. Other agencies, like the Tennessee Valley Authority, reduced their geographic and cartographic personnel. In 1947, the United States Civil Service Commission was contemplating announcing an examination for cartographers.

Although limited in the number of positions available, geographical research, writing, and editing have proved to be favorable fields for women geographers in the past and are expected to offer even greater opportunity in the future. In 1946, 8 percent of the employed women members of the American Society for Professional Geographers were engaged in such work (8). Private research institutes, now free of wartime restraints, are planning extended research programs. The revision of geography textbooks and school maps, made necessary by changes resulting from World War II, is also expected to increase the demand for editorial assistants and cartographers.

Other areas of research for women trained in geography may be developed in private industry. Women with writing ability may find opportunity with travel agencies and travel magazines, preparing popular leaflets or popular articles. There they may also engage in research or answer correspondence from tourists inquiring about the weather, the customs, the travel facilities, or other characteristics of the various localities they wish to visit. The growing recognition given to the science of geography is expected to create opportunities with air lines, oil companies, trade associations, exporting and importing firms, and investment houses (41). For most of this work, especially that involving travel, men are usually preferred. However, women with imagination and initiative who have combined their training in geography with courses in economics, statistics, political science, or business administration will be best equipped to compete successfully for these opportunities.

But a large proportion of women trained in geography will continue to find opportunities in college teaching, where an advanced degree is usually required for appointment and is necessary for advancement.

The importance of graduate training in geography was revealed in 1946 by a census of 793 professional geographers conducted by a subcommittee of the Committee on Geographical Research of the Division of Geology and Geography of the National Research Council. Of the 136 women geographers included in this count, almost three-fourths held either the master's or the doctor's degree (35). But according

to the 1946 data of the National Roster of Scientific and Specialized Personnel, the proportion of the men geographers who had doctor's degrees was more than twice that of the women (59).

Graduate study is needed for the specialization which has become so important in geography. In 1946, economic geography and physical geography were listed more frequently as major interests by women geographers than was any other specialized field. However, there are women geographers in each of the specialties (8). (See table 4.) In human geography, for example, outstanding studies on problems of land settlement and on geographical problems arising from the repatriation of refugees have been made by women geographers (44). The contributions of geographers in the newer fields are receiving greater appreciation, and more women may specialize in them in the future.

Table 4. Major Interests in Geography of 110 Women Members of the American Society for Professional Geographers, November 1946¹

| Field of major interest | Number of times listed | Percent of total listings |
|---------------------------|------------------------|---------------------------|
| Total..... | 216 | 100 |
| Systematic geography..... | 158 | 74 |
| Physical geography..... | 57 | 27 |
| Human geography..... | 18 | 8 |
| Economic geography..... | 57 | 27 |
| Political geography..... | 5 | 2 |
| Cartography..... | 21 | 10 |
| Regional geography..... | 42 | 19 |
| Geography education..... | 16 | 7 |

¹ Based upon the major interests listed by 110 women members of the Society, many of whom listed more than 1.

Source: American Society for Professional Geographers (8).

The college woman who plans to do graduate work in geography would do well to take undergraduate courses in geology, meteorology, cartography, economics, statistics, and political science, in addition to courses in physical and economic geography, as well as several courses in regional geography (76).

For those specializing in economic, human, or physical geography, field work is a necessity, since the basic facts can be secured only from direct observations of the industry, people, or topography being studied. The professional geographer is also expected to master one or two foreign languages.

Women interested in specializing in cartography need background in mathematics and civil engineering as well as courses in photogrammetry, which because of the costly stereoscopic equipment required are so far available in only a few technical institutes and universities.

Before planning to take graduate work the young college woman should seek the assistance of a professional geographer in the selection of a particular university, since opportunities for study and specialization vary, and only a few schools are outstanding in this field. In 1946, there were at least 24 colleges and universities that had granted or were planning to grant the doctorate in geography, according to a study published in the *Annals of the Association of American Geographers* (21). (For list of colleges and universities granting the Ph. D. in geography, see p. 7-44.)

Women with sound professional training and specialization in geography should find increasing opportunities in this small but growing field.



Meteorological aid releasing a pilot balloon to make observations of winds aloft.

Meteorological aid coding message of winds aloft for teletype communication.



Meteorologist analyzing charts to prepare material for forecasters in training.

Figure 4.

Courtesy U. S. Weather Bureau

Meteorologist as Defined by the National Roster of Scientific and Specialized Personnel (66)

“A meteorologist makes use of a knowledge of physics, mathematics, and meteorology in interpreting weather data obtained with various instruments such as the barometer, thermometer, hygrometer, anemometer, and radiosonde to determine the causes which bring about such atmospheric conditions as rain, fog, or snow. On the basis of his findings, he makes forecasts of weather for short or long periods. These forecasts are of great importance to farmers in planting and harvesting; shipping and insurance companies; towns; business and commercial firms; construction engineers on winter jobs; air transport companies; military and naval operations; and the public generally. The meteorologist may specialize in: Daily weather forecasting; synoptic meteorology; meteorological instruments and measurements; physical and dynamic meteorology; long range weather forecasting; or climatology.”

Weather Observer as Defined in the Dictionary of Occupational Titles (56)

“Weather Observer; cooperative observer; observer (profess. and kin.) 0-66.88. Observes and records weather conditions for use in forecasting trends and changes in weather; observes local weather conditions in terms of general visibility, temperature, and amount and time of precipitation; takes readings of various instruments which record meteorological data, such as atmospheric pressure, humidity and barometric changes; calculates wind direction and velocity with instruments sometimes releasing a balloon to obtain readings at various altitudes; converts these observations into usable form, employing mathematical scales and tables, and records them with data from other observation posts on weather maps, using standard meteorological symbols.”

THE OUTLOOK FOR WOMEN IN METEOROLOGY

Through their weather forecasts and climatic studies, meteorologists in the United States guard the health and welfare of the people. Many groups, especially those engaged in farming, forestry, flood-control, aviation, and national defense, are often completely dependent upon the weather reporting services of the United States Weather Bureau and of other agencies, not only for their livelihood, but sometimes for their very lives. Although there probably were never more than 150 to 200 professional women meteorologists in the United States even during the war, their work in that period demonstrated their ability in this important field.

Prewar Distribution

Before the war, there were approximately 1,000 meteorologists in the United States (65). However, only about 400 were considered to have had full professional training, among them about a dozen women (7) (36). Most meteorologists were working for the United States Weather Bureau; others were teaching in colleges and universities or were forecasting flight conditions for airlines. A few were employed by private forecasting agencies which serviced particular or specialized needs in industry or agriculture, and a few were working independently as weather consultants.

With the development of aviation and the increasing demand for weather reporting services, the United States Weather Bureau expanded rapidly in the decade before the war. In 1939, nearly 600 meteorologists were working in the hundreds of weather stations maintained by the Weather Bureau (65). In the Washington, D. C., office, 4 or 5 women were doing scientific or technical work, but only 1 or 2 of these were trained in meteorology. There were some women among the many hundreds of subprofessional workers also employed by the Weather Bureau as meteorological aids and meteorological observers in weather stations located in all parts of the United States and in Alaska. In addition to these paid employees more than 5,000 men and women acted as volunteer amateur weather observers for the Weather Bureau, aiding in the daily recording of temperature, rainfall, prevailing winds, and other weather phenomena (73). With the assistance of these subprofessional meteorological aids and ama-

teur weather reporters, stationed in all parts of the country, meteorologists in the United States Weather Bureau, in addition to their general weather reporting and forecasting services, were able to render such special services as issuing warnings of impending frost, hurricanes, or floods and aiding in the prevention of forest fires and crop destruction (51). The Bureau of Agricultural Economics and the Soil Conservation Service of the Department of Agriculture and the Bureau of Standards in the Department of Commerce also employed some meteorologists who were engaged in climatological or instrument research.

Just before the war, about 100 meteorologists were teaching in colleges and universities, usually in geology, geography, or physics departments, rather than in separate departments of meteorology (65). Only a few schools, like the Massachusetts Institute of Technology, the California Institute of Technology, New York University, the University of Chicago, and the University of California at Los Angeles, offered an extensive curriculum in meteorology (50). It is likely that most of the dozen women meteorologists doing professional work before the war were teaching in colleges and universities (36).

Only one woman meteorologist was employed by the airlines, where about 125 meteorologists were responsible for interpreting weather data and forecasting flight conditions for certain air routes (65).

Annual Addition to the Supply

Because of the limited number of meteorological jobs available before the war, only about 75 bachelor's degrees and one or two doctor's degrees were awarded annually in meteorology (31) (20). Five institutions of higher education offered advanced training toward a master's degree in meteorology for students with a strong undergraduate major in mathematics or physics (1). Very few women were actively interested in the science of meteorology, and because they were so scarce, they were sometimes handicapped by their conspicuousness (36).

Wartime Changes

During the war, weather data became highly strategic military information. A week after Pearl Harbor, radio stations ceased broadcasting daily weather reports, and only in the advent of storm was there any mention of weather over the air (72). However, the demand for meteorological data for use by the military forces, the Federal Government, and certain war industries increased so tremendously that thousands of persons with any training at all in meteorology were required almost immediately. This also increased the demand in

colleges and universities where professional meteorologists were needed to train others.

Instructors in meteorology had to be drawn from the existing supply, so that many of the highly trained meteorologists temporarily abandoned their research activities in the universities or their usual positions in the Federal Government to train weather officers and meteorologists for the Army, the Navy, and the United States Weather Bureau (74). By December 1942, the number of full-time faculty members teaching meteorology had more than doubled, according to a survey of the National Roster of Scientific and Specialized Personnel, which reported 324 instructors including 28 women, almost 9 percent of the total (60).

Meanwhile, other well-trained meteorologists remained at the United States Weather Bureau to guide its wartime reorganization and increased activities. The Bureau issued new and enlarged forecast services and studies, assisted in the coordination and consolidation of civilian and military weather stations, organized a central weather analysis unit in Washington, and encouraged the development of meteorological facilities in neighboring countries. In order to furnish these increased services and to replace staff members leaving for civilian training programs or military service, the Weather Bureau hired meteorologists not eligible for military service and newly trained women graduates (52). During the war the Weather Bureau employed over 800 meteorologists, including about 20 women who were hired at the beginning professional level, for work in the analysis center (concerned with the drawing and interpretation of weather maps) and in the hydrometeorological section of the central office in Washington (concerned with the analysis of rainfall data) (65). None of these women was engaged in weather forecasting, since they lacked the experience required for such responsible work. At the sub-professional level, hundreds of women were hired and trained, until altogether about 1,500 women were employed as meteorological aids and meteorological observers, in some 500 Weather Bureau stations in the United States and Alaska. They took hourly readings from instruments and recorded temperature, humidity, wind speed, and direction for Weather Bureau reports in code. Although routine in nature, their work required good judgment and ability to make observations of the visible elements. It also involved around-the-clock reporting, because the Weather Bureau must maintain service 24 hours a day, and women meteorological aids and observers, like the men, rotated on all 3 shifts, in all kinds of inclement weather. Their work enabled the Weather Bureau to maintain its services without loss of efficiency during the crucial years of the war.

At the same time, meteorologists in the Army Air Forces and the Navy were issuing weather forecasts for specific military operations and were preparing special reports for theater commanders to aid in the planning of air routes, bombing programs, convoy-protection systems and in the selection of seasons suitable for attack and invasion (45). Some of the women in the armed forces also were assigned to professional and subprofessional work in meteorology. About 10 percent of the Navy forecasters were WAVE officers stationed at air stations and in weather centrals (65). Women serving as aerology officers (weather officers) prepared forecasts and climatic reports for air and naval operations; briefed pilots on weather conditions; abstracted and prepared aerological publications; and assisted in the preparation of analyses for battles and campaigns from a weather standpoint. A few became specialized in certain fields. For example, one woman who had been teaching for 9 years before her appointment as an assistant aerology officer specialized in the analysis of current weather maps for the land and ocean areas of the Pacific, for use by naval units. Another woman who had been teaching mathematics for many years became an instructor in the Naval School for Aerographers' Mates and was later assigned to special research in meteorological communication.

Enlisted Waves also formed about 10 percent of those engaged in subprofessional naval meteorological duty, as aerographers' mates. These enlisted Waves made weather observations, computed pilot balloon soundings, and plotted weather charts in naval meteorological offices ashore (65). Similarly, in the Army Air Forces, Wacs who had qualified for training in premeteorology or advanced meteorology served as weather observers, meteorological plotters, and meteorologists.

Despite severe restrictions during the war, air-line traffic, mail, and other cargoes handled by the commercial air lines increased. The number of persons employed in air-line operations more than doubled (53). By 1945, several hundred meteorologists were working for the domestic and international air lines, among them, for the first time, some women (54). Most of these women had 2 to 4 years of college work supplemented by 3 to 6 months' intensive training before they were assigned to work in meteorology departments. Some ultimately advanced to positions as junior meteorologists (22).

Interest in private forecasting services increased during the war, and many industries indicated that they would purchase such services. But military demands had priority, and very few meteorologists remained in private practice during the war.

The need for more training facilities in meteorology had become apparent even before the outbreak of the war. The regular 4- and 5-

year college programs could not train all the thousands of meteorologists needed for national defense and expanding military services. Although by 1942 undergraduate and graduate students numbered about 2,000, including about 60 women majoring in meteorology, their number was far too small for growing needs (60). The Federal Government, therefore, established several accelerated training programs. It first expanded the facilities of the program originally begun in 1939 by the United States Weather Bureau in cooperation with the Civil Aeronautics Administration to train men and women with a civilian pilot's license and with a background in physics and mathematics. Under this program, the Federal Government paid the tuition and subsistence of the students who qualified for a special 9-month advanced training course which was given at the five universities listed earlier as offering intensive training in meteorology. There were about 10 or 12 women with pilot's licenses who were among the civilian pilots who completed this course and later used their training in civilian and military units.

In 1942, the United States Weather Bureau initiated another course at the same universities, this one to train civilians in meteorology for employment in its central and field offices which were being expanded to serve wartime needs. Qualifications for this 8-month course included 1 year of college physics and mathematics through calculus. As college students with training in physics and mathematics became scarce in relation to the industrial and government demands, the Weather Bureau engaged in an active recruiting campaign to secure students. First it used the normal channels of the colleges and universities; later the radio and widely distributed pamphlets; and finally, a woman meteorologist was sent all over the country as a recruiting agent. Among the students who completed this advanced training course were 31 college women.

At the subprofessional level hundreds of women received in-service training after accepting positions as meteorological aids and meteorological observers in Weather Bureau stations.

The same facilities which the Weather Bureau and the Civil Aeronautics Administration used for the training of civilians were utilized cooperatively by the Army Air Forces (30) and the Navy to train some 6,000 military weather officers in meteorology, known in the Navy as aerology. Women serving as WAVE officers were trained for such work in a 9-month graduate course in aerology, given at Massachusetts Institute of Technology, the University of California at Los Angeles, and the University of Chicago. Most of the 113 women who served as aerology officers were college graduates with a major in mathematics, or in mathematics and physics. Only a few had

already taken training in meteorology, and these were placed at naval air stations without having to take the 9-month course. Although most of the women were under 35 years of age, and many entered the service directly from college, there were a few in their forties, some with considerable teaching experience in mathematics or science.

In other training programs on a less advanced level, some 15,000 Army and Navy enlisted personnel were trained as weather observers during the course of the war (65). In the WAVES, high-school graduates were prepared at the Naval Air Station in Lakehurst, N. J., for work as aerographers' mates; and the Army similarly trained Wacs to serve as meteorological plotters and weather observers.

Because the military training programs drained off almost all the instructors as well as the potential students of meteorology, by 1944 only 48 civilian students, including 17 women, remained in the regular academic college courses in meteorology (67).

Earnings and Advancement

The extraordinary wartime demand increased the earnings of meteorologists in all types of employment. Meteorologists serving as college instructors before the war usually earned from \$1,200 to \$1,800 a year (64). But in 1947, the earnings of college instructors were more likely to begin at \$2,000 a year (57). During the war, the airlines usually started junior meteorologists at about \$1,440 a year (\$120 a month) and meteorologists at about \$1,800 a year (\$150 a month) (22). In 1946, however, junior meteorologists with airlines usually received from about \$1,800 to \$2,400 a year (\$150 to \$200 a month); meteorologists were paid from \$2,400 to \$3,600 a year (\$200 to \$300 a month) (55).

The Federal Government paid junior meteorologists \$2,000 a year in 1940, and \$2,644 in 1947. Before the war, weather observers were usually hired at \$1,440 a year, but in 1947 their initial salary was \$2,168 a year, and after a 6-month training period, they were able to earn \$2,394 a year. Weather Bureau employees usually receive more than the basic salary indicated in these rates, since they work on rotating shifts and receive additional pay for work at night.

Women meteorologists have gained little advancement at the United States Weather Bureau. Of those employed during the war, only a few have been advanced more than one professional grade, and further progress will be slow. Because of the tension and strain under which forecasters work during a period of storm or other bad weather, and because of the long years of training and experience required by the Weather Bureau, it is unlikely that the Bureau will employ women as forecasters in the years to come. In the past, subprofessional em-

ployees at the Weather Bureau have sometimes been able to rise to a professional rank. This advancement has usually resulted after about 10 years of work and in-service training, since instruction at educational institutions has not been generally available. However, the present interest in the science and the greater range of courses now offered in meteorology at universities will tend to increase the educational qualifications for advancement.

Advanced professional training is becoming a prerequisite to advancement in meteorology, not only on college faculties but in the Weather Bureau and elsewhere. Although in 1946 almost a third of the 1,100 persons registered in meteorology with the National Roster of Scientific and Specialized Personnel had no college degree, the trend is toward requiring higher standards of professional training for meteorologists. It is likely that the proportion of those with the bachelor's degree, now only one-half, and the proportion of those with graduate degrees, now only one-fifth, will increase in the future (59). Women meteorologists who plan to teach in colleges and universities will find graduate training necessary in seeking advancement. (See p. 7-44 for list of colleges and universities offering graduate training in meteorology.)

Organizations

The interest in meteorology developed in World War I led to the creation of the American Meteorological Society in 1919 (9). By 1940, its members totaled over 1,400 (11); by 1947, they numbered approximately 2,800. Only about 1 percent, or 28, of the members were women, most of whom were engaged in teaching or research. In the last few years, a special classification has been established for professional members. (For requirements for membership, see p. 7-43.) In addition to its desire to advance the profession of meteorology, the Society wishes to establish a policy in cooperation with Government authorities to permit airline and other meteorologists to serve transportation, industry, and agriculture effectively, in a fashion designed to supplement rather than to compete with existing Government agencies (40).

A Meteorology Section is also included in the American Geophysical Union, created by the National Research Council in 1919. In 1943, 753 men and women were members of this Section, more than a third of the entire membership of the Union at that time (34). In 1947, the total membership of the Union had increased to more than 3,000. (For requirements for membership see p. 7-42.)

The Outlook

Meteorology was probably the only physical science for which a large postwar oversupply of professionally trained persons was predicted. Although the demand was expected to be above prewar levels, the war-created supply had increased far beyond normal needs. In relation to the more than 6,000 men and women who had received advanced training in meteorology during the war, only about 500 new openings were anticipated by the Weather Bureau and private airlines (5). After the war ended, the United States Weather Bureau began receiving a flood of applications from discharged military meteorologists and weather observers, many of whom had experience and training of a caliber not previously available. As a result, requirements for professional meteorologists were raised, and competition for subprofessional jobs became very keen, especially for women.

However, the anticipated oversupply of professionally trained meteorologists failed to develop. Apparently, the vast majority of the 6,000 men and women trained in meteorology during the war have entered other fields. In 1947, there were more vacancies for professional meteorologists than qualified applicants available, and the United States Civil Service Commission was planning to announce an examination for meteorologists.

In 1946, the Weather Bureau decreased its volume of work for war purposes and shifted some of its personnel to general forecasting, to climatological work, and to some of its more specialized projects, in response to increased demands from the public for weather services (48). In 1947, it was estimated that over 1,200 professional meteorologists (about double the prewar number) were employed in the Federal Government (25). About 900 were with the United States Weather Bureau, and the others were employed in the War and Navy Departments, the Civil Aeronautics Administration, and the National Advisory Committee for Aeronautics. Despite this increase the number of women meteorologists employed in the Weather Bureau had decreased since the war. In 1947, only about 15 women meteorologists, as compared to 20 during the war and 1 or 2 before the war, were employed in the central office of the Weather Bureau. Only a few of the women had advanced beyond the beginning professional level, and none had gone beyond the grade immediately above. Because of the large number of men veterans trained in this field, who not only have veterans' preference under civil service regulations but are preferred because they can be advanced eventually to forecasting posi-

tions to which women are not apt to be appointed, it is likely that women meteorologists will not be hired in the next few years, except in rare instances.

The number of women employed in the Weather Bureau in subprofessional jobs as meteorological aids and observers has also decreased. In 1947 there were only about 1,000 women employed in these positions in contrast to about 1,500 during the war. Many of these women were war service appointees, and it is likely that some will be replaced by men with veterans' preference. In the future, women will face competition from veterans with wartime experience as weather forecasters and observers.

Although many of the wartime weather officers are turning to other pursuits, some are continuing their studies in meteorology under the GI Bill of Rights. Because of the general increase of interest in meteorology, it is expected that there will be more opportunity for meteorologists to teach in colleges and universities.

In the fall of 1946, some of the liberal arts colleges introduced meteorology into the curriculum for the first time, and former military meteorologists were given teaching appointments in these schools (6). A list of undergraduate and graduate courses in meteorology offered in universities and colleges in the United States was published by the American Geophysical Union in 1945 and 1946 (3). But, except in those universities with a separate department of meteorology, the instructor in meteorology is also expected to teach other sciences such as physics, mathematics, or geography (6). The best opportunities for women who plan to teach meteorology may be found in some of these smaller colleges and universities and especially in the women's colleges, where a few courses in meteorology might be offered through the physics or geography departments. Since teachers are expected to continue their own training and research, a graduate degree is necessary for advancement.

At present, the seven universities in the United States which offer graduate training in this field are well-supplied with meteorologists. Only a woman with outstanding ability in research will find it possible to win a permanent staff appointment at one of these universities. However, there are a number of assistantships and research positions in these institutions for which women can qualify (42). For example, in 1945, the Massachusetts Institute of Technology had five women serving on its staff as assistants, research assistants, or research associates in meteorology.

In 1947, most of the 28 women members of the American Meteorological Society were engaged in teaching and research, and it is likely that this field will continue to offer opportunity to a small number of professionally trained women meteorologists.

With the anticipated expansion of domestic and international airline operations in the next few years, the number of meteorologists employed by airlines is expected to be almost double the number employed during the war (53). However, it is likely that these positions will be filled by discharged military meteorologists, who are given preference.

Professional meteorologists may also find opportunities in enterprises which offer private weather forecasting and climatological services, but opportunities in this field were less predictable and involved all the risks of private business. As yet this area has been incompletely explored, and many discharged weather officers may wish to enter the field (43). Men and women possessing a good business sense and an interest in private enterprise may offer services to industry, commerce, and agriculture not available elsewhere. The United States Weather Bureau has indicated that it would favor an expansion of private practice in this field, on a sound and ethical basis, since some of the present demands of commerce and industry for weather data are beyond the scope of the Government's ability to serve.

The American Meteorology Society, which has compiled extensive information on training opportunities and job possibilities to assist discharged military weather personnel in the selection of postwar careers in meteorology and allied fields has also offered its advice and assistance to meteorologists planning to establish such enterprises (5).

Business surveys have shown that there are many undeveloped uses for individual and specialized services in applied meteorology, and unless enterprising meteorologists in private practice can service these needs, it is likely that many latent demands will go unsatisfied. Because of the advances made during the war, with the use of radar and other newly developed techniques, long-range forecasts of 5-, 10-, and 12-days are becoming available and are likely to increase the demand for specialized services.

In the past, department stores have depended upon the Weather Bureau forecasts of rain to feature sales of raincoats and umbrellas; manufacturers of auto supplies have rushed tire chains to portions of the country where snowstorms were predicted; ice cream plants have increased their production when warned of particularly hot days; and utilities have depended on Weather Bureau forecasts to determine when more electricity or gas would be consumed. But other services are still possible. For example, manufacturers need specialized information to help in the location of new plants, when a particularly moist or dry climate is needed; fruit and fish canneries need data to determine when crops will be ready to can or when the fishing season

will reach a peak; and farmers need climatological reports to decide when to make use of irrigation systems, when to expect rainfall.

The possibilities for women in private industry appear to be favorable. A woman meteorologist with sales ability and knowledge of a particular industry, like the baking industry for example, might be able to sell her services to a particular bakery. She might offer to make a statistical correlation of sales records with weather information and prove that she could predict, four times out of five, the days on which production of certain types of baked goods such as pastries should be increased or decreased and distribution altered for maximum profit. Thus, a woman meteorologist who concentrated on one industry or company could offer specialized services not available from the Weather Bureau and could make her own job.

Another field which offers opportunity for women trained in meteorology is that of popular writing and speaking. Writing articles for special groups, such as those appearing in farmers' or pilots' magazines, or popular books on the weather could form a full- or part-time occupation for a woman with writing ability (42).

Over the long-run, the increased demand for government and private weather forecasting services and the recent scientific advances in long-range forecasting and climatology are likely to increase the number of positions open to meteorologists. There are also a number of fields allied to meteorology in which opportunities are expected to be greater in the coming years. Hydrometeorologists with training in meteorology combined with training in civil engineering will be needed by Government agencies for the analysis of rainfall data (5). Climatologists with advanced training in the agricultural sciences and statistics will probably find openings as agricultural climatologists in agricultural experiment stations, where they are needed for preparing and refining crop estimate figures (4). The Weather Bureau has indicated that it will need meteorologists with graduate training in mathematics and applied statistics for developing objective engineering methods in forecasting and for modernizing some of the methods used in climatology (12). The need for basic research in these fields also will require the services of persons who have combined their graduate training in meteorology or climatology with work in another scientific field, such as geology, geophysical technology, mathematics and statistics, civil engineering, agronomy, or one of the other agricultural sciences (5).

Preparation for each of these fields will require more than the 4 years of work needed for the bachelor's degree, which is now the minimum educational requirement for the professional meteorologist. However, it has become apparent that persons with two specialties

who can apply the techniques and knowledge of one field to the problems of another field are especially useful in a technological society (5).

For women, however, opportunities in the field will continue to be limited in number. Only a few enthusiastic young women with excellent backgrounds in physics and mathematics, preferably with training not only in meteorology but also in a related scientific or industrial field, will find opportunity in meteorology. But for such women, one woman meteorologist has recently written that the "horizons in weather are wide, for those with vision enough to see beyond the obstructions . . ." and ". . . the character to stick out the hardships" (42).

APPENDIX

Minimum Education, Experience, and Examination Requirements for Beginning Federal Civil Service Position as Geologist (\$2,644 a year)

(As taken from Civil Service Announcement No. 48, issued April 15, 1947,
closed May 8, 1947.)¹

1. Passing of a written examination in two but no more than two of the optional subjects listed below (for each of which separate employment lists will be established) :

| | |
|-------------------------------|---|
| Mineralogy and petrology. | Geology of fuels. |
| Sedimentation. | Geology of metallic and nonmetallic mineral deposits. |
| Stratigraphy. | Engineering geology. |
| Geomorphology and glaciology. | General geology. |
| Ground water geology. | |

2. Education and experience: Applicants must have successfully completed one of the following:

A. A full 4-year course in a college or university of recognized standing leading to a bachelor's degree in geology. This study must have included courses in geology consisting of lectures, recitations, and appropriate practical laboratory and field work totaling at least 30 semester hours; or

B. Courses in geology, in a college or university of recognized standing, consisting of lectures, recitations, and appropriate practical laboratory and field work totaling at least 30 semester hours; plus additional appropriate experience or education which, when combined with the 30 semester hours in geology, will total 4 years of education and experience and give the applicant the substantial equivalent of a 4-year college course.

In either A or B above, the required 30 semester hours of study in geology must have included or have been supplemented by the successful completion of specific courses in at least 5 of the following subjects:

| | |
|--|--------------------------------|
| (a) Physiography. | (h) Ground water geology. |
| (b) Structural geology. | (i) Invertebrate paleontology. |
| (c) Geophysics. | (j) Stratigraphy. |
| (d) Mineralogy. | (k) Sedimentation. |
| (e) Petrology. | (l) Map interpretation. |
| (f) Optical mineralogy. | (m) Field geology. |
| (g) Economic geology (metals, nonmetals or fuels). | |

¹ For more complete and later information, consult latest announcements of the Civil Service Commission posted in first- and second-class post offices.

Minimum Education and Experience Requirements for Application for Beginning Federal Civil Service Position as Junior Professional Assistant With Option as Geographer (\$2,644 a year)

(As taken from Civil Service Announcement No. 75, issued October 14, 1947, closed November 4, 1947.)¹

Applicants must have successfully completed one of the following :

A. A full 4-year course, in a college or university of recognized standing, leading to a bachelor's degree. This study must have included or been supplemented by courses in geography totaling at least 24 semester hours. Study in closely allied fields such as geology, archaeology, cartography, etc. may be included in the 24 semester hours of geography provided the applicant shows at least 15 hours in purely geographic subjects; or

B. Courses in geography, in a college or university of recognized standing, consisting of lectures and recitations totaling at least 24 semester hours; plus additional appropriate experience or education which when combined with the 24 semester hours in geography will total 4 years of education and experience and give the applicant the substantial equivalent of the 4-year college course. Study in closely allied fields such as geology, archaeology, cartography, etc. may be included in the 24 semester hours of geography, provided the applicant shows at least 15 hours in purely geographic subjects.

Minimum Requirements for Fellows and Members of the Geological Society of America, Inc.

A. Fellows:

1. Fellows shall be persons who are engaged in geological work or in teaching geology and who have contributed to the advancement of the science of geology.

2. Fellows only shall be entitled to vote or be eligible for election as officers or councilors.

3. Fellows may be nominated at any time, on forms approved by the Council, by three Fellows, all of whom shall be personally acquainted with the candidate and his qualifications for membership.

B. Members:

1. Members shall be persons who are engaged in geological work, in teaching geology, or in graduate study in geology.

2. Members may be nominated at any time, on forms approved by the Council, by two Fellows, one of whom shall be personally acquainted with the candidate and his qualifications for membership.

¹ For more complete and later information, consult latest announcements of the Civil Service Commission posted in first- and second-class post offices.

Minimum Requirements for Membership in the American Association of Petroleum Geologists (2)

A. Members:

1. Engaged in work of petroleum geology or research pertaining to it.
2. Graduation from an institution of collegiate standing, with a major in geology or sciences fundamental to petroleum geology.
3. Three years' experience in petroleum geology, or in the application of other sciences to petroleum geology.

B. Associates:

1. Engaged in work of petroleum geology, or engaged in the study of petroleum geology at an institution of higher education.
2. Completion of 30 hours in geology at a reputable institution of collegiate or university standing, or field work equivalent to this, or graduation with a degree in petroleum geology.
3. One year's experience working in petroleum geology.

Minimum Requirements for Membership in the American Geophysical Union

A. Members:

1. Active contribution to geophysical research through observation, publication, teaching, or administration.
2. Active practical application of geophysical research.
3. In general the minimum qualifications for membership will be not less than three years of professional experience in some phase of geophysics.

B. Associate Members:

1. Active interest in physical processes of the earth or technical assistance in the application of geophysics.
2. In general the minimum qualification for associate membership will be a college degree in some field of geophysics or allied science or a comparable period of training and experience.

Minimum Requirements for Membership in the Association of American Geographers

Membership is limited to persons who have done original research work in some branch of geography. This usually means having published some research work, generally after receipt of the doctorate in geography, although the Ph. D. is not a specific requirement, and holding of the doctorate does not insure election as a member.

Minimum Requirements for Membership in the American Society for Professional Geographers

A professional member shall be any person holding a doctor's or master's degree in geography from a recognized institution of higher learning. The professional membership shall also include any person who holds a bachelor's degree with a full major in geography (or who has completed the equivalent courses in geography) from a recognized institute of higher learning, and who has held a position in which geographic training has been used professionally as a primary occupational basis, for a period of at least two years after the bachelor's degree was received with exclusion of any teaching below the high school level.

Persons who have made a valuable contribution to geographical knowledge may also be elected to professional membership, without a degree in geography.

A regular member may be any person or corporation or other organization who may be elected as a member on the basis of interest.

Minimum Requirements for Membership in the National Council of Geography Teachers

Membership in the National Council is open to anyone who is interested in fostering geographic education.

Minimum Requirements for Membership in the American Meteorological Society

Membership. Any persons whose interest or activity in meteorology or climatology would make them desirable members of the Society are eligible as candidates for election to the grade of Member.

Professional membership may be applied for by persons who meet the conditions in any of the following groups:

(a) Persons who have completed a professional course in meteorology at an institution of recognized standing and who have been engaged in meteorological or climatological work at a professional level for at least one year prior to election; or,

(b) Persons who have been engaged in meteorological or climatological work for at least five years and who during at least the two years next prior to election have been employed at the professional level in one of these fields; or,

(c) Persons who have made notable scientific contributions to meteorology or climatology and who maintain an active interest in one of these fields although not professionally employed therein; or,

(d) Persons whose training, work, or contributions to meteorology are, in the opinion of the Committee on Admissions, equivalent to any of the preceding groups.

List of Colleges and Universities Which Had Granted the Ph. D. in Geography, June 1935 to June 1946, and Those at Which Work for the Ph. D. in Geography was in Progress December 1946 (21)

| | |
|--|--------------------------------------|
| Clark University ¹ | University of Chicago ¹ |
| Columbia University ¹ | University of Illinois |
| Cornell University | University of Maryland |
| Dropsie College | University of Michigan ¹ |
| George Peabody College for Teachers ¹ | University of Minnesota |
| Harvard University ¹ | University of Missouri |
| Indiana University | University of Nebraska ¹ |
| Louisiana State University | University of North Carolina |
| Marquette University | University of Pittsburgh |
| New York University | University of Washington (Seattle) |
| Ohio State University ¹ | University of Wisconsin ¹ |
| University of California (Berkeley) ¹ | Washington University (St. Louis) |

List of Colleges and Universities Offering Graduate Training in Meteorology (6)

| | |
|---------------------------------------|--|
| California Institute of Technology | Pennsylvania State College |
| Massachusetts Institute of Technology | St. Louis University |
| New York University | University of California (Los Angeles) |
| | University of Chicago |

¹ Had granted more than five doctorates in geography.

SOURCES TO WHICH REFERENCE IS MADE IN THE TEXT

- (1) Allendoerfer, Carl B. The training of weather officers in wartime. *American journal of physics* 11: 153-54, June 1943.
- (2) The American Association of Petroleum Geologists membership list, March 6, 1940. *American Association of Petroleum Geologists bulletin* 24: 523-24, March 1940.
- (3) American Geophysical Union. Education in geophysics. Washington, D. C., the Union, 1945. 14 pp. *See also* Supplementary information relating to education in geophysics. 1946. 4 pp. (Reprinted from *Transactions, American Geophysical Union* 26: 463-76, December 1945, and 27: 614-17, August 1946.)
- (4) American Meteorological Society. Educational opportunities. Boston, Mass., the Society, 1945. 19 pp. Mimeo.
- (5) ——— Post-war opportunities in meteorology and allied fields. A statement by the President of the Society. *Bulletin of the American Meteorological Society* 26: 261-66, September 1945.
- (6) ——— Weather horizons. Boston, Mass., the Society, 1947. 79 pp.
- (7) ——— Committee on Meteorological Education. The teaching of meteorology in colleges and universities. *Bulletin of the American Meteorological Society* 27: 95-98, March 1946.
- (8) American Society for Professional Geographers. Directory of the American Society for Professional Geographers. Washington, D. C., the Society, November 1946. 92 pp. Appendix.
- (9) Bates, Ralph S. Scientific societies in the United States. New York, N. Y., John Wiley and Sons, Inc., 1945. 246 pp. (*See* p. 145.)
- (10) Bauer, Hubert A. Cartography (map making). Boston, Mass., Bellman Publishing Co., Inc., 1945. 31 pp. (Vocational and professional monograph No. 60.)
- (11) Brooks, Charles F. Secretary's report. *Bulletin of the American Meteorological Society* 22: 34-36, January 1941.
- (12) Careers in statistical meteorology. *Bulletin of the American Meteorological Society* 26: 352-53, October 1945.
- (13) Centers of geographic work. *News Letter of the Association of American Geographers*, July 1946. p. 33.
- (14) Cutshall, Alden. The geographer in wartime. *Journal of geography* 41: 252-58, October 1942.
- (15) Denison, A. Roger. A challenge to geology. *Oil and gas journal* 42: 66-68, 82 Mar. 23, 1944.
- (16) Geography study on the increase. *Education for victory* 1: 21-22, Feb. 15, 1943.
- (17) Geological Society of America, Inc. American women of geology. New York, N. Y., the Society, August 1946. 7 pp. Mimeo. (A list of 271 women geologists.)
- (18) ——— What is the Geological Society of America? *In* Interim proceedings of the Geological Society of America, 1945. Part I, Report of April 1945, pp. 18-19.
- (19) Heminway, Caroline E. Training of women in geology. *In* Interim proceedings of the Geological Society of America, 1947. Part I, Report of March 1947, pp. 66-69.

- (20) Henry, Edward A., Ed. Doctoral dissertations accepted by American universities 1943-44. Compiled for the Association of Research Libraries. New York, N. Y., the H. W. Wilson Co., 1944. 88 pp.
- (21) Hewes, Leslie. Dissertations in geography accepted by universities in the United States and Canada for the degree of Ph. D., June 1935 to June 1946, and those currently in progress. *Annals of the Association of American Geographers* 36: 215-47, December 1946.
- (22) Hinkel, Ralph E., and Baron, Leo. An educational guide in air transportation. Kansas City, Mo., Transcontinental and Western Air, Inc., 1944. 140 pp.
- (23) Hollis, Ernest V. Toward improving Ph. D. programs. Washington, D. C., American Council on Education, 1945. 204 pp.
- (24) Institute for Research. Careers in geology. Chicago, Ill., the Institute, 1939. 23 pp. (Research No. 15.)
- (25) Leggin, Al. President's Research Board report gives statistics on Government scientists. *Chemical and engineering news* 25: 1489, May 26, 1947.
- (26) Lemons, Hoyt. The role of geography in post-war education. *Education* 65: 283-90, January 1945.
- (27) Levorsen, A. I. Survey of college students majoring in geology. *American Association of Petroleum Geologists bulletin* 30: 730, May 1946.
- (28) ——— Trends in petroleum geology. In Annual report of the Board of Regents of the Smithsonian Institution, 1942. Washington, D. C., U. S. Government printing office, 1943. pp. 227-34.
- (29) Menge, Edward J. v. K. Jobs for the college graduate in science. New York, N. Y., Bruce Publishing Co., 1932. 175 pp.
- (30) Meteorological officers in the Army Air Forces. *Science* 96: 489, Nov. 27, 1942.
- (31) Moore, E. N. Weather predicting—new postwar business. *Commerce magazine* 41: 17-19+, February 1944.
- (32) National Council of Geography Teachers, Committee on Standards of Certification for the Teaching of Geography in High Schools. College geography and its relation to teacher training in secondary school geography. The Council, % A. H. Meyer, Valparaiso University, Valparaiso, Ind., 1946. 34 pp. (Professional paper No. 7.) (Reprinted from *Journal of geography* 45: 45-78, February 1946.)
- (33) ——— Standards of certification for the teaching of geography in high schools. The Council, % A. H. Meyer, Valparaiso University, Valparaiso, Ind., 1943. 19 pp. (Professional paper No. 6.) (Reprinted from *Journal of geography* 42: 41-58, February 1943.)
- (34) National Research Council. Practices in collection and maintenance of information on highly trained and specialized personnel in the United States. By Lowell H. Hattery. Washington, D. C., the Council, 1947. 138 pp. Mimeo.
- (35) ——— Division of Geology and Geography, Subcommittee of the Committee on Geographical Research. Census of professional geographers. Report with diagram presented at annual meeting of the Division, May 3, 1946, by W. L. G. Joerg, Chairman of the Subcommittee. Unpublished manuscript.
- (36) Opportunity for women in meteorological work. *Bulletin of the American Meteorological Society* 23: 46, January 1942.
- (37) Price, Paul H. Geologists' place in service. *American Association of Petroleum Geologists bulletin* 30: 1115-22, July 1946.

- (38) Raisz, Erwin. Cartography. *In* The Americana annual. New York and Chicago, the Americana Corporation, 1947. (See pp. 123-25.)
- (39) Ray, Louis L. American doctorates in geology, 1931-40. *Journal of geology* 49: 854-61, November 1941.
- (40) Rossby, C.-G. A message to members from President Rossby. *Bulletin of the American Meteorological Society* 25: 268-69, June 1944.
- (41) Schlesselman, G. W. The place of geography in postwar general education. *The Southwestern social science quarterly* 27: 202-07, September 1946.
- (42) Starr, Joanne G. Women in meteorology. *In* American Meteorological Society. *Weather horizons*. Boston, Mass., the Society, 1947. 79 pp. (See pp. 23-29.)
- (43) Stone, Robert G. Meteorology and climatology. *In* The Americana annual, 1945. New York, N. Y., Americana Corporation, 1945. pp. 468-69.
- (44) Strausz-Hupe, Robert. Postwar demands for women in geography and geopolitics. *In* Institute of Women's Professional Relations, war and postwar employment and its demands for educational adjustment. New London, Conn., the Institute, 1944. 226 pp. (See pp. 143-46.)
- (45) Thunder over the North Atlantic. *Fortune* 30: 153-60, 197, 199, November 1944.
- (46) Training women for work with oil firms. *Education for victory* 1: 22, Feb. 15, 1943.
- (47) Trotter, Arnold H., Ed. Doctoral dissertations accepted by American Universities 1944-45. Compiled for the Association of Research Libraries. New York, N. Y., the H. W. Wilson Co., 1945. 68 pp.
- (48) U. S. Department of Commerce. Thirty-fourth annual report of the Secretary of Commerce, 1946. Washington, D. C., U. S. Government printing office, 1946. 226 pp. (See report of the Weather Bureau, pp. 213-26.)
- (49) ——— Bureau of Census. Statistical abstract of the United States, 1946. Sixty-seventh number. Washington, D. C., U. S. Government printing office, 1946. Table 862, p. 756.
- (50) ——— Civil Aeronautics Administration. Training and employment opportunities in aviation. Washington, D. C., the Department, April 1942. 22 pp. Multi. (Rev. Ed.)
- (51) ——— Weather Bureau. Report of the Chief of the Weather Bureau, 1941. Washington, D. C., U. S. Government printing office, 1942. 15 pp. (Reprinted from the annual report of the Secretary of Commerce, 1941. pp. 135-49.)
- (52) ——— Report of the Chief of the Weather Bureau, 1942. Washington, D. C., U. S. Government printing office, 1943. 8 pp. (Reprinted from the thirtieth annual report of the Secretary of Commerce, 1942. pp. 129-36.)
- (53) U. S. Department of Labor, Bureau of Labor Statistics. Employment opportunities in aviation occupations. Part I.—Postwar employment outlook. By Helen Wood and assistant. Washington, D. C., U. S. Government printing office, 1945. 36 pp. (Bulletin No. 837-1.)
- (54) ——— Employment opportunities in aviation occupations. Part 2—Duties, qualifications, earnings, and working conditions. By Helen Wood. Washington, D. C., U. S. Government printing office, 1947. 45 pp. (Bulletin No. 837-2.)
- (55) ——— Occupational Outlook Division. Employment outlook for meteorologists. Washington, D. C., the Department, January 1946. 1 p. Mimeo.

- (56) ——— U. S. Employment Service. Dictionary of occupational titles. Supplement edition III. Washington, D. C., U. S. Government printing office, 1945. 506 pp.
- (57) ——— National Clearing House. Current job openings (partial list), January 1947. Washington, D. C., the Service. 38 pp. Mimeo.
- (58) ——— National Roster of Scientific and Specialized Personnel. Directory of colleges and universities offering graduate degrees and some form of graduate aid. Washington, D. C., the Roster, August 1946. 52 pp. Multi. (Revised.)
- (59) ——— Distribution of Roster registrants, December 31, 1946. Washington, D. C., the Roster, 1947. 5 pp. Multi.
- (60) ——— Faculty members and students in institutions of higher education, December 1942. Washington, D. C., the Roster, June 15, 1943. Final report. Chart. Multi.
- (61) ——— Geology as a profession. Washington, D. C., U. S. Government printing office, 1946. 19 pp. (Vocational booklet No. 1.)
- (62) ——— Handbook of descriptions of specialized fields in geology. Washington, D. C., U. S. Government printing office, 1945. 16 pp.
- (63) ——— The job of the geologist. Washington, D. C., U. S. Government printing office, 1945. 13 pp. (Occupational brief No. 25.)
- (64) ——— The job of the meteorologist. Washington, D. C., U. S. Government printing office, 1945. 14 pp. (Occupational brief No. 31.)
- (65) ——— Meteorology as a profession. Washington, D. C., U. S. Government printing office, 1946. 17 pp. (Vocational booklet No. 4.)
- (66) ——— Physical sciences. Washington, D. C., U. S. Government printing office, 1947. 20 pp. (Description of professions series, pamphlet No. 6.)
- (67) ——— Report on survey of full-time civilian college students as of January 1944. Washington, D. C., the Roster, 1944. 12 pp. Multi.
- (68) ——— Social sciences. Washington, D. C., U. S. Government printing office, 1947. 31 pp. (Description of professions series, pamphlet No. 7.)
- (69) (U. S.) Federal Security Agency. U. S. Office of Education. Engineering, science, and management war training. List of approved courses. From July 1, 1943 through February 29, 1944. Washington, D. C., the Office, 1944. 52 pp. (ESMWT-Misc 2070.) Mimeo.
- (70) ——— Teaching as a profession. By Benjamin W. Frazier. Washington, D. C., U. S. Government printing office, 1944. 34 pp. (Pamphlet No. 95.)
- (71) U. S. Office of Scientific Research and Development. Science, the endless frontier. A report to the President by Vannevar Bush. July 1945. Washington, D. C., U. S. Government printing office, 1945. 184 pp. (See pp. 150-51, 169.)
- (72) War restrictions on distribution of weather information. Bulletin of the American Meteorological Society 23: 36-37, January 1942.
- (73) The weather. Fortune 21: 58-63, April 1940.
- (74) Weather scientists doing important defense work. Science news letter 40: 347, Nov. 29, 1941.
- (75) Willard, Bradford. Post-war geology. Science 100: 348-50, Oct. 20, 1944.
- (76) World wondering. Mademoiselle, November 1944.

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Your Job Future After College. Leaflet. 1947. (Rev. 1948.)

LABOR LAWS

Summary of State Labor Laws for Women. 7 pp. 1947. Mimeo.

Minimum wage:

State Minimum-Wage Laws and Orders, 1942: An Analysis. Bull. 191. 52 pp. 1942. 20¢. (Supplements through 1947. Mimeo.)

State Minimum-Wage Laws. Leaflet 1. 1948.

Model Bill for State minimum-wage law for women. Mimeo.

Map showing States having minimum-wage laws. (Desk size; wall size.)

Equal pay:

Equal Pay for Women. Leaflet 2. 1947. (Rev. 1948.)

Chart analyzing State equal-pay laws and Model Bill. Mimeo.

Texts of State laws (separates). Mimeo.

Model Bill for State equal-pay law. Mimeo.

Selected References on Equal Pay for Women. 9 pp. 1947. Mimeo.

Hours of Work and Other Labor Laws:

State Labor Laws for Women, with Wartime Modifications, Dec. 15, 1944. Bull. 202:

I. Analysis of Hour Laws. 110 pp. 1945. 15¢.

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Supplements through 1947. Mimeo.

Unemployment Compensation—How it Works for Working Women. Leaflet. 1945. (Rev. 1948, in preparation.)

Map of United States showing State hour laws. (Desk size; wall size.)

LEGAL STATUS OF WOMEN

International Documents on the Status of Women. Bull. 217. 116 pp. 1947. 25¢.

Legal Status of Women in the United States of America:

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Cumulative Supplement 1938-45. Bull. 157-A. 31 pp. 1946. 10¢.

Reports for States and District of Columbia (separates). Bulls. 157-1 through 157-49. 5¢ each.

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Women Workers in Power Laundries. Bull. 215. 71 pp. 1947. 20¢.

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Typical Women's Jobs in the Telephone Industry [1944]. Bull. 207-A. 52 pp. 1947. 15¢.

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Earnings of Women in Selected Manufacturing Industries, 1946. Bull. 219. 14 pp. 1948. 10¢.

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The Leading 10 Occupations of Women Workers, 1870-1940.

Women in Selected Clerical Occupations, 1870-1940.

Women in Selected Operative and Laborer Occupations, 1870-1940.

Women in Selected Service Occupations, 1870-1940.

Women in Selected Professional Occupations, 1870-1940.

Married Women in Population and in Labor Force, 1910-1947.

Marital Status of Women in the Labor Force, 1910-1947.

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Employment Opportunities in Characteristic Industrial Occupations of Women. Bull. 201. 50 pp. 1944. 10¢.

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Women's Emergency Farm Service on the Pacific Coast in 1943. Bull. 204. 33 pp. 1945. 10¢.

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Posters (7) showing women in wartime jobs.

RECOMMENDED STANDARDS for women's working conditions, safety, and health.

Standards of Employment for Women. Leaflet 1. 1946. 5¢ each. (Rev. 1948.)

When You Hire Women. Sp. Bull. 14. 16 pp. 1944. 10¢.

The Industrial Nurse and the Woman Worker. Sp. Bull. 19. 47 pp. 1944. 10¢.

Women's Effective War Work Requires Good Posture. Sp. Bull. 10. 6 pp. 1943. 5¢.

Washing and Toilet Facilities for Women in Industry. Sp. Bull. 4. 11 pp. 1942. 5¢.

Lifting and Carrying Weights by Women in Industry. Sp. Bull. 2. (Rev. 1946.) 12 pp. 5¢.

Safety Clothing for Women in Industry. Sp. Bull. 3. 11 pp. 1941. 10¢.

Supplements: Safety Caps; Safety Shoes. 4 pp each. 1944. 5¢ each.

Night Work: Bibliography. 39 pp. 1946. Multilith.

WOMEN UNDER UNION CONTRACTS

Maternity-Benefits Under Union-Contract Health Insurance Plans. Bull. 214. 19 pp. 1947. 10¢.

TRAINING

See "Outlook for Women in Occupations in the Medical and Other Health Services," Bull. 203; and "Outlook for Women in Science," Bull. 223, for training required in these professional fields.

See "Community Household Employment Programs," Bull. 221, for training recommendations.

Training for Jobs—for Women and Girls. [Under public funds available for vocational training purposes.] Leaflet 1. 1947.

WOMEN IN LATIN AMERICA

Women Workers in Argentina, Chile, and Uruguay. Bull. 195. 15 pp. 1942. 5¢.

Women Workers in Brazil. Bull. 206. 42 pp. 1946. 10¢.

Women Workers in Paraguay. Bull. 210. 16 pp. 1946. 10¢.

Women Workers in Peru. Bull. 213. 41 pp. 1947. 10¢.

Social and Labor Problems of Peru and Uruguay. 1944. Mimeo.

Women in Latin America: Legal Rights and Restrictions. (Address before the National Association of Women Lawyers.)

REPORTS ON WOMEN WORKERS IN PREWAR YEARS. Women at work (a century of industrial change); women's economic status as compared to men's; women workers in their family environment (Cleveland and Utah); women's employment in certain industries (clothing, canneries, laundries, offices, government service); State-wide survey of women's employment in various States; economic status of university women.

THE WOMEN'S BUREAU—Its Purpose and Functions. Leaflet. 1946.

Women's Bureau Conference, 1948. Bull. 224. 210 pp. 1948.

