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ABSTRACT

This manual represents an effort to communicate the experiences of the Visiting Women Scientists Program to those who may want to establish similar programs. The guide presents an overview, describes materials and procedures, and discusses those parts of the program which were not successful. The program, including a pilot project and final study, involved 91 women scientists, accompanied by field representatives, who met with more than 40,000 tenth-grade students. Described are the selection of the scientists, the roles of the field representatives and school contact persons, and procedures for selecting and contacting schools. (SA)

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Manual on Program Operations for the Visiting Women Scientists Program

by

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and

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I. INTRODUCTION

The National Science Foundation (NSF) recognizes that the underrepresentation of women in science careers is a serious waste of national talent. In order to develop and test methods of increasing the participation of women in careers in science, NSF inaugurated a Women in Science Program with three components: (1) Science Career Workshops for women undergraduate and graduate students in science, (2) Science Career Facilitation Projects for women who wish to reenter careers in science, and (3) a Visiting Women Scientists Project for high school students.

In June 1977 the Center for Educational Research and Evaluation of the Research Triangle Institute (RTI) in North Carolina was awarded a contract to design a pilot Visiting Women Scientists Program. This pilot program was conducted in the spring of 1978, and a similar program was conducted in the 1978-79 school year. In conducting these programs, 90 women scientists visited 247 secondary schools to motivate female students to consider and pursue careers in mathematics, engineering, and the physical, biological, and social sciences. In addition to giving nearly 40,000 students an opportunity to meet with woman scientist role models, the program provided information about career opportunities and presented examples of women scientists who successfully combine careers and full personal lives.

The purpose of this Manual on Program Operations is to share the experience gained in conducting the program over the last two years with others who may wish to design and conduct similar programs. The manual was written to do the following: present an overview of the program; describe program materials and procedures; discuss procedures and materials which were discontinued or revised; and recommend steps to avoid potential problems.

A. Overview of the 1978 Pilot Visiting Women Scientists Program

The design phase of the pilot program included the development of (1) a roster of women scientists, (2) a logistical plan for scheduling and conducting visits, (3) materials to be used in the program, and (4) plans for evaluation. A complete description of the planning activities can be found in the final report for the design phase.[1]

The objectives of the Visiting Women Scientists Program were: (1) to provide an opportunity for high school students to meet and interact with

women scientists as role models; (2) to provide examples of women in a variety of science careers; (3) to provide evidence of women who have combined personal lives and successful careers; (4) to provide information about the importance of science and scientists in solving world problems; (5) to provide information about science and technology job opportunities for women in the future, and equal opportunity laws and affirmative action programs which guarantee women access to these opportunities; (6) to provide information about the preparation needed for various science careers, the importance of keeping various options open, and the sources of financial aid which are available; (7) to encourage teachers and counselors to provide support and encouragement to women who are considering science careers; (8) to promote the attitude that science careers are appropriate for women; and (9) to encourage high school females to seek additional information about women in science careers, and to provide help in obtaining such information.

The pilot program consisted of visits to 110 high schools across the United States by 40 women scientists. RTI field representatives, who accompanied women scientists, were responsible for working with each school to establish a schedule, for preparing the woman scientist for her visits, and for assisting during the day of the visit. Each principal designated a staff member as the school contact person to work with the field representative in arranging the visit.

Typically, a circuit of three or four schools in a geographic area was visited during one week. Each visit consisted of some combination of the following: (1) a large group meeting of approximately 90 tenth grade female students; (2) seminars of approximately 25 females from grades 11 and 12 who were particularly interested in exploring science careers; (3) meetings with individual classes of approximately 30 students; and (4) a meeting with school staff, including counselors, librarians, and teachers.

Evaluation data from students, school contact persons, women scientists, and field representatives demonstrated that a Visiting Women Scientists Program for secondary schools is feasible. It functioned smoothly, and there was great interest in continuing it. Comparisons between experimental and control schools demonstrated that the program was effective in encouraging high school females to seek further information about women in science careers. A significantly larger percent of females in experimental schools requested information about women in science careers by returning a postage-paid postcard, and a

significantly larger percent of experimental schools indicated an increase in the number of female students seeking information about science careers in the month following the visit. The pilot program also demonstrated that sending a resource packet to schools, even without visiting them, is an effective means of making information available.

B. Overview of the 1978-79 Visiting Women Scientists Program

For 1978-79 the program remained essentially the same, with a few modifications suggested by those who participated in the pilot program. Visits were conducted by 51 women scientists and RTI field representatives to 12 junior high and high schools in North Carolina and a total of 128 schools in the areas of Los Angeles, Philadelphia, and Minneapolis-St. Paul.

Visitors generally went to three schools in one week, and each visit consisted of some combination of the following: (1) large group meetings of approximately 100 ninth and/or tenth grade females; (2) follow-up meetings to the large group, for approximately 30 females interested in science careers; (3) seminars of approximately 25 females from grades 11 and 12 who were particularly interested in exploring science careers; and (4) a meeting with school staff, including counselors, librarians, and teachers.

Since the effectiveness of the program was determined during the pilot program, there was no experimental-control comparison in the 1978-79 program. Evaluative data collected from students, school contact persons, women scientists, and field representatives showed that the program was well received. Student reactions were again very favorable, and women scientists and contact persons responded overwhelmingly for future participation.

The 1978-79 program included the development of a national Women Scientists Roster, with information about 1,300 women scientists across the country. It was developed for the use of school districts and organizations interested in conducting programs similar to the Visiting Women Scientists Program.

C. Outline of The Manual on Program Operations

This manual was developed to assist those who are interested in designing and conducting programs to bring women scientists in contact with female students. Those who desire more detail about procedures or wish to access specific materials not included in this manual should refer to the final reports for the 1978 pilot program and the 1978-79 program.[2]

Chapter II of this manual describes program activities and materials, and Chapter III describes the roles of the field representative and school contact person. The selection and preparation of women scientists are discussed in Chapter IV, while the selection and contact of schools are discussed in Chapter V.

II. DESCRIPTION OF PROGRAM ACTIVITIES AND MATERIALS

In the pilot program conducted between January and May of 1978, 40 women scientists visited 110 high schools across the United States. Accompanied by RTI field representatives, they met with approximately 15,500 high school students, including 13,500 females and 2,000 males. Between November, 1978 and May, 1979 field representatives worked with 51 women scientists in 140 junior high and high schools in 4 geographical areas, meeting with more than 24,000 students, almost all of them females.

A major purpose of the pilot program was to raise the consciousness level of tenth grade females while they could still redirect their high school programs to include more math and science. For eleventh and twelfth grade students the purpose was to reinforce females who had shown an interest in science careers. A number of persons in the pilot program suggested expansion to other grades, including the entire range from elementary school through college. It was decided that the Visiting Women Scientists Program, as designed, was appropriate for ninth graders; therefore, the 1978-79 program included ninth graders from both junior high and high schools.

Another modification was emphasis on arranging all-female meetings. The pilot program included some male and female groups to promote the attitude among both that science careers are appropriate for women; however, females rarely raised questions about the problems associated with combining family lives and science careers when males were present. Also, males often dominated discussions about science careers, thus reinforcing the notion that science is a male's domain. It was decided that males would not be included in the 1978-79 program.

A. Types of Meetings

After the visit date was scheduled by the RTI central staff, a letter was sent to the designated school contact person describing various types of

meetings. The field representatives then worked with the contact persons by telephone in arranging the specific activities to be conducted during the visit. (The contact person letter for the 1978-79 program is in Appendix A.)

There were two major differences between activities offered in the pilot and 1978-79 programs. First, during the pilot program the school contact person received a film entitled The Women's Prejudice Film[3] about one week prior to the visit to show to students who would be involved in the program. The film and an accompanying brochure were primarily awareness materials for female students who had not given much thought to the possibility of entering non-traditional careers. Although student reactions to the film were generally favorable, the logistical problems relating to its use were considerable. A number of schools did not receive the film in time; and the film distributor did not always include return postage, thus inconveniencing school contact persons. In addition, a few counselors and/or teachers previewed the film and decided the contents were inappropriate for their students. Therefore, the film was not distributed in the 1978-79 program. As in the pilot program, this film and three films specific to women in science careers were described in the List of Resource Materials which was in the resource packet.

The second major change was dropping meetings with intact classes and adding follow-up meetings after large group sessions. Class meetings were dropped after it was decided that males were no longer to be involved. Follow-up meetings, which were suggested by women scientists and school personnel in the pilot program, were designed to provide an informal forum for interested students who attended large group meetings.

The types of meetings which were included in the 1978-79 visit schedules are discussed below.

1. Large Group Meetings

Each school was asked to arrange a large group meeting of ninth and tenth grade female students. Large schools sometimes selected a portion of their ninth and/or tenth grade females for the meeting, or they arranged two or more separate meetings. Some high schools also included students from grades 11 and 12, and a few junior high schools invited seventh and eighth grade females. Large group meetings were designed to efficiently provide a large number of students an opportunity to meet a woman scientist role model and to show examples of women in a variety of science careers.

The field representative distributed copies of Careers in Science and Technology: More Women Needed (see Section C below), which presents some of the major messages of the program. She then proceeded with a prepared introduction which emphasized the following: (1) most women do work; (2) without proper planning women may have to stay in low-paying, unskilled jobs; (3) there are many opportunities for women in the sciences; and (4) while you do not need to be a genius to succeed in a science career, you do need to take the necessary science and mathematics prerequisites.

The 15-minute introduction included a series of slides of women scientists who represent a diversity of science fields, types of employment, ages, lifestyles, and race or ethnic backgrounds. These slides were used to illustrate a number of points: women scientists work on many kinds of tasks in many settings; scientists are often involved in finding solutions to important societal problems; and women scientists have combined successful careers with their personal lives in a number of ways.

The woman scientist was then introduced, and she usually took about 15-20 minutes for her presentation. There was a great deal of variation in these presentations, depending upon the activities and personalities of the particular woman scientist. Student and faculty evaluation in the pilot program showed that women scientists who brought "hands-on" demonstrations or slide presentations were generally more successful in gaining student attention. Therefore, the initial letter to women scientists in 1978-79 gave examples of successful demonstrations and urged them to prepare similar ones appropriate to their fields, resulting in more demonstrations in 1978-79. (The letter to women scientists is in Appendix A.)

In addition to presenting demonstrations and slides, the women scientists often discussed their education, training, and personal backgrounds. Many related how they happened to choose a scientific career; some had aspired to such careers from an early age while others seemingly stumbled into them. Some talked about how they resolved the problems associated with combining a career in science and technology with a family.

After the woman scientist had completed her presentation, the field representative displayed resources for the students including the Occupational Outlook Handbook,[4] I Can Be Anything: Careers and Colleges for Young Women,[5] and the Visiting Women Scientists Program resource packet. The contents of the resource packet were briefly discussed, with references to particularly

good publications. The field representative mentioned that the packets had pamphlets on specific areas of science plus information about financial aid, and she informed students where the resource packets were to be located in the school.

2. Follow-Up Meetings

In most schools in which a large group meeting was conducted there was at least 1 follow-up meeting of approximately 30 females. In many schools there were additional follow-up meetings; and in schools with only ninth grade students, the program sometimes consisted of one or two large group meetings and several follow-up meetings.

The follow-up meetings were designed to make informal sessions available to those who were particularly interested in exploring science career possibilities. In some schools participants were chosen by school staff based upon demonstrated interest and ability in science and mathematics, and in others they were self-selected. The major purposes were (a) to establish and reinforce the notion that women can be interested and successful in science careers, combining them with full private lives, and (b) to provide specific information in response to students' questions.

The field representative established an informal atmosphere. She often conducted one of the program learning activities developed specifically for the 1978-79 program (see Section C below). If the woman scientist had a demonstration other than the one used in the large group meeting, she would sometimes use it. If not, she often described her job in more detail, including anecdotes of experiences in her science career.

The field representative usually allowed approximately ten minutes for questions and then gave each participant an opportunity to obtain a copy of Thinking About a Career in Science and Technology: A Young Woman's Choice, which was developed to help students in career planning (see Section C below). She encouraged the students to use this and other sources to seek information about science careers.

3. Seminars

Schools were encouraged to schedule seminars for approximately 25 females from grades 11 and 12. Since juniors and seniors could not easily redirect their programs to include more math and science, schools were encouraged to select students who were particularly interested in a science career, or who were taking electives in math and science. Most schools scheduled at

least one seminar and many arranged two or three. Some schools limited participation to females taking elective mathematics and science courses, while others allowed the students to decide if they wanted to attend. The major purposes of seminars were the same as for follow-up meetings.

The field representative distributed copies of Careers in Science and Technology: More Women Needed and then gave a brief version of the introduction and slide presentation used with large groups. After about 15 minutes the woman scientist was introduced to conduct the seminar for 20-25 minutes. She often opened with a demonstration or slides and then discussed her job. In these all-female settings she was likely to add a discussion of the problems associated with combining a successful career and a family, using personal examples or those of a colleague.

There were some overriding themes which were generally covered: more women are entering the traditionally male fields of science and engineering; because of new attitudes and federal laws there are many opportunities for women in the sciences; one does not have to be a genius to succeed in a career in science or engineering, but high school females should take electives in science and mathematics to ensure the option of entering these careers later.

At least ten minutes were allotted for questions because it was reported in the pilot program that eleventh and twelfth grade females often had more questions than the younger students. Each student was given the opportunity to obtain a copy of Thinking About a Career in Science and Technology: A Young Woman's Choice and urged to use available information sources, as described above for large groups.

4. Staff Meetings

In the pilot program, contact persons were requested to arrange a meeting with representatives from various departments. There were some operational problems with those meetings. Participants often learned little about the purposes of the Visiting Women Scientists Program prior to the meeting, and some staff members were unable to attend during regular class periods. Some teachers also resented the loss of class time for participating students. In addition, the field representative did not have an established set of guidelines for conducting the staff meeting.

As a result of experiences in the pilot program, modifications were made for 1978-79. The presentation was brief (15-30 minutes) and structured. Field representatives were flexible in scheduling a time period for the meeting

to make it possible for as many interested staff members to attend as possible, e.g., before school, during lunch, or after school. Also, the contact person was provided with copies of a descriptive memorandum for distribution to school staff members prior to the visit (see Chapter V).

The meeting was to be scheduled with interested staff, including the following: guidance counselors; teachers in the areas of science, mathematics, and social science; librarians; and other interested school or district personnel. The major purposes of the meeting were: (1) to describe the purposes of the Visiting Women Scientists Program; (2) to describe the types of meetings conducted and the information presented; (3) to acquaint them with the resource packet and other valuable reference materials; and (4) to encourage them to be sensitive to the purposes of the program and to reinforce the ideas after the visit.

It was sometimes difficult to arrange a staff meeting, and they often had to be held during lunch or immediately after school. A staff meeting took place in 79 percent of the pilot schools and in 69 percent of the 1978-79 schools. Across both years only counselors and science teachers were represented in more than 75 percent of the meetings, while mathematics teachers and librarians attended about half of the meetings.

At the staff meeting the field representative introduced herself and the woman scientist. She then gave a brief overview of the program and reiterated the major points to be presented to students. She stated her hope that the interaction between the role model and students, along with the information and materials provided, would help influence the students' career planning. It was emphasized that the message for students was not to choose a specific career at this time, but to consider science careers and take high school math and science courses to keep their options open. Acknowledging that a one-day program cannot accomplish this by itself, the field representative stated that one purpose of the staff meeting was to enlist the teachers' help in reinforcing females to consider science careers.

The field representative then discussed resources for the students, as described for large group meetings. She displayed the resource packet, informed participants of the location of the two packets provided to the school, and distributed the List of Resource Materials, explaining that teachers could sometimes assist their students by referencing a relevant publication. Most schools placed the packets in the guidance center, counseling office, or library, while others placed one in the science department.

In closing, the field representative once again urged the teachers to reinforce the goals of the program and opened the meeting for discussion. The staff meetings often sparked meaningful discussion. Many teachers were keenly aware of the importance of career education and desired more knowledge about career opportunities in the sciences.

B. Meetings Conducted

The types of meetings scheduled in schools varied to accommodate specific school schedules and preferences. During the pilot program at least one large group meeting was conducted in 50 percent of the schools. After the 1978-79 principal and contact person letters were modified to encourage large group meetings, nearly 80 percent of the schools scheduled one or more. In both years, over 75 percent of the schools scheduled at least one seminar; and the average number per school was over 2.5. In 1978-79 at least one follow-up meeting was conducted in over 75 percent of the schools with a large group meeting. Visits were full and active. Across both years there was an average of more than four formal meetings with students per day. When staff meetings are added, the average number of meetings per day was almost five.

Students rated the various small group meetings very highly. Seminars were rated "excellent" by over 35 percent of participants across both years and "excellent" or "good" by at least 90 percent. During the pilot year, 26 percent of the students attending class sessions rated them "excellent," and another 57 percent rated them "good." In 1978-79, 41 percent rated follow-ups "excellent," and another 51 percent rated them "good."

Students who attended only large group meetings were not asked to complete questionnaires for logistical reasons. Visitors in the pilot program felt that the large group was the least effective type of meeting; however, they were continued because a large number of students could be reached efficiently. The more highly structured presentation in 1978-79 seemed to increase their effectiveness.

C. Materials Used in the Visiting Women Scientists Program

During the planning phase of the pilot program an extensive search was made for relevant available pamphlets, books, films, filmstrips, and bibliographies of additional materials. Publishers' catalogues were examined, and professional organizations and industrial firms were contacted. Materials

were examined for their appropriateness in meeting the objectives of the Visiting Women Scientists Program. Several materials were distributed to students or included in the resource packets given to participating schools, and others were referenced in a List of Resource Materials included in the resource packet. In addition, some materials were developed by RTI specifically for use in the pilot program. These included descriptive brochures, handout materials for students, and learning activities for occasional use by field representatives with students.

Since the objectives of the pilot and 1978-79 programs were nearly the same, it was not necessary to conduct another complete search for materials; however, some materials which had not been available at the time of the pilot program were included in the 1978-79 resource packet and List of Resource Materials.

Based upon experiences of the pilot program, some of the materials developed specifically for the program were discontinued or revised, while some new materials were developed. The materials used in the 1978-79 program are described below. Copies of some of them are included in Appendix B with the List of Resource Materials.[6]

1. Visiting Women Scientists Program Resource Packet and List of Resource Materials

The 1978-79 resource packet included materials about financial aid and career opportunities in the biological and physical sciences, engineering, mathematics, and social sciences. Two particularly good publications deserve specific comment. The 16-page illustrated booklet Women in Science and Technology: Careers for Today and Tomorrow[7] explores some of the myths and realities about women in science careers and the steps necessary to plan a successful career. I'm Madly in Love with Electricity[8] gives profiles of women in a variety of science areas, including pictures and quotations.

The List of Resource Materials describes the contents of the packet and has an annotated bibliography of materials and films judged to be especially good by RTI. In the pilot program each participating school received one resource packet. Because many pilot schools requested additional packets, each school in the 1978-79 program was given two packets and an opportunity to request as many as three more.

2. Visiting Women Scientists Program Brochure

This informational brochure gives a brief overview of the program. It was included with letters to Chief State School Officers, District Superin-

tendents, women scientists, and schools. It was also sent to persons who contacted RTI for information about the program.

3. Careers in Science and Technology: More Women Needed

This brochure, which has a cover resembling a "help wanted" section of a newspaper, provides information about current and projected employment opportunities in science and technology careers. It points out that some science fields, such as engineering, are particularly promising for women and that, in general, opportunities for persons trained in the sciences are greater in industry than in academia. The importance of keeping one's options open by getting a good background in mathematics is stressed, and several sources for obtaining additional information about careers are described. All students who attended a meeting in the 1978-79 program received this brochure.

4. Visiting Women Scientists Program Learning Activities

A number of learning activities (or modules) were developed for the pilot program, and three of them were revised for 1978-79. Field representatives used them as time permitted to provide information and to stimulate discussion about science careers and career planning.

The case study describes a fictitious but fairly common situation: both the brother and sister are good students; the parents are encouraging the son to go to college to become an engineer, but they have not spoken to the daughter. Students were asked to consider what they think should happen, and the field representative had a series of questions to stimulate discussion.

A matching exercise illustrated the diversity of science careers which are available. It was designed to be rather easy to complete to avoid giving students the impression that science is difficult. The sciences are separated into major categories: engineering, physical science and mathematics, life science, social science, and interdisciplinary. As an example, five different tasks associated with life science are listed, and the students are asked to match each example with one of five types of life scientists. After the students were given time to complete the matching exercises, the field representative led a discussion about these science careers.

A four-page booklet, entitled Thinking About a Career in Science and Technology: A Young Woman's Choice, shows students the importance of career planning. It presents steps for planning a career and describes some of the resources available to assist students, including the Visiting Women Scientists Program resource packets, the U.S. Department of Labor's Occupational Outlook

Handbook,[9] I Can Be Anything: Careers and Colleges for Young Women,[10] and school counselors. The field representative was provided with a series of slides to use in presenting this information to students, and copies of this booklet were made available to interested students.

5. Press Release

During the pilot program the goals of the Visiting Women Scientists Program were perceived as very timely and appropriate, which led to an unexpected number of contacts with the press. In 1978-79 a press release was sent to a representative of each participating school district, and field representatives had copies to use when contacted by the local press.

6. Evaluation Forms

A number of forms were developed to gather data about the feasibility and effectiveness of the Visiting Women Scientists Program. In the pilot program, data were collected from students and staff members in both visited schools and control schools. In addition, the women scientists, RTI field representatives, and RTI central staff members provided data about the visits. Similar data collection procedures were used in the 1978-79 program, with revisions to some of the forms. Students handed their completed forms to the field representatives, while school personnel and women scientists were given postage-paid envelopes to use in returning their forms. A copy of the 1978-79 Student Form is included in Appendix B. The forms used in collecting data from schools, women scientists, and field representatives are included in the two final reports.

There are a number of important considerations in planning for program evaluation. Among the decisions which must be made are those relating to the questions to be answered and the data sources to be used. For example, while the ultimate goal of the program may be to increase the number of women scientists, achievement of that goal cannot be measured for a number of years. In the pilot Visiting Women Scientists Program it was decided to limit the impact evaluation to determining if students were encouraged to seek additional information about science careers. School personnel as well as the students themselves were used as data sources.

It is important that the forms used in data collection be clear and unambiguous, and that they be designed to provide the necessary information with the least possible interruption to program activities and minimal respondent burden. Data processing issues must also be considered. For example,

multiple-choice type questions may be more difficult to construct than open-ended questions, but they provide major advantages in terms of data processing efficiency.

III. THE ROLES OF THE FIELD REPRESENTATIVE AND SCHOOL CONTACT PERSON

RTI established the roles of the field representative and school contact person to ensure that details of school visits would be successfully arranged and that logistical problems would be held to a minimum. In the pilot program both the conceptual role and individual performances of field representatives were evaluated highly by women scientists and school personnel. Likewise, school contact persons did a very good job of arranging for the visits. Both roles were continued for the 1978-79 program as described below.

A. Hiring Field Representatives

For the 1978 pilot program four field representatives were employed on a full-time basis for four months to visit schools in a particular region. In the 1978-79 program three field representatives were employed for four months to visit schools in one of three metropolitan areas. They were drawn from the following: (1) science graduate students with some experience in science; (2) recently graduated master's and doctoral students with work experience; and (3) unemployed scientists seeking short-term employment.

Field representatives were recruited by running an advertisement in metropolitan newspapers. The most qualified candidates were interviewed personally, and the following factors were considered: (1) the ability to relate to women scientists and school personnel as a facilitator and coordinator; (2) the ability to relate to school officials and students in public speaking, seminars, and media presentations; and (3) a flexible schedule.

B. Training Field Representatives

During the 1978 pilot program, the field representatives were given guidance and assistance from RTI staff about the use of various materials, presentation techniques, and scheduling. However, they also maintained a good deal of freedom in these areas, since it was the purpose of the pilot program to evaluate various materials and procedures for future use.

The three field representatives were asked to complete several preliminary activities in high schools prior to the one-week training session. The activities were designed for two purposes: to acquaint the field representatives with the program, and to field test the procedures and materials. The field representatives also visited local high schools and conducted additional program activities during the training session. Based upon these experiences, RTI staff revised procedures and materials for the pilot program.

The pilot program materials and procedures that proved most successful were revised, field tested during the fall of 1978, and incorporated into a more highly structured form for the 1978-79 program. Through this process the role of the field representative also became more specifically defined, and the 1978-79 training session included more detailed instruction.

Prior to the one-week training session for 1978-79, the field representatives studied several materials designed to teach them about specific careers in science and technology, a need which became evident during the pilot program. The field representatives for the 1978-79 program were more adequately prepared for student questions about specific science careers, and their presentations and materials included more information about available resources. Other materials developed by RTI staff for study prior to the training session involved the following: their roles in preparing women scientists and contact persons for the visits; the logistical concerns in scheduling various meetings in schools; basic content and supplemental information for major presentations; and administrative procedures for completing program forms.

RTI staff arranged two complete school visits during the training session so the new field representatives could observe and participate in typical visits. The first visit was conducted by a field representative from the pilot program and an experienced visiting woman scientist. During the second visit each field representative conducted at least one meeting. These visits were discussed by the group, and individual conferences were held after the second visit. RTI also arranged conference calls to school contact persons so the new field representatives could listen to the scheduling of actual visits.

Field representatives spent the remainder of the training session studying the career materials and training manual. They discussed situations that might arise in the schools and established guidelines for dealing with school staff and women scientists. During the week following the training session, they studied procedures, called RTI with questions, and began calling contact persons and women scientists.

C. The Role of the Field Representative

Field representatives were local liaisons, arranging the details of school visits with school contact persons and ensuring that each woman scientist was prepared for her visits. After RTI established a tentative visit date, a letter was sent to the school contact person who had been designated by the principal to arrange the visit. This letter discussed the general parameters of the program and named the field representative who would call to develop a visit schedule (see Appendix A for the contact person letter). The field representative maintained telephone contact with each school contact person, often making as many as five calls to arrange a final detailed schedule and be sure that facilities and equipment would be available.

RTI staff selected women scientists and sent them materials which described the program and their general role in the visits (see Chapter IV). The field representative informed the woman scientist of the detailed meeting schedule in each of her schools and discussed her specific roles and presentations. She called the woman scientist by telephone and occasionally met with her prior to the first visit. Typically, women scientists incorporated many suggestions of the field representative for the first visit; however, once the visits began, the field representative and the woman scientist worked together to plan and revise presentations.

During visits, field representatives assisted with many of the activities and worked with school contact persons to resolve problems. They also handed out materials to students and collected student evaluation forms. After visits to all schools in the circuit, the field representatives wrote personal thank-you letters to contact persons and women scientists, and they completed RTI reports about activities and problems in each school.

D. The Role of the School Contact Person

Each principal designated a staff member as contact person to work with the field representative in arranging the visit. Most contact persons were either science teachers, including department heads, or counselors. In a few cases, principals or assistant principals served as contact persons.

The activities of the school contact person prior to the visit were: communicating with RTI staff to confirm the visit date; working with the field representative to arrange facilities and other details; and distributing memoranda and communicating with faculty members in preparing for the visit.

This required a good deal of effort but was not overly time-consuming. Across both years most contact persons reported spending from two to five hours in arranging the visit, although many spent six to ten hours.

Most school contact persons also spent considerable time with the field representative and woman scientist during the day of the visit. They helped arrange for students to attend sessions, attended the staff meeting, obtained necessary equipment and facilities, and accompanied the visitors through unfamiliar surroundings. Over 95 percent of the contact persons said they would be willing to coordinate the program again.

E. Use of Field Representatives and School Contact Persons in Similar Programs

Data collected in both years indicated that the use of field representatives and school contact persons worked very well. Women scientists in the 1978-79 program rated field representative performance in five categories: preparing them for visits; working with them during the visits; interacting with school personnel; interacting with students; and knowledge of various careers. Field representatives were rated "excellent" by at least 63 percent of the women scientists in each category; and at least 96 percent rated them "excellent" or "good."

Contact persons in 1978-79 rated field representatives in four categories: working with them in scheduling; interacting with students; knowledge of various careers; and enthusiasm about the program. At least 72 percent of the contact persons rated them "excellent" in each category, and at least 96 percent rated them either "excellent" or "good."

Some women scientists commented about the logistical support which allowed them to concentrate on their presentations. Others appreciated the fact that the field representatives were able to brief them about specific characteristics of each school based upon discussions with school contact persons. Some also remarked favorably about the way field representatives related with school personnel and about the added diversity from having a second woman scientist during the presentations. One woman scientist commented:

> I have done quite a bit of volunteer work of this nature in the past, and have often had trouble being met (the office did not know I was coming, etc.) and also arranging in advance just what was expected of me (what materials to bring). It was most pleasant having someone to smooth the way for me, and to get treated like a V.I.P. at the schools. The schools couldn't have been nicer or more helpful...

The basic field representative role is considered to be essential in conducting an effective Visiting Women Scientists Program in more than a very small, autonomous situation. Someone must coordinate communications between the school and the woman scientist to ensure a smooth visit.

With very few exceptions, women scientists and field representatives reported that schools were very well prepared, due in great part to the efforts of the contact persons. The contact person is considered to be essential. At the very least, someone in the school has to be responsible for arranging for the necessary rooms and equipment (such as a slide projector), as well as establishing a meeting schedule for students and ensuring they get to the meetings. Given the very busy schedules of principals, it seems an excellent idea to have them designate a contact person. There is usually a member of the science, mathematics, or guidance department who supports the goals of the program and is willing to coordinate the visit.

IV. SELECTING AND PREPARING WOMEN SCIENTISTS

A. Methods Used in the Visiting Women Scientists Program

One purpose of the pilot program was to test methods for obtaining women scientists for visits. Application forms were mailed to approximately 1,200 women scientists from several sources: (1) samples from rosters of professional organizations; (2) recommendations from various disciplines and organizations; (3) responses to program announcements in newsletters such as The NSF Bulletin; (4) articles such as Space for Women[11] and I'm Madly in Love with Electricity,[12] which portrayed women scientists; and (5) registration lists of the national conventions of the Society of Women Engineers and the Engineering Foundation.

Announcements in professional newsletters were very productive. Several hundred women scientists contacted RTI after seeing an announcement, and 70 percent of these completed application forms. By comparison, mailing unsolicited applications to women on rosters of professional organizations yielded a rather small return rate (24 percent). Return rates for names obtained from pamphlets about women in science and from recommendations were 42 and 46 percent, respectively. More than 600 women scientists completed application forms for the pilot program.

Forty women scientists conducted the pilot visits, and 51 were selected for the 1978-79 program. For cost reasons, geographic location was a prime consideration in selection. In addition, care was taken to ensure a balance of educational, occupational, and personal characteristics. Typically, one woman scientist, accompanied by an RTI field representative, visited several schools in a single week.

One difficult decision is how many consecutive visits are to be made by each scientist. Since the amount of preparation time for several visits is not appreciably more than that for one, it is efficient to have each scientist visit several schools. Women scientists typically visited two or three schools in a single week, and many indicated that the experiences of the first day helped them improve their presentations. However, four visits in a single week were clearly too many; most indicated that they became exhausted and found it difficult to maintain their enthusiasm. Due to scheduling constraints some women scientists visited one or two schools during one week and then visited others in later weeks. This procedure worked well and may be practical for some programs.

Training or orientation of the women scientists is very important. Prospective visitors should understand what is expected of them, and they must be given guidelines for their presentations. Most women scientists have not prepared presentations for the specific program purposes, and many have not worked with teenagers in schools. In the Visiting Women Scientists Program each woman scientist received a letter explaining the purposes of the program and describing the activities to be conducted. The field representative then communicated with each woman by telephone, helping her tailor her presentation to the needs and interests of students.

The letter sent to participating women scientists in the 1978-79 program is included in Appendix A. Women scientists were requested to prepare remarks about how they decided upon a science career, their job activities, and how they combine a career with other pursuits. It was recommended that she include a demonstration, and examples were given along with guidelines for preparing one. Some cautionary remarks were also included, such as avoiding the appearance of recruiting for their science fields or companies and avoiding the advocacy of any one lifestyle.

Although program presentations covered a variety of science areas, the visitor's area inevitably received more attention than others. Other programs

may wish to have several women scientists or perhaps a number of both male and female scientists visit the school together or over a period of days. During the 1978-79 program the team approach was tried by having two women scientists visit several schools with a field representative. Women scientists and school staff were positive about this approach. The contrast between women was enlightening and informative, and students received a more varied picture by learning about two careers and lifestyles and observing the interaction of the three visitors.

One problem with teams in the Visiting Women Scientist Program involved costs. The women were reimbursed for travel expenses and provided an honorarium ($100 per day); therefore, the team approach considerably increased the cost per visit. If no honorarium were paid or if it were small, cost would not be so important.

Another difficulty with the team approach was lack of time. In a typical school period, there was not enough time for two women scientists to make complete presentations, especially when one scientist tended to dominate. This was improved when follow-up meetings were scheduled, because students had an opportunity to explore additional ideas with each woman. If class periods could be combined and more time allotted per meeting or if an additional day were available, the effectiveness of the team would be increased.

When women scientists were asked how much time they spent in preparing for visits, the average was less than 10 hours, and most reported spending between 6 and 12 hours. It is advisable to encourage women scientists to prepare carefully for the visit, using established guidelines; and if there is remuneration for time spent in the program, preparation time should be reimbursed.

There were only minor difficulties in scheduling women scientists for visits. It was more difficult in the pilot program, because some women had to make commitments to travel large distances. When there was a last-minute cancellation, it was difficult to obtain a replacement; for this reason five schools were visited solely by a field representative. Scheduling was considerably easier in 1978-79 because the visits in each area were conducted within a 50-mile radius and nearly all women scientists were from the geographical area of the school. It was relatively easy to substitute another woman scientist for a visit on short notice.

One difficulty in the 1978-79 program was finding minority scientists to visit some schools with large minority enrollments. Suggestions had been made to utilize minority women scientists as role models in minority schools whenever possible, as well as in other schools. Minority women visited 43 of the 140 schools in 1978-79; 16 of those schools were predominantly white, while 27 had greater than a 60 percent minority enrollment. However, obtaining minority women scientists was often difficult. Industries and various minority organizations were contacted for recommendations, and an announcement was placed in the NSF Bulletin. When the original sources did not provide a sufficient number of minority women in Los Angeles and Philadelphia, additional contacts were made to find women scientists near those cities.

The following steps are advisable in obtaining women scientists: make initial contacts and commitments well in advance; before a commitment is made, be sure the prospective women scientists fully understand the program's purposes and procedures; and provide adequate written guidelines and someone who can answer their questions during preparation. Nearly all women scientists who desired to participate in the Visiting Women Scientists Program shared the goals of the program and were eager to work with students. However, most needed some help in preparing to share their experiences with teenagers, and they welcomed RTI's assistance.

B. Development of a Women Scientists Roster

As a result of suggestions in the pilot program, a national Women Scientists Roster was developed for use by schools, districts, and organizations interested in conducting similar programs. This roster includes approximately 1,300 women scientists who are interested in encouraging females to consider science careers. They come from the 50 states, Canada, Puerto Rico, and D.C.; and they represent all areas of science and a variety of educational, employment, and race or ethnic background categories.

The roster was developed by contacting nearly 900 women who had expressed interest in participating in the pilot program and by announcing its development in the NSF Bulletin and other professional publications. The roster consists of two lists. One is ordered alphabetically by last name and contains all available information: name, mailing address, phone number, general and specific areas of science, highest degree, 1978 employment, and race or ethnic background. The second is ordered alphabetically by state, numerically by zip

code, then alphabetically by last name. It shows the city, general area of science, and race or ethnic background of each woman scientist.

The Women Scientists Roster will be available through The National Science Teachers' Association, an affiliate of the American Association for the Advancement of Science.[13] It should prove useful in locating women scientists who are willing to meet with students. Scientists could be invited to give assembly presentations, meet with classes, or talk with small groups of interested students. It may also be possible to arrange for some interested students to visit the scientist at her place of work.

Some schools or program organizers may wish to locate additional women scientists. They might place an announcement in local newspapers or industrial newsletters, which describes the activities and types of persons needed and requests that interested persons contact them. Some groups have also had success in obtaining visitors by contacting local industries, although this approach was not particularly effective in the Visiting Women Scientists Program.[14] The American Association for the Advancement of Science (AAAS) has compiled a directory of handicapped scientists[15] (both male and female) which is an available resource, and the AAAS is currently developing a Minority Women in Science Network.

V. SELECTING AND CONTACTING SCHOOLS

A. Obtaining Permission to Contact the Schools

A program conducted by district personnel within their own school system is an internal matter and will follow procedures established for programs involving school visitors. For example, some school systems require that the Board of Education review all written materials to be distributed to students. When a program will be conducted by persons external to a school system or across a number of districts, the problems of protocol become more complex. It is essential that program planners inform appropriate school authorities of any contacts within their jurisdiction and obtain the necessary permission. Some of the considerations involved in obtaining permission to contact schools are discussed below.

Due to the increasing number of research studies, state education officials have taken steps to control access to the public schools. The Council

of Chief State School Officers has established the Committee on Evaluation and Information Systems (CEIS) which screens research studies in public schools. It is extremely difficult to obtain state permission to conduct any study without CEIS approval.

It is not clear whether a Visiting Women Scientists Program should be considered a research study. While such a program is primarily a service to the schools, it may also include a considerable amount of data collection in its planning and evaluation. To avoid possible problems in obtaining state clearance of the pilot and 1978-79 Visiting Women Scientists Programs, CEIS was asked to review program plans.

Chief State School Officers (CSSO's) in the states with participating schools were then contacted. They were given a program brochure, a copy of the CEIS approval form, a list of the schools to be contacted, and a collect phone number for any questions or concerns. Several CSSO's contacted RTI to indicate their endorsement of the program; none raised any objections.

When a program operates entirely within one state, it should be possible to obtain permission to contact local districts from state officials. When a number of states are involved, it may be helpful to obtain CEIS approval prior to contacting the CSSO's. In either case, it is important that the CSSO be informed of plans to visit public schools in that state. Otherwise, critical delays may be encountered during program implementation while district officials determine if the program is sanctioned by the state.

In most cases state officials will leave approval of visits to local districts. Since district superintendents are directly responsible for activities in their districts, they must be provided advance information and the opportunity to approve or disapprove. It is best to contact superintendents well in advance of the actual visits so they have ample time to react. In the pilot Visiting Women Scientists Program superintendents usually received a copy of the letter to be sent to their principals approximately three months before the visit. This provided ample opportunity for them to communicate with RTI and their principals in determining whether to approve the program.

In the 1978-79 program district personnel were integrally involved in early planning. Science and/or mathematics coordinators in certain large public and parochial school systems were contacted to determine if their districts wished to participate, and the CSSO and district superintendent received copies of the correspondence. Letters of invitation were mailed to

principals only after district approval was obtained. As the program progressed, other districts and schools were contacted using the same protocol.

B. Selection of Schools

The pilot program was designed to evaluate the feasibility and effectiveness of a Visiting Women Scientists Program, and school selection procedures were designed with these evaluation needs in mind. A probability sample of 324 U.S. high schools (including public, private, and parochial schools) was selected. Each principal received a descriptive brochure, a letter asking if the school wished to participate, and a form and postage-paid envelope to use in indicating interest. These materials were mailed in mid-October with a cutoff date in early December for receipt of forms.

A total of 134 of the 324 schools indicated they would like to participate, and 13 declined. The remaining 177 schools did not respond, and it was assumed they were not interested.[16] It was estimated that roughly 40 percent of the high schools in the United States would wish to participate in the Visiting Women Scientists Program if given the opportunity to do so, using contact procedures similar to those used in the pilot program. However, the percent of interested schools varied depending on region, type of community, and size of school. For example, urban schools were significantly less likely than others to be interested in participating in the program. Therefore, it is necessary to decide whether to visit only those schools which express interest, regardless of the balance, or to use procedures that will ensure a better balance. For example, it would be possible to compensate for the smaller percent of urban schools expected to indicate interest by making initial contacts with a larger number of urban schools. For the pilot program it was essential that participating schools represent a good cross-section of U.S. schools to test the program under a wide range of conditions; therefore, additional schools were selected to provide better balance.

Those schools which had indicated interest before the cutoff date were grouped geographically into 30 clusters for selection of experimental schools (which received a visit and a resource packet) and control schools (which received only a resource packet). Schools within each cluster were randomly assigned to experimental and control groups, using a procedure which assigned approximately 1/3 of the schools to the control group. There were 40 control schools.

Some additional schools were then scheduled for visits. Of the 110 schools visited in the pilot program, 75 were experimental schools and 35 were additional schools. The 35 additional schools were placed within the 30 geographical clusters, which constituted circuits to be visited during a single week.

For the 1978-79 program a more cost-effective operation was devised. The program was localized in three areas, and costs were reduced by using local field representatives and women scientists. Although a random sample was not selected, it was considered important to include a reasonably diverse group of schools. In order to increase the number of urban schools, visits were conducted in three metropolitan areas. Interest and participation by the major urban district(s) were prerequisites for conducting the program in each area.

The three metropolitan areas were Los Angeles, Philadelphia, and Minneapolis-St. Paul. School officials in the county of Los Angeles and the school district of Philadelphia had indicated interest during the pilot program, but the pilot design made it impossible to include them. When recontacted for the 1978-79 program, both expressed interest. Minneapolis-St. Paul was selected as a midwestern area which would provide diversity. Four of the larger districts in that area were contacted, and all indicated interest. The archdioceses in the three areas also expressed interest when contacted.

In Minneapolis-St. Paul it was possible to invite all junior high and high schools in the four districts, while also including private and parochial schools. In Philadelphia, the program was initially offered to senior high schools and some parochial and private schools. In Los Angeles, county office personnel selected one high school and an alternate per district, and a few parochial and private schools were included. Alternate schools were used when scheduled schools could not participate. When original contacts did not provide enough schools in Philadelphia and Minneapolis-St. Paul, additional districts were invited to participate.

Concentrating the visits in local areas rather than using a national probability sample of schools has advantages including reduced travel costs and improved communications with schools and field staff. In addition, the fact that the visitors generally lived and worked in the local area helped the students identify with them, and it may be possible for future visits to be arranged by schools. The major disadvantage is that evaluation results may not be generalizable to the nation.

In the pilot program initial communications were restricted to mail and telephone. Communication with district-level personnel was limited to sending the superintendent a copy of the initial letter to principals. In 1978-79 RTI worked closely with district personnel in planning school contacts. For example, one superintendent wrote a letter of endorsement, which was later included with the principal letter, and his mathematics coordinator arranged for RTI personnel to meet with the school science and mathematics chairpersons to discuss the program. The preliminary meeting was beneficial to the field representative in establishing a working relationship with some contact persons in the first telephone call; however, it was not a necessary step for a successful visit.

C. Communications with the Schools

While it is possible to work with teachers, department chairpersons, or counselors as contact persons in planning the details of the program, it is inappropriate to do so without the full approval of the principal. In both the pilot and 1978-79 programs the principals received letters describing the program and asking them to complete application forms if their schools were interested. (Copies of the 1978 principal letter and principal form are included in Appendix A.) Only after the principal approved and designated a contact person did RTI communicate with another staff member.

In the pilot program the principals were asked to provide information about the school's size and type of community, school enrollment, race or ethnic composition of the school, and the dates on which the school was not in session at the same time they were asked to designate a contact person. In the 1978-79 program the principal was asked to provide only the name of a contact person and information about visit dates. All other information was obtained later from the contact person. There were two reasons for this: (1) principals might be more likely to complete a brief form, thus increasing the percent of participating schools; and (2) obtaining information from contact persons would get them involved in the program early.

This was a good decision, but it sometimes caused a problem in selecting minority women scientists as role models in minority schools. When there were delays in receiving completed school information forms from contact persons, information about race and ethnic composition of schools had to be obtained from the district. It would have been preferable to obtain this specific piece of information from the principal in the initial contact.

One important function of the contact person was to be a liaison between the visitors and teachers. In the pilot program contact persons were not given sufficient assistance by RTI; therefore, many teachers were not adequately informed about the program. For the 1978-79 program, materials were made available to interested contact persons for distribution to teachers. These included: a memorandum which described the program and backgrounds of the visitors; a program brochure; and a list of the science career resource materials in the resource packet. The contact person indicated the number of copies desired. In some schools contact persons distributed materials to all staff members; in others they gave them only to selected persons, such as science and mathematics teachers. This additional communication proved to be effective. Teachers were more willing to release their students, and those who attended staff meetings were generally better prepared and more enthusiastic than during the pilot program.

D. Scheduling the Visits

While it would be desirable to have each school select the date for its visit, this is usually not possible. The circuit approach used in the pilot program necessitated scheduling as many as four visits in a geographic area for a single week, and it was not feasible to allow the schools to choose the exact visit dates. The visits were scheduled by RTI, and contact persons were informed of the dates by letter. Care was taken to avoid dates on which the principal had indicated school was not in session, but 26 percent of the schools experienced difficulty with the scheduled date. The most common scheduling problems were: (1) schools closed due to snow, (2) the visit date was immediately before or after vacation, and (3) the visit date conflicted with other activities such as competency testing or teacher workdays. In some cases, the schools wished to reschedule the visit; however, the fact that the schools were so widely dispersed occasionally made rescheduling impossible.

The 1978-79 program allowed a good deal more scheduling flexibility. Schools indicated dates they would most like to be visited, as well as dates which were impossible or inconvenient. Since there was a field representative in each of the three areas and the women scientists were from the local area, it was much easier to rearrange visit schedules without increasing costs. During the 1978-79 program 19 percent of the schools experienced scheduling difficulties, for the same reasons as in the pilot program. In all but one case the visits were rescheduled.

EPILOGUE

It is the wish of those at NSF who have been associated with the Visiting Women Scientists Program that others will conduct similar programs at the local level. The recommendations in this manual and the list of women scientists in the Women Scientists Roster should help those who plan and conduct such programs. NSF is interested in having knowledge of the purposes and designs of these programs. If you are involved in such a program, please send information about the purposes, audiences, and plans for the program to the following:

Women in Science Program
Division of Scientific Personnel
Improvement
National Science Foundation
Washington, DC 20550

FOOTNOTES

[1] "The Development of a Visiting Women Scientists Program for Secondary Schools: Phase I Final Report." National Science Foundation, Washington, DC, October 1977.

[2] The two reports are:

"The Visiting Women Scientists Pilot Program, 1978, Final Report." Iris R. Weiss, Carol Place, and Larry E. Conaway, National Science Foundation, Washington, DC, August 1978.

"The Visiting Women Scientists Program, 1978-79, Final Report." Carol Place, Larry E. Conaway, Iris R. Weiss, and Mary Ellen Taylor, National Science Foundation, Washington, DC, August 1979.

The pilot report is available from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, Virginia 22161. The access number for the full technical report is PB286372/AS ($9.00), and the Highlights Report is PB286373/AS ($4.00). The pilot report has also been submitted to the Educational Resources Information Center (ERIC). The 1978-79 reports will be submitted to NTIS and ERIC in the fall of 1979.

[3] The Women's Prejudice Film, Sandler Institutional Films, Inc., Hollywood, California.

[4] Occupational Outlook Handbook, U.S. Department of Labor, Bureau of Labor Statistics, Washington, DC, 1976.

[5] I Can Be Anything: Careers and Colleges for Young Women, Joyce Mitchell, College Entrance Examination Board, Princeton, New Jersey, 1978.

[6] These materials are not copyrighted and may be reproduced as needed. It is requested that the source be acknowledged as follows: "Prepared by the Center for Educational Research and Evaluation, Research Triangle Institute, as part of the National Science Foundation-Supported Visiting Women Scientists Program."

[7] Women in Science and Technology: Careers for Today and Tomorrow, American College Testing Program, Iowa City, Iowa, 1976.

[8] I'm Madly in Love with Electricity, Nancy Kreinberg, Lawrence Hall of Science, University of California, Berkeley, 1977.

[9] Occupational Outlook Handbook, op. cit.

[10] I Can Be Anything: Careers and Colleges for Young Women, op. cit.

[11] Space for Women, Center for Astrophysics, Harvard University, Cambridge, Massachusetts, 1976.

[12] I'm Madly in Love with Electricity, op. cit.

[13] The National Science Teachers' Association, 1742 Connecticut Avenue, NW, Washington, DC 20009, $3.50.

[14] RTI's letters to companies requesting names of women scientists often went unanswered, and repeated telephone contacts were also unsuccessful in many cases. It may be that contacts from local schools would yield better results. Another problem was that some individual scientists or companies perceived a recruiting function when contacts were made through companies.

[15] Resource Directory of Handicapped Scientists, Jane Yensford Owens, Martha Ross Redden, Janet Welsh Brown, ed., AAAS, No. 78-13, Washington, DC, 1978. (This publication is available from the American Association for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036; AAAS Publication No. 78-13.)

[16] No attempt was made to encourage these schools to respond since the original plans approved by CEIS and the CSSO's indicated that schools which did not respond would not be recontacted.

APPENDIX A

1978-79 Principal Letter and Principal Form

1978-79 School Contact Person Letter

1978-79 Women Scientists Letter

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

CENTER FOR EDUCATIONAL RESEARCH AND EVALUATION

Dear Principal:

The National Science Foundation (NSF) is supporting a Visiting Women Scientists Program to encourage high school girls to consider pursuing careers in science (including social science, mathematics, and engineering as well as biological and physical science). The program will be conducted by the Research Triangle Institute (RTI) during January through May, 1979 in Philadelphia and in two other areas of the United States. The purpose of this letter is to determine if your school wishes to participate in this program.

The enclosed brochure describes the Visiting Women Scientists Program in some detail. Visits will include (1) at least one large group meeting of 9th and/or 10th grade females, (2) one or more follow-up seminars for interested females who attended the large group meeting, and (3) one or more seminars for 11th and 12th grade females who are particularly interested in science, mathematics or social science. We would also like to schedule a meeting with interested staff members to discuss the program and methods for assisting students to learn more about science career opportunities. In addition, participating schools will receive two Resource Packets of science career materials.

If you are interested in having your school participate in the Visiting Women Scientists Program, please return the enclosed form to RTI in the postage-paid envelope that has been provided as soon as possible. We will work with the "contact person" you designate in scheduling, planning, and conducting a visit which will be valuable to the participants without causing undue disruption to the normal operations of your school. Brief questionnaires will be given to some of the participants to evaluate the program.

We feel that the Visiting Women Scientists Program will be a valuable contribution to your ongoing career education activities and look forward to the opportunity to provide this service to your school.

Sincerely,

Ms. Carol Place
Project Director
Visiting Women Scientists Program

CP:cr
Enclosures

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

VISITING WOMEN SCIENTISTS PROGRAM

PRINCIPAL FORM

1. The daylong visit will be scheduled between mid-January and early May, 1979. We will attempt to schedule the visit at a convenient time for you.

   a. Are there periods of time (e.g., weeks or months) when you would prefer the visit be scheduled? If so, please indicate.

   _____

   b. Are there specific dates during which school will not be in session or a visit would be impossible? If so, please indicate.

   _____

2. Please provide the name, title, and phone number of the person that we should contact to discuss details of the program. This person should be available to assist in scheduling the visit. It would also be helpful if he/she could accompany the women scientists during the day of the visit. We will contact this person within the next few weeks.

Contact Person's Name: _____
(Include Ms., Mr., Dr., etc.)

Title or Staff Position: _____

Phone Number: Area Code ( ) _____

School Name: _____

School Mailing Address: _____

_____

Principal's Name: _____

THANK YOU FOR YOUR COOPERATION.

PLEASE RETURN THIS FORM AS SOON AS POSSIBLE TO RTI IN THE ENCLOSED POSTAGE-PAID ENVELOPE.

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

February 12, 1979

[Contact Person's
Name and Address]

Dear [Contact Person]:

Your school will be participating in the National Science Foundation's Visiting Women Scientists Program to be conducted by the Research Triangle Institute (RTI) of North Carolina. An RTI Field Representative and a woman scientist from your area will visit your school for the entire day on [day and date of visit], and meet with female students and staff members. The purpose of the program is to encourage female students to consider careers in science, including biological science, physical science, mathematics, social science, and engineering.

Your principal has designated you as the person to contact in making the arrangements for the visit. Typically a visit will include 4 or 5 meetings with students and a brief meeting with some staff members. Each visit must include at least one seminar of no more than 30 interested 11th and 12th grade females and one large group meeting of 9th and/or 10th grade females. These meetings are described below and our Field Representative will work with you in planning a visitation schedule that is appropriate for your school.

1. One or more seminars, each consisting of 20-30 11th and 12th grade female students. Teachers could designate students with particular interest or ability in science and mathematics or students could be provided the opportunity to decide to attend a seminar.

2. A large-group meeting of up to 150 9th and/or 10th grade female students. If your school has more than 150 of these students or if there is no room to accommodate this many at once, multiple large group meetings can be conducted. Since slides will be shown at the large-group meetings (and possibly at other meetings as well), it will be necessary for you to provide a slide projector.

3. One or more meetings with small groups of 9th and/or 10th grade females who attended the large group meeting (no more than 40 per meeting). These students should be selected based on their interest or ability in science or mathematics.

4. A brief meeting with guidance and/or career counselors, the school librarian, and as many science, mathematics, and social science teachers as possible. (If other district or school personnel are interested they are also welcome to attend.)

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

The purpose of the meeting will be to discuss ways to assist female students in obtaining information about science career opportunities. As part of this, you might like to have a librarian, counselor, or other knowledgeable person talk briefly about the relevant resources (such as the Occupational Outlook Handbook) already available in the school. The visitors will then describe the science career materials in the Resource Packets which are being given to the school.

You will note that male students are not included in any of the program activities. In the pilot program conducted last year we included males in some sessions to see if we could promote the attitude among both males and females that science and technology careers are appropriate for women as well as men. Because of their overall greater interest in science, male students often dominated discussions about science careers and thus may have reinforced the notion that science is a male's domain. In addition, female students almost never raised questions concerning the problems associated with combining personal lives and successful careers when males were present. For these reasons, it was decided not to include males in the 1978-79 program.

Please complete the enclosed green School Information Form and return it to RTI as soon as possible in the postage-paid envelope that has been provided. The form requests certain information we need to plan the visit. Questions 2a and 2b refer to a faculty and staff memorandum which RTI will prepare and ask you to distribute; a draft of the memorandum is enclosed. We would like you to indicate the number of copies of this memorandum you will need. Some schools will wish to distribute these to all faculty and staff, while others will wish to distribute them to a limited number of faculty and staff who will have students involved in the program or who have a particular interest in the program's purposes.

When we receive your completed form, we will send you the requested number of memoranda, as well as several announcements of the program for you to post. We will also send you two Resource Packets containing science career materials. [Field Representative's name], the RTI Field Representative who will accompany the woman scientist during the visit, will call you shortly to work out the details of the visit.

We appreciate your assistance and look forward to working with you in this program. If you have any questions, please feel free to call me collect at (919) 541-6318.

Sincerely,

Carol Place, Project Director
Visiting Women Scientists Program

CP:cr
Enclosures

[Date]

[Woman Scientist's
Name and Address]

Dear [Woman Scientist]

We are delighted that you will be participating in the National Science Foundation's Visiting Women Scientists Program. The program is designed to encourage junior high and high school females to consider careers in science and technology. (Please note that NSF defines science to include mathematics, engineering, and social science, as well as biological and physical science.) The pilot Visiting Women Scientists Program conducted last year was quite successful, and we hope to build upon those experiences to have an even better program in 1978-79. I am enclosing a yellow brochure which describes the purposes and procedures of the 1978-79 program.

The objectives established for the Visiting Women Scientists Program are as follows:

1. To provide an opportunity for high school students to meet and interact with women scientists as role models.
2. To provide examples of women in a variety of science careers.
3. To provide evidence of women who have combined personal lives and successful careers in a variety of ways.
4. To promote the attitude that virtually all careers, including those in science and technology, are appropriate for women as well as men.
5. To provide information about science and technology job opportunities for women in the future (including emerging careers), and about equal opportunity laws and affirmative action programs which guarantee women access to these opportunities.
6. To provide information about the preparation needed for various science careers, the importance of keeping various options open, and the sources of financial aid which are available for obtaining this preparation.
7. To encourage students to seek additional information about women in science careers, and to provide assistance in obtaining such information.
8. To encourage teachers and counselors to provide support and encouragement to women who are considering science careers.

To accomplish these objectives, you and an RTI Field Representative will be meeting with students, teachers, counselors, and librarians in each school. You are scheduled to conduct visits the week of _____. The schools and dates for your school visits are as follows:____ Any changes in this schedule will be confirmed by the Field Representative when you speak with her. Each one-day visit will consist of some combination of the following meetings:

1. a large group presentation to as many as 150 ninth and tenth grade female students (in large schools there may be more than one large group meeting);

2. one or more meetings with small groups of students as a follow-up to the large group meeting;

3. one or more seminars, each consisting of 20-30 eleventh and twelfth grade female students who have particular interest in science and mathematics; and

4. a meeting with counselors, librarians, and science, mathematics, and social science teachers, when possible.

Your responsibilities in each of these meetings are discussed below.

1. Large Group Meeting of 9th and 10th Grade Female Students

Each large group meeting will consist of formal presentations by the Field Representative and the woman scientist. The Field Representative will begin the meeting by presenting a brief overview of the program's purposes and making a few major points: more women are entering the traditionally male fields of science and engineering; because of new attitudes and federal laws there are many opportunities for women in the sciences; one does not have to be a genius to succeed in a career in science or engineering, but high school females should definitely take electives in science and math in order to have the option of entering these careers later, and there are materials readily available for use in learning more about career opportunities. [The outline of the Field Representative's introductory remarks is included in Module 1.] The Field Representative will then give a brief slide presentation [(see Module 2)] to illustrate women in a diversity of science careers. It is anticipated that these two activities will take approximately 15 minutes.

At this point the Field Representative will turn the program over to you. You will need to be prepared to talk about various aspects of your career and your life. While you will probably spend no more than 15 or 20 minutes speaking to any one group of students, you should have enough prepared so that you can vary your presentations somewhat. If you kept repeating the same remarks to several groups in each school it is inevitable that you would begin to lose some of your sparkle.

We strongly recommend that you include as part of your presentation a demonstration or materials to illustrate some job-related activity. In the pilot program we found that women scientists who made use of such "show and tell" devices generally had an easier time motivating the students.

Many women scientists in the pilot program were able to demonstrate aspects of their work. For example, an engineer assembled a miniature water treatment system and showed how it removed minerals from hard water. Another used a portable air monitoring device to determine levels of various chemicals in the school. A chemist brought photographic plates and developed them. A sociologist illustrated the use of surveys to collect data by conducting an informal survey of the students' role expectations. A mathematician showed how the "Golden Rectangle" has been used in great works of art over the centuries. An environmental

scientist brought a set of line drawings which illustrated how diseases are spread and discussed how her work in sanitation control helped prevent this spread. A computer scientist brought along both a slide rule and a mini-computer; although she could not hook up the computer, it served as an effective prop for her discussion about emerging careers.

There are several points to keep in mind as you consider what to demonstrate. Often the simplest demonstration is the most effective. Be sure your demonstration is something which will be of interest to high school students and at a level they can understand; the Field Representative will be able to advise you about the appropriateness of the demonstration you are considering. Please resist the temptation to use the occasion to teach the students science or mathematics in an obvious fashion; a couple of women scientists attempted this in the pilot program with unfortunate results. Plan to use only materials which you can bring with you to the school, and make sure all students in the room will be able to see what you are doing. (Some demonstrations might be inappropriate for large group meetings but excellent for smaller meetings. For example, demonstrations which actively involve the students in handling equipment are very effective, but these should not be attempted in large group meetings.)

A number of women scientists in the pilot program used slides to demonstrate aspects of their jobs, while others showed slides of people they work with. This latter approach was particularly effective since it gave the women scientists an opportunity to show examples of a number of different jobs which require different skills and varying levels of education. They were also able to show women with differing personal situations, and women working with (and sometimes supervising) men as well as other women.

2. Follow-up to the Large Group Meeting

Schools have been asked to allow interested students who attend the large group meeting to participate in a small-group follow-up meeting. This will give those students an opportunity to ask you questions about your career and your life. If you have a demonstration which you were unable to use with the large group you may wish to use it in this meeting. If time permits, the Field Representative will explain to the students how they can go about seeking additional information about science career opportunities [See Module 3].

3. Seminars for 11th and 12th Grade Female Students

Students who attend the seminars will have been either self-selected or selected by the school for their interest in science and mathematics. The Field Representative will present the introductory remarks, mention the major points, and then introduce you. Your presentation to a seminar group can cover the same material as your large group presentation. However, the meeting will be much less formal and students will be encouraged to express their opinions and to ask questions. Since each of these students will attend only one meeting you need not be concerned about repeating a demonstration or remarks you have already

made. In the pilot program we found that the 11th and 12th grade females were more interested than the younger students in exploring ways of combining careers and personal lives, so you may wish to include remarks about these issues. In any case, the students will probably have questions for you. In the event that discussion lags, the Field Representative is prepared to use one of a number of modular activities to spark a discussion.

4. Staff Meeting

Teachers and other staff members will already have received information about the purposes and procedures of the Visiting Women Scientists Program. The purpose of the staff meeting is to encourage teachers and counselors to assist female students in exploring science career opportunities. As part of the program, two Resource Packets containing pamphlets about science careers are being given to the school. The Field Representative will describe the materials in the packet and also discuss other materials such as films which are available. The school will also be asked to have a librarian or counselor talk about the resources the school already has available. (For example, most schools have a copy of the Department of Labor's Occupational Outlook Handbook but very few teachers know of its existence). Though you have no specific responsibilities in the staff meeting, feel free to join in any discussion.

You will certainly want to describe your current job activities and responsibilities at least briefly to each group of students you meet. Additional topics you might discuss are:

1. Your career development -- when you decided upon a science career, who influenced you, who tried to dissuade you, your education, jobs you've held, problems you've encountered and how you've solved them.

2. How you've combined your career with other pursuits (e.g., family, social, community, leisure). If you're married, how does your husband feel about your career? How do you and your husband divide up housekeeping responsibilities? Have you had to decide what to do if one of you is offered a position in another area of the country? If you have children, how are family responsibilities handled?

3. A typical day. Several women scientists in the pilot program kept a brief diary of their activities both on and off the job for an entire day and then discussed it with the students. This proved to be a very effective device for showing the students that women scientists are "real people" too.

Your remarks should be presented conversationally, should generally include some anecdotal information, and should include some humor with which the students can relate. We hope that you are enthusiastic about your work and that you will be able to communicate your enthusiasm to the students. However, please be careful not to appear to be recruiting for your particular field or employer. Similarly, do not give students the

impression that you advocate any one life style (such as not working while your children are very young, having a full-time housekeeper, or having both the husband and wife employed half-time); the point of the program is that a diversity of life styles can be combined with careers in science and technology. Some women scientists in the pilot program kept a balance by presenting examples of how women colleagues handled similar situations differently.

It is possible that some students will interpret this program as "Women's Lib" or "pro-ERA." Please avoid letting them draw you into a debate about these issues, regardless of your personal beliefs. Also, please be careful not to depict yourself or other women scientists as "superwomen." Students will find it hard to identify with a woman who is an award-winning scientist and at the same time sews all of the clothes her family wears and cooks candlelit dinners for 20 people on a weekly basis. They might easily become discouraged from pursuing a science career because such feats are clearly beyond them.

In summary, we would like you to keep things in perspective--science careers can be exciting and rewarding, and these careers can be combined with complete and satisfying personal lives, but there will be problems that will need to be worked out.

To help you prepare for the visits, we are enclosing several materials:

1. The brochure "Careers in Science and Technology: More Women Needed" which will be distributed to students during the visits.

2. The pamphlet Women in Science and Technology which deals with many of the topics important to this program.

3. A copy of the List of Resource Materials (a set of materials about science careers which is being given to each school).

4. A booklet of modular activities which were developed for the Visiting Women Scientists Program; the Field Representative will use these activities as appropriate during the visits.

Now for a few housekeeping matters:

- Please bill us for one day's preparation time in addition to the days you spend visiting the schools; the consulting rate for visitors is $100/day.

- Reasonable expenses for meals will be reimbursed; reimbursement for travel in your own car is at a rate of $.17/mile.

- We are enclosing a "Record of Visit" form and a postage-paid envelope. Please return your invoice and the completed Record of Visit Form to us in this envelope after you have completed your visits.

The RTI Field Representative in your area, [Field Rep's name], will contact you soon to discuss plans for the visits or you can call her at [Field Rep's phone number]. If you have difficulty in reaching the Field Representative or if you have any questions or concerns you wish to discuss with me, please call me (collect 919-541-6318).

We appreciate your willingness to serve as a role model for young women and hope the experiences of the Visiting Women Scientists Program will be rewarding to both you and the students.

Sincerely,

Carol Place, Project Director
Visiting Women Scientists Program

CP:cr
Enclosures

APPENDIX B

1978-79 List of Resource Materials

1978-79 Case Study

1978-79 Matching Exercise

1978-79 Student Evaluation Form

1978-79 Informational Brochure

Careers in Science and Technology: More Women Needed

Thinking About a Career in Science and Technology: A Young Woman's Choice

1978-79 VISITING WOMEN SCIENTISTS PROGRAM
LIST OF RESOURCE MATERIALS

A. MATERIALS INCLUDED IN THE VISITING WOMEN SCIENTISTS PROGRAM RESOURCE PACKET (Please Note: Prices may have changed since the printing of this list. Many of the organizations listing a price for their publications will provide one copy free of charge. In addition, many organizations offer discounts for quantity purchases.)

1. GENERAL

$6.00/50 copies — a. *College Times: Facts for Your Future from the College Board* - College Board Publications, Box 2815, Princeton, NJ 08541

$2.00 each — b. *Science and Engineering Careers--A Bibliography* - Scientific Manpower Commission, 1776 Massachusetts Avenue, NW, Washington, DC 20036

$1.50 each — c. *Women in Science and Technology* - ACT Publications, P. O. Box 168, Iowa City, IA 52240. Explores the myths and realities about women in science and technology; discusses the careers available; presents comments from women about their work, and steps to take in planning a successful career.

$2.00 each — d. *I'm Madly in Love with Electricity* - Lawrence Hall of Science, University of California, Berkeley, CA 94720, ATTN: Careers. Includes comments about their work from women employed in careers in engineering, mathematics, physics, astronomy, chemistry, and life science. Also includes a list of resource people, publications, and organizations.

Free — e. *Science and Your Career* - U.S. Department of Labor, Bureau of Labor Statistics, 1515 Broadway, Suite 3400, New York, NY 10036.

2. ENGINEERING

Free — a. *Engineering--A Career of Dedication and Responsibility* - National Society of Professional Engineers, 2029 K Street, NW, Washington, DC 20006

$ .25 each — b. *WOMENGINEER* - Engineers Council for Professional Development, 345 East 47th Street, New York, NY 10017

$5.00/hundred — c. Several short pamphlets describing areas of engineering such as civil engineering, mechanical engineering, automotive engineering, etc. - Engineers Council for Professional Development, 345 East 47th Street, New York, NY 10017

Free — d. *A Career in Metallurgy, Metallurgical Engineering, ...* - The Metallurgical Society of AIME, 345 East 47th Street, New York, NY 10017

Free — e. *Women in Engineering at Kodak* - Corporate Information Department, Eastman Kodak Company, Rochester, NY 14650

$ .25 each — f. *Did You Ever Wish You Could Change the World?* - American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085

A. MATERIALS (continued)

3. PHYSICAL SCIENCES

$ .50 each	a.	*Women in Physics* - American Physical Society, Committee on the Status of Women in Physics, 335 East 45th Street, New York, NY 10017
$ .20 each	b.	*Careers in Chemistry Today* - American Chemical Society, Department of Educational Activities, 1155 Sixteenth Street, NW, Washington, DC 20036
$ .20 each	c.	*Careers in Chemistry--Opportunities for Minorities* - American Chemical Society, Department of Educational Activities, 1155 Sixteenth Street, NW, Washington, DC 20036
$ .25 each	d.	*Careers in Exploration Geophysics* - Society of Exploration Geophysicists, P. O. Box 3098, Tulsa, OK 74101
Free	e.	*Your Tomorrow--A Guide to Careers in the Chemical Industry* - Manufacturing Chemists Association, 1825 Connecticut Avenue, NW, Washington, DC 20009
Free	f.	*Minority Engineers in the Chemical Industry* - Manufacturing Chemists Association, 1825 Connecticut Avenue, NW, Washington, DC 20009
Free	g.	*The Challenge of Meteorology* - American Meteorological Society, 45 Beacon Street, Boston, MA 02108
$ .25 each	h.	*A Career in Astronomy* - The Executive Officer, American Astronomical Society, 211 FitzRandolph Road, Princeton, NJ 08540

4. BIOLOGICAL SCIENCES

$ .20 each	a.	*Careers in Biology* - Education Department, American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, VA 22209
$ .25 each	b.	*Microbiology in Your Future* - American Society for Microbiology, 1913 I Street, NW, Washington, DC 20006
Free	c.	*Ecology and Your Career* - U. S. Department of Labor, Bureau of Labor Statistics, 1515 Broadway, Suite 3400, New York, NY 10036

5. MATHEMATICS

Free	a.	*Math and Your Career* - U. S. Department of Labor, Bureau of Labor Statistics, 1515 Broadway, Suite 3400, New York, NY 10036
$ .05 each	b.	*The Math in High School ... You'll Need for College* - Mathematical Association of America, 1225 Connecticut Avenue, NY, Washington, DC 20036
Free	c.	*Careers in Statistics* - Committee of Presidents of Statistical Societies, c/o American Statistical Association, 806 15th Street, NW, Washington, DC 20005

6. SOCIAL SCIENCES

$ .50 each	a.	*Careers in Geography* - Association of American Geographers, 1710 Sixteenth Street, NW, Washington, DC 20009

A. MATERIALS (continued)

.60 each
b. *Careers in Psychology* - American Psychological Association, 1200 17th Street, NW, Washington, DC 20036

.60 each
c. *Careers and the Study of Political Science* (Curzan) - American Political Science Association, 1527 New Hampshire Avenue,

Free
Washington, DC 20036

d. *What is Anthropology* - American Anthropological Association, 1703 New Hampshire Avenue, NW, Washington, DC 20009

7. FINANCIAL AID

ree
a. *A selected list of major fellowship opportunities and aids...* - Fellowship Office, Commission on Human Resources, National

1.00
Research Council, 2101 Constitution Avenue, Washington, DC 20418

$1.50 each
b. *Educational Financial Aids* - American Association of University Women, 2401 Virginia Avenue, NW, Washington, DC 20037

1.50 each
c. *Don't Miss Out: The Ambitious Student's Guide to Scholarships and Loans* - Octameron Associates, P. O. Box 3437, Alexandria,

Free
VA 22302

d. *The As & Bs of Merit Scholarships* - Octameron Associates, P. O. Box 3437, Alexandria, VA 22302

e. *Financial Aid: A Partial List of Resources for Women* - Project on the Status and Education of Women, Association of American Colleges, 1818 R Street, NW, Washington, DC 20009

B. ANNOTATED BIBLIOGRAPHY OF ADDITIONAL MATERIALS

1. CAREER PUBLICATIONS

a. *Occupational Outlook Handbook*, 1978-79 - U.S. Department of Labor, Bureau of Labor Statistics, U.S. Government Printing Office, Washington, DC 20402 ($7.00) -

General reference book providing descriptions of about 850 occupations including: the nature of the work; places of employment; qualifications needed; earnings and working conditions; and sources of additional information.

b. *I Can Be Anything--Careers and Colleges for Young Women*, 1978 (Mitchell) - College Entrance Examination Board, Princeton, NJ 08540 ($7.95 paperback, $12.95 hardcover) -

Describes careers for young women--and certainly all careers are for women. Goes beyond a description of career information and introduces the critical consideration for girls and women: the consideration of life style.

B. ANNOTATED BIBLIOGRAPHY (continued)

c. *New Career Options for Women--A Counselor's Sourcebook*, 1977 - ($16.95), Human Sciences Press, New York, NY 10011 *New Career Options--A Woman's Guide*, 1977 ($4.95); *New Career Options for Women--A Selected Annotated Bibliography*, 1977 ($9.95) (Set of all three publications approximately $26.00) -

Excellent set of source books dealing with careers for women. Reviews employment opportunities, legislation, practical advice regarding family and work, and suggestions for career and educational planning.

d. *Careers for Women in the 70's*, 1973 - Women's Bureau, Department of Labor, U.S. Government Printing Office, Washington, DC 20402 ($.50) -

Expected numbers of openings in particular fields are presented as well as the employment picture for women. The suggestion is made that women's careers should not be any different from men's.

e. *U.S. Working Women - A Chartbook*, 1975 - U.S. Department of Labor, Bureau of Statistics, U.S. Government Printing Office, Washington, DC 20402 ($1.75) -

Through charts and graphs, a wide range of data are presented on the characteristics of American working women and their changing status over the last quarter of a century.

f. *Supply and Demand for Scientists and Engineers*, 1977 (Vetter) - Scientific Manpower Commission, Washington, DC 20036 ($1.50) -

An excellent review of studies including projections of the supply and demand for scientists and engineers.

g. *Women and Minorities in Science and Engineering*, 1977 - National Science Foundation, U.S. Government Printing Office, Washington, DC 20402 ($.75) -

Analytical report developed from existing statistical data to illuminate the role of women and minorities in science and engineering.

h. *Federal Career Directory*, 1976-77 - U.S. Civil Service Commission, U.S. Government Printing Office, Washington, DC 20402 ($3.45) -

Describes federal careers, employers and job briefs.

B. ANNOTATED BIBLIOGRAPHY (continued)

i. *What Can I Be? A Guide to 525 Liberal Arts and Business Careers* (Leo Lieberman, $6.75), Martin M. Bruce, Ph.D. Publishers, Box 228, New Rochelle, NY 10804 -

Presents the required and desirable academic majors, abilities and educational degrees for students who know the career they want; provides suggested majors and careers based on school subjects enjoyed in the past, for students who have not yet decided on a career or occupation.

j. *Career Opportunities Boxes*, 1978 - Time Share, Houghton Mifflin, 630 Oakwood Avenue, West Hartford, CT 06110 ($54.00 each) -

Job information associated with major disciplines. Occupations covered include a wide range of skill levels and educational requirements.

k. *Science Career Exploration for Women*, 1978 - National Science Teachers Association, 1742 Connecticut Avenue, NW, Washington, DC 20009 ($2.50) -

This book, based in part on the NSF-funded Career Exploration Project, is aimed at science teachers, counselors, and others who work with young women of high school and college age. The purpose of the book is to provide tools that can be used to help young talented women students explore careers, especially science-related professional careers.

l. *Keys to Careers in Science and Technology*, 1973 - National Science Teachers Association, Washington, DC 20036 ($1.00) -

Comprehensive bibliography of career guidance publications and information on scholarships and loans, special programs for students and teachers, awards, and agencies.

m. *Engineering as a Profession for Women*, 1976 - Engineering Manpower Bulletin #29, Engineering Manpower Commission, New York, NY 10017 ($2.00) -

Discusses misconceptions, current employment picture, barriers, and problems faced by women in engineering, and also talks about why engineering needs women.

n. *Women and Success--The Anatomy of Achievement*, Kundsin (Ed.) -

Profiles of women in careers in crystallography, mathematics, electrical engineering, physics, meteorology, chemistry, etc.

B. ANNOTATED BIBLIOGRAPHY (continued)

o. *Test Yourself for Science*, 1971 - Scientific Manpower Commission, Washington, DC 20036 (single copy $1.00; 25+ $.50 ea.) -

For students. This booklets contains puzzles and problems to think about and try to solve; also included is a section which suggests how to get more information about careers in science.

p. *When I Grow Up I'm Going to be Married* - Commission on the Status of Women, Sacramento, CA 95884 -

A game which illustrates how time and circumstance affect women.

q. *Job Family Series (e.g., "Jobs in Engineering" and "Jobs in Science")* - Science Research Associates, Inc., 155 North Wacher Drive, Chicago, IL 60606 -

Each of the booklets contains informative descriptions of job situations based on observation and worker interviews. (Booklets $2.55 each, cassettes $10.75 each)

r. *Planning for Career Options* - CATALYST, 14 East 60th Street, New York, NY 10022 (approx. $1.95) -

This is a self-guidance booklet prepared for women to help them develop realistic career goals.

2. FINANCIAL AID

a. *Catalog of Federal Education Assistance Programs*, 1976 - U.S. Government Printing Office, Washington, DC 20402 ($7.30)

b. *Federal and State Student Aid Programs*, 1972 - U.S. Government Printing Office, Washington, DC 20402 ($1.10)

c. *Financing Postsecondary Education in the United States*, 1974 - U.S. Government Printing Office, Washington, DC 20402 ($4.00)

d. *Guaranteed Student Loan Program*, 1976 - U.S. Government Printing Office, Washington, DC 20402 ($3.40)

e. *Financial Aid for College Students* - American Chemical Society, Department of Educational Activities, 1155 Sixteenth Street, NW, Washington, DC 20036 ($.05)

B. ANNOTATED BIBLIOGRAPHY (continued)

3. FILMS

a. "Keep the Door Open..." - (18 minutes, color). Review copy sent upon request.

Sandia Laboratories
Box 5800
Albuquerque, NM 87115

An excellent discussion by 13 professional women of the problems involved in combining careers with marriage and a family, stereotypes and obstacles to be overcome, along with the joys experienced in a career. Women portrayed represent such areas as chemistry, law, zoology, engineering, math and biology.

b. "The Women's Prejudice Film" - ($255.00 - 18 minutes, color). Review copy sent upon request.

Sandler Institutional Films, Inc.
1001 N. Poinsettia Place
Hollywood, CA 90046

Specific prejudices and stereotypes are voiced by both men and women. Included are short profiles of women in traditionally male careers. The film states that women must overcome their own self doubts and worries as well as wade through male chauvinism. While this film is not specific to science, it is a particularly good consciousness-raising device for females who have not considered problems of discrimination against working women.

c. "Women's Work: Engineering" - ($295.00 purchase or $30.00 5-day rental, 26 minutes, 16mm film or color videotape) -

MIT
Center for Advanced Engineering Study
77 Massachusetts Avenue
Cambridge, MA 02139

Explores the experience of being an engineer and a woman--through the professional and personal lives of students and working engineers.

CASE STUDY

Sally Wilson is a junior in high school. She has always liked school and made good grades. She is especially proud of an award she won for her chemistry project in the science fair and she would like to go to college to become a chemist. Her younger brother, Bob, with whom Sally has a close relationship, is in the 10th grade. He loves to work with motors, does well in math and science courses and is considering an engineering career.

Mr. and Mrs. Wilson have decided Bob should go to college. They have begun to talk to him about possible engineering schools, and have encouraged him to discuss his plans with the school counselor. No one has talked to Sally about college, and she is beginning to feel left out. The Wilsons are not rich--they haven't enough money to send both Bob and Sally to college. Sally knows that if she is to have a chance to enter college, she should begin to plan right away.

What do you think should happen?

What should Sally do?

NATIONAL SCIENCE FOUNDATION
1979 VISITING WOMEN SCIENTISTS PROGRAM

Examples of Science Careers

Prepared by

Center for Educational Research and Evaluation
Research Triangle Institute
Research Triangle Park, North Carolina 27709

JOB TITLES

I. Engineering

A. Aeronautical
B. Civil
C. Electrical
D. Mechanical
E. Petroleum

II. Physical Sciences and Mathematics

F. Chemist
G. Computer Programmer
H. Meteorologist
I. Physicist
J. Statistician

III. Life Sciences

K. Botanist
L. Geneticist
M. Microbiologist
N. Oceanographer
O. Physiologist

IV. Social Sciences

P. Anthropologist
Q. Economist
R. Political Scientist
S. Industrial Psychologist

V. Interdisciplinary

T. Biochemist
U. Food Scientist
V. Psychophysiologist

EXAMPLES OF SCIENCE CAREERS

INSTRUCTIONS: Below you will find an example of the many different tasks associated with a particular job. Match the example with the titles of people who may perform these tasks in science and technology careers.

I. Engineering

____ 1. Designs, tests and supervises the manufacture of communications equipment (telephone, telegraph etc.)

____ 2. Involved in the drilling for and production of oil

____ 3. Works in the development of clean, quiet jet engines

____ 4. Responsible for the design and production of efficient internal combustion engines

____ 5. Designs and supervises construction of buildings in high risk areas to ensure that they meet earthquake safety standards

II. Physical Sciences and Mathematics

____ 1. Analyzes and uses numerical data such as that gathered for a population census

____ 2. Studies current weather patterns in order to make predictions about future conditions

____ 3. Develops new compounds such as rocket fuel, detergents or cosmetics

____ 4. Writes detailed instructions for a machine to follow in order to solve a problem

____ 5. Develops mathematical models of physical phenomenon such as gravity

III. Life Sciences

____ 1. Determines the effect of pollution on marine life

____ 2. Studies the inheritance traits such as eye color from one generation to another

____ 3. Studies the effects of a new fertilizer on plant life

____ 4. Investigates how the human body reacts to space travel

____ 5. Isolates and analyzes bacteria that causes disease

IV. Social Sciences

____ 1. Advises large corporations on matters of regional supply and demand for their product

____ 2. Tests job applicants to determine if they fit the personnel needs of a large company

____ 3. Lives with a group of people to observe and write about their social customs, beliefs and material possessions

____ 4. Studies and writes about the structure of governments in developing nations

V. Interdisciplinary

____ 1. Studies how the imbalance of hormones in humans can affect behavior

____ 2. Deals with the proteins and other compounds involved in the processes of living things.

____ 3. Conducts tests to assure safe and sanitary processing of canned goods

O.M.B. No. 99-R0310
Approval Expires 5/31/82

1978-79 VISITING WOMEN SCIENTISTS PROGRAM
STUDENT FORM

Name of School: _____ Date of Visit: _____

1. Please indicate your grade:

(Circle one.)

7 8 9 10 11 12 Other

2. Please indicate your sex:

(Circle one.)

1. Female 2. Male

3. How would you rate this Visiting Women Scientists Program overall?

(Circle one.)

1. Excellent 2. Good 3. Fair 4. Poor

4. How valuable was the program to you in each of the following ways?

(Circle one on each line.)

	Not Valuable	Somewhat Valuable	Very Valuable
a. Taught me about a number of careers of which I hadn't been aware	1	2	3
b. Showed me that women can successfully combine careers and family lives	1	2	3
c. Taught me about the preparation needed for various science careers	1	2	3
d. Showed me the importance of keeping my options open by taking science and mathematics courses in high school	1	2	3
e. Encouraged me to seek further information about science career opportunities	1	2	3

5. Which parts of the program did you particularly like?

(Circle one on each line.)

	Did Not Like	Liked Somewhat	Liked Very Much	Does Not Apply
a. Women scientists' talks	1	2	3	
c. Slides of women in various science careers	1	2	3	4
c. Learning about careers for women in science	1	2	3	4
d. Opportunity to have questions answered	1	2	3	4

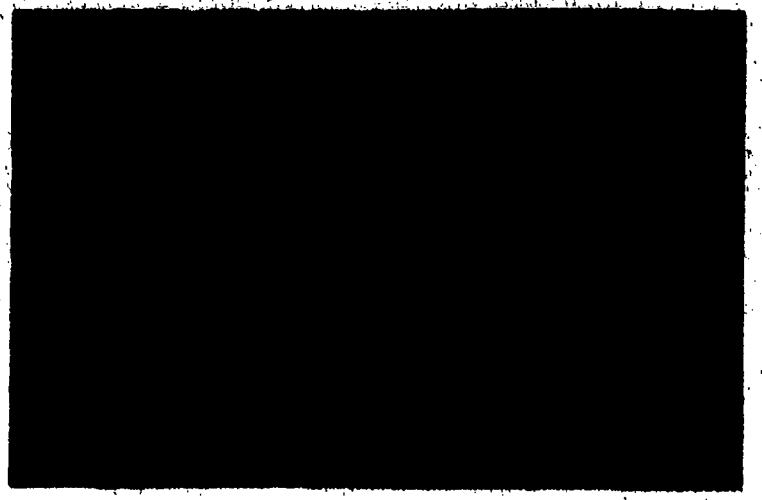
showed slides of themselves at home with their families and friends, or enjoying their leisure moments in recreational activities. In addition, the women scientists talked to the students about their education, training and personal backgrounds. Many related how they happened to choose a scientific career, and some talked about the problems associated with combining a science career with a personal life, telling how they resolved these problems.

In most schools a meeting will be scheduled with school staff including some or all of the following: guidance counselors; teachers in the areas of science, mathematics and social science; school librarians; and other interested school, or district personnel. There are four purposes for the meeting: (1) to explain the goals and rationale of the Visiting Women Scientists Program and relate what the visitors are doing in the school; (2) to discuss how the school's own career-related resources can be used more effectively by students and teachers; (3) to describe the science career materials which are being given to the school; and (4) to discuss the overall topic of women in science, eliciting any ideas the staff might have as to how the National Science Foundation could assist schools in encouraging more females to continue in science and engineering.

Each school which participates in the program will receive two packets of materials describing careers in various areas of science, mathematics, social science and engineering. Students and school staff members will also be given assistance in obtaining additional resources including pamphlets, films, games, and bibliographies for further study.

THE NATIONAL SCIENCE FOUNDATION

VISITING WOMEN SCIENTISTS PROGRAM



Conducted by the

Center for Educational Research and Evaluation
Research Triangle Institute
Research Triangle Park, North Carolina

THE VISITING WOMEN SCIENTISTS PROGRAM

The Visiting Women Scientists Program is an attempt to increase the participation of women in careers in science and technology by: (1) giving female students an opportunity to see and interact with women scientists; (2) providing information about career opportunities in science and technology and about the preparation needed for such careers; and (3) presenting examples of ways in which women scientists are successfully combining science careers and personal lives.

In 1978 the National Science Foundation supported a pilot Visiting Women Scientists Program to encourage high school females to pursue careers in science, including biological science, physical science, mathematics, social science and engineering. As part of the pilot program, women scientists visited 110 high schools across the country. The pilot program was very well received by high school students and staff, and evaluation results indicate that it was successful in encouraging females to seek further information about careers in science.

Because of the success of the pilot program, a similar program will be conducted in the 1978-79 school year by the Research Triangle Institute (RTI). Visits will be conducted in several North Carolina schools during October and November of 1978; and a total of about 135 schools in three other areas of the United States will be visited January through May of 1979.

Typically, an RTI field representative and a woman scientist from the local area will spend one day in each school. In addition to making presentations to large groups of ninth and tenth grade female students, the women scientists will conduct seminars for eleventh and twelfth grade female students who have already shown an interest in science, and they will meet with teachers, counselors and administrators on an individual or small group basis.

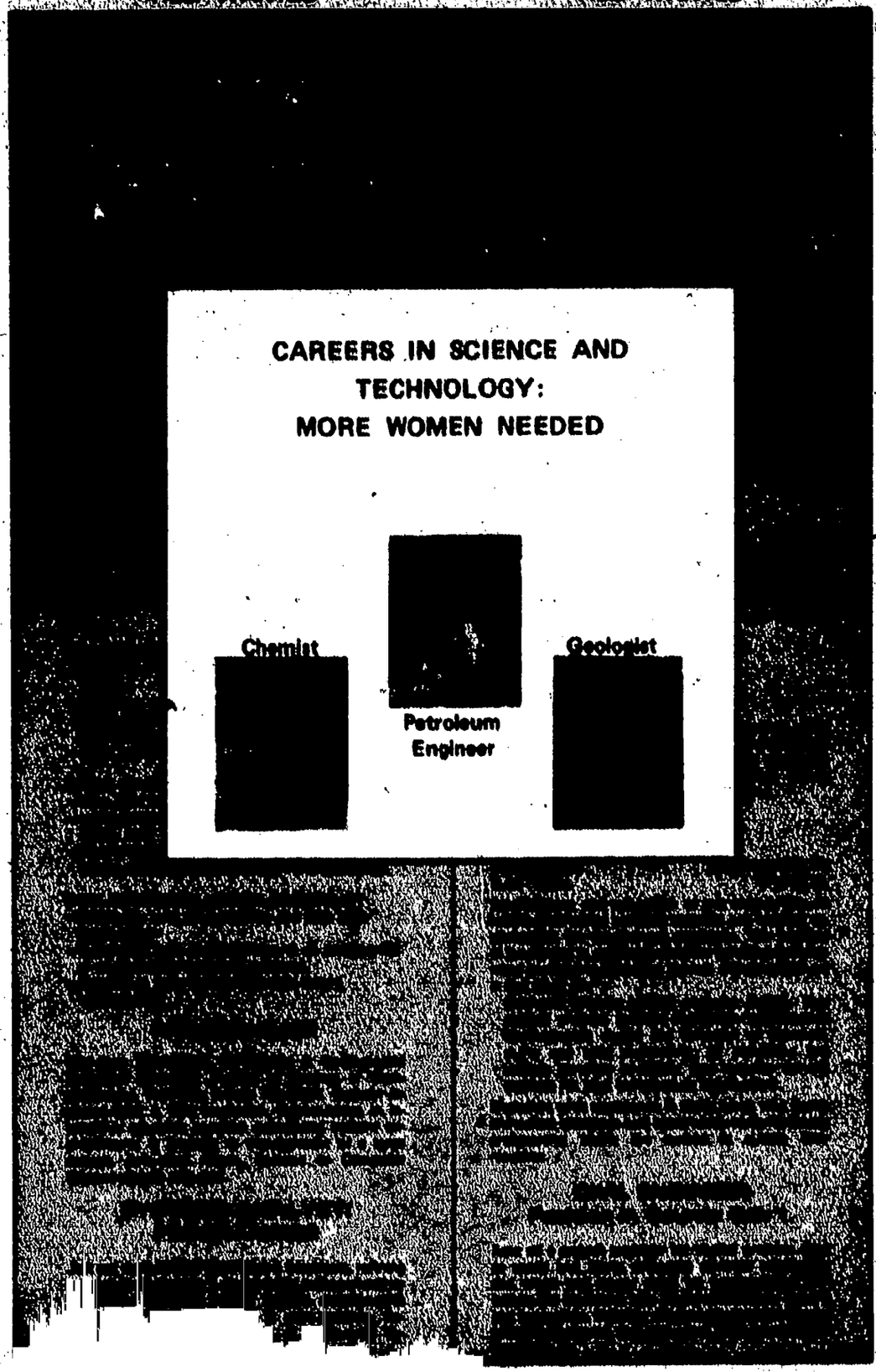
The major purposes of the large group meetings are (1) to provide students with an opportunity to meet a woman scientist role model, and (2) to raise their consciousness level while they can still easily redirect their high school programs to include more mathematics and science. The major purposes of the seminars are (1) to reinforce the notions that women can be interested and successful in science careers and that they can combine these careers with full private lives, and (2) to provide specific information in response to the students' questions. Generally, a few major points are stressed: more women are entering the traditionally male fields of science and engineering; because of new attitudes and federal laws there are many opportunities for women in science; one does not have to be a genius to succeed in a career in science or engineering, but high school females should definitely take electives in science and mathematics in order to have the option of entering these careers later.

As part of their presentations, the women scientists will describe aspects of their careers and their personal lives. During the pilot program, many women scientists prepared demonstrations related to their jobs. For example, one woman scientist brought an actual cross section of a cylinder head from an aircraft engine in order to describe her research on fuel injectors. Some women scientists brought slides or pictures related to jobs, including state population and migration patterns, cultural anthropologists at work, and physiological slides of different animals; others

- What it is like to work at that job
- The amount of education needed
- The number of women in the field and where they work
- Salaries
- The future for women in the job
- Which colleges award the most degrees to women in the field
- Where more information can be obtained

3. Pamphlets published by professional organizations such as the American Chemical Society, the Society of Women Engineers, and many others. Schools which participated in the Visiting Women Scientists Program received resource packets containing pamphlets about financial aid and career opportunities in areas of science and engineering.
4. Your school counselors. Depending upon the organization of your school, there may be guidance counselors, career counselors, or both available to you. Part of their job will be to assist individual students in thinking about future careers and how to prepare for them. The counselors have been trained to help you in thinking about careers, and they have many materials available to assist you.

by the Center for Educational Research and Evaluation, Research Triangle Institute,
part of the National Science Foundation's Visiting Women Scientists Program



An Increasing Number of Women Will Work

Over the past decade, a greater percentage of women have been employed outside their homes. The Women's Bureau of the U.S. Department of Labor reports that 9 out of 10 women will work at some time in their lives. Even with a break in employment for marriage and children, the average woman can expect to work 25 years. And it is not just single women, widows, and divorcees who are working; the majority of working women are married women living with their husbands and families.

Expanding Job Opportunities for Women

In the past, many women were unaware that they would probably work for a number of years, and they did not adequately prepare themselves for a career. When they later decided to seek employment, they were often forced to accept low-paying and unrewarding positions even though they were capable of succeeding in other jobs. Even professional women have tended to choose the few fields traditionally open to women, such as teaching, nursing, and social work; relatively few have chosen occupations in science and technology.

However, times are changing. During the past 10-20 years, an increasing number of women have been employed in occupations which were once considered the exclusive domain of males. For example, in the 6 years from 1968 to 1974 the proportion of women in the science labor force increased from 8 percent to 14 percent, and it seems that more women than ever are planning to enter traditionally male careers. For example, while only 7 percent of American physicians are women, 17 percent of the physicians in training are women.

It has become quite evident that women can successfully perform jobs which have traditionally been carried out by men. In addition, recent federal laws make it illegal for an organization to discriminate on the basis of sex. Many schools and companies now have affirmative action plans and are actively recruiting women for positions traditionally filled by men.

Opportunities for Women in the Sciences

Careers in science, engineering, and technology are included among those careers that are becoming available to qualified women at an ever-increasing rate. Employers are actively seeking qualified women for positions in these fields, but there is a scarcity of women trained for many of these areas.

Scientists are employed in industry, government, colleges and universities, research laboratories, consulting firms, etc. Many employers are seeking women trained in the various science fields (including mathematics, engineering, biological science, physical science, and social science). In general, opportunities for persons trained in the sciences are much better in industry than in academia. Also, fields which already have a considerable number of women are generally less eager than others to train and employ additional women.

Engineering is a particularly promising field for women. Examples of the activities of engineers include developing scientific equipment, designing and supervising construction, and generally planning and implementing technical solutions to modern day problems. Women are needed in every area of engineering—aerospace, agricultural, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, and others. Currently, only about two percent of all engineers are women, and employers are actively seeking more. According to Daniel Drucker, Dean of the College of Engineering at the University of Illinois, "Large corporations and small are just about knocking each other down in their eagerness to find qualified women engineers." Many engineering jobs are available to persons with a bachelor's degree, and salaries are excellent.

Keeping Your Options Open for a Career in Science and Technology

A woman does not have to be a genius to pursue a successful science career. You might want to consider a career in one of the many science-related fields if you:

- are curious about why and how events occur;
- like to see how things work;
- like challenges; and
- take pride in performing tasks well.

As one scientist said, "Gender doesn't matter. A scientist or technologist can be 100% feminine and do the job well."

While you do not have to be the brightest student in your class, you do need to have a good background in science and mathematics to qualify for many of these jobs. In the past, many young women who have been fully capable of obtaining a solid background in science and mathematics have failed to do so because they did not think seriously about a career or because they thought science careers were reserved for men. In some cases their inadequate science and mathematics backgrounds cost them a chance at an interesting, worthwhile career; in other cases they were forced to spend valuable time and money catching up on basic mathematics and science skills. Keep your options open by getting a good background in mathematics and science, especially mathematics, while you are in high school, even if you do not think you will want to pursue a science-related career. Don't limit yourself later by failing to get adequate high school preparation.

Obtaining Additional Information About Careers

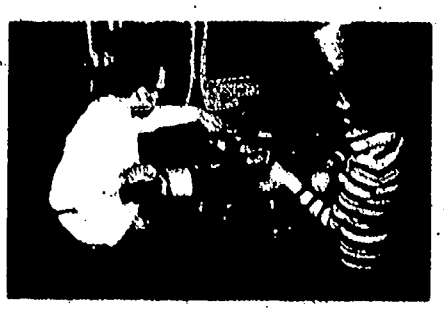
While you may already have a pretty good idea about your interests and abilities, you probably need to know about various occupations before you can decide about possible careers. Some resources you might want to use include:

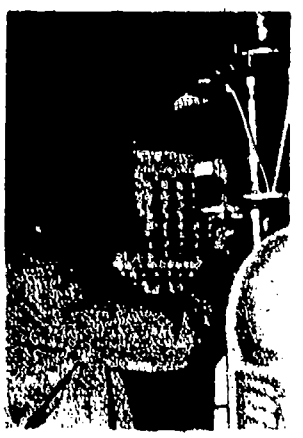
1. *The Occupational Outlook Handbook*. This "encyclopedia of careers," published by the U.S. Department of Labor, is available in most high schools and public libraries. The handbook contains information about more than 800 occupations, including what the work is like; places of employment; training, qualifications and advancement; job prospects; salaries and working conditions; and sources of additional information.
2. *I Can be Anything: Careers and Colleges for Young Women*. Joyce Slayton Mitchell. College Entrance Examination Board, Princeton, New Jersey, 1978.

   In addition to describing a large number of careers, this book encourages women to consider the concept of life style as they think about career alternatives. The author includes examples of working women in various careers and discusses the future for women in those careers. For each occupation this book discusses the following:

THINKING ABOUT A CAREER IN SCIENCE AND TECHNOLOGY

A YOUNG WOMAN'S CHOICE





Prepared by the
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Visiting Women Scientists Program

Thinking About A Career

Most young women will work for a number of years and there are many new, exciting job opportunities available to those who qualify. Each young woman today should consider the likelihood that she can succeed at a variety of careers, including those in science and technology.

It is not important for you as a high school student to choose a specific career and prepare only for that career. You should, however, spend some time thinking about possible careers, and relating them to your personal interests, abilities and ambitions. This will provide you an opportunity to consider rewarding careers and plan a high school and college program which will prepare you for a job that satisfies your goals and interests.

If you haven't begun to think about career alternatives or study materials related to careers in science and technology, here are some resources you might want to use.

Visiting Women Scientists Program Resource Packet

Packets of resource materials were prepared specifically for this program, and they are available in your school. They contain pamphlets about financial aid and career opportunities in the areas of science, mathematics, social science and engineering. They also include a listing of many other career publications and where you can obtain them.

What Steps Can You Take To Plan A Successful Career?

On the back page of this pamphlet is a list of steps you can take in thinking about a career. This was reprinted from a booklet in the resource packet; and it might help you begin to plan for a career. Remember that no matter what resources you use in career planning, the most important one is you. Only you can relate your interests and abilities to decisions about a future career.

I Can Be Anything

Joyce Slayton Mitchell is the author of *I Can Be Anything: Careers and Colleges for Young Women*, published in 1978 by the College Entrance Examination Board in Princeton, New Jersey.

In addition to describing a large number of careers, this book encourages women to consider the concept of life style as they think about career alternatives. The author includes examples of working women in various careers and discusses the future for women in those careers.

For each occupation this book discusses the following: What it is like to work at that job; what education will be needed; how many women are in the field and where they work; what the salaries are; the future for women in the job; what colleges award the most degrees to women in the field; and where more information can be obtained.

The Occupational Outlook Handbook

This "encyclopedia of careers" is published by the U.S. Department of Labor, Bureau of Labor Statistics. It is available in most school and public libraries.

The handbook includes information about 850 jobs and more than 30 major industries. In the table of contents, most science, mathematics, and engineering occupations are listed under "Science and Technical Occupations;" there is also a section on "social scientists." The following examples show just a small sample of the information you can obtain in the *Occupational Outlook Handbook*.

Nature of the Work

- Civil engineers design and supervise the construction of roads, bridges, airports, and buildings.
- Computer systems analysts plan efficient methods of processing data.

Places of Employment

- Most anthropologists, geographers, and political scientists work in colleges and universities while most statisticians and economists work in private industry or research organizations.
- Four of 10 oceanographers work in just 3 states—California, Maryland and Virginia.

Training, Qualifications and Advancement

- A bachelor's degree in engineering is the usual requirement for a beginning engineering job.
- A doctoral degree is almost always required for a job as an astronomer or a psychologist.

Job Prospects Through the Mid-1980's

- Engineers will be particularly needed in energy-related activities such as designing energy-saving systems for automobiles and homes.
- The outlook for graduates of computer-related curriculums should be excellent.
- The number of persons who will graduate with advanced degrees in sociology is likely to exceed available job openings.

Salary and Working Conditions

- Biologists with a bachelor's degree and no experience had an average starting salary of $10,200 in private industry in 1976, while the average starting salary for engineering graduates was $14,800 a year.
- Many engineers work indoors in offices and research laboratories, but others spend a lot of time in factories, mines,

construction sites, or other outdoor locations.

Sources of Additional Information

- Lists of schools offering education in forestry are available from the Society of American Forestors, 5400 Grosvenor Lane, Washington, D.C. 20014
- Information on career opportunities and earnings for chemists is available from the American Chemical Society, 1155 16th Street, NW, Washington, D.C. 20036

School Counselors

Depending upon the organization of your school, there may be guidance counselors, career counselors, or both available to you. Part of their job is to assist individual students in thinking about future careers and how to prepare for them. The counselors have been trained to help you in thinking about careers, and they have many materials available which can help you.

School counselors are often very busy people with many different jobs and responsibilities. It is possible that they will not have the time to take the initiative to work with each student in discussing a career. However, if you wish to discuss your career alternatives with your counselor and take the initiative to make an appointment, it is very likely that he or she will assist you with personal discussion and useful materials available in your school or public library.

Steps You Can Take To Plan A Successful Career*

Take yourself seriously and decide to plan responsibly for your own future.

Think about how you want your career to fit into the life you want. As you do, try to picture yourself in careers you may not have considered before, as well as in those you have already thought about.

Become an expert on yourself.

Explore your interests and abilities. Ability tests and interest inventory results are one way to begin. See about these at the counseling center of your school or college. If you took the ACT or SAT, check your score report.

Find out about some of the many career opportunities which are open to you.

Don't limit yourself to the outdated lists of "women's careers." Consider all possibilities: Look for up-to-date information about specific careers. Talk to women in science and technology careers. Learn about why they chose careers that in the past were unusual for women. Write to professional associations. Watch for TV shows, speakers, and conferences about these fields, too. You might become interested in a career you have never dreamed of, if

you knew something about it.

Learn what is required to succeed in each of the careers you consider.
Talk to counselors and advisors who are particularly interested in helping young women explore the full range of career possibilities. Ask them to help you find out about the kinds of training and education you will need. Write to colleges for program information.

Begin to prepare early for your career.
Be sure to take courses in high school and college that keep your options open. Enroll in summer science programs offered by colleges and universities, while you are still in high school. These programs can give you some idea of what a career in science is like. Look for part-time jobs, summer employment, or volunteer activities to help you explore the world of work. Career options develop out of experience.

Don't restrict yourself as you begin to make decisions about your career.
Consider *all* the careers that interest you and for which you can qualify. Women today and tomorrow will be leading full lives, engaging in a wide range of careers, enjoying a variety of family life styles, and helping as equal partners in the search for a better world.

Set your own goals and learn how to work for them.
Keep a strong image in your mind of what those goals are. Work toward your goals with the idea of success in your mind. Many women are successful and happy in challenging and interesting careers. You can be too!

Take charge of making decisions for your own life and career.
Assert your own ideas about what is the best career for you, whether it is in science or technology or some other area. You know best what your abilities and interests are. Others can help you explore your options, but don't let anyone else decide for you. Keep your dreams alive and make the best ones come true!

* Reprinted from *Women in Science and Technology: Careers for Today and Tomorrow*, 1976, with slight modification and the permission of the American College Testing Program.