Computing Research Association Committee on the Status of Women in Computing Research

Graduate School Information Guide

Research Mentoring

◆

Sharing Information

◆

Building Communities

◆

Effecting Organizational Change

◆

www.cra.org/craw

CRA W

CRA-W

Committee on the Status of Women in Computing Research

CRA-W aims to take positive action to increase the number and success of women in computing research and higher education through its four areas of activity:

Research Mentoring

Providing hands-on research experiences and mentoring programs that guide, support, and encourage women in computing.

- Best Practices in Recruiting and Retaining Women in Computer Science and Engineering
- Career Mentoring Workshops
- Collaborative Research Experiences for Women
- Distributed Mentoring Project

Information Sharing

Collecting, analyzing, and disseminating information about and for women in computing.

- Careers Booklet
- CRA-W Online
- CSE Ph.D. Database
- "Expanding the Pipeline" Column

Community Building

Fostering professional networking, collaboration, and recognition of women in computing.

- Award Nominations
- Coalition of Women in Computing
- CRA-W/Lucent Technologies Distinguished Lecture Series
- Systers Academia

Effecting Organizational Change

Educating and influencing organizations on issues, policies, and procedures to promote the full participation of women in computing.

- Government Affairs
- Senior Leadership Development Workshop

www.cra.org/craw

Graduate School Information Guide

Guidance for Undergraduate and Graduate Students

Original Guide • Sandra Johnson Baylor, *IBM T.J. Watson Research Center*

Year 2000 Updates • Carla Ellis, *Duke University*
Ann Redelfs, *San Diego Supercomputer Center*

Contents

Preface

In 1991, the Computing Research Association (www.cra.org) established a subcommittee to address the problems of attracting and retaining women in computer science and engineering (CSE). The resulting CRA Committee on the Status of Women in Computing Research (www.cra.org/craw), CRA-W, has developed a number of highly successful programs and publications.

This publication, "CRA-W Graduate School Information Guide," is designed to help lead students through the graduate school process. It includes advice and other information on the decision to pursue a graduate degree, the application process, and matriculation. Also included is information on the problems experienced by many women pursuing advanced degrees in CSE, and strategies to improve the graduate school experience. A list of sources of financial support can be found at the end of this publication.

Another publication, "CRA-W Career Mentoring Workshops," covers a decade of successful workshops providing critical information and mentoring to students and professional women at all levels in computer science and engineering. The panelists at the workshops include prominent senior women from academia, funding agencies, the national laboratories, and industry, who speak expertly on a variety of subjects from "getting a job" to "obtaining funding" to "time management."

To obtain additional copies of CRA-W publications, go to www.cra.org/craw/pubs.html.

We wish you all the best as you pursue your graduate career.

Sandra Johnson Baylor
IBM T.J. Watson Research Center

Carla Ellis
Duke University

Ann Redelfs
San Diego Supercomputer Center

Graduate School Information Guide

1. INTRODUCTION

Computer Science and Engineering (CSE) research has fueled numerous innovative and technological advances, resulting in the improvement of the quality of life for many. Although women have made major contributions to these advances, they are underrepresented in the field.

The 1997-98 Computing Research Association (CRA) Taulbee Survey [5] found that only 10.8% of the faculty of Ph.D.-granting CS&CE departments were female and only 8% of full professors were women. Also, although women who choose technical disciplines as undergraduates are more likely to earn their bachelor's degree than men, women drop out of Ph.D. programs at twice the rate of men. Only 14% of the Ph.D. recipients in 1998 were women.

The objective of this CRA-W Graduate School Information Guide is to encourage more women to pursue an advanced degree in CSE and to help them better understand the graduate school experience so they will be more likely to succeed. Included is some discussion of the problems experienced by female graduate students and strategies to improve their graduate school experience. Also included is advice on the steps needed to obtain a graduate degree that focuses on the experiences many women encounter as part of this process, an examination of the reasons for obtaining an advanced degree, and information on the application process and matriculation.

The process used to obtain a graduate degree in CSE can vary widely from department to department. Included here are some general guidelines. Your specific department will include some, but possibly not all, of these requirements. These comments pertain primarily to programs in the United States and Canada.

Section 2 discusses the advantages and disadvantages of pursuing an advanced degree in CSE, including information on financial benefits, the time it takes to complete advanced degrees, exciting intellectual challenges, and the aspect of spending time conducting research. Section 3 offers advice on choosing the right graduate school, including decisions you'll need to make about deciding where to apply, questions you can ask yourself about programs you are considering, and how to weigh various factors when it's time to make your final decision.

Section 4 of this guide covers the graduate application process, which includes steps on filling out applications, getting valuable letters of recommendation, writing your personal statement on your interest in graduate school, and how to stay organized. Section 5 presents information on graduate financial aid, pointing out that financial aid is available—you just have to know where to look, who to ask for assistance, and the pros and cons of various types of support. Finally, Section 6 discusses graduate school matriculation, including the M.S. and Ph.D. requirements, choosing the right advisor, and the problems many women face while in graduate school.

The final section of this publication is a resource guide of sources of financial aid. This list is a small sample of the fellowships and grants available to support graduate study. You should inquire about other sources, asking your colleagues, advisors, and professors for suggestions.

2. ADVANTAGES OF OBTAINING AN ADVANCED DEGREE

There are many reasons for deciding whether to attend graduate school. The reasons vary from individual to individual and are based on many factors including, but not limited to, career goals, lifestyles, family commitments, personality, and financial and other constraints.

Having an advanced degree generally results in earning a higher salary from the very beginning of your career. A report in the *Electrical Engineering Times* [8] showed that median annual salaries for M.S. and Ph.D. electrical engineers and computer scientists are substantially higher than those for holders of the B.S. degree (median salaries in 1999: Ph.D. $90,900, M.S. (E.E) $81,500, M.S. (C.S.) $87,000, and B.S. $73,500).

Sources of information on starting salaries [3, 9] show that the difference an advanced degree can make in the initial job offer is substantial. However, the decision to attend graduate school should not be based solely on the expectation of monetary benefits. One of the disadvantages of attending graduate school is the fact that the marginal gain of a few thousand dollars a year in starting salary may not offset the income you might earn if you do not attend graduate school and invest wisely the money earned right out of college.

It typically takes one to three years and five to eight years to obtain a M.S. and Ph.D., respectively, in CSE. The longer the stay in graduate school, the greater this monetary disadvantage. You may never recoup the difference resulting from attending graduate school and beginning your career later. As explained in Section 5, students are often adequately supported (tuition and a stipend) to attend graduate school in CSE; however, the amount of money you earn as a graduate student is considerably less than the amount you would earn while working on a job. This may be a serious disadvantage if you have others to support.

Many of the advantages of graduate school are qualitative, involving the kind of challenging projects you can pursue with an advanced degree that might not be open to you without one and the satisfaction that results. Graduate school provides training in research. Attending graduate school facilitates the student's ability to advance the state of the art in their chosen CSE area through cutting-edge research. A graduate degree gives the holder more credibility among peers.

Another advantage is that an advanced degree adds depth and breadth to your academic background, which may improve your chances of obtaining an interesting job, or improve your job performance if you already are employed. An advanced degree gives you more flexibility in choosing projects and provides you with the expertise needed for increased levels of responsibility.

An advanced degree is viewed as a distinguishing criterion for separating job seekers in the applicant pool and it provides research and writing experiences vital for launching your career onto the fast track. Throughout your career, these are the attributes that often make the critical difference in job satisfaction. Finally, some jobs require an advanced degree. For example, if you plan to teach or do research at an academic institution, a Ph.D. is usually required (certainly a master's).

Graduate school, however, is very demanding and it requires discipline and focus. It is a humbling experience and it is also very stressful. If you do not have the personality, coping mechanisms, and/or an effective mentor, you may be overwhelmed. In Section 6, various ways of finding and/or building a support network are discussed.

An important factor to consider is your ability. You should conduct a realistic assessment of your chances to successfully complete a degree program. You may not be able to make a realistic assessment yourself, as some women tend to underestimate their abilities. Your professors can help you with this assessment. Get to know as many of your undergraduate course professors as possible, particularly in the technical areas that interest you. A good way to interact with professors is to take advanced undergraduate courses and even, if possible, introductory graduate courses. (This will also add depth and breath to your background.) Also, get to know the graduate students, particularly the teaching assistants, if they are present at your school. Go to these professors and graduate students and discuss your desire to attend graduate school. Get their opinions on how well they think you would do.

One of the most important questions to ask yourself is whether you will enjoy doing research. Undergraduates often have had little exposure to research which, rather than classwork, is the central focus of the graduate school experience. However, there are an increasing number of opportunities to gain this experience while still an undergraduate. By starting to think about graduate school during your junior year, you have time to explore these opportunities.

Research Experiences for Undergraduates (REUs) and the CRA Distributed Mentor Project [4] are examples of programs that sponsor this type of activity. Look into these programs and take advantage of the experience they offer. Taking an independent study course is another way to get involved in the research projects pursued by a professor at your college. The supervising professor can help you access your ability to do research. As Section 4 will explain, experience gained from this type of activity can also be a major selling point when applying to graduate school, and your research supervisor may get to know you well enough to provide a good recommendation letter.

Excellent advice on how to find undergraduate research opportunities and leverage them in applying to graduate school is available from professional societies, such as the Association for Computing Machinery (ACM) [2]. While others can provide insight and encouragement, ultimately, the decision is yours, based on your situation and goals.

After making the decision to go to graduate school, the next question may be what degree you are going to pursue. If you are thinking of first getting a master's and then (possibly) your Ph.D. degree, you should be aware that there are usually advantages in applying directly to a Ph.D. program (and receiving your master's along the way) rather than presenting your plans in the more natural, chronological order. Students applying for a master's degree often are not considered for financial aid. If you are certain that you are not interested in continuing for the Ph.D., then you should consider a "terminal" master's program.

3. CHOOSING THE RIGHT GRADUATE SCHOOL

3.1 Deciding Where to Apply

Once you decide to attend graduate school, there are many factors to consider in determining which school is right for you. The goal should be to find the right match between your goals and the program you choose. In this section, we discuss some of the questions you might want to ask and how to find those answers.

One of the first questions to consider is what areas of CSE interest you the most and then to determine which schools offer quality programs in those fields. Some students at this stage seem certain of the specific area in which they want to specialize and possibly even the professor they want as a mentor. Other students have not narrowed down their interests to this extent. This may make a big difference in your evaluation of programs. Some universities offer top-ranked programs in one area (e.g., graphics) and are relatively weak in other areas; whereas other universities are highly ranked, in general, and offer a breadth of areas, but do not have depth or a critical mass of faculty in the one area of interest to you. Since it is not uncommon for students to change interests or advisors during their graduate school tenure, some breadth is desirable in the department you choose. The "right" balance between depth in one area and overall breadth is something you should try to determine.

Where you do graduate work is important, since the reputation of the institution can add to or subtract from the value of your credentials upon completion. For graduate school, the national reputation of the particular department is more important than ranking of the university as a whole. This is determined by the quality of its faculty, library holdings, research facilities, research funding, and the success of its graduates.

Two sources to consult for comparative rankings of programs are the annual surveys by *U.S. News and World Report* [13] and a somewhat older survey by the National Research Council. [10] Both are valuable in allowing you to select various criteria that may be of interest to you (e.g., the number of women faculty in the department). While rankings convey important information, they don't necessarily reflect centers of excellence in particular areas or new opportunities that have developed at an institution since the last survey.

Professors and graduate students at your undergraduate institution can make recommendations regarding what schools you should apply to, based on your abilities and interests as well as the latest news about departments on the academic grapevine.

If you are working, then you can seek advice from co-workers or others in your company who have earned graduate degrees in CSE. Also, many human resource departments classify and rank CSE graduate programs for recruitment purposes. You may want to first enroll as a part-time student at a local university and take a few courses in your area of interest to provide more depth and breath to your background. Get to know the teachers because they can advise you on graduate schools, particularly if they know your abilities.

There are many considerations that go beyond the reputation of the program. Graduate programs vary widely in size, cost, supportive envi-

ronments, and style. You should seriously consider the type of program in which you would excel, weighing all of your options. Some questions you should ask yourself include:

- In what type of academic climate do I wish to study?
- What type of degree am I seeking?
- What are my academic credentials? Research abilities? Writing skills? GPA? Test scores?
- What are my financial needs?

For descriptive information on degree offerings, enrollment, number of graduates, admission requirements, academic calendar, and faculty size, an easy way is to consult each department's own Web site. Many schools now offer on-line applications from their Web sites, as well. For information all in one place, the Peterson's Guide [11] is a good source. Also, the ACM offers a Web site entitled, "Graduate Assistantship Directory" [1]. Hardcopy of these publications should be available in most university libraries. Furthermore, you should take advantage of graduate program career fairs.

These events provide you with an opportunity to learn more about specific programs by talking with pro-gram representatives. They also provide you with the opportunity to gather information to compare various programs.

After you have made a personal assessment and gathered advice from professors, graduate students, and/or co-workers, make a list of schools that seem right for you. This list should include schools in each of the following categories: 1) highly ranked, selective "dream" schools, offering both breadth and depth; 2) schools that are especially strong in your narrow area of interest, if known; and 3) schools in which you have a very good chance of acceptance. This should improve the probability of acceptance into at least one graduate program and, if you tend to underestimate your ability, a better one than you may have expected.

Once you have a list of schools, gather as much information about them as possible. For each department, list its location; size; type (major state or private university); the cultural, social, and academic environment of the campus; the percentage and number of women in the CSE graduate program; the percentage and number of female faculty members; the academic calendar (semester or quarter); and the financial aid packages.

Prerequisites for entering specific programs and requirements for graduation are major determinants of expectations and length of time for completion. With this in mind, a careful review should be made of what is required, recommended, or optional in terms of: 1) course hours; 2) thesis/dissertation; and 3) residency.

The campus environment—the place where a student lives, studies, and gains intellectual prowess—must be conducive to self-determination and self-fulfillment, and it must allow for personal and academic growth. Thus, areas such as living accommodations for graduate students, cultural and social outlets, and collegiality of association are all critical factors in the assessment of each institution.

One important feature of graduate education—a feature that makes it uniquely different from undergraduate studies—is the close working relationship formed between the student and the thesis/dissertation advisor. The uniqueness of this relationship is such that it is imperative that: 1) the graduate program has a history of advising, mentoring, and graduating female graduate students; and 2) the department is recognized as a place that appreciates and supports the intellectual capabilities of female students.

Other questions to ask about the graduate program you are considering include:

- Does the faculty exhibit special strengths and research qualities through their graduate advisees, published works, and funded research?
- Are the libraries, laboratories, computers and other research facilities adequate for your educational needs?
- Are the graduates of the program sought by recruiters?
- Does the department of interest offer sufficiently large and varied curriculum to allow you a broad offering of courses and options?
- How senior are the professors in your area, what are their interests and what will their availability be? Do they already have a large number of students? Are they heavily involved in outside activities(e.g., startups)?
- What are the degree requirements? Number of hours of coursework required? Major exams? What are the expectations for a thesis or dissertation?
- What is the completion rate of the general graduate population? Of the female graduate population?
- How long will it take to complete the program?
- Is study space and/or office space available for graduate students?
- Is there a chapter of a formal association (e.g., Society of Women Engineers) or an informal group (e.g., monthly luncheon) for women in the department or college?

Once you have collected as much information as you can about the schools on your list, you should narrow the list down to a handful of schools and then start the application process. One of the best ways to get answers to many of your questions is to take the time to visit several CSE departments. Many students do this in the summer or fall of their senior year when considering where to apply.

3.2 Deciding Where to Accept

Once offers of admission and financial aid go out, it is time to make the final choice of the one program you will accept. Many departments now host visits for prospective graduate students who have already been offered admission into their programs in March or April prior to the deadline for making their decision (which is traditionally April 15). Schools may even offer to reimburse travel expenses for such visits. Visiting and talking with faculty and current students is one of the best ways to assess the academic climate for women at that school. There is no better way to judge the qualitative aspects of the program that do not show up well on paper. Are the students, especially the women, happy? Are the faculty members in your area people you think you could form a working relationship with? Are the women in the department visible and respected members of the community? Excellent advice on what to look for during a campus visit can be found in [12].

4. THE GRADUATE SCHOOL APPLICATION PROCESS

The application process consists of writing letters to the graduate programs to request application materials, taking the required exams, completing and submitting the application materials prior to the deadline (usually December or January), asking for letters of recommendation to be sent on your behalf, and sending letters of acceptance or rejection once you are admitted to a program. You can begin requesting application materials as early as the summer before the last academic year before you matriculate as a graduate student, but no later than September.

In this letter, include a statement about your interest in applying to

the graduate program of the particular department, a request for detailed information about the department, and a request for all application materials, including financial aid. Even though many schools are making applications available on the Web, you should still start early to ensure you have time to gather all the materials you will need. Start organizing a file of information about this process. We recommend one folder for each school to which you are applying and a folder for your transcript(s) and GRE scores.

The graduate school application generally includes an application, your personal statement, transcript(s), GRE scores, and letters of recommendation. The objective of the graduate committee reviewing these applications is to assess and quantify your ability to conduct a successful research program within the department. Therefore, your application preparation and presentation should show a professional set of credentials that make the case for your research potential. This includes using a clear, concise, and coherent writing style and completing of all parts of the application as directed.

Before you complete the actual application, read it thoroughly and make sure you understand everything that is requested of you. Make a copy of the application and think about each item before completing it on the copy. Make sure your responses reflect your interest, qualifications, and motivation to pursue an advanced degree. Once you have completed the application, look it over carefully, first to make sure you are satisfied with the expression of your ideas, and second to check for grammatical errors and misspelled words. Then complete the actual application, using your copy as a guide. When the actual application is complete, review it for content, grammar, and spelling.

Official transcripts usually are required when submitting an application. Your undergraduate institution usually will send the official transcript directly to graduate admissions. However, before this occurs, obtain an unofficial copy of your transcript and make sure it is correct. Request the official transcript well in advance of the application deadline so you have time to correct any problems before the deadline.

Results for the Graduate Record Examinations, GREs, (Educational Testing Service, P.O. Box 955, Princeton, NJ, 08540, (609) 921-9000, http://www.ets.org) are required by many, but not all, CSE graduate admissions programs. Many schools require the general GREs (verbal, quantitative, and analytical tests), and an advanced GRE. Advanced GREs are offered in computer science, math, and electrical engineering (as well as many other fields). The GRE office will send you information about these advanced tests with sample exam questions. The GRE can be taken late in your junior year but no later than the fall of your senior year. Make sure that the schools to which you are applying that require GRE scores are included in the list of schools, agencies, etc., that will receive your scores. The GREs are now given in a computerized format. It is a good idea to do a bit of preparation both for the new format and because you probably have gotten out of practice for taking standardized tests since your SATs.

An important component of the application is the personal statement. This statement gives you the opportunity to elaborate on your motivation for wanting to pursue an advanced degree, your interests in the graduate program at the specific school, your technical area of interest, and your professional goals. This gives the graduate admissions committee the ability to assess your ability to conduct a successful research project in the environment present at the school. Research should be the central theme in this statement. Whereas good academic performance in an undergraduate program usually means getting good grades in coursework, the admissions committee will be looking for evidence of originality, creativity, problem-solving ability, inquisitiveness, independence as well as the ability to collaborate, and good writing skills as predictors of future research success. Include in your personal statement any background work that indicates you can successfully complete a graduate research program. If you had any research experiences as an undergraduate in CSE that you loved, describe them. If you did any independent study in your technical area of interest under a professor, describe this. Explain why you are interested in the given technical area and why you think you should be admitted. Describe any relevant accomplishments— this is not the time to be modest. The length of your personal statement should be reasonable. Many schools limit the length to one typed page or 500 words. In these cases, make sure you work within these guidelines. It is wise to write a rough draft and have at least two of your professors or coworkers critique it. Once you are satisfied with its contents, proofread it thoroughly before transferring it to the actual application.

Another important component of the application is the set of letters of recommendation written for you. Many graduate admissions programs require at least three letters of recommendation. Approach professors who know you and your abilities. It is very important that all of your letters of recommendation are positive. Ask potential letter writers if they would give you a positive recommendation. Although this may be awkward and difficult, it is imperative that you know that positive letters of recommendation are included in your total application. Otherwise, you may have excellent credentials, stellar GPA and GRE scores, a concise and well-written personal statement, but a negative letter of recommendation from a well-known and respected researcher in your area of interest. If that is the case, you probably will not be admitted to the graduate program. A good letter has to say more than the fact that you received an "A" in some class you took from them. Give the letter writers all the pertinent information needed to write an effective and positive recommendation such as a resume and your personal statement.

There is some evidence that letter writers sometimes subconsciously write a different kind of letter for women than for men, emphasizing their positive "feminine" qualities (e.g. cooperation) instead of other qualities they have which may be perceived by some readers as more important for graduate success (e.g. ambition). Ideally, you may know your letter writers well enough to have a conversation about this issue. If not, guard against falling into the same trap within your own personal statement. Describe yourself in the documentation you give to your letter writers in the same way you would like them to describe you in their letters. If you set the tone you want, they may follow suit.

The writer should be told the name and address of each school to which you are applying, your technical area of interest, and the application deadlines. Supply the letter writer with a correctly addressed, stamped envelope to send each letter. Make your request known to the letter writer well in advance of the application deadline. Approximately two weeks before the deadline, follow up with the letter writer to make sure the recommendation has been sent.

Additional advice on the application process, especially on how to write a strong personal statement and get good letters of recommendation can be found in [2, 12].

Once you have completed the entire application, review it thoroughly and make copies of everything before mailing it. Because the postal service does not guarantee delivery, having a copy of the application will expedite the re-application process if needed. Some graduate applications include a postcard that is used to notify you of receipt of the application. Be sure to include your address on this card and postcard postage. If an application does not include such a postcard, it is a good

idea to include one yourself. This postcard may include the statement "The Department of CS acknowledges receipt of the application of Jane Doe," and space for a date and signature. To verify that the entire application package has been received, you may want to include this type of postcard with the application you send, as well as the transcript and the letters of recommendation sent by others. The Educational Testing Service will inform you when your GRE test scores have been sent to the schools you have chosen. Make a copy of the application and place it in the file folder you have for the specific school. When you receive the postcards, place them in this folder.

Graduate admissions usually notify you of their decision by March or April of the academic year prior to your matriculation. When you are accepted into a graduate program (especially more than one program), a primary factor to consider is the financial aid package offered to you (this is discussed in detail in the next section). This is also the time to think seriously about the offers. You may want to go to your professors or co-workers and ask for their advice. They will be pleased that you have been accepted into a graduate program and more likely than not, will be happy to offer advice on the reputations of the specific programs. Try to find someone who has graduated from the graduate program of that department and seek their advice and discuss their experiences. Visit if possible.

You should make your decision in a timely manner. Once this is done, notify your school of choice of your decision to accept and your intention to enroll. Notify the institutions you did not choose and thank them for considering your application. A timely response is important because these schools may quickly offer this slot to someone else.

5. FINANCING GRADUATE STUDY

Funds for graduate study are available. Most departments support their Ph.D. students with both tuition and a stipend to live on. Master's students may not be offered such support. However, there are numerous sponsorship, research, institution, and fellowship dollars available. Even if you expect funding from the Ph.D. program that admits you, there are good reasons to seek out and apply for various fellowship programs.

Independent funding gives you flexibility and more freedom in choosing research advisors. If granted prior to admission decisions, an outside fellowship can also make you more attractive to admissions committees.

Make a list of all the graduate funding programs available. Seek advice from the career counseling and placement center and the graduate financial aid office at your undergraduate institution. You can also seek advice from the graduate financial aid offices of the schools to which you apply. Read graduate study announcements and department bulletin boards. Talk to faculty. Go to the reference section of your school's library or of your local public library. There is generally a plethora of information available in these reference sections on graduate financial aid.

Included at the end of this publication is a resource list of organizations and programs offering financial support for graduate study in CSE. There are two basic types of graduate school aid available: fellowships and assistantships. A fellowship is a form of financial aid that is similar to a scholarship. It is a grant of money for which no work is required, and can cover all or part of tuition, and it may include an additional stipend for living expenses. Fellowships are awarded based on merit and may be offered by universities but most are through organizations outside the university such as private industry, foundations, and the government. Many corporations that sponsor fellowships also provide paid summer internships. There is usually no requirement to work for the company after graduation; however, a successful internship may result in an offer of permanent employment.

An assistantship is a form of financial aid in which the student is required to work. The work is often related to the student's studies or areas of interest. There are two types of assistantships: research (RA) and teaching (TA). RAs pay the student to assist a professor in an experiment or a research project. To be chosen as a RA is prestigious and offers several advantages. You are directly associated with an ongoing research project, and you may be able to formulate your thesis or dissertation topic as a result of the work. You also may be able to conduct research for your thesis. Another advantage is that you are working with someone who may be well respected in the field. Published papers that result from the work will include your name associated with this respected individual. If these papers are presented at a conference, you may have the opportunity to present the work and make contact with others working in the field.

TAs pay the student to assist in a professor's course or teach low-level undergraduate courses. Assisting a professor may require grading problem sets or examinations, overseeing laboratory courses, teaching tutorial sessions related to the course, or provide office hours to explain problems relating to the course. Many graduate students in CSE are supported by assistantships available through the department. They usually are awarded based on merit (academic potential and performance as assessed from your application). Many schools require all students to TA at some point as training for academic positions they may apply for upon graduation.

Gather information about graduate aid during your junior year or the summer preceding your senior year. Many programs have early deadlines (November or December of your senior year) so you should request application materials no later than September of your senior year.

Funding can only be awarded to those who apply. Many programs do not have an effective program for finding you, so you must be diligent in finding them (in fact, many funding programs do not award as much aid as they would like to because students do not apply). Apply to as many programs for which you are eligible. The incremental effort to apply for additional fellowships is minimal once you have prepared the necessary materials for the first one. Make copies of everything before mailing and add the copies to your file.

6. MATRICULATION

6.1 Degree Requirements

It is important that you understand the academic standards for graduate students at your chosen school and the actual process required to obtain your advanced degree. Programs vary a great deal and it is hard to make generalizations. Often the first couple of years of a Ph.D. program resemble a master's degree program. This period is likely to involve coursework to acquire sufficient breadth in the field. This phase is likely to culminate in an exam, called the qualifying, preliminary, or comprehensive exam. This exam may be written, oral, or both and each student prepares for it independently. The exam is usually taken after the completion of formal coursework; however, many graduate programs require that you initially take this exam during the first year of your graduate program.

Actually earning a master's degree may be an explicit requirement for continuing on to the Ph.D. or it may be awarded as a "side-effect" of clearing these initial hurdles in the Ph.D. process. There may be an early research requirement (a project that need not have anything to do with the eventual dissertation topic or a master's thesis) to demonstrate research ability.

The next step is to define a dissertation topic and convince one's research committee that it is a project worth doing and you are ready to do it. The dissertation is an independent project under the leadership of the research advisor (see the discussion on choosing the right advisor below). The Ph.D. student is usually required to present a written dissertation proposal to the research committee and defend it in an oral exam.

This committee generally includes your advisor, other professors in your chosen area, and some outside your area. Different schools have different procedures for selecting members of this committee. They range from permitting you to select all of the members of your committee by following certain guidelines to having members of the department and the graduate school appoint the members.

The last stage is to complete the dissertation research. The dissertation varies in form and length, depending on the technical area and the type of research involved. It is designed to show a mastery of the subject matter and of research tools. It should contribute something new to the field. This phase can take three to five years to complete. Once the research is completed and a draft of the dissertation is written, the student is usually required to conduct a defense (or oral exam) of the work. In most instances, you will be required to discuss your work, including your methodology, results, and conclusions. You must defend the accuracy of these results as well as their significance and original contribution to the field. After passing this exam and polishing the final document, the student usually has completed all the requirements to receive the Ph.D. degree.

Excellent advice about how to maintain momentum, focus, and a positive attitude during the long, unstructured research phase is available in [6, 7]. To obtain a "terminal" master's degree, schools may require coursework only or coursework and a thesis.

You may have a choice between the two. A thesis is a research document presented as one of the final fulfillments for obtaining a master's degree. Your decision to pursue graduate work with or without the thesis option depends on your career goals. If you plan to obtain an M.S. degree and then work in industry, then the coursework option may work best for you. But if you plan to eventually obtain a Ph.D. (even if you plan to take a break between getting your M.S. degree and starting in a Ph.D. program), you should choose the thesis option to develop your research skills.

In M.S. programs that require coursework only, there usually is a requirement to take a number of in-depth courses in your area of interest, as well as some breadth courses for completeness. You also may take a few additional courses, including an option to do independent study or complete a minor. There may also be an exam covering some core curriculum in this option.

M.S. programs that require a thesis also require you to take courses in CSE. You are required to have a research committee that oversees your research. You may be required to present a proposal to this committee.

The proposal is typically a description of the type of research you wish to pursue and a presentation of some details about how the work will be conducted and the results you hope to achieve. Once you have completed your research work and have completed or are near the completion of the writing of your thesis, you may be required to defend your work. The defense make take one of several forms, such as a lecture on the thesis topic, a formal oral examination of your work, or some combination of the two. Once you have passed this defense and completed the required coursework, you have completed all the requirements to obtain the M.S. degree.

6.2 The Advisor-Student Relationship

A major figure in the life of the graduate student is the research advisor. The relationship you establish with your advisor is vital to your successful completion of your graduate program. Therefore, it is of utmost importance that you do your homework when selecting an advisor. There are several basic questions that should serve as a guide to you in selecting your advisor, described below.

First, ask if the faculty member is in a position to share her or his time and advice. Graduate-level faculty are expected to accept new doctoral students; however, because of tenure status, research, or resource constraints, and other factors, they may not be willing to take on additional students at this time. You may not want an advisor with too little available time to give you the attention you need. If your potential advisor does not have tenure but is up for tenure review in two years, it may not be a good idea to have this person as an advisor because the individual may not get tenure. As a result, they may leave while you are in the middle of your research program. It may be possible to assess the faculty member's tenure prospects by talking with various faculty members within the department. You may want to seek their advice and opinions before making your decision.

Second, determine if the faculty member has a reputation for producing quality research in a timely manner. A part of the thesis process and a major part of the doctoral process are the development and completion of an original research project worthy of publication in conference proceedings or journals in your technical area. Your advisor's research expertise and laboratory output will be crucial to your research productivity. Having an advisor with a good reputation in the field will be beneficial to you when completing your studies (particularly for those in Ph.D. programs). A well-known advisor will result in an increased marketability for academic and other research positions upon graduation.

Third, determine if the faculty member's current research area is of interest to you and in keeping with your graduate study goals. If your research interests are totally opposite from those of the faculty member, this probably is not a good choice. An effective research alliance requires commonality of interest. If you find you have a good rapport with a faculty member who is not conducting research in your area of interest, you may want to establish another form of mentoring relationship with that faculty member. For example, you may be able to obtain professional advice from this faculty member.

Fourth, determine if the faculty member's working style is compatible with your own. If you need frequent interaction but your advisor takes a "hands-off" approach, the relationship may be less satisfying and the process of finishing the research more difficult than otherwise. If you prefer to collaborate on large projects but your advisor encourages independent projects, it may not work as well. How well can you communicate with this person?

Finally, you should determine if the faculty member is sensitive to the concerns and problems many women face as a graduate student. The small numbers of female graduate students in CSE sometimes

result in feelings of isolation. Women also encounter a number of other problems that fall disproportionately within a woman's domain. Ideally, you may wish to have an advisor who is aware of the unique problems you may encounter and who will provide a supportive environment. However, this may not be the case. In such instances, you should seek supportive mechanisms elsewhere.

6.3 Gender Issues and Support

Many women encounter problems in graduate school in CSE that are unique to their gender. Women also often react differently to the common problems that all graduate students experience. If you do not find a supportive environment during your matriculation, it may be difficult for you to complete your degree requirements.

The period of transition from the familiarity of coursework to the unstructured nature of research is a stressful time for most graduate students. It may help to realize that almost all students experience the doldrums sometime during the middle years of the program. Unfortunately, many of the men will not talk about it and many women may still feel they are alone with these feelings. The nature of this period can challenge anyone's identity and women often have lower self-esteem to begin with. Add to these emotional challenges a sense of isolation and lack of role models, family responsibilities that fall more directly upon women, and even harassment and blatant discrimination.

All graduate students deserve a positive environment, but women, in particular, need a support structure to deal with such issues. Before you enter the program, do some research to determine if the department or the graduate school provides some means of support and encouragement. For example, there may be a formal women-in-computer science program that pairs female faculty, other sensitive faculty members, or more advanced graduate students with new women graduate students for mentoring or other support. There also may be informal programs where female graduate students and faculty meet on a regular basis (for example, lunch once a month) to discuss problems, issues they encounter, and technical work. Some CSE departments provide some kind of support for the special needs of female graduate students such as childcare. If you are not aware of these programs when you arrive, ask about them. If they do not exist in your department, you may want to start an informal group.

If there are few women in your department, you may try getting together with women in other technical disciplines such as engineering or the physical sciences. To get more exposure to women role models, you might propose women speakers be invited for your departmental colloquia or you may ask to be supported to attend conferences such as the Grace Hopper Conference or CRA Mentoring Workshops where you can meet many other women in the field.

7. EPILOGUE

Earning a graduate degree in CSE can be an empowering process. It is possible that the intense intellectual enlightenment associated with this process may not be repeated at any other point in your life. It can be an exciting time. However, it is also a humbling experience that can be extremely stressful. This guide outlined the graduate school process for women in CSE. The overview presented here was designed to educate you on this process, and highlight some of the advantages and disadvantages of pursuing a graduate degree. Also discussed were some formal and informal programs you can use to provide a supportive environment conducive to conducting a successful independent research program while enjoying your life.

ACKNOWLEDGEMENTS

We would like to thank Howard Adams of the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) for helping to inspire this publication by producing a minority student Graduate School Information Kit entitled, "Negotiating the Graduate School Process." We also would like to thank Gail A. Alverson, Phil Agre, Rachel Pottinger, and the women of systers (an electronic support group for women in computing) for giving us summaries of advice from the experiences of a number of women and other graduate students. We want to thank Dror Feitelson for advising us on the specifics of LaTEX.

Finally, We want to thank Mary Jane Irwin, Pennsylvania State University, and Dian Lopez, University of Minnesota, Morris, for their valuable comments on the review of preliminary versions of this document.

REFERENCES

1. ACM. Graduate assistantship directory. www.acm.org/gad.

2. Paul Arge. Advice for Undergraduates Considering Graduate School. ACM Crossroads, 1996. www.acm.org/crossroads/xrds3-4/gradschool.html.

3. Bureau of Labor Statistics. Occupational Outlook Handbook: Computer Scientists, Computer Engineers, and Systems Analysts. stats.bls.gov/oco/ocos042.htm#earnings, 1999.

4. CRA-W. Distributed Mentor Project. www.cra.org/Activities/craw/projects/researchMentoring/dmp

5. CRA. Taulbee survey. www.cra.org/CRN/html/9903/survey/dk.4_1_t.shtml, 1999. Demographic data: www.cra.org/CRN/html/survey/faculty_demographics.html.

6. Marie desJardins. How to Succeed in Graduate School: A Guide for Students and Advisors, Part 1. ACM Crossroads, 1994. www.acm.org/crossroads/xrds1-2/advice1.html.

7. Marie desJardins. How to Succeed in Graduate School: A Guide for Students and Advisors, Part 2. ACM Crossroads, 1994. www.acm.org/crossroads/xrds1-3/advice2.html.

8. EETimes. 1999 Salary Survey. www.eetimes.com/salarysurvey/1999/money.html, 1999.

9. National Association of College and Employers. Job Outlook—Starting Salaries. www.jobweb. org/pubs/JobOutlook/salaries.html, 1999.

10. National Research Council. Ph.D. Programs in Computer Science. http://www.cra.org/ statistics/nrcstudy2/home.html, 1995.

11.Peterson's. Guide to Graduate Studies in Engineering, Computer Science, and Information Studies. www.petersons.com/compsci/programs.html. Hardcopy and CD-ROM available.

12. Rachel Pottinger. Choosing a Ph.D. Program in Computer Science. ACM Crossroads, 1999. www.acm.org/crossroads/xrds6-1/choosing.html.

13. U.S. News and World Report. Rankings of Computer Science Ph.D. Programs. www.usnews.com/usnews/edu/beyond/gradrank/gbcompsc.htm, 1999.

Resources

Sources of Financial Support

This list is a sampling of the many fellowships and grants available to support graduate study. As you plan your graduate career, be assertive in asking colleagues, counselors, advisors, and faculty members for additional resources that may be of use to you.

Alfred P. Sloan Foundation

630 Fifth Avenue
Suite # 2550
New York, NY 10111
(212) 649-1649
http://www.sloan.org/programs/scitech_fellowships.htm

A.T. Anderson Memorial Scholarship

Applicant must be a full-time undergraduate student at a four-year accredited college. Must be majoring in a math-based discipline including math, engineering, and science. Must have a 2.0 GPA. Must be a member of an American Indian tribe or otherwise considered to be an American Indian or at least 1/4 Alaskan Native.

$1,000 (undergraduate/year)

$2,000 (graduate/year)

EPA Tribal Lands Environmental Science Scholarship

Must be attending an accredited institution, majoring in an environmental related discipline including biology, biochemistry, chemical engineering, chemistry, or environmental science. Must be a member of an American Indian tribe or otherwise considered to be an American Indian tribe or at least 1/4 Alaskan Native. Must have a 2.5 GPA.

$4,000/ per year

American Association of University Women Educational Foundation (AAUW)

111 Sixteenth Street NW
Washington, DC 20036-4873
(202) 728-7603
http://www.aauw.org

American Fellowships

American Fellowships support women doctoral candidates completing dissertations, scholars seeking funds for postdoctoral research leave, or those preparing completed research for publication. Candidates are evaluated on the basis of scholarly excellence, teaching experience, and active commitment to helping women and girls through service in their communities, professions, or fields of research.

$27,000

American Dissertation Fellowships

These fellowships are available to women who are in the final year of a doctoral degree program at an accredited institution, and complete the writing of their dissertations between July 1 and June 30 of the next academic year.

$15,000 in one year

International Fellowships

International Fellowships are awarded for full-time study or research to women who are not U.S. citizens or permanent residents.

$16,500

Selected Professional Fellowship

Selected Professional Fellowships are awarded to women who are U.S. citizens or permanent residents and who intend to pursue a full-time course of study at an accredited institution during the fellowship year in designated degree programs where participation by women traditionally has been low.

$5,000-12,000

Dissertation Fellowships for Doctoral Candidates in Engineering

Awarded to women who have completed all course work and passed all preliminary exams by November 15th. Candidates must be U. S. citizens or permanent residents.

$15,000

American Society for Microbiology (ASM)

Minority Undergraduate Research Fellowship
Office of Education and Training
1752 N. Street, NW
Washington, DC 20036
(202) 737-3600
http://www.fellowships~careerinformation@asmusa.org

ASM Minority Undergraduate Research Fellowship

The American Society for Microbiology is offering research fellowships to minority under-graduate students in microbiological sciences. Applicants must be a member of an under-represented minority group in the sciences, including Black/African American, Hispanic American, Native Americans, Native Pacific Islander, or Alaskan Native American. Must be enrolled as a full-time undergraduate student and have a strong interest in obtaining a Ph.D. or M.D./Ph.D. in the microbiological sciences. Must be U.S. citizen.

$2,5000/stipend

$850 –student lodging/$500/research supplies

Bell Laboratories and Lucent Technologies

101 Crawfords Corner Road
Room 1E-209
Holmdel, NJ 07733
(732) 949-3000
http://www.bell-labs.com/fellowships/GRPW

Graduate Research Program for Women (GRPW)

The Graduate Research Program for Women (GRPW) sponsored by Lucent Technologies and Bell Laboratories is designed to identify and develop scientific and engineering research ability in women and to increase female representation in science and engineering.

The program provides support for outstanding women students pursuing full-time doctoral studies. The program consists of two types of awards: fellowships and grants. The fellowship provides an annual living stipend of $17,000, tuition and fees, and textbook allowance. The grant provides $2,000 annually to be used by the recipient the following year in any way that benefits her professional development normally not covered by other awards. Both fellowship and grant recipients are eligible for summer employment and are matched with a Bell Laboratories scientist as a mentor.

GRPW provides financial support for outstanding women students who are pursuing full-time doctoral studies in the following disciplines: chemical engineering, chemistry, communications, electrical engineering, information science, materials science, mathematics, mechanical engineering, operations research, physics, or statistics.

Cooperative Research Fellowship Program (CRFP)

The CRFP is designed to develop scientific and engineering ability among members of minority groups underrepresented in science. The fellowship provides tuition, university fees, books, an annual living stipend of $17,000 and related travel expenses.

Business and Professional Women's Foundation

Attention: Scholarships
2012 Massachusetts Avenue, NW
Washington, DC 20036
(202) 293-1200
http://www.bpwusa.org

Career Advancement Scholarship Program

This program targets non-traditional female students 25 years of age and older with critical financial need who are seeking the education necessary for entry into, re-entry into, or advancement within the work force. Candidates must be U.S. citizens.

500-$1,000 for one year

Caltech

Attention: Carol Casey
MURF Program
Student-Faculty Programs Office
Mail Code 139-74
Pasadena, CA 91125
(626) 395-2885
http:///www.its.caltech.edu/~murf/

Minority Undergraduate Research Fellowships (MURF)

Caltech's Minority Undergraduate Research Fellowship provides support for undergraduates to spend a summer working in a research laboratory on the Caltech campus. The MURF program is aimed at improving representation of African Americans, Hispanics, Native Americans, Puerto Ricans and Pacific Islanders in science and engineering. Must be U.S. citizens or a permanent resident.

Canadian Federation of University Women

Attention: Dorothy Howland
251 Bank Street, Suite # 600
Ottawa, ON K2P 1X3
(613) 234-2732
http://www.cfuw.ca

The Canadian Federation of University Women (CFUW) Fellowships and awards program is an affirmative action program as provided for by the constitution of Canada. Consequently, eligibility for these fellowships and awards is restricted to female graduate students.

Dr. Marion Elder Grant Fellowship: funded by CFUW/Wolfville

The candidate must be studying full-time at the master's or doctoral level, in Canada or abroad. All else being equal, preference will be given to the holder of an Acadia University degree.

$9,000

Beverly Jackson Fellowship: funded by UWC North YORK

The candidate must be over the age of 35 at the time of application and enrolled in graduate work at an Ontario university.

$3,000

Margaret McWilliams Predoctoral Fellowship

The candidate must have completed at least one full calendar year as a full-time student in doctoral level studies, and be a full-time student at the time of application. She may be studying abroad.

$10,000

CFUW Memorial/Professional Fellowship

The candidate must be enrolled in a master's degree program in science and technology in the 2000-2001 academic year. She may be studying abroad.

$5,000

1989 Polytechnique Commemorative Award

For graduate studies in any field, with special consideration given to study of issues related particularly to women. The onus is on the candidate to justify the relevance of her work to women.

$1,400

Alice E. Wilson Award

For graduate studies in any field, with special consideration given to candidates returning to study after at least three years.

$1,500

Lawrence Livermore National Laboratory

Student Recruitment Office, MSC-3NPS
Box 3001
La Cruces, New Mexico 88003-8001
(800) 952-4118 or
(505) 646-6097
http://www.npsc.org

National Physical Science Consortium Graduate Fellowship Program (NPSC)

This is a unique six-year doctoral fellowship program in astronomy, chemistry, computer science, geology, material science, mathematics or physics for women and minorities. The total estimated value of the fellowship can be as much as $200,000 depending on the cost of the university attended by the fellow. Applicants will be accepted only for study and research for a doctoral degree. Must be U.S. citizen, with a minimum GPA of 3.0.

$12,5000 for the 1st 4 years

$15,00 for years 5 and 6

Michigan State University

AAGFAP/Urban Affairs Programs
West 112 Owen Graduate Center
East Lansing, MI 48824-1100
(517) 353-1803
http://www.msu.edu/unit/uap

Education Opportunity Program (EOP) Fellowship

This fellowship is based on the needs analysis completed by the Office of Financial Aid with exact awards varying (not to exceed $1,800 plus $300 for each dependent per semester) for each student depending on financial need. EOP recipients must be either racial/ethic minorities or women receiving public assistance.

Graduate Education Opportunity Programs (GEOP)

To be considered for financial support under the GEOP program, all recipients must be U.S. citizens or permanent residents. A brief description of each of the GEOP-administered programs follows.

Competitive Doctoral Enrichment Fellowships (CDEF)

The CDEF fellowships support new racial/ethnic minority doctoral candidates at Michigan State University (MSU), and cover stipends and tuition allowances.

Academic Achievement Graduate Assistantships (AAGA)

The Academic Achievement Graduate Assistantship is used to fund graduate study in areas where women and racial/ethnic minorities are under-represented.

Education Opportunity Fellowship (EOF)

This fellowship is based on a needs analysis completed by the Office of Financial Aid with exact awards varying for each student, depending on financial need. EOP recipients must be either racial/ethnic minorities or women receiving public assistance.

National Action Council for Minorities in Engineering (NACME)

Attention: Antionette Torres
The Empire State Building
350 Fifth Avenue
Suite # 2212
New York, NY 10118-2297
(212) 279-2626 or
(800) 888-9929
http://www.nacme.org

Elizabeth and Stephen D. Bechtel, Jr. Foundation Fellows

Elizabeth and Stephen Bechtel, Jr. Foundation Fellows Awards encourage and recognize undergraduate engineering students with exceptional academic records and outstanding leadership skills from underrepresented minority population groups.

$10,000

Sustaining Fellows Award

This fellows award scholarship is payable over four years to undergraduate engineering students from underrepresented minority population groups. Must have a minimum GPA of 3.0/4.0, and must be a U.S. citizen.

$20,000

W. Lincoln Hawkins Undergraduate Research Fellowship

This fellowship offers an exceptional opportunity to outstanding African American, Latino and American Indian chemical engineering students. Must have a minimum GPA of 3.5/4.0 and must be a U.S. citizen or permanent resident.

$20,000 (two years)

$10,000 applied to a research project

$10,000 applied to education costs

Philip D. Reed Undergraduate Award in Environmental Engineering

This award is offered to African American, Latino and American Indian students interested in environmental engineering. Must have a minimum 3.0 GPA and must be a U. S. citizen.

$10,000 (two years)

National Science Foundation

4201 Wilson Blvd.
Arlington, VA 22230
(703) 306-1774
http://www.her.nsf.gov/HER/DGE/grf.htm

Graduate Research Fellowships

A competition is conducted for Graduate Research Fellowships with additional awards offered for women in engineering and computer and information science. Approximately 90 awards will be in the Women in Engineering (WENG) and Women in Computer and Information Science (WICS) components. Awards made will carry a stipend for each fellow of $15,000 for 12 months, and an annual cost-of-education allowance of $10,500 paid to the Fellow's institution in lieu of tuition and fees. Must be U.S. citizen.

National Society of Black Engineers (NSBE)

1454 Duke Street
Alexandria, VA 22314
(703) 549-2207, ext. 249
http://www.scholarships@nsbe.org

Ernst & Young LLP Scholarship Program

Must be a member of the National Society of Black Engineers (NSBE) and have an engineering or technical major with a grade point average of 3.0. Must have attended one the 14 universities listed here: Duke University, Georgia Institute of Technology, Carnegie Mellon University, Northwestern University, University of Michigan at Ann Arbor, University of Virginia, University of Pennsylvania, UC, Berkeley, Notre Dame, Indiana University, North Carolina A&T University, Washington University, University of Texas at Austin, or Cornell University.

$2,500 scholarship

General Electric African American Forum Scholarship

This scholarship is awarded to undergraduates majoring in one of the programs offered by a school of business or engineering. Must be a member of the NSBE and have a 3.2 GPA.

$1,500

IBM Student Research Scholarship

This scholarship is designed to encourage students to pursue graduate studies in science and engineering fields. The applicant must be a member of the NSBE. The qualified fields of study are: chemistry, physics, applied or engineering physics, materials science or engineering, computer science, computer engineering, or chemical, electrical, mechanical or optical engineering.

$2,500 (two years)

The Microsoft Corporation Computer Science Scholarship

This scholarship was established to encourage students to pursue collegiate studies in computer science and technology fields. Must be a member of the NSBE and have a GPA of 3.0.

$2,500

The Seagate Scholarship Program

Established to encourage and reward academic excellence. Must be an undergraduate student with a 3.0 GPA studying the following: chemical engineering, computer science, electrical engineering, information technology, material science, mechanical engineering, or physics. Must be a member of the NSBE.

$2,000

New Mexico State University

Student Recruitment Office, MSC-3NPS
Box 30001
Las Cruces, NM 88003-8001
(505) 646-6038
http://www.npsc.org

National Physical Science Consortium (NPSC)

For all qualified students with continued emphasis toward recruitment of minority and female physical science students. Must be a U.S. citizen. Must be an undergraduate senior with at least a 3.0 GPA.

Stipends of $12,500/year for years 1-4

$15,000/year for years 5-6.

Worth up to $200,000 for 6 years, depending on the cost of the university attended by the NPSC fellow.

Graduate Fellowships for Minorities and Women

Women and minorities who are U.S. citizens and are eligible to pursue graduate study at a participating NPSC university. Entering or returning students are eligible.

$150,000-$180,000 for 4 years

Notre Dame

Attention: Erica T. Cain-Ward
P.O. Box 537
Notre Dame, IN 46556
(219) 631-7778 or (219) 631-7771
http://www.nd.edu/~gem

GEM Fellowship Program (National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc.-- GEM)

This program is designed to provide opportunities for under-represented ethnic minority students to obtain M.S. degrees in engineering and Ph.D. degrees in engineering and the natural sciences. GEM also offers three separate awards in MS engineering, Ph.D. science, and Ph.D. engineering. Candidates are selected from the following groups: African American, Mexican American, Native American Indian, Puerto Rican American, or other Hispanic Americans. Must be a U.S. citizen and have a GPA of 2.80.

$6,000 (year for M.S. Engineering)

$14,400(year for Ph.D. Engineering and Ph.D. Science)

$5,500 cost of instruction grant from the GEM central office for the 1st year

---

Oak Ridge Associated Universities

P.O. Box 3010
Oak Ridge, TN 37831-3010
(865) 241-4300
http://www.orau.org/nsf/nsffel.htm

NSF Graduate Research Fellowship Program

Awarded to women, minorities, the disabled, and others interested in working on a master's or doctoral degree in several disciplines, including computer science, mathematics, and engineering. Must be a citizen of the U.S.

$15,000/ for 12 month tenures

$10,500 cost of education allowance per tenure year

The Ohio State University

Attention: Professor H. Rao Unnava
2100 Neil Avenue
Columbus, OH 43210-1144
(614) 292-1506
email: unnava.1@osu.edu

General Electric (GE) Fellowships

The Ohio State University is teaming with the General Electric Foundation in a comprehensive programs focused on increasing the number of domestic minority doctoral students in business disciplines. African American, Hispanic Americans, and Native American students will be sought out as participants in the GE/Fisher College Program.

$20,000/1st year of doctoral program

P.E.O. Executive Office

3700 Grand Avenue
Des Moines, IA 50312
(515) 255-3153
http://www.tulane.edu/~finaid/peo.html

The International Peace Scholarship Fund

This program provides grants-in-aid for selected women from other countries for graduate studies in the United States and Canada. Also, candidate must not be a citizen of the U.S. or Canada.

Rutgers, The State University of New Jersey

Douglas College
50 Bishop Street
New Brunswick, NJ 08901-8558
(732) 932-9197
email: dougproj@rci.rutgers.edu

Douglas Project for Rutgers Women in Math, Science, and Engineering

The Bunting-Cobb Graduate Residential Fellowship Program provides awards to women graduate students only in mathematics, the sciences, or engineering at Rutgers-New Brunswick.

$4,000

Saint Louis University

The Clare Boothe Luce Fellowship Program
c/o Dean of the Graduate School
221 No. Grand Blvd.
St. Louis, MO 63103
(314) 977-2222
http://www.creighton.edu/Luce/

Clare Boothe Luce Fund Graduate Fellowship for Women in Science

The fund is intended to encourage women to enter, study, graduate, and teach in the fields of science and engineering. Academic excellence and professional potential will be the basis upon which candidates will be judged. The eligible fields are: biology, chemistry, geophysics, mathematics, and meteorology. The fellowship is tenable at Saint Louis University.

$25,000

Sigma Delta Epsilon Graduate Women in Science, Inc.

SDE Fellowships
c/o Regina Vidaver
300-12th St. SW
Room # 405/Cotton Annex Bldg.
Washington, DC 20250
(202) 205-0210
http://www.gac.edu/People/orgs/gwis
email: regina@women's-health.org

Sigma Delta Epsilon Fellowship

This fellowship was set up to encourage research by women. Open to graduate students and post-doctoral scientists in all natural sciences, mathematical, computer, and life science. Awarded to persons in U.S. and Canada. Open to graduate students and postdoctoral researchers for research. Not for tuition or scholarship support.

$1,200-$3,000

A maximum of $3,000 per application may be requested

Simon Fraser University

Dean of Graduate Studies
Burnaby, British Columbia
Canada V5A 1S6
(604) 291-4255
http://www.simonfraser.university.ca.edu

Simons Foundation Doctoral Entrance Fellowship

The Simons Foundation Doctoral Entrance Fellowship is valued @ $17,000 per year. To be eligible to apply, a student must be a woman planning to enter a Ph.D. program at Simon Fraser University, whose research work has potential for significant contributions to society.

Students already enrolled in the intended program are not eligible to apply for this award.

Society of Hispanic Professional Engineers Foundation (SHPE)

5400 East Olympic Blvd.
Suite # 210
Los Angeles, CA 90022
(323) 888-2080
http://www.shpe.org

SHPE Foundation Scholarship

Qualifying applicants must be an undergraduate college student enrolled full-time as an engineering or science major. Applicants must be of Hispanic background. These scholarships are based upon academic achievement, financial need, commitment to a college education, Involvement in school and community activities, career goals, and counselor recommendations.

$500-7,000

The Society of Women Engineers

120 Wall Street
New York, NY 10005-3902
(212) 509-9577
http://www.swe.org

The Society of Women Engineers Scholarship Program

The Society of Women Engineers (SWE) administers more than 90 scholarships annually, varying in amount from $200 to over $5,000 per year and totaling more than $150,000.

All SWE scholarships are open only to women pursuing baccalaureate or master degrees in ABET (Accreditation Board of Engineering and Technology) accredited engineering programs, engineering at SWE approved colleges and universities, or computer science at ABET-accredited or SWE-approved colleges and universities.

The minimum required GPA is 3.5.

Application forms can be obtained through the deans of engineering at eligible schools, through SWE sections, student sections, and from SWE headquarters. Requests for hard copy from SWE headquarters must be accompanied by a self-addressed stamped envelope.

Soroptimist Foundation of Los Angeles

P.O. Box 71783
Los Angeles, CA 90071
(818) 904-2030
http://www.soroptimist.org

The first Soroptimist club was formed in 1921. The name was chosen from two Latin words meaning "best for women."

Women's Opportunity Awards

The Women's Opportunity Awards program founded by Soroptimist assists women who, as head of their households, must enter or return to the work force, or upgrade their employment status.

Three recipients in each Soroptimist International of the Americas' (SIA) 29 regions receive awards: one $5,000 award and two $4,000 awards. One organizational finalist is chosen from among the region winners to receive an additional award of $10,000. Applications are available from local participating Soroptimist clubs, or by sending a letter-sized, self-addressed stamped envelope between July 1, 1999 and November 15, 1999 to: Women's Opportunity Awards, Soroptimist International of the Americas, Two Penn Center Plaza, Suite # 1000, Philadelphia, PA 19102-1883.

University of Arizona

Attention: Sonia Economou
Graduate Program Coordinator
Department of Computer Science
725 Gould-Simpson Bldg.
Tuscon, AZ 85721
(520) 621-4049
http://www.cs.arizona.edu

Graduate College Fellowship

Minority students and women are given a priority for this fellowship.

$10,000 and out-of-state tuition waiver

University of California, Davis

Office of Graduate Studies
One Shields Avenue
Davis, CA 95616
(530) 752-6314
http://www.eddie.ucdavis.edu/gspub/fellows/fellow.htm

GAANN Fellowship

Government Assistance in Areas of National Need Fellowship (GAANN). This fellowship is targeted to aid recruiting people from groups traditionally underrepresented in certain academic disciplines, including women and underrepresented groups. One grant received from the Department of Education has been established to attract students to advanced study in computer science.

$15,000 stipend per year

UC Davis-CSU-SF NIG Grant for Postdocs in Biological and Chemical Sciences

UC Davis and CSU-San Francisco have received a $3.1 million five-year training grant from the National Institutes of Health (NIH) for training and professional career development activities for post-doctoral scholars in biological and chemical sciences. The goals of the grant include: helping to prepare top candidates for academic faculty positions at universities like those in the University of California and California State University systems through a program of training and professional development activities; developing productive research collaborations between faculty and UCD and San Francisco State University (SFSU); and recruiting individuals who have been traditionally underrepresented in biological and chemical sciences to participate in the postdoctoral development program. Post docs will spend approximately three years in the program, the first two years at UC Davis and the third year at SFSU. Research by postdoctoral scholars at SFSU and UC Davis during the three-year period will involve a collaborative mentorship between faculty at the two institutions.

Contact: Margaret Brice (530) 754-6830

mrbrice@ucdavis.edu

Women's International Network of Utility Professionals (WIN)

P.O. Box 335
Whites Creek, TN 37189
(615) 876-5444
http://www:winup.org/sch.htm
email: winup@aol.com

Julie Kiene Fellowship

Named for a past president of the organization who serves as an inspiration to young women who pursue careers in the electrical industry.

$2,000/year

Lyle Mamer Fellowship

Named for Lyle Mamer, an associate professor and who will long be remembered for her dedication and contributions to young women who pursue careers in the electrical industry.

$1,000/year

Xerox Research & Technology

3333 Coyote Hill road, PA35-341
Palo Alto, CA 94304
(650) 812-4813
http://www.xerox.com/go/xrx/about xerox/employment.jsp

Technical Minority Scholarships Program

Geared to those minority students interested in pursuing or considering an undergraduate or advanced degree in chemistry and engineering with an annual scholarship of up to $4,000 for undergraduate coursework or up to $5,000 for graduate studies.

Zonta International Foundation

557 West Randolph Street
Chicago, IL 60661-2206
(312) 930-5848
http://www.zonta.org
email: aubides@zonta.org

Amelia Earhart Fellowship

Applicant must be a woman who has a bachelor's degree in a qualifying area of science or engineering. Must have completed one year of graduate school at a well-recognized institution of higher learning.

$6,000 for 1 year

To learn more about CRA-W and the programs it offers, visit www.cra.org/craw. *Sign up to receive news about CRA-W projects and opportunities at* www.cra.org/craw/mailinglist. *To request additional copies of this or any other CRA-W publication, go to* www.cra.org/craw/pubs.html.

CRA-W is a committee of the Computing Research Association and is partially supported by the National Science Foundation and EOT-PACI, a national education, outreach, and training program funded by the NSF National Partnership for Advanced Computational Infrastructure program. Lucent Technologies and the ACM SIG Board have also provided funding.