

# S&T

A quarterly newsletter on research, teaching, management, policy making and leadership in **Science and Technology**.

## INSIDE:

2. **A Newsletter for Bryn Mawr's "Invisible College"**
4. **Nurturing the Next Generation of Scientist-Teachers**
5. **Finding Big Answers in Small Places**
8. **Formula for Success in Venture Capital**
10. **Breaking Down Barriers: A Woman of Many Firsts**
12. **Foundations for the Future: Mentoring Undergraduates in Science Research**

## KEEP US INFORMED:

**Please send us your comments on this issue, ideas for future issues, and news about your professional interests and accomplishments.**

Al Dorof, Editor  
adorof@brynmawr.edu  
info@brynmawr.edu  
610-526-6525 (fax)

## Summer Program Gives Mathematics Grad Students an EDGE by Barbara Spector

### EDGE

**W**HEN SUSAN D'AGOSTINO arrived as a mathematics grad student at Dartmouth College, she was stunned by the difficulty of the material. But she wasn't stymied by the terminology used in several courses. She had heard those words before.

And mathematics graduate student Farrah Jackson didn't have to face her first daunting weeks at North Carolina State University alone. A faculty member checked in to see how she was adjusting.

These women had extra help navigating the rocky transition from undergraduate to graduate mathematical studies thanks to a summer program called EDGE (Enhancing Diversity in Graduate Education). The program, the brainchild of mathematics professors Rhonda J. Hughes of Bryn Mawr College and Sylvia T. Bozeman of Spelman College, prepares female students academically and psychologically for the challenges of grad school.

EDGE is funded by the National Science Foundation, the National Security Agency (a major employer of U.S. mathematicians) and the Andrew W. Mellon Foundation. Hughes and Bozeman, its co-directors, hope to counter the disproportionately high attrition rate of women and minority graduate students in the field.

#### Coping Strategies

"We were frustrated by the small things that led to students leaving grad school," says Hughes, the Helen Herrmann Professor of Mathematics at Bryn Mawr. A student accustomed to being at the top of her college class, for example, may not be able to handle negative feedback from an adviser or poor performance on an early exam. If the student is shy about reaching out to classmates, she may get the wrong impression that she's the only one coping with such pressures, or that the problem lies with her inadequacy rather than the inherent difficulty of the material.

"Grad students — especially minority and women students — internalize it, and when they can't take it anymore, they leave," says Bozeman, associate provost for science and mathematics at Spelman. These students, the professors realized, *(continued on page 15)*

EDGE Program Co-Director Rhonda J. Hughes, Helen Herrmann Professor of Mathematics at Bryn Mawr College.

EDGE Program Co-Director Sylvia T. Bozeman, associate provost for science and mathematics at Spelman College.



## Invisible College

A Newsletter for Bryn Mawr's "Invisible College"

Robert Boyle, the eminent 17th-century chemist and natural philosopher, is credited with the earliest use of the phrase "invisible college." Boyle used this term in reference to his scientist colleagues in Oxford and London, who met informally to discuss their research and later joined him in founding the Royal Society in 1660.

The invisible college has since come to denote for all scientists their extensive network of colleagues, associates and research collaborators around the world. It is through this informal, personal network that scientists stay current with breaking research developments, share new and improved lab methods, learn about upcoming conferences and grant opportunities, exchange preprints and reprints of research papers, and generally keep abreast of news about their colleagues and profession.

With this inaugural issue of *Bryn Mawr S&T*, we launch a newsletter dedicated to Bryn Mawr's own invisible college of science and technology professionals worldwide. Its goal is to keep you informed of



the diverse activities of the Bryn Mawr community in basic and applied research, teaching, management, funding and policy making.

Through *Bryn Mawr S&T* we hope to foster and deepen the sense of community among our invisible college. The newsletter is our way of keeping you current with what is happening at Bryn Mawr and among our alumnae engaged in science and technology. We invite and encourage you to make the newsletter your way of keeping in touch with your colleagues and friends, and letting the community know what is happening in your professional life.

We welcome your participation in making *Bryn Mawr S&T* an engaging and effective publication about our shared interests, activities

and accomplishments. Let us know what you think of the articles in this inaugural issue, and the stories that you would like to see published in future. As the newsletter matures, we look forward to hearing from you via letters to the editor as well as guest commentaries and opinion pieces on science and technology issues important to our community.

Of course, we are especially interested in hearing about your professional activities and research interests. The focus of *Bryn Mawr S&T* is really on you and your colleagues within our invisible college. The news and information you send us will be shared with the Bryn Mawr community via an online edition of *Bryn Mawr S&T*, which will be available on the College's Web site later this year. Please keep us all informed by sending your personal and professional updates to the editor of *Bryn Mawr S&T* at the addresses provided on the cover.

Nancy J. Vickers  
President, Bryn Mawr College

# Scientist-Teachers

## Nurturing the Next Generation of Scientist-Teachers

by Dorothy Wright

*Dorothy Wright contributes news and feature articles on science, technology, engineering and general interest topics to a variety of publications, including Civil Engineering, Engineering News Record and Bryn Mawr Now.*

HERE IS AN URGENT NATIONAL need for programs that will create a community of scientists and mathematicians who are committed to, and well prepared for, the undergraduate teaching enterprise. There is also a national need for expertise in the teaching and encouragement of women with interest and promise in science and mathematics. A new program at Bryn Mawr — the Bryn Mawr College Keck Postdoctoral Research/Teaching Fellowships in Sciences and Mathematics — is designed to meet these needs.

The College received a \$750,000 grant from the W.M. Keck Foundation of Los Angeles to establish and test a postdoctoral science program for training in research and undergraduate teaching. The Keck grant will fund the first five years of the program, after which the College will provide continuing support.

The program has been designed for young scientists trained in graduate programs with a traditional focus on research who want to make an equal, or greater, commitment to undergraduate teaching. “Scientists and mathematicians trained in traditional university doctoral programs have been primarily trained to conduct research, not to teach,” explains Alfonso Albano, Marion Reilly Professor of Physics and program director. “When they obtain a faculty position at a liberal arts college, they often are unprepared to teach undergraduates. Our hope is that a program like this will educate them in the art of teaching, as well as the science of research. There are very few programs in the country that address this need.”

The first two fellows will begin their three-year terms in fall 2001, with two additional fellows to be appointed in fall 2002. During the initial development phase, additional appointments will be made to include four fellows in the program.



“Scientists and mathematicians trained in traditional university doctoral programs have been primarily trained to conduct research, not to teach.”

Alfonso Albano,  
Marion Reilly Professor  
of Physics

### Balancing Research and Teaching

The scale of the College’s research programs makes it a perfect setting for a program of this nature. “It allows for extraordinarily close working relationships among undergraduates, graduate students, postdoctoral fellows and their faculty mentors,” says Paul Grobstein, Eleanor A. Bliss Professor of Biology and director of Bryn Mawr’s new Center for Science in Society, who is directing the Keck program in 2000–01.

(continued on page 4)

“It allows for extraordinarily close working relationships among undergraduates, graduate students, postdoctoral fellows and their faculty mentors,”

Paul Grobstein,  
Eleanor A. Bliss  
Professor of Biology  
and director of Bryn  
Mawr's new Center for  
Science in Society.



*(continued from page 3)*

Indeed, in awarding the grant, the Keck Foundation recognized Bryn Mawr's distinctiveness as an institution with a dual focus on quality research and an excellent liberal arts education. Keck Program Director Maria Pellegrini said Bryn Mawr is an “ideal site” to test this program.

Grobstein notes that the grant came at just the right time: “The aims of the program intersect with those of the Center for Science in Society, whose general thrust is to contribute to producing scientists who take a broader view of their activities and, at the same time, to make the rest of the world more aware of — and part of — the development of the scientific enterprise.”

As in traditional postdoctoral programs, fellows will conduct research in collaboration with Bryn Mawr faculty members. The program, however, is distinctive in providing fellows with an apprenticeship in how to teach a variety of different courses, and how to guide undergraduate researchers. Over their three-year terms, fellows will spend half of their time on teaching and half on research.

### Multidisciplinary Teaching Apprenticeship

While at Bryn Mawr, fellows will be expected to sustain active research programs, producing results worthy of presentation at national meetings and publication in peer-reviewed journals. Fellows will teach in their respective departments and will have the opportunity to participate in interdisciplinary activities — including the College Seminar Program, programs in environmental sciences as well as neural and behavioral sciences, and the Center for Science in Society — to extend their teaching into new areas.

Fellows' teaching experiences, spanning introductory through advanced courses, will vary over their three-year terms. These will include shadowing mentors and team teaching, progressing through responsibility for teaching a regular departmental offering each semester and, finally, teaching a one-semester course on a topic that is of special interest to them or collaborating on the development of a new interdisciplinary course. They also will learn how to develop and supervise undergraduate research projects. “Alison Cook-Sather, director of the Education Program of Bryn Mawr and Haverford Colleges and assistant professor of education at Bryn Mawr, has been working closely with us in developing this program,” Grobstein says.

Fellowship opportunities are currently available with 18 faculty in the departments of biology, chemistry, mathematics and physics. Opportunities with faculty in the department of geology will be announced in fall 2001 for the academic year 2002–03. The program is described in detail on the College's Web site at <www.serendip.brynmawr.edu/local/keck>, a site that also lists the areas of specialization of sponsoring faculty members.

Interested applicants must first contact a sponsoring faculty member to discuss their interest, then submit an application with the endorsement of that faculty member. “Faculty in every department have been contacted, so there is a lot of interest in the program,” Grobstein says. “The faculty tell us applicants are saying that this is exactly what they have been looking for.” ■

# Big Answers

## Finding Big Answers in Small Places

by Lisa R. Bechler

*Lisa Bechler is a communications consultant for clients in the high technology, health care, pharmaceutical, financial services and higher education sectors.*



“I really like seeing students get excited about science.”

Tamara Davis, assistant professor of biology

WHAT MAKES THE MEDICINAL LEECH SWIM? How does the expression of certain proteins enable maturing nerve cells to communicate with one another? Does the placement of mutations in cancers affect the course and treatment of the disease?

These are just some of the questions posed by the biology department at Bryn Mawr College — questions that students and faculty investigate and answer together.

Tamara Davis, the department’s newest assistant professor, believes her work in genetics and use of molecular biology techniques can help broaden the way students approach these and other biological questions. At a time when the scientific environment has become increasingly multidisciplinary, this expanded emphasis at the molecular level is critical to a student’s success.

“Molecular biology affects potentially everything we teach,” says Peter Brodfuehrer, associate professor and chair of the biology department. “Tamara clearly has the most experience in manipulating the genome and looking at how those manipulations affect organisms.”

### Students Discover Science

Davis joined Bryn Mawr’s faculty in 2000 and currently teaches introductory biology, genetics and a senior seminar and research tutorial in genetics. She is also developing a class in molecular biology. She sees her role in the introductory course as an opportunity to pique students’ interest in the sciences. “It’s important to show students that science

*(continued on page 6)*



Bench Work (From left)  
Anuja Ogirala '01,  
Assistant Professor of  
Biology Tamara L. Davis,  
Ruthie Worrell '01, Amber  
Carmo '01 and Anna  
Arnaudo '02.



Chair and Associate  
Professor of Biology  
Peter D. Brodfuehrer  
focuses on neuronal  
control of behavior.

“It was clear as soon as Tamara stepped into the building that she is an incredibly energetic and talented individual.”

Peter D. Brodfuehrer

## Big Answers

*(continued from page 5)*

isn't boring. I try to get them synthesizing information early on in their academic careers instead of thinking that biology is just memorized facts.”

Davis also collaborates on research with several students, an opportunity she was looking for when considering Bryn Mawr. “I really like seeing students get excited about science, being able to generate data and see results,” she says. “Here, they can actively participate in all aspects of a research project, which fosters a sense of pride in their work.”

The curriculum also allows Davis to introduce students to her own research, which involves investigating the expression of imprinted genes. This unusual form of gene regulation allows only one copy in a gene pair to be expressed. For example, individuals normally inherit one copy of every gene from their fathers and one copy of every gene from their mothers. Both contribute to normal development.

“With imprinted genes, however,” Davis explains, “you get one copy from your father and one from your mother, but only one copy is expressed while the other is shut down. This can result in development defects if the expressed gene is mutant, because the

shut-down gene, whether normal or wild type, can't generate a functional product since it isn't being expressed." Several hypotheses have been proposed to explain why this form of gene regulation exists, but the underlying reasons are not well understood.

There are currently 35 to 40 imprinted genes that have been identified, about one-third of which are related to growth factors. Through her research, Davis hopes to discover what it is about imprinted genes that causes them to be differentially expressed. "The term used to describe my research is 'the establishment of the imprint during germ cell development,'" she says. "In other words, I investigate how these differences get set up in the male sperm and female oocyte."

To support her research, Davis' lab was recently renovated. Two smaller rooms were combined to form one large room, plus Davis' office and a desk area for students. Several pieces of state-of-the-art equipment were installed, including a PCR thermal cycler for amplifying small fragments of DNA. With most of her start-up funds from Bryn Mawr used to equip the lab, Davis has recently submitted grant applications to the National Science Foundation and the National Institutes of Health for additional funding.

### The Right Fit with Bryn Mawr

Davis earned her B.A. in molecular biology from the University of California at San Diego in 1991 and her Ph.D. from the University of California at Berkeley in 1996. Funded by grants from the Howard Hughes Medical Institute and the National Institutes of Health, she conducted her postdoctoral research at the University of Pennsylvania Medical School. It was there that she became interested in the concept of genomic imprinting, an area of research that would help tip the scales in her favor at Bryn Mawr College, where she was hand-picked from more than 150 applicants and four final candidates.

"It was clear as soon as Tamara stepped into the building that she is an incredibly energetic and talented individual," says Brodfuehrer. "I think she'll be a key player in coming up with ideas about integrating multiple disciplines to address broader biological questions."

Davis may have found the ideal setting in which to do so. Her work complements Bryn Mawr's noteworthy history in genetics that includes former faculty members E.B. Wilson, a distinguished American biologist, Nettie Stevens, Ph.D. 1903, who discovered the correlation between chromosomal composition and sex, and T.H. Morgan, who received the Nobel Prize as a founder of fruit fly genetics. Bryn Mawr's smaller size doesn't hurt, either.

"At a large university, you tend to be grouped with a lot of people who are doing the same thing as you," says Davis. "I like being at a small college where everyone's area of expertise is very different from one other. It makes me think about science differently than I would otherwise. It forces me to expand the breadth of my own biology."

"One of the reasons I wanted to work at a small liberal arts college like Bryn Mawr is that I enjoy interacting closely with undergraduate students. I find it very gratifying to see students get excited about science, whether in the classroom or laboratory. Also, the relatively small class sizes at Bryn Mawr provide an opportunity for real discussion that deepens our investigation of current advances in biology."

# genetics

### Anything Is Possible

In addition to her teaching and research activities, Davis serves on the Biology Search Committee at Haverford College, helping to identify potential new faculty members. Her free time is spent with husband Bruce, a professor of biology at Muhlenberg College, and her 1 1/2 old son. She is optimistic about her role as both a woman in the sciences and a wife and mother at home, and she believes other women can make it happen for themselves. Her advice: "Go for it."

As for the days and years to come, Davis is equally optimistic about pursuing life's big answers. "Research never really comes to an end," she says. "Whatever results you get ultimately lead to the next series of questions. Or they give you options of where to go in the future. That means you can't plan that far in advance; you can't always know what you'll be doing next. I find that very compelling." ■

Mary Friedberg writes frequently on education, health care and business news. She was the editor of the Cincinnati Business Courier and business editor of The Kentucky Post.

# Venture

Formula for Success in Venture Capital **by Mary Friedberg**

# W

HEN KAREN KERR GRADUATED FROM BRYN MAWR IN 1989, she planned to become a chemistry professor. But shortly before completing her Ph.D. in physical chemistry at the University of Chicago, her career took an unexpected turn, thanks to “a little bit of serendipity” and her Bryn Mawr credentials.

Today, Kerr runs the New York office of a Chicago-based venture capital firm and is a role model for women investment professionals and entrepreneurs, especially African-American women.

Kerr, 32, is a managing director of ARCH Venture Partners, focusing specialty on chemicals and materials companies and early-stage information technology firms. “Much of what we get involved with are raw start-ups out of universities, national labs and corporate research. I get a chance to put on my chemist’s cap to talk to professors, understand their technology, discuss marketing opportunities and be a partner to them in building these new companies,” she says.

Kerr was introduced to the world of venture capitalism while working on her doctorate. At the time, she was considering her career options. Shortly after reading a newspaper article about venture capital, a colleague asked her to help him write a business plan for ARCH Development Corporation. Initially, she suggested an organic chemist would be better suited to the task. But ARCH executive Keith L. Crandell assured her he had complete faith in her abilities because she went to Bryn Mawr, just like his wife, Susan E. Davis ’82.

“If I’m not good at it, I’m going to work harder on it.”

Karen E. Kerr '89, managing director of ARCH Venture Partners

## Building the Business

Kerr worked at ARCH Development as a consultant while finishing her dissertation. In 1995, she headed to Patricof & Co. Ventures in New York, for the first year of a two-year fellowship from the Kaufman Foundation for Entrepreneurial Leadership. In 1996, when ARCH Development spun off its early-stage venture fund, ARCH Venture Partners, Kerr returned to Chicago to join the firm as an associate. She became a managing director in 1999.

In January, Kerr moved back to New York to help expand the firm’s East Coast presence. “The goal is to build that office and use it as a springboard, not only for looking at investments in the New York region, but to get into Boston and down into some of the mid-Atlantic states,” she says. The company, which employs about 45 people, also has offices in Seattle, Albuquerque and Austin.

In February, Kerr married Dietrich Kappe, a fellow New Yorker and University of Chicago alumnus. Kerr and Kappe, founder of an IT consulting group called Pathfinder Associates, are buying a condominium in New York City.

Kerr describes herself as a person who tries to master whatever she's doing. For example, she played on championship tennis teams in high school and at Bryn Mawr. "If I'm going to do something, I want to be good at it. If I'm not good at it, I'm going to work harder on it," she says.

During the past five years, Kerr led investments in a number of companies, including Philadelphia-based Infinicon Systems, which is developing a next-generation switching product initially targeted at storage area networking. She is a director or board observer of several companies.

### Role Model for Women Entrepreneurs

Kerr also has become a role model for women in venture capital. Less than 30 percent of the people in the industry are women, and she's one of only a handful of African-American women, she estimates. "It's an industry that's largely been an old-boys' network. In recent years, we've seen more women come into the industry, but it's certainly something I'm interested in helping to promote," she says.

Kerr is on the Steering Committee of Springboard 2001–Midwest, one of a series of venture capital conferences organized by the National Women's Business Council to help women entrepreneurs gain access to capital markets, and she served in various roles for earlier Springboard conferences. She's also a member of Bryn Mawr's Slade Committee, which focuses on encouraging leadership-giving to the annual fund. She was a board member of the Chicago alumnae club and co-chaired the Reunion Gift Committee for the 10-year reunion of her class in 1999.

As one of the top women in venture capital, Kerr is often asked for career advice. She encourages students to get a well-rounded education. "I don't actually think it matters what you major in. To get in there, learn how to think and develop some good communication skills — that's all that really matters," she says.

John R. Boehm Reproduced with permission from Crain's Chicago Business ©2000.



# chemistry

For her, the technology training she received at Bryn Mawr and the University of Chicago has been very helpful since ARCH Venture Partners invests in technology companies. She also credits Bryn Mawr with helping her to hone her writing skills and develop leadership skills. She was co-president of her class and head of the Honor Board, where she learned to resolve disputes. "I use that skill all the time with management teams and other board members when we're talking through difficult issues," she says.

Although Kerr plans to stay in venture capital for the foreseeable future, she may venture back into the classroom someday. "Probably at the end of what I hope is a successful career in venture capital, I could fancy myself teaching chemistry and doing research," she says. ■

# Breaking Down Barriers:

## A Woman of Many Firsts

by Dorothy Wright

Priscilla Perkins Grew '62, professor of geosciences at the University of Nebraska-Lincoln



Priscilla Perkins Grew '62 never set out to break down barriers to women in the geosciences, yet that is what one is likely to infer from her career. A professor of geosciences at the University of Nebraska at Lincoln, Grew was the first woman ever to head the California Department of Conservation, to chair the California Mining and Geology Board, to direct the Minnesota Geological Survey, and to serve as Vice Chancellor of Research at the University of Nebraska-Lincoln. In October 2000, Grew became the first woman to receive the Ian Campbell Medal, the highest honor of the American Geological Institute.

It was not feminist ambition that drove Grew. "I never had a five-year plan setting out the steps to become the first woman this, that or the other," she says. "I didn't have that orientation."

Indeed, at Bryn Mawr, it never occurred to Grew that she had chosen an unusual career for a woman. "I didn't realize there was anything particularly special about being a woman in geology," she says. "There were women graduate students and a woman geology professor in the department, and undergrads were encouraged to major."

After she arrived at Berkeley on a National Science Foundation graduate fellowship, she suddenly realized women geologists were few and far between. "There were about 80 graduate students and only four were women — three from Bryn Mawr — and zero women geology professors," she says. "That's where I began to realize this was unusual."

### Government Service

In the late '70s, then-Governor of California Jerry Brown appointed her chair of the state's Mining and Geology Board and director of the California Department of Conservation. "For Governor Brown, I was a very high-risk appointment," she says. "I had no experience in state government administration."

A few years later Grew served as a commissioner of the California Public Utilities Commission. "I was the first person with a Ph.D. in geology, as far as I know, to be a public utilities commissioner in California," she says. "A lot of people questioned the appointment. They were skeptical because I had a geological instead of a financial or regulatory background."

Grew believes two key factors led to these and other firsts. "Being a woman was definitely a factor in my appointments to these positions," she acknowledges. "I recognize that I owe a great deal to affirmative action. Although affirmative action is under a lot of political fire, I strongly support it, and I know it opened many doors for me."

She also believes her wide range of interests has played an important part in her appointments. "I think my greatest asset is being able to work with people from widely different disciplines," she says.

### Multidisciplinary Perspective

Grew says she first broke out of a narrow academic specialty in the early '70s, when she worked at UCLA on the administration of the Lake Powell Research Project, a study of the impacts of coal and water development on the Colorado River Basin. "It was half natural sciences and half social sciences," she explains. "It gave me an ability to work with people of different disciplines. It really changed my career."

For a while, Grew says, large multidisciplinary research projects were out of fashion. Now she believes the scientific community is coming full circle. "There is a realization that you can't divide analysis into little disciplinary boxes and be successful, whether it is global change research or regional

environmental research," she says. "You need to integrate the human dimension with the natural-science dimension. Now I think there is a lot more appreciation that certain problems, for example, require anthropologists and geologists to work together."

Grew says that is why the Campbell Medal means so much to her. "The Campbell Medal wasn't for research performance in a specific specialty, but for broad service to the profession — geology and public policy," she says. "That medal is very important to me because it is a recognition of exactly the kind of career that I've worked so hard on."

# geology

Now, Grew is teaching introductory geology to a class of 170 non-majors at the University of Nebraska. "It's the first time I've taught Geology 101 since 1969," she says. "I feel like Rip Van Winkle: I wake up and there are all these resources on the Internet, multimedia classrooms, marvelous new textbooks in full color! So many new things have been discovered about the Earth in the last 30 years that in 1969 I would have told my students were impossible. Now I am 'learning along' with my students, doing all new lectures and computerized presentations, and I have put my course on an interactive Web site. Plus I hope to share with my students my career experience in geology and public policy — out in the political world, the state government world, the world of applications of geology." ■

"There is a realization that you can't divide analysis into little disciplinary boxes and be successful... You need to integrate the human dimension with the natural-science dimension."

Priscilla Perkins  
Grew '62

# Science Mentoring

Foundations for the Future: Mentoring Undergraduates in Science Research **by Karen Young Kreeger**

# OK,

so maybe spending hours each week per semester or all day, every weekday during the summer holed up in the lab isn't the ideal way to pass time for many college students. However, for many undergraduates at Bryn Mawr, putting in the time to conduct independent research now has tremendous payoffs later.

Take Alexandra K. Smith '01, an undergrad biology student with Peter D. Brodfuehrer, chair and associate professor of biology. Her lab experience has already improved her prospects for a career in science. During a recent interview for a laboratory technician position at the esteemed Wistar Institute in Philadelphia, the recruiter thought she was well qualified for the position almost solely on the basis of her hands-on lab experience. Smith eventually wants to go on to medical or graduate school, but at this point, she's looking to spend a year or two in the workforce.

Smith started off by volunteering in Brodfuehrer's lab once a week during the spring semester of her junior year. She stayed on for the summer program and narrowed her research topic, which eventually became her senior thesis. Her question centers on how nerve cells translate sensory input into movement.

Besides finding the hands-on research experience stimulating, Smith says that participating in her independent research project has revealed much more about how science is done. "It's taught me a lot about what it's like to do basic research and work with other people in an academic setting," she says, conceding that labwork can be tedious at times. But, echoing the thoughts of scientists the world over, Smith says, "It's all worthwhile when you get some really good results."

## Many Opportunities

The mentor-apprentice approach to science education has always been a part of the Bryn Mawr experience. The College has offered master's and Ph.D. programs in the sciences since its founding in 1885. Undergraduates have always been encouraged to participate in research projects with graduate students and faculty, and more than 50 percent of all science majors at Bryn Mawr currently do so. They participate as volunteers, in the summer research program or, more formally, in senior-year independent research projects for credit.

# research

The summer program runs for 10 weeks, 40 hours per week, with students receiving a \$3,100 stipend. It was established in 1989 and each year accepts about 35 students. The summer of 2000 saw eight women participating in biology projects, 15 in chemistry, one in geology, five in mathematics and computer science, one in physics and six in psychology.

*Karen Young Kreeger is a science journalist who writes on biomedical and women's health topics, as well as careers in science. Her most recent work has appeared in BioScience, Genome Technology, Muse and The Scientist.*

The sources of funding for the summer programs are diverse. They range from nonprofit foundations, such as the Howard Hughes Medical Institute and the National Science Foundation, to corporate sponsors, including the GE Fund and Zimmer Inc., to endowments established by alumnae and friends of the College — the Robert Conner Undergraduate Biology Fellowship Fund, the Helen Louise Robinson '66 Fund for the Biological Sciences, and the Carlos Nathaniel Vicens and Maria Teresa Joglar de Vicens Fund.



Each lab experience also gives students a chance to hone their written and oral communication skills. At the end of the summer, students present their work to their peers and faculty at a day-long research symposium, as well as preparing an abstract of their project for the annual report on the program. During the school year, students write senior theses, and some departments also require an oral presentation. Undergraduate research may also appear in peer-reviewed journals.

### Giving Back

Brodfehrer, a cellular neurophysiologist, has mentored undergraduates in his lab at Bryn Mawr for 10 years. He uses the medicinal leech as a model to study how nerves activate muscles in a coordinated fashion to swim. “The students in my lab all work with questions associated with trying to see how the nervous system does that,” he explains. “I think the benefit to the students is to get a feel for how science is done.

*(continued on page 14)*

Undergraduate Researchers. (from left) Aparna Kanneganti '01, Alexandra K. Smith '01 and Peter D. Brodfehrer.

“I think the benefit to the students is to get a feel for how science is done.”

Peter D. Brodfehrer, chair and associate professor of biology

“I got to where I am today because of my undergraduate independent research project.”

Peter D. Brodfuehrer

## Mentoring

*(continued from page 13)*

How one asks questions. How to go about designing an experiment and then, once you get results, figuring out what kind of conclusions you can draw.”

Part of Brodfuehrer’s and the other faculty mentors’ job is to give a clear picture of the practice of science, as well as imparting their subject-matter expertise and guiding experiments. At the start of a student’s independent project, Brodfuehrer’s approach is to talk over possible research questions and explain his expectations.

“I expect a commitment out of them — at least 10 hours in the lab and time outside of that searching the literature and thinking about their question,” he says. “Often students do not have a feel for the amount of time it takes to actually do an experiment from start to finish. They’re used to lab sections of courses where we have a three-hour time window and things are already set up for them. Science moves slowly, and they don’t understand this.”

A sense of giving back is part of faculty members’ motivation to take the time to mentor students. “I got to where I am today because of my undergraduate independent research project,” remembers Brodfuehrer. “I loved every second of it and have been doing it ever since.”

## Success Stories

In addition to Bryn Mawr research seminars, students present their results at national meetings. Anuja Ogirala ’01 won first prize in the biological sciences poster session of the Third Annual Undergraduate

Research Symposium in the Chemical and Biological Sciences held at the University of Maryland. She works with Tamara L. Davis, assistant professor of biology, who specializes in genetic imprinting.

Edina Sarajlic ’00 was one of six finalists for the LeRoy Apker Award from the American Physical Society. Her mentor is Elizabeth McCormack, assistant professor of physics, whose research involves quantum beat spectroscopy. Sarajlic is now in a Ph.D. program in the physics department at Stanford University.

The lasting effects of an independent scientific research project at Bryn Mawr are perhaps the most valuable part of the experience. Lori Rogers Kisley ’92 is a research associate at the University of Colorado Health Sciences Center in Denver. She worked in Brodfuehrer’s lab during the fall and spring semesters of her senior year. Her project involved the biochemistry of leech swimming behavior and the underlying role of serotonin.

For Kisley, the Bryn Mawr experience is most memorable for the close relationships with faculty and the sophisticated hands-on experience that in some ways only a small, teaching-oriented college can provide. “I got to cannulate a rat as an undergrad,” she quips. “The experience confirmed my love of science and research, and it helped me find an avenue of interest. It solidified my interest in the biochemistry and pharmacology underlying behavior.”

She also came away from Bryn Mawr with something valuable about the process of science, noting that her lab experience emphasized how to ask questions and interpret results. “It was a nurturing experience scientifically and it laid the groundwork for the rest of my career,” concludes Kisley. ■

## EDGE

(continued from front cover)



Fern Y. Hunt '69, NIST mathematician and Bryn Mawr College trustee.

could benefit from a program that combines academic preparation with coping strategies, presented by women who have been through the experience.

“Mathematics is a male field,” says Danielle Carr, program officer for higher education at the Mellon

Foundation and a former faculty member at Bryn Mawr, who has taught in the EDGE program. “If you put females into the mix, they often feel as if they’re walking into a male locker room. It’s just awkward.”

### Support Network

Hughes and Bozeman were introduced at a professional meeting by a colleague who knew they shared an interest in encouraging women to pursue mathematical careers. Their first collaborative effort, the Spelman-Bryn Mawr Summer Mathematics Program, focused on encouraging talented undergraduate women to continue their mathematical studies. The NSF-funded program lasted from 1992 to 1995 and helped increase the ranks of female grad students in mathematics. Yet when they assessed participants’ success, Hughes and Bozeman realized the women wouldn’t receive much help in acclimating to grad-school culture. They decided to turn their attention to students entering that new environment.

“A lot of graduate programs literally leave you alone for two years, and then you have to pass a qualifying exam,” says Fern Y. Hunt '69, a Bryn Mawr College trustee and a mathematician at the National Institute of Standards and Technology. Students accustomed to the feedback continually offered in undergraduate courses may have trouble adjusting, says Hunt, who has taught in the EDGE program.

Because grad students rely on each other for academic support, Hughes and Bozeman realized the program had to help women from diverse racial and cultural backgrounds work together. And because

grad students can languish alone, they knew they had to support participants after they left the program.

### Grad-School Mentors

Begun in 1998, the EDGE program has nurtured 27 students in its first three years and will have up to 10 participants in this summer’s session, taking place June 4–29 at Spelman College. The four-week program, held in alternate years at Bryn Mawr and Spelman, consists of core courses in analysis and algebra, minicourses in key areas of mathematics and guest lectures. Women mathematicians from academia and industry visit the program and speak candidly about their careers, their memories of grad school, and balancing work and personal lives. Graduate-student mentors live with participants in dormitories and are on hand to address their mathematical and personal concerns.

“Because the mentors are graduate students themselves, we are a direct link for the participants to the world they are about to enter,” says mentor Cathleen Battiste, a Bryn Mawr grad student.

Each EDGE participant receives an \$1,800 stipend plus room and board for the summer. Social activities include a weekly communal dinner courtesy of the program. Mentors receive the same benefits as the participants.

With the participants’ permission, Hughes and Bozeman will contact their grad-school departments to ensure a built-in support network. “It’s a comfort to know that if I get in a jam, I can call on someone,” says NCSU student Farrah Jackson.

### Learning the Ropes

Program participants say EDGE helped them academically. “After seeing the material again, I understand it a little more than I did the first time around, which puts me at an advantage over students who are being overwhelmed by the new subjects,” says Rice University grad student Ebonii Anderson.

EDGE mentor Ulrica Wilson Parker, a grad student at Emory University, says the program’s coursework helps identify trouble spots. “They have a lot of work thrown at them,” Parker says. “You can see



EDGE Mentors (From left) Math grad students Tara Brendle, Columbia University, Cathleen Battiste, Bryn Mawr College, and Ulrica W. Parker, Emory University.

(continued on page 16)

A quarterly newsletter on research, teaching, management, policy making and leadership in **Science and Technology.**

# S&T



## EDGE

(continued from page 15)

how they stress out over that — or they don't take it seriously enough. As these flags get raised, we try to deal with them."

Diversity among the EDGE participants prepared her to meet her grad school classmates, says Anderson. At Spelman, her undergraduate institution, her classmates were all minorities. Rice, by contrast, has a very small minority population. "It helped me to get out of my comfort zone," she says.

When Dartmouth student Susan D'Agostino first got to grad school, "I couldn't even understand what my homework questions were, let alone answer them," she recalls.

It would have been easy for her to believe she was the only one experiencing difficulties, D'Agostino says. But she remembered the warnings of her EDGE instructors. "They brought in so many women at all possible levels — current female grad students, tenured faculty, women who had earned their Ph.D.'s and gone into industry. If there was one consistent message, they were all saying, 'Grad school is so hard.'"

Parker says the program's social component helps stress the importance of outside interests. "We want them to see how to balance their work and social life," she says.

### A Committed Community

The connections formed during the summer are maintained year-round via a password-protected Internet message board, facilitating confidential communication. Postings include expressions of moral support as well as academic advice. "It shows that they trust each other," says Columbia University grad student Tara Brendle, an EDGE mentor and one of the first

participants in the original Spelman-Bryn Mawr Summer Mathematics Program as a Haverford College undergraduate. An annual reunion enables current participants to network with EDGE alumnae.

Brendle cites continuity of personnel as a strong point of the program. "There's a core group of people who are committed to the goals of the program," she says. "Students see that, and it gives them a role model of how mathematicians can work professionally through networks." Mentors benefit as well, she says. "I meet so many other mathematicians and make so many connections. The net gain is incredibly large."

The program's NSF grant ends after this summer. Bozeman and Hughes say they will huddle with advisers to assess what form the next phase should take. They agree, however, that it's important to continue supporting mathematics grad students.

Mentors, instructors and participants feel committed to Hughes and Bozeman because they see the professors' commitment to others, Brendle says. "The big joke about Rhonda and Sylvia is that once you get into their programs, they never let you go." If they haven't heard from a student, they will contact her to ask how she's doing and what they can do to help. "They involve themselves to a degree that other professors don't," Brendle says.

"We'd do anything for them. They've earned our very loyal support." ■

*Barbara Spector writes on science and technology as well as business topics. She is the managing editor of Family Business magazine and former editor of The Scientist.*

(top to bottom)  
Susan D'Agostino,  
Dartmouth College

Ebonii Anderson,  
Rice University

Farrah Jackson,  
North Carolina State  
University