

DOE/ER/75840--1

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**CAREER INFORMATION IN THE
MATHEMATICAL SCIENCES (CIMS)**

Technical Progress Report

for Period November 1, 1992 - April 30, 1993

Andrew Sterrett

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May 1993

Prepared for

**THE U.S. DEPARTMENT OF ENERGY
AGREEMENT NO. DE-FG02-93ER75840**

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Abstract

Technical Annual Progress Report

awarded to

The Conference Board of the Mathematical Sciences

May 5, 1993

In November of 1992, a CBMS Steering Committee for Career Information was appointed by the CBMS Council. An informal meeting of those members in attendance at the Annual Meeting of the MAA and the AMS was held in January, 1993. The first meeting of the full committee was held on May 1, 2 in Washington, DC in conjunction with the meeting of the CBMS Council. Information with regard to existing career materials was provided to the Council at that time and Council reactions were obtained via a workshop format. These reactions, along with reviews of material by students, faculty members and counselors, were used by the Steering Committee to plan specific activities for the next 6-18 months.

Three initiatives were given high priority:

- 1) to produce and widely disseminate an annotated bibliography of career information relevant to the mathematical sciences,**
- 2) to remedy the lack of messages to junior high school students, parents, teachers and counselors on the importance of mathematics in finding good jobs in a technological society, and**
- 3) to encourage women and minorities to take all the mathematics that they can and to consider careers in which mathematics plays an important role.**

Technical Annual Progress Report
Career Information in the Mathematical Sciences
awarded to
The Conference Board of the Mathematical Sciences
May 5, 1993

In late November, 1992, the CBMS Council appointed a Steering Committee of eight representatives from among the CBMS member organizations to work with Andrew Sterrett, Principal Investigator of this project and Assistant Director of Programs for the Mathematical Association of America. A list of the members of the Steering Committee is attached to this report.

Because little time had elapsed since the beginning of the grant period and relatively few members of the Steering Committee planned to attend the Annual Meeting of the AMS and the MAA, only an informal meeting to discuss the general project was held at the January Annual Meeting.

During the past six months, sets of 13 career pamphlets and books published by the CBMS societies have been reviewed by students and faculty members at Denison University, Hampden-Sidney College, and Humboldt State University. Materials also are being reviewed by the Review Committee of the National Career Development Association. Additional reviews will be obtained in the coming months to ensure a valid sampling of student, counselor and faculty opinion.

The first full meeting of the Steering Committee was held on May 1-2, 1993 in Washington, DC. A Workshop for the CBMS Council, which met concurrently, was conducted in an attempt to provide Association Presidents with an opportunity to discuss their own materials and for the Steering Committee to profit from the experience of these association leaders. The Steering Committee met before and after the Workshop and provided direction for future activities to accomplish our mission. We realize that we have several audiences to reach -- the teachers and counselors who must decide that the information should be given to students as well as the students who must find the material interesting enough to read or watch. We also intend to take some steps designed to convince the parents of younger students to strongly encourage their children to acquire a solid background in mathematics regardless of their occupational goals.

Three initiatives were given high priority by the CBMS Steering Committee:

- 1) to produce and widely disseminate an annotated bibliography of career information that pertains to the mathematical sciences,
- 2) to remedy the lack of messages to junior high school students, parents, teachers and counselors on the importance of mathematics in finding good jobs in a technological society, and
- 3) to encourage women and minorities to take all the mathematics that they can and to consider careers in which mathematics plays a significant role.

Several activities have taken place that will come together as the project evolves:

- * Representatives of the National Security Agency and the Mathematical Association of America have agreed on changes in "You're Gonna Need Those Numbers" that was produced by NSA for MAA. We believe that these changes will provide us with effective messages for junior high students -- "Stay in school" and "Take lots of math."
- * The Operations Research Society of America has approved making a 10 minute video on Operations Research for junior high school students.
- * Twenty five thousand copies of a pamphlet "More Careers in the Mathematical Sciences" have been printed by the MAA. This pamphlet features short autobiographical statements by six mathematicians who work on some very interesting problems.
- * The American Statistical Association has revised its pamphlet "Careers in Statistics."
- * Andrew Sterrett is scheduled to speak to counselors at the national meeting of the American School Counselor Association to be held in June. Their theme is "Shortchanging Girls, Shortchanging America - A Call To Action." Sterrett's topic will be "Careers for Women in the Mathematical Sciences." In the fall, Sterrett will discuss careers with students at Hampden-Sidney College and at Denison University.

The project has been strengthened by the addition of Dr. Ronald Rosier, Administrative Officer of CBMS, who will devote one day a month to the project. His familiarity with members of the CBMS Council and his experience as a faculty member at Georgetown University makes him a valuable addition to the administrative team.

**CBMS-MAA Career Information in the Mathematical Sciences Project
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A Continuation Proposal

Career Information in the Mathematical Sciences

from

The Conference Board of the Mathematical Sciences

Summary

On behalf of the Conference Board of the Mathematical Sciences (CBMS), the Mathematical Association of America (MAA) requested support for a three year initiative to develop a comprehensive program to prepare and disseminate career information in the mathematical sciences. This initiative will serve as the basis for a sustained multi-faceted effort by the fifteen CBMS member societies to provide up-to-date career information in the mathematical sciences to students, teachers, and guidance counselors in schools and colleges. One goal of this project, Career Information in the Mathematical Sciences (CIMS), is to move the CBMS societies to a point where regular preparation and dissemination of effective career information becomes a permanent part of their professional programs.

The CBMS initiative for which we sought support in this proposal was based on four related components:

- A. Gather information about existing career information and unfilled needs.
- B. Link efforts of the mathematical community with other organizations that provide career information.
- C. Develop needed new materials in print and video tape format.
- D. Establish a subscription program for career information.

The project is being closely coordinated with several related initiatives of other mathematical organizations (e.g., MSEB, COMAP, AWM, MAA) and will enhance these other efforts by strengthening mechanisms for dissemination.

The project is being directed by Dr. Andrew Sterrett, Professor Emeritus of Mathematics at Denison University. Dr. Sterrett recently completed a term as Acting Associate Director of the MAA, where he focused much of his work in the area of career information. Dr. Sterrett has returned to the Washington office and now serves as Assistant Director of Programs as a volunteer. Staff work for the project will be carried out in the MAA's Washington office. In addition, Dr. Ronald Rosier, Professor of Mathematics at Georgetown University and the CBMS Administrative Officer, has agreed to give one day a month to the project. His involvement will facilitate communication with CBMS Presidents and will not add

involvement will facilitate communication with CBMS Presidents and will not add administrative costs since Dr. Sterrett receives only expenses. A request to modify the budget has been submitted.

Oversight responsibility for general policy and project direction is vested in a Steering Committee appointed by CBMS. This Committee is working with the Project Director to suggest priorities for materials to be developed, keep the CBMS societies informed of the project activities, involve the societies in dissemination efforts, and develop plans for sustained CBMS support of a long-term coordinated program of career information in the mathematical sciences. A list of the members of the Steering Committee is attached. The Project director will utilize the existing MAA Committee on Career Information for advice and review on many detailed aspects of the project.

Related Projects: Progress to date/plans for the future

Currently, several other projects relating to career information are being developed within the mathematical community. Although they are not strictly part of this CBMS-MAA proposal, they are part of the community-wide efforts that are included in our planning and developmental activities. In addition, their products will be incorporated into our dissemination program as they become available:

1. *Careers of Mathematics Graduates* is a research proposal of the Consortium for Mathematics and its Applications (COMAP) intended to sample career information from students who receive an undergraduate major in the mathematical sciences. This important research effort will necessarily need to be repeated on a regular basis to provide timely information to current students. It awaits funding.
2. *Outreach for Mathematics* is an effort of the Mathematical Sciences Education Board (MSEB) of the National Research Council to forge connections with a variety of organizations dealing with education who do not have special expertise in mathematics. Some of this effort involves guidance counselors and career advisors and thus will provide a natural mechanism for expanding the reach of the CBMS-MAA career information project.

Project Description

The CIMS proposal on career information is intended to amplify individual efforts of the CBMS member societies, to develop needed new materials and mechanisms for dissemination, and to lay the foundation for a permanent effort by CBMS societies in the area of career information. Specifically, the project will consist of four closely related activities:

- A. Gather information about existing career information and unfilled needs.

- B. Link efforts of the mathematical community with other organizations that provide career information.
- C. Develop needed new materials in print and video tape format.
- D. Establish a subscription program for career information.

A. Gather Information

The mathematical community has a lot to learn about how to be effective in developing and communicating career information. A first step will inventory available material, both items produced by the mathematical community and information about mathematics-based careers produced by other organizations. Many magazines and periodicals have regular features on careers (e.g., *Career World*); others (e.g. *Science*, *Mathematics Teacher*) produce occasional special issues devoted to careers. In addition, several organizations have produced videotapes that relate to mathematical careers (e.g., *Futures* videotapes).

Information will be gathered with several purposes in mind. First, we need to find out what is available so that the dissemination activities can build on the best current materials. At the same time, we will seek to determine what is not available: where good materials do not exist, or where materials that do exist are not appropriate for their intended audiences. In addition, we need to learn how current materials are being disseminated and how effective that process seems to be. Thus one early outcome of this project will be a needs assessment of career materials in the mathematical sciences.

A collateral aspect of gathering information will be to determine from organizations and individuals outside the mathematical community how we---mathematical scientists and CBMS societies---can best work with those who have expertise in career counseling. Cooperation among these two different communities is essential in order that mathematicians, teachers, and counselors can provide students with career information that includes timely and effective information about the mathematical sciences.

Progress to date/plans for the future

Thirteen pamphlets of career information have been collected from the CBMS member organizations and have been evaluated by students, faculty members, and counselors at Denison University, Hampden-Sidney College, and Humboldt State University. Additional reviews will be obtained within the next few months from high school, two-year college, and university students.

B. Link Efforts

Preliminary discussion about this project has been initiated with the American Association for Counseling and Development (AACD), an umbrella organization of 16 professional societies, half of whom deal with career counseling in some significant way. Issues that we are exploring with AACD include such questions as:

1. Where do career and guidance counselors obtain their information about careers that depend on the mathematical sciences? Do these sources accurately reflect the current uses of mathematics in the work place?
2. What can the CBMS societies do to help provide better and more useful information to career and guidance counselors?
3. How can AACD help the mathematical community learn to do a more effective job of career guidance, both through the professional societies and through the individual members of these societies?

A major focus of the dialog between CBMS and AACD will be to discover what messages are missing from career counseling, either because appropriate materials do not exist or because those messages and materials are not finding their way to the students who need them.

Progress to date/plans for the future

At this time we are waiting for reviews of existing career information from the Review Committee of the National Career Development Association. This June, Andrew Sterrett, Principal Investigator of this project, will speak to members of the American School Counselor Association and expects to obtain feedback from the counselors at that meeting. We also expect to be represented at a similar meeting next January.

C. Develop Materials

The major thrust of this component of the project will be to develop additional print materials and a series of videotapes (with coordinated print materials) on careers in mathematics. These materials will emphasize a broad range of careers based on mathematics, statistics, and operations research directed towards opportunities for students with a bachelor's degree who majored or minored in mathematics.

Current plans, which will be reshaped based on information gleaned from the needs assessment and the discussions with AACD, are to produce brief (10-15 minute) videotapes supported by print materials and other references which would be useful to

departments of mathematical sciences as they seek to interest students in continuing their study of mathematics, statistics, and operations research. MAA is currently working with the National Security Agency to develop a careers videotape which may become a prototype for this series. Subsequent topics may be on themes related to the job search process or attending graduate school in the mathematical sciences.

Lessons learned from the production and dissemination of these videotapes will be used to help develop a plan for a succession of such tapes which can be distributed to student chapters and departments of mathematics and statistics at colleges around the country. Other mechanism for dissemination (e.g., to career counselors) will be arranged in cooperation with AACD. Part of the production and dissemination plan will include a strategy for periodic revision to ensure that the materials stay current.

Progress to date/plans for the future

1. *Mathematics Major Magazine*, now named *Math Horizons*, will be published in the winter of '93 and the fall of '94. Funds are available to send all mathematics departments in the two- and four year colleges and all universities free copies of the first two issues. Efforts are being made to obtain funds to increase the number of free issues during the first year to four. After the first year, departments will be expected to purchase copies for their students.

This magazine is an initiative of the Mathematical Association of America to provide to undergraduates a range of information about the mathematical sciences in an appealing and effective form. Career information will be one of several major features of this publication for students.
2. *Women in the Mathematical Sciences*, a project of the Association for Women in Mathematics (AWM), seeks to develop career materials designed specifically to attract girls and young women to pursue the study of mathematics. AWM is preparing a video that is intended to introduce high school women to several role models who use mathematics in their work.
3. *Mathematician of the Month* is an initiative of the MAA to provide through its student chapters regular profiles of individuals who use mathematics or statistics in their daily work. Profiles developed for this series will be available for use in other career materials including *Math Horizons*. Thirty nine career essays have been distributed to date, with more than a dozen in preparation for 1993-94.
4. *Mathematical Scientists at Work* presents fourteen individuals describing their mathematical work in their own words. This booklet is now in its second printing, 15,000 copies having been distributed.

5. *Careers in the Mathematical Sciences* is a brochure that features profiles of six of the mathematical scientists at work. More than 90,000 copies have been distributed since it was released in August 1990. Twenty five thousand copies of a new brochure, *More Careers in the Mathematical Sciences*, were printed by the MAA in April, '93.
6. The American Statistical Association has updated its brochure, *Careers in Statistics*.
7. The Operations Research Society of America has approved the production of a video for junior high school students in which some interesting but elementary examples of operations are described.
8. A revision of a video *You're Gonna Need Those Numbers*, produced by the National Security Agency for the MAA, has been agreed upon. A tentative schedule calls for the revisions to be made in late July and the video to be available in the late fall. This video will make two points to the junior high school audience: stay in school and take lots of math.
9. The MAA has just received a promising manuscript in which 39 women describe their backgrounds and careers and how elementary mathematics has played a significant role in these various careers. Each essay is followed by a problem set illustrating that occupation. We anticipate favorable reviews of this manuscript.

During its meeting on May 2, the CBMS Career Steering Committee set the following priorities for future activities and we plan to begin to implement them immediately:

1. to produce and widely disseminate an annotated bibliography of career information in the mathematical sciences,
2. to remedy the lack of messages to junior high school students, parents, teachers and counselors on the importance of a solid mathematics background in finding jobs in a technological society, and
3. to encourage women and minorities to take all the mathematics that they can and to consider careers in which mathematics plays an important role.

D. Establish Subscriptions

To ensure that career information is regularly disseminated to high schools and college campuses, the CIMS project will develop a subscription program to provide subscribers with current materials on an annual or semi-annual basis. Subscribers would receive videotapes as they become available; samples and order forms for

career information produced by all CBMS societies; up-to-date information about salaries and career opportunities; profiles of recent mathematics graduates; and regularly-revised lists of individuals in the work place who are willing to be contacted by students about their work.

We expect that subscribers will include high school, college, and university mathematics departments, libraries, and corporations. The key to a successful subscription program will be to secure a place in regular departmental budgets, based on initial offerings of effective materials. Once in the budget, we anticipate that it will be relatively easy to sustain such line items, so that the subscription program can become self-supporting within five years.

Progress to date/plans for the future

We consider the subscription program to be an activity for the third year of this project.

Project Timetable and Management

The career information initiative envisioned in this proposal is the first step of a decade-long endeavor to move the mathematical community to a new plateau of sophistication regarding career information. The CIMS project described here is intended as the first stage, to be carried out over a three year period:

Year I: Setting the Stage

Gather information on what is currently available;
Begin dissemination of materials;
Conduct needs assessment;
Plan cooperative work between AACD and CBMS;
Prepare first videotape;

Year II: Dissemination and Growth

Disseminate first year materials;
Expand formal programs between CBMS and AACD;
Produce additional video and print materials;
Conduct workshops at various professional meetings;
Preliminary plans for continuity of program within the CBMS societies.

Year III: Consolidation and Planning

Disseminate second year materials;
Develop subscription program;

Produce additional materials;
Evaluate program success and remaining weaknesses;
Finalize plans to ensure continuity within CBMS societies.

Budget and Funding

**The proposed budget for Year II is based on the amount awarded for year I.
Changes from that proposed for Year II are:**

A, line 1. Because Andrew Sterrett is a volunteer, this item is reduced to zero.

A, line 2. Ronald Rosier is added to Senior Personnel, one day per month. His experience as CBMS Administrative Officer and in working with students adds breadth to the leadership of the project. The rate given is commensurate with his stipend paid by CBMS.

F, line 3. During the first year of the project, the most efficient way to obtain reviews of our material has been through individual contacts. Depending on the amount of material produced in the second year, this amount may vary, but \$1,000 appears to be sufficient at this time.

F, line 2. Because we very much want to distribute material where it is most badly needed, we want to put any money that can be saved from other sources into the production and distribution of material.

**CBMS-MAA Career Information in the Mathematical Sciences Project
Steering Committee**

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U.S. Department of Energy
OEN Grant Application Budget Summary
(See Reverse for Definitions and Instructions)OMB Control No.
1910-1400
OMB Disclosure on
Reverse

CONTINUATION 93-94

Please Print or Type

Organization:	Period Covering:			FOR ER USE ONLY
	From: 11-1-93		To: 10-31-94	Proposal No:
Principal Investigator (P.I.)/Project Director (P.D.): ANDREW M. STERRETT			Award No.: DE-FG02-93ER75840	
A. SENIOR PERSONNEL, PPD Co PIs, Faculty and Other Senior Associates (List each separately with title, A-6 show number in brackets. Attach separate sheet, if required.)		DOE Funded Persons-Mos		Funds Requested By Proposer
1. Andrew M. Sterrett		Cal.	Acctd.	Sum.
2. Ronald Rosier (1 day/month) (Based on compensation paid by CBMS, 12 days @ \$256/day)		1.2		VOLUNTEER 3,072
3.				
4.				
5.				
6. (1) TOTAL SENIOR PERSONNEL (1-5)		1.2		
7. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1. () POST DOCTORAL ASSOCIATES				
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				
3. () GRADUATE STUDENTS				
4. () UNDERGRADUATE STUDENTS				
5. (1) SECRETARIAL-CLERICAL (108)				3,400
6. () OTHER				
TOTAL SALARIES AND WAGES (A + B)				6,472
G. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 20%				1,294
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + G)				7,766
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM)				
TOTAL PERMANENT EQUIPMENT				
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)				14,350
2. FOREIGN				
F. OTHER DIRECT COSTS				
1. MATERIALS AND SUPPLIES				
2. PUBLICATION COSTS/PAGE CHARGES				28,334
3. CONSULTANT SERVICES				1,000
4. COMPUTER (ADPE) SERVICES				
5. CONTRACTS AND SUBGRANTS				
6. OTHER Telephone, postage, duplication				6,250
TOTAL OTHER DIRECT COSTS				35,584
G. TOTAL DIRECT COSTS (A THROUGH F)				57,700
H. INDIRECT COSTS (SPECIFY RATE AND BASE)				
TOTAL INDIRECT COSTS 30% MTDC				17,300
I. TOTAL DIRECT AND INDIRECT COSTS (G & H)				75,000
J. PROPOSER'S COST SHARING (IF ANY)				
K. TOTAL AMOUNT OF THIS REQUEST (ITEM I LESS ITEM J)				75,000
PPD TYPED NAME & SIGNATURE Andrew M. Sterrett		DATE		5/5/93
INST. REP. TYPED NAME & SIGNATURE Marcia P. Sward		DATE		5/5/93

END

DATE
FILMED

6 / 14 / 93

