FOCUS

THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

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Survey Reveals Dramatic Changes in Collegiate Mathematics

Every five years for the past fifteen years, the Conference Board of the Mathematical Sciences (CBMS) has conducted a survey of undergraduate course enrollments, faculty, and teaching patterns in the mathematical science departments of universities, four-year colleges, and two-year colleges in the United States. The purpose of these surveys has been to provide information useful for decision-making in mathematical science departments, professional organizations, and government agencies.

The report on the 1980 CBMS Survey is now available for $6.00 from The Conference Board of the Mathematical Sciences, 1500 Massachusetts Avenue, N.W., Suite 457-8, Washington, D.C. 20005. Highlights of the report are published here with the permission of CBMS to help disseminate the information gathered in the survey as widely as possible in the mathematical community.

Four-Year Institutions

Course Enrollments

Mathematical science course enrollments grew substantially.

There was a 33% increase in total mathematical science course enrollments from 1975 to 1980. (Full-time-equivalent enrollments in all fields increased only 8% in this same period.) Most of this increase was concentrated in elementary service courses and in computing courses:

- Calculus enrollments increased by 30%.
- Enrollments in computing and related courses increased by 196%.
- Enrollments in remedial (high school level) courses were up 72% and now constitute 16% of all mathematical science enrollments. (For public four-year colleges the figure is 25% and, as noted below, is even higher for two-year colleges.)

One reason for the marked increase in course enrollments was the surge of student interest in such practically-oriented majors as engineering and business, where employment prospects have recently been excellent. The large increase in remedial mathematics confirms evidence from various other sources that a disappointingly large proportion of students in the United States come to college quite poorly trained in mathematics. Another factor contributing to increased elementary mathematics enrollments appears to be the growing use of quantitative methods in the social, biological, and management sciences.

Upper division mathematics courses experienced a modest enrollment increase.

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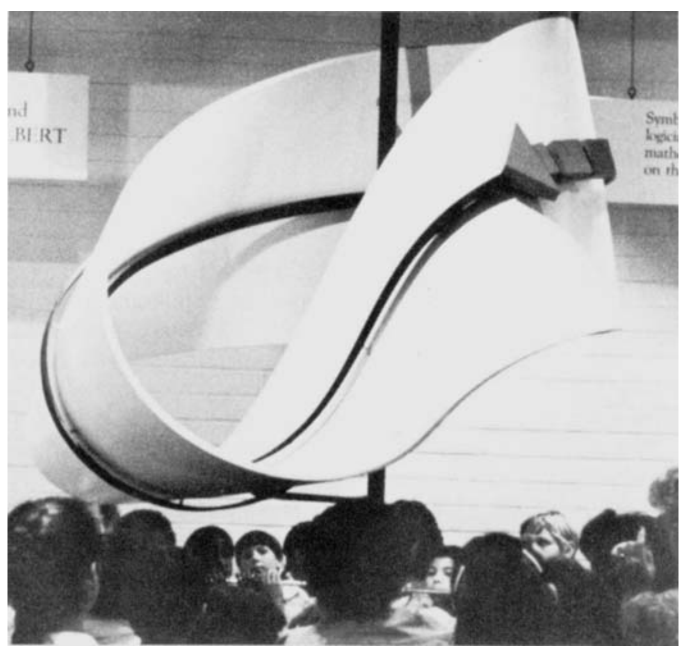

A 15-foot by 3-foot Moebius band towers over the exhibition, *Mathematica: A World of Numbers . . . and Beyond*, at Boston's Museum of Science. The Moebius band is one of several "prove-it-yourself" audience participation models in this IBM-sponsored exhibition. A jointed, three-dimensional red arrow travels continuously over its surface to demonstrate that the Moebius band has only one surface and one edge.

Survey *(continued from page 1)*

There was a 4% increase in upper division mathematics course enrollments from 1975 to 1980, with enrollments up in courses with a more applied flavor and down in courses for prospective teachers (−37%) and in advanced courses in "pure mathematics" (−19%). As the number of mathematics majors has declined, an adequate spectrum of upper division mathematics courses is not available in many departments. This problem is more severe in four-year colleges than in universities.

Instructional Formats

The majority of students in the elementary courses on which data was collected are taught in small classes.

Data were collected on the instructional formats used in courses on finite mathematics, calculus, computer programming, and elementary statistics. Overall nearly 60% of the students in these courses are taught in classes with fewer than 40 students. Most of the rest are taught in large classes (40-80 students) or in large lectures (with or without recitation sections). Fewer than 1% were taught using self-paced instruction or other modes. This is in contrast to two-year colleges, where alternate instructional modes are used increasingly.

Bachelor's Degrees

There was a marked drop in the number of bachelor's degrees in mathematics and a large increase in the number of computer science bachelor's degrees.

The number of bachelor's degrees in mathematics fell from 17,700 in 1974-1975 to 10,200 in 1979-1980, a 42% decrease. The number of mathematical science bachelor's degrees with majors in secondary teaching fell from 4800 in 1974-1975 to only 1750 in 1979-1980.

The number of computer science bachelor's degrees awarded in 1979-1980 is estimated to be 8900, as compared with only 3600 for 1974-1975.

Number of Faculty

The number of full-time mathematical science faculty increased 8%.

The estimated total number of full-time mathematical science faculty in four-year colleges and universities in the United States increased from about 16,900 in 1975 to 18,300 in 1980. The addition of some 280 positions per year during this period contributed to a better academic job market for mathematicians than there was during the bleak period immediately preceeding these years, when there was essentially no change in the number of full-time mathematical science faculty at the same time that the number of new Ph.D.'s reached an all-time high.

The number of part-time faculty increased dramatically.

There was a 75% increase in the number of part-time faculty from 1975 to 1980, compared to only an 8% increase in full-time faculty during the same five-year period. This fact (and the fact that the percentage of faculty granted tenure during 1980 was much lower than during 1975—see below) presumably reflects the preoccupation of many institutions of higher learning with holding down costs, and with avoiding additional longer term commitments to faculty.

On the other hand, some departments in four-year colleges are unable to hire (or to retain) full-time faculty with desired credentials, especially for positions in computer science, statistics, or other applied mathematical science areas. In such instances, hiring a part-time person is sometimes the best available alternative.

The number of mathematical science faculty, measured on a full-time-equivalent basis, increased by about 13% in the period 1975 to 1980.

Since this was substantially less than the 33% overall increase in course enrollments during the same five-year period, an increase in faculty loads resulted.

The continued availability of a sufficient number of qualified teaching assistants is in doubt.

Many departments are finding it necessary to seek teaching assistants from other sources in addition to their own graduate students. In 1980 over 25% of all teaching assistants employed by mathematical science departments were not mathematical science graduate students, but were graduate students in other fields or were undergraduates.

The rapid decline in numbers of mathematics majors suggests that departments with traditional mathematics graduate programs may encounter still more difficulty in recruiting teaching assistants in the years ahead.

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FOCUS

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Associate Editors: Charles A. Cable, Allegheny College; James R. C. Leitzel, Ohio State University.

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Guest Editorial

A Plea for Better Mathematical Pedagogy

Morris Kline

In the October 1951 issue of the *American Mathematical Monthly* (p. 523) Hermann Weyl stated, "*. . . One may say. . . .that mathematics talks about the things which are of no concern at all to man. Mathematics has the inhuman quality of starlight, brilliant and sharp, but cold . . . Thus we are cleverest where knowledge matters least: in mathematics, especially in number theory.*" Of course Weyl was speaking of mathematics proper, that is, mathematics in and for itself and isolated from vital human interest. Since he made deep contributions to mathematical physics he knew how valuable and important mathematics is.

How does Weyl's description of mathematics relate to mathematical pedagogy today? On all levels—primary, secondary, and undergraduate—mathematics is taught as an isolated subject with few if any ties to the real world. To students, mathematics appears to deal almost entirely with "things which are of no concern at all to man." Mathematics is expected either to be immediately attractive to students on its own merits or to be accepted by students solely on the basis of the teacher's assurance that it will be helpful in later life. The latter expectation promises, as Alfred North Whitehead has said, "pie in the sky." The former just ain't so.

Why should students take any interest in mathematics? A six-year-old may wish to calculate how much six bars of candy will cost if he knows the price of one bar. A few students can be attracted by the puzzle aspect, and a few will strive to do well only to earn grades because they know that grades are important for admission to college. Is there an aesthetic appeal? Hardly any to speak about in the mathematics that is taught at the levels in question. Moreover, some sophistication is required to appreciate aesthetic appeal. Does learning mathematics teach people how to reason? There is no evidence for this among students. Whether the behavior of mathematics professors supplies any, I leave to the reader to decide.

For 95% of the students, mathematics proper makes no appeal. I have asked many high school teachers of mathematics whether they have ever had occasion outside the classroom to solve a quadratic equation or to use a trigonometric identity. I need not state the replies.

Why should we teach any mathematics at all beyond elementary arithmetic, the only part of mathematics which obviously has utilitarian value? The answer is that **mathematics is the key to understanding and mastering our physical, social, and biological worlds.** This is what needs to be taught along with the usual mathematical topics through a variety of applications.

The word "applications"—used here for the sake of brevity—must be understood in the broadest sense. For the elementary school, applications should include games, probability (as used in dice and cards), baseball figures (such as batting averages), and puzzles. For high school students, one can advance the level of the physical applications and treat more of the applications of statistics and probability to sociological and biological problems. At the undergraduate level, there is an enormous number of applications of increased depth in physics, biology, computer use, and many other fields. In fact, the variety of applications is increasing constantly in the outside world, if not in the classroom.

Can one be sure that applications will attract students to mathematics and make them appreciate the value of mathematics? Not necessarily. One must test various applications to see if they work, that is, whether they attract students and make them like mathematics. Those that survive the test must be incorporated into mathematics textbooks at appropriate places both as motivation to study mathematics and for their own educational value.

There is much talk today about applications, but it is just talk. Applications are not being incorporated into teaching. Why not? Elementary and secondary school teachers do not know them and even fear them. College professors are also ignorant of them and balk at learning them—they are under pressure to write research papers or to advance their careers in other ways that are irrelevant to pedagogy. Moreover, don't applications contaminate mathematics?

The importance of mathematical applications for the great mathematicians of the past and for a few today has lain in what they do to help man understand and master his physical world, to improve his material life, and to improve his general welfare. If these values were taught today, many more students would be glad to study mathematics and then, perhaps, to enter an applied field.

How does all of this relate to the work of the Mathematical Association of America? The Association should, through its journals, advance the training of elementary, secondary, two-year, and four-year college teachers by providing articles that show how and where to include applications in the classroom. In my opinion, this should be the major effort undertaken by the Association in the next decade to improve the teaching of mathematics.

from the Editor's mailbox . . .

"As a South African mathematician who has taught university mathematics extensively, both in South Africa (at the Witwatersrand University) and in the United States (at the University of Wisconsin and at Lawrence University), I found much of interest in the article on South Africa by Peter Hilton which appeared in the November-December issue of *FOCUS*. I believe, however, that several of the comments Professor Hilton made about the state of mathematics teaching in South Africa were unfair and display some lack of understanding on his part.

Professor Hilton regrets that the level of incoming students to university is highly variable. This is true. But South Africa's society itself is, as Professor Hilton describes so well, highly variable. However, within each socio-economic group, the level is not nearly as variable as it is among similar people in the United States. One reason for this is South Africa's nation-wide Matriculation Examination, something else that Professor Hilton regrets. For all its defects (which are many), the Matriculation Examination is vastly superior to its closest American counterpart, the SAT, because it requires its candidates to express themselves, to write out proofs, to show their working. No multiple choice test can compare with it and the Matriculation Examination has been shown to be a fairly reliable measure of a student's potential to study university mathematics.

I believe that one of the reasons why the average university entrant in the U.S. is so unable to express him (or her) self is that the high schools are not pressured to maintain a minimal standard in the way they would be if there were a public examination. Anyone who doubts that American students enter university in a desperate state should ask beginning calculus students to derive the formula

$$\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$$

and be ready for a good laugh. In fact, among those South Africans whose socio-economic level is similar to that of the average American student, the level of academic attainment is head and shoulders above the American level. The South African undergraduate curriculum, in addition to producing many great scientists and engineers, produces a disproportionally large member of research mathematicians. Many U.S. graduate schools can attest to the high standard of South Africans who have come for their Ph.D.'s.

Certainly, not all is well in the South African universities. There is, as Professor Hilton says, an acute shortage of university mathematics teachers and there are many other problems. I do not write to say that all is rosy but that several of Professor Hilton's remarks were uncalled for."

Jonathan W. Lewin, Lawrence University.

Survey *(continued from page 2)*

Faculty Loads

Faculty course loads increased by 27% during the decade 1970-1980, with most of the increase during the last five years.

Mathematical science course enrollments per full-time-equivalent faculty member increased from 77 in 1970 to 83 in 1975 and to 98 in 1980, for an overall increase of 27%.

There was also an increase in faculty loads, as measured by the number of credit hours taught per week. For example, 80% of faculty in university mathematics departments taught less than 9 hours per week in 1970, but in 1980 only 62% taught less than 9 hours per week. In 1970, 47% of faculty in public four-year college mathematics departments taught less than 12 hours per week, but in 1980 this percentage had decreased to only 20%.

Faculty Qualifications

The percentage of mathematical science faculty with doctorates decreased.

A national goal during the 1960's was to raise the educational qualifications of college teachers up to the doctoral level. A great deal of progress was made toward that goal between 1965 and 1975, but more recently there has been slippage in the mathematical sciences. In 1980, over 90% of full-time mathematical science faculty in universities had doctorates. However, only 66% of those in four-year colleges had doctorates, compared to 71% in 1975.

Only about half of computer science faculty in four-year colleges hold doctoral degrees.

Among 830 private colleges only about 220 mathematical science faculty have their highest degree in computer science, and only about 40% of those have Ph.D.'s in computer science.

The rapid growth of the computer/high-technology industry in the United States has created excellent employment opportunities for computer science graduates at all levels (bachelor's through Ph.D.). This has made the recruitment and retention of computer science faculty difficult, particularly in institutions without graduate programs.

Tenure

The total number of tenured mathematical science faculty remained nearly constant between 1975 and 1980, but the percentage declined from 72% to 67%.

Among the probable contributing factors to this percentage decline are the growth of young computer science departments (only about half of computer science department faculty were tenured in 1980), stricter tenure policies of some institutions, and the development of opportunities in industry for Ph.D.'s during the 1970's which attracted some faculty away from academe.

Women Faculty

The percentage of full-time faculty who are women increased from 10% to 14% in the period 1975-1980.

Restructuring of Departments

There was some restructuring of mathematical science departments at public four-year colleges, but little at universities.

Only a few instances of administrative restructuring of mathematical science departments were reported by universities. Those that were reported generally involved the formation of a new computer science department.

A larger number of reorganizations were reported at public four-year colleges. These included consolidations of mathematical science departments into larger administrative units, creation of computer science departments, and the addition of computer science programs and titles in many mathematics departments.

Prospects for the 1980's

Because of projected declines in the 18-21 age group, mathematical science enrollments may be expected to increase at a slower rate from 1980 to 1985 than they did in the period 1975 to 1980. The impact of the population decline on the mathematical sciences may be mitigated if present career-oriented attitudes among college students persist.

There is likely to be a continuing problem in obtaining adequate resources to cover the instructional load in the mathematical sciences. While there was some increase in numbers of faculty (full-time and part-time) during the late 1970's, the increase was by no means sufficient to cover the substantially heavier instructional loads. There is presently little evidence that, in the years immediately ahead, higher education will command enough priority in the competition for scarce public funds to alleviate matters.

The traditional role of upper division instruction in college and university mathematics departments has been the training of future mathematics teachers and researchers. These programs are being deserted by students more interested in careers in the computing field, or to a lesser degree, in an applied mathematical field such as statistics or operations research. This poses a dilemma for mathematics departments regarding their instructional mission in the years ahead. Is it to be preponderantly elementary service courses, or can programs of broader appeal be introduced? For example, there are successful joint majors in mathematics-computer science, mathematics-economics, or mathematics-biology in many institutions. There are reports of shortages of high school mathematics teachers, as many teachers leave for well-paying jobs in industry. How can student interest in teaching careers be rekindled?

There is also the need to maintain a core of future researchers and college-level teachers, to replace an aging national mathematics faculty. While numbers of mathematics professors retiring per year are expected to remain relatively low during the 1980's, there will be a large increase in retirements during the 1990's. Considering the nearly ten-year lead time from entry into graduate school until crucial tenure decisions are made, there should be many tenured positions in colleges and universities for students now at the point of starting graduate studies.

In the shorter term, there is a critical problem in recruiting and retaining enough computer science faculty. If the explosive growth of enrollments in computing courses continues, the problem can only become more acute. More generally, many four-year college departments have difficulty recruiting doctorate-holding faculty in the applied mathematical sciences, to develop programs and teach courses in those areas. Numbers of new Ph.D.'s in both pure and applied mathematical fields have been declining, and there are attractive alternatives in industry.

A more fundamental national problem is to upgrade precollege mathematics in the schools. To a considerable extent this lies outside the scope of the present report, although college and university departments can help through their role in training teachers. It is in their own self-interest to help as they can.

Two-Year Institutions

During the period 1975-1980, mathematics programs in two-year colleges underwent significant changes. Combined trends in enrollment, programs, student populations, and faculty populations do not bode well for the mathematical sciences in two-year colleges.

Course Enrollments

Mathematical science enrollments kept pace with overall enrollment gains.

Mathematical science enrollments grew by 20%, as compared with overall enrollment gains of 19%. (This gain was much less than the 50% growth in the previous five-year period, 1970-1975.) However, this growth was due primarily to the explosive growth of computer science course enrollments and to continued expansion in remedial courses.

Computer science gains alone account for 48% of the total gains in enrollment.

Computer science enrollments now exceed calculus enrollments.

Remedial courses now account for 42% of *all* two-year college mathematics enrollments.

(continued on page 6)

In Memoriam

Dan J. Eustice of The Ohio State University died August 5, 1981 at the age of 50. He was a member of the MAA for 22 years and served as Associate Editor and Problems Editor for *Mathematics Magazine.*

Anthony S. Holland of the University of Calgary died August 5, 1981 at the age of 51. He was a member of the MAA for 18 years.

L. Aileen Hostinsky of Connecticut College died October 21, 1981. She was a member of the MAA for 18 years.

John B. Mertle, Jr., retired from the U.S. Geological Survey, died December 1980 at the age of 93. He was a member of the MAA for 42 years.

John R. Pasta retired Director of the Division of Mathematical and Computer Sciences in the National Science Foundation, died June 5, 1981 at the age of 62. He was a member of the MAA for four years.

Survey *(continued from page 5)*

Dealing with remediation was identified by survey respondents as far and away the biggest problem facing two-year college mathematics faculty in 1980.

Enrollments in mathematics courses taught *outside* mathematics programs have nearly tripled since 1970 and are now equal to 13% of mathematics enrollments.

Instructional Formats

Every alternative instruction mode monitored by the survey showed a gain in usage.

Independent study, modules, PSI, computer-assisted instruction, and several other alternative techniques registered gains. The standard lecture-recitation format is still strongly dominant, but experimentation clearly is growing. Computers and calculators are now widespread among two-year colleges. The impact of computers on the teaching of mathematics seems to be slight at best. Nearly two-thirds of all two-year colleges report that calculators are recommended as adjuncts to instruction in some of their courses.

Linked to instructional innovation is the growing presence of mathematics labs, which can now be found in 68% of all two-year colleges.

Programs

There was a marked shift away from liberal arts programs towards occupational/technical programs.

Enrollments in occupational/technical programs grew to more than one-half of all full-time equivalent enrollments, outdistancing college-transfer enrollments. In 1975, by way of contrast, occupational/technical programs accounted for slightly more than one-third of all full-time equivalent enrollments. These shifts in student preferences away from liberal arts were mirrored in enrollment gains in applied courses and sharp declines in courses such as mathematics for liberal arts.

These program trends may be at least partially explained by the increase in part-time enrollments from 53% in 1975 to 63% in 1980.

Number of Faculty

The number of full-time mathematical sciences faculty decreased 5% in the period 1975-1980.

This decrease occurred during the same period during which enrollments in mathematical science courses grew by 20%. For whatever reasons—burnout, economic exigencies, frustrations with remediation, increased teaching loads—the full-time faculty of 1980 was smaller than that of 1975. Age distributions indicate that those leaving the profession tended to be at least 45 years of age, which strongly suggests that experienced teachers are finding employment other than teaching.

The part-time faculty nearly doubled in size.

Part-timers now outnumber full-timers. If the number of full-time faculty teaching overloads (see below) had been smaller, then it is likely that the part-time fraction would have been even larger.

High schools continue to be the largest supplier of part-time mathematics faculty.

Faculty Loads

Teaching loads are up by 30 students per faculty member since 1970 and *nearly half* of the full-time faculty are teaching overloads as well.

Faculty Qualifications

The percentage of doctorates among two-year college mathematics faculty increased to 15%.

Women Faculty

Women now account for one-fourth of the full-time two-year college faculty.

The design of the questionnaire (which was sent to a sample of 416 institutions) and overall advice and guidance for the 1980 survey were provided by the CBMS Survey Committee: Donald J. Albers, Menlo College; William F. Atchison, University of Maryland; Wendell H. Fleming, Brown University; John W. Jewett, Oklahoma State University; Don O. Loftsgaarden, University of Montana; Martha K. Smith, University of Texas; Robert J. Thompson, Sandia Laboratories; Joseph Waksberg, WESTAT Research Corporation; James T. Fey, University of Maryland (Executive Secretary). The report was written by James T. Fey, Donald J. Albers, and Wendell H. Fleming. Technical assistance was provided by Clarence B. Lindquist of Washington, D.C.

FOCUS' New Friends

Warm thanks go these individuals for their generous contributions to the *Friends of FOCUS* campaign: Frances Campell Amemiya, Richard V. Andree, Sheldon Axler, Herbert and Binnie Baruch, Carole A. Bauer, Albert A. Blank, Milo F. Byrn, Jack and Sally Carter, Ronald M. Davis in memory of Dr. Richard J. Kohlmeyer, Michael W. Ecker in memory of Professor Harry Rauch, Ruth Anne Fish, F. P. Garriga, Nicholas Grant, Larry and Betty Hinman, John H. Hodges in honor of Leonard Carlitz, J. G. Horne, John M. Horváth, John P. Hoyt, John Kenelly, B. Melvin Kiernan, Samuel R. Knox, Daniel B. and Mazie Lloyd, Dennis Mar, John D. Neff, Mary Muskoff Neff, Bruce O'Neill, David P. Roselle, James A. Sansalone, Donval R. and Dorothy T. Simpson, John M. and Judy A. Smith, Max A. Sobel, William and Jean Stamey, David W. Starr, Gilbert L. Sward, Gordon L. Walker

Friends of FOCUS donations, now totalling more than $5000, are being used to help defray the start-up costs of *FOCUS*, the newest member of the MAA family of publications.

People in the News

Joel E. Cohen of the Department of Populations, Rockefeller University, has been selected as a Prize Fellow by the John D. and Catherine T. MacArthur Foundation. He will receive $36,800 a year for five years.

Professor Cohen is currently at the Center of Advanced Studies in the Behavioral Sciences at Stanford University. He is Chairman of the Board of Directors of the Society for Industrial and Applied Mathematics and is the author of four books and 94 professional articles.

Thirty-nine other exceptionally talented individuals were also selected by the MacArthur Foundation as Prize Fellows this year. The awards range from $24,000 to $60,000, according to age. According to John E. Corbally, President of the Foundation, "The awards are intended to enhance the ability of the recipients to pursue their work in accordance with their own direction and inclination . . . The Foundation hopes this program will lead to discoveries or other significant contributions to society that might otherwise not be made."

Benjamin Epstein of the Technion-Israel Institute of Technology, who recently received the 1981 Reliability Society Award of the Institute of Electrical and Electronic Engineers, has been elected President of the Israel Statistical Association for 1982-1983.

Bruce B. Peterson, Professor of Mathematics at Middlebury College, has been recently appointed to the Charles A. Dana Chair in Mathematics at the College. The appointment is in recognition of his outstanding teaching and service to Middlebury College. Professor Peterson is an active writer and invited lecturer on convexity, combinatorics, and other topics. He has served as an MAA Visiting Lecturer since 1977.

Charles A. Dana had a long-standing devotion to small colleges throughout the Northeast. The Foundation that bears his name awards grants primarily to these small colleges. His intention in establishing the professorships was to keep good people in small liberal arts colleges by recognizing outstanding teaching.

Mary Ellen Rudin, Professor of Mathematics at the University of Wisconsin-Madison, has been the recipient of a named Chair in Mathematics.

With the approval of the Board of Trustees, Professor Rudin has chosen the title "Grace Chisholm Young Professor of Mathematics." The name was selected because of the connections Grace Chisholm Young had with the University of Wisconsin as well as the mathematical ties between the research work of Professor Young and Professor Rudin. Grace Chisholm Young's son, Laurence, was a Professor of Mathematics at the University of Wisconsin-Madison and her granddaughter, Sylvia Wiegand (now a Professor of Mathematics at the University of Nebraska) also taught at Wisconsin. Both Professor Rudin and Professor Young have made important contributions to set theory.

Sabbatical Exchange Directory Ready

MAA members may obtain a free copy of the 1982-83 Sabbatical Exchange Information Service (SEIS) Directory by writing to SEIS, Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036. Non-members may purchase the SEIS Directory for $5.

Mathematical sciences faculty members who are interested in exploring the possibility of no-cost sabbatical exchanges during the academic year 1982-83 are invited to write to any of the SEIS participants listed in the Directory.

Calendar

National MAA Meetings

65th Annual Meeting, Cincinnati, Ohio
January 14-17, 1982

62nd Summer Meeting, Toronto, Canada
August 23-25, 1982

Sectional MAA Meetings

Allegheny Mountain Allegheny College, Meadville, Pennsylvania, April 30 - May 1, 1982.
Florida Valencia Community College, Orlando, Florida, March 5-6, 1982.
Illinois Southern Illinois University, Edwardsville, Illinois, April 30 - May 1, 1982.
Indiana Ball State University, Muncie, Indiana, April 24, 1982.
Intermountain Southern Utah State College, Cedar City, Utah, April 16-17, 1982.
Iowa Grinnell College, Grinnell, Iowa, March 26-27, 1982.
Kansas Emporia State University, Emporia, Kansas, April 2-3, 1982.
Kentucky University of Kentucky, Lexington, Kentucky, April 2-3, 1982.
Louisiana-Mississippi University of Southwestern Louisiana, Lafayette, Louisiana, February 12-13, 1982.
Maryland-DC-Virginia James Madison University, Harrisonburg, Virginia, April 17, 1982.
Metropolitan New York Courant Institute of New York University, New York, New York, May 2, 1982.
Michigan Calvin College, Grand Rapids, Michigan, May 7-8, 1982.
Missouri University of Missouri, Rolla, Missouri, April 9-10, 1982.
Nebraska Kearney State College, Kearney, Nebraska, April 2-3, 1982.
New Jersey Georgian Court College, Lakewood, New Jersey, April 17, 1982.
North Central St. John's University, Collegeville, Minnesota, April 23-24, 1982.
Northern California University of California, Davis, California, February 20, 1982.
Ohio Capital University, Columbus, Ohio, April 30 - May 1, 1982.
Oklahoma-Arkansas University of Arkansas, Fayetteville, Arkansas, March 26-27, 1982.
Pacific Northwest Western Washington University, Bellingham, Washington, June 18-19, 1982.
Rocky Mountain Western State College, Gunnison, Colorado, April 30 - May 1, 1982.
Seaway Skidmore College, Saratoga Springs, New York, April 23-24, 1982.
Southeastern Emory University, Atlanta, Georgia, April 9-10, 1982.
Southern California California State Polytechnic University, Pomona, California, March 6, 1982.
Wisconsin University of Wisconsin, Fond Du Lac, March 26-27, 1982.

Other Meetings

JANUARY 1982

13-17. **88th Annual Meeting of American Mathematical Society,** Cincinnati, Ohio. Contact: AMS, P.O. Box 6887, Providence, RI 02940.

14-15. **Meeting of Association for Women in Mathematics,** Cincinnati, Ohio. Contact: AWM, Women's Research Center, Wellesley College, 828 Washington Street, Wellesley, MA 02181.

APRIL 1982

14-17. **60th Annual Meeting of National Council of Teachers of Mathematics,** Toronto, Canada. Contact: NCTM, Convention Department, 1906 Association Drive, Reston, VA 22901.

19-21. **The Institute of Management Sciences/Operations Research Society of America Joint Meeting,** Detroit, Michigan. Contact: ORSA, 428 East Preston Street, Baltimore, MD 21202.

22-23. **13th Annual Pittsburgh Conference on Modeling and Simulation,** University of Pittsburgh. Contact: William G. Vogt, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15261.

24. **Mathematics Learning Conference,** Rutgers University. Contact: Arthur Powell, Academic Foundations Department, Rutgers University-NCAS, Newark, NJ 07102.

26-30. **NSF-CBMS Conference on Automorphism Groups of von Neumann Algebras and the Structure of Factors,** University of Iowa. Contact: Paul Muhly, Department of Mathematics, University of Iowa, Iowa City, IA 52242.

JUNE 1982

8-11. **MAA Ohio Section Short Course—Teaching Computer Science in a Mathematics Department,** Denison University. Contact: Andrew Sterrett, Jr., Department of Mathematics, Denison University, Granville, OH 43023.

28-30. **1982 National Educational Computing Conference,** Kansas City, Missouri. Contact: E. Michael Staman, Campus Computing Services, University of Missouri-Columbia, 305 Jesse Hall, Columbia, MO 65211.

28-July 3. **Second World Conference on Mathematics at the Service of Man,** Las Palmas (Canary Islands), Spain. (*FOCUS*, September-October 1981)

JULY 1982

19-23. **Society for Industrial and Applied Mathematics 30th Anniversary Meeting,** Stanford University, Stanford, California. Contact: H. B. Hair, 117 S. 17th Street, Suite 1405, Philadelphia, PA 19103.

AUGUST 1982

9-13. **International Conference on Teaching Statistics,** Sheffield, England. (*FOCUS*, September-October 1981)

11-19. **International Congress of Mathematicians,** Warsaw, Poland. (*FOCUS*, September-October 1981)

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