FOCUS

Volume 24 Issue 1

Inside

On the cover: The Pacific Northwest Section will be holding its first meeting in Alaska this summer. See the story on page 6. Photo courtesy of Explore Tours, Anchorage, Alaska, http://www.exploretours.com.

FOCUS Deadlines

	March	April	May/June
Editorial Copy	January 18	February 13	March 11
Display Ads	January 29	February 25	March 25
Employment Ads	January 15	February 11	March 12

FOCUS is published by the Mathematical Association of America in January, February, March, April, May/June, August/September, October, November, and December.

Editor: Fernando Gouvêa, Colby College; fqgouvea@colby.edu

Managing Editor: Carol Baxter, MAA cbaxter@maa.org

Senior Writer: Harry Waldman, MAA hwaldman@maa.org

Please address advertising inquiries to: Carol Baxter, MAA; cbaxter@maa.org

Letters to the editor should be addressed to Fernando Gouvêa, Colby College, Dept. of Mathematics, Waterville, ME 04901, or by email to fqgouvea@colby.edu.

Subscription and membership questions should be directed to the MAA Customer Service Center, 800-331-1622; e-mail: maahq@maa.org; (301) 617-7800 (outside U.S. and Canada); fax: (301) 206-9789.

Periodicals postage paid at Washington, DC and additional mailing offices. **Postmaster:** Send address changes to FOCUS, Mathematical Association of America, P.O. Box 90973, Washington, DC 20090-0973.

ISSN: 0731-2040; Printed in the United States of America.

Project ACCCESS: Advancing Community College Careers: Education, Scholarship and Service

The American Mathematical Association of Two-Year Colleges (AMATYC) and the Mathematical Association of America proudly announce the creation of Project ACCCESS, a mentoring and professional development initiative for two-year college faculty, funded through a three-year grant of $475,000.00 from the ExxonMobil Foundation. Project ACCCESS will be a program for new or recently hired faculty interested in advancing the teaching and learning of mathematics in two-year colleges. Its goal is to develop faculty who are effective teachers and who engage in a full range of professional activities in the mathematics community.

Two-year colleges provide post-secondary education to students who might otherwise not have that opportunity. First-generation college students, people who want to change careers and future workers in high-tech areas gravitate to TYCs to improve their skills in critical areas, especially mathematics. Many two-year college students transfer to four-year institutions to continue their academic careers. The presence of a strong faculty that is well versed in mathematics and that possesses a variety of effective teaching strategies is key to the preparation of competent workers and informed citizens.

Project ACCCESS will support groups of 30 fellows each year. Participants must be two-year college mathematics faculty in the first three years of a full-time, renewable position. Fellows will be selected on the basis of breadth of interests, motivation for participation, plans for implementing project goals, and degree of institutional support.

The goal of Project ACCCESS is to develop a cadre of new two-year college mathematics faculty (Project ACCCESS Fellows) who are effective members of their profession. The objectives of this program are for participants to:

- gain knowledge of the culture and mission of the two-year college and its students,
- acquire familiarity with the scholarship of teaching,
- commit to continued growth in mathematics, and
- participate in professional communities.

Fellows will attend two consecutive AMATYC Conferences, where they will participate in pre-conference workshops as well as regular conference activities. In the intervening year, Fellows will attend an MAA Section meeting near their home institution where they will participate in both regular and specially designed activities. For the duration of the project, an electronic network will link Project ACCCESS Fellows with each other and with a group of distinguished mathematics educators. The development, implementation, and evaluation of an individual project will play a key role in each Fellow's professional development experience.

The directors of Project ACCCESS are Sadie Bragg (Borough of Manhattan Community College), Mary Robinson (University of New Mexico, Valencia Campus) for AMATYC, Sharon Ross (Georgia Perimeter College, emerita), and Janet Ray (Seattle Central Community College) for MAA.

Application materials will be available spring 2004. More information about Project ACCCESS can be found at http://www.maa.org/ProjectACCCESS.

From left to right: Joseph A. Gallian, Sharon Ross, Co-director of Project ACCCESS; Philip Mahler, Truman Bell, Program Officer, ExxonMobil Foundation; Sadie Bragg, Co-director of Project ACCCESS; Mary Robinson, Co-director of Project ACCCESS.

Pacific Northwest Section to Meet in Alaska

Anchorage, AK. The site of the next section meeting of the Pacific Northwest Section. Copyright Frank Flavin/Anchorage Convention and Visitor's Bureau. Used with permission.

For the first time in its 59-year history, the Pacific Northwest Section of the MAA will be meeting in Alaska — in the summer of 2004, at the University of Alaska Anchorage. Speakers for the meeting include Ron Graham and Ken Ross (present and past MAA Presidents, respectively) and Pólya Lecturer I. Martin Isaacs (University of Wisconsin). Adding to the traditional sessions will be one on mathematics in the arctic; other specialty sessions are being planned and will be described on the meeting's web site. Workshops and the Pacific Northwest Section Project NExT meeting are scheduled for June 24th. Paper sessions, invited addresses, banquet, etc. are planned for June 25 and 26.

This meeting will begin shortly after one of Alaska's most exciting days — the summer solstice, with Alaska's famous midnight sun. To celebrate, members can hike Anchorage's famous trails after a day of mathematics. For those who decide to combine the meeting with a vacation, travel web links are included in the meeting's web site. (The "reasons to attend" explained at the meeting web site are worth checking out even if you're not planning to go.)

To reduce travel costs, a block of university residence hall rooms will be available at reasonable cost (families are welcome). For additional information, contact Larry Foster (aflmf@uaa.alaska.edu) at the Department of Mathematical Sciences of the University of Alaska Anchorage or visit the meeting's web site at http://www.math.uaa.alaska.edu/pnwmaa.

Incompleteness — the Theorem Becomes a Play

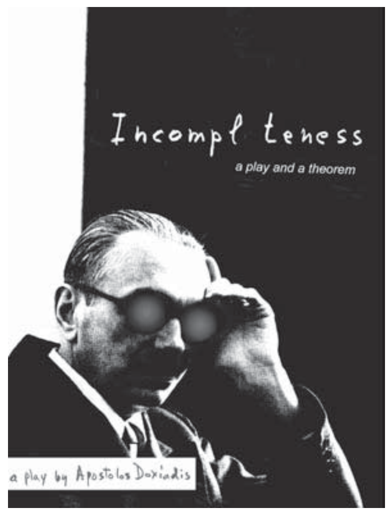
Apostolos Doxiadis, author of the novel *Uncle Petros and Goldbach's Conjecture,* has recently released a play called *Incompleteness: A Play and a Theorem*. The play was first seen in a "workshop production" in Athens last summer. Doxiadis hopes that the play will be produced in the United States in the near future.

Doxiadis' play centers on the last days of Kurt Gödel, when the great logician was dying of malnutrition as a consequence of a serious mental illness. Building on what is known about Gödel's life during this period, Doxiadis constructs his story, which pits Gödel's logical approach to everything against the point of view of his fictional hospital dietician.

The workshop production was directed by Tony Stevens, designed by Maria Pesmatzoglou and lit by Andreas Bellis. The actors were Judy Boyle, Jonathan Kemp, Alexandra Pavlidou, and Ian Robertson. The play was well received by the Greek and international press. Vivienne Nilan, writing in the *Herald Tribune*, described the play as "moving but not pessimistic. Loss leads to illumination and the beginning of hope for another character." Tefchros Michailidis, writing in *Ta Nea*, describes the play as a "splendid experience."

Gregory Chaitin of the IBM Thomas J. Watson Research Center is one of the few American mathematicians to have seen the play. "In *Incompleteness: A Play and A Theorem,*" he says, "Apostolos Doxiadis has achieved the impossible. This moving and deeply human play manages to bring Gödel back to life and simultaneously tell us why so many mathematicians, philosophers and post-modern artists are fascinated and obsessed by Gödel and his infamous 'incompleteness theorem'. Even though it's about a famous mathematician, the play is an entertaining, life-affirming intellectual treat."

Uncle Petros and Goldbach's Conjecture was one of the first of the recent group of novels dealing with mathematics and mathematicians. In his MAA Online review, Keith Devlin said that "not only does [Doxiadis] get the math bits correct, he can write fiction as well." (See http://www.maa.org/reviews/petros.html for the full review.)



Apostolos Doxiadis was born in Brisbane, Australia but grew up and lives in Greece. He has always been interested in fiction and the arts, but a "sudden love affair with mathematics," he said, led him to do graduate work in mathematics. In the 1980s, he turned back to his first love, working in film, theatre, and literature. *Uncle Petros*, written and published in Greek then translated to English by the author, was his breakout work. For more information about Doxiadis and his play, visit his home page at http://www.apostolosdoxiadis.com.

Scientists and Mathematicians Exchange Latest Results in SARS Research

By Harry Waldman

In early September, leading scientists and mathematicians convened in Banff, Alberta, Canada, to present the latest findings about SARS and to work together to determine collaborative research topics. Their aim was to speed up the process of finding effective tests, prevention, and controls in the prevention and treatment of the frightening disease.

Mathematical models were one aspect of the research effort. They are integrated with statistical analysis of real data and are built on a solid epidemiological foundation. The results from this conference will be interpreted and translated into public health policy recommendations in the various nations. The collaborative approach of this workshop, led by mathematicians, hoped to offer insights into research on the epidemiology of SARS.

Scientists and mathematicians from the United States, Canada, the UK, Taiwan and Australia participated in the gathering, which was being jointly supported and coordinated by MITACS (Mathematics of Information Technology and Complex Systems) and the Pacific Institute for the Mathematical Sciences (PIMS).

The event was held at the Banff International Research Station (BIRS) in Banff, Alberta, on the site of the Banff Centre, from September 5-6, 2003. The interdisciplinary approach involved the collaboration of mathematicians, statisticians, epidemiologists, and virologists.

The SARS workshop was organized by Dr. Fred Brauer (University of British Columbia), Dr. Ping Yan (Health Canada), and Dr. Jianhong Wu (York University). "Working together with Health Canada will enable this research to have a real effect on health policy guideline recommendations," said Dr. Arvind Gupta, Scientific Director of MITACS.

Scientific experts participating in the workshop included Dr. John Glasser from the Centers for Disease Control and Prevention, Atlanta, GA; Dr. Steven Riley of Imperial College, London, UK; Dr. Ying-Hen Hsieh of the National Chung Hsing University, Taiwan; Dr. Niels Becker from The Australian National University; and Dr. Ping Yan of Health Canada.

These researchers were joined by many respected scientists from North America, Europe, and Asia, all hoping to compare their experiences and to increase understanding of SARS at a faster pace.

Established in 1999, the Mathematics of Information Technology and Complex Systems networks (MITACS) is one of 19 components of the Canadian Networks of Centres of Excellence. The 250 scientists in the network are working on 32 research projects in collaboration with more than 80 organizations. Over 400 students and other trainees work directly with the scientists and private sector firms. MITACS works with organizations to identify their problems, find scientists capable of tackling those problems, and provide significant funds towards the research that leads to innovative solutions.

The Pacific Institute for the Mathematical Sciences (PIMS) was created in 1996 by scientists in Alberta and British Columbia. This collaborative international venture of seven universities in Western Canada, as well as the University of Washington, in Seattle, involves over 300 scientists from these institutions, with additional funding from the governments of Alberta and British Columbia.

The Banff International Research Station for Mathematical Innovation and Discovery (BIRS) is a collaboration of PIMS and MSRI, the Mathematical Sciences Research Institute in Berkeley, California. BIRS is operated in coordination with MITACS. BIRS provides an environment for enhanced opportunities for creative interaction and the exchange of ideas, knowledge, and methods within the mathematical sciences, related scientific fields and industry. BIRS is located on the site of the world-renowned Banff Centre in Banff.

Recent Reviews on MAA Online

The Curious Incident of the Dog in the Night-time
by Mark Haddon
Reviewed by Maria G. Fung

Four Colors Suffice: How the Map Problem Was Solved
by Robin Wilson
Reviewed by G. L. Alexanderson

Big Ideas for Small Mathematicians:
by Ann Kajander
Reviewed by Laurie Johnson

New Math?

According to *Air Force Print News*, a 7th grade student has just come up with a new way of subtracting mixed numbers. Here's an example:

$$8\frac{2}{5} - 5\frac{3}{5} = 3\frac{-1}{5} = 2 + \frac{5}{5} - \frac{1}{5} = 2\frac{4}{5}$$

According to the report, the girl's teacher has never seen anyone use negative numbers to do such computations. "I went home and tried to find fault with it, but I couldn't," he is quoted as saying.

You can see the story at http://www.af.mil/stories/story_print.asp?storyID=123006043.

The Vanishing Line Between High School and College Mathematics

By Michael Pearson

The *Fall 2000 CBMS Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States (CBMS 2000)*, released fall 2002 and available online at http://www.ams.org/cbms/, raised concerns about the increasing availability of "dual enrollment" courses that allow high school students to take college-level courses, either at their high school or (principally) at local community colleges. According to *CBMS 2000*, approximately 14% of all sections of courses in college algebra, 37% of precalculus sections and 15% of calculus I sections listed by two-year colleges in fall 2000 were offered via dual enrollment, while 7% of elementary statistics courses were available in this way. Concerns about such programs center around the quality of instruction and the level of control that the colleges, who are eventually asked to accept the credit, have over the course content.

A closer look at mathematics courses offered at both U.S. high schools and colleges reveals a much more complex picture. In addition to dual enrollment as defined above, increasing numbers of high school students are gaining access to Advanced Placement (AP) courses and International Baccalaureate (IB) programs, both of which allow high school students the chance to earn college credit through exams based on courses that also provide high school credit. Over 200,000 students took the AP Calculus exams in 2002. Some estimates suggest that nearly half of high school juniors and seniors are enrolled in some sort of program which offers an opportunity to gain both high school and college credit. Almost all of these students will wind up in college classrooms, so it is impossible to discount the impact such programs have on mathematics instruction.

Everyone agrees that providing challenging, relevant instruction to our best high school students is essential to maintaining U.S. competitiveness, and there is some evidence that offering advanced courses even to "average" students increases their level of engagement and achievement (perhaps primarily because of the quality of instruction and increased attention usually given to students in such courses). But while various forms of dual enrollment (exam based or not) continue to grow in U.S. high schools, enrollment in remedial courses in postsecondary institutions now represents approximately 25% of total mathematics enrollment, while well over half of current enrollment is at the precalculus level. Clearly, there are too many students being left behind and under-prepared for college-level mathematics. Thus there is the blurring of distinction between high school and college mathematics referred to in the title of this article. It is no longer possible to clearly identify distinct roles in mathematics education for U.S. secondary and postsecondary schools.

Dual enrollment, AP and IB programs are all connected with the growing need for thoughtful consideration of both the secondary curriculum and the roles of and relationships between high school and college faculty. Our public schools are being called to task, through e.g. No Child Left Behind, to prove, often through high-stakes testing, to show that they are answering the call to provide quality education for all students. Parents and the public at large are questioning the educational status quo, and rightly asking for a reasonable return on their tax dollars. We, as collegiate faculty, want students to come to us prepared to succeed in our classes. For this last, it is important that we take a more intentional approach to articulating what skills are necessary and desirable for entering students, and (at least as a discipline) a more active role in working with our colleagues in the high schools to provide them the tools to educate their students.

Increasing calls for accountability at institutions of higher education are also beginning to be heard, and I do not believe that we can long rely on our claims of expertise and academic freedom to avoid concrete, data-driven responses. What is more important is that we educate ourselves and direct the responses, rather than wait until standards are imposed from outside.

Dual Enrollment as an Opportunity to Foster Improved Mathematics Instruction

As indicated above, the CBMS survey raises concerns about the increasing number of students in dual enrollment courses. If high school students enrolled in such courses have regular high school faculty as instructors, with little supervision by the associated institution where college credit is granted, the quality of the course may reasonably be questioned. On the other hand, a well-coordinated program that involves mathematics faculty at both the college and high school may serve to enhance not only the students' experience in a single course, but offer long-term articulation benefits for mathematics curriculum at both institutions.

One example of a program that uses dual enrollment programs to foster professional development of high school teachers is the Nassau Community College (NCC) Precalculus and Calculus Partnership Program. According to Phil Chiefetz, a former president of AMATYC and director of the NCC program, the Partnership began in the 1997-1998 school year with 41 students enrolled in three precalculus classes in one school district. For the 2003-04 academic year, 12 NCC faculty and 20 high school faculty from 10 districts are involved, and over 500 student applications had been processed by July 2003.

In order to participate in the NCC program, high school faculty must attend a week-long workshop, as well as monthly meetings through their first two years. NCC faculty partner with each high school teacher, and the NCC faculty member assigned to a calculus or precalculus class meets the class (at the high school) 32 times during the course of the academic year, administers three quar-

TABLE DEN. 16 Number of sections of various courses offered by two-year colleges via dual enrollment in Spring and Fall, 2000, plus total number of sections of those courses: Fall 2000.

	Number of dual enrollment sections		
	Spring 2000	Fall 2000	Total Fall sections
College algebra	522	924	6619
Precalculus/Elementary functions	510	362	1991
Intro to Mathematical modeling	10	0	329
Calculus I	347	440	3026[1]
Elementary Statistics	179	190	2794

Note: 0 means less than 5 sections.
[1] Combination of mainstream and non-mainstream calculus sections offered Fall 2000.

TABLE DEN.17 Percentages of two-year college Mathematics Programs that controlled various aspects of dual enrollment courses for which they award credit: Fall 2000.

	Percentages of two-year Mathematics Programs that controlled the following aspects of dual enrollment courses		
	Never	Sometimes	Always
Choice of textbook	10	12	79
Design of syllabus	8	11	82
Design of final exam	15	28	57
Choice of instructor	19	20	61

terly and one final exam, and assigns the final NCC course grade for each student using a set weight on the students' grades that includes 35% for quizzes/tests administered by the high school teacher. The students' grades at the high school are assigned solely by the high school teacher. According to Phil, data suggests that when students go through the NCC precalculus program and then take AP Calculus (AB), 94% receive a 3 or better and 67% receive a 5. The NCC program illustrates the opportunities for collegiate math faculty to become more involved with high school mathematics that dual enrollment programs can offer, though clearly not without effort.

A quick search on the internet will turn up a huge amount of information on dual enrollment programs across the U.S. One site offering a range of information on dual enrollment, including state-by-state listing of dual enrollment policies, is the Center for Community College Policy located online at (http://www.communitycollegepolicy.org) maintained by the Education Commission for the States in cooperation with the Department of Education. Most states have passed laws that set rules for (and often mandating implementation of) dual enrollment programs. This is natural given the funding ramifications for both public high schools and institutions of higher education. Justification for such programs is found in studies showing that, statistically, students who participate in either AP or dual enrollment programs tend to perform better once they become full-time college students. See, for example, the study "Community College and AP Credit: An Analysis of the Impact on Freshman Grades" published by the University of Arizona's Assessment and Enrollment Research office, available through http://aer.arizona.edu/AER/. A more recent article, "Dual Enrollment Programs: Easing Transitions from High School to College," available through the Community College Research Center at the Teacher's College of Columbia University (http://www.tc.columbia.edu/ccrc/) points to similar results for other programs, as well as cautionary notes about quality control and providing appropriate access to all students.

Your institution probably has articulation agreements with regional schools that define what transfer credit is allowed. The mathematics department usually has some influence in determining how mathematics credit is granted, both for transfer/dual credit and for test-based programs such as AP and IB. Perhaps it's time for us to use the increasing popularity of and demand for such programs as an opportunity to strengthen our connections to the secondary schools, working with local systems to help improve the quality of the program and help align goals so that more students can successfully make the transition from high school to college.

AP, IB and the Role of Collegiate Mathematics Faculty

The June 2, 2003, issue of *Newsweek* featured an article on the "top high schools in America" and included a list titled "The 100 Best High Schools in America." The list was actually compiled by Jay Matthews, a writer at *The Washington Post*, who calls his list "The Challenge List." In fact, the list was constructed solely on the basis of the number of Advanced Placement (AP) or International Baccalaureate (IB) exams taken in 2002, divided by the number of graduating seniors. While school administrators complain that the process of constructing the list is flawed, parents often see the availability of such courses as providing enhanced opportunities for admission to college and access to scholarship funds and are putting greater pressure on their children's schools to make such courses available to them.

As mentioned earlier, participation in both advanced placement (including IB) and dual enrollment programs is associated with improved academic performance in later college courses. Moreover, both students and their parents are coming to view participation in such programs as an important part of gaining admission (and scholarships) at prestigious universities. While never the sole basis for admissions decisions, enrollment counselors readily admit that students with a good AP background on their transcripts do indeed have an advantage over students who do not. With higher education increasingly viewed as the gateway to better employment opportunities, we can expect the pressure for expanded access to AP/IB and dual enrollment programs.

A recent report from the National Research Council, *Learning and Understanding: Improving Advanced Study of Mathematics and Science in U.S. High Schools*, identified the primary goal of advanced study (in any discipline) to be the development of "deep conceptual understanding of the discipline's content and unifying skills." The report went on to recommend that AP courses not be designed to "replicate typical introductory college courses." Among the crucial issues identified in the report were access to advanced study courses, and alignment of curriculum, pedagogy and assessment with current knowledge about how people learn, and availability of substantial professional development opportunities for teachers.

The AP calculus course, redesigned during the 1990's in response to the calculus reform movement, was singled out as a good example for other disciplines to use in the development of such a course. The AP statistics course, though not as widespread, is actually providing a means for high schools to offer a course that has not traditionally been a part of the high school curriculum. Available data suggests that students who fare well on AP exams also perform well in subsequent courses (see e.g. the "21 Colleges Study," available through the College Board's AP Central, which is located at http://apcentral.collegeboard.com/). From the point of view of course development, then, it appears that AP mathematics is in reasonable shape. However, some concern about professional development for teachers of AP courses remains. There is little direct supervision of what goes on in the AP classroom. Quality control is maintained largely through the exam process. Another concern is that students may use AP credit to fulfill core distribution requirements and avoid enrolling in subsequent courses altogether. By reaching out to high school faculty who teach AP courses, and their students, we may be able to help support improvement in instruction while simultaneously encouraging further study of mathematics.

I mentioned above the need for the mathematical community to spell out what skills we want our students to develop. A variety of voices are now calling for a concerted effort across secondary and post-secondary institutions to more clearly express expectations for all disciplines. Some states are already forming groups to promote improved articulation between high schools and colleges, including not only enhanced expectations for students entering college but also standards for placement and exit skills for remedial courses. Our call as mathematicians, then, is first to set goals as to just what mathematics should be taught, and to which students, then to examine the full range of mathematical experiences our students have, at both the precollege and college level, assess their effectiveness and participate in the process of refining or redesigning curriculum to meet those goals. Easier said than done, of course, but worthy objectives, and necessary for us if we are to maintain the level of control of our discipline that we now enjoy.

The complete CBMS 2000 report is available online: http://www.ams.org/cbms/

Michael Pearson is Director of Programs and Services at the MAA.

Tables on page 7 reprinted with permission of the American Mathematical Society.

Statistics, Technology, and the Social Sciences: A Successful Interdisciplinary Project

By Catherine Bénéteau and June Rohrbach

Recently we completed an interdisciplinary project involving Mathematics and the Social Sciences at Seton Hall University, a small, suburban Liberal Arts college in South Orange, New Jersey. The student body consists of about 10,000 students, which includes undergraduates, graduates, and law school students. The students are ethnically diverse, and many of them commute to class. Seton Hall has also been named one of the top-25 most wired universities in the U.S. Each full-time student receives a laptop computer and the faculty is encouraged to integrate technology into the classroom. The university tries to promote such integration by offering internal curriculum development grants.

June Rohrbach teaching her class on Statistical Models for the Social Sciences. The class uses the computer about 20% of the time. The data used is from the 1996 General Social Survey.

All students at SHU are required to take at least one mathematics course as part of their core curriculum, so the Mathematics Department services the other departments in the various colleges. There are about 2,500 students in the College of Arts and Sciences. We were approached about applying for a three year Curriculum Development Initiative grant in conjunction with the social sciences in the fall semester of 2000. Now that we have completed our third year on this joint project we have found it to be professionally stimulating and have formed good friendships in the process.

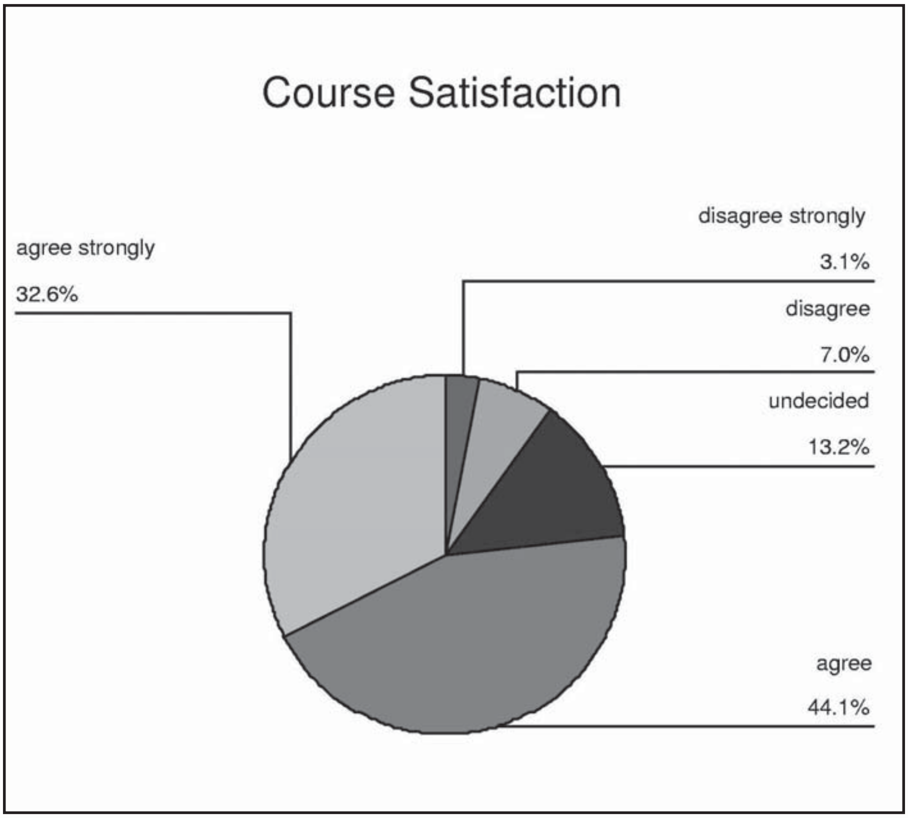
Students in the Social Sciences, which comprise sociology, social work, social and behavioral sciences, criminology, anthropology and diplomacy majors, are required to take statistics as part of their core requirement. This course, based on evaluating given data sets, serves as a prerequisite for their Research Methods course, which teaches how to collect data and design research studies. The faculty in the social sciences noted three problems associated with our current statistics course, which was also required for Nursing majors and certain Liberal Arts majors. First, as with most undergraduate statistics courses, it was based primarily on quantitative data, which is beneficial for the Nursing majors, but somewhat incomplete for the Social Science majors. The students did not feel that the material was relevant to their lives, their course of study and to their future professions. The material did not always transfer well to the Research Methods class. Secondly, Statistics was taken in the students' freshman year and Research Methods in their junior year. Having three semesters between these courses presented a retention problem. Third, we needed to standardize our technology. The Mathematics Department was using SPSS (Statistical Product and Service Solutions) while Research Methods classes were using Micro Case.

The solutions to our last two issues were relatively easy. Research Methods would be offered during the students' sophomore year, hopefully minimizing the retention problem. It was also decided that both Statistics and Research Methods would use SPSS to standardize the technology used in both courses. SPSS is windows based and user friendly. It is also the software of choice for many organizations and companies.

The real problem was developing a statistics course that would be useful to Social Science Majors but still be rigorous enough to satisfy the Mathematics faculty. Finding a textbook that would satisfy these requirements was difficult. As we stated before, most statistics courses, and therefore most textbooks, are based mostly on quantitative data. We needed a book that had social science applications, that incorporated technology (specifically SPSS), and that had an appropriate mix of both quantitative and qualitative data. *Social Statistics*, by J. Richard Kendrick, Jr. was the book we chose. As with most textbooks, it did not satisfy all our needs, so we supplemented certain topics such as the Empirical Rule, probability, and additional topics on hypothesis testing.

The resulting course, *Statistical Models for the Social Sciences*, has been a huge success. It stresses procedure, interpretation and computer application over rigor and emphasizes qualitative data over quantitative data. SPSS is used throughout the course and is incorporated into the classroom on a daily basis. Computer projects are assigned that use real-life data from the 1996 General Social Survey. Students are required to analyze data from this survey on social issues such as race, gender, and income, and write the outcome in article form. This incorporates another project important at Seton Hall: writing across the curriculum. The use of real data motivates enthusiastic classroom discussions on statistics and its social implications. The students seem to like the more relaxed atmosphere this type of communication encourages. They appear to have a deeper understanding of the interpretation of outcomes in statistics although their mathematical skills are not as developed. And of course, their computer skills are greatly enhanced.

To measure the impact of the course on the students, a survey was administered to each student, and the results were tabulated. The survey consisted of ten questions. The questions were designed to measure course satisfaction, understanding of the material, and student attitudes towards their research as a result of the course. Each of the first nine questions had a scale of 1 to 5, with 1 indicating strong disagreement and 5 indicating strong agreement.



Course satisfaction on statistics course for social science majors.

Course satisfaction was high: 77% of students were very satisfied with the course. The materials developed for the course also met with success: students agreed that assignments and tests proved useful in clarifying the concepts covered during the semester. We integrated the use of SPSS, a statistical software package for the social sciences, into the every day working of the class. More than half the class agreed that the use of SPSS made a great difference in comprehending the material covered in the course. Students also appeared to connect statistics to their lives and their work in a positive manner. For example, 75% of students agreed that as a result of the course, they felt much more comfortable understanding statistics reported in the popular media. In addition, they said that they would be more comfortable using statistics in their research and writing than they did before taking the course, and that as a result of the course, they would be more likely to use statistics in their research and writing. Finally, we noticed several negative comments about the textbook used, although more than half the students felt that the textbook was helpful in understanding the material covered.

In conclusion, the results of the survey show that from the students' point of view, Statistical Models for the Social Sciences was a positive experience. The faculty also benefited from developing the course. It has been an exciting and stimulating class to teach. We have learned even more about statistics and the SPSS software, which have lead to consulting positions. We got to work closely with other members of the Mathematics and Social Sciences Departments, which improved departmental connections and communication.

Catherine Bénéteau (beneteca@shu.edu) *is an Assistant Professor and June Rohrbach* (rohrbaju@shu.edu) *is a Faculty Associate in the Mathematics and Computer Science Department at Seton Hall University.*

Math Scores of Students on the Rise

By Harry Waldman

The nation's fourth-graders and eighth-graders are getting better at mathematics — that's the surprising conclusion based on 2003 test scores. The results come from the test considered to be the nation's report card: the National Assessment of Educational Progress, which shows that mathematics scores are heading in the right direction.

Compared to their peers in 2000, when the mathematics test was last given, fourth-graders and eighth-graders made significant gains at every level, from the lowest performers to the top achievers. Also encouraging is the fact that Black and Hispanic students narrowed their performance gap with white students. The mathematics test covered probability, algebra, and mathematical reasoning, etc.

Nationally, more than 75% percent of fourth-graders showed a basic understanding mathematics, which translates into an understanding of the basics for academic work. That's up from 65% when the test was last given. Among eighth-graders, close to 70% did well, up from 63%.

"The achievement levels represent very challenging standards, so when you have these kinds of increases, they're to be celebrated," said Bella Rosenberg, an education policy specialist at the American Federation of Teachers. "It's important... to understand that 'basic' is a pretty high standard."

The results have become significant because the national test is now used as a benchmark as to whether states are sufficiently challenging their students. The year 2003 marked the first time all 50 states were required to make use of the test as a condition for receiving federal money.

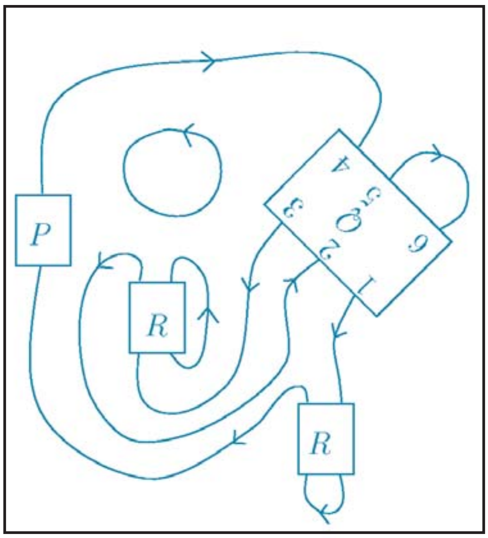
Every two years, national scores will come out in grades four and eight for mathematics and reading. Under federal law, all students must be "proficient" in mathematics and reading by 2013-14, but there is one proviso: the states are allowed to define what that means.

Fields Medalist Lectures on Planar Algebras

Contributed by Dale Rolfsen, University of British Columbia

We all learned algebra as a sort of linear activity. Equations, like sentences in English, are written from left to right on a line, with few deviations, perhaps for exponents and fractions. If you want to compute, for example, x minus y, the order in which you write x and y makes a big difference. What if you could write x ABOVE y, or to the northeast? What if you could turn the variables upside-down? A new version of algebra, Planar Algebras, developed by Fields medalist **Vaughan Jones**, allows exactly that to happen. A poet may think of this as a liberation of algebra from the tyranny of linear thinking.

In the language of planar algebra, an algebraic expression might look like this:



On a more mathematical level, Jones showed how doing algebra in the plane is connected to a central idea in the theory of operator algebras, the type II_1 subfactors which go back to the work of von Neumann. Jones argues that every finite index subfactor arises from a type of planar algebra and vice-versa, a remarkable correspondence, which is not yet clearly understood.

Jones recently discussed these ideas at UBC in November 2003, in the *Cascade Topology Seminar* and as PIMS Distinguished Lecturer in the UBC Mathematics Colloquium. The work brings together ideas from operator theory, quantum physics, statistical mechanics and the more geometric theory of knots and tangles. The planar approach was inspired by John Conway in his skein theory developed in the late 1960's, which converts geometric and topological pictures of bits of knots into algebraic objects, which can then be studied more precisely and are more amenable to actual calculation, using for example powerful methods of linear algebra. On the other hand, some arguments that might be quite complicated algebraically are much simplified by the geometric point of view. This gives a fruitful interplay between ideas of algebra and methods of geometry and topology.

Because of Jones' earlier work—most famously the Jones polynomial—the theory of knots has undergone a revolution in the last two decades. His current work in planar algebras is but one direction of the vast amount of research currently going on in this fascinating circle of ideas.

Many of the new knot invariants can be understood in terms of planar algebras, and Jones' approach has facilitated the use of geometric and combinatorial methods in solving algebraic problems.

Vaughan Jones was born on New Year's eve in 1952 in Gisborne, New Zealand. After undergraduate studies at the University of Auckland, he went on to graduate school at the University of Geneva, first in the Ecole de Physique and later the Ecole de Mathematiques, under the supervision of Professor Andre Haefliger, where he received his doctorate in 1979. Following positions at UCLA and University of Pennsylvania, Jones became Professor of Mathematics at the University of California, Berkeley in 1985, shortly after his ground-breaking work in knot theory.

Vaughan Jones

Jones was awarded the Fields medal in 1990, and in the same year became a Fellow of the Royal Society. Among other awards, Jones was a Sloane Fellow, a Guggenheim Fellow, and has been elected to the US National Academy of Sciences, the Norwegian Royal Society of Letters and Sciences, the London Mathematical Society and the American Academy of Arts and Sciences. He has honorary doctorates from the University of Auckland and the University of Wales and he is the winner of the Onsager medal from Trondheim University. Jones is also an Honorary vice-president for life of the International Guild of Knot Tyers. He is the Director of the New Zealand Mathematics Research Institute and a strong friend of PIMS.

This article was first published in the Pacific Institute of Mathematics Magazine; reprinted with permission

Are Our Mathematics Natural?

By Ivar Ekeland, University of British Columbia

Several years ago, David Ruelle (*Bull. Amer. Math. Soc.* **19** (1988), no. 1, 259-268) published a beautiful paper entitled: "*Are our mathematics natural*?" He contended that if somewhere there is a planet, gravitating chaotically around three suns, and where the physical conditions on the surface, although very different from the ones we experience on Earth, do support some form of intelligent life, then the mathematics developed on that planet are likely to be quite different from the ones we know.

Not that there would be different ideas of what is correct and what is not. There would be a general agreement on what a theorem is, but not on what is an interesting result. Ruelle proves his point by stating a theorem which no one in his right mind would want to prove, and then disclosing that it plays an important role in equilibrium statistical mechanics.

It strikes me that, although we are not likely to travel out of our solar system in the near future, we can still experiment with different mathematics by moving out of our immediate intellectual neighborhood. Ruelle's example comes from physics, but there are more distant solar systems in economics, and in the other social sciences.

It certainly has been my experience that basic problems in economic theory give rise to quite difficult mathematical problems with the unmistakable flavour of the exotic. Who would ever have thought of restricting variational principles (such as Dirichlet's principle) to convex functions? Except for some very early work by Isaac Newton, there is nothing like this in the classical literature on the calculus of variations, probably because it was not considered an interesting or natural problem. And yet it has emerged in the past years as a mathematical model of a basic problem in economics, namely informational asymmetry: people will lie to you if it is in their own interest, and contracts should take that possibly into account.

Ivar Ekeland

Similar things are happening in econometrics. Certain goods, houses for instance, are priced according to a complex bundle of qualities.

You buy only one house, but you take into account its location, proximity to schools, shops, public transportation, the view, the neighbors, the size and interior distribution, and so forth. Is it possible to observe the market price of houses, and infer the prices of all these different qualities? For instance, could one find out in this way how much people are willing to pay for an unpolluted environment? Models to do that have been developed in the seventies, by the late Sherwin Rosen in Chicago. They are called hedonic models, and they have become very popular in recent years, because of the needs of environmental studies. However, there are great mathematical difficulties at all levels, and only recently have they begun to be cleared, under the impulse of Nobel Laureate Jim Heckman. The mathematical structure is similar to the classical optimal transportation problem of Monge and Kantorovich, again with an added twist that would have been judged uninteresting or unnatural if it had come from mathematics alone.

And there is, of course, the case of mathematical finance: the first documented appearance of Brownian motion in the mathematical literature is in the 1900 thesis of Louis Bachelier, who was trying to model financial markets. Unfortunately, neither the financial nor the mathematical community were ready for him, and it was only in the seventies that the importance of his work became clear. It does not always pay to come in from another planet.

This article was first published in the Pacific Institute of Mathematics Magazine; reprinted with permission

What I Learned by Teaching Real Analysis

By Fernando Q. Gouvêa

My main mathematical interests are in number theory and the history of mathematics. So what was I doing teaching Real Analysis? We do that sometimes, my colleague Ben Mathes and me: I teach Analysis, and he gets to teach Algebra. We have fun and vary our course assignments a little bit, and the students get the subliminal message that mathematics is still enough of a unified whole that people can teach courses in areas other than their own.

I had taught Colby's Real Analysis course once before. The first time I teach a new course, I tend to just dive in and see what happens (it went all right). The second time, however, is when one starts to want to think about the course. This article is one of the results of that process. It may be that everything I have to say is well known to anyone who specializes in analysis; if so, I'm sure they'll write in to tell me that. Still, maybe I can share a few insights.

Analysis courses can vary a lot, so let me first lay out the bare facts about our version. Real Analysis at Colby is taken mostly by juniors and seniors, with a sprinkling of brave sophomores. It is a required course for our Mathematics major, and it has the reputation of being difficult. (This course and Abstract Algebra contend for the "most difficult" spot.) The content might best be summarized as "foundations of analysis": epsilonics, the topology of point sets, the basic theory of convergence, etc. As the title of a textbook has it, the goal of the course is to cover "the theory of calculus."

The first thing to do was to choose a textbook. The most common choice at Colby has been Walter Rudin's classic, *Principles of Mathematical Analysis*. It is a hard book for students to read, but reading such books is a good skill for a mathematics major to acquire, and Rudin's book repays the effort that students need to put into reading it. There is a lot of beautiful mathematics in it, and students eventually come to respect, perhaps even enjoy, the book.

But two serious problems have developed, neither of which is really Prof. Rudin's fault. The first is the price. *Principles* is now so expensive that I feel guilty making students buy a copy. The second is the internet. Many instructors around the world have used this book, and in the goodness of their hearts have posted solutions to some of the problems for their students. They have neglected to set up their sites so that only their students have access to them, however. As a result, almost any problem from Rudin's book has a solution online somewhere, and *Google* will find it for whoever wants it. Since I want my students to think about hard problems rather than learn to find their answers online, I decided I should look for another text.

To my rescue came the MAA Online book review column. Steve Kennedy had written a glowing review of *Understanding Analysis*, by Stephen D. Abbott (you can see it at http://www.maa.org/reviews/understand.html). The first paragraph of that review went like this:

This is a dangerous book. Understanding Analysis *is so well-written and the development of the theory so well-motivated that exposing students to it could well lead them to expect such excellence in all their textbooks. It might not be a good idea to create such expectations. You might not want to adopt this text unless you're comfortable teaching from a book in which the exposition will nearly always be clearer than your lectures.* Understanding Analysis *is perfectly titled; if your students read it, that's what's going to happen.*

And the price is very reasonable. So I decided this would be my textbook. I also decided to encourage students to buy a supplementary book, and made two suggestions: *A Course of Modern Analysis*, by Whittaker and Watson, and *A Primer of Real Functions*, by Boas. As I explained to them, one can't imagine two more different books, and both of them are also very different from Abbott. Plus, one can buy all three for about the cost of buying Rudin's *Principles*.

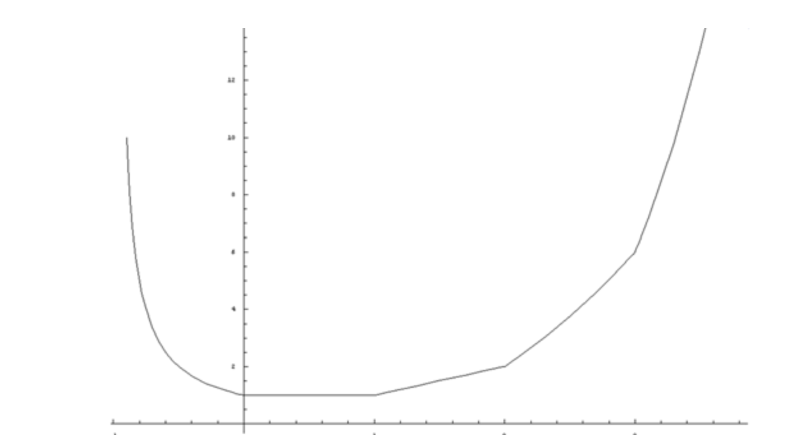
Now, I make no pretense of having carefully examined the available textbooks, which is why this isn't a "what's the best textbook" article. I went with what I knew, and with Steve Kennedy's recommendation. It worked out pretty well, though next time I'll probably want to choose different books for the supplement slot.

OK, so we launch into the course itself. Before we start, it is useful to ask what we want to achieve. The first answer comes easily: we want to introduce students to epsilon-delta proofs, and to use this technique to prove all those theorems they took for granted in their calculus course. But the answer generates questions of its own. Why do this? What do students gain from such knowledge?

That's easy to answer if your students are likely to be going to graduate school. But most of my students are not, at least not immediately or not in mathematics. (A vast majority of Colby students do end up getting an advanced degree, but that's different from going on to get a Ph.D. in mathematics.) So the question becomes a little sharper. I decided to take it for granted that my students wanted to learn *mathematics*, irrespective of their future career plans. The sharper question is, then, are epsilon-delta proofs a crucial thing for them to learn, and, if so, why?

Now, it's easy to mount an argument that learning this stuff is in fact not that important. After all, lots of people learn and use sophisticated mathematics without ever having felt the need to delve into the foundations of the calculus. Convergence questions can usually be settled by "this gets small, and that's even smaller" arguments. Turning those into formal epsilon-delta arguments is a nice party trick, and one that professional mathematicians have to know how to do, but no one should get too excited about it.

As a counter to that, let's note that some of my students were planning to go to graduate school, and they would need to know the trick. And the course is there in the curriculum, and listed as required.



A mock factorial function: define f(x) = 1 for x between zero and one and extend using the functional equation f(x) = xf(x– 1).

So it must be important after all. This makes it clear that in order to justify the formalism of real analysis, one needs to find situations and problems in which the epsilon-delta approach is essential.

There is, of course, a very famous moment (by no means the only such moment, but probably the best known) in the history of mathematics that serves as an example: Cauchy's "proof" that the sum of a series of continuous functions is continuous. As presented by Cauchy, this is a classic "this is small, and so is this" argument. And, of course, it doesn't work, because hidden in the argument is a uniformity assumption. I decided to use this example (or a simplified version of it) fairly early on.

Abbott's book turned out to be a good fit, because the author was clearly worried about similar issues. Each of his chapters begins with an example where things "go wrong" in ways that can only be understood by using the formal tools of analysis. Some of these are more convincing than others, but I was delighted to be using a textbook that noticed that such examples are crucial to the course.

One of the main threads in the course, then, was the idea of uniformity. The very definitions of uniform continuity and uniform convergence require the epsilon-delta formalism, and the notions simply cannot be understood without it. Over and over, I showed students examples of things that went wrong because something failed to be uniform, and showed them how to fix it by adding the uniformity assumption.

To this, I added two other threads, both stolen from articles written by wiser mathematicians than me. The first was the problem of partitioning the real numbers into two disjoint sets A and B, and then finding two functions f and g where f is continuous on A and discontinuous on B, and g does the reverse. The easiest case is when A is a singleton set (well, A empty is even easier, I guess), and students are usually able to push that a little. The case A = **Q** is the clincher: in this case the function g exists, but not the function f (i.e., no function can be continuous at all rational points and discontinuous at all the irrationals). This follows from a beautiful (and fairly easy) theorem of Volterra that William Dunham wrote up in an article for *Mathematics Magazine* some years ago. (The precise reference is given below.)

This thread doesn't really connect to the issue of uniformity, but it fits in well with the point set topology. I also like it because it shows that not every kind of monster exists. What I mean is this: when students first start learning point set topology, they get a feeling that things can get arbitrarily pathological, that anything can be done. Cantor sets and similar objects tend to reinforce that feeling. Volterra's theorem, however, shows that in fact not everything can be done, and it does it without having to introduce something like Baire category theory.

The second added thread is the problem of constructing a "nice" function that interpolates the factorials. In other words, I posed to students the question of how one should define $x!$ when x is not an integer. David Fowler wrote a series of articles for the *Mathematical Gazette* on this topic, and I stole his ideas without remorse. For example, it's easy to construct a continuous function that does the trick: define $x!$ to be 1 if x is between 0 and 1, and then extend it by using the functional equation $x! = x(x\text{-}1)!$. Unfortunately, the resulting function fails to be differentiable. Finding the simplest way to define $x!$ on [0,1] so that the extended function is differentiable is a nice exercise. Eventually, of course, we ended up with the Gamma function (on the reals). To do that, we had to deal with improper integrals depending on a parameter. (Unfortunately, Abbott doesn't cover improper integrals and integrals depending on a parameter, so I had to fish this part out from other texts.) The nice thing is that for most properties of the Gamma function (continuity, differentiability, etc.) we had to deal with issues of uniformity again, neatly closing the circle. In fact, "as long as the convergence is uniform" came up so often in the last few classes that it became clear to me that this was the core concept I was teaching.

What did my students learn? By the end of the semester they certainly had a good enough understanding of uniform convergence and of the techniques used to understand and prove things related to it. I don't know that that understanding will last very long unless it is reinforced in other courses. But they did understand, I think, that the difficult formalism of analysis is there for a reason, and that it is needed if we are to do interesting things with functions. I don't think they'll forget that. And that's good enough for me.

References:

"A Historical Gem from Vito Volterra," by William Dunham. *Mathematics Magazine*, **63** (1990), pp. 234–237.

"A Simple Approach to the Factorial Function," by David Fowler. *Mathematical Gazette*, **80** (1996), 378–380.

"A Simple Approach to theFactorial Function — the next step," by David Fowler. *Mathematical Gazette,* 83 (1999), 53–57.

NSF Beat

By Sharon Cutler Ross

In October, the National Science Foundation and the National Science Digital Library (NSDL) hosted a poster reception in Washington, DC, in conjunction with the annual NSDL meeting. The NSDL is an NSF-supported program to build an online, digital library for science, technology, engineering, and mathematics education. Over 150 projects have received NSDL awards since 2000; this year 35 new projects were funded. Five of these new projects are designed to strengthen digital resources for mathematics education.

CAUSEweb: A Digital Library of Undergraduate Statistics Education (D. Pearl, Ohio State University Research Foundation) will provide peer reviewed resources for undergraduate statistics teachers. The project is an initiative of the Consortium for the Advancement of Undergraduate Statistics Education (CAUSE), a group of thirty diverse institutions. *Collaboration Services for the Math Forum Digital Library* (G. Stahl, Drexel University) will establish a model and test case for direct collaborative use of a digital library. The project will allow small, online groups to work both asynchronously and synchronously on the Problem of the Week.

Mathematics presents particular challenges both textually and graphically for the developers and users of digital library resources; the remaining projects address some of these projects. *Techexplorer and MathDL: Robust Support for Dynamic Web-based Mathematics* (D. DeLand, Integre) will construct a robust development and delivery environment for interactive mathematical content and web services through a stable, easy-to-install plug-in that works with a variety of browsers and operating systems. *Enabling Large-Scale Coherency Among Mathematical Texts in the NSDL* (R. Constable, Cornell University) will extend common authoring tools so they can easily produce semantically anchored documents. A document is said to be semantically anchored when elements, such as definitions and theorems, are formally linked to counterparts in formal logical theories that are implemented by computer systems. Finally, *Enhancing the Searching of Mathematics* (R. Miner, Design Science, Inc.) will develop search algorithms, markup guidelines, and metadata practices with an emphasis on using MathML. This project will also sponsor a workshop and conference for toolmakers, content providers, librarians, and other NSDL stakeholders.

What Have You Learned?

Have you learned something when you taught a standard undergraduate mathematics course? Want to tell others? Write your own "What I Learned by Teaching X" article! See page 14 for ye humble editor's contribution.

Faces of Mathematics Goes Online

An exhibit called *Faces of Mathematics* can now be seen online at http://www.ma.hw.ac.uk/Endg/fom.html. The photographs, which feature British research mathematicians, are by Marc Atkins, a photographer and video producer. The goal of the project, which was coordinated by Nick Gilbert of the Heriot-Watt University in Edinburgh, was to display the creative side of mathematics by focusing on the creators themselves.

The Faces of Mathematics *exhibit at Oxford.*

In his description of the project, Gilbert says, “Who are the mathematicians? What sort of people are they? *Faces of Mathematics* offers a glimpse into the lives and personalities of some of the most successful and influential mathematical researchers currently working in the UK and shows mathematical research as a creative, human endeavour. We see engaging, passionate and enthusiastic people, with a shared commitment to the development of mathematical ideas and with a shared secret. They have looked long and hard at some of the most challenging problems in modern mathematics, statistics, and mathematical physics; and they share the secret of success, because they have solved these problems and made their own extraordinary contribution to the subject.”


Sir Michael Atiyah

In addition to the photos, the exhibit included biographical information and pages of mathematics taken from the notebooks of the researcher in each photograph. These pages can be seen online as the background of the page containing the main photograph.


Timothy Gowers

Before going online, *Faces of Mathematics* was shown at the Highgate Literary and Scientific Institution, the Oxford University Museum of Natural History, and at the 2003 conference of the Mathematical Association at The University of East Anglia. Project coordinator Nick Gilbert works in group theory and topology, and has a particular interest in the public understanding of mathematics. Photographer Marc Atkins has exhibited in London, Paris, Rome, and New York. His work has been published in books and magazines worldwide, and features in both private and public collections, including the National Portrait Gallery, London

Short Takes

Are you coming to HRUMC XI?

The eleventh annual *Hudson River Undergraduate Mathematics Conference* will be held at Mt. Holyoke College in South Hadley, MA on April 3, 2004. The conference includes presentations on mathematics by both faculty and students, and both are encouraged to participate. Conference sessions are designed so that some presentations are accessible to undergraduates in their first years of study, and others are accessible to third- or fourth-year undergraduate mathematics majors.

The keynote speaker for this year will be Dr. Nancy Kopell, co-director of the Center for BioDynamics at Boston University. She will be speaking on *Dynamical Systems of the Nervous System: Do Rhythms help us think?* You can find out more about HRUMC by visiting the conference web site located at http://www.skidmore.edu/academics/mcs/hrumc.htm.

Those wishing to make a presentation at the conference should submit an abstract via the website by February 27, 2004. We would like to thank Mt. Holyoke College and the MAA for their support of HRUMC XI.

MAA Again Extends Free Memberships to New Math Ph.D. Recipients

The MAA has just given complimentary association memberships to 956 recent Ph.D. and Ed.D. recipients. These complimentary memberships were given to those who received their advanced degrees between December 2002 and August 2003. This is another way in which the MAA encourages the participation of new Ph.D.s and Ed.D.s, which helps keep the Mathematical Association vital and current. After a year, these complimentary memberships can be renewed at a low, graduated promotional dues rate for the subsequent two years.

Readers who received a mathematics Ph.D. or Ed.D. degree during this time period and did not receive their complimentary membership should contact the MAA Service Center by email at member@maa.org or by phone at 800-331-1622.

DIMACS Reconnect '04 Conferences: Current Research Relevant to the Classroom

The Reconnect '04 Conferences, sponsored by DIMACS (the Center for Discrete Mathematics and Theoretical Computer Science), are geared towards exposing faculty teaching undergraduates to current research topics relevant to the classroom, involving them in writing materials useful in the classroom and reconnecting them to the mathematical sciences enterprise by exposing them to new research directions and questions. The three programs: "Experimental Algorithmics, with a Focus on Branch and Bound for Discrete Optimization Problems" at Lafayette College, June 20-26, 2004; "Folding and Unfolding in Computational Geometry" at St. Mary's College, July 11-17, 2004; "Topics in Computational Molecular Biology" at DIMACS/Rutgers University, August 8-14, 2004. Applicants accepted to participate will receive lodging and meals through NSF funding. For more information or an application form, visit their web site at http://dimacs.rutgers.edu/reconnect/ or contact the Reconnect Program Coordinator by email at reconnect@dimacs.rutgers.edu or by phone at (732) 445-4304.

HOMSIGMAA Events at the Joint Meetings

The History of Mathematics SIGMAA will hold its third annual meeting during the Joint Mathematics Meetings in Phoenix. Vicki Hill's new documentary on Constantin Carathéodory will be one of the featured events. Check the JMM schedule for time and place.

In addition, HOMSIGMAA will sponsor its first annual guest lecture. Peggy Kidwell and Amy Ackerberg-Hastings will present a lecture on *Making Sense of Your Department's Material Culture.* In many cases, math professors don't need to leave their home institutions to "explore the material culture of mathematics." Historic models, devices, and books may be tucked away in the drawers and closets of their own departments. Kidwell and Ackerberg will discuss how to identify, understand, and arrange such mathematical objects and books.

For more information, go to the HOMSIGMAA web site at http://www.maa.org/homsigmaa or contact Amy Shell-Gellasch via email at amy.shellgellasch@us.army.mil.

Assessing Doctoral Programs

In 1995, the National Research Council released *Assessing the Quality of Research-Doctorate Programs: Continuity and Change*, a report that evaluated and ranked doctoral programs in the U.S. Now it has released a new report, *Assessing Research-Doctorate Programs: A Methodology Study,* which argues that the older report should be updated as soon as possible using newer and better methods. The full report, which was prepared by the National Academies' Board on Higher Education and the Workforce, can be viewed or ordered online from http://books.nap.edu/catalog/10859.html.

Two Mathematical Scientists Named MacArthur Fellows

Among the 24 new MacArthur Fellows named in October 2003, there are two whose work in closely connected to mathematics. James J. Collins of Boston University is a biomedical engineer whose work "crosses the boundaries of engineering, mathematics, and biology to explore the complex mechanisms regulating biological systems." Collins' work uses mathematics to understand how organisms move and to suggest ideas for treating disorders associated to movement and posture. Erik Demaine of the Massachusetts Institute of Technology (and a member of MAA) is a computational geometer who "has already established a reputation for tackling and solving difficult problems." Demaine's work ranges all the way from parallel processing architectures and complexity of algorithms to geometry. He recently collaborated in the proof of a long-standing conjecture that asserts that all closed polygons with non-crossing connections can be made convex without breaking or changing the length of the connections. He also proved that the computer game Tetris is NP-complete.

The MacArthur Fellowships, sometimes known as the “genius grants,” are designed to recognize and support truly creative individuals. Fellows “are selected for the originality and creativity of their work and the potential to do more in the future.” Each fellows receives $500,000 over five years, with absolutely no strings attached. To find out more about the program and to read about the other 22 fellows for 2003, visit http://www.macfound.org/programs/fel/announce.htm.

Articulation Continues to be a Concern

Various conferences and reports continue to address the issue of the transitions facing students as they move from high school to college. The Boston-based *Jobs for the Future* (http://www.jff.org) has recently released the results of a survey that found that 57% of Americans believe that students need to be better prepared for the transition. Large majorities favored more effective guidance counseling and more challenging high school courses. A second *Jobs for the Future* report, prepared jointly with the National Governors Association, makes recommendations to state officials on how to improve articulation. The report is online at http://www.nga.org/cda/files/031READY.pdf.

Two Mathematicians Named State Professors of the Year


Joe Gallian

Every year, the Carnegie Foundation for the Advancement of Teaching names Professors of the Year, both at the state level and at a national level. Two mathematicians are among this year’s State Professors of the Year: Joe Gallian of the University of Minnesota Duluth and Judy Kasabian of El Camino Community College in California. Gallian is currently Second Vice-President of the MAA.

The Professors of the Year program has existed since 1981. It recognizes outstanding teaching at the undergraduate level. Every year the program chooses winners in each state and four winners at the national level.

To read more about the program, visit the Carnegie Foundation web site at http://www.carnegiefoundation.org/POY/index.htm.

150,000 Students in AMC 8 Contest

MAA Director of Competitions Steven Dunbar reports that American Mathematics Competitions has registered about 2800 schools worldwide for the AMC 8 contest. They estimate that about 150,000 students around the world took the test. By the time this issue comes out, we expect to know the winners and high scorers for this competition.

The AMC 8 is a 25 question, 40 minute multiple choice open to junior high and middle school students. Its problems are based on the concepts and ideas from the junior high mathematics curriculum. That does not mean they are easy! Most of the problems are designed to challenge students and to offer problem solving experiences beyond those provided in most junior high school mathematics classes. Students who do well in this exam are invited to participate in the AMC 10 competition.

To read more about AMC 8, visit the AMC web site at http://www.unl.edu/amc/.

Winter School on Number Theory and Physics

The Southwestern Center for Arithmetic Algebraic Geometry has been running Winter Schools for several years now. The 2004 session will take place at the University of Texas at Austin on March 13 to 17. The topic will be *Number Theory and Physics.* Invited speakers include Victor Batyrev, Philip Candelas, David Morrison, and Daqing Wan. Check out the Southwestern Center web site at http://swc.math.arizona.edu for more information. Also available at this site are notes and streaming video recordings of lectures from past Winter Schools and from the Southwestern Center Distinguished Lecture Series.

NSB Sees Need for More Science and Engineering Professionals

The National Science Board has released a report entitled *The Science and Engineering Workforce: Realizing America’s Potential.* The report argues that global competition for science and engineering professionals is intensifying, and that the United States may not be able to rely on an influx of such professionals from abroad. It also argues that the number of American science and engineering graduates is likely to decrease unless something is done to encourage more students, and especially more students from currently underrepresented demographic groups, to pursue such studies. The report has several specific policy recommendations intended to help produce this outcome. The report is available online at http:/www.nsf.gov/nsb/documents/2003/nsb0369/nsb0369.pdf.

.

Sources. HRUMC: the organizers. Free memberships: MAA headquarters. DIMACS: Reconnect coordinator. HOMSIGMAA: Amy Schell-Gellasch. Assessing Ph.D. programs: National Academies news web site. MacArthur fellows: MacArthur Foundation web site. Articulation: NASSMC Briefing Service. Professors of the Year: AMS web site, Carnegie Foundation web site. AMC 8: Steven Dunbar. Winter School: SWC email, SWC web site. NSB Report: NASSMC briefing, NSB web site.

Letters to the Editor

Divisibility Tests Used

Professor Cohn's article on divisibility tests (in the November issue) particularly interested me since I have long found it useless to attempt to overcome occasional insomnia by counting sheep. Not enough sheep left in Connecticut.

Instead, in order to put myself to, or back to, sleep, I amuse myself by factoring into its primes a bedside clock's digital reading. One needs a clock that either is or can be illuminated.

Of course, if one delays bedtime until, or awakens after, 12:59 AM, the job is easy. The times between, say, 11:01 PM and 11:59 AM, inclusive, are more challenging.

Since the factoring of just one number does not take very long, I usually do several in succession, until I get bored, fall asleep, or loose track of where I am. To preserve my self-esteem, I have not tabulated the relative frequency of each of these three events.

Ed Rosenberg
Emeritus Professor of Mathematics
Western Connecticut State University

Divisibility Tests Modified

I enjoyed Paul Cohn's, "Divisibility Tests Remembered" in the November 2003 issue of FOCUS. I wonder why, however, he subtracts a non-multiple of 1001 in two of the steps for checking the example number 479563. After stating "since 7x11x13 = 1001, one can test for divisibility by 7, 11, or 13 by subtracting multiples of 1001," Mr. Cohn goes on to give the example 479563. He lists the steps as

479563 → 79163 → 76160 → 7616 → 1610 → 161 = 7 x 23.
(400400) (3003) (68544) (6006) (1449)

(I have indicated the differences at each step.) In the third step, Mr. Cohn subtracts a multiple of 7 to obtain 7616. This particular multiple of 7 (68544) is neither a multiple of 11, nor of 13. Mr. Cohn does so without explaining why he has chosen not to continue to subtract a multiple of 1001. In the final step, he again subtracts a multiple of 7 (1449) which is neither a multiple of 11 nor of 13, to get 161. Had he subtracted numbers that are multiples of 1001 in every step, readers would have not only seen that $479563 \equiv 0 \bmod 7$, but that $479563 \equiv 7 \bmod 11$ and $479563 \equiv 6 \bmod 13$. I followed the procedure of subtracting multiples of 1001, in two different ways. The numbers subtracted in each step are indicated in parentheses.

My steps (always use the leading digit to choose the multiple of 1001):
479563 → 79163 → 9093 → 84.
(400400) (70070) (9009)

And note that $84 \equiv 0 \bmod 7$, $84 \equiv 7 \bmod 11$, and $84 \equiv 6 \bmod 13$. Thus, 479563 shares those congruences.

Alternatively (following Mr. Cohn's first two steps):
479563 → 79163 → 76160 → 16100 → 6090 → 84.
(400400) (3003) (60060) (10010) (6006)

Margaret Stempien
Mathematics Department
Indiana University of Pennsylvania

Why No Gender Data on Overall Membership?

On page 22 of the August/September 2003 issue of FOCUS there is a table "Data on Gender For 2002." Why doesn't the table include the percentage of female members of the MAA?

Albert VanCleave
VanCleave_Albert@colstate.edu
Columbus State Univ., Columbus, Ga

Jim Gandorf, MAA Director of Membership, responds:

We've been gathering gender information on members for 2 years (renewal notices and new member surveys). Unfortunately, only about 23% of our members have chosen to provide us with that information.

Was it Regular?

I just received the December issue of FOCUS, a publication I always find very interesting. Your article about the Texas octagon was well done. The possible explanation for the numbers in the picture are sobering but certainly plausible. I'd like to make one little comment, however.

The paragraph, which begins "Well, I figured it out", continues with "The truth is that no octagon with those measurements exists." In fact no *regular* octagon with those measurements exists, because there are three given facts about the right triangle, an angle and two sides and those figures conflict. However, there are any number of irregular octagons that one could make with the triangle as pictured, if the assumption of it being "regular" is discarded. Was "regular" in the original problem? If not, any of the answers could be considered possible I should think.

Delene Perley
mathperley@earthlink.net
Retired

Good catch! You had me worried there for a moment. But the original problem did say "What is the perimeter to the nearest centimeter of the regular octagon drawn below?" So yes, a regular octagon was intended. Otherwise, as you say, almost any answer would have been acceptable.

Employment Opportunities

KANSAS

Tabor College
Faculty Position: Mathematical Sciences Department
Full-time teaching and advising in mathematics and computer science, starting Fall 2004. Minimum master's degree in computer science with strong mathematics. Prefer doctorate. Teaching experience required. Affirm Tabor's Anabaptist Evangelical Christian college perspective and articulate personal Christian commitment.

Applications accepted until March 1, 2004. Letter, vita, and three references who can be contacted to Dr. Howard Keim, Vice President of Academic Affairs, Tabor College, 400 S. Jefferson, Hillsboro, KS 67063. See Tabor College at http://www.tabor.edu

NEW JERSEY

Ramapo College
Assistant Professor of Mathematics
Tenure-Track, Fall 2004
JOB DESCRIPTION: Teaching responsibilities encompass a wide range of undergraduate mathematics courses, including General Education mathematics courses.

REQUIREMENTS: Ph.D. in Pure or Applied Mathematics by September 1, 2004 is required. Teaching experience at the college level is preferred. The applicant must have a proven research record or research potential.

Faculty members are expected to maintain active participation in research, scholarship, college governance, service, academic advisement and professional development activities.

Ramapo College of New Jersey is a four-year undergraduate college located in the beautiful foothills of the Ramapo Valley Mountains approximately 25 miles northwest of New York City. Established in 1969 as a state-supported, coeducational college of liberal arts, sciences and professional studies, this institution offers an array of undergraduate, graduate, and post baccalaureate programs focused on the four " pillars " of the Ramapo College mission – international, intercultural, interdisciplinary, and experiential education. The College is committed to global education. It is a Fulbright Center and houses the New Jersey Governor's School for International Studies.

All applications must be completed online at: http://www.ramapojobs.com. Please attach resume, cover letter, a statement of teaching and research interests, and a list of three references to the application. Since its beginning, Ramapo College has had an intercultural/international mission. Please tell us how your background, interest and experience can contribute to this mission, as well as to the specific position for which you are applying.

Supporting documentation in non-electronic format can be sent to Professor Marion Berger, Search Committee Chair, School of Theoretical and Applied Science. Review of applications will begin immediately and continue until the position is filled. Position offers excellent state benefits. To request accommodation, call (201) 684-7734.

RAMAPO COLLEGE OF NEW JERSEY
Dept. 42
505 Ramapo Valley Road
Mahwah, NJ 07430

"New Jersey's Public Liberal Arts College"

Ramapo College is a member of the Council of Public Liberal Arts Colleges (COPLAC), a national alliance of leading liberal arts colleges in the public sector.

EEO/AFFIRMATIVE ACTION

SOUTH CAROLINA

Wofford College
Tenure Track Appointment beginning August 2004. Qualifications: Ph.D. in Mathematics, excellence in teaching undergraduates, continuing professional growth, ability to use technology to improve understanding, and reflective concern for the teaching and learning of mathematics. Salary commensurate with qualifications and experience. Send a letter of application, vita, graduate transcripts, and three letters of recommendation, at least one of which assesses teaching ability and potential, to Lee O. Hagglund, Chairman, Department of Mathematics, Wofford College, Spartanburg, SC 29303-3663. Go to http://dept.wofford.edu/mathematics/facultyposition.html

TEXAS

Legacy of R. L. Moore Project
Executive Director
personnel@edu-adv-foundation.org
Austin, TX
The Educational Advancement Foundation, a nonprofit organization supporting mathematical education through inquiry-based learning, seeks a full-time Executive Director for the Legacy of R. L. Moore Project.

Applicants should have a strong mathematics background (preferably a current or former faculty member), including recent administrative or leadership experience in academic societies or professional associations. In addition, some "entrepreneurial" experience (i.e. sole proprietorship or small business) is desirable.

Duties: Strong "hands-on" managerial leadership is essential, with strong personal involvement in carrying out non-routine activities. The Executive Director will coordinate workflow and assign "priority" while working actively with a small staff and a large, diverse group of outside consultants/volunteers/constituency members. The candidate shall have exceptional communication, organizational, and executive skills as well as an ability to articulate a mission-focused vision to diverse constituencies. It is essential that the Executive Director be able to manage actively and conclude multiple non-routine projects on a timely basis.

Requirements: Advanced degree in mathematics, science, or MBA/Business with over 10 years educational/administrative experience. The prospective Executive Director must demonstrate accomplishment in combining leadership with administrative controls and support, while sustaining entrepreneurial initiatives. Applicants must be adaptable and flexible to rapidly changing priorities; a self-starter with a successful history working with both small groups and larger organizations/associations.

Excellent benefits (health, life, and long-term disability insurance, and retirement plan) and a stimulating cross-discipline working environment with demanding workload. Compensation includes an early merit bonus for exceptional performance.

The Educational Advancement Foundation is an equal opportunity employer. U. S. Citizenship required.

Email cover letter and resume to:
personnel@edu-adv-foundation.org

Advertising Information for Display & Classified Ads

Mechanical Specifications
Trim Size: 8 1/2 " wide x 10 3/8 " high
Screen: 150-line halftone Full page bleed 8 3/4" x 11 1/4", (10% extra charge) Color: FOCUS standard second color available (15% extra charge). Column width: 2 5/16", 4 13/16", 7 3/8"
Printing: Offset, saddle-stitched

How to send your Materials:
Electronic files: Laser output should accompany your electronic files. PC and MAC based files must be sent as Postscript files (please subset and embed all fonts). PDF files are also acceptable.

Camera-ready art: Should be prepared according to the mechanical specifications shown on this page.
Classified Rates (includes a a free listing in MAA Online to appear the same month as the print ad): $2.25 per word.

Contact the MAA Advertising Department toll free at 1-866-821-1221, fax: (703) 528-0019. Ads may be sent via email to ads@catalystcom.com.

MAA Section Meeting Schedule 2004

ALLEGHENY MOUNTAIN

March 26-27, 2004–West Virginia Wesleyan College, Buckhannon, WV

FLORIDA

February 20-21, 2004–University of Central Florida, Orlando, Florida

ILLINOIS

April 1-3, 2004–Roosevelt University, Schaumburg, IL

INDIANA

April 2–3, 2004–Goshen College, Goshen, IN

INTERMOUNTAIN

March 26-27, 2004–Weber State University, Odgen, UT

IOWA

April 16-17, 2004–Central College Pella, IA

KANSAS

March 19-20, 2004–Benedictine College, Atchison, KS

KENTUCKY

April 2-3, 2004–Murray State University, Murray, KY

LOUISIANA-MISSISSIPPI

March 4–6, 2004-Southeastern Louisiana University, Hammond, LA

MD-DC-VA

April 23-24, 2004, Salisbury State University, Salisbury, MD

METRO. NEW YORK

May 2, 2004–Nassau Community College (SUNY), Garden City, NY

MICHIGAN

May 7-8, 2004-Oakland University, Rochester, MI

MISSOURI

April 2-3, 2004–Southeast Missouri State University, Cape Girardeau, MO

NEBRASKA-SOUTHEAST SOUTH DAKOTA

April 2–3, 2004–University of Nebraska at Kearney, Kearney, NE

NEW JERSEY

March 27, 2004–Rutgers University, Busch Campus, New Brunswick, NJ

NORTH CENTRAL

April 23-24, 2004–Winona State University, Winona, MN

NORTHEASTERN

June 3-4, 2004–Roger Williams University, Bristol, RI

NORTHERN CALIFORNIA, NEVADA, HAWAII

February 24, 2004–California State University, Hayward, CA

OHIO

March 26–27, 2004–University of Cincinnati, Cincinnati, OH

OKLAHOMA-ARKANSAS

March 26-27, 2004-University of Central Arkansas, Conway, AR

PACIFIC NORTHWEST

June 24-25, 2004–University of Alaska, Anchorage, AK

ROCKY MOUNTAIN

April 16–17, 2004-Colorado College, Colorado Springs, CO

SOUTHEASTERN

March 26-27, 2004–Austin Peay State University, Clarksville, TN

SOUTHERN CALIFORNIA

March 6, 2004–University of San Diego, San Diego, CA

SOUTHWESTERN

April 2-3, 2004–Northern Arizona University, Flagstaff, AZ

SEAWAY

April 23-24, 2004–SUNY College at Cortland, Cortland, NY

TEXAS

April 1-3, 2004–Texas A&M University, Corpus Christi, TX

WISCONSIN

April 16-17, 2004–University of Wisconsin-Platteville, Platteville, WI