INDIANA UNIVERSITY

MTC

Supported by NSF

# MATHEMATICS THROUGHOUT THE CURRICULUM

PROJECT NEWSLETTER

▸ Spring 2001 ▸ Volume 4, No. 2

# The Right Course at the Right Time

## MATH/POLITICS COURSE ANTICIPATES ELECTION EXCITEMENT

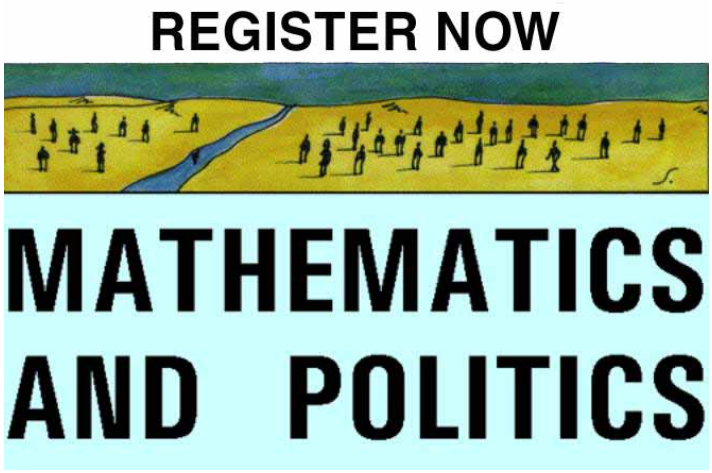
Who will be our next president? So goes the first line on the poster for the new MTC course in Mathematics and Politics. Course developer Professor Iztok Hozo of Indiana University Northwest taught the course for the first time last fall. Obviously a presidential election year is an ideal time to launch such a course, and as we now know, the last election topped them all.

Hozo's course explored such questions as "What if you voted by awarding points and counted their totals?" and "What if you ranked the candidates instead of voting just for your favorite?" These questions were interesting enough at the beginning of the semester, but by the time the controversial election was held, such questions were on the minds of many Americans. The closeness of the election, the hotly disputed results, and the disparity between popular and electoral votes made the voting system itself a major focus of the election.

In fact, according to a *Washington Post* article dated April 21 of this year, more than 1,500 election reform bills were introduced in state legislatures, and dozens filed on Capitol Hill following the election. Many political leaders around the world were offering America free advice on how to do it better. If a course ever deserved the description "timely," Math and Politics would have to be it.

In addition to exploring voting systems, Math and Politics addressed topics such as Social Choice, Sample Surveys, Statistical reasoning, Political power, Models of international conflict, and Game Theory. The last two weeks of class were devoted to presentations of student projects.

The course targeted social science and humanities majors with minimal math backgrounds. With the help of Political Science Professor Jean Poulard, Hozo provided his students with a wealth of online instructional and research materials, including links to other sites[1].




**Voting theme:** *Iztok Hozo's poster page for Mathematics and Politics had the ideal emphasis for a semester that saw one of the most controversial elections in the nation's history.*

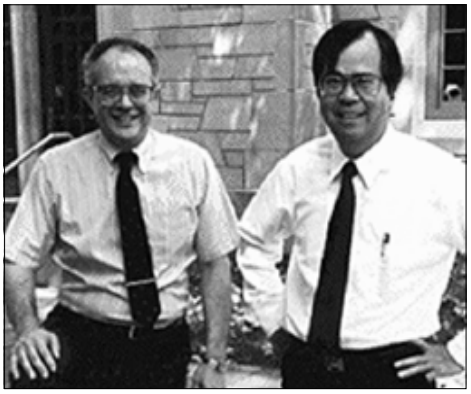
The timing of the course naturally helped in grabbing the students' attention. As one student said, "You had a chance to be in the class where math applied to politics, and you were able to see it happen in a presidential election. This is a great course, which will come in handy when they change the electoral process." The course will run during every presidential election, and possibly during each congressional election.

1. See www.math.iun.indiana.edu/math/ihozo/fall00/syllabusm110.htm, and also www.math.iun.indiana.edu/math/ihozo/m110.htm.

# Dissemination at the National Level

## WORKSHOPS CONTINUE DISSEMINATION

This issue features an article on MTC's presence at the Joint Meetings of the American Mathematical Society and the Mathematical Association of America (AMS/MAA). In addition to our booth, which was very popular, several MTC participants gave presentations to their AMS/MAA colleagues. National meetings and national professional organizations are proving to be excellent channels for the dissemination of our courses and ideas.



IU math Professors Daniel Maki and Bart Ng

Our evaluation team of Diana Lambdin, Dasha Kinelovsky, and (formerly) Rajee Amarasinghe has given several presentations at annual meetings of national education organizations, such as the American Educational Research Association. The MAA's new PREP (Professional Enhancement Programs) initiative will be supporting the VIEWPOINTS 2001 Math and Art workshop run by MTC course developers Annalisa Crannell and Marc Frantz (see www.maa.org/pfdev/prep/prep.html). In addition to providing financial support, PREP takes care of advertising through the MAA Focus and MAA's online Professional Development Calendar.

One of the great things about exposure at the national level is that it supports our more in-depth dissemination efforts elsewhere. For instance, one of the hottest items at our Joint Meetings booth was the display of brochures for our summer workshops. We will again have a booth at the Joint Meetings in San Diego, on January 6-9, 2002. As we begin planning our booth this fall, we will send out a request to our participants for textbooks, CD-ROM's, workshop brochures, etc.

More generally, we encourage our participants to link their dissemination efforts with national organizations, not only in mathematics, but also in partner disciplines relevant to their courses. Whether it's running a workshop, making a presentation at a national meeting, or contributing materials to a booth or exhibit, the support of a national professional organization can greatly enhance the effectiveness of our dissemination efforts.

**We welcome people to contact us for more information or with suggestions for new courses.**

**Please see the back page for our mailing address, phone number, web address and our e-mail addresses.**

**We look forward to your comments.**

# MTC Course Developer Wins Award

## IPFW'S PETER HAMBURGER HONORED BY SCHOOL

It all started when his daughter wanted to learn Fourier analysis in two weeks. That, according to Indiana University Purdue University Fort Wayne (IPFW) Professor Peter Hamburger, was the first step that led to his receiving the IPFW School of Arts and Sciences 2001 Award for the Enhancement of Learning.

The award was for the continuing and impressive success of Hamburger's MTC honors calculus course, "Catch the Waves to Calculus" (see this Newsletter, Vol. 3, No. 2).

Hamburger revealed the origin of his idea when he accepted the award during the presentation of his students' class projects in April of this year. It seems that Hamburger's daughter Zsuzsi, a Ph.D. graduate student in biochemistry at Caltech, had realized that Fourier analysis could be helpful in her research. Caltech would of course be able to teach her what she needed to know, but it would take two semesters, and she wanted to know in two weeks. Naturally, she asked her father, a Professor of Mathematics at IPFW.

*Peter Hamburger proudly displays his award at the opening of his students' presentations.*

Hamburger considered the request a challenge, and he began to gather books and compile notes for the crash course. At the same time, he began learning the biochemistry he needed to know in order to make his presentation as relevant as possible. When father and daughter finally set down together, they worked nonstop, ten hours a day, for two weeks. At the end, they were both satisfied that she had learned what she needed to know.

One thing bothered Hamburger, however: what could he do with all those notes and painstakingly selected books, now that he had them? Recalling the methods great mathematicians such as Euler and Gauss had used to impart their knowledge to others, he realized that Fourier analysis would be an ideal focal point for an honors calculus course at IPFW. Thus the idea was born.

After Hamburger told his story, he sat back with the rest of the students and faculty who had gathered to watch his students' presentations. April's presenters included Matt Landrigan (Vibrations of a Nonlinear System), Brian Wenninger (A Closer Look at Diffraction), Brian Smith (Wedge Interferometer), Travis Fravel (Michelson Interferometer), and Kevin Bryan (Stereo Frequency Modulation).

Hamburger acknowledged the contributions of his students and his department to the course's success. He also acknowledged the support of MTC, the National Science Foundation, and the IU Strategic Directions Initiative. In addition to a plaque that was awarded to Hamburger, the School of Arts and Sciences will award $500 to the IPFW Department of Mathematical Sciences.

# MTC at the Joint Meetings

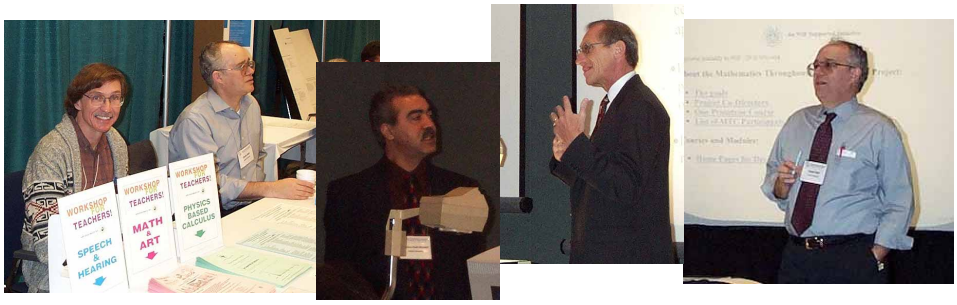
## BOOTH, PRESENTATIONS GENERATE INTEREST

The Joint Meetings of the American Mathematical Society and the Mathematical Association of America (AMS/MAA) is perhaps the world's largest annual gathering of mathematicians and mathematics educators. It would therefore seem to be an ideal place for MTC to generate interest in its interdisciplinary courses and workshops. This was indeed the case at the 2001 Joint Meetings in New Orleans on January 10-13.

The MTC Project was visible on a daily basis at its booth in the Grand Ballroom of the New Orleans Marriott, one of the two hotels hosting the meetings. There the throngs of math educators attending the meetings could browse through textbooks by MTC course developers, run course software on a laptop, and take copies of the MTC Project Newsletter, as well as brochures for summer workshops.

The interest at the booth was remarkable. The supply of newsletters was exhausted by the end of the meetings, and several trips had to be be made to the hotel business office to make more copies of the workshop brochures. (For information on these workshops, see the links at the end of this article.)

In addition to the booth, several MTC participants gave presentations at the meetings. Project Director Dan Maki spoke about MTC to the Project Next Fellows in a special session on creating and teaching interdisciplinary courses involving mathematics.




Left: *Marc Frantz and Dan Maki at the MTC booth.* Center: *Morteza Shafii-Mousavi and Paul Kochanowski speak about their course.* Right: *Dan Maki addresses the Project Next Fellows.*

Marc Frantz of IU Bloomington gave a poster presentation for the MTC Project at an MAA Poster Session for National Science Foundation-sponsored curriculum development initiatives. Like the booth, the presentation included summer workshop brochures, which were again extremely popular.

Morteza Shafii-Mousavi and Paul Kochanowski of IU South Bend gave talks about their MTC course, "Mathematics in Action—Social and Industrial Problems," at two different MAA Sessions. Itzok Hozo of IU Northwest spoke about his MTC course, "Mathematics and Politics" at one of the same sessions.

An occasional pleasant result of interdisciplinary teaching is the "spinoff course" which makes use of previously developed materials. One such example is the course, "Shapes of Nature," developed by MTC participant Annalisa Crannell and paleontologist Roger Thomas at Franklin & Marshall College. "Shapes" makes use of ideas from Crannell's MTC course in Mathematics and Art. One of Crannell's undergraduate students, Jack Stewart, came along to give his first talk to an audience of professionals. Stewart was responsible for implementing the online "eSource" version of "Shapes," under the direction of Crannell and Thomas.

**Speech and Hearing Workshop:**
http://www.indiana.edu/~acoustic/s319/workshop.html

**Physics-based Calculus Workshop:**
http://www.ipfw.edu/math/Workshop/PBC.html

**VIEWPOINTS 2001 Math & Art Workshop:**
http://php.indiana.edu/~mathart/viewpoints/

**Shapes of Nature eSource:**
http://www.fandm.edu/Academics/Foundations/NTW114/default2.html

# Math and Art Combination is Contagious

## CLASSROOM EXPERIENCES SHARED AT VIEWPOINTS 2000'

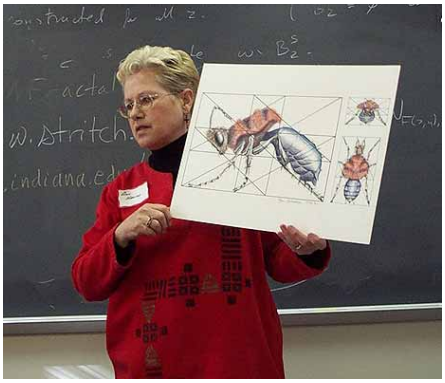
Turnabout is not only fair play, it's also a good theme for a workshop. That was the philosophy of MTC Math and Art course developers Marc Frantz and Annalisa Crannell, when they hosted the VIEWPOINTS 2000' workshop (note the prime) last November 18th in Bloomington.

The workshop was a sequel to the week-long VIEWPOINTS 2000 Math & Art workshop hosted by Crannell and Frantz last June at Crannell's home institution, Franklin & Marshall College. (See this *Newsletter*, Vol. 4, No. 1.) The goal of the first workshop was to inform (and hopefully inspire) the participants to blend Math and Art in their classrooms.

The goal of the sequel was closure. In addition to the lure of support money from the National Science Foundation, and reuniting with old friends, there was a catch. This time the participants would be the presenters, showing Crannell and Frantz how they had incorporated Math and Art into their classes.

The idea of the follow-up workshop came from MTC Project Director Dan Maki, who has used it in his workshops for high school teachers. Many of Maki's teachers have confessed gratitude for the responsibility of having to give a presentation; they said it was the one thing that pushed them to try new approaches, despite the pressure and demands of business-as-usual.

Crannell and Frantz were delighted by the response of their fellow VIEWPOINT-ers (a word coined by participant Dave Hartz). Some presenters had used Math and Art "modules" to enliven their more traditional classes, while others taught (or will teach in the spring) full-semester courses in Math & Art. A list of presentation topics, and pictures from VIEWPOINTS 2000', can be found on the website listed at the end of this article.



Left: **Quadrilateral quilt.** *Any quadrilateral can be used to tile the plane; Marion Cohen of Drexel University presents a proof in the form of a quilt.* Right: **Dynamic Hornet.** *Ann Hanson of Columbia College has had remarkable success in getting her art students to incorporate math-based themes in their work. Dynamic rectangles and the Golden Rectangle are favorites.*

In addition to these presentations, Crannell discussed her new course, "Shapes of Nature," which incorporates elements from her Math & Art course.

Frantz gave a "quiz" as a way of updating participants on the progress of original mathematical results that came out of group discussions on perspective at VIEWPOINTS 2000. The first of these results, a "proof without words," has already been completed by "The VIEWPOINTS 2000 Group," a group of seven original VIEWPOINT-ers. *Mathematics Magazine* will publish their result later this year.

The presentations concluded with a lesson in Japanese *sumi-e* painting by Paula Scott-Frantz, Studio Coordinator for the Indianapolis Museum of Art.

Many of the VIEWPOINTER-ers are anxious to return as invited guests to VIEWPOINTS 2001, June 3-8, at Franklin & Marshall. There they will study Math & Art in more depth, and present some of their own ideas to the newcomers.

The MAA Comprehensive Professional Development Program, supported by the National Science Foundation, has chosen VIEWPOINTS 2001 to be among its "first wave" of workshops. The MAA program will fund tuition, food, lodging, art supplies, and field trips for this year's VIEWPOINTers.

***VIEWPOINTS home page:***

**php.indiana.edu/~mathart/viewpoints**

## For more information about MTC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# COMING EVENTS

## PHYSICS-BASED CALCULUS WORKSHOP

In this Newsletter, we discuss the MTC course, "Catch the Waves to Calculus," for which Indiana-Purdue Fort Wayne (IPFW) Professor Peter Hamburger won an award. Now you can learn about this exciting course and other interdisciplinary approaches to calculus at **Physics-Based Calculus**, a workshop for science and mathematics teachers. The workshop will be held Friday, May 4, to Sunday, May 6, 2001, at IPFW. For more information see the PBC workshop home page at www.ipfw.edu/math/Workshop/PBC.html.

## VIEWPOINTS 2001

This is version two of the VIEWPOINTS 2000 Mathematics and Art workshop mentioned in this issue. **VIEWPOINTS 2001** will be held June 3–8, 2001, at Franklin & Marshall College in Lancaster, PA. For more informationand registration forms, visit the VIEWPOINTS home page at php.indiana.edu/~mathart/viewpoints.

## SPEECH AND HEARING WORKSHOP

Professors Diane Kewley-Port, David Eddins, and Paul Kehle will present a workshop on their MTC course, "Mathematical Foundations of Speech and Hearing Sciences." The workshop is scheduled for June 15–17, 2001. For more information, see the workshop home page at www.indiana.edu/~acoustic/s319/workshop.html.




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ABOUT MTC The Indiana University Mathematics Throughout the Curriculum project is a National Science Foundation sponsored curriculum development initiative. MTC has developed, taught, and disseminated interdisciplinary courses linked to mathematics since 1996. MTC involves faculty from the Indiana University system, Franklin & Marshall College, Illinois Wesleyan University, and the State University of New York at Buffalo.