A Fresh Point of View

EDUCATOR VISITS, WRITES ABOUT MTC

Professor of Mathematics Education, award-winning instructor, Indiana University graduate: these are excellent qualifications for understanding the mission and accomplishments of MTC. They are also three reasons why MTC Director Dan Maki invited Ted Hodgson of Montana State University to visit IU Bloomington during the spring semester of 2004. Hodgson’s mission: to learn about—and write about—the MTC project.

Hodgson came well prepared to learn. He was already familiar with the IU Mathematics and Education departments, having earned his bachelor’s and doctorate degrees at the Bloomington campus. In between, he earned his masters degree at the University of California at San Diego, where he also taught high school. Currently an associate professor in the Department of Mathematical Science at Montana State, Hodgson has a reputation as an excellent teacher, having earned the President’s Distinguished Teacher Award.

Hodgson found plenty to write about. Although all of his articles were collaborations with MTC personnel, Hodgson was the driving force in each case. He started out by asking the big question. “Is Mathematics Now Throughout the Curriculum? Reflections on an MATC Project” is an article Hodgson co-wrote with Maki, Marc Frantz, and Bart Ng. Readers wanting to know the answer can find it in the MAA journal FOCUS, where the article will appear in late 2004.

Naturally, Hodgson wanted to learn about the MTC prototype course “Analytical Problem Solving,” developed by Dan Maki and Wayne Winston. Impressed that the course had spawned versions at IU South Bend (taught by Morteza Shafii-Mousavi and Paul Kochanowski) and IU Southeast (taught by Chris Lang and Kathy Ernstberger), Hodgson wrote “On the use of Client-Driven Projects in the Mathematics Classroom,” collaborating with all six instructors. The article was submitted to the mathematics education journal PRIMUS.

Hodgson traveled to IUPUI to interview biologist Robert Keck and mathematician Richard Patterson about their MTC course, “The Mathematics of Biology: Plants.” As a result, Hodgson collaborated with Keck, Patterson, and Maki on “Mathematics, Models, and a Model of Mathematics in the Biology Classroom,” which will appear in the Journal of College Science Teaching.

While sharing an office with Marc Frantz, Hodgson became interested in the MTC course “Mathematics and Art,” developed by Frantz and Annalisa Crannell of Franklin & Marshall College. Hodgson, Frantz, and Crannell submitted “Hands-On Perspective” to the NCTM Mathematics Teacher. Impressed by Hodgson’s enthusiasm, the Montana State College of Arts and Architecture is now interested in having him pilot a similar course for their majors.
Invention and Impact

MTC DISSEMINATES IN WASHINGTON

On April 16-18 2004, the National Science Foundation (NSF) and the American Association for the Advancement of Science (AAAS) hosted a national conference to highlight recent innovations in undergraduate Science, Technology, Engineering, and Mathematics (STEM) education. The conference, titled *Invention and Impact: Building Excellence in Undergraduate STEM Education*, was held at the Hyatt Regency Crystal City in Arlington, Virginia, just outside Washington, D.C.

MTC Executive Director Marc Frantz attended to present one of 40 workshops for the more than 400 participants. The participants included representatives from colleges and universities, professional societies, government agencies, media organizations, foundations, and businesses.

The conference focused on four overarching themes:

**Invention** — development and integration of innovative modules, courses, curricula, technology, and instructional methods;

**Adaptation** — adaptability of classroom, department, or institutional strategies that build on exemplary materials, tools, or practices developed by others;

**Assessment** — development, testing, and dissemination of assessment practices, materials, tools, and measures to guide efforts that improve effectiveness of courses, curricula, and programs of study; and

**Impact** — examination of the influence of innovative pedagogy and practice on undergraduate STEM education for diverse learners.

Frantz’s workshop, titled “What I Wish I Had Known in Art School,” was based on his MTC course in Mathematics and Art. Workshop participants worked in teams to tackle problems in perspective drawing that required creative mathematical solutions. After the solutions were shared and proofs were given, Frantz demonstrated some of his own students’ solutions to the same problems, and showed how the students used their solutions in elaborate perspective drawings.

The participants’ evaluations of Frantz’s workshop were among the highest of the conference. Professor Frank Wattenberg of the United States Military Academy was particularly enthusiastic, and two of his West Point colleagues subsequently attended the VIEWPOINTS 2004 Mathematics and Art workshop (see Page 5).

In addition to giving the workshop, Frantz gave a poster presentation on the MTC project to the attendees, as well as to NSF and AAAS administrators and representatives from Capitol Hill. Frantz also handed out flyers for MTC summer workshops in Physics-Based Calculus, Speech and Hearing Sciences, and Mathematics and Art.

NSF and AAAS will publish an archival book from the workshop, to which Frantz will contribute an article on his course and the MTC project. For more information on *Invention and Impact*, see the workshop home page at http://www.ccliconference.com/.
Dissemination Continues

MEETINGS, PUBLICATIONS, WORKSHOPS DISSEMINATE COURSES

During the past year, MTC dissemination efforts continued in three main areas: presentations, publications, and faculty development workshops. Here we highlight these activities.

AMS/MAA JOINT MATHEMATICS MEETINGS

For the fifth year in a row, MTC Director Dan Maki and Executive Director Marc Frantz manned a dissemination booth in the exhibits room at the AMS/MAA Joint Mathematics Meetings. The 2004 Joint Meetings were held in Phoenix, Arizona, on January 7-10. The booth featured brochures on MTC, texts by MTC course developers, and flyers for MTC summer faculty development workshops.

Presentations at the Joint Meetings

• Paul Kochanowski and Morteza Shafii-Mousavi of IU South Bend, developers of the MTC course “Mathematics for Social and Industrial Problems” (MSIP) gave a presentation on “Linking Discrete Mathematics with Computer & Information Technology.” The developers discussed how they have linked their original course to a 3-credit “Introduction to Computing” course. Students take the two courses in parallel, using their computer skills to help with their consulting projects in MSIP.

• Kochanowski and Shafii-Mousavi also discussed the pedagogy of MSIP at the Joint Meetings in the contributed paper “A demonstration of Teaching and Applying Bayes’ Formula.”

This year’s meetings featured a two-day MAA special session on Mathematics and the Arts. Four of the talks were by graduates of the MTC VIEWPOINTS Mathematics and Art workshops:

• “Counting of the Art of James Mai,” by Daylene Zielinski, Bellarmine University;

• “Discovery or Creation?: Mathematical Platonism and the Visual Arts,” by Mark D. Schlatter, Centenary College of Louisiana;

• “Mathematics for poets (and drummers): the mathematics of rhythm,” by Rachel W. Hall, Saint Joseph’s University; and

• “Art and Mathematics: A Liberal Arts Mathematics course,” David Hartz, College of St. Benedict.

PUBLICATIONS

• Dan Maki and Maynard Thompson have a new book forthcoming from Brooks-Cole, titled Mathematical Models and Computer Simulation. The expected publication date is fall 2004, with a 2005 copyright.


• PIs Dan Maki and Bart Ng, and Assistant Director Marc Frantz, have written a chapter on MTC for the book The Scholarship of Teaching and Learning in Post-Secondary Education: The Contributions of Research Universities. The chapter is titled “The Indiana University Mathematics Throughout
Dissemination

(Continued)


• Annalisa Crannell frequently uses techniques from her Mathematics and Art class in higher level courses. Along with former Franklin & Marshall student Brian Habecker, ’02, she described some of these activities in the article “Using Fractals to Motivate Linear Algebra.” The article has now been accepted for publication by Undergraduate Mathematics and its Applications (UMAP).

• During the spring semester of 2004, MTC sponsored Ted Hodgson, an Associate Professor of Mathematics Education from Montana State University as a visitor at IU Bloomington. Hodgson, an award-winning educator at Montana State, lent his expertise and insights and collaborated with MTC personnel on several papers for journals specializing in education. (See article, Page 1.)

FACULTY DEVELOPMENT WORKSHOPS

VIEWPOINTS 2003 Reunion
November 15, 2003

One of our most successful series of dissemination workshops has been the VIEWPOINTS Mathematics and Art workshops for teachers, held during the summers at Franklin & Marshall College, with a follow-up workshop in the fall at IU Bloomington.

The VIEWPOINTS facilitators are Marc Frantz of IU and Annalisa Crannell of F&M. On November 15, 2003, VIEWPOINTS participants reunited at IU to give presentations on their use of VIEWPOINTS ideas and materials in their classrooms.

The workshop featured a specially arranged field trip to the Indiana University Art Museum. IU Professor Diane Pelrine, Curator of African, Oceanic, and Pre-Columbian Art, showed participants a huge Ndop cloth from Cameroon. Mathematician and VIEWPOINTS graduate Andrzej Gutek, who has lived in Cameroon, discussed the mathematical symbolism in the cloth’s designs. The participants (Continued)
Dissemination

(Continued)

also took time to tour the galleries. A list of presenters and pictures from the workshop can be seen on the VIEWPOINTS home page at php.indiana.edu/~mathart/viewpoints/vp2003prime/.

VIEWPOINTS 2004

June 6–11

Once again, some two dozen undergraduate instructors from around the country (this year including one from Istanbul, Turkey) attended the summer MTC VIEWPOINTS Mathematics and Art workshop at Franklin & Marshall College. Participants used Marc Frantz’s *Lessons in Mathematics and Art*, along with substantial supplements from co-leader Annalisa Crannell’s courses at Franklin & Marshall.

Activities included studio work, computer lab work, and perspective viewing in a poster gallery. As usual, participants will be invited to a reunion workshop at IU Bloomington in November to present their use of VIEWPOINTS ideas and materials in their classrooms. The VIEWPOINTS web site is at mypage.iu.edu/~mathart/viewpoints/.

**Physics-Based Calculus**

*June 7–9, 2003*

Another successful series of MTC workshops is Physics-Based Calculus, which ran for the fourth consecutive year on June 7–9 at Indiana University - Purdue University Fort Wayne (IPFW). The workshops are based on IPFW professor Peter Hamburger’s MTC course “Catch the Waves to Calculus.”

Hamburger’s students learn calculus via Fourier analysis and research projects mentored by professors from other disciplines. The workshop teaches college and high school instructors how to follow in Hamburger’s footsteps. Activities include hands-on work in a physics lab with experimental and data-gathering equipment. The workshop website is at www.ipfw.edu/math/Workshop/PBC.html.

**Mathematics & Physics for Speech & Hearing**

*June 5–6, 2004*

This workshop disseminates the classroom and computer lab techniques of the MTC course “Mathematical Foundations of Speech and Hearing,” taught at IU Bloomington. The developers are Diane Kewley-Port, David Eddins, and Paul Kehle. “Foundations” is now a required IU course. David Eddins has also taught the course four times at the University at Buffalo by Eddins, where the course is required.

The workshop sessions included hands-on computer labs to help instructors master the course software. More information about the workshop can be found on the home page at www.indiana.edu/~acoustic/s319/workshop.html.
COMING EVENTS

MATHFEST 2004

Once again, MTC will have a dissemination booth in the exhibition room of the Mathematical Association of America’s annual Mathfest. The conference will take place on August 12–14, 2004, at the Rhode Island Convention Center in Providence, Rhode Island. The home page for Mathfest is at www.maa.org/mathfest/.

VIEWPOINTS REUNION

Marc Frantz and Annalisa Crannell will host a reunion for participants in their VIEWPOINTS 2004 Mathematics & Art workshop. The reunion will take place on Saturday, November 20, 2004, at Indiana University Bloomington. Participants will give presentations on their use of Math and Art in their classes.

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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, and the State University of New York at Buffalo. Schools that have adopted and adapted MTC courses and materials include: Clarion University, DePauw University, the College of St. Benedict, Arapahoe Community College, Goshen College, Chadron State College, the University of Rio Grande, Sul Ross State University, Joliet Junior College, the College of Charleston, Christian Brothers University, Marshall University, Centenary College, Mohawk College (Canada), George Brown College (Canada), Wheaton College, and St. Joseph’s University.