

## THE CURRENT TOP TEN

We extend congratulations to our current TOP TEN students, determined by averaging their college Calculus and Physics grades for the first semester. They are listed alphabetically by schools:

- Drue Cohoon (Fort Osage)
- Tracey Sterbenz (Fort Osage)
- Jeff Thate (Fort Osage)
- Shane Henry (Ruskin)
- Mitch Dobson (Truman)
- Shannon Lundy (Truman)
- Jason Gorden (Truman)
- Jamy Bacchus (Wm. Chrisman)
- Rana Barber (Wm. Chrisman)
- Danielle Glossip (Wm. Chrisman)

(Note: Drue Cohoon is taking only Physics, and Shane Henry is taking only Calculus.)

## SOON COMES SOFTWARE

Now that the MPI owns an IBM-compatible 386/16 computer, we have been researching appropriate mathematics and physics software, and some hardware. In particular we are buying programs which will allow us to create demonstrations, and be flexible enough to engage students in true exploration, by providing a set of tools to use, rather than just a tutorial to follow.

Currently we have on order MathCAD, Derive, Calculus (True Basic), Cal, Calculus Pad, Microcalc, and some graphing programs, as well as physics experimental interfaces and programs. Our hope is to begin integrating these into the MPI

program beginning next year, and perhaps within two years to establish a small microcomputer laboratory for our MPI students.

## OUR 1990 TEAMS TEST TEAM PREPARES

This year marks our second entry in the annual TEAMS (Tests of Engineering Aptitude, Mathematics and Science) to be held on the UMKC Truman campus on Friday Feb. 16. We will be competing against other 'schools' having some selective admission criteria.

The 6 team members and 5 individuals entered (Comp.Fund. = Computer Fundamentals) are:

### Team:

- Rana Barber - English/Biology
- Ivan Bird - Chem./Physics
- Danielle Glossip - English/Biology
- Shane Henry - Math/Comp.Fund.
- Danny Porter - Math/Comp.Fund.
- Jeff Thate - Chem./Physics

### Individuals:

- Jamy Bacchus - Math/Physics
- Michael Gish - Math/Comp.Fund.
- Ron Overbeck - Math/Chemistry
- Tracey Sterbenz - Math/English
- Chris Walker - Phys/Comp.Fund.

This year we have spent a few more weeks in training, and hope to see the difference in performance. We wish them all luck!

## ENRICHMENTS

Our MPI Christmas Party almost didn't take place because Dec. 15

was a snow day for all three school districts involved with the MPI program. But the few students who did show up went to the phones and called everyone else. In the end about 25 people enjoyed a small but vibrant party. (After all, no one had school!)

The annual MPI Reunion on Jan. 3 was well-attended, with 9 speakers and other students from three former MPI classes appearing on that cold morning.

Jan. 10 brought us Dave Wieliczka from the Physics Dept. to demonstrate lasers and holograms, and illuminate some topics in optics.

On Jan. 24, Paul Hilpman from Geosciences spoke on Radon, informing us that our homes drew in the dangerous gas by declaiming: 'Your House Sucks.' Radon of course, being a inert gas, is not itself directly lethal, but its immediate daughter products are dangerously radioactive. In fact, most lung cancer may be ultimately due to radon.

#### UPCOMING ENRICHMENTS

Feb. 7 will see Quinton Bowles of Mechanical Engineering giving our students a tour of the local UMKC ME labs, with explanations of their current projects.

Shelley Wolff, a project civil engineer specializing in highway design, and a participant in the Women And Mathematics (WAM) Program of the MAA will be our speaker on Feb. 21, following the Highway Slope Design Project of our students, described later in this newsletter. She will discuss the use of circular, compound, reverse, and parabolic curves in the horizontal and vertical design of roadways.

We also look forward to snaring a speaker from NASA (as we did last year), or from JPL, to talk about either the Space Shuttle or the recent Voyager Neptune fly-by, and we hope to tour the GM Fairfax plant if all goes well there. Medical History, Mathematics, and Superconductors are all topics for which we hope to find speakers.

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#### RECRUITMENT - JAN. 30

On Jan. 30, over 130 students from 5 high schools visited the MPI, and heard our recruitment talk. We used MPI student guides to escort the school groups, and later these same guides frankly shared their feelings about the MPI program. There were donuts and good questions, so we hope to have another strong class next year.

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#### HIGHWAY SLOPE DESIGN PROJECT

In February, MPI students will engage themselves in one of the TEAMS (Teaching Experiential and Applied Mathematics) projects, called: Highway Slope Design. This will precede our civil engineer speaker on Feb. 21, and we hope to link the two events. The project takes several days of work in groups of 2-3 and the students must produce a written report at the end. All this provides a welcome, and worthwhile, break from the daily classroom routine.

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#### STUDENT QUOTES

" Ever since my brother was in the MPI program, I have looked forward to taking the classes myself. I am glad I have the opportunity to earn college credit before I get out of high school. The MPI is giving me a headstart

to college, and I am glad I took it, even though my high school GPA dropped."

Jennifer Sessa  
Wm. Chrisman High School  
Independence District

" I just want to say, if you think you're ready for the real world, go to the MPI. But if you do go there you better study hard and learn all you can learn while in school. Trust me, I learned the hard way."

Junior Vele  
Van Horn High School  
Kansas City, MO. District

" Both calculus and physics are difficult, but physics is harder than calculus to me because it requires an ability to read English and comprehend well. I don't understand many of the questions on tests and homework because of my poor English vocabulary, but my teachers and friends help me a lot. I think that it is a great experience to be part of the MPI, being able to realize how much more studying is needed in colleges compared to high schools, before actually going to a college."

Hiromi Yokoyama  
Truman High School  
Independence District

" The MPI is, in my opinion, a great experience. The building and parking lot may be a little 'ancient', but the teachers most definitely aren't. If any one of us needs help with a problem, they're always ready and willing to assist. For me, anything that has to do with math belongs to the manure pile (I HATE math!);

nevertheless, the MPI is fun, and I wouldn't change my decision to go for anything."

Rana Barber  
Wm. Chrisman High School  
Independence District

A SOLUTION TO  
PHYSICS CHALLENGE # 2

Suppose an astronaut in zero gravity uncovers a glass of water and wants to empty the glass quickly into the air. Describe THREE different ways he can do this by using the water's inertia.

SOLUTION:

Three ways to empty the glass are:

- 1) Hold the glass still and then jerk it quickly in the direction of its base. This will leave the water behind.
- 2) Move the glass in the direction of its open end, then suddenly stop it. The water will continue moving forward.
- 3) Swing the glass in a circle with its open end outward. Centrifugal force (a form of inertia) will propel the water from the glass.

(From: Space Puzzles, by Martin Gardner.)

MATHEMATICS CHALLENGE #12

Why must a house whose rooms each have an even number of doors likewise have an even number of outside entrance doors?

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(From: Ingenious Mathematical Problems and Methods, by L.A. Graham.)

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### PHYSICS CHALLENGE #3

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Everyone knows that the moon's gravity (sometimes assisted by the sun) is the major cause of tides, pulling the water of the oceans upward toward the moon in a bulge about a foot or two high.

But not many people know that at the same time there is also a 'high tide' on the side of the earth directly OPPOSITE the moon. What causes it?

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The MPI Newsletter is published five times a year on the first of the month during the months of August, October, December, February, and April at The Mathematics and Physics Institute, 600 W. Mechanic, Independence, Mo. 64050, phone (816) 276-1272. Please address all correspondence concerning this newsletter to 'MPI Newsletter'.

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### BACK FROM THE AAPT MEETING

As reported in December, our physics teachers, Calvin Nelson, Larry Harding, and Richard Waring participated in the annual convention of the American Association of Physics Teachers (AAPT) in Atlanta, GA, Jan 20-25. There were papers on nearly every topic of physics, laboratory experiments, demonstrations of apparatus, the use of computers in physics education, and a number of papers on methods of teaching physics. The trip provided a welcome break from our everyday routine, but after listening to one presentation after another for a few days, we were ready to return to our students and classes.

Richard Waring

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