Mπ The Mathematics and Physics Institute NEWSLETTER

Director: Jennifer Discenna
Associate Director: Richard Delaware

October 1, 1998 Vol. 13, No. 2

YEAR 15 - WE BEGIN

Currently enrolled at the MPI are **65 students**, from Central (1), Fort Osage (8), Northeast (8), Paseo (1), Truman (19), Van Horn (13), and Wm. Chrisman (15) high schools. Of these 37 are female and 28 are male.

! MPI OPEN HOUSE !

Sunday, Nov. 8, from 2-4 pm, the MPI will hold its annual OPEN HOUSE for parents, teachers, counselors, administrators, and anyone else interested in talking to the faculty, staff, or students of the MPI.

We'll be in the Truman Campus Building of UMKC behind the Truman Library just north off Hwy 24 in Independence. There will be 1) physics demonstrations and laboratory set-ups, 2) mathematics demonstration problems on chalkboards with SHARP graphing calculators on display, and 3) the MPI Calculus Lab in Room 223 will be open with MPI student assistants ready to demonstrate mathematics software to our visitors.

In **Room 207 at 2:30 pm,** the MPI Director will make some brief remarks and introduce the MPI teachers. And of course, there will be refreshments. If you have any questions, please call 235-1272. You're invited!

!! MPI OPEN HOUSE !!
SUNDAY NOV 8, 1998, 2-4 PM

SOME STATISTICS FROM OUR 97-98 ANNUAL REPORT

- 667 students have completed the MPI program (Years 1-14, Sept. 1984 - May 1998; 401 (60%) of these were male, and 266 (40%) female.
- On average, 74% of all MPI students who start the program actually finish.
- Of the 425 MPI Alumni from Years 1-9 (1984-93) (excluding foreign-exchange students), 40 (94%) entered college, receiving 316 college degrees (to the best of our knowledge), including at least 178 degrees in Science, Mathematics, or Engineering, and 9 Medical Doctors.

TO ALL MPI ALUMNI:

HAVE YOU GRADUATED FROM COLLEGE?

IF SO:
PLEASE CONSIDER BEING AN
- ENRICHMENT SPEAKER -

CALL (816) 235-1272
or E-MAIL
rdelaware@cctr.umkc.edu

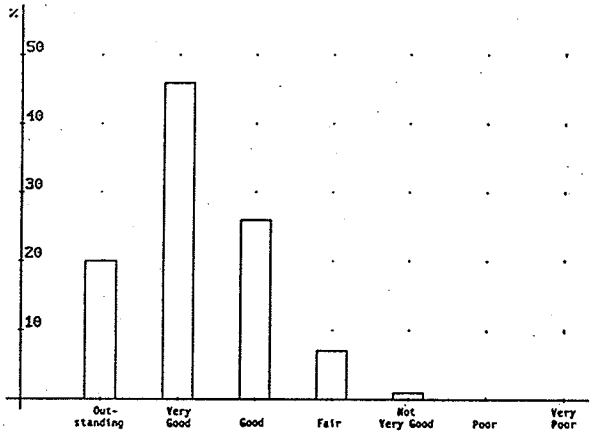
MPI Alumni who have spoken:

Brent Harding	(84-85)
Pam Deters/Stephen Koop	(84-85)
Seth McMenemy	(88-89)
Mitch Dobson	(89-90)
Rachel Allen	(92-93)

■ Where 75% of MPI Alumni Go:

26% UMKC
16% UM-Columbia
10% UM-Rolla
4% CMSU
4% Truman State Univ. (NEMSU)
4% Univ. of Kansas
4% Penn Valley Com. Col.
3% Rockhurst
2% NWMSU
2% Wm. Jewell College

In answer to the end of year MPI evaluation question **"Overall, how would you rate the MPI?"**, students responded:



ODDS AND ENDS

On **Sept. 11** the Associate Director gave a talk in the UMKC mathematics Expository Talks series entitled: "It's All Corners!... The Failure of Intuition: Functions Continuous Everywhere but Differentiable Nowhere."

Wednesday, **Sept. 23**, Sheri Adams attended an Assessment Conference at UMKC.

On **Sept. 30**, the Associate Director met at UMKC with students from several rural high schools who are enrolled in his video-taped College Algebra course.

Oct. 2-3, both the Associate Director and Libby Sparks will attend the 8th Annual Kansas City Regional Mathematics Technology EXPO at Rockhurst College in Kansas City, MO. The Associate Director is a member of the EXPO steering committee and will present two talks, one entitled "Stop, Go, and Actively Engage! College Algebra on Videotape in 1998", and the other entitled "Alternate Office Hours: From Blackboard & Chalk to Internet Whiteboard & Digital Pen."

On **Oct. 9**, Sheri Adams will attend the Calculus Reform Conference at the Lake of the Ozarks.

Oct. 17, Libby Sparks will present a talk on Internet sites in Math and Science at the Independence District Professional Development Conference.

From **Oct. 28 to Nov. 1**, Jim Graczyk will attend and present a talk on the use of instrumentation in physics at the National Tech Prep Conference in Kansas City, MO.

In **November**, the Associate Director will reprise his Sept. 11 talk at Johnson County Community College.

ENRICHMENTS

FOLLOW UP

On Friday, **Sept. 25**, Ed Kiker, a Harvard graduate who majored in Lunar Geology, member of the National Space Society, and the CEO of Outer Space Industrial Resources Investigations Systems, spoke on **OUR FUTURE IN OUTER SPACE.**

Students responded:

■ Mr. Kiker talked about why space exploration is beneficial and necessary, what benefits we get from space exploration, the future in space exploration and possibilities of movies like "Deep Impact" actually happening. Mr. Kiker's subject matters were very interesting, I enjoyed the whole talk very much.

■ Ed Kiker was an advocate for space exploration. His presentation focused on five reasons for space exploration. He told that tourism is one of the primary reasons to explore space. Tourism is the biggest industry in the world. Other reasons include finding alternates to depleted resources and population increases. Overall, I thought it was an interesting presentation.

■ The speaker could have been less blunt about the destruction of the world. I really don't need to know

that all my working and studying is for no reason. Besides that the speaker was fine.

■ He talked about the geology in space and how rocks from space are worth so much more than rocks here. He mentioned the possibility of public travel to the moon within the next 10-20 years, and the cost of making such a journey. All in all, the presentation was pretty interesting.

■ The speaker was pretty interesting, he really gave me something to think about. I had mixed emotions about some of the information he was giving to us about the asteroid hitting the earth in November of 1999. He also caught my attention when he was saying how scientists were trying to figure out whether or not it would ever be possible for humans to survive on Mars. Overall, he had an informative topic to discuss, but I don't know if I was ready to hear it.

■ The recent advancements in space technology have a very profound influence on life as we know it. Already satellites control and aid many aspects of our lives, from the internet and trans-atlantic communication to aircraft courses and military surveillance. The Global Positioning System (GPS), which operates with 24 satellites, is useful in tracking the earth's natural resources, which are quickly diminishing. For this reason, and others, life in space is becoming more and more feasible. Other planets offer many of the resources we are running out of, and some we have never considered. Mr. Kiker predicts that within the next ten years, there will be hotels, and later whole communities, in space. I really enjoyed Mr. Kiker and found his presentation fascinating!

■ I really like the presentation and I thought Ed did a great job. He gave good information and he brought some neat minerals to pass around.

■ Mr. Kiker talked about meteors, and how 65 million years ago a 5 mi. in diameter meteor, hit earth and killed the dinosaurs. People are now plotting where asteroids are in space with the help of satellites, to be prepared for a possible hit. Absolutely no changes. Mr. Kiker was awesome. I only wish that he had a longer time to speak.

■ Mr. Kiker gave a good overview of possibilities for meteors and asteroids striking earth, and how it is necessary to detect them. He also explained the value of the satellite tracking device and the advancing of the product. The possibilities of space tourism and costs were discussed as well as the value of things found in space as opposed to on earth.

■ Mr. Kiker was a wonderful speaker who presented his information about space and radar with great skill and interest. (Maybe it's a field I may want to go into...) Another thing I liked about his time with us was that he let us handle many of his props. I thought it was fun and very nice of him to allow us to do that. I think he was wonderful – it would be nice to visit his labs or the stations he works out of. Thanks, this was a great one!

UPCOMING

Friday **Oct. 9** brings Steve Snyder, Director of Science for Kansas City's Science City, to speak on **THE PHYSICS OF TOYS.**

We will have paleontologist and dinosaur hunter Craig Sundell of KU speak on **Oct. 23** about **THE REAL JURASSIC PARK: A WINDOW INTO PALEOECOLOGY.**

On **Nov. 6**, Frank Booth, from the Kansas City Regional Crime Laboratories, with his very popular **SCIENCE IN THE CRIME LAB** talk.

Finally, on Friday, **Nov. 20**, we will take our fifth annual trip to the **UMKC PHYSICS DEPARTMENT.** Last year we toured laboratories in: **Surface Physics** (David Wieliczka), **Superconductivity** (Michael Kruger), **Chaos Demonstration on PC's** (James Phillips), **Photo-Luminescence** (Jerzy Wrobel), and **Scanning-Tunnelling Electron Microscopy** (Fred Leibsle).

NEW (OR CHANGED) MPI ALUMNI E-MAIL ADDRESSES

[A complete list of known MPI Alumni e-mail addresses is available on request.]

**** NEW ****

(90-91) **Don Wolfgeher**
c572472@showme.missouri.edu
UNIV OF MO-COLUMBIA

(97-98) **Joseph Davis**
254230@sbuniv.edu
SOUTHWEST BAPTIST UNIV

(97-98) **Wilma Hines**
whines@usa.net
UNIV MARYLAND-EASTERN SHORE

(97-98) **Jeff Weston**
jweston@umr.edu
UNIV OF MO-ROLLA

**** CHANGES ****

(85-86) **Melissa Steffens Akey**
teamel@juno.com
LAHAINA, HI

(89-90) **Mark Lambros**
mark.lambros@theaustin.com
THE AUSTIN CO

WE HEAR FROM PAST STUDENTS

Jeff Weston (97-98)
(Computer Engineering Major)

E-mail received 9-7-98:

"WOW!! 9 people in Section C! That's a big improvement over last year's 2!

Well, I am down here at the University of Missouri - Rolla. I am thinking about majoring in Computer Engineering. MPI really helped me prepare for UMR. I am in Calc 3, and I am taking Calc-based Physics. Well, I just thought I'd give you my e-mail address: jweston@umr.edu. See you later."

MPI E-MAIL ADDRESS:

rdelaware@cctr.umkc.edu

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1998-99 STUDENT FIRST IMPRESSIONS

"The first couple of weeks at MPI can be best described as weeks of adjustment. I've had to constantly adjust my schedule so that my rest and study aren't abused. It's a trade-off between enough sleep to be functional and enough study to be successful (this is where the caffeine comes into play)."

Anthony Brown, Jr.
Central High School
Kansas City, MO School District

"The fast paced agenda is really different from high school, and at times things can get overwhelming, but the study skills and organization I'm learning will be great for next year at college."

Katie Allen
Truman High School
Independence School District

"I just came from Vietnam. I'm living and studying at Kansas City only half year. When I lived in my country, I very liked to study about math, physics and chemistry. When I come to America then I feel fear because this is a big country. I have trouble about my language. I know English a little bit. Sometime I can't hear (what) somebody says and I feel pain. Everything is strange with me. I remember my family, my teachers, my friends at my country. ...my teacher introduced MPI to me. The first time I go to MPI I'm afraid a little bit because I must meet many strangers. I see new friends, new teachers, and whatever... I'm the only Vietnamese in my section. But when I'm beginning my lesson, then I can't believe because everything is very good for me. Teachers are very kind and nice. Many friends come from different schools, but they are lovely. The first lectures were very difficult for me. Then I must try to listen to what they are talking about. Little by little I understood what my teachers are teaching. And if I still don't know or don't understand I can ask somebody in the classroom. They always help me. Right now MPI is my best friend. I very like it. I must get up early and go to school early, too. But when teachers teach I feel better and don't feel tired or sleep. Time I come to MPI I don't feel sad and boring like before. But it becomes busy and exciting. So I also happy

very much when I have a solution for math or physics. I like to do lab too, because I can see many graphs of functions on the computer. We can have fast answers for equations. It's wonderful.

I'm excited when studying at MPI. But I think that I need to learn so much and work hard then. I so hope everything be okay with me.

So I'll try my best to achieve my goal if I can, because I love MPI, love the people in MPI, and the program."

Trinh Phan
Northeast High School
Kansas City, MO School District

"I like MPI even though it makes my brain hurt. I really know that I am thinking. Calculus and physics keeps me on my toes."

Rebecca Phillips
Van Horn High School
Kansas City MO School District

"At first when I got here, I thought I was at the wrong building because no one was in the halls... most likely because I got here at 6:30 am to make sure I wasn't late!"

Wendy Robello
Wm. Chrisman High School
Independence School District

A SOLUTION TO MATHEMATICS CHALLENGE #54

Recall the problem statement:

Imagine a polyhedron with 1999 vertices (corners). Then imagine that each edge is assigned an electrical charge of +1 or -1.

Explain why there must be a vertex such that the product of the charges of all the edges that meet at that vertex must be +1.

[Due to Maşek; recorded in Techniques of Problem Solving, by Steven G. Krantz, 1997, Problem 1.6.4, p. 39.]

SOLUTION:

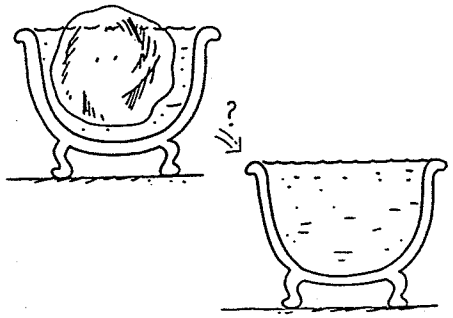
Suppose we multiply together into a single number all the products corresponding to all the vertices. Then every edge contributes two factors to this single number product, since each edge has two vertices at its ends, so that every +1 appears as a factor twice and likewise every -1 appears as a factor twice. So this single number product must be +1.

But, there are an odd number of vertices (1999 to be exact). So, it cannot be true that the product coming from each vertex is -1, since the product of an odd number of -1's is equal to -1. Therefore, at least one vertex has product equal to +1, as desired.

A SOLUTION TO PHYSICS CHALLENGE #45

Recall the problem statement:

This is a bathtub brim full of ice-cold water with an iceberg floating in it. When the iceberg melts, will the water in the tub: a) go down a little, b) spill over, c) stay exactly brim full without spilling?



[From: Thinking Physics, Practical Lessons in Critical Thinking by Lewis Carroll Epstein, p. 187]

SOLUTION:

The answer is: c. The weight of the water displaced by the iceberg exactly equals the weight of the iceberg. When the iceberg melts it "shrinks" and turns back to water and fits exactly into the volume of water it displaced. Incidentally, the volume of ice above water must be exactly equal to the increase in volume of the water that froze and expanded to become ice.

MATHEMATICS CHALLENGE #55

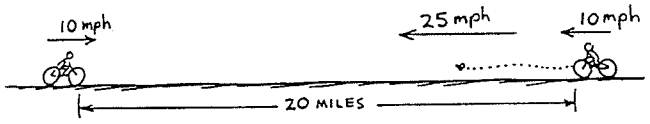
Fifteen sheets of paper of various sizes and shapes lie on a desktop covering it completely. The sheets may overlap one another and may even hang over the edge of the desktop.

Prove that five of the sheets can be removed so that the remaining ten sheets cover at least two-thirds of the desktop.

[From: Which Way Did the Bicycle Go? and Other Intriguing Mathematical Mysteries, by Konhauser, Velleman, & Wagon, 1996, Problem #5, p. 54]

PHYSICS CHALLENGE #46

Two bicyclists travel at a uniform speed of 10 mph toward each other. At the moment when they are 20 miles apart, a bumble bee flies from the front wheel of one of the bikes at a uniform speed of 25 mph directly to the wheel of the other bike. It touches it and turns around in a negligibly short time and returns at the same speed to the first bike, whereupon it touches the wheel and instantaneously turns around and repeats the back-and-forth trip over and over again – successive trips becoming shorter and shorter until the bikes collide and squash the unfortunate bee between the front wheels.



What was the total mileage of the bee in its many back-and-forth trips from the time the bikes were 20 miles apart until its hapless end? (This can be very simple or very difficult, depending on your approach.)

a) 20 miles
b) 25 miles
c) 50 miles
d) More than 50 miles
e) This problem cannot be solved with the information given.

[From: Thinking Physics, Practical Lessons in Critical Thinking by Lewis Carroll Epstein, p. 10]

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