

# M $\pi$

## The Mathematics and Physics Institute NEWSLETTER

Director: Richard Waring  
Mathematics Coordinator: Richard Delaware

August 1, 1997

Vol. 12, No. 1

### WELCOME TO YEAR 14

We welcome the 14th class to the MPI, representing 9 high schools: Central, Fort Osage, Lincoln, Northeast, Paseo, Truman, Van Horn, Westport, and Wm. Chrisman. In May, 105 students were tested for the MPI, and those planning to enroll are listed later in this newsletter.

A few notes for this year:

- We'll adopt a new graphics calculator, the **SHARP EL-9600**, although our supply may not arrive until late September;
- On August 1, the Independence School District takes over the management of the UMKC Truman Campus building, which will not affect us;
- And, of course, all our various MPI manuals have been updated over the summer.

### MPI STUDENT ORIENTATION SEPT. 3 - 5, 1997

Each year the first three days at the MPI are spent in giving our students an overview of how we operate, a discussion of our policies on attendance, grading, etc., and two diagnostic tests. Time is then set aside for the instructors to informally 'get to know' their classes before we all become preoccupied with class work.

In particular, on the first day, Sept. 3, 1997, we'll provide each student with a packet of information and have each of them fill out a personal data form.

If you have any questions, call our MPI secretary Doris, Mon. - Thurs., 8 am - 1 pm, 235-1272. We look forward to seeing our 14th class on **Wed. Sept. 3 at 7 am in Rm 207!**

### STUDENTS PLEASE BRING, ON SEPT. 3, 7 am, TO ROOM 207:

- Your Social Security Number.
- Your daily schedule of high school classes.
- Your schedule of extra-curricular activities.
- Your counselor's name.
- Ideas for Enrichment Speakers or topics.

### MPI E-MAIL ADDRESS:

[rdelaware@cctr.umkc.edu](mailto:rdelaware@cctr.umkc.edu)

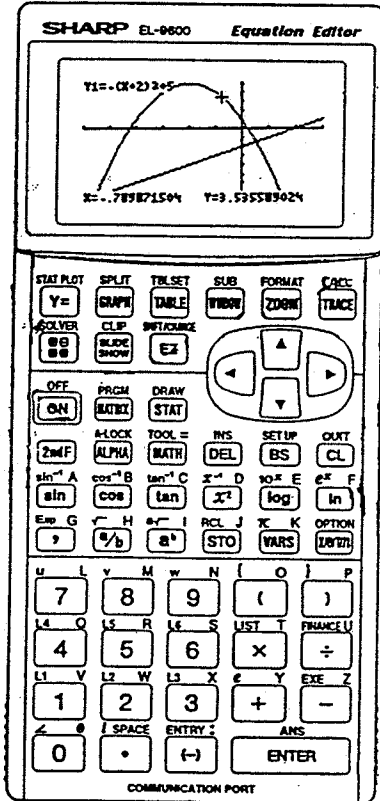
A list of known MPI Alumni e-mail addresses is available on request.

### MPI GRAPHICS CALCULATORS

The MPI requires ALL students to have and use a graphics calculator in both physics and calculus. For our purposes, we have selected the new **SHARP EL-9600**. Although the SHARP is not the most powerful such graphics calculator on the market, it is ideally suited to the MPI, and its selection of students. One unique feature, even in older models, is the ability to enter fractions and exponentials exactly as you would write them on paper. Some new features, beyond those in the former SHARP EL-9300C (now out of production) are:

- Pen-touch screen entry option [A plastic stylus is included.]

- TABLE feature
- Up to 10 x-y functions for graphing (rather than 4)
- Unique Rapid Graph & Rapid Window features
- Connects to a TI CBL (Calculator Based Lab)
- Sequence graphing
- Split Screen option
- More pixels for a finer screen resolution
- Slide show feature
- Financial functions



All MPI students are required, as soon as the new calculators arrive (probably in late Sept.), to rent from us a **SHARP EL-9600**, paying a \$10.00 one-time, non-refundable fee for the entire academic year, with an option to buy the calculator outright at any time, OR, to provide themselves with an equal or better graphics calculator from among only the following models: TI-86 (TI-85), HP 38G, HP 48G (HP 48GX). [Information, including cost, on all these graphics calculators can be gotten from the MPI Mathematics Coordinator by calling 235-1290.] Please note that MPI support and an MPI calculator manual will only be provided for the one calculator we rent.

The MPI rented calculators will initially be loaded with a set of AAA batteries, but as these fail over the course of the year, student-renters are entirely responsible for buying and replacing them. (Our experience has been that at most one or two replacements are needed over the year.)

**TO ALL MPI ALUMNI:**

**HAVE YOU GRADUATED FROM COLLEGE?**

**IF SO:**

**PLEASE CONSIDER BEING AN MPI ENRICHMENT SPEAKER!**

**CALL (816) 235-1272**

**1997 MPI AWARDS PRESENTATION AND TOP 10 MPI STUDENTS OF 1996-97**

Our final awards presentation was held on May 15, 1997, during which we were pleased to present many of our 1996-97 students with the following variety of awards (see list). Also present were 11 administrators, counselors, board of education members, and the superintendent of the Independence School District.

**Certificates for Outstanding Achievement (college grade of A or B):**

**CALCULUS I**

(Name)	(School)
Andy Alexander	Truman
Tamara Calvert	Truman
Rachel Cianciolo	Truman
Jenny Coonts	Truman
Tim Dawson	Truman
Jacqueline Fairley	Van Horn
Stephanie Farnan	Ft. Osage
Jay Farrington	Truman
Michael Flowers	Wm. Chrisman
Eric Fryatt	Truman
Crystal Gearke	Wm. Chrisman
Tom Gregory	Wm. Chrisman
Rebecca Herling	Truman

Corbin Jones	Ft. Osage
Kevin Kommel	Wm. Chrisman
Whitney Meagher	Truman
Rob Monnig	Truman
Khoi Nguyen	Northeast
Beth Olson	Truman
Misty Piatt	Center Place
Shelley Record	Truman
Sarah Thompson	Ft. Osage
Jonathan Wilson	Ft. Osage

**CALCULUS I and II**

Brian Johnson	Wm. Chrisman
Jessica Ostrom	Truman
Teresa Schlueter	Paseo

**PHYSICS**

Andy Alexander	Truman
Rachel Cianciolo	Truman
Jenny Coonts	Truman
Tim Dawson	Truman
Stephanie Farnan	Ft. Osage
Jay Farrington	Truman
Michael Flowers	Wm. Chrisman
Eric Fryatt	Truman
Rebecca Herling	Truman
Brian Johnson	Wm. Chrisman
Kevin Kommel	Wm. Chrisman
Whitney Meagher	Truman
Rob Monnig	Truman
Khoi Nguyen	Northeast
Beth Olson	Truman
Jessica Ostrom	Truman
Jigna Patel	Truman
Misty Piatt	Center Place
Shelley Record	Truman
Teresa Schlueter	Paseo
Sarah Thompson	Ft. Osage

We also honored the **TOP TEN** students (ranked according to the mean of their full-year college calculus and physics grades) by giving them a one year subscription to Scientific American magazine, and a copy of "What's Happening in the Mathematical Sciences 1995-96":

TOP 10 MPI STUDENTS 1996-97	
1) Rob Monnig	Truman
2) Rachel Cianciolo	Truman
3) Beth Olson	Truman
4) Jessica Ostrom	Truman
5) Misty Piatt	Center Place
6) Teresa Schlueter	Paseo
7) Sarah Thompson	Ft. Osage
8) Whitney Meagher	Truman
9) Brian Johnson	Wm. Chrisman
10) Stephanie Farnan	Ft. Osage
10) Jay Farrington	Truman

Finally, we list those MPI students planning to attend UMKC who received various scholarships from UMKC; included here are those students to whom the MPI awarded Chancellor's Scholarships:

**UMKC Chancellors Award Winners:**

Tim Dawson	Truman
Tom Gregory (MPI)	Wm. Chrisman
Brian Johnson	Wm. Chrisman
Khoi Nguyen (MPI)	Northeast
Tuyen Nguyen (MPI)	Northeast
Jacqueline Fairley	Van Horn
Teresa Schlueter	Paseo

**UM Curators Award Winners:**

Stephanie Farnan	Ft. Osage
Rebecca Herling	Truman
Corbin Jones	Ft. Osage
Kevin Kommel	Wm. Chrisman
Rob Monnig	Truman
Misty Piatt	Center Place
Sarah Thompson	Ft. Osage
Samantha Webb	Truman

**ADVICE TO STUDENTS OF YEAR 14 FROM THE STUDENTS OF YEAR 13**

At the end of this last year, in May, we decided once again to have our students write however much they wanted in answer to the question:

"What ADVICE would you give to incoming students about study, attitude, or any other aspect of surviving the MPI in 1997-98?"

Each incoming student will receive a complete set of these words of advice from their peers of Year 13. Here are some excerpts from that document:

"MPI has taught me a lot about self-discipline and learning how to actually study for once in my life. When I first came here, I was extremely intimidated, but I soon learned that I actually have a brain. Don't let yourself get into a mess by not keeping up with your studying or you'll soon be so far behind that you're overwhelmed with stress. I should know, because I was lost for the first 5 or 6 chapters in Physics. Take advantage of ALL the problem solvings and always, always remember to study with friends AFTER you've tried working out problems on your own. Studying with your friends is a major stress reliever, especially

when you guys throw in a few jokes here and there.

If you remember to study regularly (before problem solvings) MPI won't seem so bad. Most importantly though, if you remember to laugh you'll go far in life! Oh yeah, and of course don't forget to drink plenty of caffeine if you didn't get enough sleep the night before."

**Tamara Calvert**  
Truman High School

"First of all, make sure that your schedule at school allows plenty of time for MPI. This is like no other class you have taken before. You must be sure that you understand each section before moving on. Study hard for the exams and don't procrastinate. Also, do as many problems in Calculus as you can, for it will help you more than anything else. Remember, Luke... the force is with you!"

**Omer Choudhary**  
Truman High School

"Don't fall asleep. Ever! If you missed notes, ask for someone else's. (They throw you stuff that is not in the book, sometimes.) Start studying for tests and working on labs way in advance, otherwise you'll get mental indigestion. Come to class every day on time. After a while it becomes a habit and it isn't hard at all. If you listen to music when you study, listen to music without words, because there's no way all these little equations (half of them involve greek letters) can compete with the lyrics of your favorite song. Make friends with your calculator early, and it will be so good for you."

**Mary Comeau**  
Paseo High School

"Look to your right, look to your left, the people you see now probably won't be attending the MPI at the end of the program. You must remember that you are smart, or else you wouldn't be in the program in the first place. It's "the survival of the fittest," so never give up. Most

importantly "MAINTAIN."

**Jacqueline Fairley**  
Van Horn High School

"To succeed at MPI you must be willing to devote hours to it every night. Start a study group and use these people throughout the year. Take a positive attitude towards this year. Everyone will do fine if you just work your hardest."

**Stephanie Farnan**  
Ft. Osage High School

"Form study groups early. Keep the phone list. These can be invaluable tools if you are stuck on something. Utilize all of your time in the problem solving sessions. You will only get out of MPI what you put into it."

**Michael Flowers**  
Wm. Chrisman High School

"One thing that will successfully get you through this course is study groups. If you get in groups of 4 or larger, all of the brains involved will finally figure out the problems. If you do not want to be here, you will not survive. You have to strive for everything you get. Warning - do not COPY assignments, learn yourself, or you will fail the tests, which are 60% of your grade. Good luck future MPI students!"

**Crystal Gearke**  
Wm. Chrisman High School

"If you are here, you are crazy. If you have a life, get rid of it. If you have a job, quit. Don't give up no matter how hard it gets. It will get harder, then easier, then harder again, but in the end you'll feel happy that you accomplished something. I made it, you can too! Pray every night, and cry everyday.

P.S. If you don't know how to study, SORRY!"

**Duwan Hardge**  
Van Horn High School

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"Work. Hard."

**Brian Johnson**  
Wm. Chrisman High School

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"Get ready for a crazy ride!  
Expect the unexpected as the year  
begins. Your life will change from  
attending the MPI.

One of the first things you  
should do is form study groups.  
There will be many questions that you  
won't be able to answer, but someone  
in your group might.

Mingle with the other students  
that are not from your school. This  
will help you throughout the year.  
Trust me.

Make sure you set aside time  
(quite a bit) to do homework and  
study. If you don't, you might as  
well drop out now. Time will become  
very precious to you. Don't let it  
slip away.

One very important tool is the  
telephone. Use it without fear.  
Most students will be more than happy  
to help you out on a problem (they'll  
be doing the same).

Well, hope your year goes  
great. Remember, when stress is  
getting to you, just scream, let out  
your emotions, and then go back to  
work. Remember, it's only one year -  
your last year in high school!"

**Kevin Kommel**  
Wm. Chrisman High School

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"To the new MPI students: Be  
ready for sleepless nights and waking  
early in the morning to drive  
yourself all the way to Independence,  
MO for 2 hours and drive back to  
school for more torture. Really, MPI  
is a very good experience for you to  
get a feel of college. The academic  
level is very high, which means  
you'll get more out of MPI than what  
you put in. MPI taught me how to  
prepare myself for college. Now I  
know better than to wait until the  
last minute to do something. MPI  
you're a life saver!"

**Chi Nguyen**  
Northeast High School

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"The only advice I have for  
those incoming students is STUDY  
HARD. When you come to MPI,  
everything is different from high  
school. If you don't study you can  
not pass the courses. The more you  
study, the more confident you will be  
able to understand the problems.  
This is a good opportunity to get  
ready for college. You will know  
what college life looks like, and now  
you can be prepared for it. Study  
hard but you also need sometimes to  
relax and get some sleep. Good luck  
to all of you. And talk to the  
teachers if you need help."

**Tuyen Nguyen**  
Northeast High School

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"Don't come to MPI expecting an  
easy A. You have to study right from  
the start - cramming for the tests  
doesn't work. (Helpful hint: start  
working out now so you can make it up  
all the steps.)"

**Jessica Ostrom**  
Truman High School

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"MPI was a great experience, it  
showed me what I should expect next  
year in college - doing homework 24  
hours and getting winks of sleep. If  
you really want to get through MPI,  
make a lot of friends so they can  
help you. You might hear a lot from  
the past MPI students that (it) is  
real hard, but it is only hard if you  
make it hard. In other words nothing  
is hard unless you make it hard. So  
don't give up!"

**Jigna Patel**  
Truman High School

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"Do not start MPI thinking it  
will be easy. It is challenging.  
You must work and study hard to  
succeed here. If you mess up on an  
assignment, don't panic and don't  
give up. Keep trying. If you need  
help, ask for help; the teachers will  
help you if you ask.

Do not get behind. It will be  
hard to catch up and will affect your  
grades. Keep up with the calculus  
problems and studying for the tests  
will not be so daunting. Reading the  
texts, especially the physics text,

will help you on the tests. Good luck - and have fun!"

**Misty Piatt**  
Center Place Restoration School

"1) At the beginning of the year, organize a study group with people you are comfortable with, and that you can get together with easily.

2) Get as much homework done in problem solving as possible, it's really hard to get motivated at home.

3) Sometime during each chapter, read the whole chapter, it doesn't take very long, and it gives you an idea of what the lectures were about.

4) Do the lab write-up as soon as possible, it's hard to remember what you were doing 2 weeks later."

**Shelley Record**  
Truman High School

"Believe in yourself! I have had many rough nights wrestling with calculus demons, but believe in your ability, work hard, and you will overcome those rough nights."

**Teresa Schlueter**  
Paseo High School

"Be prepared to work hard and give it 100%. MPI classes are college-level classes, and they demand college-quality work. You can't fake your way through anything. I strongly encourage you to develop good study habits. Don't wait until the night before a test to cram; you won't retain as much and won't be at your best the next morning. Just use common sense and realize that you're in college now. Best of luck!"

**Sarah Thompson**  
Ft. Osage High School

"One of the aspects of  $M\pi$  that I had the most trouble with was the "suggested" homework. Since it was only "suggested" it often didn't get done at all, except for what was done

during problem solving. My advice is to take the "suggested" problem list, make your own assignments, and a schedule to complete those assignments. Remember you don't have to do the problems, but if you don't you'll probably bomb the test."

**Jonathan Wilson**  
Ft. Osage High School

## THE 1997-98 CLASS (TO DATE)

### Section A (19)

Nancy DeLaCruz	Northeast
Derek Funk	Wm. Chrisman
Aaron Goddard	Ft. Osage
Jenny Green	Truman
Natasha Harding	Ft. Osage
Damon Harris	Central
Zaid Hayyeh	Wm. Chrisman
Wilma Hines	Lincoln
Trang Huyen	Northeast
Anissa Kincaid	Ft. Osage
Jason Kleyh	Wm. Chrisman
Adam Lipps	Wm. Chrisman
Gretchen Nguyen	Northeast
Autumn Orphey	Van Horn
Tommy Prichard	Wm. Chrisman
Joseph Reese	Van Horn
Richaella Riley	Paseo
Brent Thompson	Ft. Osage
Matt Woolf	Truman

### Section B (18)

Jose Alcocer	Van Horn
Scott Anderson	Wm. Chrisman
Amy Appleton	Truman
Matt Ashbaugh	Wm. Chrisman
Drew Barr	Lincoln
Gene Calvert	Van Horn
Joseph Davis	Northeast
Isaac Ferguson	Van Horn
Tim Gengler	Ft. Osage
Derek Hawkins	Ft. Osage
Clarice Jensen	Wm. Chrisman
Courtney Jones	Truman
Daphne King	Van Horn
Tabitha Kremer	Truman
Dianne Le	Northeast
Sherise Massey	Central
Eric Noland	Wm. Chrisman
Jennifer Sattler	Van Horn

### Section C (4)

Joseph Chapman	Truman
Luke Small	Wm. Chrisman
Christina Verren	Ft. Osage
Jeff Weston	Wm. Chrisman

Section D (18)

Keith Brown	Van Horn
Kevin Butler	Ft. Osage
Ken Chretien	Ft. Osage
Paul Fueston	Ft. Osage
Daniel Haney	Wm. Chrisman
Lillian Jones	Lincoln
Antonio Lee	Central
Donald Millern	Wm. Chrisman
Heather Mills	Truman
Tuyet Nguyen	Northeast
Catherin Randall	Westport
Sara Redmond	Van Horn
Alicia Siy	Wm. Chrisman
Visach Son	Northeast
John Stover	Van Horn
Cary Tompkins IV	Wm. Chrisman
Kirsteen Twitchell	Wm. Chrisman
Amy Williams	Truman

These are the total of 59 students (as of this newsletter) who will be enrolled. As usual there will be additions and deletions through September.

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**THE 1997-98 MPI STAFF**

**In PHYSICS:**

**Larry Harding** (retired), formerly from Fort Osage, **Jim Graczyk** from Van Horn, with some assistance from our liaison **Roy Cook** of Northeast,

**and, in CALCULUS:**

**Sheri Adams** from Truman, and **Al Morse** (retired), formerly from Wm. Chrisman.

Our University staff is listed in the heading of this newsletter, and our half-time secretary and assistant is **Doris Kirst**.

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**MPI T-SHIRTS!**

Beginning in October, we will once again be selling bright blue MPI T-shirts and sweatshirts to our students. These shirts have a classy 3D graph ( $z = \cos x \cdot \sin y$ ) on the back and our student-designed MPI logo on the left front.

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**NEW (OR CHANGED) MPI ALUMNI E-MAIL ADDRESSES**

[A list of known MPI Alumni e-mail

addresses is available on request.]

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**\*\* NEW \*\***

- (87-88) **Kelly (Nance) Johnson**  
prov31@airmail.net
- (90-91) **Mary Noah**  
marynoah@juno.com  
UNIV. OF MO - KANSAS CITY
- (93-94) **Derek Fisher**  
derek82263@aol.com  
PARK COLLEGE
- (93-94) **Bobbi Hopkins**  
q809@truman.edu  
TRUMAN STATE UNIV.
- (94-95) **Leslie Gross**  
lgross@mail.trib.net  
COLUMBIA COLLEGE
- (95-96) **Corey Baker**  
coreybaker@juno.com  
UNIV. OF MO - KANSAS CITY
- (95-96) **Greg Finke**  
gregory.c.finke@wheaton.edu  
WHEATON COLLEGE
- (95-96) **Sierra McDaniel**  
c690685@showme.missouri.edu  
UNIV. OF MO - COLUMBIA
- (95-96) **Heidi Miller**  
0211752@acad.nwmissouri.edu  
or  
toddladyh@aol.com  
NORTHWEST MO STATE UNIV.

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**\*\* CHANGES \*\***

- (92-93) **Brett Williams**  
willi@umr.edu  
UNIV. OF MO - ROLLA
- (94-95) **Rachel Roberts**  
rachel.r.roberts@vanderbilt.edu  
VANDERBILT UNIV.

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**ENRICHMENTS**

**FOLLOW UP**

**March 21**, Ed Kiker, a Harvard graduate who majored in Lunar Geology, a member of the National Space Society, and the CEO of Outer Space Industrial Resources Investigations Systems, returned to speak on **FUTURE STUDIES**. Students responded:

■ Kiker's talk reminded me of the Butterfly Effect - the notion that a butterfly stirring the air today in Peking can transform storm systems next month in New York - because small discoveries can lead to large changes. Benjamin Franklin probably would have never imagined his discovery of electricity would lead to such advancements in technology. It's amazing to think that man started out w/o even the knowledge of fire, now we have satellite dishes, portable phones, huge advancements in technology, and can even clone animals w/genetic engineering!

■ Good speaker. The subject was interesting and I would recommend him for next year.

■ He talked about STEEP, which is society, technology, environment, economics, and politics. If there are any small changes in any of those then there will be great effects from them. There are certain criteria for guessing about the future. They are probable, possible, preferable, and wildcards. Mr. Kiker was really interesting. Some of the stuff he brought was kind of cool because I had never really thought about them.

■ Bad things happen because you do not plan ahead and look at the future repercussions of your actions.

■ He covered a lot of information quickly. I thought he was very prepared and a very good speaker. I am not that interested in space, but he made his material interesting.

■ He was one of the most interesting speakers we've had this year. He used examples to prove his point. He also delivered his point in a way that was captivating. Great job!!

■ Mr. Kiker talked about how he worked in groups on a moon base. He spoke about imagining the future so that we can prepare for it. (Things change!!) Changes can be classified into groups. Wildcard changes effect everything. I enjoyed hearing this guy talk. He had lots of interesting things to say.

■ Ed Kiker talked to us about the future and what kinds of technology could possibly be in store for us. He mentioned that, for people our age, we will probably change careers, not jobs, five times in our lifetimes, which is pretty mind-

boggling. Also, he talked about different kinds of events and inventions that can pop up suddenly and completely change the course of things.

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On April 11 David Wieliczka, of the UMKC Physics Dept., repeated his popular **LASERS AND HOLOGRAPHY** talk.

Student comments were:

■ It's hard for one to grasp the concept that if a hologram's film was cut into pieces, the image of the film isn't lost, you just are simply restricting your viewing angle of the image.

■ Light is an electromagnetic wave. This consists of an electric field as well as a magnetic field. Microwaves are also electromagnetic waves that interact with water, which is in the food that you heat in the microwave. If we know the frequency, we can determine the wavelength. White light is composed of all wavelengths, all the colors mixed together appear to us as white light. Also no light is lack of colors. There are no color waves, so it appears as black light or no light. It was a very interesting and informative talk. I learned quite a bit about light and lasers.

■ He was really interesting and easy to listen to. His examples were helpful and made the material easier to comprehend. The topic was more interesting than I had thought it would be.

■ Lasers are used for CD players, laser jet printers, scanners at supermarkets, fiber optic cables, etc. I thought his presentation was very interesting. I liked how he set up a laser and brought some holograms for us to see.

■ He did a very good job of keeping my interest by using a lot of examples and showing many demonstrations.

■ Examples of lasers and holograms were awesome! Information was simple and good! No improvements were needed. This is the best enrichment yet!!

[Continued after the Calendar]



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## Mathematics and Physics Institute

### CALENDAR 1997 - 1998 YEAR 14

MPI Begins	Wed. September 3, 1997
Mid-1st Quarter Progress Reports Sent (All)	October 3, 1997
6-Week Term Grade Reports Sent (Independence)	October 10, 1997
1st Quarter Grade (FO & KC) & <u>Probation</u> Reports Sent (All)	October 29, 1997
6-Week Term Grade Reports Sent (Independence)	November 21, 1997
<b>MPI OPEN HOUSE</b> for Parents/Teachers/etc.	Sunday, November 23, 1997
Thanksgiving Holiday	November 27-28, 1997
Mid-2nd Quarter Progress Reports Sent (All)	December 12, 1997
Christmas Holiday	December 19, 1997 - January 2, 1998
MPI Classes Resume	Mon. January 5, 1998
<b>MPI REUNION &amp; PANEL DISCUSSION</b>	Tues. January 6, 1998
Final Exam - Calculus I - (Math C Only)	January 14, 1998
2nd Quarter/1st Semester Grade Reports Sent (All)	January 15, 1998
Holiday (FO & KC)	January 16, 1998
Martin Luther King Holiday	January 19, 1998
Mid-3rd Quarter Progress Reports Sent (All)	February 13, 1998
Presidents' Day Holiday	February 16, 1998
6-Week Term Grade Reports Sent (Independence)	March 6, 1998
3rd Quarter Grade Reports Sent (FO & KC)	March 20, 1998
MPI Spring Break	April 6-10, 1998
MPI Classes Resume	April 13, 1998
Mid-4th Quarter Progress Reports Sent (All)	April 17, 1998
6-Week Term Grade Reports Sent (Independence)	April 24, 1998
Final Exams - Calculus I (A, B, D) and Calculus II (Math C Only)	Mon. May 11, 1998
Final Exam - Physics (A, B, C, D)	Tues. May 12, 1998
MPI Picnic Breakfast (McCoy Park)	Wed. May 13, 1998
MPI Awards Presentation/Last Day of Classes	Thurs. May 14, 1998
4th Quarter/2nd Semester Grade Reports Sent (All)	Fri. May 15, 1998

■ This was one of the best speakers all year. He brought examples of how lasers work, holograms work, and used terminology we understood. He also told us how 3D movies are rip-offs of holograms.

■ Wieliczka's a vibrant speaker with a knack for keeping us entertained and awake.

■ Holograms can be used to test products (non-destructive testing) in medicine, technology, and manufacturing processes.

■ This enrichment was probably the best one out of all of them. I liked the examples he used, such as telling if we are near or far-sighted. It was interesting to know that holograms and lasers are being used in medical technology, manufacturing processes, CD disk players, scanners at super markets, and Sprint phones.

■ He spoke to us about lasers and holography. I never knew that holograms could be used as a diagnostic tool. Some of the material I had already been exposed to, but he added a new twist w/examples and his own computer program. I liked how he pointed out that laser is an acronym. Hey, I even wrote it down: Light Amplification through Stimulated Emission of Radiation.

■ He said that lasers have a very low power compared to regular lights, 50 - 100 milliwatts, but are a very intense, focused light source. They can damage your eyes or even cause blindness.

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On April 25, Brent Harding (MPI 84-85) an Engineer Specialist at Stanford Telecom spoke on **SOME NASA PROJECTS**.

Students responded:

■ Wow! I thought it was really fascinating to see all the satellite images of different stars, galaxies, and planets. I never knew there was ice found in the moon's craters around its south pole. It was pretty interesting to hear about the different space missions (satellites, probes, etc.). It surprised me that it was possible to launch a probe onto a comet to take samples, or that Saturn's moon, Titan, has a surface

much like what scientists believe earth may have been like before life began. I also never knew that some space missions are fueled by radioactive fuel. This was a cool enrichment.

■ He began by describing his trip on a shuttle test airplane which simulates shuttle landings by approaching the landing site at an angle six times the angle at which most airplanes land. Currently, he is working on the global navigational system, which employs 24 satellites. His discussion was very interesting because he explained lots of complicated technological procedures in simple terms. I especially enjoyed the slinky example.

■ This enrichment was the best one so far. His material was very interesting. He had great examples and very interesting photographs.

■ I liked the fact that Mr Harding used visual aids (slinkies) to demonstrate how satellites are used to find the location of a space shuttle. The visual aids kept me attentive and helped me to better understand the subject being discussed.

■ He was generous and had a good personality. I enjoyed listening to him speak, even though I am not that interested in space. He had neat tools that we could look at. I could understand what he was talking about. **BEST ENRICHMENT SPEAKER EVER!** Enjoyed the detailed pictures.

■ After filtering out the atmosphere, selective signals, you can find where you are in the world to 50 ft. With GPS, a plane can land itself on a runway in the middle of winter. The more accurate the GPS, we can shorten the flight lanes in air traffic, saving money in the long term. He used a demo to explain how the GPS works.

■ Mr. Harding taught us about star life and how a star is born. One way is when two galaxies collide. This causes a chemical reaction that causes stars to form. He also informed us on how satellites are sent out to other planets to take pictures and samples from the planet. Space technology is very challenging and you need good math and physics skills. By the way I got a slinky for being a satellite!

■ There's water on the Moon!! Nice slinkys!! The pictures were really neat.

■ Mr. Harding spoke to us about his projects that he is currently working on, mostly, global positioning systems. The slinky interpretation worked wonders. I learned a few new terms and even imagined our Sun burping and swallowing all of us up. (But that isn't supposed to happen.) I enjoyed the slinky demo and the numerous pictures to illustrate what Mr. Harding was talking about.

#### UPCOMING ENRICHMENTS

One of the special features of the MPI is its biweekly enrichment series, in which on alternate Fridays either professionals in the sciences, engineering, mathematics, etc., speak to our MPI students, or, we take a field trip to such places as the nuclear research reactor in Columbia, UMKC's Physics Dept., or Worlds of Fun for some 'hands on' physics.

As part of our early MPI orientation, Debra Gaggens of UMKC, will speak on **Friday, Sept. 5** about college admissions in general, and the importance of thinking about applications EARLY. (This is not intended to be a recruitment for UMKC, but a general discussion to help sensitize our students to the importance for colleges of deadlines.)

The October 1 newsletter will report on those speakers scheduled for October and beyond. But, during the first two weeks of classes at the MPI we will spend one day discussing a topic which is vital for study and college survival. Specifically: **TIME MANAGEMENT**. This session will be presented by Augusta Nichols from UMKC's Academic Support Services on **Friday, Sept. 12**.

On **Friday, Sept. 26**, Mitch Dobson (MPI 89-90), currently the resident Prosthetist/Orthotist at Rehab Designs of America in Lenexa, KS, will join us for the 4th time to speak on **PRINCIPLES AND ADVANCEMENTS IN PROSTHETIC TECHNOLOGY**.

#### TO THE PARENTS OF THE 1997-98 CLASS AT THE MPI

[Modified from the August 1, 1987 newsletter.]

This newsletter is written for **YOUR** information, and there will be one sent to you every two months during this year while your son or daughter is at the MPI.

We firmly believe that without your support and concern at home students cannot succeed in such a rigorous program as the MPI. Our classes are NOT high schools classes, and require both study skills and a commitment that students still in high school, however talented, have not experienced before. In both of these areas **YOU** as parents can be of enormous help.

One of the first facts we have learned to face in the last 13 years is that many bright students never learn to study efficiently; they have often gotten along very well with a 'wait and cram' attitude, giving textbooks only an occasional cursory look in time for testing, and relying on their innate ability to absorb information and skills in the classroom. However, in coming to the MPI these same students always find themselves at first, and suddenly, falling behind.

In general, in college classes **MORE MATERIAL** is covered, and **MORE SKILL** with concepts is required, i.e., **THINKING** is expected regularly. This comes as a shock to many talented students. One of the MPI's goals is to expose students to this shock, and help them overcome it by learning effective study skills in actual practice. But **YOU** as parents can help this transition enormously, by suggesting that your children actually spend the minimum of one hour per subject, per night of study that we here at the MPI urge. They must come to realize that longer study times reflect the new rigor of the **COURSES**, not their lack of talent. This is a point of view that many students find hard to accept at first. Your encouragement can help them over this hump. Encourage them to seek the help of all the teachers involved in the program, and to put aside the false idea that only remedial students need to **TALK** about mathematics and physics. The fact is that true understanding comes only

from learning to discuss and explain a subject, and this is ESPECIALLY SO in physics and mathematics.

Finally, we urge you to call us if you ever have a question, and we hope that you will find time to visit the MPI during our annual **OPEN HOUSE** on **Sunday afternoon, November 23, 1997**. (See the calendar in this issue; more about this in the October newsletter.)

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## **WE HEAR FROM PAST STUDENTS**

**CHRISTY CRAMER (92-93)**  
(BA Political Science)

"I realized that in order to succeed in MPI courses I had to study long and hard. This realization also helped me succeed in college.

MPI showed me how college would be. MPI gave me an extra advantage, in that I knew what it would take to succeed at college before I even started.

I was not interested in pursuing an education in math or physics, but my MPI experience provided the framework which allowed me to compete in college. When I was in the MPI program I was very frustrated with how hard everything was; but I held in there and finished the program. I walked away a better person, with the tools for success.

I will begin my legal education at the University of Kansas School of Law on August 22, 1997."

---

**BRETT WILLIAMS (92-93)**  
(Mechanical Engineering Major)

"The calc class gave me a great head start on completing my graduation requirements and prepared me well for subsequent classes."

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**RACHEL HAYES (93-94)**  
(Psychology Major)

"MPI gave me a wonderful head-start on credit hours, and a beneficial glimpse into the inner workings of college. I also felt like I had the time to LEARN the principles of calculus and physics, (since the MPI courses lasted the

entire year) which has been of benefit to me in a wide range of college courses from microeconomics to biomedical science.

MPI is a great program with both high school and college academic benefits. In addition, it is a wonderful transition between high school and college, and a great networking device as well! I recommend that the program expand and develop as necessary, but also remain small enough to keep a close-knit atmosphere."

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**ERIK WARNER (93-94)**  
(Environmental Engineering Major)

"MPI's courses give you a good taste for homework or what studying is all about. Prepares you for future college courses. The guest speakers are a very important part of the course I believe. They give the students motivation to be the best they can be."

---

**JENNIFER BROWN (94-95)**  
(French Major)

E-mail received 4-4-97:

"I just wanted to let everyone know that I will be studying in Lyon, France this summer with the UMKC program. I am very excited and I leave May 26!!!!"

---

**TONY GRIFFIN (94-95)**  
(Finance Major)

"My participation in MPI has put me a full semester ahead. Also, MPI opened my eyes to how one must study and prepare for class, if they want to stay afloat."

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**LESLIE GROSS (94-95)**  
(Education Major)

"I believe that the MPI courses have held a superior rank to those I have taken since. Both math and science have failed in comparison to MPI.

My encouragement from MPI and drive has continued because of MPI.

Last year I had a horrible Calculus II instructor, and it is because of my year at MPI that I picked up the book and retried the course. I remember the year fondly, and that encourages me.

I really enjoyed MPI and I learned a lot more than I thought. It is a wonderful program."

---

**AHMAD LATIFZAI (94-95)**  
(Chemical Engineering Major)

"At MPI the pace was slow so catching up was easy. At UMR the pace is much faster therefore catching up is harder, and much of the details are not covered as much as they should be.

In MPI a large amount of help is provided in Mathematics and Physics. At UMR help is not provided as much as MPI provided in Mathematics. Help in Physics on the other hand, is about the same, they have a program called "The Support Group for Victims of Engineering Physics."

MPI opened my eyes, basically. This is my second year in UMR, where one has to have a strong math background, in order to go through the school of engineering. Before I attended MPI I had a very limited mathematics ability, after leaving MPI my math background was competitive enough for UMR."

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**RACHEL ROBERTS (94-95)**  
(Language & Communication Major)

"The quality of the instruction of my Calc I & II class was vastly superior to the Calc III class I took since. The use of graphics technology and the commitment of the instructor clearly outperformed the non-calculator-based T.A.-taught math course I took after the MPI. The quality of the MPI mathematics program is unsurpassed by my standards.

It gave me a tremendous advantage coming into a full-time college situation; it eased the transition from high school to college. The MPI program is rigorous yet provides ample support to students newly adjusting to the

rigors of college education. The use of computers in the math and physics assignments was also integral to my learning about technological aids. This has been extremely important as society becomes more computer and technology dependent."

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**SIERRA McDANIEL (95-96)**  
(Pre-Med, Biology Major)

E-mail received 5-1-97:

"Hello MPI. This is Sierra McDaniel. It is hard to believe that it has almost been a year since my class had its MPI picnic. Things have progressed so quickly that I just don't know what to do.

It was good to hear that there will be more students at MPI in the future. Yes, the torture I went through at MPI was well worth it because my Calculus credit from MPI covers the requirements for Biology and without MPI's Physics, I would be totally lost in my current Physics class. Three cheers for MPI!!!

In the last newsletter you mentioned that you were upgrading your graphing calculators and wanted to get rid of the older ones. My calculator was stolen and I would really like to replace it. I don't like the graphing calculators people use here at Mizzou, and I miss my Sharp! Is there any way I can buy one from MPI again? I will be most grateful if there is. [Sierra's mother picked one up for her before her exams. Ed.]

Hope everything goes smoothly for the rest of your year. I'm just starting to gear up for finals. In two more weeks I'll be home free and I can't wait. Thank you!"

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### A SOLUTION TO MATHEMATICS CHALLENGE #48

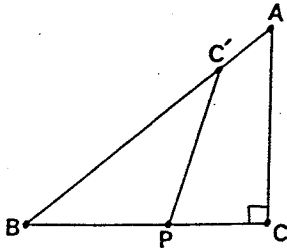
Recall the problem statement:

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This problem (circa 1810) is one of many that first appeared as a beautifully colored drawing on a wooden tablet hung under the roof of a Japanese shrine or temple as a common act of devotion:

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A right triangle  $\triangle ABC$  is given as shown, with point  $C'$  chosen on the hypotenuse  $AB$  such that  $BC' = BC$ . Suppose that point  $P$  is placed on  $BC$  so that  $C'P$  divides triangle  $\triangle ABC$  into two parts of equal area.

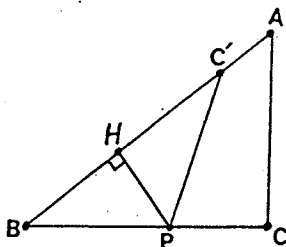


Show that  $2C'P = AB$ .

[From: Japanese Temple Geometry Problems, by Fukagawa & Pedoe, 1989; Ex. 4.1, p.46]

**SOLUTION:**

In the given figure, drop a perpendicular from  $P$  to a point  $H$  on side  $AB$ , as shown below:



Then, recalling that the area of a triangle is  $(1/2)(\text{base})(\text{height})$ , and using the given information that  $BC' = BC$ , and that  $C'P$  bisects the area of the original triangle, we have

$$\begin{aligned} \text{Area}(\triangle ABC) &= (1/2) \cdot BC \cdot AC \\ &= 2 \cdot \text{Area}(\triangle BPC') \\ &= 2 \cdot (1/2) \cdot BC \cdot PH, \end{aligned}$$

meaning  $(1/2) \cdot AC = PH$   
 $AC/PH = 2$ .

Since by construction triangles  $\triangle ABC$  and  $\triangle PBH$  are similar, and using the last fact, we next have:

$$BC/BH = AB/BP = AC/PH = 2.$$

From the first and last terms we get  $BC = 2 \cdot BH$  (hence  $BC' = 2 \cdot BH$  too), meaning  $\triangle BPC'$  is in fact isosceles,

so that  $BP = C'P$ . Combining this with the second and last terms above we can now write:

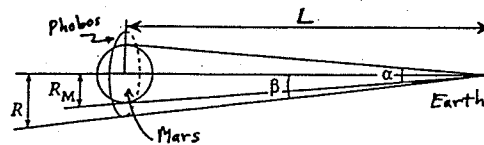
$$\begin{aligned} (1/2) \cdot AB &= BP = C'P \\ AB &= 2 \cdot C'P, \text{ as desired.} \end{aligned}$$

**A SOLUTION TO  
PHYSICS CHALLENGE #39**

Recall the problem statement:

During opposition, Mars is located at a distance  $L = 5.56 \cdot 10^{10}$  m from the Earth, and its angular diameter is  $\alpha = 25.1''$ . [Recall that:  $1'' = (\pi/180) \cdot (1/60^2)$  radians.]

Find the acceleration due to gravity on the Martian surface,  $g_M$ , if the maximum angular distance between the center of Mars and its moon Phobos is  $\beta = 34.5''$ , while the period of revolution of Phobos around Mars is  $T = 2.76 \cdot 10^4$  s.



Here,  $R_M$  = the radius of Mars, and  $R$  = the radius of the orbit of Phobos.

[From: Quantum Magazine, July/August 1996, p. 19, problem P176.]

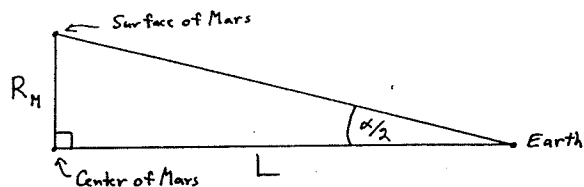
**SOLUTION:**

Let  $g_M$ , as above, be the acceleration due to gravity on the Martian surface, let  $M$  be the mass of Mars, and  $R_M$  the radius of Mars. For any object of, say, mass  $m$ , near the Martian surface, equating the net force given by Newton's Second Law,  $F = m_0 g_M$ , to the force of gravity given by the Law of Universal Gravitation  $F = GMm_0/R_M^2$ , we get

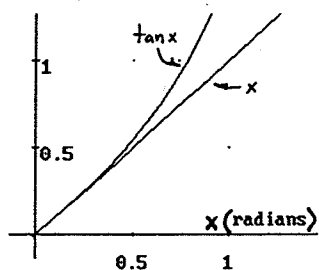
$$1) \quad g_M = \frac{GM}{R_M^2}$$

where  $G$  is the universal gravitational constant. We will now find numerical values for  $R_M$  and  $GM$ .

First, from the sketch above we find that



$R_M = L \cdot \tan(\alpha/2)$ . Since for "small" angles  $x$ ,  $\tan x \sim x$ , as the graph below suggests,

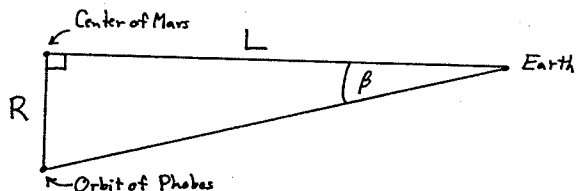


we can rewrite this as:

2)  $R_M \sim L \cdot \alpha/2$

[Note that here, the given  $\alpha$  and  $\beta$  are both less than .0002 radians which are certainly "small" angles.]

Next, to find the mass  $M$  of Mars, we consider the orbit of its moon Phobos, which we assume for simplicity is circular with radius  $R$  given by:



3)  $R = L \cdot \tan\beta \sim L \cdot \beta$ , as above.

At the orbit radius of Phobos the net force on Phobos is equal to the gravitation force due to Mars. Thus

4)  $ma = \frac{GmM}{R^2}$

where  $m$  = the mass of Phobos. With  $T$  = the period of revolution of Phobos about Mars, the centripetal acceleration,  $a$ , of Phobos is:

5)  $a = \omega^2 R = (2\pi/T)^2 R$ .

where  $\omega$  is the angular velocity of Phobos. Substituting "a" from equation 5 into equation 4 gives:

$$\frac{GM}{R^2} = \left(\frac{2\pi}{T}\right)^2 R$$

$$GM = \left(\frac{2\pi}{T}\right)^2 R^3$$

Substituting  $R$  from equation 3 we get

6)  $GM \sim \left(\frac{2\pi}{T}\right)^2 (L \cdot \beta)^3$

Substituting the value of  $GM$  from equation 6 and  $R_M$  from equation 2 into equation 1, gives:

$$g_M \sim \left(\frac{2\pi}{T}\right)^2 (L \cdot \beta)^3 \cdot \frac{1}{\left(L \cdot \frac{\alpha}{2}\right)^2}$$

$$\sim \frac{16\pi^2 \left(\frac{\beta}{\alpha}\right)^2 L \cdot \beta}{T^2}$$

$$\sim \frac{16\pi^2}{(2.76 \cdot 10^4)^2} \left(\frac{34.5}{25.1}\right)^2 \cdot 5.56 \cdot 10^{10} \cdot 34.5 \cdot \frac{\pi}{180} \cdot \frac{1}{60^2}$$

so,

$$g_M \sim 3.64218 \text{ m/sec}^2$$

NOTE: You might compare this to the acceleration due to gravity at the Earth's surface:  $g \sim 9.8 \text{ m/sec}^2$ .

### MATHEMATICS CHALLENGE #49

Compare  ${}^3\sqrt{9!}$  with  ${}^{10}\sqrt{10!}$ .

Prove which one is larger.

[From: Challenging Problems in Algebra, by Posamentier & Salkind, 1970, Problem 11-10, p.156.]

### PHYSICS CHALLENGE #40

Suppose you have two, large opaque vessels. One contains kerosene, the other contains kerosene and water.

How can you tell the one from the other using a spring scale and a weight on a string?

[From: Quantum Magazine, Sept/Oct 1996, p. 10, B183.]

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**Editor/Writer: Richard Delaware**

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