

Director: Richard Waring

Mathematics Coordinator: Richard Delaware

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### FIRST SEMESTER -- TOP TEN

By taking the mean of their college Calculus and Physics grades for the first semester, we have determined our current Top Ten MPI students. We congratulate them all. Alphabetically by schools, they are:

Alex Bates	(Fort Osage)
Don Vaught	(Fort Osage)
Julie Domsch	(Lutheran)
Corey Baker	(Truman)
Ragan Buckley	(Truman)
Josh Harrington	(Truman)
Jennifer Watts	(Truman)
Joe Ziolkowski	(Van Horn)
Tina Jensen	(Wm Chrisman)
Scott Preston	(Wm Chrisman)

### RECRUITMENT DAY -- FEB. 13

On Tuesday Feb. 13, we are inviting for a visit interested juniors and their teachers from the high schools involved in the MPI program. (Last year we hosted about 150 students.) They will arrive between 8 and 8:15 am and, with MPI student tour guides, take a short tour of the MPI classrooms. There will be MPI students at work on Calculus in our computer lab, a Physics lab set-up for viewing, and lectures or problem-solving sessions in action. Following the tour, everyone will be led to Rm. 207, to receive an MPI brochure, this issue of the Newsletter, a sheet containing information about the Calculus Readiness Test and MPI Mathematics Technology, a donut (!), and be seated for our slide show, along with computer, calculator, and physics demonstrations. Afterward, several MPI students will be asked to share their thoughts about being in the program, and we'll all take questions from the audience.

### TO ALL MPI ALUMNI:

#### HAVE YOU GRADUATED FROM COLLEGE?

IF SO:

PLEASE CONSIDER BEING  
AN ENRICHMENT SPEAKER

CALL (816) 235-1272

### A PROFILE IN COURAGE

Just before our Christmas break we received word that JESSIE NOLLE (MPI 92-93) had been in a terrible auto accident on Dec. 8. I understand she was traveling from Columbia, MO where she is an honor student at MU in Civil Engineering, to Hermann, MO for a weekend visit with her grandparents, when a car crossed the median on I-70 and collided with her car. After extraction from her car she was flown to a St. Louis trauma hospital, suffering life-threatening injuries which included a badly fractured skull, numerous facial injuries and a badly mangled leg with multiple fractures.

She underwent facial reconstruction surgery and received a tracheotomy on Dec. 13, remaining in intensive care. At the time, her sister Charity said Jessie would have an artificial knee, and that it might be a year before she could walk unassisted.

Less than seven weeks after the accident, I talked with Jessie on the UMKC campus while she was enrolling in a class for the Winter semester. She intends to resume her studies at MU in Fall '96. I was astonished by

the absolutely remarkable progress Jessie has made in recovering from her injuries! Through all the adversity she has managed to retain her sense of humor, saying "It wasn't all bad because my father has lost about fifteen pounds which he needed to lose anyway!"

Jessie is a remarkable young lady, and must have a will of steel and the heart of a lion. All of us at the MPI wish Jessie a speedy and complete recovery and stand ready to do whatever we can to make the road a little smoother.

*Richard Waring*  
Richard Waring  
Director

**A NOTE FROM JESSIE:**

"Dear Friends:

I wish so much that I had the eyesight and strength to send you each a hand-written thanks for all the cards, gifts, and visits that I have received since my little mishap on I-70, but I do not. So a form letter will have to suffice. It has been truly wonderful, the response I have gotten, and believe it or not it has helped my attitude and outlook. (Anyone who has spent much time with me knows that my sarcasm and cynicism often need help anyway.) It's too bad that it takes such a terrible thing to make someone realize just how many people do care about her. Not everyone gets that chance. I'm told that I will possess a better character when this is all over, but who is to say. Thank you all once again for all the thoughts, prayers, and consideration that you have given me and my family.

Love, Jessie."

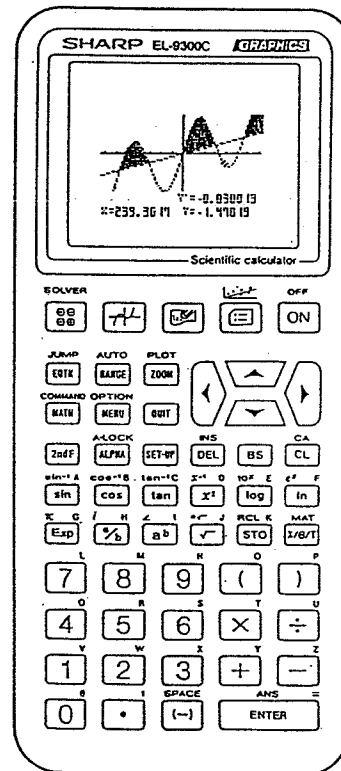
**MATHEMATICS TECHNOLOGY REPORT**

1. During the week of Jan. 22 we gave a graphics calculator survey to all MPI students, and we learned that of those who have rented the SHARP EL-9300C from us, possibly 22 plan to buy it at year's end. Also, 5 students still regularly use a plain scientific calculator along with their graphics calculator, claiming it is faster, smaller, and saves the SHARP's batteries. They also made it

plain which SHARP programs they rarely found useful, naming in particular "2piece" and "3piece". Other survey questions with selected answers follow:

**"Describe in what places outside the MPI classrooms, and at what times you find yourself using your graphics calculator:"**

- I use it in pre-calculus class, basically all my classes at Van Horn including adding up my hours.
- I use it in classes to figure grades, play with it to draw pictures. I have actually tried figuring physics of certain goings-on around the house. I also use it to store information for test taking.
- Analytic geometry.
- When I am at work calculating figures and also when at work calculating hours and wages.
- Introductory analysis.
- To show off to my friends. My cousins use it to play with. I use the normal real mode to do my accounting.
- In my trigonometry class.
- As a phone book. In the grocery store, in Pre-Calc I, in Physics.



What features of your graphics calculator do you like most, in comparison to any other graphics calculator you may be familiar with?"

■ This is the first graphing calculator I have had. I find it very useful in notetaking.

■ The easy ability to store information and facts is very useful on tests.

■ Enter my fractions and powers the way they look.

■ I can't specify a single aspect that I'd like the most, but everything is so easy; that is what makes this calculator great.

■ I love being able to program my calculator with different programs. I love that back-space button for all the mistakes and misspellings I have made. I just love that calculator.

"Can you suggest any ideas for new SHARP programs we could add that might be useful in Calculus or Physics?"

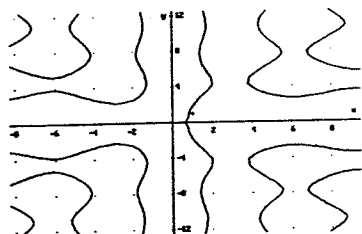
■ Physics equations: angular and linear.

■ More info in PhysDat possibly and a calc counterpart.

■ Possibly an anti-drop program, which will levitate the calculator when it slips off the desk.

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2. Now that Derive allows the plotting of implicitly defined curves, we have seen some unusual sights. For instance, on a recent calculus exam we examined the curve given by  $x \cdot \sin(y) = y \cdot \cos(x)$ , and saw the following graph:



## ODDS AND ENDS

During Fall 1995, the MPI was once again mentioned in Perspectives: The Newsmagazine of the University of Missouri - Kansas City in the "Partnership Power" article about UMKC's Truman Campus, now called the Higher Education Center.

We came back from Christmas break on Jan. 2 to discover that the building had been vandalized during our absence. Luckily, the only damage affecting the MPI was the slashing of our wonderful wall-to-wall and floor-to-ceiling projection screen in the room where we host our enrichment speakers every two weeks. It has been replaced with a much smaller screen less than a third of the size, which will pose some unavoidable difficulties in upcoming presentations.

On the brighter side, all our classrooms are scheduled to be repainted, for the first time since before the MPI began in 1984. We may also be getting some tables and chairs to replace at least a few traditional student tablet-armchairs in some classrooms. As mentioned before in this newsletter, these chairs are totally inadequate for anything but taking notes during a lecture. Yet, less than half of MPI classes are simple lectures. During problem-solving sessions, what with large textbooks for Calculus and Physics and omnipresent graphics calculators, these tablet-armchairs furnish far too small a surface to get any work done without contortions, or the sound of books and calculators crashing to the floor.

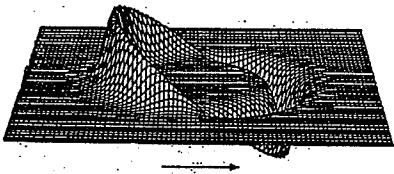
As of this semester, both high schools in the Independence School District have gone to a 6 week grading schedule. Although our other participating high schools still use a quarter (8 week) grading schedule, so that we now must compute MPI high school grades 8 times instead of 4 times over the course of the year, having the Recordbreaker! grading software has thankfully made this effortless.

Finally, last semester four of our MPI teachers, Sheri Adams, Roy Cook, Jim Graczyk, and Tina Knutson completed the 6 hour University of Missouri - Columbia course "Curriculum Methods for Gifted and Talented."

## ENRICHMENTS

### FOLLOW UP

On Dec. 8, 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, returned to the MPI to speak on **OUTER SPACE AS A CHANGE-DRIVER**. Among other things he brought with him information on the Master of Science in Future Studies program at the Univ. of Houston - Clear Lake, and three articles from the journals Physics Essays, American Scientist, and Classical and Quantum Gravity on a possible warp drive!



Ed also sent us a letter after his talk, responding to some of the student comments below.

Students wrote:

■ He told us about STEEP, or social, technology, economic, environmental, and political changes. The world has to change to survive. Almost all of these factors relate to economics, but all relate to technology.

■ We learned about space tourism [and about] sub-orbital flights launched straight up through the atmosphere. I found out that a typical sub-orbital flight can have up to five minutes of feeling weightless after the flight. I also didn't know that NASA wants to do experimental flights with families and tourists.

■ (1) Mr. Kiker is in a very interesting set of careers, and is somewhat after my own heart in looking to the future. He was very enthusiastic that commerce was supporting the asteroid mapping program. I'm glad that it is supported, but scientists have been saying this is a problem for at least fifteen years. It seems strange that profit is more important than the survival of the human race. If an asteroid is found heading for us,

will you be thinking "Let's try a complicated maneuver unlike anything we've tried before to capture this asteroid for iron ore", or "Let's push this asteroid out of the way, so it doesn't annihilate us"?

(2) Another thing I thought was strange was his slight lack of enthusiasm in Mars. Despite its apparent (!!!) lack of economic viability, it is still our best bet for colonization, for planetary archaeology (ancient life?), and for a base for voyages to the outer planets and the asteroid belt. The last is even economically viable!

Kiker responds to (1) above:

"Survival is the most important, of course. No survival, no profit. However, both asteroid-shoving actions are the same: shove it somewhere. The question is where. If you just shove it in an arbitrary manner so it does not hit the Earth this time, it might still be a hazard later. So, you want to shove it somewhere particular so it cannot ever be a hazard. Well, as long as you are shoving it somewhere particular, why not into an orbit where you can get at it again later? If you do that, and later mine it to death, it will never be a hazard again, and you have made enough profit from the operation to pay for shoving it in the first place. That also means that a mining corporation paid for the shoving mission, not the government using our tax money. That is the way to go! Anytime you can find a private enterprise way to solve a problem, that is always better than letting the government do it and sending us the bill. Always remember second, and third-order effects, not just first-order."

Kiker responds to (2) above:

"Good comment. My personal desire is to spend all my days exploring Mars - there could be no greater adventure! That is more personally interesting to me than running a mine on the Moon. However, remember, there is no free lunch, all things must be paid for. A purely scientific exploration colony on Mars would be all tax-supported, and very expensive. Therefore, if we want to do it right, we need to make private enterprise make space pay, and the corporate taxes on that can pay for the non-paying exploration of Mars.

We know that there are resources on the Moon, so for now that is where my emphasis is until mining them begins to pay. I am being economically and politically practical. Few taxpayers will support a purely scientific Mars exploration program or space station unless they see something economically useful coming from it, and the taxpayers are the final arbiters of what is done with tax money. Remember also that I said: "Mars will have surprises!" I have no doubt at all that Mars can be made to pay economically, but I cannot prove it yet with proven resources. Only the exploration will do that, and probably not until several years after exploration has begun. Another problem with Mars is life: my training in biology tells me that since Mars once had abundant water, it also had life. If it had life at any point in the past, it still has life, of some form. The "Prime Directive" of Star Trek fame applies here: we dare not disturb such life until we know it thoroughly, and the effects we might have on it. And its effects on us. Mars will therefore be robotically explored for a long, long time before humans can begin to think of colonizing it or terraforming it. Lastly, you are Right-On about the asteroid belt! We need to begin now to map both the Earth-orbit crossing asteroids and the Main Belt asteroids for mining resources. Only with that knowledge can we begin to formulate a way to use them. While NASA may have a part in that, I personally want to see it almost entirely carried out by mining companies. That is their business, and it is they and their stockholders who will make the profits. They should therefore pay for the exploration and mapping. Besides, they will do a better job than the government precisely because they have a stake in the results."

#### Returning to student comments:

■ Knowledge will increase 500 times in the next 50 years. Mr. Kiker brought us a sample from a meteor that landed in Arizona and created a huge crater.

■ I actually got to touch a piece of the meteor that hit in AZ!!! The best [enrichment] yet - real thought-provoking ideas here. I want to do a space tour.

■ I believe that Mr. Kiker taught us

the most about how math and science can be used in a career and in the so called "real world". He showed us new ways to look at life so that we could be flexible and prepared for what life has to offer in the future. Mr. Kiker was a fine, organized speaker and he should definitely be invited back for as many years as he would like to return.

■ He spoke mostly about the new technology being created that will soon allow the average person to travel in space. Another interesting thing he spoke about was ecology and pollution. He said that pollution is more an opportunity than a problem; if new techniques are invented to dispose of pollution, it leads to fortunes. This enrichment was interesting and enjoyable, probably the best one so far.

■ Check the dating methods used in the Yucatan Peninsula asteroid. It is only 1,961 years ago.

#### Kiker responds to this final comment:

"Well, no, afraid not. That would have been in 34 A.D. during the height of the Roman Empire. The Yucatan astroblem ("star-wound" as meteorite impact craters are called) is well and conclusively dated at 65 million years ago. If it had happened only 1,961 years ago, the Earth would still be a cold, desolate and almost lifeless world, and there would have been little or no further human history. This meteorite was about 5 miles in diameter, hit at about 150,000 miles per hour, and blasted a crater about 25 miles deep into the crust and mantle, and 112 miles in diameter. The result of such a strike can only be global disaster, not just local effects. The Yucatan astroblem has an upraised area in the center from isostatic rebound, just as seen in large Lunar impact craters. Nothing is visible on the surface, as it is covered with 3,600 feet of limestone deposition from the ensuing 65 million years. It takes a long time to deposit all that limestone. The Yucatan astroblem was found by an oil geologist doing gravitational and magnetic anomaly studies for a Mexican oil company, a procedure that helps to locate oil deposits by mapping subsurface rock densities. This astroblem has now been thoroughly mapped, and core samples have proven the dating with proven

methods. Debris fallout from this event is found at many places in the world, exactly at the Cretaceous-Tertiary (or K-T) Boundary, in a layer of clay which has no fossils but which is rich in meteoritic iridium, glass spheres, shocked quartz, and carbon soot from burning forests. Elsewhere in the world there are reliably dated huge lava traps, or outpourings of lava hundreds and thousands of feet thick, of the same age as the Yucatan astrobomb. While it has not yet been conclusively proven that the two are related, it is very likely that the Yucatan event caused large seismic waves through the Earth which in turn caused this unusual vulcanism."

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Our 11th annual **PANEL DISCUSSION** on Jan. 3 was again held in Rm. 207, and moderated by Sheri Adams and Al Morse. As usual, each of the 6 panelists discussed their college experience, their major, and/or work experience.

The alumni panelists this year were:

**Laura Dilley** (91-92)  
MIT  
Brain & Cognitive Sciences Major  
(Soon to be Pre-Med)

**Sonya Smith** (91-92)  
Macalester College  
Environmental Studies & Biology Major

**Derek Olson** (94-95)  
Univ. of Missouri-Rolla  
Undecided Major

**Rachel Roberts** (94-95)  
Vanderbilt University  
Cognitive Sciences Major

**Rebecca Schweitz** (94-95)  
Harvard University  
Undecided Major

**Marlene Toole** (94-95)  
Univ. of Missouri-Kansas City  
Biology Major

In all, 17 former MPI students appeared. Some specific current MPI student comments were:

■ I was very surprised that there was such a diversity of schools represented - from tiny Macalester to the UM system of colleges, even Harvard and MIT. The students were

pretty open about what life is like in college and describing what kind of link MPI provides. It seems like MPI provides a nice transition; it gets you to be more self-motivated than a regular high school schedule. Seeing how different the colleges really are was really terrific. The cultural difference between Boston and Minneapolis is really quite remarkable.

■ The most helpful and entertaining part of the reunion was the opportunity to speak individually with past students. I am very grateful that I could talk with past Truman students to find out how they were doing and how college life is.

■ They told us about how much they enjoyed dorm life, gave advice about what to do at college, and told about how they paid for college. They also talked about how they made money and still did their studies. They advised us to talk to professors on a personal basis and that money is readily available for loans and grants to help pay for college. I thought it was a good enrichment, with good variety of schools represented.

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Jan. 12, Seth McMenemy (MPI 88-89) now an electrical engineer with Kansas City Power and Light, spoke on **ELECTRICITY: POWER, TECHNOLOGY, AND ENGINEERING**. Student observations were:

■ Mr. McMenemy was very interesting to listen to because he added humor to his presentation, and told us funny little things about birds and squirrels on the power lines.

■ I like the way that he gave us a base to make sure that we understand what he was talking about. He told us how electricity is processed and how we use electricity in our homes. He also spoke of safety. The EMF debate discussion was very interesting. There are many possibilities in electric/solar vehicles.

■ He talked about electrical safety, what was actually harmful, and what you should do to avoid being shocked. Then he showed how electricity is made, amplified, stored, and shipped to your house. He discussed how and where voltage is split so that there

isn't more power than needed through any one circuit. He talked about the government and how it grants a certain area to a certain company and also sets the prices so that we're not overcharged. Deregulation would cause prices to come down while competitiveness went up. He ended by talking about electro-magnetic fields and other interesting things.

■ Safety tips include advice not to be the path for the electricity to something else. Conducting electricity causes muscles to fibrillate. Companies transmit power at high voltages because less heat is lost and money is saved. Funny guy - the material was not that interesting to me, but his presentation made it more interesting.

■ I think he did a great job! He was excited to talk about his subject and he presented the subject well. He kept us interested and involved.

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Ray Coveney, UMKC Professor of Geosciences, spoke to us Jan. 26 on **GEOLOGICAL PROCESSES: FROM SEDIMENTS TO VOLCANOS**. Students responded:

■ A broad overview of Geology -- from plate tectonics to vacuoles measured in microns. Mr. Coveney conveys knowledge and great enthusiasm for the subject.

■ Geology combines physics, biology, chemistry, and even history. Mineral deposits and mining are the most practical applications of geology. A few principles of geology include: the theory of plate tectonics, which contributes to the formation of mountains and ridges; magmatic activity, which contributes to the formation of basaltic rocks and other rocks formed at high temperatures; erosional formations, which form sea shore formations through wave action and sedimentary formations; solution activity, which forms cold cave formations and ore deposits. I enjoyed the discussion of "fluid inclusions" -- WOW!

■ This was just one of those really good enrichments. I have always been fascinated by things like this.

■ We were able to see some quartz under a microscope. We also saw different kinds of processes throughout the U.S. Most of the

rocks in Kansas City are either limestone or shale. Fossils of sea lilies have been found in K.C. The slides were good and the different processes around the world were quite interesting. I also enjoyed the different pictures of ores and the actual hands-on material was great!

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#### UPCOMING

On Feb. 9, UMKC Physics Professor David Wieliczka will bring back his popular talk **LASERS AND HOLOGRAMS**.

Kay Weiss, an astronomer from Kansas City Kansas Community College, will join us on Feb. 23 to speak on **STELLAR EVOLUTION**.

On Mar. 8 we will make our second annual Field Trip to the **UMKC PHYSICS DEPT**. Last year we toured laboratories in: **Surface Physics** (Dave Wieliczka), **High Pressure Physics with Diamond Anvil Cells** (Michael Kruger), **Atomic Force Microscopy and Scanning-Tunnelling Electron Microscopy** (Da-Ming Dhu), and **Photo-Luminescence** (Jerzy Wrobel).

Our speaker for Mar. 22 has not yet been confirmed.

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#### 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.

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

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

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#### \*\* CHANGES \*\*

(91-92) Jeff Schreiner  
schreinerjt96@c520.usafa  
@codetrail.usafa.af.mil  
U.S. AIR FORCE ACADEMY

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

- (89-90) **Mark Lambros**  
lambros@umr.edu  
UNIV. OF MO - ROLLA
- (90-91) **Jared Coleman**  
jcoleman@umkc  
UNIV. OF MO - KANSAS CITY
- (90-91) **Jacquelynn Morris**  
c570701@showme.missouri.edu  
UNIV. OF MO - COLUMBIA
- (91-92) **Jerry Morton**  
jmorton@vax1.umkc.edu  
UNIV. OF MO - KANSAS CITY
- (92-93) **Richard Fulton**  
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KANSAS STATE UNIVERSITY
- (93-94) **Mark Cleveland**  
mccleveland@oz.manc.edu  
MID-AMERICA NAZARENE COLLEGE
- (93-94) **Ginny McCarty**  
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avila.mail  
AVILA COLLEGE
- (93-94) **Joshua Small**  
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- (94-95) **Aimee Newell**  
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- (94-95) **Rachel Roberts**  
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vanderbilt.edu  
VANDERBILT UNIVERSITY

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### **WE HEAR FROM PAST STUDENTS**

**STEPHANIE (McGUIRE) ZECH (90-91)**  
(Management Major)

"I am working currently at Gateway 2000, a direct market PC retailer. I am currently up for a promotion that would put me in charge

of training for the entire facility. That person at this time is my boss, so I am in charge of the coordinating of all different aspects of the training department. I am working on my bachelor's degree in management at Park College, which I expect to have completed by Dec. of 1996. I have yet to decide what my minor will be. I am also the proud mother of a wonderful little boy.

I thought MPI was great! Maybe not so much while I was there, but when I got into college, it was a breeze compared to what I had taken at MPI!! But seriously, MPI did prepare me for the tough, high-level science and math classes I have taken.

I may be working for a management degree now, but I know that my love of science will take me back in that direction. As I said before, taking A & P, Micro, Physics II, Calc II, etc. just didn't seem so difficult after tackling it first in the MPI environment. It gave a feeling of a "safety" net that we could fall on if we failed in class. In real life, things aren't that easy, nor are they as "safe" as we sometimes want them to be.

Thanks to the entire staff, especially Al Morse, who helped me turn around when things seemed tough."

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**JASON VAN NATTA (91-92)**  
(Nursing Major; Pre-Med Minor)

"The courses I've taken since MPI contained much more material and were faster paced than those at MPI; but lacked the individual instruction and quality of explanation. I would have to say from a percentage standpoint I learned and retained more from MPI classes. So often at universities you are forced to memorize and regurgitate info just to forget it later.

[MPI] definitely helps with study skills and so forth. Most people don't have to study at all to do well in high school, but college is an entirely different ballgame. The amount and speed at which information is covered won't allow you to "get by" (in upper level classes that is). It is also a good social experience getting you out of your secure little niche. Most of us



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have gone to school with the same people for many years and the integration at college is a shock.

Just keep the program alive. So many students go unchallenged in high school. This causes them to either fail to achieve their full potential or worse yet go to college with a false sense of security and not do well. MPI also boosts your self confidence. While many people are taking the easiest classes they can just to "get out of school," MPI students are doing and learning things that will be helpful in anyone's future regardless of their career choice."

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**LESLIE (FARROW) BAY (91-92)**  
(Accounting Major)

"MPI is one of the best classes I've ever had. The instructors made learning interesting and fun. I miss it, you don't see many like them and it was a pleasure to be a student there.

College is so different from high school. High school was a breeze. Now I have to study and earn my grades. MPI was a great help to me. It helped in the transition process. MPI helped me learn good study habits, how to keep up with a faster pace of education where you actually cover the entire book and not just  $\frac{1}{2}$  of it.

Any senior that is planning to go to college should enroll in MPI. I'm very glad I did. I didn't go into advanced math, physics or engineering but just the experience was worth it. The teachers are great! They are very understanding and helpful. They are there to help you learn!"

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**VALERIE SUMMERS (92-93)**  
(Animal Sciences Major)

"Keep up the good work! I'm glad to see that there are more schools participating in this program. It isn't until you have a physics class with 200+ students that you realize how lucky you are to be a part of the MPI program, and to get those physics and calculus credits out of the way when you have more than one instructor who is willing to help you, instead of one instructor and 4 or 5 teaching assistants who

can't be reached most of the time. I now regret not having pushed myself to get the grades at MPI so I wouldn't have had to take them again."

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**JOSH SMALL (93-94)**  
(Chemical Engineering Major)

"The participation in MPI has affected my later education. MPI forced me to study effectively my senior year, a quality few college students possess when entering college. It also allowed me to get a "taste" of college style classes. This allowed me to enter college knowing basically how things ran, making me feel a little more comfortable with class formats.

I know that you stress study skills, and the importance of it, but I would recommend taking one of the first couple of class periods giving advice on how to study properly and effectively. Knowing how to study for tests, regular homework, and knowing how to read a text for comprehension are extremely valuable skills. This allows the student to study less and receive better results in class. If a habit is formed early then failure in class is less likely to occur. Lack of study skills is the number one problem I see in my peers. I have recently read Ron Fry's "How to Study" book and it gives excellent tips, advice, and "how to's" that have helped me immensely. You might suggest this book to some of the students."

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**TRANG TRAN (93-94)**  
(Chemistry Major)

"MPI classes prepared me for college classes because it gave me a college setting, and the instructors taught me thoroughly about the subjects. I just had a course in math at my college and I wished that an MPI instructor was teaching the class. MPI courses were just as in-depth in their subjects."

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**GINNY McCARTY (93-94)**  
(English Major)

"Since MPI, I have only taken one math class and no physics courses. The math class that I took

was interesting and reminded me a little of MPI. However, the teachers are friendly with students at my college though they cannot compare with the warm atmosphere of MPI. The instructors at MPI are on an excellent level with the students.

I am on my way to becoming a teacher now. From my experiences at MPI I learned that teamwork is vital to education. The opportunity to work with others at MPI was wonderful. Another aspect that I appreciated at MPI was the size of the classes. The smaller class size helps students and teachers interact with each other.

I would just like to say that I really appreciate the experience of MPI. Thanks to all those instructors that helped me out!"

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

"MPI gave me a jumping board into college. I gained confidence and a solid base of mathematical knowledge. The credits that I earned through MPI are currently enabling me to graduate a semester early - but, instead of graduating early, I am taking the opportunity to study abroad with my extra semester. In addition, I have a solid network of friends at schools around Missouri ... friends that I made through the MPI. Even with my Psychology major, the courses that I took at the MPI are helping - in such areas as statistical analysis and experimental designs.

I definitely recommend MPI for anyone who wants to get the most out of high school and a good headstart on college."

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**MARK CLEVELAND (93-94)**  
(Computer Science Major)

"[The MPI] prepared me for what I was about to face in college. It gave me a lot of confidence in my academic abilities that I never would have had. It helped me a little more in working with other people on labs, projects and homework."

**ROSA NUÑEZ (94-95)**  
(Psychology Major)

"A very useful habit that I developed at the MPI is responsibility. The thinking that I had to do when taking the calculus and physics tests, have helped me to use logic problem heuristic strategies in my diverse college courses, especially in Psychology. Specifically, the MPI made me a more mature person."

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**MARLENE TOOLE (94-95)**  
(Biology Major)

"Most of the thinking and reasoning I developed because of MPI had to do with personal organization and planning to fight my instincts - procrastination!

[The MPI is] great preparation, it's free college hours, the instructors are caring and helpful, it's a good chance to meet people and to get a pretty good idea of how well your high school has prepared you, and it's fun (most of the time).

Keep up the great work. This is a fantastic program that really benefits us, and you all seem to understand that we have seven other classes on a high school schedule and give us time to complete the work you assign. Overall, I am a much better person for the experience."

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**RACHEL ROBERTS (94-95)**  
(Cognitive Science Major)

"Doing equilibrium problems (statics) in physics helped to develop greater analytical thinking; I can better look at all the variables in a given problem and isolate the forces that have the most effect on the problem situation; by scrutinizing those forces, I can arrive at the most viable solution I can. (So physics helped my problem-solving in a general sense.) Writing up physics labs encouraged synthesizing and summarizing and writing skills.

I believe that my intellectual curiosity was encouraged [at the MPI], and my ideas were treated with respect, which helped give me greater intellectual self-confidence."

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**MORE 1995-96 STUDENT  
IMPRESSIONS**

"MPI has been an interesting experience so far. I've had to study more for these two classes than I have for any other classes in high school. I'm sure it's good experience for college, though. Studying in groups is very helpful also. Not only does it help you learn if you don't understand, but it's good even if you do. Explaining to others helps you learn the material more thoroughly. Besides, it's a lot more fun to be with a group of friends than it is to study all alone. So, if anyone wants to join our group, feel free to talk to any of the Chrisman students. The more the merrier!"

**Tina Jensen**  
Wm. Chrisman High School  
Independence School District

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"MPI is hard for me. When I began to study MPI, I [was] bored because I understood just a little English. I always want[ed] to give up, but Mr. Cook, and my friends encouraged me and gave me good advice. I'm continuing [to] study. Before I came to the U.S., I already [graduated from] high school when I was in Vietnam. I [use] my own knowledge that I learned from Vietnam High School and practice more on calculus and physics [in the] MPI program.

I also need Mr. Cook to help [with] something I don't know. [He is a] big help for me. I try to study more [and] more in MPI. I hope, [at] the end of the year, I still get my grade [of] "C"."

**Tien Nguyen**  
Northeast High School  
Kansas City, MO School District

[Editor's Note: Tien's English may be weak, but her work so far in both Calculus and Physics is solid!]

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"MPI, the toughest, roughest, earliest, most difficult yet most beneficial, most enriching, and most college-like class with the toughest, roughest, smartest, nicest, funniest, most wise, and most intelligent teachers I've had in my high school

experience. Need I say More?"

**Sam Yoo**  
Ft. Osage High School  
Ft. Osage School District

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"When the option of attending the MPI was introduced to me, I wasn't so sure about it. It would be the first time in my life that I would attend classes where everybody in them were "the best of the best!" Luckily for me though, I had a friend who was currently enrolled in the program. He convinced me to give MPI a try because maybe it could prove worthwhile to me as it did for him.

Now that I'm here, I kinda like it. I've met a lot of new people and I'm gettin' a taste of what "real" college is all about. So now I know what to look forward to ... a whole lot of studying! But all in all, MPI has given me the chance to see just what I'm made of. I'm glad I got the chance to experience MPI to its fullest. Thanks for the challenge."

**Gina Calvert**  
Van Horn High School  
Kansas City, MO School District

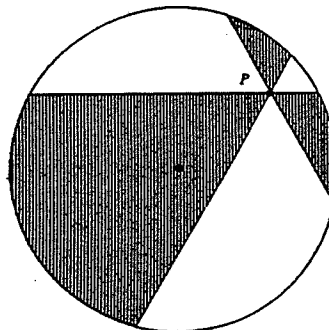
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**A SOLUTION TO  
MATHEMATICS CHALLENGE #41**

Recall the problem statement:

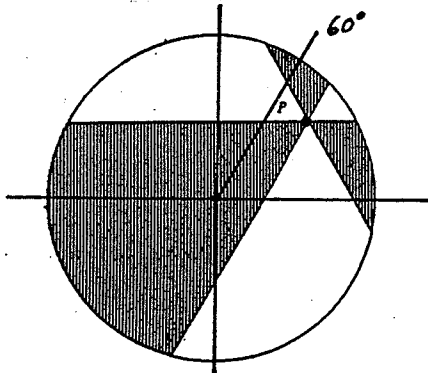
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Let P be any point inside a circle, and draw three chords through P making six  $60^\circ$  angles at P. Color the six "pizza slices" alternately black and white, as shown below. This creates a 3-part white region, and a 3-part black region:



Prove that whichever 3-part region contains the center of the circle has the larger total area.

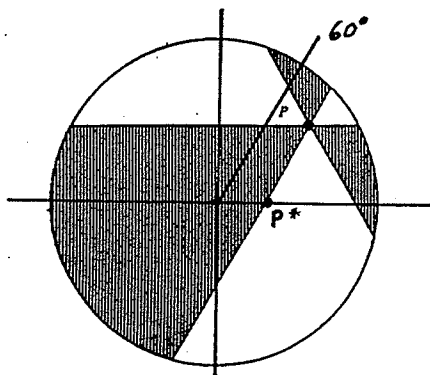
**REMARK:** To make this very specific, we can assume that the circle is the unit circle (radius 1) centered at the origin, that one of the chords through  $P$  is parallel to the  $x$ -axis, and that  $P$  lies in the region of the circle corresponding to the angles  $0 \leq \theta < 60^\circ$ , as shown below. [No generality is lost by any of these assumptions, because any other configuration can be rotated into one like this.]



[From: Mathematics Magazine, Oct. 1995, p. 312.]

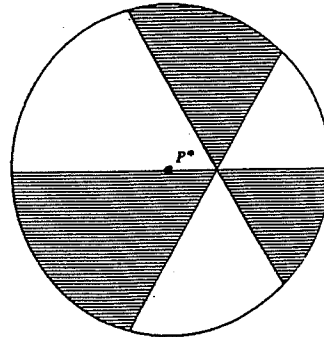
**SOLUTION:**

We'll show that the 3-part region (shaded above) containing the origin (= the center of the circle) has area greater than or equal to half the area of the pizza, and hence has the larger total area, as desired. First, let  $P^*$  be the intersection of the  $x$ -axis (horizontal axis) with the cut in the direction of  $60^\circ$  as marked in the figure below:

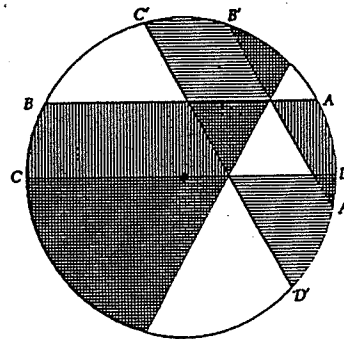


Now, take a new pizza (of the

same size) and make cuts parallel to those on the first pizza, but this time through the new point  $P^*$ . Then, by construction, the shaded 3-part region on the new pizza corresponding to the shaded 3-part region on the first pizza has exactly half the area of the new pizza. Just look at the figure below!



We would be finished if we could show that the shaded 3-part region of the first pizza has area greater than or equal to the shaded 3-part region of the new pizza. Toward that end, overlay the two pizzas as in the figure below:



The picture is the proof! That is, in our comparison of the two pizzas we disregard the doubly-shaded (crosshatched) regions, since they occur in both pizzas, and compare only what remains, namely the horizontal "strip" ABCD from the first pizza, and the diagonal "strip" A'B'C'D' from the new pizza (without their doubly-shaded intersection, of course.) These "strips" are of equal thickness, by construction. However, since A'B'C'D' is at a greater distance from the origin, clearly ABCD has the larger area. Thus, the original shaded 3-part region of the first pizza has the larger total area as desired, since its area is greater than or equal to the shaded 3-part

region of the new pizza, which in turn is greater than or equal to half the area of either pizza.

[This solution is due to Paul Deiermann and Rick Mabry, Louisiana State University in Shreveport, LA, published in Mathematics Magazine, Oct. 1995, p. 312.]

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### A SOLUTION TO PHYSICS CHALLENGE #32

Recall the problem statement:

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To the nearest power of 10, how many railroad cars will it take to reach across the United States?

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#### SOLUTION:

The distance across the U.S. is most certainly much more than  $10^2$  miles and much less than  $10^4$  miles. Thus to the nearest power of 10 the distance across the U.S. would be  $10^3$  miles. To the nearest power of 10 there are  $10^4$  feet/mile. The length of a railroad car is much more than  $10^1$  feet and much less than  $10^3$  feet, so to the nearest power of 10 the length of a railroad car would be  $10^2$  feet/car. Thus the number of cars it takes to reach across the U.S. is:

$$\frac{(10^3 \text{ miles})(10^4 \text{ feet/mile})}{10^2 \text{ feet/car}} = 10^5 \text{ cars.}$$

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### MATHEMATICS CHALLENGE #42

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A café is furnished with round (circular) tables and square tables. [Tables of the same shape are the same size.] Each round table is completely covered by 4 equal square napkins, and each square table is completely covered by 4 equal round napkins. Show that:

- The diameter of a round napkin is  $\geq$  half the diagonal of a square table, and
  - The side of a square napkin is  $\geq$  the radius of a round table.
- 

[From: V. Proizvolov in Quantum Magazine, Jan./Feb. 1996, p. 15.]

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### PHYSICS CHALLENGE #33

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When the mass of a body placed in the center of a square table exceeds a certain value  $m$ , the table's legs break.

Find the regions on the table's surface where a body of mass  $m/2$  can be placed without breaking the table's legs.

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[From: O. Batishchev in Quantum Magazine, Jan/Feb. 1996, p. 19]

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Editor/Writer: Richard Delaware

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