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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:

Todd Reimer	(Fort Osage)
Mark Crawford	(Northeast)
Khanh Tran	(Northeast)
Christopher Bird	(Truman)
Paul Grutter	(Truman)
Jeff Hoskins	(Truman)
Matt Roberds	(Truman)
Jason Anderson	(Wm. Chrisman)
Shalom Barber	(Wm. Chrisman)
Kendra Van Tuyl	(Wm. Chrisman)

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### OUR NEW LOGO

We hope you'll enjoy the appropriately mathematical MPI logo above, which we have finally adopted for this newsletter, though it has always appeared on the front of our MPI T-shirts and sweatshirts.

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### PC LAB -- THE RETURN!

On Jan. 18, 1991, Section C (those 7 students taking both Calculus I and II over the course of the year) was finally able to return to our MPI experiment in using the UMKC Engineering PC Lab as an integral part of teaching Calculus. (Our experiment, as you recall, was interrupted when the Lab was burglarized over the weekend of Oct. 13, 1990.) We once again have the use of five 386SX PCs and printers, and have access to the software DERIVE and CALCULUS.

As the possibility grows that the MPI will furnish its own PC lab

next year, we look forward to the careful and detailed comments from this year's student-users.

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### RECRUITMENT VISIT -- FEB. 12

On Tuesday Feb. 12, we are inviting interested juniors and their teachers, from the six high schools involved in the MPI program, to tour the MPI at 8:30 am, and afterward to hear a presentation, including speakers, slides, demonstrations, and of course DONUTS! Last year over 130 students attended. Once again we will be using current MPI students to escort the five groups, and to share with them later their frank feelings about participating in the program.

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### TEAMS TEST TEAM -- 1991

This year the annual TEAMS (Tests of Engineering Aptitude, Mathematics and Science) test is dramatically changed. Instead of six individual 40 min. tests in the areas of Biology, Chemistry, Computer Fundamentals, Mathematics, Physics, and English, taken separately by separate students as in the past, this year ONE two-hour test, made up of six sections in the areas listed above, will be taken by the ENTIRE team together during that one marathon 120 min. period. In addition, this year's test is open book and notes!

We hope that under these new rules, our MPI emphasis on working in groups will partially compensate for our perennial lack of time to prepare. We will nonetheless be having several preparation sessions, and wish our team of the following eight MPI students the best of luck:

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Jason Anderson	Matt Roberds
Shalom Barber	Jennifer Spungen
Mark Crawford	Khanh Tran
Sheri Harrison	Kendra Van Tuyl

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and hope for a lifting of spirits.

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#### MATH FACULTY TO MEETINGS

This semester several MPI mathematics faculty members will be traveling to mathematics meetings:

Al Morse (Wm. Chrisman High School) has already worked on and attended the KCATM (Kansas City Area Teachers of Mathematics) Winter Conference on Jan. 19, in downtown Kansas City.

Feb. 24-26, Sheri Adams (Truman High School) will attend the Interface Conference at Tan Tara.

From April 17-20, Joe Kaifes (Van Horn High School) will attend the 69th Annual Meeting of the NCTM (National Council of Teachers of Mathematics) in New Orleans.

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#### ENRICHMENTS

##### FOLLOW UP

Our Christmas party of Dec. 14 had many funny moments: a Birth of the Calculus skit, an MPI Rap, and the 12 Days of Christmas sung with friendly digs at the MPI. This last song had one memorable line shouted out in the spirit of the familiar Medic-Alert commercial "I've fallen and I can't get up", except that OUR version was: "I'm failing and I can't get out!"

At the Jan. 2 Panel Discussion we were fortunate to have among our MPI alumni guests, Robin Crick (formerly, Steen), a first year (84-85) MPI graduate, who discussed at length her MU college career and her current employment as an accountant in the KC Area. She was articulate and clearly outlined a realistic path through the college years on to a profession. Many other former MPI students also attended. Listed below are the annual Panel Discussion dates with the number of MPI alumni

#### TEST ANXIETY WORKSHOPS

Every year we have MPI students who find taking tests, especially college-level tests for the first time, a trying experience. We often see these students do well in problem-solving sessions, clearly demonstrating to us their command of the material, and then produce poor work on our college tests. So, on Tues. Jan. 29, and then again for follow-up on Tues. Feb. 5, 1991, David Wakefield of UMKC's Counseling and Placement Center, will conduct one hour workshops at the MPI, to address this phenomenon of talented students who have yet to learn how to approach a test with reasonable calm. Approximately 15 students have expressed interest, and we will keep you posted here on the results.

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#### MATHLETICS VS. 2ND SEMESTER SLUMP

Since MPI students are all seniors, come second semester we perennially face the dreaded "senioritis" syndrome, wherein even the best students long for an end to their high school years, and find it difficult to motivate themselves to study their Calculus and Physics. This year we have designed a campaign to boost interest during this slow March-April period.

In addition to a selection of fine second semester speakers (see ENRICHMENTS below), including two women, a guest from NASA, and a Nobel Prize winner, we will hold our first annual MPI Mathletics Contest for the MPI class of 1990-91.

This contest will require speed, teamwork, and of course, mathematical knowledge. We will award prizes and have refreshments,

attending each year:

Panel #1 - Jan. 3, 1986 - ?  
Panel #2 - Jan. 7, 1987 - 29  
Panel #3 - Jan. 6, 1988 - 21  
Panel #4 - Jan. 4, 1989 - 21  
Panel #5 - Jan. 3, 1990 - 29  
Panel #6 - Jan. 2, 1991 - 19

On Jan. 8, we were visited, in a special enrichment, by James 'Tom' Sawyer, a professional Civil Engineer, Chief Operating Officer and Vice-President of Greiner Engineering, one of the country's largest transportation design firms, and current president of the ASCE (American Society of Civil Engineers). He was very down-to-earth in his southern manner, and the students enjoyed his talk. He emphasized Calculus and Physics as absolutely necessary foundations for any engineering work, and left us with one unusual statistic: Out of every 10,000 people in Japan there are 1 attorney, 3 accountants, and 600 engineers, while in the US the numbers are 20 attorneys, 40 accountants, and only 70 engineers!

Jan. 23 brought UMKC Physicist David Wieliczka to discuss light, lasers, and holography. He used the MPI computer to illustrate constructive and destructive light wave interference, then described diffraction, and showed us three holograms. Finally, noting uses from sharpening fuzzy negatives with a spatial filter and non-destructive testing of circuit boards to compact disk players and laser printers, Dr. Wieliczka briefly outlined the exciting and fast-growing field of optical engineering.

#### UPCOMING ENRICHMENTS

On Feb. 6, Karin Bauer, Principal Applied Statistician at Midwest Research Institute, will briefly discuss how she became a statistician, and explain in detail some of the projects she's worked on over the years.

Feb. 20 brings back for a second annual visit, Shelley Wolff, a civil engineer specializing in highway design, and a participant in the Women and Mathematics program. Her talk will follow by a week and expand upon our annual Highway Slope Design mathematics project here at the MPI. This Applied Mathematics Project was designed by the MAA (Mathematical Association of America) to introduce students to some of the actual applications of mathematics (in this case, calculus) to real affairs. We use it also as a welcome break from the winter routine of classes.

On Mar. 6, Larry Deaton, Assistant Superintendent for Secondary Education of the Fort Osage School District, has a talk for our weary seniors which we hope will lend them some insight into their own motivations and directions. He will discuss the characteristics of birth order positions, and the effects of birth order on learning and education, sibling rivalry, marriage, and interpersonal relationships.

On Friday Mar. 22, in a special enrichment, we are extremely pleased to host the second Nobel Laureate ever to visit the MPI. Dr. Roald Hoffmann survived the Nazi occupation of Poland, came to the US in 1949, and has become one of the world's leading chemists. Currently at Cornell University, he shared the 1981 Nobel Prize in Chemistry with John Newman and Kenichi Fukui for their work in applying the theories of quantum mechanics to predict the course of chemical reactions. He is in the Kansas City area to give a talk entitled "Molecular Beauty" at UMKC on Thurs. evening, Mar. 21, and being an established poet, will participate as well in a poetry reading later Friday at 4 pm.

With the help of Charles Wurrey, a former MPI enrichment speaker himself, we have been lucky enough to convince Dr. Hoffmann to address our MPI students Friday morning. Whatever

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he decides to discuss, all of us here at the MPI will be honored by his gracious agreement to speak.

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MPI: FROM THE INSIDE

by Julie Park & Jill Blake  
(Class of 1990-91)

Late nights, low GPAs, frequent cranial explosions and nearly impossible tests. Welcome to the Mathematics and Physics Institute.

It isn't just a group of hyper-active kids who enjoy getting up before dawn to get some advanced education in college-level physics and calculus, but rather a time to get into the mode of transition from high school to college life.

"Going to the Institute has opened my eyes to what college is really going to be like - hard. MPI is a sort of medium between high school and college because it's fun, too," Jennifer Spungen, Truman student, said.

And boy, do we have fun! Enrichment speakers varying from Neandertal Man to Space Industrialization are guests at the Institute every other week. And physics experiments take up every non-enrichment week, which takes up the entire two-hour block of classes.

The tests are also another aspect of MPI that tends to be different and difficult. The students can study until they drop but sometimes they still fail the tests.

"They are challenging. I don't think any test really measures what you learn. You can study the night before and understand the material but still bomb the test," Van Horn student Anthony Hall said.

However, there are a few, very few, students who actually appreciate

what the Institute is trying to do for us in the way of making learning more interesting and to get the students and parents involved in the educational process.

"I appreciate the Institute because it breaks the monotony of going to school everyday doing the same things. We have enrichments and labs, so most weeks turn out at least a little different from the previous week," Paul Grutter, Truman, said.

"I think that it (Open House) was a great opportunity for our parents to see what the MPI is, what we do here and how we do it," Fort Osage student John Gribble said.

But perhaps Wm. Chrisman student Jenny Myers sums up what most students think of the Institute:

"MPI: where GPAs disappear, never to see daylight again."

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PAST STUDENTS WRITE TO US

MICHELE KLIEBERT (87-88)  
(Special Education Teacher)

"I began working as a teacher at the Truman Neurological Center. I have a class of seven adults - all have cerebral palsy and severe mental retardation. They are great and I have finally discovered what I was meant to do.

MPI really prepared me for all of my college classes. This includes everything from taking notes, tests, and listening in class to arranging my time outside of class. It also helped many of us to gain a lot of self-esteem in the process."

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VANESSA KEMPER (nee' WHITE) (87-88)  
(Mathematics Major)

"Self discipline is a necessity in college and is taught at MPI.

The best thing about MPI for me was the opportunity to meet new people. Students in college must meet new people and learn to work with them. The fact that MPI is made up of students from many schools is one of the best things about it."

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RYAN BAKER (87-88)  
(Mechanical Engineering Major)

"I am glad I went to MPI. It made me aware of certain study habits I needed to change. I knew exactly what to do my first semester in college. Some students were 'shocked' and couldn't adjust right away. Also, I took Calculus over my first semester because I thought I didn't know it well enough. I was wrong. I made an A with minimal effort. MPI allowed me to make my mistakes early instead of making them in a class that cost money and that could hurt my GPA."

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MARIA AGUILERA (86-87)  
(Chemical Engineering Major)

"My participation at MPI has enabled me to excel in later courses because it gave me confidence to follow a more difficult and substantive degree than I otherwise would have. -- The quality of teaching at MPI is SUPERB."

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ERIC BAKER (85-86)  
(Medical School)

"I have 18 months left until I graduate...There are several goals I have. I'm thinking about specializing in internal medicine. My residency upon graduating may be with the Air Force or a civilian hospital. I owe the USAF 3 years 'pay back' time after I graduate, so I may be sunning in Saudi Arabia in 18 months, who knows?

I would still recommend the MPI to any high school senior. It gives

you a feeling for college, the real world."

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SETH McMENEMY (88-89)  
(Electrical Engineering Major)

"The atmosphere of MPI itself, I think, helped me pre-adjust to the more relaxed, less structured college atmosphere. It helped me develop the initiative everyone needs to stay on top of their studies. Even though college is a lot less structured, the MPI does a good job of exposing students to what is expected of them in college. In college the education is yours, you pay for it, you work at it, you build it. MPI helped me see that it's my responsibility to get help, to study, to understand."

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ERIC BUTKOVICH (86-87)  
(Law School)

"The credits I earned at MPI were especially useful, allowing me to graduate and enter law school after only 3 years of college at UMKC...Keep up the good work."

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JOHN BUCKLEY (86-87)  
(Physics and Mathematics Major)

"The quality of the MPI courses have always equalled or have been better than those taught at UMC. I am especially impressed with the extra concern expressed for us students during that most critical time in our educational careers.

Again, I wish to express my appreciation for all who have made MPI possible. The program has definitely influenced my academic career. I strongly recommend this program to all who show strong interest/motivation in math/physics. Wonderful program!"

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GREG WRIGHT (85-86)  
(Mechanical Engineer)

"I am working in the hydropower section of the Corps of Engineers in Kansas City. My main duties are keeping the Truman Power Plant and Stockton Power Plant running.

Try to relate to the students the importance of Calculus and Physics and how they will use the subjects later on."

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PAT LIANG (86-87)  
(Medical School)

"As a second year resident assistant at Foster Quad, Indiana U., I am exposed to different types of people each day. Seeing this on a smaller scale at MPI allowed me to increase my diversity awareness and to help in these everyday interactions.

MPI has proven to be a very profitable experience as I look back on it 4 years later. I could not have succeeded on a campus of 37,000 students had it not been for the 'small college' experience I had at MPI. Thanks..."

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DANIELLE GLOSSIP (89-90)  
(Anthropology Major)

"Hello MPI! I want to thank you so much for inviting me to be a part of the enrichment lecture on Wednesday. (NOTE: Wed. Nov. 21, 1990, Dr. David Frayer from KU discussed at the MPI the Emergence of Modern Man, Neandertal man, etc.) I found Dr. Frayer to be quite interesting, and he actually helped me to understand what we talked about in my Physical Anthropology class here at Washington U. just a week before... Again, thank you so much for having me."

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1990-91 STUDENT QUOTES AGAIN

"In my opinion MPI is a wonderful opportunity for high school students to get a jump on math and science for college. The Institute has helped to prepare me for the challenges that are waiting for me in college. My only regret is that not all high school students can take advantage of these college courses."

Mark Crawford  
Northeast High School  
Kansas City, MO School District

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"Until recently I believed that I could get by without doing much homework; then it became time for finals. I learned that they were right when they kept saying 'keep up', 'Do your homework'."

Mary Noah  
Wm. Chrisman High School  
Independence School District

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"I am glad I am going to the MPI. There is a fun learning environment (there). I don't want to mislead anyone, it is not an easy program. Unlike high school, you have to work hard for an A or B. The teachers are helpful and ... This program will prepare you for college and whatever else lies ahead."

Junior Salamasina  
Fort Osage High School  
Fort Osage School District

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"As I walk down the x-zubering path MPI abruptly stuck in front of me, I conclude from my ponderous ponderings that my senior year would be lacking something had I not enrolled in this program. To meet all these intellectually inverted people and go to those spiffy enrichments is something I wouldn't have traded for all the lime Jell-O cubes in the world."

Don Wolfgeher  
Truman High School  
Independence School District

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## PROFILES IN SUCCESS

In this edition of the MPI newsletter we feature Robin (Steen) Crick. Robin participated in the MPI during our first year (1984-85). After graduating from Truman High School, Robin attended the University of Missouri-Columbia, where she majored in Accounting. While at UMC Robin was active in the Kappa Delta Sorority, Phi Chi Theta Business Fraternity, the Association of Accountancy Students and was a member of the Golden Key Honor Society. Robin graduated from UMC in 1989 with an outstanding 3.5 grade point average.

Robin is employed by Directories America, a subsidiary of United Telecom in Overland Park, Kansas. She began as a cost analyst and has moved up to the tax accounting department, and spends part of her time as a Special Quality Facilitator.

Outside of work Robin is a member of the Toastmasters International Club, Alumni Advisors Board of Kappa Delta, and is Membership Vice-President of the Greater Kansas City Alumni Group of Kappa Delta. In her "spare time" she enjoys playing volleyball and softball on club teams. Robin lives in Overland Park with her husband, John, who is also a graduate of Truman High School and UMC.

Robin says her experience at the MPI was very valuable, and helped her prepare for college courses. "Every student should participate!"

We at the MPI are very proud of Robin and her accomplishments. She has our best wishes for continued success.

Richard Waring

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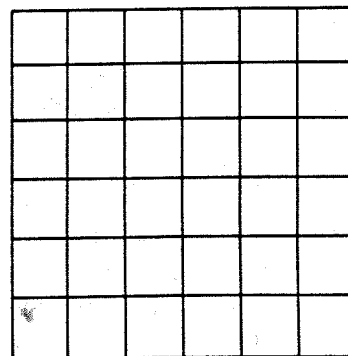
A SOLUTION TO  
MATHEMATICS CHALLENGE #16

Recall the problem statement:

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Can 18 two-inch by one-inch dominoes be assembled into a solid square in which NO straight line formed by the edges of the dominoes joins opposite sides? (Such a square is called "fault-free".)  
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SOLUTION:

NO fault-free arrangement is possible. Consider for instance a 6 in. by 6 in. grid, which has 5 vertical and 5 horizontal grid lines, as shown below:



When covered by the eighteen 2 in. by 1 in. dominoes, the assemblage will be fault-free if each grid intersects at least ONE domino.

Every vertical grid line has an EVEN number of squares to its left. Since each domino occupies an even number of squares, parts of any 'cut' dominoes also must occupy an EVEN number of squares to the left of the line. So, if it is not to be a fault line, every grid line must cut at least TWO dominoes. No domino can be cut by more than one grid line, so a total of 20 dominoes are needed to correspond to the 10 grid lines. But only 18 dominoes are available! Thus, at least one grid line must be a fault line.

[Solution by S. Golomb, Scientific American, Dec. 1960, p. 168.]

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A SOLUTION TO  
PHYSICS CHALLENGE #7

PHYSICS CHALLENGE #8

Recall the problem statement:

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Hold a yardstick horizontally on your index fingers and slide your fingers together smoothly. Does the stick slide smoothly over your fingers? No, it slides first on one finger and then on the other, and so on. Why does the sliding change back and forth?  
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SOLUTION:

The finger that is first moved slides beneath the stick with a KINETIC coefficient of friction. The stick does not slide over the other finger because the STATIC coefficient of friction there is larger. Now, the magnitude of the friction on either finger depends not only on the coefficient of friction, but also on the WEIGHT of the stick on the finger. As the MOVING finger is brought toward the center, more and more of the stick's weight is on that finger. Eventually the friction on that finger is greater than that on the other finger, in spite of the difference in coefficients of friction. At that moment, the first finger stops, and the other finger begins to slide. Such an exchange of motion can occur several times before both fingers are at the center.

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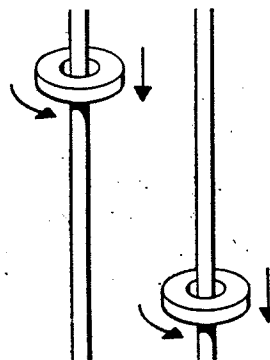
MATHEMATICS CHALLENGE #17

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Solve the following system of equations:

$$\begin{aligned}x + 7y + 3v + 5u &= 16 \\8x + 4y + 6v + 2u &= -16 \\2x + 6y + 4v + 8u &= 16 \\5x + 3y + 7v + u &= -16\end{aligned}$$

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'Fiddlesticks' is a remarkably simple, yet fascinating toy. It consists of a plastic ring (of relatively large inner diameter) on a stick. Once the ring is sent spinning by a flick of your fingers, the stick is held vertically. The ring begins to drop (slower than you might expect), and as it comes down the stick, the ring spins faster and falls even slower! (See the figure below.) By inverting the stick just before the ring reaches the lower end of the stick, the process can be repeated indefinitely.



Why does the spin increase as the ring falls? In fact, why doesn't the ring just fall with the full gravitational acceleration?

[From: The Flying Circle of Physics, by Jearl Walker.]

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