



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:

- Tim Gengler (Fort Osage)
- Brent Thompson (Fort Osage)
- Gretchen Nguyen (Northeast)
- Vi Sach Son (Northeast)
- Richaela Riley (Paseo)
- Joe Chapman (Truman)
- Courtney Jones (Truman)
- Amy Williams (Truman)
- José Alcocer (Van Horn)
- Jeff Weston (Wm Chrisman)

RECRUITMENT DAY -- FEB 10

On Tuesday Feb. 10, 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 132 students.) They will arrive between 8 and 8:10 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 at 8:30 am, be seated for our slide show, which includes computer, calculator, and physics demonstrations. Afterward, we'll all take questions from the audience, finishing up at about 9:30 am.

FAREWELL

During the winter of 1984 I was asked if I would work with some Kansas City area school districts and UMKC, to develop a program in Mathematics and Physics, for talented and gifted high school seniors. I accepted the challenge and in September of 1984 we opened the Mathematics and Physics Institute (MPI).

Now, after 38 years of teaching, research, and service at UMKC, including 14 years as Director of the MPI, I am retiring. I will leave with many fond memories, and perhaps a few others.

I have seen the University grow from a student body of around 3,000 to more than 10,000 and the Physics Department grow from a faculty of 3 to 10 plus numerous research and teaching assistants and support staff. The Department has grown from a bachelors degree granting department to one offering masters and interdisciplinary PhD degrees. I have seen more new buildings added to the campus than existed when I arrived. These include buildings of Biology and Chemistry, the Law School, the School of Business and Public Administration, the Dental School, the Medical School, the School of Education, the Performing Arts Center, Royall Hall, a new Bookstore, General Service Building and Library, and additions to the gymnasium and Student Center. A new Technology Center is under construction.

I am honored to have had the opportunity to have been elected to successive terms as President of the National Physics Honor Society, Sigma Pi Sigma, and to have received the Alumni Outstanding Undergraduate Teaching Award at UMKC.

I am also fortunate to have received more than a million dollars in grants and contracts for teaching and research.

I am blessed to have worked with a number of teachers who, I think, are truly outstanding and have been with us since the inception of the MPI. They are Sheri Adams, Larry Harding, Al Morse, Joe Kaifes (retired), Calvin Nelson (retired), and Richard Delaware, who I hired to coordinate the calculus portion of the MPI. Richard has been of invaluable assistance. Jim Graczyk and Roy Cook replaced our retiring teachers and have made significant contributions to the success of the MPI. Our secretary, Doris Kirst, keeps everything running smoothly, and keeps me out of a lot of trouble by somehow getting things which I need completed, before I ask.

Perhaps my fondest memory will be that of seeing the students in my classes mature and grow intellectually, become independent learners, launch successful careers and become productive members of our society. Of the students who completed the MPI program 93% enrolled in college and two-thirds of those, who have had sufficient time, have earned one or more college degrees. For them this is a magnificent achievement. No fewer than ten are now medical doctors and others are in the Health Sciences Profession. A very large number are now practicing scientists and engineers. One has served as a senior advisor at the Pentagon, one solved a navigational problem in the Space Shuttle, one designs state of the art prosthetic devices, and several have entered the teaching profession. One student wrote us saying "If it were not for the MPI, I would be doing the same thing I am doing; only now I am designing cars for General Motors instead of working on them in my back yard".

My final request, before retirement, is to hear from all my former students.

Finally, I would like to thank the administrators and school board members of the Fort Osage, Independence, and Kansas City school districts. The MPI could not have been successful without your cooperation and support for the last

fourteen years.

Richard Waring
Richard Waring
Director

TO ALL MPI ALUMNI:

HAVE YOU GRADUATED FROM COLLEGE?

IF SO:
PLEASE CONSIDER BEING
AN ENRICHMENT SPEAKER

CALL (816) 235-1272

ENRICHMENTS

FOLLOW UP

Dec. 5, Frank Booth from the Kansas City Regional Crime Laboratories, returned with his very popular **SCIENCE IN THE CRIME LAB** talk.

Students responded:

■ He showed how ultraviolet photography was able to detect a shoe print or to show gunpowder burns. He showed how he identified finger prints and he showed how they used lasers on evidence that has been dyed to show finger prints. He showed how he could compare hair and how he could eliminate certain things. He could also tell fibers. This was the best speaker so far this year. This was also the most interesting subject we have had thus far.

■ Talked about evidence given when a gun fires. How powder discharges from it and how any bullet that is fired from a gun is marked specifically to that gun... He explained how your shoes are actually so unique through small nicks and cuts in the soles, that it's almost as unique as your finger prints.

■ I thought that this has been one of the most interesting speakers all year. The blood and blue spray was the most interesting part.

■ A chemical called luminal can be sprayed on a surface to see blood. It reacts with the iron and glows for about 45 seconds. Don't try to cheat the police - they can figure out everything. This was one of the most interesting enrichments so far, I especially liked the demonstration with the luminal.

■ This enrichment was a peek into a forensic chemist's doorway. Forensic chemists and other specialists at the crime lab must literally visualize more than can be seen by the naked eye. Using a substance called luminal, Frank Booth made ghostly blue prints appear where bloodstains were. This chemical reacts w/the iron in blood. Other than luminal many other technological advancements are used in solving criminal mysteries. Lasers, ultraviolet lights, and DNA are other uses. Frank Booth was one of the best speakers we've had this year. Not only did he remain relevant to the subject matter, but he also made it interesting w/slides, bullets, and other actual objects. He took command of his subject matter from start to finish.

■ He's in trace evidence, hair, DNA, and fibers. Compare bullet striations found at the crime scene with other bullets shot into a tank of water from a gun in question. Each striation is different for every gun because the drill used to make the hole is changed after every use due to wear. Rolls of plastic bags have different striations roll to roll. Stamping a gun changes the atomic structure. If it is filed off, it can be restored by using chemicals. Ultraviolet rays enhance everything, used in photographing shoe prints. Speedometer needles make impressions on the glass when they stop suddenly so you can see how fast they were going, if they were in a wreck. It was really cool. Now I can commit the perfect crime!

■ Showed us how easy it is to get something on someone. But with all of the possible ways, why do so many people still wonder whether O.J. did it or not?

Our 13th annual **PANEL DISCUSSION AND REUNION** on Jan. 6 was again held in Rm. 207, and moderated by Sheri Adams and Al Morse. As usual, each of the panelists discussed their college experience, their major, and/or work experience.

The alumni panelists this year were:

Josh Small (93-94)
Univ. of MO-Rolla
Chemical Engineering Major

Joanna Tucker (93-94)
Univ. of MO-Columbia
Physical Therapy Major

Pamela (Moseley) Stuck (94-95)
Univ. of MO-Kansas City
Secondary Education/Math Major

Ragan Buckley (95-96)
Harvard University
Government Major

Jennifer Coonts (96-97)
Central MO State University
Chemistry Major

Their presentations were clear and perceptive.

The following is a list of the 9 other alumni that visited. In all, 14 former MPI students attended.

Jennifer Musil (94-95)
Central MO State University

Jennifer Woolsey (94-95)
Rockhurst College

Amanda Benavidez (95-96)
Univ. of MO-Columbia

Robert Davis (95-96)
Longview Community College

Melinda Woolsey (95-96)
Concorde Career Institute

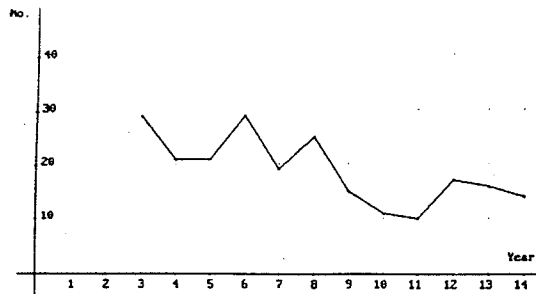
Stephanie Farnan (96-97)
Univ. of MO-Columbia

Corbin Jones (96-97)
Univ. of MO-Columbia

Sarah Thompson (96-97)
Univ. of MO-Columbia

Samantha Webb (96-97)
Univ. of MO-Columbia

MPI Alumni Attendance Years 3-14



NOTE: Of course NO reunion was held in Year 1, and the number in Year 2 was not recorded.

Some specific current MPI students comments were:

■ At MPI, you pick up good college study habits plus the reassurance of not having to take a fully loaded schedule just to ease your way into college life. Harvard, and most Ivy League universities, don't accept MPI credits, but it's still a good base to have. Sports can take a lot of time and keep you busy, the coaches usually get on you to keep your grades up. When you have a lot of free time, you may put things off. In a lot of schools, if you lose your scholarship, sometimes you can get it back when you raise it (grades) back up. Don't live with your best friend!

■ Most of them say it's much harder in college than in high school. Most of them don't want to waste any time at all, because it costs a lot of money to stay on the campus, and by the time their education is complete, they'll have a bunch of debt.

■ There were students from large schools and small schools, cheap schools and expensive schools. They told us about their individual school, the academics, sports, dorms, alcohol, and anything else we wanted to know.

■ Each person on the panel went to a different college. There were people from CMSU, Rolla, UMKC, MU, and even Harvard! They told us how MPI helped them in college, and how it was in comparison to life at their university.

■ All of them said the MPI really prepared them for college. A lot of

them had wished they had been more aggressive in finding and applying for scholarships. They encouraged us to apply for as many as possible. The next question was over sports, work, and school - can you do it all? They said yes, because of MPI they had learned to manage their time. I really enjoyed this. Before today I wasn't as serious about scholarships as I am now. The cost and paying for college didn't mean as much as it does now.

■ They discussed how MPI was beneficial to their college years, how they manage their time with jobs and sports, dorm and fraternity life, scholarships, study habits, and much more. Each student answered every question separately. It was helpful to hear some students talk about their experiences and about college life.

■ This enrichment was valuable, since for many, it directed a path of what we needed to do in order to achieve in college. It was an eye-opener.

■ The panel revealed their thoughts and observations on various aspects of college life. Afterward, we had donuts and juice and time to mingle, ask questions, or continue on work. The enrichment was really interesting and informative.

■ I think it is an excellent idea to invite students back from past years because they have gone through this program before and also have seen what is ahead of us all. They are able to give an excellent view into concerns that will be affecting our lives very soon. This certainly helps us to gain perspective on our motivation.

■ Students discussed what it was like to be a college student. They talked about the changes from high school, what they liked and what they didn't. They also discussed in what ways MPI prepared them for the college experience.

■ The alumni shared what they gained by attending MPI: credit going into college, problem-solving skills, and experience with group work. They also talked about juggling classes, work, homework, and sports. They discussed scholarship opportunities and how much they pay for college, plus how they like dorm life/sororities and fraternities.

Several students suggested taking classes in the morning so you'll have afternoons free.

UPCOMING

For our Jan. 30 enrichment, we have David Wieliczka, of the UMKC Physics Dept., returning to speak on **THE PHYSICS OF DENTISTRY**.

Friday, Feb. 13 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, will return to speak on **OUR FUTURE IN SPACE**.

Ron Schuchard, Professor of Ophthalmology and Physics at UMKC, joins us on Friday, Feb. 27 to speak on **VISUAL INFORMATION PROCESSING: HOW DOES THE BRAIN SEE?**

March 13, we will take our fourth annual trip to the **UMKC PHYSICS DEPARTMENT**. Last year we toured laboratories in: **Surface Physics** (David Wieliczka), **High Pressure Physics with Diamond Anvil Cells** (Michael Kruger), **Atomic Force Microscopy** (Da-Ming Dhu), **Photo-Luminescence** (Jerzy Wrobel), and **Scanning-Tunnelling Electron Microscopy** (Fred Leibsle).

As of this printing we do not have a confirmed speaker for our March 27 enrichment.

NEW (OR CHANGED) MPI ALUMNI E-MAIL ADDRESSES

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

** NEW **

- (89-90) **Hiromi Yokoyama**
k-office@mars.dti.ne.jp
YOKOHAMA JAPAN
- (91-92) **Scott Hummel**
shummel@hotmail.com
WILLIAM JEWELL
- (93-94) **Alex Maginness**
c642295@showme.missouri.edu
UNIV OF MO-COLUMBIA

- (93-94) **Joanna Tucker**
c709436@showme.missouri.edu
UNIV OF MO-COLUMBIA
- (95-96) **Benetta Fairley**
c701335@showme.missouri.edu
UNIV OF MO-COLUMBIA
- (96-97) **Stephanie Farnan**
c714073@showme.missouri.edu
UNIV OF MO-COLUMBIA
- (96-97) **Rebe Herling**
c715110@showme.missouri.edu
UNIV OF MO-COLUMBIA
- (96-97) **Corbin Jones**
c716580@showme.missouri.edu
UNIV OF MO-COLUMBIA
- (96-97) **Jigna Patel**
jiggiy@aol.com
ROCKHURST COLLEGE
- (96-97) **Teresa Schlueter**
0214121@acad.nwmissouri.edu
NORTHWEST MO STATE UNIV
- (96-97) **Samantha Webb**
c718948@showme.missouri.edu
UNIV OF MO-COLUMBIA

** CHANGES **

- (88-89) **Kevin Crosby**
kevin.l.crosby@jsc.nasa.gov
LOCKHEED MARTIN, Houston, TX
- (91-92) **Jason VanNatta**
jvannatta@juno.com
LEE'S SUMMIT FIRE DEPARTMENT
- (92-93) **Andrea Slusser**
andis@ksu.edu
KANSAS STATE UNIV
- (93-94) **Mark Cleveland**
mclevela@mnu.edu
MIDAMERICA NAZARINE UNIV
- (93-94) **Derek Fisher**
math4life@worldnet.att.net
PARK COLLEGE
- (94-95) **Mark Molder**
sphicted@sound.net
AFFORDABLE MOBILE HOMES
- (95-96) **Ragan Buckley**
buckley@fas.harvard.edu
or rebuckley@earthlink.net
HARVARD UNIV
- (95-96) **Don Vaught**
c689354@showme.missouri.edu
or apuleis@yahoo.com
UNIV OF MO-COLUMBIA

WE HEAR FROM PAST STUDENTS

Hiromi Yokoyama (89-90)
(BBA Business Administration
MBA Direct Marketing)

E-mail received 11-25-97:

"Happy Thanksgiving Day!!! I hope everyone is doing well. Things have been rather crazy around here, but I guess that is a good thing. I am still keeping myself very busy and have very little social life going on... but I had several people visit me in the past few weeks and it was fun. And with the holiday season coming up, more people will be here. I am looking forward to seeing those of you who will be in Japan during the holidays. Be sure to call me when you are in town!

Please take care, and have a lot of turkey."

E-mail received 12-17-97:

"Hello! Greetings from Japan! This is Hiromi Yokoyama. I wonder if you still remember me... I was in the C section in '89-90 class. I came back to Japan last year and have been helping my mother at her company. I'm not using any calculus in my work, but I'm doing fine... So, how is MPI? I hope everything is going well. Please keep in touch...

Well, I just thought I'd drop you a note to wish you happy holidays..."

E-mail received 12-18-97:

"Hello! Nice to hear back from you! No, I'm not receiving the newsletter... I would love to get them if they could send it to me.

I am currently working for my mother's company which does 'total creation of the office'. We do interior designing, decorating, sell office furniture, supplies, equipment, computers, develop software, design advertising pieces, business cards, etc., etc., ... in short, we sell anything that has anything to do with an office. But my degree was in Direct Marketing, to be specific, MBA with an emphasis in Direct Marketing. And my degree was acquired at UMKC! Anyway, I am trying to do more business

consulting. I have a few projects at hand which may or may not materialize... I am waiting for the clients' responses. I am also working on importing/exporting products. So I'm doing a few different things nowadays. I am enjoying it ok. I've been back for a little over a year now, and I am slowly adjusting to the life in Japan. Things are quite different. The economy is in fact doing not so well. A lot of banks and securities companies are in trouble, and people are reluctant to spend money. But it's not like everyone's starving or anything. I just hope that the stock market would rise a little! It is hopeless. But oh well, that is life. No risk, no return, I guess.

Well, I guess I should get back to work. (Yes, I am writing this during my office hours! Shame on me!)

Please take care, and happy holidays...

Hiromi"

Teresa Schlueter (96-97)
(Northwest MO State Univ)

E-mail received 12-16-97:

"Hello Mr. Delaware!

How is everything with this year's MPI? I am currently working on the survey that you sent out earlier. I still have one more final to get through before my Xmas break begins.

I was writing specifically to ask you some questions about math classes in the summer at UMKC. I am planning on taking Multivariate Calc or College Geometry at UMKC either this summer or next summer or both. I was wondering if this sounds like a good decision. I know some of the summer courses may be more accelerated or more difficult depending upon the teacher. Do you have any suggestions or recommendations of who to take during the summer? Are you by chance teaching any of the courses?

Thank you very much for all your help through MPI. It has been an amazing help in college. I don't have to take college algebra since I came in with so much math credit.

I'm thrilled to get into upper level math courses. I'll talk more with you later.

Have a wonderful break!

Teresa Schlueter
(one of the Paseo girls!)"

E-mail received 12-17-97:

"Thank you for writing a response to my email so quickly. Tell Richaela I'm very proud of her and glad that she is pursuing higher level math!

The information you gave me about the summer courses was very helpful. I will probably try to take the Calculus III class either next summer or the one after. It probably won't be as much fun as the first two Calc courses I had.

I won't be able to make the reunion because I will be out of town. I'm going to California to visit one of my former teachers, Autumn Chapman. She's the woman who inspired me to direct my teaching into the area of science. I am very excited to see her. I hope everything goes well with the reunion.

Well, I'd better be going. Hang in there Richaela, it is definitely worth it!"

Kevin Crosby (88-89)
(BS Electrical Engineering
BS Computer Engineering
BS Mathematics
MS Electrical Engineering)

E-mail received 12-18-97:

"Just thought I would give you an update of my new email, address, education, and job...

As you may already know, I completed three Bachelor's degrees from MU in Electrical Engineering and Computer Engineering in December '93, and in Mathematics in May '94. Most of this course work was done at UMKC prior to transferring to MU.

I graduated with my Masters in Electrical Engineering at the University of Arizona in May '97. Since I successfully defended my thesis in March '97, I was able to

begin employment in early April '97 in Houston, Texas.

Now, I work for Lockheed Martin at the Johnson Space Center. Our group supports the Shuttle, the Mir, the Hubble Space Telescope, and (very soon) the International Space Station. We work with image processing and making measurements on digital video and analog tape. These measurements include determining how far a solar array moves or where an antenna might be located in 3-space. We also perform screening of tape and video of the Shuttle launching and landings to ensure everything goes smoothly. The Challenger accident is responsible for the creation of our group.

The MPI courses that I had really helped me out. In retrospect, I wish I could have been in Section C and taken both Calc I and II. I may have finished my degrees sooner.

Keep up the good work! Have a terrific holiday season!"

Chheng Meng (91-92)
(BS Nursing)

"I recommend MPI to all seniors if they can. It is very useful and gets one into a head start. It is a very good program and excellent teachers. It gives the students opportunity to get a feel of what college is about."

Kristi Bass (92-93)
(BS Biology)

"I am taking one year off of school right now, but will be back at Rockhurst in August. I finished one year of grad school (Physical Therapy) and have two years left until I'm done. So, for the time being I'm working in an outpatient rehab clinic."

Derek Fisher (93-94)
(Mathematics Major)

"The foundations set in MPI-Calculus worked extremely well to my advantage. Since having that great background, my current GPA for mathematics is a 3.4.

MPI taught me how to prepare hard for what you want to accomplish in life. With the experience from MPI, I am now able to use those preparation skills for my internship at Cerner Corporation as a System Analyst."

James McIntosh (94-95)
(Mathematics Major)

"The classes at MPI are very similar to those at Vanderbilt in math and physics. I had to retake physics because Vanderbilt's physics is calculus based, and they won't accept credit from a class that is not composed of more than $\frac{1}{2}$ college students. However, it was very useful to have this physics background.

I am now a math major. MPI gave me the opportunity to expand my math skills before I got to college. MPI is the foundation of my degree."

Jennifer Musil (94-95)
(Graphic Design Major)

"It (MPI) has allowed me to take my time by getting ahead in college. It teaches you to spread out your studying and helped me not to procrastinate on assignments. I also enjoyed the opportunity to meet students from around the area."

Jennifer (Stafford) Seal (94-95)
(Accounting Major)

"With the Calc I & II classes that I took at MPI I learned so much more and with less difficulty than in the math classes that I took later at UMKC. The instructors cared more about the students and they were also concerned that students were actually grasping the concepts necessary to complete the course. With the professors at UMKC it was a 180° turn in the wrong direction. I dropped my math major and switched over to an accounting degree at the Bloch School.

I think that MPI gave me a good head start in preparing to enter college. I could learn from mistakes while at MPI and then avoid making similar ones down the road. It turned me into a more mature student.

FYI: Dana Kleithermes won't be able to respond to your questionnaire - she is currently spending the year studying abroad in Spain and is a student at Washington University in St. Louis, MO."

Pamela (Moseley) Stuck (94-95)
(Secondary Ed/Mathematics Major)

"The MPI math course was FAR superior to the math classes I've had at UMKC since then. The level of understanding I gained in Calculus I was amazing when I consider what my Calculus II course was like at UMKC. Not only that, but the people I've tutored at UMKC for Calculus I didn't seem to receive much instruction at all about what Calculus has to do with graphs.

For me, the MPI was a wake-up call that gave me a glimpse of what college would be like. I believe it helped me make the transition between high school and college. The professors at MPI expect much more from you than high school teachers do, and I learned more because of that. MPI is an excellent program for high school seniors. It helped me learn how to really study - something I didn't have to do in high school."

Jennifer Woolsey (94-95)
(Accounting Major)

"The MPI teachers cared about their students. The instruction was excellent as was the quality of the MPI courses. The teachers take the time to explain things better if a student didn't understand something.

MPI helped me to ease into college classes. I learned what to expect from college classes and what is expected of me. I also learned how to study better for exams. Hard work is the key to success in college.

Keep up the great work. MPI is well worth it."

Sam Young (94-95)
(Industrial Engineering Major)

"The instruction I received at MPI has rivaled any class I have

taken since. As far as calculus, MPI did a far cry better. MPI instructors were easy to follow and did a terrific job of explaining ideas. MPI did the best job of blending computer assignments into the class as I have experienced yet. That was something I took for granted then, but which I have learned to relish as some classes since have made me worrying of computer assignments by professors.

MPI enabled me to take full advantage of my freshman year in college. I did not have to spend very much of my time adjusting to the college study schedule. My time at MPI had prepared me well for that. Therefore I was able to get a good start on college.

I would recommend it for all. MPI taught me how to think. Calculus and physics first taxed me to develop problem solving skills. If calc and physics is not how someone wants to make their living, then maybe one of the enrichments will point them in the direction they want to go. One of the most unexpected pluses was the fellowship of students from other schools. I still have fond memories of just being around a great group of people."

Amanda Benavidez (95-96)
(Business Major)

"MPI has helped me in that I feel more confident in doing my math. Since I changed my major, I will be having to take more math than I had originally been taking. However, MPI helps prepare students for higher mathematics. I think it has really helped and I wouldn't feel nearly as confident if I hadn't enrolled in MPI.

I think that the students should try and get other kids involved in MPI. In many majors, basic math isn't enough, and to go through it first with a little extra help really makes a big difference."

Ragan Buckley (95-96)
(Government Major)

"It helped a lot in my chemistry course; the difficulty of problem sets was similar and the problem solving sections were a lot

like our chemistry sections. Having two-hour labs prepared me for the four-hour labs here at Harvard; the lab reports also prepared me for writing up chemistry experiments. As the rest of my classes have been social studies and/or humanities, MPI really doesn't apply.

I can't apply what I learned in MPI directly to my situation because my major is government, but I feel that if I had chosen a science or math major, I would have had an excellent head start."

Robert Davis (95-96)
(Mechanical Engineering Major)

"I would have never made it through Calc I without MPI. Although Physics II is not offered at MPI, the guest speakers gave us a preview of Phys. II. Light, lasers, special relativity, and many other subjects were useful in Physics II.

The sleep deprivation skills "learned" at MPI were a great start in teaching us the art of taking tests with only 4 hours of sleep the night before!!

Keep them seniors on track, and keep up the good work!"

Benetta Fairley (95-96)
(Psychology Major)

"MPI was a great breakthrough for me; through the program I got an advanced look on what college is about. I also learned that due to my early education I was not as prepared as those students who have attended suburban schools and because of that I needed to work harder.

I hope that the program continues. Although I didn't do as well at MPI as I hoped, it gave me a great advantage to learning how to function in a higher academic atmosphere - especially in regards to studying and sticking with it."

Christina Jensen (95-96)
(Journalism/Music Major)

"MPI taught me how to study and prepare for college level classes.

Although I have not taken more advanced math or physics classes, the study skills and habits I learned from taking college-level classes during high school have been the most valuable tools I have used in any of my classes in college.

Keep making 'em work!"

Heidi Miller (95-96)
(Secondary Business Education Major)

"The instructors at MPI seemed to care more about my progress in calculus. (I only took calculus.) They were more willing to help, and there was a lot more one-on-one contact.

It taught me how hard and how much work college really is.

I think MPI is a great learning tool for students. I really didn't learn much in class, but I learned how to study, to do your homework, and how to ask for help without feeling stupid. Thanks!"

Donald Vaught (95-96)
(Philosophy, Economics, Math Major)

"The classes were roughly equivalent. Adapting to a class integrated with Mathematica (at Univ of MO - Columbia) was difficult, though. Nevertheless, MPI was definitely a college-level experience. I covered or was exposed to sufficient amounts of mathematics in Calc I and II to get me through so far.

MPI has had three major effects. First, it allowed me to jump start college to obtain a triple major. Second, it gave me a great background in math. I truly believe I was given a better introduction to the fundamentals of calculus than I would have if I had taken these courses on campus. Finally, I was given a good example at a real college experience before I ever set foot on campus. MPI allows students a true learning opportunity. I was forced to adopt more efficient study and learning habits, and it has paid off in the long run."

Jennifer Watts (95-96)
(Mathematics, Pre-Med. Major)

"The courses taken at MPI are a lot like the math and physics courses at Rockhurst. The lab section of calc I and II is a good integration of material learned with application.

MPI prepared me for college classes by putting me in a "quasi-college atmosphere". It allowed me to make my own decisions regarding school work and it prepared me for expectations in college. It is also a great opportunity to receive college credit. Because of MPI and other college classes I chose to participate in through high school, I will graduate a year early - then of course I will spend many more years in medical school!

One of the things I thought should be offered at MPI is calc based physics. I felt it should be offered when I was there and even more so now that I am in college. I think students in the calc I and calc II section learn calculus soon enough for physics use and most of the people have had some previous knowledge of calculus before attending MPI. Most all of the science fields prefer physics calc based, so why not offer it early?"

Joe Ziolkowski (95-96)
(Mechanical Engineering Major)

"Calculus I, taken at MPI allowed me to skip calculus I and II at WPI. Physics taken at MPI covered more material than physics I at WPI. I think the quality at MPI is much better because students are given the necessary personal attention that is needed. Especially since the material is so new.

I am more than a semester ahead in my college proceedings. In fact, right now I am set to graduate in 1999, one year early."

Jay Farrington (96-97)
(Biology Major)

"The MPI experience enhanced my study skills for college. It taught me endurance in studying.

MPI taught me to look at

situations in different ways.

MPI allowed me to get a taste of college. It gave me a little dose of what college will be like which helped to prepare me for college.

Gives students a reality check."

Corbin Jones (96-97)
(Political Science Major)

"I've learned to sit down with the books and actually study instead of assuming that I know enough to do well.

Instead of just going through the motions of studying I now try to make sure I truly understand the material set before me.

I now know how important studying for college courses is, and this has helped me keep my focus at college.

The introduction to an actual college course without quite as much of the pressure and pace of the true college course helped me to accustom myself to the pace and pressure of the actual experience of college."

Samantha Webb (96-97)
(Biology Major)

"I'm glad that I had the experience of two challenging classes. They have aided me drastically in college. I have learned to "buckle down" and study when things get tough. I've learned that giving up is the easy way out and that to succeed you must persevere."

MPI E-MAIL ADDRESS:

rdelaware@cctr.umkc.edu

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

**MORE 1997-98 STUDENT
IMPRESSIONS**

"At first I was a little overwhelmed by MPI. Starting classes at 7 am, walking up a countless number of stairs, and all the work involved took some time to get used to. Fortunately, I got used to the demands of MPI and I can honestly say that it is now preparing me for college next year."

Brent Thompson
Fort Osage High School
Fort Osage School District

"The MPI is a great program. I have really enjoyed this first semester (except for the part about having to be here at 7 in the morning). My attendance at the MPI (not to mention the 12 hours of free college credit) will really help me get ahead at UMR next year.

The MPI has also taught me how to study. This year, for the first time, I have had to really study. The MPI is a lot of hard work, but I think that it will definitely pay off in the end."

Jeff Weston
Wm. Chrisman High School
Independence School District

"Peaked atop a bluff which seems to touch the sky, MPI stands, overseeing its students come and go everyday. Reminding me of the mysterious caves of obscure masters in the fables I once read, I, at the year's start, stood below, trying to find the trail I had long waited to climb. As of yet, I have trekked half my journey and am pleased MPI has withstood my expectations as well as I its. Every step has represented a worthy academic challenge. Every step has led me to something I had not known before. For me, MPI has so far been one of the strongest supports in building my future bridge. Furthermore, I'm happy and somewhat relieved to see others finally realize that in order to reach the top, you must make an effortful climb. Everything in life must be difficult before it is easy. Generally, MPI symbolizes something different, yet significant to everyone. Personally, even though the wait to reach MPI had been rather long, it ultimately has been worthwhile in all aspects."

Gretchen Nguyen
 Northeast High School
 Kansas City, MO School District

"MPI has brought about a few changes in my life. The homework takes more than five minutes to complete, I actually have to study for the tests, and lately waking up at 8:00 is sleeping in. Although these changes aren't pleasant, I believe that in the future they will be beneficial."

Amy Williams
 Truman High School
 Independence School District

A SOLUTION TO MATHEMATICS CHALLENGE #51

Recall the problem statement:

Notice in the following table that the last digit of n^5 seems to be the same as the last digit of n :

n	n^5
1	1
2	32
3	243
4	1024
5	3125
6	7776
.	.
.	.

Prove that this is always true for all $n = 1, 2, 3, \dots$

[From: Challenging Problems in Algebra, by Posamentier and Salkind, 1970.]

SOLUTION:

To prove this statement true for the infinite set $n = 1, 2, 3, \dots$ we'll use a technique known as mathematical induction.

First, we establish a first case. Certainly it is true that the last digit of 1^5 is the same as the last digit of 1. [In fact, the list above provides us with six base cases.]

Second, we assume that the last digit of k^5 is the same as the last digit of k and prove that the last digit of $(k + 1)^5$ is the same as the

last digit of $k + 1$. This is known as the induction step.

Proof: Multiply out $(k + 1)^5$ to get $k^5 + 5k^4 + 10k^3 + 10k^2 + 5k + 1$. Now, the last digit of $10k^3 + 10k^2$ is 0, so it won't affect the last digit of $(k + 1)^5$. Next examine $5k^4 + 5k = 5k(k^3 + 1)$. If k is even, then $5k$ is a multiple of 10, so the last digit of $5k(k^3 + 1)$ is 0. If k is odd, then k^3 is odd, so $k^3 + 1$ is even, leading to the same result. Thus, the last digit of $(k + 1)^5$ is the same as that of $k^5 + 1$. But the last digit of k^5 is the same as that of k , so the last digit of $(k + 1)^5$ is the same as that of $k + 1$ as desired.//

This proof shows that no matter what k is, the statement is true for its successor $k + 1$. Since the statement is true for $k = 1$, it is then true for all $n = 1, 2, 3, \dots$, by the principle of mathematical induction.

This result can be generalized: The last digit of n^{4m+1} is the same as that of n , for all $m = 0, 1, 2, \dots$ [The $m = 0$ case is obvious, and the $m = 1$ case is the one proven above.]

A SOLUTION TO PHYSICS CHALLENGE #42

Recall the problem statement:

To the nearest power of 10, what is the ratio of the kinetic energy of the earth in orbit to its kinetic energy of spin on its axis?

[From: Physics Olympics Handbook]

SOLUTION:

Our knowledge of mechanics tells us the translational kinetic energy of an object is $1/2 mv^2$ where m is its mass and v is its speed, and the rotational kinetic energy of an object is $1/2 I\omega^2$ where I is its rotational inertia and ω is its angular speed. Treating the earth as a sphere, $I = 2/5 mr^2$ where r is the earth's radius. So $KE_{rot.} = 1/5 mr^2\omega^2$. Thus the ratio of $KE_{trans.}/KE_{rot.} = \frac{1/2 mv^2}{1/5 mr^2\omega^2}$

$$\text{or } \frac{KE_{trans.}}{KE_{rot.}} = \frac{5v^2}{2r^2\omega^2}$$

Now $v = \frac{\text{circumference of earth orbit about the sun}}{\text{time for one orbit}}$

so, $v = \frac{2\pi R}{T}$ where $R =$ radius of earth's orbit and $T =$ its period.

Now, $T = (365 \text{ days})(24 \text{ hr/day})(3600 \text{ s/hr}) \sim 10^7$ seconds,

and $R = (93 \times 10^6 \text{ mi})(5.28 \times 10^3 \text{ ft/mi})(1 \text{ m}/3.28 \text{ ft}) \sim 10^{11}$ meters.

So $v \sim \frac{2\pi(10^{11} \text{ m})}{10^7 \text{ s}} \sim 10^5 \text{ m/s}$.

Now $r \sim 4000 \text{ mi} (5280 \text{ ft/mi})(1 \text{ m}/3.28 \text{ ft})$

$r \sim 10^7 \text{ m}$

and $\omega = \frac{1 \text{ rev}}{24 \text{ hr}} \left(\frac{2\pi \text{ rad}}{\text{rev}} \right) \left(\frac{1 \text{ hr}}{3600 \text{ s}} \right)$

$\omega \sim 10^{-4}$ radians/s

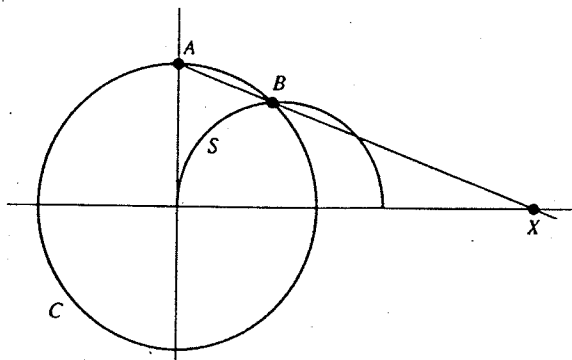
Since $\frac{KE_{\text{trans}}}{KE_{\text{rot}}} = \frac{5v^2}{2r^2\omega^2}$

$$\frac{KE_{\text{trans}}}{KE_{\text{rot}}} \sim \frac{5(10^5 \text{ m/s})^2}{2(10^7 \text{ m})^2 (10^{-4} \text{ rad/s})^2}$$

$$\frac{KE_{\text{trans}}}{KE_{\text{rot}}} \sim 10^4$$

MATHEMATICS CHALLENGE #52

Let S be a semicircle rising from the origin and lying on the positive x -axis, as illustrated. Consider also a circle C centered at the origin and let A and B be the points of intersection of C with the positive y -axis and with S , respectively. Extend the line AB rightward, letting X be its intersection with the x -axis. What happens to X as C becomes smaller and smaller, its radius approaching zero?



[From: Which Way Did the Bicycle Go? and Other Intriguing Mathematical Mysteries, by Konhauser, Velleman, and Wagon, 1996, Problem #5, pp 2 and 67.]

PHYSICS CHALLENGE #43

When a driver brings a car to a stop by braking as hard as possible, the stopping distance can be regarded as the sum of a "reaction distance," which is initial speed times the driver's reaction time, and a "braking distance," which is the distance covered during braking. The following table gives typical values:

INITIAL SPEED (m/s)	REACTION DISTANCE (m)	BRAKING DISTANCE (m)	STOPPING DISTANCE (m)
10	7.5	5.0	12.5
20	15	20	35
30	22.5	45	67.5

- What reaction time is the driver assumed to have?
- What is the car's stopping distance if the initial speed is 25 m/s?

[From: Fundamentals of Physics Extended, by Halliday, Resnick, and Walker, problem #52P, p 39.]

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