

Director: Jennifer Snyder
Associate Director: Richard Delaware

August 1, 1999

Vol. 14, No. 1

YEAR 16 – A NEW MILLENIUM BECKONS

Welcome to the 16th year of the MPI! Let us assure you first of all that the teaching of neither Calculus nor Physics will be affected by Y2K glitches. We promise that we have taken all appropriate steps to assure that our instructors' brains will not suffer any ill effects on New Year's Eve...at least those effects related to the change of date! We'll continue as we have for the past 15 years to lay a firm foundation in Calculus and Physics for all our students over the course of the year and hope that they will join us in that effort with enthusiasm.

This year is unusual in that we are welcoming the upcoming participation of the Blue Springs School District in the MPI program; the first addition of a district since the MPI began in Fall 1984. Although there will be no Blue Springs students at the MPI this year, we will be advertising to juniors at both district high schools this Fall, plan to see many of them at our Recruitment Day in February, and hope to begin having Blue Springs students participate next Fall. A new district will allow us to tap a new pool of students and instructors as we enter the new century and continue the tradition of the MPI.

MPI STUDENT ORIENTATION SEPT. 1-3, 1999

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

In particular, on the first day, Sept. 1, 1999, we'll provide each student with a packet of information and have each of them fill out a personal data form.

If you have any questions, call our MPI secretary, Suzanne, Mon-Thurs., 8:00am to 1:00pm, at 235-1272. We look forward to seeing our 16th class on Wed., Sept. 1 at 7:00am in Room 207!

STUDENTS PLEASE BRING: ON SEPT. 1, 7 am, TO ROOM 207

- Your Social Security Number.
- \$10.00 to rent a calculator.
- Your daily schedule of high school classes.
- Your schedule of extra-curricular activities.
- Your counselor's name.
- Ideas for Enrichment Speaker or topics.

MPI E-MAIL ADDRESS:

rdelaware@cctr.umkc.edu

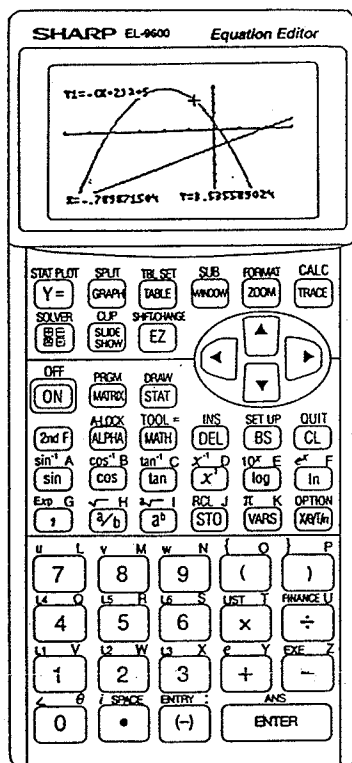
A list of known MPI Alumni e-mail addresses is available upon request.

MPI GRAPHICS CALCULATORS

The MPI requires ALL students to have and use a graphics calculator in both physics and calculus. For our purposes we have selected the SHARP EL-9600. Although the SHARP is not the most powerful graphics calculator on the market, it is ideally suited to the MPI and its selection of students. One unique feature, even in older models, is the

ability to enter fractions and exponentials exactly as you would write them on paper. Some new features, beyond those in the former SHARP 9300C (now out of production) are:

- Pen-touch screen entry option.
[A plastic stylus is included.]
- TABLE feature.
- Up to 10 x-y functions for graphing, rather than 4.
- Unique Rapid Graph, Rapid Window, and Rapid Zoom features.
- Connects to a TI CBL (Calculator Based Lab).
- Sequence graphing.
- Split Screen option.
- More pixels for a finer screen resolution.
- Slide show feature.



All MPI students are required to rent a **SHARP EL-9600** from us, paying a \$10.00 one-time non-refundable fee for the entire academic year, with an option to buy the calculator outright at any time [the full price, after the rental fee is deducted, is \$60.00], OR, to provide themselves with an equal or better graphics calculator from among only the following models: TI-86 (TI-85), HP 38G, HP 48G (HB 48GX). [Information, including cost, on all of these calculators can be gotten from the MPI Associate Director by calling 235-1290.] Please note that MPI support and an MPI calculator manual will only be provided for the one calculator we rent.

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

TO ALL MPI ALUMNI:

**HAVE YOU GRADUATED
FROM COLLEGE?**

IF SO:
PLEASE CONSIDER BEING AN
-ENRICHMENT SPEAKER -

CALL 816-235-1272
Or E-MAIL
rdelaware@cctr.umkc.edu

MPI Alumni who have spoken:

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

**1999 MPI AWARDS PRESENTATION
AND
TOP 10 MPI STUDENTS OF 1998-99**

Our final awards presentation was held on May 13, 1999, during which we were pleased to present many of our 1998-99 students with the following variety of awards. Also present were 10 administrators, counselors, board of education members, and the superintendents of Fort Osage and Independence School Districts.

CALCULUS I

(Name)	(School)
Josh Albin	Truman
Anthony Brown	Central
James Henry-Rhoads	Wm. Chrisman
Ryan Kliethermes	Truman
Khushal Latifzai	Wm. Chrisman
Brian McMillan	Wm. Chrisman

Trinh Phan	Northeast
Amanda Rodriguez	Paseo
Kara Schumacher	Truman
Josh Titus	Truman
Laura Van Fleet	Ft. Osage
Angelina Walls	Ft. Osage
Eric Watts	Truman
Ryan Wilson	Truman

CALCULUS I AND II

(Name)	(School)
Katie Allen	Truman
Brad Martin	Truman
Mychel Varner	Truman
Michael Watts	Truman

PHYSICS

(Name)	(School)
Josh Albin	Truman
Katie Allen	Truman
Anthony Brown	Central
Corey Crandall	Ft. Osage
Mark Davidson	Truman
Tabitha Hanson	Ft. Osage
James Henry-Rhoads	Wm. Chrisman
Jennifer Jecker	CPR
Jerome Jennings	Wm. Chrisman
Ryan Kliethermes	Truman
Khushal Latifzai	Wm. Chrisman
Suzanne Leslie	Truman
Brad Martin	Truman
Brian McMillan	Wm. Chrisman
Trinh Phan	Northeast
Wendy Robello	Wm. Chrisman
Derrick Rohr	Ft. Osage
Kara Schumacher	Truman
Josh Titus	Truman
Laura Van Fleet	Ft. Osage
Erika Van Tuyl	F t. Osage
Mychel Varner	Truman
Eric Watts	Truman
Michael Watts	Truman
Tracy Weber	Northeast
Ryan Wilson	Truman
Kristiana Zackula	Ft. Osage

We also honored the **TOP TEN** students (ranked according to the mean of their full-year college calculus and physics grades) by giving them a one year subscription to **Scientific American**

Magazine and a copy of "What's Happening in the Mathematical Sciences."

TOP 10 MPI STUDENTS 1998-99

1) Brad Martin	Truman
2) Michael Watts	Truman
3) Eric Watts	Truman
4) Katie Allen	Truman
5) Ryan Wilson	Truman
6) Brian McMillan	Wm. Chrisman
7) Joshua Titus	Truman
8) Laura Van Fleet	Ft. Osage
9) Mychel Varner	Truman
10) Kara Schumacher	Truman

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

UMKC Chancellor's Award Winners:

Phuong Le (MPI)	Van Horn
Jeremy Stayton	CPR

UM Curators Award Winners:

Adison Loving	Wm. Chrisman
Jerome Jennings	Wm. Chrisman
Lara McMillin	Ft. Osage
Eric Watts	Truman
Mark Davidson	Truman
Brad Martin	Truman
Jennifer Jecker	CPR

ADVICE TO STUDENTS OF YEAR 16 FROM THE STUDENTS OF YEAR 15

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

"What ADVICE would you give to incoming students about study, attitude, or any other aspect of surviving the MPI in 1999-2000?"

We were pleased at how seriously-and with what maturity they wrote, and so each incoming student will receive a complete set of these words of advice from the students of Year 15. Here are some of the excerpts from that document.

"MPI can be overwhelming at times, but, as Mr. Delaware says, take small bites to make it easier on you. There will be some nights when you will look at your list of things to do and you will just want to give up. In situations like these, you must consider that every other MPI student has a similar list and most will be just as frustrated. Form bonds with fellow frustrated students. If nothing else, you can vent your frustration together! You also must pick small chunks or bits to focus on. It is humanly impossible to do Calculus and Physics homework – completely – in the same night and that's okay. Do what needs to be done and learn to deal with three pages of things to do.

More important than homework, however, are the tests, which seem to appear on the calendar way too often. On Sunday night at 8:00 before the big Calculus exam, after just completing loads of English and History homework, you will freak when the realization hits that you are clueless when it comes to this foreign word called derivatives or any other strange word heard only in Calculus classrooms. The best thing to do in a situation like this is to take out some paper and prepare for fun times. Your best friends will be the practice problems at the back of each section. Master these and you will ace the tests! This isn't a high school class anymore, and it will take more time on your part to do well. Of course, the best habit I adopted at the MPI was a healthy breakfast during Calculus lectures. I prefer dry cereal with apple juice while my classmates elected for fruit or granola bars."

Katie Allen
Truman High School

"Top Official and Unofficial B's of the MPI!"

Be on time!
Be prepared!
Be optimistic!
Be motivated!
Be ready to work!
Believe in yourself!
Bestir your brain!
Be ready to tackle those 59 stairs twice a day!
Be nice to Suzanne...she'll give you candy!"

Angelina Walls
Ft. Osage High School

"I'm not going to search for some great inspirational words or advice. But I can tell you what not to do. Don't be discouraged just because you may have gotten a 60 on a Calculus test (it's most likely a "C" anyway). Don't forget to get donuts at Poppy's on the way back to your respective schools. Don't forget your homework. Don't freak out if a teacher writes something wrong on the board (hey they're human too!). Don't sleep in class (too often)! Don't worry...be happy! In case you're wondering how I know all of this, well...let's just say that I did some-err-most-err-okay, all of it. Have a great senior year and remember, don't worry!"

Josh Albin
Truman High School

"Suggested problems are not homework, but they give them to you for a reason! Do them! Don't think that you will remember how to do things just from the lectures because you won't. Enrichments are good! They may only be worth one point each so they seem okay to skip, however, by the end of the year these points add up. Just doing your enrichment reports can raise your grade by 5%. Most importantly, try really hard not to miss MPI. Even problem-solving days are good to be here for."

Samantha Bradley
Wm. Chrisman High School

"The most important thing one must remember is to **STUDY!!!** Without studying, no one will be able to survive. Besides studying, everyone needs to get used to losing sleep because you will stay up late regularly. Having to wake up early in the morning may keep you from coming, but remember...keep a good positive attitude. Believe me, you will not make it at MPI without belief in yourself. Keeping up the good attitude and good study habits are the only way anyone can survive a year at MPI!"

Tracy Weber
Northeast High School

"I'm not very good at presenting advice to other people; however, there is one piece of advice that comes from my personal experiences and observations. **DON'T QUIT!** Look for help when you need it, but think about the questions before you ask. You are never too far behind. There are many lessons learned through MPI. Some people will learn

failure, some will learn discipline, and some might learn a bit more about themselves and their strengths and weaknesses. Stepping up to the challenge will probably be the best choice you could make, whatever path you choose after high school."

Dana Curran
Northeast High School

"You may start off on the wrong foot and attitude. I did and that's why I didn't do that well at first. Getting on the right foot and having a positive attitude got me far at MPI. I felt, if they can do it, why can't I? MPI is **VERY** challenging. Don't let that get you down. Keep your head held high. Don't be afraid to ask questions. Talk to other students that don't go to your school. Don't wait until the last minute to do your homework. **BE ON TIME! DON'T SLEEP IN CLASS! PAY ATTENTION! DON'T GIVE UP! BELIEVE IN YOURSELF!**"

LaKeeia Hawkins
Van Horn High School

"In order to survive MPI, you need to stay focused. Don't think you can slack off and still do well. Also, always pay attention in lecture. Ask questions when you don't understand. Do the suggested homework problems. Form study groups to study with. And get to know the students from other schools. Good luck and have fun!"

Erika Van Tuyl
Ft. Osage High School

"**YOU NEED A STUDY GROUP!**" I think it would help you. Regardless of what everyone else says, it does not get easier after the first couple of weeks. You must pay attention and understand what's going on in the beginning because everything is just added on. If you get lost, then you better get help quick! Don't worry about everything so much. Just relax and study, study, study, study. Do as many problems as you can in problem-solving!"

Corey Crandall
Ft. Osage High School

"Another year is here and you're ready for your last year of high school! If you're involved with this program, I hope you didn't plan on partying every night of your senior year, because it will be tough!

Make new friends from other schools and your own. Form study groups! This is what will get you through the year. Take plenty of notes and make sure you ask questions until you understand it. Don't be scared of the professors; they're not out to fail you like some others! Don't be disappointed with your grades during the first few weeks; it will most likely be a shock! Just take MPI in a little at a time. Plan your time wisely and have fun with it! Just make sure you can be up at school at 7:00am in the morning. That's the killer!"

Wendy Robello
Wm. Chrisman High School

"I know most of you who are reading this now have mixed feelings on what this place could really be like. "Is it really as bad as I've heard," you must be saying. I know this because I did the same thing. The only thing I can tell you is this: get through the first month. During this time you are trying to get used to getting up early (which never happened to me!) and trying to do everything you possibly can to keep up. Trust me, after awhile, things calm down (a little) and you will make it. Personally, I think if I made it, each of you at MPI 1999-2000 will make it too!"

Joshua Titus
Truman High School

"In Calculus - **DO THE HOMEWORK PROBLEMS!!** Just grab your book and work a few odd problems every night. Make friends with the smart people and get in a study group (and just so you don't feel like a mooch, bring some food). Don't sleep in class. If you don't wait until the night before to do your homework, you won't be so tired the next morning. Don't give up! It doesn't get any easier, but you get used to the failures. Have fun!"

Jennifer Jecker
Center Place Restoration

"I would have to say that MPI has been a great experience for me. Before I came here, I never had to work hard to make good grades. The MPI has been a big wake-up call for me. I found out very soon that things wouldn't always be so easy. My advice to you is to try hard and do the work, even the "pointless" suggested homework. It really does help. Yes, I know 7:00am is not a good time to work on or learn math and science, but believe me, in the end it

was worth every minute of it. In just a few short months it will all be over. So don't ever give up!"

Michelle Bailey
Truman High School

THE 1999-2000 CLASS (TO DATE)

Section A (18)

Nikunj Bhakta	Northeast
James Cameron	CPR
Tri Do	Northeast
Jessi Erickson	Wm. Chrisman
Reshawn Fields	Paseo
Daniel Goodman	Wm. Chrisman
Melinda Hacker	Truman
Richard Henley	Northeast
Herber Hernandez	Northeast
Tim Hudson	Wm. Chrisman
Peter Kelsey	Ft. Osage
Lyndsey Main	Wm. Chrisman
Sariah McCune	Wm. Chrisman
Joe Moccia	Paseo
Sarah Piatt	CPR
Sarah Smith	Paseo
Adam Steele	Truman
Eric Wheeler	Ft. Osage

Section B (18)

Melanie Bean	Wm. Chrisman
Brad Carrow	Ft. Osage
Ben Gatrost	CPR
Jeremy Hinken	Wm. Chrisman
Ha Huynh	Wm. Chrisman
Nathan Johnson	Truman
Calvin Kapileo	Northeast
Jeremy Knoll	Paseo
Chan Le	Northeast
Elizabeth Nicolaus	Truman
Jason O'Malley	Ft. Osage
Stacey Osborn	Wm. Chrisman
Nam Phan	Northeast
Nicole Piers	Van Horn
Andrew Schmidt	Hope Christian
Nick Stafford	CPR
Sarah Steele	Van Horn
Tu Tran	Northeast

Section C (6)

Megan MacDonald	Truman
Cassy Pallo	Truman
Michael Reichmann	Ft. Osage

Seth Watson	CPR
Geoffrey Willard	Wm. Chrisman
Rachel Yeargin	Truman

Section D (17)

Nirmal Bhakta	Northeast
Heather Biggs	Wm. Chrisman
Nadia Curren	Northeast
Kenneth Denton	Ft. Osage
Nathan Harris	CPR
John Hershberger	Ft. Osage
Teeyana Kent	Van Horn
Nathan Lane	Truman
Tung Le	Northeast
Jeremy Lowe	St. Mary's
Jonathan Martin	Truman
Sam Slee	Truman
Brandon Stowell	Wm. Chrisman
Amanda Thatch	Paseo
LaConda Thornton	Van Horn
Jessica Warkentien	Van Horn
Ryan Williams	Truman

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

THE 1999-2000 STAFF

In PHYSICS:

Larry Harding (retired), from Fort Osage, a UMKC Physics Undergraduate Student, with some assistance from our liaison **Roy Cook** of Northeast,

And, in CALCULUS:

Sheri Adams from Truman, and **Libbi Sparks** from William Chrisman.

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

MPI T-SHIRTS!

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

ENRICHMENTS

FOLLOW UP

On April 16 Tony Thornton (MPI 88-89), a Network Design Engineer working on Broadband Operating System Development for Sprint, spoke on **A CAREER PATH: MPI TO SPRINT.**

- Getting Off to a Good Start
- Experiences Along the Way
- A Career at Sprint: "MPI Questions"
- Sprint Video:
"University Recruitment 1998"

Student comments were:

- He presented the information well, keeping my attention. He was cool because he gave us free stuff.
- I think this is a very good enrichment. Mr. Thornton's presentation was well organized and very informative. It is cool to see someone who is successful that has been through MPI.
- I can tell he was really excited about talking to us; that's really nice. He came well prepared.
- I was very impressed with Tony. What a busy and hardworking guy!
- Tony Thornton's topic and presentation was very good. From him, I know what steps I must take to succeed in life. Besides, he is a positive influence by being a former MPI student and then succeeding in life.
- I think this was a good enrichment because he helped us to realize what is ahead of us next year and in the years to come. I wish we could have heard this sooner though, since we leave soon.
- I think that it's good to have a successful person come and speak who can say to young people that you don't have to be a certain race, very very smart, or come from a certain school district to fulfill your dreams and become successful.
- Thornton was a very good speaker and a good example of someone who has worked toward success by staying focused and motivated.
- I loved the pens and the long distance calling

cards. Good enrichment speaker!

On April 30 Brent Harding (MPI 84-85), an Engineer Specialist at Orbital Sciences Corporation, spoke on **APPLICATIONS OF SATELLITE TECHNOLOGY.**

Students responded:

- This was definitely the best enrichment we've had this year. He seemed like a pretty good fella and his subject matter was interesting. He definitely knew what he was talking about, and he didn't get too technical so as to lose our attention. Got a little slower toward the end but still good.
- He seemed to have a good personality. Even though he was way smart, he seemed to have social skills! A PLUS!
- Very interesting and entertaining enrichment. Stuff that everyone is doing with satellites, i.e., the Northern Russians and their giant mirror was, or rather is, very intriguing. I love the enrichments - the speakers and subjects are always superb!
- I liked how he used the slickies as a visual. Some of us are visual learners, more so than just speech.
- This was a very cool enrichment. It kept us interested.. He's a good speaker. The subject was cool, too!
- The technological advancements that are being studied by Mr. Harding were very interesting to me. The idea of space exploration is one topic that sparks my brain and keeps me attentive. This was a cool enrichment.
- I thought this was one of the best enrichment Speakers yet, though I may have been biased by the fact that he was speaking about topics very closely related to the field I'm interested in. I hope that MPI invites him back so next year's kids can hear what he's been doing since this year.
- He did a great job and I enjoyed his presentation!

Continued after the Calendar →

Mathematics and Physics Institute

CALENDAR 1999-2000

YEAR 16

MPI Begins	Wed., September 1, 1999
Labor Day Holiday	Mon., September 7, 1999
1 st . Quarter Grade and Probation Reports Sent	Mon., October 25, 1999
MPI OPEN HOUSE for Parents/Teachers/etc.	Sunday, November 7, 1999
Thanksgiving Holiday	November 25-26, 1999
Christmas Holiday	Sat.-Sun., December 18, 1999-January 2, 2000
MPI Classes Resume	Mon., January 3, 2000
PANEL DISCUSSION & REUNION	Tues., January 4, 2000
Final Exam – Calculus I - (Math C Only)	Wed., January 12, 2000
2 nd Quarter/1 st Semester Grade Reports Sent	Thurs., January 13, 2000
Martin Luther King Holiday	Mon., January 17, 2000
Holiday (Fort Osage & Independence are out)	Fri., January 21, 2000
President's Day Holiday	Mon., February 21, 2000
3 rd . Quarter Grade Reports Sent	Tues., March 21, 2000
MPI Spring Break	Thurs-Tuesday, March 30-April 4, 2000
MPI Classes Resume	Wed., April 5, 2000
Easter Holiday	Fri., April 21, 2000
Final Exams – Calculus I (A,B,D) and Calculus II (C Only)	Mon., May 8, 2000
Final Exam – Physics	Tues., May 9, 2000
MPI Breakfast	Wed., May 10, 2000
MPI Awards Presentation/Last Day of MPI Classes	Thurs., May 11, 2000

UPCOMING ENRICHMENTS

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

As part of our early MPI orientation, Debra Gaggens of UMKC, will speak on Sept. 3rd, about college admissions in general, and the importance of thinking about applications EARLY. (This is not intended to be a recruitment for UMKC, but a general discussion to help sensitize our students to the importance for colleges of deadlines.)

On Friday, Sept. 17th, Ed Kiker, a Harvard graduate who majored in Lunar Geology and previously served with the Army Space Institute as a Senior Space Systems Analyst, will speak on: **MARS BASE - OUR NEXT FRONTIER**. He will have just returned from giving a talk at the annual Mars Conference in Boulder, Co.

The October 1 newsletter will report on those speakers scheduled for October and beyond.

TO THE PARENTS OF THE 1999-2000 CLASS AT MPI

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

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

One of the first facts we have learned to face in the last fifteen years is that many bright students never learn to study efficiently; they have often gotten along very well with a 'wait and cram'

attitude, giving textbooks only an occasional cursory look in time for testing and relying on their innate ability to absorb information and skills in the classroom. However, in coming to the MPI, these same students always find themselves at first, and suddenly, falling behind.

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

Finally, we urge you to call us if you ever have a question, and we hope that you will find time to visit the MPI during our **OPEN HOUSE** on **Sunday afternoon, November 7, 1999**. (See the Calendar in this issue; more about this in the October newsletter.)

WE HEAR FROM PAST STUDENTS

Bobbi Hopkins (93-94)
(BS Biology)

"The MPI program is a great way to get a head start on required courses for college credit. There is more personal attention given so that students have a good base understanding before going to a University."

Tamara Calvert (96-97)
(Nursing Major)

"MPI helped to teach me self-discipline. College could be very tough for people who don't know how to crack down on studying. I felt that

gave me an advantage over other Freshmen in college.

Even though I hated getting up in the mornings and dragging myself to MPI, it has actually been one of my favorite memories from high school. I made a lot of close friends at MPI.”

Greg Finke (95-96)
(English Literature Major)

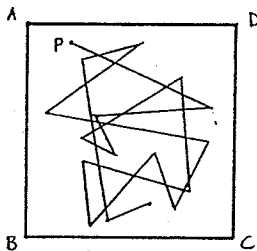
“While a student at MPI, I did not concentrate and work as hard as I was capable of and it showed on my test scores. Throughout my first year of college I did not apply myself and it definitely showed in my grades. However, I now realize the kind of work it takes to succeed.

Take this opportunity to establish for yourselves a disciplined, yet balanced, schedule. This will make a difference when you are at college without a (strict) regimen put in place by your parents. Remember, though, a lot of learning comes not from within the walls of your classrooms.”

**A SOLUTION TO
MATHEMATICS CHALLENGE #58**

Recall the problem statement:

Suppose $S = ABCD$ is a square of side length 1, and inside S we draw a polygonal curve P (meaning P consists of only straight line segments), having total length greater than 10. P can be made up of as many line segments as you like, as long as their total length is greater than 10, and P could even intersect itself.



PROVE that some straight line L , parallel to one of the sides of the square S , must cross any such P at least 6 times.

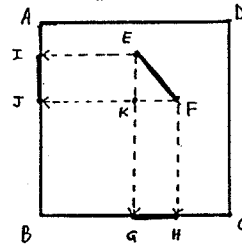
HINT: Consider the projections (shadows) of the segments of P onto two adjacent sides, say AB and BC .

[Note: This question can be generalized if you like by replacing 10 by $2n$, and 6 by $n+1$.]

[Modified from an exercise in Combinatorial Theory: An Introduction, by Street & Wallis, 1977, as reported by Honsberger in Mathematical Gems III, 1985, pp. 139-140.]

SOLUTION:

We'll solve this for the generalized n^{th} case indicated in the note above. Let EF be an arbitrary line segment of the polygonal curve P , and let GH and IJ be its projections (shadows) on the two adjacent sides of the square AB and BC as sketched below:



Applying the triangle inequality to the triangle EFK , we see that

$$GH + IJ = KF + EK \geq EF,$$

meaning the sum of EF 's two projections is greater than or equal to EF itself. Since EF was arbitrary, this inequality is true for all the segments forming P . Now, we'll use Σ as a generic summation symbol, so that for instance, ΣGH will represent the sum of all the projections of segments of P onto the side BC , and so on. Recalling our assumption about the total length of P , we can then write:

$$\Sigma GH + \Sigma IJ \geq \Sigma EF = \text{Length of } P \geq 2n.$$

Since the two terms on the left add to something greater than or equal to $2n$ on the right, than at least one of them is greater than n . (If both were less than n , then the sum would be less than $2n$.) To be specific, suppose $\Sigma GH > n$. But, ΣGH is the sum of all projections of segments of P onto BC , and BC is of length 1, so these projections must cover BC n times and a bit more, meaning at least one point, say X , of BC is covered by at least $n+1$ of these projections. Thus, a line L through X parallel to side AB crosses at least the $n+1$ segments of P whose $n+1$ projections cover X . So, we're done.

**A SOLUTION TO
PHYSICS CHALLENGE #49**

Recall the problem statement:

HIGH VOLTAGE BIRD



Will this bird get a shock sitting on a bare high-voltage line?

- a) Yes!
- b) No.

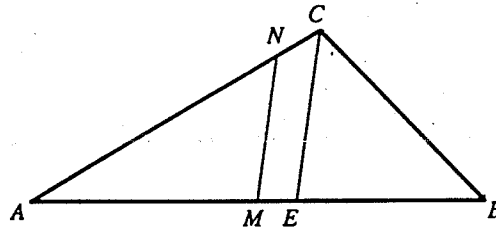
[From: Thinking Physics, Practical Lessons in Critical Thinking by Lewis Carroll Epstein, p. 409.]

SOLUTION:

The answer is: b. You might think that a voltage high enough to compensate for the high resistance of the bird, say 20,000 volts, would produce a damaging current in the bird. But 20,000 volts refers to the voltage of the whole length of wire with respect to the ground. Although the bird on the wire would also be at 20,000 volts, there is no part of its body that isn't; there is no voltage *difference* across its body. Current is made to flow in a conducting medium when there is a voltage difference across the conductor – no voltage different no current. Now if the bird extended its wings so as to touch a neighboring wire at a different voltage – **ZAP!** Power lines are strung sufficiently far apart so as to be beyond the wingspans of birds so they aren't short circuited.

MATHEMATICS CHALLENGE #59

In triangle ABC, as sketched below, let M be the midpoint of side AB. Through M draw a line parallel to the angle bisector of angle ACB, as shown, intersecting triangle ABC again at N. Show that the line segment MN bisects the perimeter of triangle ABC.



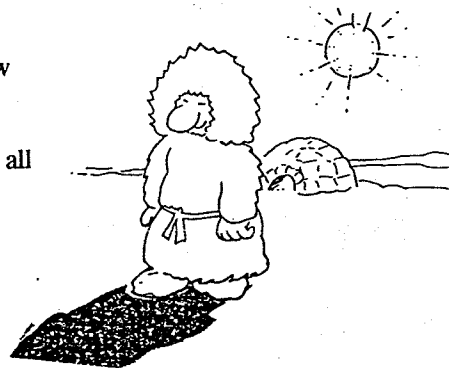
[From: Which Way Did the Bicycle Go?, by Konhauser, et al., 1996, p.8, #24.]

PHYSICS CHALLENGE #50

WHAT COLOR IS YOUR SHADOW?

On a clear and sunny day you are on snow and look at your shadow. You see that it is tinted

- a) red
- b) yellow
- c) green
- d) blue
- e) not at all



[From: Thinking Physics, Practical Lessons in Critical Thinking by Lewis Carroll Epstein, p. 307.]

Editor/Writer:

Richard Delaware

This $M\pi$ Newsletter is typed in Microsoft Word 97 and published five times a year on the first of the month during the months of August, October, December, February and April, at the Mathematics and Physics Institute (MPI), 600 W. Mechanic, Room 224, Independence, MO 64050, Phone: (816) 235-1272, E-Mail: rdelaware@cctr.umkc.edu. Please address all correspondence concerning this newsletter to 'M π Newsletter'.

University of Missouri-Kansas City
Mathematics and Physics Institute
600 W. Mechanic, Room 224
Independence, Missouri 64050-1799

