Mπ

The Mathematics and Physics Institute NEWSLETTER

Director: Elizabeth Stoddard, Ph.D.
Associate Director: Richard Delaware, Ph.D.

August 1, 2002 **mpi@umkc.edu** **Vol. 17, No. 1**

WELCOME TO YEAR 19

We welcome the 19th class to the MPI, representing 9 high schools: Central, Center Place Restoration, Fort Osage, Hickman Mills, Northeast, St. Mary's, Southeast, Truman, and William Chrisman.

MPI STUDENT ORIENTATION
August 28-30, 2002

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, August 28, 2002, 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, Donna, Mon.-Thurs., 8:00am to 1:00pm, at 235-1272. We look forward to seeing our 19th class on **Wed., Aug. 28, at 7:00am in Room 207!**

STUDENTS PLEASE BRING:
ON AUG 28, 7am, 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 Speakers or topics.

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 is the ability to enter fractions and exponentials exactly as you would write them on paper. Some other features are:

- Pen-touch screen entry option. [A plastic stylus is included.]
- TABLE feature.
- Unique Rapid Graph, Rapid Window, and Rapid Zoom features.
- Split Screen option.
- More pixels for a finer screen resolution.
- Slide show feature.

All MPI students are required to EITHER 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 except for the TI-89, TI-92, and other calculators with computer algebra systems included. 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 –
Contact us at (816)235-1272
Or **mpi@umkc.edu**

MPI Alumni who have spoken:

Doug Bullock	(84-85)
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)

2002 MPI AWARDS PRESENTATION AND TOP 10 MPI STUDENTS OF 2001-2002

Our final awards presentation was held on May 9, 2002. In addition to our students, also present were administrators for Independence: David Rock, Superintendent and Patty Schumacher, Associate Superintendent for Education; Steve Scott, Principal of Fort Osage High School; Brian Schumann, Vice Principal of William Chrisman; Richard Neill, School Administrator of CPRS and Archie Gatrost, teacher at CPRS; Parents and family members of: Chris Nevans, Aaron Scott, Johnathon Bender, David Winfrey, Matt House, Tim Colyer, Brian Henks, and Leslie Tiensvold.

We were pleased to present many of our students with the following variety of awards. All students also received a copy of the classic book, Flatland, by A. A. Abbott.

Certificates for Outstanding Achievement
(College grade of A or B)

CALCULUS I

NAME		SCHOOL
Johnathon	Bender	Ft. Osage
Tim	Colyer	Ft. Osage
Reva	Hertlein	Truman
Aaron	Scott	CPRS

CALCULUS I & II

NAME	SCHOOL
Jacob Fulcher	Truman
Christopher Nevans	Truman
Dustin Sullivan	Ft. Osage
Leslie Tiensvold	Truman

PHYSICS

	NAME	SCHOOL
Tim	Colyer	Ft. Osage
Jacob	Fulcher	Truman
Andrew	Gibler	Ft. Osage
Brian	Henks	Truman
Reva	Hertlein	Truman
Matt	House	Ft. Osage
Christopher	Nevans	Truman
Aaron	Scott	CPRS
Dustin	Sullivan	Ft. Osage
Joshua	Tanner	Wm. Chrisman
Devin	Thompson	Ft. Osage
Leslie	Tiensvold	Truman
Alexander	Williams	Ft. Osage
David	Winfrey	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 copies of **"What's Happening in the Mathematical Sciences"** and **"Mr. Tompkins in Paperback" by George Gamow.**

RANK	NAME	SCHOOL
1	Christopher Nevans	Truman
2	Aaron Scott	CPRS
3	Leslie Tiensvold	Truman
4	Dustin Sullivan	Ft. Osage
5	David Winfrey	Ft. Osage
6	Tim Colyer	Ft. Osage
7	Jacob Fulcher	Truman
8	Reva Hertlein	Truman
9	Joshua Tanner	Wm Chrisman
10	Alex Williams	Ft. Osage

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:
Mounish Patel

UM Curators Award Winners:

Jake Fulcher	Truman
Dustin Sullivan	Ft. Osage
Alex Williams	Ft. Osage
David Winfrey	Ft. Osage

ADVICE TO STUDENTS OF YEAR 19 FROM THE STUDENTS OF YEAR 18

"Study! It's not a joke. Speaking from experience, you will fall behind and quit. Don't get discouraged if you don't get the A's you are used to (this isn't your high school). The majority of the MPI students are feeling the same way. It's a hard year, but never give up. Once you've started the course the only way you'll be considered a failure is if you don't finish. Some days will be a bit boring, but there's always that one person who makes everyone laugh. I'm not gonna lie to you, MPI was very challenging for me but I made it through. Just a small piece of advice, take advantage of these problem solving days, you'll regret it in the end if you don't. Also, don't be afraid to ask for help.

PS: For the Kansas City Missouri School District, this is a very different atmosphere from what you are used to (if you know what I mean) but get used to it and do your best. Try to be in the top 10. Please Don't Give Up! Show the MPI staff that Ms. Hayden knows how to pick the exceptional ones."

Danielle Cole
Southeast High School

"If you are incapable of making conscience sacrifices for your own good, then MPI is not for you. If you refuse to take unanticipated challenges head-on, then MPI is not for you. If you have serious health conditions, such as heart disorders, insomnia, or broken limbs, the MPI is not for you. Your grades will drop and a healthy heart will be required to handle the shock. MPI starts earlier than school, and you will need a good night's sleep to have your brain function, so not sleeping at night will produce a great challenge. Also, writing is a fact of life at MPI, whether on paper or at the chalkboard, so you want all of your limbs in proper working order to make your life easier.

MPI will give back to you everything that you put into it. I came to MPI with the idea that I know nothing, and that I have much to learn. I put out an average amount of effort, and am receiving an average grade. In most cases I encourage people to succeed, and for those of you who want to succeed, that's great, but I have found it is more important to learn than to succeed. When I say learn, I don't mean just Physics and Calculus, I mean find out what college will be like next year. Although I can't say from experience what college is like, the courses offered at MPI have challenged me more than any other. I hope they challenge you too for the time after high school."

Tim Colyer
Ft. Osage High School

"The best advice I can give for surviving the MPI is that if you don't understand something, quickly figure it out. Otherwise it will snowball. Try as hard as you can not to fall behind. If you stay on top of things, the MPI is really not that difficult. Do not let one bad test break your confidence or your drive. A good attitude is the most important attribute you can have while at the MPI. If you put forth a little effort and have a good attitude, you will definitely succeed."

Jake Fulcher
Truman High School

"There is so much advice one can give about "surviving the MPI." Mainly though you should try to fight the attacks of senioritis as hard as you can. It is the worst thing that can happen to a serious student. Another thing is to try to come every day. It will be very productive. Also study - not necessarily everyday – but at least enough so that you are prepared for tests, although you will never be totally prepared. Well, good luck. Stick with it and the benefits will outweigh the effort you put in."

Reva Hertlein
Truman High School

"This is a course you should take if you can, no matter what. It is fun, and you will learn a lot. It is a good experience with the difficulty of college work, and it can't hurt your GPA because it is heavily weighted and doesn't have to count for a college grade."

Ben Neal
William Chrisman High School

"My suggestion is to study. Do every odd problem relating to the coming exam. Use the problem solving sessions to ask about what you do not understand. Take notes during the lectures and from the book."

Christopher Nevans
Truman High School

"You can either take my advice or not and learn the hard way like I did. Study 30 minutes for Physics and 30 minutes for Calculus. Use problem solving days to actually solve problems. The key to survive through MPI is to not procrastinate!!!"

Mounish Patel
Truman High School

"There are two main methods for success at the MPI. One is easy the other is not. The method that the teachers will recommend is the hard one. They will say to study hard, prepare for your tests, and do all your homework. While this will invariably result in good grades, it also requires sacrifice and commitment. When you look back of the end of the year, you will see a road of toil and torment, with only a small degree of satisfaction.

The second method is absolutely abhorred by teachers. This method involves desensitization, low-test scores, and feelings of bliss. The basic idea is to try every once in a while so that your grade stays at a minimum of a C. The rest of the time, you slack off. This way you can get low scores. Everyone else will be getting low scores too, so you can maintain your self-esteem. This method is vastly superior because a) you never feel pain when you do bad on a test, b) your letter grade won't be all that low since everyone else will be doing bad, and c) you will be well prepared for college because while everyone else is moping about their grades, you will be feeling good due to the fact that the MPI has destroyed your will to do well.

In all seriousness though, you do need to study. Don't let it consume your life or ever get in the way of stuff that is more important, but do put at least a little time into it. Try to find the happy balance of good grades and desensitization. And remember so long as you do well at the beginning, you can always salvage a decent grade no matter how you do at the end. Help the curve: fail the test!"

Aaron Scott
Center Place Restoration School

"Advice I would give to incoming students is don't be afraid to learn something new and be prepared to lose some old habits. The most important advice is to keep up with the material and study on your own as much as possible. Reading a lot in the textbook and continuously following examples in the book will help you learn the material quicker. Always pay attention to the lectures because there will always be something your instructor knows about the material that you overlooked while studying the night before. Overall, staying on top of subjects and steadily studying is the key."

Kenneth Steward
Central High School

"To survive at MPI you must have the attitude that you are going to try, no matter what. The professors will help you to the best of their ability. They make it where the only way you are going to mess up is if you don't try. Studying is another issue. Like you I wasn't a big studier in high school, and I started out that way at MPI. But you will find yourself wanting to study, believe me. My advice is make close friends and try, always, try."

Joshua Tanner
William Chrisman High School

"When you come into MPI, don't fall asleep. It is very bad to fall behind in your classes. When the teacher gives you suggested problems, work on them so you can get an understanding of the math. Last of all, taking good notes is probably the most important thing."

Devin Thompson
Ft. Osage High School

"Good Luck!!! Hope you survive because it is an uphill battle both ways. Seriously though, it is hard work, so any time you put in will pay off. Also, whatever you do, do not forget to have fun! It will be a long sleepy year without it."

Leslie Tiensvold
Truman High School

THE 2002-2003 CLASS (TO DATE)

Section A (9)

NAME		SCHOOL
Ta'Quela	Blaylock	Southeast High School
Nicholas	Dryer	Ft. Osage High School
Ryan	Larson	Wm Chrisman High School
Esther	McCune	Wm Chrisman High School
Roberta	McKinney	Truman High School
Trang	Nguyen	Northeast High School
Caleb	Postlethwait	CPRS
Jamison	Ryan	Hickman Mills High School
Phuong	Vu	Northeast High School

Section B (10)

NAME		SCHOOL
Jerah	Bates	CPRS
Hoan	Bui	Northeast High School
Chris	Deming	Truman High School
Andrew	Gnefkow	Wm Chrisman High School
Douglas	Hill	Truman High School
Weisha	Jackson	Central High School
Francesca	Menes	Central High School
Chung	Pham	Northeast High School
Shantris	Stamps	Hickman Mills High School
Latosha	Young	Southeast High School

Section C (12)

NAME		SCHOOL
Kevin	Chow	Truman High School
Joe	Goodman	Wm Chrisman High School
Mike	Gordon	St. Mary's High School
Joseph	Hare	St. Mary's High School
Phillip	Hodges	Wm Chrisman High School
Adam	Nichols	Truman High School
Courtney	Olson	Ft. Osage High School
Matt	Orlovick	Truman High School
Ian	Quinn	Wm Chrisman High School
Rachel	VanTuyl	Ft. Osage High School
Edgar	Vargas	Hickman Mills High School
Kris	Vaught	Ft. Osage High School

Section D (9)

NAME		SCHOOL
Jeremiah	Cogan	Wm Chrisman High School
Stephen	Gulick	Truman High School
Jason	Hamilton	CPRS
Cathy	Martens	CPRS
Philong	Nguyen	Northeast High School
Jullian	Ohrman	Wm Chrisman High School
Matthew	Perry	Truman High School
Sergej	Rempel	Northeast High School
Samantha	Smith	Wm Chrisman High School

These are the total of **40 students** (as of this newsletter) who will be enrolled. As usual, there will be additions and deletions through September.

THE 2002-2003 STAFF

In PHYSICS:

Larry Harding (retired), from Fort Osage High School and **Dr. Russell Clothier**, a Truman High School Physics teacher.

And, in CALCULUS:

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

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

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 19,** Dr. John Urani, Dept. of Physics, UMKC, spoke on **Neutrinos.**

Student comments were:

- Discussed the history of Quantum Mechanics and Atomic Theory that led to experiments and study of neutrinos. Gave general definition of neutrinos: massless, chargeless particles that carry energy and momentum. Classified atomic particles into Fermions, Bosons, Leptons, etc. Introduced conservation of Lepton and Baryon numbers, and how it disproved the Grand Unified Theory of 1972. Showed how a supernova in 1987(a) gave evidence that the neutrino has mass, and how a solar collection experiment ratified this result. He listed a number of possible explanations of inconsistencies of neutrino behavior, and explained pro's and con's of each.

- Professor Urani explained what neutrinos are, where they are produced, and how they get to earth. Apparently, the sun makes neutrinos during fusion, they are released into the universe and end up on earth. He showed us the process used to measure the amount arriving

on earth and how the results of this process are helping them understand more about neutrinos.

■ He is a great speaker. I kept up with what he was talking about throughout the whole enrichment.

■ The topic was very interesting, and Dr. Urani had a lot of funny jokes to mix in with his lecture.

■ I liked this enrichment because it involved a lot of chemistry; plus his dry humor was pretty amusing.

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 Linda Hall Library of Engineering, Science, and Technology, UMKC's Physics Department, or Worlds of Fun for some 'hands on' physics.

As part of our early MPI orientation, a financial aid expert from UMKC will speak on **August 30** 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.)

Speakers for **September 13 and 27** are not yet scheduled. The October newsletter will report on those speakers scheduled for October and beyond.

TO THE PARENTS OF THE 2002-2003 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 eighteen 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 10, 2002.** (See the Calendar in this issue; more about this in the October newsletter.)

WE HEAR FROM PAST STUDENTS

Melissa (Steffens) Akey (85-86)
University of Missouri – Kansas City
BA Mathematics and Secondary Education
MA Curriculum and Instruction, Emphasis On Teaching High School Mathematics

Email Received 7-28-02:

I have recently been contacted by many friends and family members who have reminded me that I have lost touch so I thought it was time to come out of my Maui-induced slumber. Brace yourselves because I will try to get you caught up since my last long letter...ha ha...

Continued after the Calendar →

Mathematics and Physics Institute

CALENDAR 2002-2003

YEAR 19

MPI Begins	Wed., August 28, 2002
MPI 6-Week Grades (Independence & Hickman Mills)	Wed., Sept. 26, 2002
MPI 1st Quarter Grades and Probation Reports Sent	Thurs., October 17, 2002
No MPI Classes	Fri., October 25, 2002
MPI 12-Week Grades (Independence & Hickman Mills)	Wed., November 6, 2002
MPI OPEN HOUSE for Parents/Teachers/Etc.	Sun., November 10, 2002
Thanksgiving Holiday	Wed., Thurs. & Fri., November 27-29, 2002
Final Exam – Calculus I (Math C Only)	Wed., December 18, 2002
MPI 2nd Quarter/1st Semester Grade Reports sent	Thurs., December 19, 2002
Christmas Holiday	December 21, 2002-January 5, 2003
MPI Classes resume	Mon., January 6, 2003
PANEL DISCUSSION & REUNION	Tues., January 7, 2003
Martin Luther King Holiday	Mon., January 20, 2003
Recruitment Day #1	Mon., January 27, 2003
Recruitment Day #2	Tues., January 28, 2003
MPI 6-Week Grades (Independence & Hickman Mills)	Wed., February 12, 2003
President's Day Holiday	Fri., & Mon., February 14-17, 2003
MPI 3rd Quarter Grade Reports Sent	Thurs., March 6, 2003
MPI 12-Week Grades (Independence & Hickman Mills)	Wed., Mar. 26, 2003
Easter Holiday	Fri. & Mon., April 18-21, 2003
Worlds of Fun	Sat., or Sun., April 26 & 27, 2003
Final Exams – Calculus I (A, B, D) and Calculus II (C Only)	Mon., May 5, 2003
Final Exam – Physics	Tues., May 6, 2003
MPI Breakfast	Wed., May 7, 2003
MPI Awards Presentation/Last Day of MPI Classes	Thurs., May 8, 2003

School's out so I am trying to keep busy. This is my first summer in 10 years where I actually have tons of free time... This next school year I am teaching all of the same courses as last year (for the first time ever) so I don't have as much lesson planning and I am done with my Master's and I am in the same room for a change. I will be teaching Trigonometry, Pre-Calculus, Honors Algebra II and regular Algebra I again. While I don't use the exact same plans all year, I don't have to start from scratch.

I also plan on working with Patty on Algebra ideas since she and I try to have the same lessons since we have all of the Algebra I students at our school. This works out great because the Geometry and Algebra II teachers don't have to guess at what was covered or have some students say things like "our teacher didn't teach us that".

Joyce and I are also trying to put together projects which we can use in her Physics and my Trig/Pre-Calculus courses. We have almost all of the same students so it gets pretty funny because the kids know what we are doing. Some students even joke that they are leaving my math class to go to their "other" math class. I am glad they are seeing the connection between math and science. I try to be really flexible about the order of the math topics so that Joyce can tell me what she needs. It works out great because I teach the math behind Physics so that she can spend more time on labs and research with the students.

Joyce is starting to teach Chemistry next year and will have a lot of the same students that I have in Honors Algebra II so we are going to try to align those courses also...

I have been going to the school to do free tutoring for those students who are having trouble with their summer math packet. When I first joined Lahainaluna [High School], the Honors math teachers gave summer math packets and I suggested that we should have all high school students do a packet since they forget so much over the summer. I also started the summer tutoring so that the students would get help. Last year I was the only one coming to the school to help the students but this year the other math teachers are chipping in their time at the school in addition to answering e-mail questions from the students. We also have the National Honor Society students coming and helping the 9th graders. As you can tell, I am very proud of the program since it helps us get a head start on the school year.

I have been getting together with other math teachers like Dawn and Kathy to discuss teaching ideas. I have also started my National Board Certification and brushed up on Statistics. I laugh when I read the previous sentence because it makes it sound so easy. My friends think I am crazy for starting the National Boards because it will be so time-consuming. I have to put together a fairly large portfolio with lots of writing and videos of my class lessons and then I have to take a 6 part test (I am actually looking forward to the test, though, since it sounds really challenging). The total time investment is about 200 to 400 hours of work which I have finish by April. I have to take the test before the end of June. On top of all that work, the cost is at least $2300 and you have to wait about 8 months to get your results. So far only 8 teachers in Hawaii have passed their Boards (only 16044 teachers nationwide).

To make it easier to share information with parents and students, I have also started my own web page this summer at

http://myschoolonline.com/hi/mrs_akey

...My page is not done but I have a pretty good start. I have also e-mailed students to ask for their input on what other things they'd like for me to put on the page.

I am pretty good at using the graphing calculator to teach math but this summer I have been writing lessons on how to use the graphing calculator to teach simple computer programming skills. I have also been designing some computer programs to use on the graphing calculator, TI83 PLUS. I am making mathematical graphing games for the students. Luckily Texas Instruments makes a great cable so that I can link my calculator to a student's calculator to give them the program to play. As they play the games, I will show them the code so that they can learn how to design their own math games.

Last school year was tough, financially as well as professionally, due to **September 11th.** Since the tourist industry took a huge loss, many of our students had families who were struggling financially (just like Tim and I) and so some students were not able to focus on their studies (understandably). Unfortunately the previous year we had the 3-week strike that was disruptive to student learning also. So we are really seeing a lot of students struggling to survive. Hopefully next year will be better for everyone.

John Winkler (86-87)
BS Aeronautical Engineering
University of Missouri – Rolla
MA, Ph.D. Aeronautical &Astronautical Engineering
University of Illinois

Letter received 5/30/02 from his parents:

"I want to take a few moments to tell you how much we feel the MPI and the UMKC program helped prepare our son [John] for college and a successful career. Our son worked hard and excelled as a student in the Independence school system. He attended the Zero Hour program [the MPI] on his own decision and by graduation I believe he had 20 to 21 college credits. This program [the MPI] provided him the opportunity he would not have had available to him in other schools if we had stayed in Ohio. He seemed to be in the right place at the right time.

He attended the University of Missouri-Rolla and graduated with a BS in Aeronautical Engineering with a 3.98. He was awarded a scholarship at the University of Illinois where he obtained his masters and Ph.D. He specialized in wind tunnel studies and de-icing, I again believe on a grant from NASA. He is currently working for Swift Engineering in San Clemente, California. He continues to work with wind tunnels.

I would certainly recommend the MPI program continue to provide students a choice to step up another notch, a wonderful chance and opportunity to make the best of their time while in school.

Thank you and those who made this program available while John was in the Independence school system."

John and Judi Winkler

Garrett Mosiman (89-90)
BA Arts & Architecture
Rice University

Letter received on 6/5/02 from his mother:

"As a parent I would like to offer this opinion. These MPI Classes were the bright spot in Garrett's [MPI 1989-90] day. (Although awfully early in the morning!) He was able to take advantage of the credit in order to take more classes related to his field at Rice. It is a great program! Thank you.

Joyce Mosiman."

ODDS AND ENDS

On **May 28,** the director received the following letter:

"Thank you for your letter dated May 22, 2002, regarding the students from the Independence School District that will be enrolled in the Mathematics and Physics Institute for the 2002-2003 school year.

The challenges and opportunities the students encounter in MPI better prepares them for their advanced studies as they plan for their future and choose career paths. We have been very proud of the achievements the students from our District have made as well as the opportunity for them to receive dual credit through the University of Missouri-Kansas City for these Calculus and Physics courses.

We really appreciate everything that you and Richard Delaware provide for MPI students. The Mathematics and Physics Program is outstanding due to your expertise and leadership."

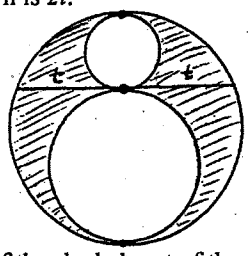
Dr. David Rock
Superintendent of Schools
Independence School District

On **July 29,** Elizabeth Stoddard and Richard Delaware met with Gene Fite, Curriculum Coordinator for Mathematics for the Kansas City Kansas School District about their possibly joining the MPI.

A SOLUTION TO MATHEMATICS CHALLENGE #73

Recall the problem statement:

The length of the chord tangent to the inscribed circles as shown is *2t*.

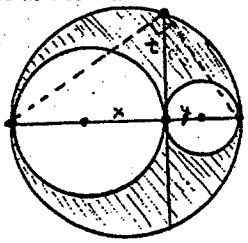


Find the area of the shaded part of the circle in terms of *t*.

[From: Mathematical Discovery, by George Polya, p. 43.]

SOLUTION:

First, it's convenient to rotate the picture by 90 degrees clockwise, and label the radii of the two inscribed circles as shown:



We'll use many standard facts and theorems of Euclidean geometry in this solution.

First, the two inscribed circles' radii are each perpendicular to the chord of length 2t since that chord is simultaneously tangent to both inscribed circles. So, the common point of tangency and the centers of the two inscribed circles are collinear, forming a line segment. Since this line segment is perpendicular to the midpoint of the chord of length 2t, it is therefore a diameter of the largest circle, which thus has radius $x + y$.

We can then write the shaded area A as

$$A = \pi(x + y)^2 - \pi x^2 - \pi y^2$$
$$= 2\pi xy .$$

By Euclid II-14, it is immediate that

$t^2 = (2x)(2y) = 4xy$. So,
$xy = t^2/4$.

[We could also get this from Euclid III-31, the so-called Thales theorem that an angle inscribed in a semicircle, that is on a diameter, is a right angle, and then use the Pythagorean theorem, Euclid I-47.]

Thus, the area A of the shaded part of the circle in terms of t is

$$A = 2\pi xy = 2\pi(t^2/4) = (\pi/2)\, t^2.$$

Observe that as the position of the chord of length 2t varies, A has a minimum value of 0, and a maximum value when $t = x + y$, the radius of the largest circle, that is, when A is half the area of that largest circle.

NOTE: This problem has a long history before the Polya book, rooted in the work of Archimedes [c.287-212 BC] (Lemmas, Prop. 4) and the Arabic editor Thabit ibn Qurra [c.826-901].

A SOLUTION TO PHYSICS CHALLENGE #64

Recall the problem statement:

Why are Polaroid sunglasses recommended for drivers or boaters who want to cut glare from surfaces of roads and lakes?

SOLUTION:

Glare is composed of light polarized (waving only in one plane) parallel to the reflecting surface. This is true because the electrons in the surface have some freedom to move within the surface, serving as the source of the reflected light wave. Since they cannot generally escape the surface, or move perpendicular to the surface, the reflected beam will not contain light polarized perpendicular to the surface.

Most glaring surfaces (roads, lakes, car roofs, etc.) are horizontal, so sunglasses which pass only vertically polarized light waves, known as Polaroid sunglasses, will filter out the glare. Meanwhile, conventional sunglasses will simply decrease overall light transition through the lenses by either reflecting or absorbing it, allowing glare to still be seen by the wearer.

MATHEMATICS CHALLENGE #74

A teen-age boy is now n times as old as his sister, where $n > 3.5$. In 3 years he will be $n - 1$ times as old as she will be then. If the sister's age in years is an integer, find the present age of the boy.

[From: Challenging Problems in Algebra, Alfred S. Posamentier and Charles T. Salkind, 1970 (1996 Dover), pp. 36 & 155, #11-6.]

PHYSICS CHALLENGE #65

Let's discuss the Doppler Effect. We have all experienced the Doppler Effect in sound waves when an ambulance's siren sounds higher pitched as it approaches than as it recedes. This effect is general to all types of waves, including light. Observation of the universe shows that all bits of matter in the universe are receding from each other as shrapnel in an explosion, and this explosion is known as the Big Bang. Can you think of a way astronomers could use the Doppler Effect in light to estimate how long ago the Big Bang occurred?

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