

MPI's EARTHQUAKE TEAM!

In response to the current furor over the possibility of a New Madrid earthquake Dec. 2-3, the MPI has assembled our own Earthquake Team to research the question. The Team consists of 6 students: Jason Anderson, Jenny Myers, and Kendra Van Tuyl (all from Wm. Chrisman High School), Mark Crawford (Northeast), Todd Reimer (Fort Osage), and Matt Roberds (Truman). We obtained a copy of the US Geological Survey Ad Hoc Working Group report of Oct. 18, which examines Iben Browning's prediction in detail, and have also been collecting newspaper and magazine articles dealing with the quake to enrich our understanding of the impact of this prediction and its effect on the population near New Madrid.

The conclusion of the team agrees with the careful analysis of the Ad Hoc report that Dr. Browning's prediction fails one important test of credibility: there is no sound scientific basis for his claim. It follows that the panic in the area is unreasonable. However, because few people have read the Ad Hoc report, and fewer still in the media explain it in detail, most residents of the New Madrid area have concluded it is best to hedge their bets and be elsewhere on Dec. 2-3. It is unfortunate that such a pseudo-scientific claim can be so widely reported, and so widely accepted.

Our team was assembled to shed some rational light on this irrational cloud of hype and fear: Leanna Joyce from Channel 5 interviewed the students on Tues. Nov. 27, and this interview was broadcast at 12, 5, and 6 pm that day; The Kansas

City Star spoke to one team member and Richard Waring by phone for a short article appearing in the Wed. Nov. 28 Star. The U-News, UMKC's student newspaper came by on Thurs. Nov. 29; and finally, on Fri. Nov. 30, both the Independence Examiner and Radio Station KFKF interviewed the team. In addition to gathering some welcome publicity for the MPI program, we hope our students have learned something about scientific method, as well as scientific responsibility.

CALVIN NELSON MAKES THE STAR

Our own Calvin Nelson from Northeast High School, who teaches Physics here at the MPI, was featured in a KC Star article on Nov. 15, 1990. He discussed the status of the athletic program at Northeast from his perspective as athletic director for the last 27 years, observing that with so much competition for students' time today, participation and attendance is down for most sports. He hopes that by instilling pride in his players he can reverse this trend.

OPEN HOUSE 1990

More than 100 people attended our 1990 Open House. We want to thank all those who contributed to its success and hope everyone had an enjoyable afternoon. Especially I want to thank the parents who took an afternoon from their busy schedule to show support for their children by seeing what is going on in a part of their lives. We believe a quality education for our young people is of paramount importance in today's world. The basis of that education

is set at home through your encouragement, support, and guidance.

I also want to thank the students who helped set up and put away the equipment, and those who discussed the calculus problems and videos, and the physics labs and demonstrations with our guests. Hopefully we didn't give too many "wrong answers", and everyone had a good time.

Richard Waring

ENRICHMENTS

FOLLOW UP

We have heard the sad news that the Unique Science Adventure exhibit at the Downtown Airport which we visited as our first field trip this year has closed for lack of business. We are sorry to see it go, and hope that our region will grow to support such ventures in the future.

On the bright side, the Kansas City Museum has placed science and technology as its first priority in all exhibits from now on, and has as its president a former director of the Science and Technology Museum in Chicago. We anticipate great things.

Henry Mitchell was unable to visit us in November, but on Nov. 7 our speaker was Ed Kiker, a space consultant and member of the National Space Society. He gave a stimulating talk on the Industrialization of Space, and how essential it is for our planet to look outward.

UPCOMING ENRICHMENTS

On Dec. 5 we take our annual trek to the Research Reactor in Columbia, and the MU Physics Dept. This all-day field trip is usually a favorite for our students.

Jan. 2, 1991, our first day back after the Christmas Break will also be the day of our annual Panel

Discussion and Reunion, on which former MPI students return and discuss their college and work experiences beyond the MPI. This year we are taking pains to collect questions from this year's class in order to give current focus to the panelists' comments.

On Jan. 9, our guest will be UMKC Physicist David Wieliczka, who will discuss lasers and holograms.

ALL PCs STOLEN

Over the weekend of Oct. 13, the Truman campus Engineering PC Lab was burglarized and all PC's and printers were stolen. Although the MPI owned no equipment down there, our experiment with a PC-based Calculus Lab, using DERIVE and CALCULUS software, was immediately ended. The equipment has just been replaced, and by January we will be able to return to our first attempt at using computer labs in teaching mathematics at the MPI.

UPDATE ON QUANTUM

Our use of the new US-USSR collaborative magazine QUANTUM continues. We, and all our students, have now received our second issue of the year, and continue to find this science and mathematics magazine for students to be clever, fun and enlightening. We have already begun using the magazine to illustrate concepts in our courses, and have offered extra credit for reports on certain readings. A new development is that a major publishing house, Springer-Verlag, has agreed to publish and distribute the magazine world-wide. We applaud this fine effort to engage students around the world in the essential and wondrous adventure of science and mathematics, and hope QUANTUM thrives into the 21st century.

MORE 1990-91 STUDENT QUOTES

"The Institute is neat because it gives us a chance to get away from our high schools, and have a little bit of responsibility and trust given to us by the administration."

Jennifer Spungen
Truman High School
Independence School District

"So far, the MPI is great. It gives you a break from the same old high school stuff and challenges you to work and study harder."

Khanh Tran
Northeast High School
Kansas City, MO School District

"I've never really had to study for anything before; it's a change that's helping me prepare for college."

Holly Buxter
Van Horn High School
Kansas City, MO School District

"So far, this year at MPI has been a lot of fun. I've met new people and I feel like I'm preparing to go to college."

Kathy Minton
Fort Osage High School
Fort Osage School District

PROFILES IN SUCCESS

In this issue of the NEWSLETTER we have outstanding success stories from our 1984-85 class and our 1985-86 class.

From our 1984-85 class we feature Brent Harding. Brent

attended Fort Osage High School where he was valedictorian and participated in varsity basketball and golf. He was also the top student in the 1984-85 MPI class.

Last year Brent graduated second in his class of Aeronautical Engineers at the University of Texas, where he was a member of the Alpha Phi Omega Service Fraternity, and participated in intramural basketball. Upon graduation Brent received attractive offers from General Dynamics, the Unisys Corp., and McDonnell Douglas. He chose McDonnell Douglas primarily because of the opportunity to work on Freedom, the NASA space station scheduled to begin deployment in 1995. Brent works on the guidance systems for changing orbits and attitudes. Brent works at the division of McDonnell Douglas located near the Johnson Space Flight Center in Clear Lake City, Texas.

From our 1985-86 class we feature Phillip Fleming. Phil attended Wm. Chrisman High School. After graduation Phil enrolled at the University of Missouri-Columbia where he received his Bachelor of Science-Education degree with a chemistry specialty in 1990. His grade point average was an excellent 3.49. While at UMC, he had the opportunity to do research under Dr. Stanley Monahan, a nationally known environmental chemist. Phil's research involved the immobilization of metal waste using reverse burn coal char techniques. He was also a judge at the Missouri State Science Olympiad, and did his practice teaching at Columbia Hickman High School.

Phil is now employed by the Fort Osage School District, where he teaches chemistry and advanced chemistry at the high school.

In August his days as a bachelor ended when he and Maria were

BROTHERS AND SISTERS

Here, as a curiosity, is a chart of the sets of siblings who have attended the MPI over the years from 84-85 to the present:

<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>	<u>Year 6</u>	<u>Year 7</u>
	Rolando Aguilera	Maria Aguilera		Anthony Aguilera		
Darla Allen					Rana Barber	Brad Allen Shalom Barber
		Tim Bacchus			Jamy Bacchus	
	Eric Baker		Ryan Baker		Ivan Bird	Chris Bird
Jody Breshears		Suzanne Breshears				
				Jeff Coleman		Jared Coleman
	Trang Du			Hang Du		
	Gladys Gilford Glynda Gilford					
	Phil Kelsay			Brian Kelsay		
	Sun Hwa Kim					SeHan Kim
				Andrea Linville Audrey Linville		
				Todd Myers		Jenny Myers
Sheryl Nance		Tri Nguyen	Kelly Nance	Loan Nguyen		Mary Noah
		Caroline Noah				
			Duc Tran Chi Tran		Candi Smith	Charles Smith
			Dinh Tran	Thaison Tran		
	Van Tran		Hien Tran			
		LeAnna Van Tuyl				Kendra Van Tuyl
				Sokha Vath		Mao Vath
				Patrick Windes		Jason Windes

married. They now reside in Independence, where she teaches English at Palmer Junior High School and Truman High School.

Best wishes to both these young men as they begin their careers, and become contributing members of our society.

Richard Waring

A SOLUTION TO
MATHEMATICS CHALLENGE #15

Recall the problem statement:

A jailer, carrying out the terms of a partial amnesty, unlocked every cell in a prison. Next he locked every second cell. Then he turned the key in every third cell, locking those cells which were open and opening those cells which were locked. He continued this way, on the n th trip turning the key in every n th cell. Those prisoners whose cells eventually remained open were allowed to go free. Who were the lucky ones?

SOLUTION:

The number of times t that the key was turned in the n th cell is equal to the number of DIVISORS of n . So, if we completely factor n as

$$n = P_1^{a_1} \cdot P_2^{a_2} \cdot \dots \cdot P_k^{a_k}$$

where the P_i 's are distinct prime numbers, then remembering that any divisor of n is some product of these primes, where the powers of the i th prime can range from 0 up to a_i , we conclude that

$$t = (a_1 + 1)(a_2 + 1) \dots (a_k + 1).$$

Now, if any a_i is ODD, then t is even, and the corresponding cell eventually remained locked. If all the a_i are EVEN, then n is a perfect square, t is odd, and the lucky occupants of the "perfect square" cells found that their cells eventually remained open.

[From: Mathematical Quickies, by Charles W. Trigg.]

A SOLUTION TO
PHYSICS CHALLENGE #6

Recall the problem statement:

Every driver will occasionally have to make a quick decision whether or not to stop at a yellow light. Her intuition about this has been built up by many tests and some mistakes, but a calculation might reveal some situations where intuition will not help.

For some given light duration and intersection size, what combinations of initial speed and distance require you to stop (or run a red light)? What range of speed and distance would allow you to make it through in time?

Notice that for a certain range of these parameters you can choose either to stop or not. But there is also a range in which you can do neither in time, in which case you may be in a lot of trouble.

SOLUTION:

Upon approaching an intersection whose light has just turned yellow, you can stop at a maximum negative acceleration, race through at some maximum positive acceleration, or maintain your same speed. For example, suppose your car is moving at 20 mph (30 ft/sec) when

the light turns yellow, the intersection is 30 ft wide, the duration of the yellow light is 2 sec, and the maximum acceleration is either + 10 m/sec² (for increasing your speed) or - 10 ft/sec² (for stopping). Assuming ideal conditions (e.g., that your engine instantly responds to a push on the acceleration pedal), we can calculate the distances to the intersection needed for your three options. In order to race through successfully, you would have to be closer than 50 ft when the yellow appears. To stop successfully, you have to be further away than 45 ft. Between 45 ft and 50 ft, you have either option.

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MATHEMATICS CHALLENGE #16

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

PHYSICS CHALLENGE #7

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