

# M $\pi$

The Mathematics and Physics Institute NEWSLETTER

Director: Richard Waring

Mathematics Coordinator: Richard Delaware

December 1, 1994

Vol. 9, No. 3

## TO ALL MPI ALUMNI:

HAVE YOU GRADUATED  
FROM COLLEGE?

IF SO:  
PLEASE CONSIDER JOINING OUR  
PANEL DISCUSSION THIS YEAR!  
(Tues. Jan. 3, 1995)

ALSO, PLEASE CONSIDER BEING  
AN ENRICHMENT SPEAKER!

CALL (816) 235-1272

demonstrates that someone in their school cares.

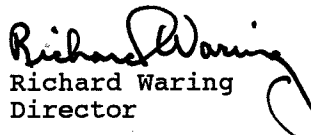
Although we believe everyone should have a solid basic understanding of mathematics and his/her physical environment, the study habits, reasoning ability and problem solving skills developed at the MPI are our highest priority, since these qualities carry over to other disciplines, and are essential in every productive individual. As we move, more and more, to a world economy, a solid education with well developed reasoning and problem solving skills is becoming a necessity.

Should questions about the MPI arise, please feel free to call.

## OPEN HOUSE THANK YOU

One hundred and two individuals attended our 10th annual Open House on Nov. 6. Included were 62 parents and relatives of MPI students, 28 students, 2 school administrators, and the entire MPI faculty and staff. This was the largest turnout ever and I want to thank all of you for taking time from your busy schedules to find out what is going on at the MPI. Your attendance demonstrated to your son or daughter a genuine interest in their activities and education. Your support has helped mold their priorities and goals. You have probably found that the demands and expectations at the MPI may be a new experience for your son or daughter. Your continued help, support and encouragement will contribute immensely to their success.

I particularly want to recognize Steve Scott, Fort Osage High School Principal, and David Rock from the Independence Central Office: school-related functions demanding your time must seem unending. However, for students your presence

  
Richard Waring  
Director

## MATHEMATICS TECHNOLOGY REPORT

1. With the first printing of the 101 page MPI "Red" Lab book this year, written by the mathematics coordinator, all Calculus I computer labs, with corresponding information about our primary mathematics program Derive, are in one place, and in one format. Students have no difficulty finding labs and faculty have clear references, which is a major improvement over the innumerable handouts of past years. A corresponding MPI "Green" Lab book for Calculus II computer labs will be produced this month.

2. Derive, version 3.0 is finally on the market! We have bought the upgrade from our current version 2.55, and will install it over the Christmas break. The improvements are many, especially in the user interface, including automatic

numerical labels for the tick marks on coordinate axes, the ability to plot implicit 2D curves, a collection of options familiar on graphics calculators such as: autoscaling of graphs, a "trace" function, direct setting of the range of a plot, and having the screen "follow" the crosshair when it moves off-screen. There are also mathematical function upgrades that we will discover over time. In all, an excellent program only gets better.

3. The MPI currently has 15 IBM-compatible computers: 3 are in the separate offices of the Director, the Mathematics Coordinator, and the secretary, 1 is on a large cart with an overhead projector and color LCD panel attached, and 11 are otherwise on rolling carts for student use in calculus and physics labs. In particular we have: one (ancient) Eltech, 1989, 386/16; one (old) Blackship, 1991, 386SX/16; ten DTK Gråfikas, 1992, 386/25; one IBM Valuepoint, 1993, 486/33; and two DTK Gråfikas, 1994, 486/33. Of course, whenever possible students battle for use of these last two (fast, and, with HP Deskjet printers). The only real usage conflict we currently have is that when physics labs require PCs, for 5 days we cannot use them for calculus. But, in time, a few more computers will eliminate even this conflict.

4. Our usage of the SHARP EL-9300C graphics calculators is becoming more refined and active, especially since we adopted a new calculus text by Thomas, Finney, Demana and Waits which carefully integrates the existence of technology with the teaching of calculus. We actively use the ability of our calculators to accept entry of functions typed in the way one would write them out by hand, and to compute first or second numerical derivatives at a point, or, to graph functions in rectangular or parametric form, as well as graph first and second numerical derivatives. Thanks to the Technology Resource manual for the SHARP that is a supplement to this calculus text, as well as the calculator programming efforts of the mathematics coordinator and Jason Anderson (MPI 1990-91), we now have a variety of SHARP programs, distributed to all students, which enable them to further explore mathematics (and physics) on their

own. Some of these are programs to: graph tangent lines to curves, compute Newton's Method step by step, graph functions defined in 2 or 3 pieces, graph integrals numerically, convert physics units, look up physical data and constants, produce a slope field, and more. (Next year we may have to bind yet another colored MPI book just for our SHARP uses!) In short, students now seem to "own" more mathematics, and to our pleasure, continue to surprise us by using their graphics calculators to examine calculus in ways we hadn't even considered.

## ODDS AND ENDS

On Sept. 27, Sheri Adams attended a conference on Integrated Curriculum, at the Learning Exchange in Kansas City.

On Oct. 7-8, the mathematics coordinator chaired the 4th Annual Greater Kansas City Mathematics Technology EXPO held at Kansas City Kansas Community College. It was a great success, attended by participants from 45 colleges and universities, 11 high schools, and 7 states.

On Nov. 2, for the first time in at least 11 years, our MPI office was painted, which not only brightened up the room we all spend so much time in ("cream" is so much better than "hospital green"), but also (and not insignificantly) cheered our long-suffering secretary Doris. If nothing else, she was happy to finally replace some of the old Einstein posters on our wall!

Also on the morning of Nov. 2, a photographer and graphics editor from UMKC's Creative Services took new photos for a fresh printing of our MPI brochure. Physics lab, calculus lab, problem-solving, and lecture shots were taken, with the cooperation of our busy students. (We did however ask them to try and look intelligent...)

Finally, on Monday Nov. 14, we distributed to students a letter to their parents with "M $\pi$  Christmas Gift Ideas", containing information about recommended graphics calculators and, how to get Derive for themselves.

## ENRICHMENTS

### FOLLOW UP

On Oct. 14, Kathleen Fuller, a physical anthropologist from the University of Kansas, spoke on **BIG BRAINS AND BIPEDALITY**.

Some student comments were:

--The speaker proved to us which came first, big brains or bipedality. She showed us how humans separated from primates and how humans have bipedality. She was a good speaker because she got the audience involved in brainstorming.

--It was first believed that the thing that separated humans from apes was big brains. However, it was discovered that big brains didn't come in until 100,000 years ago, and that's fairly modern. Bipedality came to replace the big brain theory because a knee-joint and other items were found in Africa proved that there had been bipedal hominid about 3 million years ago.

--The speaker talked about how humans are related to primates. Apes with big brains have a correlation with the pelvis size of the animal. Ms Fuller said they built an entire skull off of a single bone chip.

--I have always been interested in archeology, so I especially enjoyed this enrichment. I really liked the skulls and bones she brought. They gave us the opportunity to actually see the size and shape "in person" rather than in pictures.

--We discussed different reasons why people began to walk upright and its advantages. She showed us the difference between the human and ape's upper leg bones, which is that the human's is at a slant for balance. She said when the brain started getting larger, the pelvic bone had a bigger area and the babies were probably born earlier. The babies are now more dependant on their mother right after birth than the ape babies.

--Once again, this is fascinating. I love anthropology! She had many interesting details to tell, and the visual aids were wonderful. Next time, cancel calc too, and let her bring slides and footprints. This

was very interesting but I want to see as much as possible.

--Lucy was an example of one of the first bipeds found. Bipedality seems to be the only separating factor between hominids and chimps. Since chimps make tools also, that was not a difference. Ex utero gestation is a difference also. The first hominid became pair-bonded and they developed bipedality to adapt to the changing environment.

--This enrichment taught us that we are hominid--not because we have big brains, but because of our bipedality. I found it stimulating to learn that the early hominid had very small brains. It was also interesting to learn that the pelvis plays a role not only in the way we walk, but in the size of our brains. I felt quite privileged to listen to this enrichment.

--We were shown that, in fact, our standing pose evolved before our huge noggin. Actually, our "big brains" developed much after our bipedality, and made us less efficient walkers. We discussed reasons for become bipedal, and these included staying cool, carrying stuff, and possibly swimming!

--This was a good presentation--you could tell she really knew her stuff. I was worried at one point, though, that someone in the audience was going to try to start an evolution/creation argument, which would have been completely counterproductive. The speaker handled it well.

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Oct. 28 brought Steve Chiappari, a mathematician from Avila College to talk about **THE GAME OF LIFE**, a surprising mathematical game.

Students commented:

--If a cell is alive and has 2-3 neighbors, it stays alive, if it is dead and has exactly 3 neighbors, it comes alive. All others either die or remain dead. The patterns are fairly unpredictable just like real life. Things aren't always as they seem; things tend to get more symmetric over time.

--It is an interesting use of mathematics that demonstrates, in many ways, the creation of life.

--It has two simple rules and a very simple grid game board, and is intended to simulate the life cycles of (I suppose) a culture of bacterium. Cells live and die, and form interesting geometric shapes. I found it really neat!

--I found the complexities of a game so simple in appearance to be quite interesting.

--This was a bit different than I expected. I expected to hear about some stupid game. Well, this game is very interesting and challenging. The changes in the dots (blocks) are amazing. The lecture was very informative on how many "games" relate to what we do everyday.

--If a single cell is neighbor of two or three cells, that cell will survive. On the other hand if a cell is neighbor of more than three cells, or if it is neighbor of just one neighbor, those cells will die. They die sometimes because they are alone, and other times they don't survive because they are too overcrowded. I think it was interesting, because I never had heard of that before. It sounded a little strange at first, but I liked it.

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Finally, on Nov. 11, we made our annual all-day field trip to the **NUCLEAR RESEARCH REACTOR** and the **PHYSICS DEPT.** at the University of Missouri-Columbia campus.

Students responded:

--At the reactor the tour guide said they produce more energy at the reactor in Columbia than all of the other college reactors in the country combined. I thought it was interesting that they took the clear topaz stones and put them into the reactor to turn them blue. I was also surprised at how much energy one of their fuel elements would provide. I think it was equivalent to 3 barrels of oil or a few thousand cars of coal.

--The Research Reactor was amazing. It was quite small compared to what I thought it would be. The whole contraption was pretty big with the 30 ft. pool and the blue glowing water. I thought it was neat how the reactor paid for itself.

--In the Physics Department we saw the technology being used by undergraduate and graduate students, such as lasers, diamonds, modern "darkrooms" (in progress at MU), an x-ray producing machine to discover the internal structure of atoms, and computer labs. At the Reactor, we learned about the nuclear fission process, saw the water tank containing the reactor core (with the cool bluish light), and learned about applications of nuclear science (as in radioactive dating, topaz coloring, treating bone cancer, supplying bomb uranium, etc.). I was delighted to wear the radioactive measuring tag for my group!

--We saw the reactor--what a majestic sight. The pool was glowing blue from radiation (electrons moving faster than the speed of light in water). At the physics lab we saw many lasers (I want one for Xmas), and we also smashed a tennis ball that had been in liquid nitrogen.

--This trip was definitely interesting. I am really glad I got a chance to see the MU reactor. I was not aware it was possible to shoot a neutron at topaz and change its color. I really enjoyed the lasers and liquid nitrogen at the Physics Department. I'd have to say, however, that my favorite part of this trip happened as we were leaving the nuclear reactor. I set off the radiation detector, not because I was irradiated, but because the sensor didn't detect me because I was too short!

--It was a chance to get away from the hard school life and relax.

--Visiting MU's campus and its Research Reactor was a memorable experience. It allowed us to get better acquainted, while letting us see MU and its reactor up close. I had never seen the reactor before, and its immense size and brilliant blue water were impressive. The demonstrations and the lasers were also exciting to see up close. When I hear some of the things we saw discussed in the future, I will have a better idea of what is being said.

--We saw some lasers and an optics lab. A grad student showed us some tricks with liquid nitrogen. He dipped a piece of my gum in it. Then let me chew it. People said that a bunch of steam came out of my mouth

when I first chewed the gum. The reactor was interesting. I liked the blue color of the water. It was neat how they lowered the air pressure in the core so in case of a breach the air would rush in instead of out.

--At the University, I had the opportunity to see experiments that I hadn't even thought of. For example, one that impressed me the most is one in which we inflated a balloon, and then put it into a device with water at about 70° F. I thought that the balloon would blow up and shatter into pieces, but to my surprise, the balloon shrank.

--Where's Homer Simpson's station?

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**UPCOMING**

On Dec. 9th we will welcome back a perennial favorite speaker Frank Booth, from the Kansas City Regional Crime Laboratories. He will discuss **SCIENCE IN THE CRIME LAB.**

Jan. 3 will be our annual **PANEL DISCUSSION AND REUNION** with MPI Alumni.

On Jan. 13 UMKC Professor David Wieliczka will once again demonstrate his **LASERS AND HOLOGRAMS.**

Then on Jan. 27, Lori Hill, one of our former (85-86) physics tutors and now a Senior Software Engineer at Wilcox Electric, will return to speak on **LANDING PLANES USING SATELLITES: THE GLOBAL POSITIONING SYSTEM.**

**NEW (OR CHANGED)  
E-MAIL ADDRESSES**

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

**\*\* NEW \*\***

- (84-85) **Scott Huerter**  
usfmcq4p@ibmmail.com  
FORD MOTOR CO.
- (85-86) **Sarah Littlewood**  
srlittle@artsci.wustl.edu  
WASHINGTON UNIVERSITY
- (86-87) **Cindy Gillespie**  
cindy@ee.umn.edu  
UM-ROLLA

- (93-94) **Chris Goldsmith**  
cgold@umr.edu  
UM-ROLLA
- (93-94) **Trang Tran**  
st065188@vax1.rockhurst.edu  
ROCKHURST COLLEGE

**\*\* CHANGED \*\***

- (84-85) **Brent Harding**  
brent@Moe.sed.stel.com  
STANFORD TELECOM CO.
- (86-87) **Eugene Bae**  
bae@mit.edu  
THE PENTAGON
- (87-88) **Nate Moore**  
nateiv@aol.com  
ST. LOUIS

**MPI E-MAIL ADDRESS:**

**rdelaware@vax1.umkc.edu**

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

**WE HEAR FROM PAST STUDENTS**

**SCOTT HUERTER (84-85)**  
(BS, Mechanical Engineering;  
MS, Civil Engineering)

10-19-94 e-mail:

"Hello all. I just received the latest issue of M $\pi$  and noticed that there was a listing of E-mail addresses of persons who have attended the MPI. I have decided that it is time to let you all in on my location and what has happened to me since I left the MPI.

I received my BS in Mechanical Engineering from the University of Kansas in May 1991. I then worked for the University as a Systems Analyst up until this past year. I have in the interim completed my MS degree in Civil Engineering, also from KU, which I recently defended. Now I am working as an Engineer for Ford Motor Company at their largest Engine plant in Lima, OH. (That is Lima, like lima bean, not Peru).

Other than that not much else to report at this time.

All e-mail is welcome. I wish you all continued success with the program, and please keep in touch."

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**CHRIS GOLDSMITH (93-94)**  
(Engineering Major)

10-17-94 e-mail:

"Greetings from beautiful but quiet Rolla, Missouri! I just got the Newsletter by snail mail today, so I thought I'd start e-mailing people. Rolla is a great town. I have really enjoyed the change in scenery. I like the small town setting and the fresh air. I'm getting more accomplished each day, so I feel fulfilled. The classes aren't bad, but then again I'm only a first semester freshman. Calc II is a bit easier here than it was at MPI. I got a 37 on the natural log and exponential function test. That was the first one of the year and I had expected to do badly. I got a 74 on the Integration techniques test. I hope I can continue to improve especially since the next test is over infinite series. (Boo, Hiss...)

There is one reason I am glad I went to MPI. It's not that I learned study techniques. It's not that I learned to think early in the morning (although that has been helpful). I am glad I went to MPI because I learned that if I don't do any homework and I don't read the book I do poorly on the test. I haven't studied this hard for anything since...well, I don't remember studying this hard! Give this advice to your students.. "When Delaware gives you a list of "suggested" homework problems, he really means "required for you to do well on the test" problems. Don't go through the year without doing homework. You have a great opportunity to get personal attention from your Profs. Take advantage of it!"

Tina Knutson was the youngest of 14 children? Ouch! Life with that many siblings must have been interesting.

Like I said, I like Rolla. It is unfortunate that Rolla lacks two of my favorite things: muscle cars and good women. There are a few old El Caminos here, but none as cool as

mine. I haven't even drag raced anyone yet. On women... it's 4:1 guy to girl... need I say more? I don't need the distraction since I have to study so much.

One cool thing I'm involved in is the Solar Car Team. I'm on the brake design team. I have really enjoyed being on the design end of a car. After all, that's what I want to do for a living. We've got a totally new design for this year and it will be a rewarding experience to see how well it does next summer in the race.

Well, I've got to go do 9.2 homework for calc. Say hi to Mrs. Adams for me! Bye!"

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**JENNIFER YUTZY (93-94)**  
(Engineering Major)

10-25-94 e-mail:

"Hi! Well, it's a little too late for the Calc thing. I did end up dropping that class and I feel so much better now. I'm still not sure what I'm going to do about school, but I do know that I don't want to go into engineering. It's not that I can't do it, but I don't want to do it for a career. Yes, there are a lot of people who get an engineering degree and do business and such, but what's the point of going through this majorly hard program when I can go into something that I enjoy without all the electronics and science. Maybe I'm just lazy.

I'm going to take a Computer Science course next semester-- wherever I end up at--to see if that's something I can see myself doing. I'm just going to take it easy. You know, do the basic requirements and a few electives. I think I'll be in much better shape. The only thing is that I have a scholarship that will only be mine if I am enrolled in an engineering school. So, whatever I do I have to declare Engineering at least one more semester. I'm sure it will be okay though. Life's more fun with all the challenges."

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**LAURA DILLEY (91-92)**  
(Brain & Cognitive  
Sciences/Linguistics Major)

9-4-94 e-mail:

"Hi! Just thought I'd write you a short note. I'm busy clearing our my inbox and came across one of your letters. The summer ended up with a spurt in my productivity at work, though I haven't finished the paper yet. Not due to my own neglect, but it just turned out to be a bigger problem to tackle than we thought. We're shooting for Sept. 30 for a final draft. In the meantime, classes start Wednesday. I'm probably taking 2 linguistics classes (syntax and psycholinguistics!) as well as a class at Harvard in conversational German and another class which I haven't decided entirely upon, but which will probably be neurobiology/psychology. Or maybe prob & stat, though I'd rather take the former (sorry!). Are you gearing up for another year at MPI? Bet so. You'll get my brother this year, you know. He may be a handful, just a warning. Make sure he puts his nose to the grindstone."

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**SARAH LITTLEWOOD (85-86)**  
(BA, Mathematics/Physics;  
PHD Student, Mathematics)

11-12-94 e-mail:

"This school year has gone much better. I finally decided on a field and an advisor. I have to laugh now, because when I started everyone kept telling me I should go into applied (mathematics). I wanted to go into theory (or at least what I thought was theory). Well, now I want to go into the numerical analysis area. (And be about as applied as I can be and still graduate from here.) My advisor (M.V. Wickerhauser) is in Wavelets. This is a hot field at Wash U.

Anyway, I just looked at the time and I really need to get to work. Please write me; I would love to hear from you. The best way to reach me is by e-mail. I try to check at least once a day. Take care!"

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**BRENT HARDING (84-85)**  
(BS, Aerospace Engineering;  
MS, Physical Science)

11-14-94 e-mail:

"Greetings everyone! It's been a while since I've e-mailed most of you, so I thought I would send out a

quick message to update you on my whereabouts. I am working at Stanford Telecom in Reston, Virginia, doing GPS (Global Positioning System) work for the FAA (Federal Aviation Administration). I can be reached at brent@Moe.sed.stel.com.

We're in the process of upgrading our computer system here, so I'll send out an update if my e-mail address changes. Also, I don't think that the "M" in "Moe" has to be capitalized.

That's all for now. Hope to hear from you soon!"

### 1994-95 STUDENT IMPRESSIONS

"Participating in the MPI program has been and is continuing to be a tremendous experience. The teachers here are great. All are very knowledgeable, and we have the opportunity to work with a variety of instructors, thus we are exposed to several different teaching methods and thought processes. All of the educators are very patient and always willing to help. The individualized attention which can be attained here is invaluable.

There is a great deal to be learned, and not all of it has to do with calculus or physics. With students from so many different schools, we are provided the opportunity to learn about other school districts. It is often quite interesting to compare your own school system with another and analyze similarities and differences. I believe that the greatest benefit of the variety of school districts is the chance to meet new people. It is difficult not to make new friends here.

Overall, I feel that this is an exemplary program and I encourage anyone interested in taking calculus or physics to become a part of it."

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**Marlene Toole**  
Ft. Osage High School  
Ft. Osage School District

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"The MPI is full of many exciting and rigorous challenges. It provides us with the opportunity to become acquainted and work with students from different schools. We are also given more freedom to decide

when to work problems and review, which ultimately helps build responsibility through time management skills. For those of us who have not yet learned to avoid procrastination, the MPI allows us to recognize and eliminate this defeating strategy before it destroys us in college. All in all, this year is shaping up to be a memorable one at the MPI."

Amy Bentz  
Truman High School  
Independence School District  
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"I find it scary when I take a test, and answer all the questions, only to find out 5 minutes before the end that my calculator was set in degrees instead of radians."

Jennifer Brown  
Wm. Chrisman High School  
Independence School District  
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"My impressions of MPI:

Waking up at 5 a.m. to go to school is not my idea of having fun. However, it does sound good to get college credit for free. I didn't know what to expect when I first began the MPI program. This is a fast-paced learning experience. I have learned a lot already. I thought that it would be just lectures, but it's not. I have enjoyed the enrichments and the field trips. I also like the physics labs and PC labs. This is quite an experience that I will always remember."

Jennifer Woolsey  
Northeast High School  
Kansas City MO School District

### A SOLUTION TO MATHEMATICS CHALLENGE #35

Recall the problem statement:

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What is the curve of minimum length which bisects the area of an equilateral triangle?

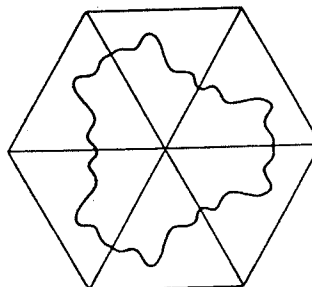


[From: Mathematical Quickies, by

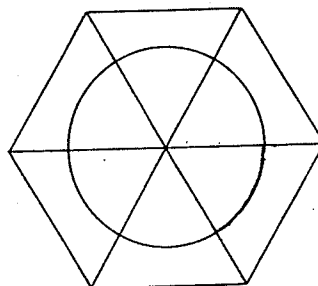
Charles Trigg]

SOLUTION:

Keeping fixed, say, the left vertex of the triangle above, reflect both the triangle and the bisecting curve repeatedly, to produce the regular hexagon below:



The curve, which bisected the area of the original triangle, has now become (through repeated reflections) a closed curve within the hexagon, and of course now it bisects the area of the hexagon. So this curve encloses a fixed area, specifically, half the area of the hexagon. If the length (perimeter) of this curve (enclosing a fixed area) is to be a minimum, it must in fact be a circle, whose center is at the fixed vertex of our original triangle:



### A SOLUTION TO PHYSICS CHALLENGE #26

Recall the problem statement:

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WHO'S WHO IN PHYSICS?

Two cylinders, one of lead and the other of aluminum, are identical in physical dimensions and both are



painted so as to be similar in appearance. They both weigh the same, the aluminum being solid while the lead is hollow. Using no other objects, how could you determine which is which? (Note: The lead cylinder does not sound hollow when tapped. You may not scratch or damage the cylinders.)

[From: Pasco Scientific Notes]

**SOLUTION:**

If both cylinders are rolled side-by-side down an inclined ramp, the hollow one made of lead will lag behind, while the solid one made of aluminum will advance ahead. This is because the rotational inertia of the two cylinders is different.

Rotational inertia is that property of an object that causes it to resist a change in its rotational state. It depends not only on the mass of the object but how the mass is distributed. Since the mass of the hollow cylinder is distributed farther from its central axis than the solid cylinder, it has a greater rotational inertia and hence will lag behind any solid cylinder of the same mass and radius.

**MATHEMATICS CHALLENGE #36**

**THE STEEPEST PARABOLA**

Find the smallest positive number "h" such that

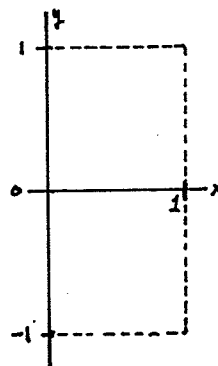
IF  $f(x) = ax^2+bx+c$  is a quadratic function satisfying  $|f(x)| \leq 1$  whenever  $0 \leq x \leq 1$ ,

THEN the inequality  $|f'(x)| \leq h$  holds.

[Calculus Note:  $f'(x)$  is the first derivative of  $f(x)$ .]

Since the graph of a quadratic function is just a parabola, another way to state this question is:

Find the absolute value of the steepest (positive or negative) slope that a line tangent to a parabola can have if whenever  $0 \leq x \leq 1$ , that part of the parabola lies entirely between  $y = -1$  and  $y = 1$ :



[From: Quantum Magazine, July/August 1994, p.31.]

**PHYSICS CHALLENGE #27**

**LONG TRAIN**

A train moving under its own momentum goes up an incline of angle  $\alpha$ . When the train stops, one half of its length is on the incline. What time elapses from the moment the train begins to go up the incline until the moment it stops? The length of the train is  $L$ . Disregard the friction between the train's wheels and the incline.



[From: Quantum Magazine, Nov./Dec. 1994, p.23]

**Editor/Writer: Richard Delaware**

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