# NEWSLETTER

ONTARIO ASSOCIATION OF PHYSICS TEACHERS
(an affiliate of the American Association of Physics Teachers)
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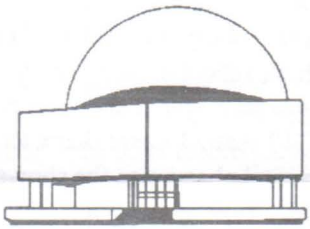
## McLaughlin Offers New Programs


Ian G. McGregor, Educator, McLaughlin

### Background

Since the McLaughlin Planetarium opened in 1968, a variety of programs have been available for high school students. For many years we had two school shows which were simply titled the "Physics" show and the "Geography" show. The "Physics" show worked in support of the PSSC/Harvard Physics and various "Space and Man" courses being offered in Ontario schools and had a strong focus on planetary motions. The "Geography" show supported the Grade 11 physical geography programmes. The shows were presented live in the 340 seat 23 metre diameter Theatre of the Stars and basically were a 60 minute illustrated presentation making use of the special abilities of our giant star projector as well as up to 100 other projectors.

Over the years changes took place in the school curriculum in Ontario as well as the profile of the students visiting the Planetarium. A new show titled "The Cosmic Question" designed for intermediate level students used the search for life in the universe as a means to introduce a broad number of topics including the earth as a planet., a tour of the solar system, the search for planets orbiting other stars as well as ideas about travel between the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## 1995 OAPT Physics Contest

The OAPT contest for grade 12 physics students will be held this year on Tuesday, May 16 in the morning. To assist students and teachers who would like to prepare for it, a list of the content on which most of the questions will be based has been prepared and circulated. The test will be similar to last year with 30 questions to be done in one hour, but it should be a bit easier. If you would like to buy some copies of old papers, or have questions about administrative details, contact Fred Hainsworth, OAPT Contest, 350 Victoria St. Toronto, M5B 2K3 or fax a message to him at (416) 979-5064. If you have any questions about the exam, the content, or if you would like to contribute questions, please write Bill Prior at Malvern C.I., 55 Malvern Ave, Toronto, M4E 3E4; phone him at (416) 393-0765; or fax him at (416) 393-1493. The committee consisting of Bill Prior, Malcolm Coutts, Dianne Ness, Pauline Plooard and Peter Spencer will meet in the middle of January to start selecting the questions. Fred Hainsworth will send out a mailing early in March to all schools with information about registration.

## 1995 OAPT CONFERENCE UPDATE

Plans are well underway for the 1995 OAPT Conference, to be held June 22-24 at the University of Guelph.

Thursday evening (June 22) will feature a choice of four workshops: Chaos & Fractals, Teaching Electronics in High Schools, Making Holograms, and Using the Internet. A social get-together will follow the workshops.

Invited and contributed papers will be presented on Friday and Saturday. Invited speakers have been contacted and we even have some contributed papers already promised. Topics so far include: Using CD-ROMs in Teaching Physics, Update on the Sudbury Neutrino Observatory (SNO), Weather Research, Wind Tunnels and Urban Design, Teaching Large Introductory University Physics Classes, Physics Day at Canada's Wonderland,, and The Electric Hotdog & the Electric Pickle (see the "Demonstration Corner" in this Newsletter) . As always, Friday night will be highlighted by the banquet, followed this year by an entertaining presentation, "100 Years of Physics Teaching on the Guelph Campus," given by Jim Hunt of the University of Guelph's Physics Department.

A "Call for Papers" is being mailed with this Newsletter. If you have a useful physics-teaching technique, demonstration, or other tidbit that you could share with other teachers at the conference, please complete the information requested on the "Call for Papers" sheet and return it by March 31, 1995.

Registration costs have not yet been finalized, but it is expected that the registration fee will be about $100. This would include all sessions, two lunches, and the banquet. Bed and breakfast on campus will cost about $45 per night (more in local motels).

Detailed conference information will be mailed out with the April Newsletter. Any enquiries about the conference should be directed to Ernie McFarland, Dept. of Physics, University of Guelph, Ontario, NlG 2Wl. (Phone: (519) 824-4120, ext. 3653; Fax: (519) 836-9967; E-mail: elm@physics.uoguelph.ca)

# PHYSICS DEMOS

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(a continuation of demos found on CompuServe's Science forum; these are just a few of them—Ed.)

### When Chocolate Chip Speaks, Students Listen

Take about 50 turns of fine, insulated wire and tape to the back of an ice cream carton (or whatever), leaving the two leads of the wire to be attached to the output of an amplifier. Bring a large magnet up to the back of the voice coil when the amplifier is signaling appropriate music.

You may construct the speaker in class, discussing it in abstract terms so students are taken by surprise.

### Running Interference

Concentric ring patterns may be purchased from drafting suppliers for about $3 per sheet. Make different wave lengths by enlarging or reducing the pattern. With these made into overheads, you may demonstrate (1) 2-slit interference, (2) the effect of changing slit spacing or wavelength (3) n-slit interference (4) diffraction grating (5) effect of telescope aperture and incident wavelength on resolving power.

### Back to Normalcy

Clamp a weight to a kitchen scale and tilt it to show normal force variance with angle. In general, you will find a kitchen scale to be a frequently used piece of apparatus for all sorts of phenomena. They are available with metric readouts.

### Bubble Dome

Make a soap solution as follows: 70 mL of Joy, 200 mL glycerin, 230 mL water. Roll a cone from a piece of paper and blow a large bubble onto a glass plate on an overhead projector. Ignore projection on screen and look at beautiful, iridescent interference on the bubble itself. With the right mixture of bubble soap the bubble should get thin enough to become totally transparent to reflected light, just before it breaks.

## . . . McLaughlin, from page 1

stars, UFOs, and communication across the great depths of space. Then, four years ago, the Planetarium introduced another new school show titled "Discover the Universe" for all levels of high school students which discussed the process and methods of the human discovery of the universe from ancient times to the present. A major part of the show is observationally oriented with demonstrations of the phases of the Moon and the motions of the planets as well as modern observations with the Hubble Space Telescope.

### Sky Observing Workshops

This school year the McLaughlin Planetarium is introducing a new program for high school students titled "Sky Observing Workshops". Unlike our regular high school shows, which feature a live 60 minute presentation in the 340 seat 23 metre diameter Theatre of the Stars in which the students listen and observe as the shows are presented, the Workshops are participatory-oriented programs in which the teachers have direct input in choosing the actual content of the activities which will be conducted in the Theatre.

The Workshops are conducted for a maximum of 80 students. Teachers can choose from 11 different activity modules which last from 20 minutes to 60 minutes and feature the students observing, estimating, mapping, and/or recording events in the Theatre using worksheets and red reading lights. Topics can range from reading star maps to discover the night sky to demonstrations of the retrograde motion of Mars, the seasonal motions of the sun and moon, the precession of the equinoxes, and the discovery of the zodiac. As well, classroom sessions at the Planetarium choosing from at least eight classroom modules can form a part of the Workshop which when combined with a program in the Planetarium's display gallery can add up to a 2-1/2 hour intensive workshop in astronomy. The cost for a Workshop is $5.00 per person.

To the end of November six workshops had been conducted for six different schools. The students came from a variety of backgrounds. Four of the Workshops were for grade 10 science students while one was for grade 11 geography students and one was for grade 10-12 Latin students. The response has been very positive from the teachers involved as the Planetarium is an unique laboratory environment.

Teachers interested in setting up a Workshop for their students can write. phone or fax the Planetarium and a brochure describing in detail the Workshops can be sent out by the Planetarium Box Office. The actual scheduling, coordination, and dialogue between teacher and Planetarium on the content of a specific Workshop is handled by myself. To obtain a brochure you can write to:

McLaughlin Planetarium
School Bookings
100 Queens Park
Toronto, Ontario M5S 2C6

Or phone (416) 586-5736 and ask for School Bookings. The Planetarium's fax number is (416) 586-5887. Apart from our current eleven Theatre modules and eight classroom modules I would be interested in hearing of ideas for other modules ranging in length from 20 minutes to 60 minutes.

Clear skies!

# We get more letters!

Your article entitled "Eye Defects and Glasses" reminded me of two other ways of determining whether a person is hyperopic or myopic, which may be of interest for your readers. You can tell if a person is near-sighted or far-sighted by comparing the brightness of the skin behind the glasses with the brightness of the person's cheek. The skin behind a hyperopic person's glasses appears to be brighter than the person's cheek skin. The skin behind a myopic person's glasses appears to be dimmer than the person's cheek skin. The effects are due to the converging lens that is used to compensate for hyperopia and the diverging lens that is used to compensate for myopia. The converving lens that is used for a hyperopic person converge the light that is reflected from the person's skin behind the lens to the observer. The converged light has a higher intensity. Similarly a diverging lens that is used to compensate for myopia causes the light that is reflected from behind the glasses is diverged therefore has less intensity. The other technique is the use of laser light speckle. Speckle is the grainy appearance of coherent light that is reflected from solid surfaces. It is readily observed by expanding a laser beam with a simple lens and reflecting it off of a solid smooth surface. (How intriguing that an extremely expensive "light bulb" should yield the observation of grainy light.) I ask students to observe the speckle. Then I ask them to remove their glasses and observe the speckle while they move their heads from side to side. I have them raise their hands if the speckle is stationary, moves in the same direction as their heads, or in the opposite direction as their heads. Students with perfect vision observe that the graininess is stationary in the spot of light. Students with hyperopia observe that the graininess moves in the spot in the same direction as their heads. Students with myopia observe that the graininess moves in the opposite direction as their heads. This leads to a very interesting discussion of vision, the uniqueness of human observations, and opens up their minds to new views about light.

*Bob Speers, Firelands College of Bowling Green State University*

Send comments, compliments, constructive criticisms and complaints to:
Paul Laxon, 201 Chestnut Street, St. Thomas, ON, N5R 2B5
fax: 519-633-9014
e-mail: paullaxo@village.ca
(Yes, I did have another problem with my e-mail, but it is fixed now. If you want you can also send e-mail to me at plaxon@edu.uwo.ca)

## Physics Day at Cedar Point,Ohio

Physics Day at Cedar Point will be held on Wednesday, May 24, in 1995. The attractions are lots of great roller coasters and rotating rides. We are working on and hoping that an astronaut can again be at Cedar Point that day and give talks for the students and the teachers. For information about tickets, contact Group Sales, Cedar Point, Sandusky, OH 44871. For information about the educational program contact Dr. Robert R. Speers, Firelands College—B.G.S.U., Huron, OH 44839.

We'd love to have some of the Canadian students and teachers join us in this fun and educational day. Similarly, I would hope that some of the U.S.A. physics students and teachers go to Wonderland. Cultural diversity in physics is essential, also.

## Evolution of the Math Problem

1960: A logger sells a truckload of lumber for $100. If his cost of production is 4/5 of this price, what is his profit?

1970: (Traditional Math) A logger sells a truckload of lumber for $100. His cost of production is 4/5 of this price, or in other words, $80. What is his profit?

1970: (New Math) A logger exchanges a set L of lumber for a set M of money. The cardinality of Set M is 100, amd each element is worth a dollar. Make 100 dots representing the elements of set M. The set C of the cost of production contains 20 fewer points than set M. represent the set C as a subset of M, and answer the following question: What is the cardinality of set P of profit?

1980: A logger sells a truckload of lumber for $100. His cost of production is $80, and his profit is $20. Your assignment is to underline the number 20.

1990: (Outcome Based Education) By cutting down beautiful forest trees a logger makes $20. What do you think of this way of making a living? (Topic for class discussion: How did the forest birds and squirrels feel?)

*THE DEMONSTRATION CORNER*

# THE ELECTRIC HOTDOG

## (followed by the Electric Pickle)

by

**Roland Meisel**

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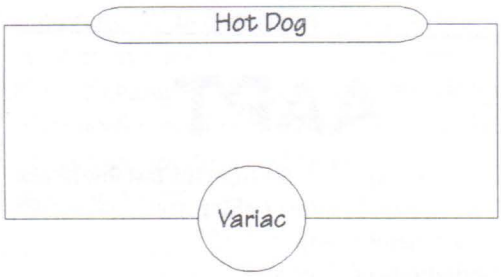
A current can be run through a hotdog in order to cook it. There are commercial hotdog cookers that make use of this principle. I use it near the end of the unit on resistance in the Grade 12 Physics course. I have a couple of projection metres which I add to the circuit so that students may monitor and record the voltage and current during the minute or two that the hotdog cooks. This is a nice example of a decrease in resistance with an increase in temperature. At the end of the demonstration, students may calculate the total energy required to cook the hotdog, and compare it to other methods of cooking. I usually do the cooking on a porcelain plate, and then cut the hotdog into small pieces for the consumption of those who wish to try. Mustard is optional.




*Probes from voltmeters or ammeters make good connecting wires.*

This is followed by a similar demonstration using a pickle. A nice, salty kosher pickle seems to work best. I like to use Strub's ®, which are easily available in any grocery store. The room should be darkened for this one, since the pickle will light up with a ghostly greenish-orange glow. Since the next unit is Optics, a brief mention of the yellow-orange light produced by sodium is in order.

(Ed.—If you get several packages of hotdogs you can have a lunch-time physics party. You can cook several hotdogs in parallel, depending on the maximum safe current available from your power supply. I won't get into all the safety hazards, just remember that these dogs have a powerful bite while they're "plugged in.")

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Submissions describing demonstrations will be gladly received by the column editor.

## Andre Ampère

Andre Ampère, b. Jan. 10, 1775, d.June 10, 1836, was a French physicist who laid the foundations for the science of electrodynamics through his demonstration that electric currents produce magnetic fields, and through his subsequent investigation into the relationship between these two phenomena.

The son of a well-to-do merchant, Ampère educated himself through diligent reading in the family library. He survived the French Revolution to become a science teacher, first in Lyons and then in Bourg. He later took a post at the Ecole Polytechnique, and in 1808 became inspector general of the university system in Paris. Beginning in 1824, he also taught physics at the College de France and philosophy at the Faculte des Lettres, pursuing diverse scientific interests in the midst of personal tragedy. He was greatly affected by his father's execution by guillotine during the Revolution and, after his first wife's early death, had a catastrophic second marriage.

Ampère's most notable achievements were his independent determination (1814) of Avogadro's law and his work from 1820 to 1827 based on Oersted's discovery, announced in 1820, that a magnetic needle moves in the vicinity of an electric current. Ampère succeeded in explaining the latter phenomenon by assuming that an electric current is capable of exciting a magnetic field. He further demonstrated that the direction of the magnetic field is determined by the direction of the current. He developed a quantitative relationship for the strength of a magnetic field in relation to an electric current (Ampère's theorem) and propounded a theory as to how iron becomes magnetized. Ampère also devised a rule governing the mutual interaction of current-carrying wires (Ampère's law) and produced a definition of the unit of measurement of current flow, now known as the Ampère.

Bibliography: Ampère, Andre, Correspondence, 3 vols.(1936-43);
Bordeau, Sanford P., Volts to Hertz: The Rise of Electricity (1982);
Williams, L.P., "Andre-Marie Ampère," Scientific American, January 1989.