OAPT in Ottawa

by Paul Laxon

The OAPT conference has always been the highlight of my year as far as professional development is concerned, and this year's Technology and Physics conference at Carleton University in Ottawa was no exception. I dare anyone to point out a conference that gives you a 2.5 days worth of workshops, tours and presentations with 2 nights accomodations and all your meals included for $160 (Canadian). Only with the OAPT.

The sessions started out Thursday evening with hands-on workshops. I attended the "Teaching Electronics in High School Physics" by John Wiley and, after trying out the experiments, ended up with a package of instructions and a parts list to use in the classroom.

Friday morning and early afternoon was a tour of Bell Northern Research. Our hosts were very organized and accomodating, offering several tour packages that included computer modelling, stereolithography, the fabrication of integrated circuits, fibre-optics, etc. And, almost as important, BNR served a wonderful lasagna and pasta lunch.

After a tour of Carleton's Science Technology Centre. Everyone rested up for another wonderful meal (did you get enough shrimp Al?), a thoughtful presentation by Dr. Chong Chan, Associate Dean of Engineering at Carleton, and a wildly entertaining don't-do-this-at-home-kids Cryogenic Cabaret by Dr. Marcel Leblanc (entertaining enough to induce a seizure in every health and safety officer within 5 km).

Saturday morning's festivities began with a graphic slideshow presentation by a sargent from the RCMP on murder scene analysis of blood spattering, followed by Dr. Fred Carter's talk on computer software he developed to help in this analysis.

Thanks and congratulations to Greg Marshall and his assistant Diana Hall for planning and running the conference. It was a great success.
(More details on the sessions in the next issue)

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An Historical Perspective on Science

I know it's a little late into the year to be contemplating what you did this summer, but I hope you had a little time to do some reading. In the last issue I printed a list of books that I have read, or that I was in the middle of reading, and I wanted to mention a couple that I finished as a lead-in to next June's OAPT conference (I know it's a little early to be contemplating next summer) which will be held at the university of Guelph.

The theme for the conference is "100 Years of Physics Teaching at Guelph" in honour of the university's one-hundredth anniversary, and I think that the historical perspective on physics is an important one in helping to understand the development of physics, especially in looking at the dividing line of classical and modern physics which has occured in the 20th century and which has lead us into the fast-changing technological developments of today.

This summer I finished reading Ronald Clark's "Einstein: The life and times" and James Gleick's "Genius: The life and science of Richard Feynman." Both books look not only at the personal lives of two great scientists, but also at some of the details of the physics they helped develop, and at the relationships between them and the other physicists of their time.

Having a historical context which you can use to introduce a topic is tremendously helpful: Einstein and Bohr's arguments about complementarity and the use of statistical probability; Millikan's hundreds of thousands of experimental data of which he threw out thousands; Galileo's use of the telescope to make money from Venice merchants; Newton's dislike of Hooke. These relationship's between scientists and the stories about their lives can add a little flavour as well as a better understanding of the topic.

Even today there is a great interest in the influences on a scientist's life and work, as is attested to by the title of one of the latest *Physics Today* articles: "Of Love, Physics and Other Passions: The Letters of Albert and Mileva."

PHYSICS DEMOS

compiled by Pat Cannan
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(I found a large list of demos on CompuServe's Science forum, these are just a few of them—Ed.)

Banana Drop

When introducing acceleration of gravity, discuss it in terms of a falling banana (or rutabaga, or whatever). Demonstrate the fall and then compare to a heavy banana (filled with lead shot and rubber latex or aquarium sealant). Drop both bananas at once by quickly pulling a book out from under them.
Conclusion: All bananas accelerate at the same rate. This can then be quoted for the rest of the year to remind students of the demonstration.

And/or another variation

Galileo's home country—Italy. National fruit of Italy—Grapes. So all grapes fall at the same rate whether dropped individually or in a bunch. Show it. Bunching them makes no difference! Each atom accelerates at g regardless of its companions.

Centripetal hang-ups

Bend a coat hanger and its hook so that a penny will balance on the upturned hook. Hold the hanger by your index finger and swing it in a circle. The penny will (with practice) remain in place.

Swingin' big scare

Suspend a small (25cm diam) board from three strings so it can be vertically swung around. Place objects on the board and scare everyone! Practice this before trying beakers of water etc.

TP Rip-off

Single-ply toilet paper takes a force of about 10 newtons to separate. A rapid linear acceleration of the paper takes advantage of the rotational inertia of the roll to help stretch and tear the paper. The build-up to the breaking point must occur quickly so that angular velocity of the roll is kept small and paper is not dumped onto the floor. As the roll is used up, the moment of inertia decreases making it increasingly difficult to get paper off with one hand.
Place a new roll of TP and an almost empty roll on a bar held by two students. Give the new roll a yank, and the paper should tear nicely. Give the small roll a yank, and it should unravel onto the floor.
Discuss the moment of inertia. The new roll approximates a disk, the old roll a hoop.

Sound Thinking

With a small transistor radio blaring away, enclose it in a cage of wire mesh. The Faraday cage will shield the radio from any electric fields and hence will shield it from radio waves. (The electric waves of light enter and leave the cage because their wavelengths are much smaller than the mesh size.)

New Astronomy materials in ASP Catalog

The nonprofit Astronomical Society of the Pacific has recently published a new catalog that includes materials for teaching and exploring astronomy. To obtain a free copy of the new catalog, send your name and address to: Catalog Requests Department, ASP, 390 Ashton Ave., San Francisco, CA 94112 or call 415-337-1100.

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E-Mail Us!

Drop me a line through the mail, fax, or Internet (sorry about the sudden change in address, I didn't realize it had happened until the end of the summer). Your comments, criticisms, observations are welcome.

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We Get Mail!

I enjoy receiving the OAPT newsletter and I saw your request for comments in the Summer issue.

The action-reaction brain twister is a variation of the "inverse sprinkler" problem—one that Feynman worked on. There have been articles and notes about this in the American Journal of Physics.

Al Bartlett
University of Colorado

There is also an interesting account of how Feynman tested his solution in Gleick's book *Genius*.—Ed.

Canadian Shares Nobel for Development of Neutron Scattering Techniques

Canada's second Nobel prize in physics was shared by Bertram Brockhouse of McMaster University for neutron spectroscopy, and Clifford Shull of MIT for neutron diffraction. The prize was based on work they did nearly 50 years ago. Since then neutron scattering has become indispensable in the study of light-atom crystallography, atomic motion in solids, and magnetic materials.

Archimedes

Archimedes, b. c.298 BC, d. 212 BC, was the greatest mathematician of ancient times. A native of Syracuse, Sicily, he was killed during its capture by the Romans in the Second Punic War. Stories from Plutarch, Livy, and Polybius describe machines including the CATAPULT, the compound pulley, and a burning-mirror invented by Archimedes for the defense of Syracuse.

He spent some time in Egypt, where he invented a device now known as ARCHIMEDES' SCREW. Archimedes made many original contributions to geometry in his work on the areas of plane figures and the areas and volumes of curved surfaces. His methods anticipated INTEGRAL CALCULUS 2,000 years before it was "invented" by Newton and Leibniz. Archimedes proved that the volume of a sphere is two-thirds the volume of a circumscribed cylinder. Evidently he considered this one of his most significant accomplishments, since he requested that a representation of a cylinder circumscribing a sphere be inscribed on his tomb.

He was also known for his approximation of pi (between the values 310/71 and 31/7) obtained by circumscribing and inscribing a circle with regular polygons having 96 sides. In theoretical mechanics, Archimedes is responsible for fundamental theorems concerning the centers of gravity of plane figures and solids, and he is famous for his theorem on the weight of a body immersed in a liquid, called ARCHIMEDES' PRINCIPLE. A famous story, unfortunately with no foundation, relates that having discovered this while in the bath, he ran naked through the streets crying, "Eureka," or "I have found it."

Archimedes' treatises are remarkable for their original ideas, rigorous demonstrations, and excellent computational technique. His surviving works include *On the Sphere and Cylinder, Measurement of a Circle, On Conoids and Spheroids, On Spirals, On Plane Equilibriums, The Sand Reckoner, Quadrature of the Parabola, On Floating Bodies,* and *Stomachion* (fragment only).

Bibliography: Dijksterhuis, E. J., *Archimedes* (1987).

REFLECTIONS³

by

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A laser, chalk dust and right-angle corner made of mirror tiles show the retro-reflection of light from a corner cube mirror. (Safety note: use a low-power laser beam and take care to avoid directing the beam into the audience.) Students will also enjoy looking into the mirror and observing that the image of their face (or open eye) is always in the corner. Try this with one eye closed.

An array of corner cube "mirrors" (actually they were solid glass cubes) was left on the moon to retro-reflect a pulsed laser beam, making possible very accurate measurements of the earth-moon distance.
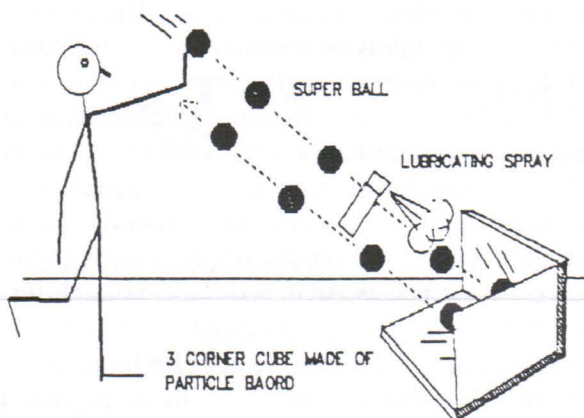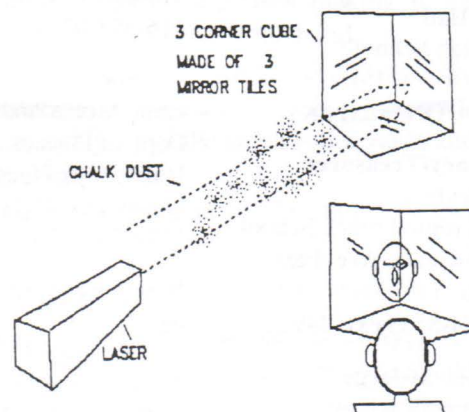
The retro-reflecting property of a corner cube can also be demonstrated MECHANICALLY with a "super ball" or similar ball with a high coefficient of restitution. For this you need an unobstructed corner of a room or a corner constructed from formica or smooth particle board. Because of friction and spin, a ball thrown at this corner will normally not return on a parallel path. To remove the effect of spin and friction, the corner needs to be made very slippery. Soap solutions or silicone sprays work well on painted or formica covered surfaces. The best results are obtained when the corner is loosely lined with polyethylene film which has been sprayed with soapy water or WD-40.

The demonstration works even better out-of-doors where you can throw the ball faster and at a greater distance. Have your students try this and watch out -- the ball bounces straight back. (Please use common sense and caution here.) With a little practice, you can nonchalantly throw the ball and have it return directly to your throwing hand. Throwing two or three balls at once adds to the excitement and "risk".

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