Ontario Association of Physics Teachers

NEWSLETTER

Volume XII, Number 1
October, 1989

ANNUAL MEETING

(report by Alan Hirsh, Section Representative)

The annual meeting of the OAPT was held on June 25 to 27, 1989, at the University of Western Ontario in London. Among the 100 registrants were several visitors from the U.S., particularly from Ohio, Michigan and New York. Their contributions and enthusiasm were most welcome.

The featured guest at the meeting was Dr. Tung Jeong from Lake Forest, Illinois, one of the worlds best-known specialists in holography. On Sunday afternoon he conducted a holography workshop during which he explained the physics of various types of holograms, including one involving motion. (Watch for the Ronald McDonald action hologram.) The workshop participants produced their own holograms that were visible in white light.

Dr. Jeong was also the after-dinner speaker at the traditional banquet, held on Monday evening. He presented numerous examples and explanations of holography as well as a look at the future of this exciting field. His enthusiasm, humour and love of teaching were an inspiration.

Another highlight of the meeting were the tours offered, first on the Sunday night (at the imaging department of St. Joseph's Hospital) and then on Tuesday afternoon (at the Boundary Layer Wind Tunnel).

On Tuesday afternoon, Bill Reitz conducted a workshop on the teaching of electrostatics. This workshop was fun, practical and well received by the participants.

The following list reveals the variety of titles and presenters during the sessions on Monday and Tuesday:

"Science R Us" by Bill Reitz, Ohio

"How I Teach Centripetal Force" by John Beach, Ohio

"Room temperature Fusion" by Dr. Innes MacKenzie, U. of Guelph

"Room Temperature Fusion In Secondary School?" by Andrew Blaber, Oakville

"Light Wave Communications For Under $50" by John Pitre, U. of Toronto

"Motivating Strudents in Science" by Larry Butt, Stratford

"An Alternate Approach For Starting A Physics Course" by John Reichart, New York

"Using Light Wave Technology To Measure Force" by Walter North, U. of Windsor

"Probing Societal Impacts of Science and Technology", from P.J.Spratt and Associates, Toronto

"Model Rocketry" by Taras Tataryn and Paul Wolosszanskyj

"Teaching General Level Physics" by Bill Tallman, London

"Dividing by Vectors" by Huschilt and W.E.Baylis

"Canadian Physics Olympiad" by John Wylie, Toronto

"Math CAD" by Paul Zitzewitz, Michigan

"The New Sun Scope" by John Daicopoulos, Sudbury

"The OAPT Contest" by George Kelly, Guelph

"My Favorite Demonstration" by Bill Konrad, Kent County

Congratulations and many thanks are extended to Dean Gaily and Bill Konrad who together organized, hosted and chaired a very successful meeting.

OAPT is affiliated with The AAPT

Laser and Lightwave Sciences Workshop

(Report by Bill Konrad)

This past summer from August 20 till August 25, 28 physics teachers from across the province participated in the first Laser and Lightwave Research Centre in Toronto. This centre is one of seven centres of excellence established in 1987 by the provincial government. The purpose of this centre is to put Ontario in the forefront of international research and development in the fields of Lasers, Quantum Electronics, Modern Optics and Lightwave Science, and Engineering. In addition to research, the centre has organized a variety of educational programs designed to meet various levels of scientific understanding. The five day summer program was specifically designed for secondary school physics teachers.

As a participant in this five day workshop, I would highly recommend it as a very worthwhile experience. The Laser and Lightwave Research Centre is located at McLennan Physical Laboratories at the University of Toronto. The workshop was also held at this location and had the following features:

(1) Lectures: Four major lectures were presented during the five day workshop. Each lecture started at the grade 13 (or OAC) physics level and built from that point. From my perspective the lecturers gauged their depth of treatment perfectly. They increased our knowledge and stretched our minds without burying us in abstract mathematics. The lectures dealt with the interference of light including holography, the interaction of radiation and matter, propagation of light, and fibre optics.

(2) Two afternoons were devoted to lab exercises. Participants could choose from a number of laboratory exercises. In some cases we dealt with equipment we would never be able to purchase on our secondary school budget, such as a Raman spectroscope. But we also saw a number of examples that could be adapted to the secondary school, such as the acoustical interferometer.

(3) Field trips to a holography studio, to a laser machining centre, and to a laser light show gave us a number of examples of how light is being used in numerous applications in business and industry.

(4) A tour of a number of labs in the laser and lightwave research centre as well as the physics and chemistry departments showed us specific examples of how lasers are being used in scientific research today.

(5) An evening session in which participants shared teaching ideas of various types enabled everyone to teach as well as benefit.

There are a number of benefits in participating in such a workshop. These include:

* giving a teacher a chance to be a student. This is probably a healthy experience for us to have from time to time. Many physics teachers are the only "physics expert" in their school. As a result, their knowledge is seldom challenged. A five day immersion experience with other physics teachers reveals that we are not the absolute experts that lack of challenges at the school level had led us to believe we were.

* giving us a first hand glimpse of the technology being used in research today. In touring the facilities it soon became obvious that lasers have become an indispensable tool. Using ingenious methods and a variety of lasers, scientists can generate almost any wavelength of laser light that they wish, within a given range. They are constantly trying to extend this range by developing lasers which produce shorter and shorter wavelengths. One physics post-graduate student was trying to isolate atomic hydrogen and then freeze its motion by trapping it with laser light.

* upgrading outdated knowledge. For example during the lab tour we encountered a student working toward his Ph D in chemistry, studying the photoemission of electrons from metals. He stated that it is possible for two or three photons to act together to emit an electron and that with the equipment he was using, it was easy to detect when it happened. (This is contrary to what I have been teaching for a number of years.)

The Ontario Laser and Lightwave Research Centre plans to run this program again next year. By using the feedback provided by this year's group it plans to improve the program. I would highly recommend this experience as a very worthwhile professional development exercise. Watch for advertisements at the school level next spring and then get that application in.

Section Executive for 1989-90

President: Bill Konrad, Kent County Board of Education, Box 1000, Chatham, N7M 5L7

Past-President: Stuart Quick, 100 Spadina Rd., #804, Toronto, M5R 2T7

Vice-President and Conference Chairman: Nigel Hedgecock, Department of Physics, University of Windsor, Windsor, N4B 3P4

Secretary-Treasurer: Peter Scovil, Box 1169, Waterford, N0E 1Y0

Section Representative: Alan Hirsch, 2199 Parker Dr., Mississauga, L5B 1W3

Contest Chairperson: George Kelly, 18 Shoemaker Crescent, Guelph, N1K 1J8

Memberships: Ernie McFarland, Department of Physics, University of Guelph, Guelph, N1G 2W1

Member-at-Large: This position is currently unfilled. Ideally, it should be someone who can provide liason with the CAAT's. If you are interested or have any suggestions, please contact any member of the executive.

More Physics Teachers Wanted

A joint committee representing CAP-OAPT-STAO has made a submission to the Minister of Education regarding the shortage of qualified physics teachers in Ontario. More information about this issue will appear in the next issue of the newsletter.

Suggestions?

This newsletter is published four times a year to keep the membership informed about the activities of the OAPT and its umbrella organization, the AAPT. If you have any suggestions for items to be included in the newsletter, feel free to contact the editor. Malcolm Coutts, 6 Swanwick Ave., Toronto, Ontario, M4E 1Z1

June Conference, 1990

The annual conference of the OAPT will be held at the University of Windsor, June 17 - 19, 1990. Mark your calendar to-day and look for more information in subsequent newsletters.

Honk If You're Aristotle

A Grade 12 Physics class was assigned a project which consisted of designing and performing an experiment to measure the acceleration of some object. One pair of students proposed to measure the acceleration of an automobile. They would do this by marking the position of the accelerating car at regular time intervals. But how? They came up with an ingenious suggestion. A passenger in the car would have a stopwatch and a handful of darts. Every three seconds, he would drop a dart out the window. Thus, a trail of darts would be left sticking in the road. They could come back and measure the distances between darts at their leisure.

Membership Due?

The date on your address label is the expiry date for your membership. If it says June 89, your membership has already expired. You may use the coupon below to renew it.

Membership Application and/or Renewal

Name _____

Address _____

_____

_____

$5.00 per year, payable to the OAPT

Send to: Professor Ernie McFarland, Department of Physics, University of Guelph, Guelph, Ontario, N1G 2W1

Bloody Ballistics

by George Vanderkuur
Ontario Science Centre
(Premier's Council 1989-90
56 Wellesley Street
Toronto, Ontario)

Introduction:

The heart is a mechanical pump that is used to move an incompressible fluid (i.e., blood) through a very elastic closed network of tubes. With each cycle of the "pump," the whole system expands and contracts.

Construction:

None is required. All you need is an ordinary (probably cheap) bathroom scale and a barefoot volunteer. Bare feet may be optional, but it's the only way I have done this.

Operation:

When you stand on the scale in bare feet, you will be able to observe a periodic movement of the dial. This movement corresponds to your pulse rate.

I do not have an explanation for this effect. This gives opportunity for discussion and perhaps some experimentation. I believe one of the following explanations applies:

* a shift in the centre of mass of the body during each heart beat as the volume of blood changes in different parts of the body (Fig. 1.);

* a slight swelling of the feet and straightening of the legs as blood pressure increases during part of the heart beat cycle.

Notes:

1. There is a diagnostic procedure that uses this principle. I am not sure what it measures, perhaps the elasticity of the artery walls.

2. It should be possible to measure the energy transferred to the scale during each half cycle and hence the power expended. This could be compared to the power output of the heart. (The reason for using the half cycle is that, when the scale rebounds, it does not do work on the circulatory system.)

3. A laser beam could be used to amplify the motion optically by fixing a mirror to the scale (Fig. 2).

Column Editor: Ernie McFarland, Physics Dept., University of Guelph, Guelph, Ontario, N1G 2W1

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

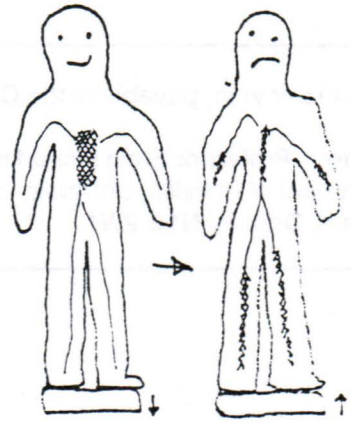

Fig. 1

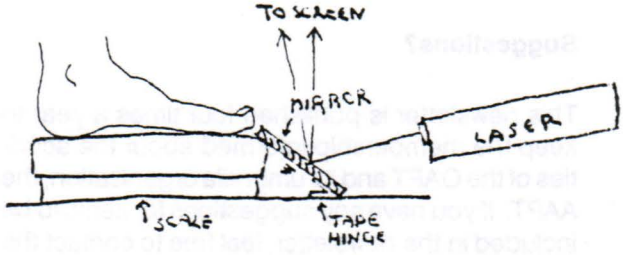

Fig. 2