



American Association of Physics Teachers

AAPT Ontario Section

FOURTH ANNUAL CONFERENCE

at UNIVERSITY OF WESTERN ONTARIO LONDON, ONTARIO

JUNE 18 & 19, 1982

Program at a glance

Conference Features



PROGRAM HIGHLIGHTS

Pre-Conference Workshop

Physics Olympics Panel

Creativity in Classroom - Dr. Don Woods
McMaster University

Banquet Speaker - Dr. Eric Rogers, Princeton
University

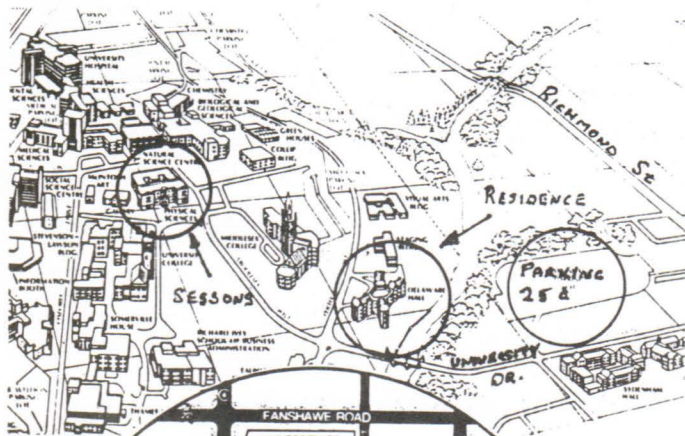
Computer Program Exchange

Invited Speakers:

Dr. John Vanderkooy - Waterloo

Dr. Brian Kaye - Laurentian

Dr. Don Woods - McMaster



THURSDAY, JUNE 17th

PRE-CONFERENCE WORKSHOP - Dr. Don Woods
Physics & Astronomy Building, Room 123

9:00 - 5:00 All-day workshop on
"Creativity in the Classroom"
Meals available in U.W.O. cafeteria.

CONFERENCE PROGRAM BEGINS

7:00 - 11:00 Registration, Reception, and Cash Bar in
Delaware Hall Residence.
All Conference registrants are welcome!
DON'T miss this popular event!

FRIDAY PROGRAM JUNE 18th

8:30 - 9:15 Register in Physics & Astronomy Building
Room 123 and visit displays

9:15 - 9:30 Welcoming remarks in Physics & Astronomy
Building - Room 137

9:30 - 10:30 Panel on Physics Olympics: Dean Gaily,
Ed Gregotsky, Murray Kucherawy, student
guest

10:30 - 11:00 Coffee and Physics Displays

11:00 - 12:30 Contributed papers A1-A6

12:30 - 1:30 Lunch and Displays

1:30 - 2:30 Invited paper:
Prof. Don Wood of MacMaster University
Topic: "Building CREATIVITY in our
students"

2:30 - 3:00 Business Meeting - Gord McKye Presiding

3:00 - 3:30 Coffee and Physics Displays

3:30 - 4:30 Contributed papers B1-B4

4:30 - 5:15 Computer program exchange session

5:30 - 6:30 Cash Bar at Delaware Hall

6:30 - 8:00 Banquet-Barbecue in Delaware Hall

8:00 - 9:00 Keynote speaker:
Dr. Eric Rogers of Princeton University
Topic: "Examinations...a powerful
influence for good or harm in developing
new teaching!"

9:00 - 11:00 Tour of Physics facilities

SATURDAY PROGRAM JUNE 19th

8:30 - 9:00 Register in Physics & Astronomy Bldg -
Room 123

9:00 - 10:00 Invited paper:
Dr. Brian Kaye of Laurentian Univ.
Topic: "Delightful Discoveries of
Physics in Unexpected Places"

10:00 - 10:30 Coffee and Physics Displays

10:30 - 11:30 Contributed papers C1-C4

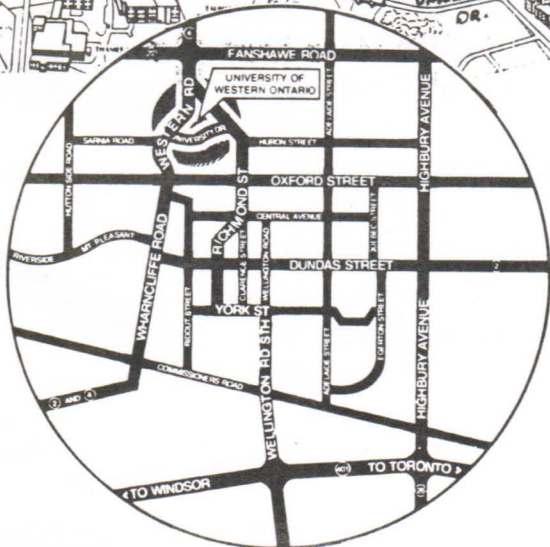
11:30 - 12:30 Seminar:
Dr. Eric Rogers of Princeton University
Topic: "Why not explain by demons?"

12:30 - 1:30 Lunch

1:30 - 2:30 Invited paper:
Prof John Vanderkooy of University of
Waterloo Topic: "Using computers in
the measurement and design of loud-
speaker systems"

2:30 - 3:15 My Favourite Demonstration
Dr. Tom Stewart of U.W.O. presiding

3:15 - 4:15 Computer program exchange session



General Information

GENERAL CONFERENCE INFORMATION: The Fourth Annual Conference of the American Association of Physics Teachers (Ontario Section) will be held from Thursday evening, June 17th to Saturday afternoon, June 19, 1982, at the University of Western Ontario, London, Ontario

REGISTRATION: Registration for residence and the Conference will occur at Delaware Hall residence on Thursday evening from 7:00 p.m. to 10:00 p.m. and on Friday and Saturday in the Physics Office in the Astronomy and Physics building (room 123). Conference parking is provided in the (Medway) parking lot across the river from Delaware Hall (25¢). Those who have pre-registered can pick up their package of materials from the registration desk. Note the cost of the conference is less if you pre-register. Whether you are staying at the college or not, plan to join us on the Thursday evening from 7:00 p.m. to 11:00 p.m. for our popular informal get-together in Delaware Hall. This is a great time to make new friends and renew old friendships. Confirmations will be sent to all registrants.

PLEASE NOTE: Pre-registrations must be received by June 4th!!

CONFERENCE MEALS: Both accommodation and meals will be provided at Delaware Hall. Book your meals in advance and pay for them together. Meal tickets are available without overnight stay but buy them in advance to avoid confusion.

PRE-CONFERENCE WORKSHOP: Dr. Don Woods' workshop on creativity will commence in the Physics and Astronomy building at 9:00 a.m. on Thursday, June 17th for those who are registered. Meals on Thursday are available in U.W.O. cafeterias.

BARBEQUE: The Barbeque (weather permitting) will be held on the lawn outside Delaware Hall on the banks of the Thames River. The keynote address will be given by Dr. Eric Rogers in Delaware Hall following the Barbeque. You are invited to bring your spouse if you so wish.

NEW!!! COMPUTER PROGRAM EXCHANGE

Bring your best program on a protected disk (or tape) and a blank disk, as there will be an opportunity for you to display and exchange (mine for yours) programs on Pets and Apples (microcomputers). A room and a time has been allocated for this from 4:30 to 5:15 Friday; and 3:15 to 4:15 Saturday. This will be an informal exchange session.

PROGRAM CONVENOR - George F. Kelly
Lester B. Pearson C.I.
150 Tapscott Road
Agincourt, M1B 2L2

"A" Session Abstracts

A-1 How Olympic Records Depend on Location

Ernie McFarland, Dept. of Physics, Univ. of Guelph, Guelph

The Olympic records of many athletic events show anomalies in the results for the 1968 Mexico City Olympics. These anomalies can be explained by taking into account the low value of "g" and the low air density at Mexico City. The explanations provide an extremely interesting example for use in introductory mechanics courses.

A-2 A Simplified Method of Teaching A.C. Suitable for High School Courses

Donald S. Ainslie, 25 Hawthorn Ave., Toronto

The study of Physics should emphasize the experimental aspects of the study rather than the mathematical concepts and made relevant to everyday life. The outline in my paper is a simplified approach to the study of A.C. circuits which does not require a knowledge of calculus. In place of the usual textbook introduction, start with a C.R.O. to show that the ordinary 60 Hz power supply is sinusoidal. For an A.C. current $i_m \sin \theta$ flowing in a resistance R the power in watts W is $W = i_m^2$ (Ave. of $\sin^2 \theta$) R . Now for N pairs of values of $\sin \theta$ and $\cos \theta$ the value of each pair $\sin^2 \theta + \cos^2 \theta$. The sum for each series = N . But the $\sin^2 \theta$ sum = the $\cos^2 \theta$ sum = $N/2$. Hence the average = $1/2$ and the energy output per second W is $W = i_m^2/2 R$ or $W = i^2 R$ where $i = i_m/\sqrt{2}$ represents the rms value of the current and is the value ordinarily used in AC work. For voltage measurements $V = V_m/\sqrt{2}$. If the full wave is rectified, AC output is measured by means of a DC meter, the indicated value equals to arithmetic average i_a of the current. Now $i_a = i_m$ (Ave. of $\sin \theta$). In appendix to a paper (Crucible 1980) on the simple pendulum, I derived a proof showing that the average of $\sin \theta = 2/\pi$ and hence $i_a = i_m 2/\pi$. These ideas have been used to drive noncalculus proofs for the standard equations pertaining to AC circuits. This should be of special interest to a group of students who about this time in their life start experimenting with radio and T.V. circuits.

A-3 The Use of Calculus in Grade 13 Physics

Bill Prior, Malvern C.I., 55 Malvern Ave., Toronto

Most grade 13 Physics text books avoid the use of Calculus since the students for whom these books were written do not study it. This is not true in Ontario. There are many places in the grade 13 Physics course where the techniques of Calculus can provide valuable enrichment. Several examples of this will be discussed in this presentation.

A-4 Photography As A Motivator

Bob Orrett, Cawthra Park Secondary School, Mississauga, Ontario

General level physics teachers are always looking for ways to motivate their students through practical applications of the laws of physics. Photography provides endless examples of the uses of the rules of optics and gives most students a "want to learn" attitude which is so pleasant to teach to.

The author will describe with slides how his classroom is transformed into a photography studio four weeks out of each year. A proven technique for teaching the unit will be described along with suggestions for resource material.

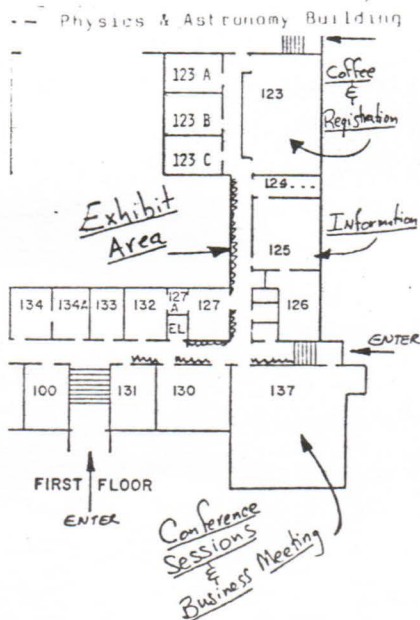
A-5 & A-6 Have Telescope, Will Travel

Steve Dodson, Ecole Secondaire Algonquin, North Bay

The largest mobile telescope in Canada unites in its design two recent and previously separate breakthroughs, making it practical for a single individual to transport and set up at remote sites a very stable and powerful instrument with equatorial tracking.

Considerations of centre of gravity and stability which lead to the new design will be discussed and highlights of the post-completion telescope treks (both cosmic and highway-type) will be presented.

When the 1st report was made at last June's conference, construction was only half completed. A month and a half later the finished scope merited 2nd prize for mechanical design at the "Stellafane" telescope maker's conference in Vermont. In the 3 months following completion hundreds of people at widely-scattered sites have viewed deep-sky wonders through this 22-inch reflector.



'B' Session Abstracts

B-1 A Lab Tutor called "Superbrain"

J. Law, F.R. Hallett, and S. Bird, Physics Department, University of Guelph, Guelph, Ontario

Superbrain Microcomputers have been integrated into our Biophysics I and II courses as adjuncts to laboratory tutors. Students perform their laboratory exercises as usual and then have a choice of either getting their data and calculations checked by a lab instructor or by the Superbrain Micro. A software package written in Microsoft V5.0 Basic contains all the labs that are performed in both courses. Students choosing to have their lab checked by the Superbrain, if successful, get a printed slip which they can attach to their lab book.

The software/hardware will be described. Some results of student reactions will be presented. A demonstration of the system on a Superbrain will be given.

B-2 Using Computers in the Physics Lab

Alan Hirsch, Woodlands School Mississauga

Using simple computer programs to analyse experimental data has great advantages for certain physics experiments.

The students have instant feedback and they learn from interacting with each other as the computer tells them whether or not their results are within an acceptable range.

Another advantage, probably the most important one, will be discussed during the presentation.

B-3 Method for Collecting and Analyzing Data in Study of Normal Modes

P. Rochon & N. Gauthier of Royal Military College

When a single glider attached to 2 springs on a horizontal linear air track is put in motion, there results an oscillation characterized by a single frequency. However, when 2 identical gliders are coupled to each other by a third spring, the resulting motion is characterized by 2 frequencies.

We have used the induction technique described by us elsewhere¹ to analyze the motion of the gliders and to study the phenomenon of energy transfer from 1 glider to the other.

Our method uses the voltage output of the induction transducer, transforms it into a digital signal, and feeds it directly into a computer. Results will be presented and discussed.

1. P. Rochon & N. Gauthier - Am Journal of Physics, January 1982; also, P. Rochon, N. Gauthier, & J.R. Gosselin, Physics 13 News, January 1982.

B-4 Computer-Aided Testing in Freshman Physics Laboratories at U.W.O.-the Second Year

Donald R. Hay, Physics Dept., U.W.O., London, Ont.

Conventional grading of laboratory reports on each experiment was replaced by oral interviews several years ago, and by computer testing for half of the students two years ago. At the beginning of the current year, the computer tests were replaced by tutorial dialogs on computers. The latter reviewed numerical calculations, the use of units, and the interpretations of parameters in formulas, without assigning a grade.

Each student's performance was assessed in a short interview by the I.A., following the computer dialogue.

Student reaction to this method of grading generally was favourable. Adverse comments were directed mainly at the time spent in waiting for computer terminals and oral interviews, and the tendency for some I.A.'s to extend the short interview into a longer tutorial. From the viewpoint of the laboratory supervisor, the computer dialogues gave all students a painless introduction to computers, provided a uniform screening of those aspects of analysis that are most difficult for I.A.'s to review, and quickly indicated shortcomings in the preparation of the I.A.'s, the students, and the laboratory manual. These results suggest the need for more extensive use of the computers in a tutorial role as part of the laboratory, and for better training of the I.A.'s for in-laboratory assessment of the student's work.

"C" Session Abstracts

C-1 Poetic Imagery In Astronomy

Doug Cunningham, Science Head,
Bruce Peninsula District School

Perhaps no other branch of physics has the power to overwhelm and captivate the imagination of young people quite like astronomy. Direct experience of the heavens usually evokes both an emotional and intellectual response--seeing with both their minds and their eyes as they experience at first hand incredibly wondrous and beautiful celestial sights. Certain writers, such as Tennyson, Whitman, and Serviss have a unique ability to capture this emotional essence by producing a crisp train of intellectual associations. As educators, we can capitalize on these poetic flights of imagery and thus bring astronomy alive for our students. Perhaps in this area is a lesson for all science teachers.

C-2 Physics and Society, A Unit

Dr. Eknath V. Marathé, 25 King's Grant Rd.,
St. Catharines, Ontario

Last few years, at Grantham High School, a General Science course is being taught at Grade 13 level. This is an experimental course and a number of units for the course have been developed. The course is basically designed for the students who have very little background in Science but have basic mathematics skills. The general goal of this course is to expose the students, who will not necessarily pursue study of Science in their future life, to the processes of Science. The so called "Scientific Process" is not a monopoly of Science. It is hoped that the students will learn to approach any problem in a logical manner after having some basic facts in hand. One of the Units, Dynamics, Kinematics, and Economics of Automobile is presented.

C-3 A Statics Unit for Grade 13

Robert H. Squires, B.A.Sc. M.A. Brantford
C.I. & V.S.

Statics became an orphan when dropped from the math courses in the mid 1960's.

At Brantford C.I. & V.S. we adopted it as part of the Grade 13 Physics course in 1978. Despite a lack of S.I. metric problems we struggled through the first year and now have a large bank of student material.

Topics covered are: forces, components, concurrent forces, equilibrium, friction, non-concurrent forces, moments, rotational and translational equilibrium and couples. The unit requires 3 weeks of non-semestered time.

C-4 Milli & microsecond lab timing with a microcomputer

Peter Spencer, Leacock C.I., Scarborough

It is possible to use a microcomputer and a few photo transistors in the introductory lab as either a very versatile timer with pulse, gated, one shot, data-logging, on time of flight modes, or as a frequency meter with one shot, averaging, or data-logging modes.

Conference Exhibitors

Publishers

Book Society of Canada
D.C. Heath
Holt, Rinehart & Winston
McGraw-Hill, Ryerson Ltd.

Scientific Equipment

Sargent Welch Scientific
Merlan Scientific
Lyons Logic (Computers)

PRE-CONFERENCE WORKSHOP

Workshop Leader: Donald R. Woods, McMaster University

Don is a Professor and Chairman of the Department of Chemical Engineering and has for a long time been interested in improving teaching and learning and especially improving the student's abilities to solve problems. To gather information on what the problem is in teaching problem solving, he became a freshman student and followed the same group of undergraduate students through their four-year undergraduate program. Some of these students volunteered to attend extra sessions to display how they solved or did not solve their homework assignments.

Based on this research, the major challenges of teaching problem solving were identified and a set of teaching and learning objectives identified. Teaching materials are being prepared and revisions are being made to the curriculum. Since 1974 Don has presented over 200 seminars and over a dozen workshops on developing problem solving.

He received the OCUFA Award and the McMaster Student Union Award for outstanding teaching. He is the author of half a dozen texts and over 100 papers. He edits a bimonthly newsletter on teaching problem solving "PS News", and is on the editorial board of the newsletter "Problem Solving".

WORKSHOP PROGRAM - Thursday, June 17th

In Physics & Astronomy Building - Room 123

9:00 a.m. to 10:00 a.m. - Overview (Unit 1)

10:00 a.m. to 10:15 a.m. - Break

10:15 a.m. to 12:00 noon - Developing Awareness (Unit 2)

12:00 noon to 1:30 p.m. - Lunch - U.W.O. Cafeterias

1:30 p.m. to 3:00 p.m. - Creativity (Unit 4)

3:00 p.m. to 3:15 p.m. - Break

3:15 p.m. to 5:00 p.m. - Creativity (Unit 4)

AAPT (ONTARIO) ANNUAL MEETING - JUNE 17-19/82

REGISTRATION FORM

NAME:.....

HOME:

BUSINESS ADDRESS:.....

HOME PHONE:..... BUSINESS PHONE:.....

MEMBERSHIP RENEWAL

Membership in A.A.P.T.(Ontario Section) costs \$3.00 per year.(still a Bargain!!)

() I wish to renew my membership for the 1982-1983 year, () I wish to become a member for the first time!

PRE-CONFERENCE WORKSHOP

() I wish to register for the Workshop on The Teaching of CREATIVITY in the classroom \$10.00

CONFERENCE PREREGISTRATION

Note that the rates at the Conference will be higher than the rates quoted below. If you are using the low preregistration rates, please mail so this form will be received by June 4th.

() 1 Day, AAPT-Ont member \$10.00 () 1 day, non member \$13.00

() 2 Days, AAPT-Ont member \$17.00 () 2 days, non member \$20.00

() I plan to contribute a demonstration in the session 'My Favourite Demonstration'.

Title of My Demonstration

ACCOMMODATION AND MEAL RESERVATION

Accommodation and meals will be at Delaware Hall, University of Western Ontario.

Please prepay both accommodation and meals. Meal tickets will be provided when you arrive on campus. Meal tickets are available without overnight stay!!

Arrival at residence: date: Junetime:..... Departure: date: June time:.....

ACCOMMODATION : Single room..\$18.19 (7% Ont tax inc)/night for..... nights => \$

Twin room..\$12.84 (7% Ont.tax inc)night/person for nights => \$

If you have requested twin accommodation, please give room-mate's name:.....

Meals requested: breakfast (\$4.00) lunch (\$5.00) Banquet-Barbecue \$15.45

Friday June 18

(10% Ont.tax inc) => \$.....

Saturday June 19

TOTAL Accommodation and meals -> --> \$.....

TOTAL REGISTRATION FEES

Membership (1982-1983) \$, 3.00

NOTE:

Pre-Conference Workshop--> \$, .

Conference preregistration \$, .

DEADLINE FOR

Accommodation and meals \$, .

PREREGISTRATION IS

TOTAL \$, .

JUNE 1ST!

Please send a cheque or money order, payable to AAPT-ONTARIO, for the above total along with this registration form to:
Prof. Dean Gaily, Department of Physics, University of Western Ontario, London, Ontario, N6A 3K7.

PRE-CONFERENCE WORKSHOP

Workshop Leader: Donald R. Woods, McMaster University

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