AMERICAN ASSOCIATION OF PHYSICS TEACHERS

ONTARIO SECTION

THIRD ANNUAL CONFERENCE

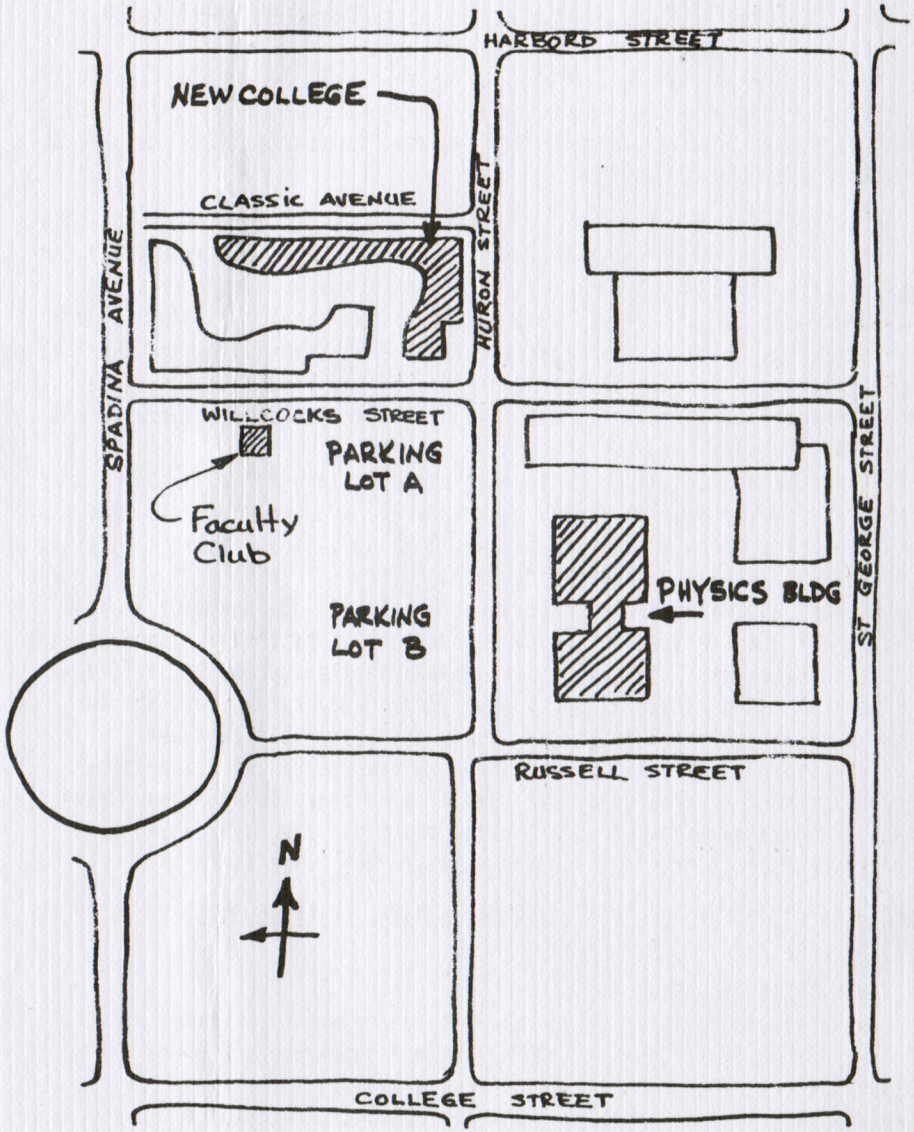
JUNE 11-13,1981

UNIVERSITY OF TORONTO

FEATURING-

*Invited and contributed papers on a wide variety of topics related to physics teaching
*Live Taping by CBC of Quirks and Quarks
*Paper by Jearl Walker
*Showing of latest films
*Display of latest equipment and books
*Microcomputer sessions & displays
*Tours of U of T physics
*AAPT products display
*My Favourite Demonstration session

MAP OF THE UNIVERSITY OF TORONTO
FACILITIES FOR AAPT-ONTARIO
SPRING CONFERENCE 1981



GENERAL CONFERENCE INFORMATION

The third annual conference of the American Association of Physics Teachers (Ontario Section) will be held from Thursday evening, June 11 to Saturday afternoon, June 13, 1981 at the University of Toronto, Toronto, Ontario.

The residence home for the conference will be in New College and the conference sessions will take place in the nearby U of T Physics building. A map of the various buildings we will use is included in this program.

REGISTRATION

Registration for residence will occur at New College (Wetmore Hall) from 4 PM to 12 PM on Thursday. Convenient parking is available in lots A or B. The only cost for parking is $2.30 for Friday. Enter New College (Wetmore Hall) from the north entrance off Classic Avenue. If you wish to arrive Friday and stay in residence Friday evening only, arrangements can be made to register at the residence at noon on Friday.

Whether or not you are staying in residence, plan to join us on Thursday evening from 7:30 til 11:00 PM for an informal reception and get-together in New College. This is a great time to make new friends and renew old friendships.

Registration for the conference itself will take place in the foyer of the Physics building on the Friday morning. Tables will be set up in the foyer to accommodate registration from 8:30 to 9:15 AM. After that time, registration will take place in the conference office (Rm 118 on the map). Even if you have preregistered, please check with the registration desk for a package of material including your name tag which is your receipt for the conference. You will note that the cost of conference registration is less if you preregister by June 1.

Please note that preregistrations must be received by June 1. Do it now!

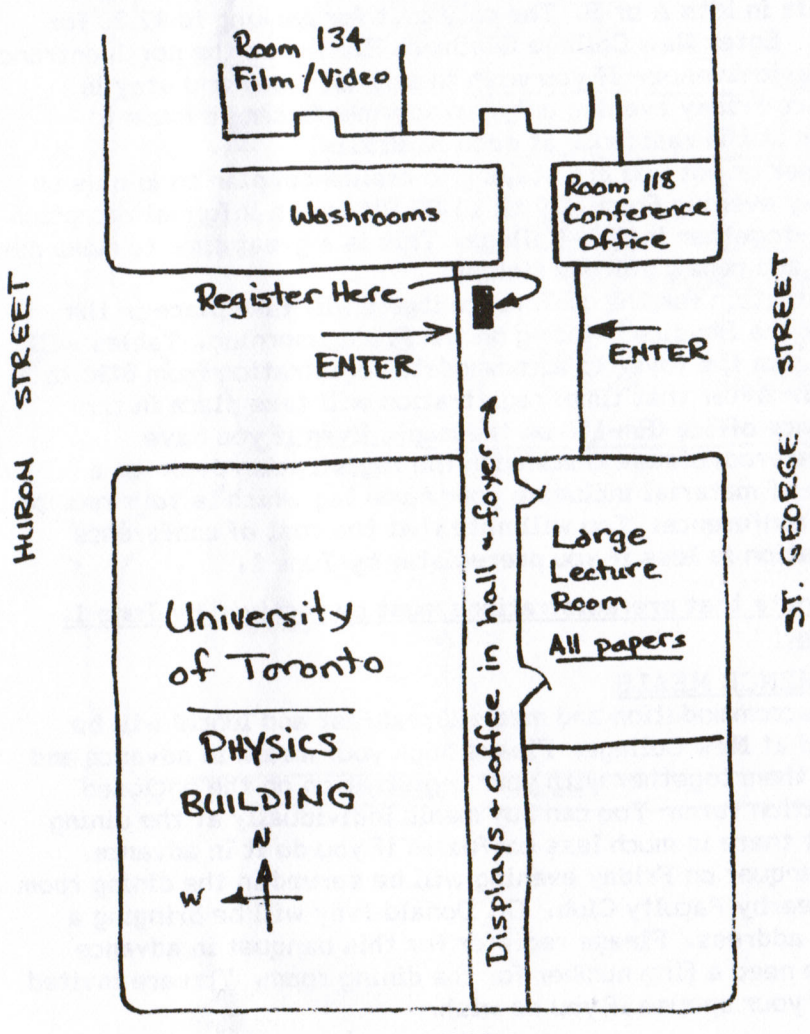
CONFERENCE MEALS

Both accommodation and meals (breakfast and lunch) will be provided at New College. Please book your meals in advance and pay for them together with your registration on the enclosed registration form. You can buy meals individually at the dining hall, but there is much less confusion if you do it in advance.

The banquet on Friday evening will be served in the dining room of the nearby Faculty Club. Dr. Donald Ivey will be bringing a banquet address. Please register for this banquet in advance since we need a firm number for the dining room. You are invited to bring your spouse if you so wish.

CONFERENCE MAP OF PHYSICS BUILDING

All papers will be given in the large lecture hall.
Conference office is Room 118.
Room 134 will be used as a film and video tape viewing room.
Displays of equipment and books will be located in the foyer and hall.
Coffee will be served in the foyer and hall during both morning and afternoon.



PROGRAM AT A GLANCE

Thursday, June 11

4.00 - 12.00 PM Registration for accomodation at New College
7.00 - 11.00 PM Reception in New College - all conference registrants welcome.

Friday, June 12

8:30 - 9:15	Registration in Physics Building Foyer
9:15 - 9:30	Introductory Remarks
9:30 - 10:30	Contributed papers A1-A4
10:30 - 11:00	Coffee and Displays
11:00 - 11.15	Current Ministry Activities Mr. Doug Bannister, Education Officer
11:15 - 12:15	Contributed papers B1-B4
12:30 - 1:30	Lunch (New College)
1:30 - 2:15	Microcomputers in the Physics Classroom Mr. Don Whitewood
2:15 - 2:45	Business meeting
2:45 - 3:15	Coffee and Displays
3:15 - 4:15	Contributed papers C1-C4
4:15 - 5:00	Displays
5:30 - 6:30	Cash Bar at Faculty Club
6:30 - 8:00	Dinner at the Faculty Club
8:00 - 8:45	"Sientific Litteracy" Dr. Donald Ivey, Vice President of U of T, Professor of Physics, U of T
9:00 - 10:00	Tours of the physics facilities at U of T

Saturday, June 13

9:15 - 9:45	Putting Science on the Air Mr. Jay Ingram, Science Journalist
9:45 - 10:15	A live taping of several sessions of Quirks and Quarks Canadian Broadcasting Corporation
10:15 - 10:45	Amateur Science for Physics Education Prof Jearl Walker, Department of Physics, Cleveland State University
10:45 - 11:15	Coffee and Displays
11:15 - 12:30	Contributed papers D1-D5
12:30 - 1:45	Lunch (New College)
1:45 - 2:45	"My Favourite Demonstration Session"
2:45 - 3:15	Science for the Gifted (Process or Content) Mr. George Vanderkuur, Ontario Science Centre

A1 Spring Wars and Mystery Boxes

Bill Konrad, Tecumseh Secondary School, Chatham, N1L 1R8

Two specific suggestions for motivating your physics students. The author will describe the use of circuit puzzles for the electricity unit at the grade 11 level. The puzzles consist of boxes containing resistors and/or wires connected to one surface of the box by means of little bolts. The student's task is to determine the contents of the box using an ohmmeter.

The rules and scoring for the "Annual Spring War" in which students shoot springs at various targets will also be presented. This activity involves a number of physics concepts and is carried out at the end of the section on potential energy.

A2 Induction Transducer For Recording Glider Velocity on an Air Track

P. Rochon and N. Gauthier, Royal Military College, Kingston, K7L 2W3

Linear air tracks have proven to be extremely useful tools for teaching elementary mechanics and are extensively used in classroom demonstrations, in student projects and in laboratory experiments. The standard techniques in current use have one common feature: they generate a discrete set of position-time points which may be used to examine the motion of the glider. These techniques are difficult to use in many situations, such as harmonic motion. In the present paper we describe a simple electromagnetic way of plotting directly and automatically a continuous velocity-time curve. The signal may then be electronically processed to obtain position-time or acceleration-time curves. As an example of the method we present the results obtained in the case of damped and undamped forced harmonic motion.

A3 Errors Anyone?

N. Pereira, Agincourt Collegiate Institute, Scarborough Board of Ed.

Physics texts currently available vary in their treatment of errors of observation. Students have difficulties in understanding these concepts for two reasons. Few examples are given to practise the rules that are set out and secondly they are never applied to physicl situations later on in the text.

The observation of errors in an experiment and their subsequent treatment, is a skill well worth developing. A scheme for presenting this in a cyclic manner, starting in the early grades in Physics will be presented. Participants will receive a draft copy of a handout meant for student use and reference.

A4 Computer-aided Testing in Freshman Physics Laboratories

Donald R. Hay, University of Western Ontario, London, N6A 3K7

Oral testing of students in the large freshman physics laboratories was initiated in 1974 by full-time demonstrators, when graduate students were no longer available in sufficient numbers. The freshmen students responded well to this testing method. In the Fall of 1980, graduate students as part-time demonstrators were re-introduced into these laboratories, but the available time would not permit oral testing of acceptable quality. As an alternative, a pilot program of testing was started, in which half of the students were tested by interactive programs on 6 microcomputers and the other half were tested orally. A C.A.T. model has been developed that combines the best features of these two methods; the computer provides preliminary testing of the student's data analysis, and subsequently students are interviewed orally in pairs on non-routine topics.

B1 The Importance of Newton's First and Third Laws

Graham S. Rose, University of Western Ontario, London, N6A 3K7

Most students taking a physics course in the first year of their University program meet Newton's laws for the third time - yet they still have considerable difficulty in applying these laws to any other than the simplest one-dimensional problems. It is suggested that this is due to an emphasis of the second law - probably because it is expressed as a simple formula - at the expense and sometimes neglect of the first and third laws. An understanding of Newton's first and third laws is essential for a correct identification of motion in a given direction and all the forces which produce it; his second law merely quantifies the cause and effect relationship between these forces and the resulting acceleration. Several examples will be discussed to illustrate the importance of the first and third laws.

B2 Streaming and What to Teach in Grade 13 Physics

Bill Prior, Malvern Collegiate, Toronto Board of Education

An attempt has been made to serve the needs of students more effectively by offering two different approaches to the student of Grade 13 Physics. For those who will continue with Physics at university, mathematics and problem solving are stressed. For those who will not take another course in Physics, a more historical approach is used.

B3 The Use of an Analog Computer in Physics Demonstrations

G.R. Heyland, Northern College, Kirkland Lake, P2N 3L8

In an Analog Computer program, an electric circuit, which is 'analogous' mathematically to a physical system is constructed. The solution, usually in graphical form, is then displayed on an X-Y recorder or on an oscilloscope. The various response variables are then available for simultaneous display. A change in a problem parameter, such as the degree of damping will show up immediately as an altered system output. This emphasis upon visual, rather than mathematical solutions, qualifies the computer as a valuable demonstration aid.

Two programs are discussed. The first is the response of an automobile suspension system when this is subjected to various road conditions. The second program demonstrates the exponential decay law.

B4 The Great Physics Poster Contest

Doug Fox, Belle River District High School, Belle River, Ontario, N0R 1A0

In one simple assignment you can take a bare classroom and transform it into one full of Physics. Students are asked to illustrate a principle, idea, personality, word, equation or some other thing from Physics in a poster format. The assignment uses creative, communication, language and visual skills. The results teach, stimulate discussion and generate interest. Examples of the results will be shown. An instruction sheet and scoring form will be provided.

INVITED PAPER

Microcomputers in the Physics Classroom

Don Whitewood, Consultant, 44 Wychwood Pk, Toronto, Ontario.

Microcomputers are finding many uses in the Physics classroom. They can be used to provide individualized instruction and drill, as a laboratory recording device, as a means of providing interesting simulated experiences, as a means of checking laboratory calculations and as a means of providing interesting demonstrations. From his years of experience in the classroom and with microcomputers, Don will show us some of the best ways to use the micro to encourage student learning.

C1 A Personalized Student Instruction (P.S.I.) Approach to Grade 13

George Kelly, Pearson C.I., Scarborough Board of Eduction

This program, written for use with the P.S.S.C. Physics course, has been the basis of the program in Grade 13 at Pearson C. I. for the last two years (open only 3 years). This course uses mastery gates (pass-fail) for each topic (chapt.) as well as for several experiments during the term. Mid term and end of term exams are also included on the mark total. Special topic seminars and films round out the course. The student's success is a function of his efforts. A suggested time line is provided with bonus marks for early completions to combat procrastination. Weekly posting of marks-to-date (by student number) keeps students aware of their progress through the course.

The use of material from M.I.T. will be described along with several local variations. The use of (bootstrap) proctors will also be discussed.

C2 A Simple Demonstration of Spherical Aberration

A.R. Lachaine and P. Rochon, Royal Military College, Kingston, K7L 2W3

An experimental method is described which permits both a measurement of spherical aberration in a plano-concave lens and a simple correlation to theory.

A series of straight pins are used to determine the images of a fixed object placed at the centre of curvature of the concave face of the lens, as formed by a number of rays making various angles of incidence with respect to the lens axis. The image distance is found to be relatively independent of angle at low angles as predicted by the paraxial ray theory. However, at larger angles, a measurable variation of the image distance is observed.

The theoretical analysis is relatively simple since no refraction occurs at the concave face, the object being at its centre of curvature. Snell's law is applied to the plane face and, using simple geometry, an analytical equation is derived between image distance and angle of incidence. Experimental results agree with theory to within experimental limits.

C3 "Eureka!" TVOntario Physics Programs

Ernie McFarland, University of Guelph, Guelph, N1G 2W1
David Stansfield & Denise Boiteau, TVOntario, Box 200, Station Q, Toronto

"Eureka" is the name of a series of five minute TVO programs on elementary physics. At present there are 25 programs and more being planned. The content (mechanics and heat) follows the Intermediate (Grade 7-10) Science Guidelines, although the programs have proven themselves useful at higher grades as well. In this paper we will give an overview of the content and philosophy of the series, discuss the accompanying teachers' guides, and will show one of the programs. (If you attended the 1980 AAPT-Ontario conference, you may recall the showing of a "Eureka" program which contained some errors in physics. These have been corrected, and considerable effort has been made during the past year to ensure that the physics in the series is correct.)

C4 Give a Lift to your Science Program - Try Model Rocketry

Doug Cunningham, Bruce Peninsula District School, Lion's Head, Ontario

Science as modern as the space shuttle, an exciting vehicle for teaching Newtonian mechanics, an opportunity for individual creativity and craftsmanship, outdoor fun and healthy activity - model rocketry encompasses all this and much more. For the past ten years, students of Bruce Peninsula District School have been actively involved in the support of model rocketry. From the construction of common kits to innovative student designs, from wind tunnel tests to actual flight history predictions, from the thrill of night launches to the achievement of altitude records, our students have explored many of the potentials of model rocketry. This brief talk, illustrated with slides, will present our experience with this fascinating hobby.

INVITED PAPER

Putting Science on the Air

Jay Ingram, Science Journalist

Quirks and Quarks is a science program that covers news in science. It is produced out of thin air every week, and the production can be exciting, nerve-racking, frustrating, exhilarating, or all of the above. No matter what obstacles appear, the program must be on the air Saurday. This talk will describe how and how not to put a radio science program together.

INVITED PAPER

Amateur Science for Physics Education

Jearl Walker, Professor of Physics, Cleveland State University, Cleveland, Ohio, 44115

Examples of presenting physics about science for the amateur. Examples will be from my articles in Scientific American, my book "Flying Circus of Physics, with Answers", my interviews on "Quirks and Quarks" and some videotapes I have made. The message in all the material is that if you want to educate, you must first interest the student.

D1 Physics of Home Heating and Energy Conservation - Theory and Practice

Syed Ziauddin, Laurentian University, Sudbury, Ontario P3E 2C6

During the winter season, energy and heat loss from buildings should be kept at a minimum. Simple laws of physics suggest the ways and means of achieving this. The design and plan for the building provides for these details. What happens in practice is entirely a different story. These aspects will be discussed, with illustrations.

D2 Studying Wave Motion on a Microcomputer

Malcolm Coutts, Head of Physics, Riverdale C.I., Toronto

Volunteers were withdrawn from Grade 11 physics classes to study wave motion using the computer package WAVES AND VIBRATIONS from the Merlan Micro Series. Despite a lack of computer literacy and some problems with equipment, most of the students indicated that they enjoyed computer assisted learning and would choose to do it again.

D3 Studies on Why Some Students "Just Don't Get It"

David Harrison and A.W. Key, University of Toronto, Toronto, Ont M5S 1A7

The application of Piaget's analysis indicates that a significant number of students at the high school and university level do not possess the cognitive structures necessary to do well in physics courses. We shall present experimental results, based on Piagetian ideas, that appear to directly identify the thinking skills that students in difficulty do not possess.

D4 Individualized Physics - Minicourse and Microcomputers

Gordon G. McKye, Etobicoke Board of Education, Etobicoke, M9C 2B3

Although an individualized classroom is difficult to manage, it still appears to offer the best method to provide a physics course which meets the needs of the students we see in Ontario physics classrooms. An audiotutorial minicourse system provides one effective means of delivering individualized instruction. The availablilty of appropriate microcomputer hardware and software now provides an additional means of providing effective individualized instruction.

D5 Teaching Archaeometry: An interdisciplinary link between the physical sciences and anthropology.

R.M. Farquhar, University of Toronto, Toronto, Ontario M5S 1A7

The development of modern techniques for remote sensing, dating and quantitative analysis provide anthropologists with a variety of new tools with which to study the histories and social interactions among ancient cultures. Anthropology undergraduates, in general, have not taken even introductory courses in the physical sciences, but significant numbers of them are eager to learn the rudiments of the new methods. A course aimed at introducing these students to the theory and practice of archaeometric techniques is thus a challenge to design and teach. We shall describe such an offering that is given at the University of Toronto.

INVITED PAPER

Science for the Gifted (Process or Content)

George Vanderkuur, Ontario Science Centre, Toronto, Ontario.

A discussion with lots of demonstrations illustrating the learning objectives met by a science centred program for gifted students. This program has been run at the Ontario Science Centre for two years and will be extended to the senior secondary school level next year. Come with your ideas, biases, opinions etc.

CONFERENCE EXHIBITORS

The following companies have a display booth at the AAPT Conference. We appreciate their support and the service they provide. Please visit their booths and support their efforts.

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NOTES:

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