American Association of Physics Teachers

Ontario Section

NEWSLETTER

Volume V, Number 3 Editor: Dean Gaily February 1984

AAPT-ONTARIO ANNUAL CONFERENCE

JUNE 14-16, 1984
(THURSDAY THROUGH SATURDAY)

ROYAL MILITARY COLLEGE, KINGSTON

Features

Thursday workshop led by George Van der Kuur on Demonstrations, Holograms and Cryogenics
Featured speaker, Dr. Tuzo Wilson, Ontario Science Centre
Invited Speakers
Contributed Papers; My Favourite Demonstration
Evening Boat Tour of the Thousand Islands

Accommodation at Royal Military College
all-inclusive, $15.00 per day!

DO NOT DELAY PLAN NOW

Complete information and registration form will be available in the next issue of this Newsletter. WATCH FOR IT!!

PAPERS PAPERS PAPERS

CALL FOR PAPERS

Now is the time to prepare your presentation for our annual June conference at Royal Military College on Thursday to Saturday, June 14-16, 1984. The program consists of contributed papers, software exchange and, of course, the popular "My Favourite Demonstration".

Organize your abstract for that particular topic or idea you do so well and share it with your colleagues as a presentation in the appropriate section. If you have not given a paper and are uncertain about what to do, just indicate this when you send in your abstract and we will send you a copy of an article from The Physics Teacher on "How to present a paper".

Send your abstract (150 words, maximum) to:

Brenda Molloy
Bayridge S. S.
1059 Taylor Blvd.
Kingston, Ontario K7M 6J9

It is essential that you respond soon as the program must be prepared for early distribution. Thus, the DEADLINE IS 7 APRIL, 1984 for the submission of abstracts.

PAPERS PAPERS PAPERS

NOMINATIONS FOR AAPT-ONTARIO OFFICE

Nominations are requested for the following executive positions in AAPT-Ontario

Vice-President
Member-at-Large

These offices are currently held by Brenda Molloy, Bayridge S.S., Kingston and Eknath Marathé, St. Catharines.

Any member of AAPT-Ontario may make a nomination, the nominee must be a current member of the Ontario Section. Please send all nominations, by 1 April, 1984, to :

T. Dean Gaily
Department of Physics
University of Western Ontario
London, Ontario N6A 3K7

PHYSICS CONTEST

Each year on the first Tuesday in May, the Ontario Section of AAPT sponsors its Grade Eleven Prize Physics Contest. May 1, 1984 marks the fourth year of the Contest. Any student enrolled in grade eleven physics is eligible to write. Information and entry forms are mailed to all Ontario high schools in late February. Students outside Ontario may also enter. Students should be in an introductory high school physics course, not the final year class of physics. Information and forms for those interested will be sent if you write to

Doug Fox
Belle River District High School
BELLE RIVER, Ontario NOR 1AO

The purpose of the Contest is to generate interest in Physics and to permit the best students to compete with each other.

We hope your students will be among the three thousand students who will write May 1, 1984.

From the editor...

On the front page of this Newsletter is the annual call for papers to be presented at our annual Conference in June. There may be a number of people reading this who well know the answers to the following questions, but then there may be some who aren't so sure:

What is a PAPER?
Who presents a PAPER?
How do I present a PAPER?

First, a paper is merely a 10 minute talk, given by you to the assembled group of physics teachers at the Conference. By giving the talk, you are obliged to first submit a brief abstract of your talk for publication in the Conference Program, to interest those of us attending into listening to what you have to say.

Any member of the Ontario Section of AAPT may present a paper, and anyone else, provided a member 'sponsors' that person by submitting the abstract in his or her name, and including that name on the paper as co-author.

Finally, to present a paper, first collect your thoughts, or research findings into presentable form, write a 150 word abstract summarizing these thoughts, send the abstract to Brenda Molloy and then prepare your 10 minute presentation. Be sure to include appropriate visual support materials, such as overheads or slides so that the audience can fully appreciate what you are trying to tell them; try to practice your presentation at least once before giving it and then be assured that you are really making a welcome contribution to physics teaching in Ontario!

T Dean Gaily

OAIP to USA

The Ontario Section of AAPT cooperated with the National AAPT Office in a large project late in 1983. Thanks to the Ontario Ministry of Education we were able to obtain about 640 copies of OAIP:Physics and mail them to AAPT members in the United States who are high school teachers. AAPT-Ontario and the National Office shared the distribution costs. We were happy to be associated with the project. Responses from the randomly selected high school teachers indicate that they were very pleased to receive the package and greatly admired its quality. Doug Fox of Belle River D. H. S. conceived and supervised the project.

MEMBERSHIP RENEWALS AND NEW MEMBERSHIPS 1984-85

On the mailing label for this Newsletter is the date of your membership expiration. To renew your membership or to become a member for the first time, complete the form below and send it along with the membership fee of $5.00 (cheques payable to AAPT-Ontario) to:

John Hlynialuk
Wiarton District High School
Box 580
Wiarton, Ontario N0H 2T0

NAME...

SCHOOL (UNIVERSITY)...

ADDRESS..

CITY...

POSTAL CODE..............**RENEWAL**...........**NEW MEMBER ?**........

APPARATUS COMPETITION-1984

The fourteenth biennial Apparatus Competition is being conducted by the AAPT Apparatus Committee during the 1984 Summer Meeting at the University of Maryland. Many entrants will be able to use the excellent facilities of the University to exhibit their apparatus in a effective manner.

Apparatus entered in the competition should be:

i) Either new in design or a modification of existing apparatus;
ii) Not commercially available;
iii) Not described in a previous written publication.

The apparatus may be set up by the participant (or an attending colleague) or may be shipped to the competition and assembled by the Apparatus Committee. Regrettably, difficulties with customs procedures, etc. make it impossible for the Committee to ship entries back to countries outside North America.

Judges chosen for the competition will make awards in both entry divisions: i) Pre-College Division (open to any pre-college teacher), and ii) College Division. Award winners who are able to be present will be recognized at the evening demonstration program of the summer meeting. Prizes will accompany awards given by the judges in each of the two divisions:

First Prize..............$300 (US)
Second Prize............. 200
Third Prize.............. 100

At the discretion of the judges, all three awards are not necessarily given in each division. Judges are not informed of the school or name(s) of the entrants.

A short manuscript must be submitted which should include a brief account of the use of the apparatus and a description in sufficient detail to allow others to duplicate the apparatus. Entrants are encouraged to submit their manuscripts for publication by AAPT journals after the competition. A brief description of all accepted apparatus appears in the brochure published for the competition.

The deadline for entering the competition is May 4, 1984. Send your application form and manuscript to the Competition Director:

R. W. Peterson
Department of Physics
Bethel College
3900 Bethel Drive
St. Paul, MN 55112

NOTE: For local information, contact Ernie McFarland, Department of Physics, University of Guelph, Guelph, Ontario.

Vernier
SOFTWARE

NEW for Apple II/IIe, suitable for intro. physics:

Orbit II
Graphical Analysis II
Vector Addition II
Projectiles II
Charged Particles II
Wave Addition II
Kinematics II

Each program $24.95 (US). Catalog available from

2920 S.W. 89TH STREET PORTLAND, OR 97225

IMPORTANT DATES TO REMEMBER

DESCARTES Math test for Grade 13
25 April, 1984
Faculty of Mathematics
University of Waterloo N2Z 3G1

CAP Physics Exam for Grade 13
26 April, 1984
Contact: T. W. W. Stewart
Department of Physics
University of Western Ontario
London, Ontario N6A 3K7

AAPT-ONTARIO GRADE 11 PRIZE EXAM
1 MAY, 1984
Contact: Doug Fox
Belle River D. H. S.
Belle River, Ontario NOR 1A0

SIR ISAAC NEWTON (SIN) Test for Grade 13
3 May, 1984
Contact: P. C. Eastman
Department of Physics
University of Waterloo
Waterloo, Ontario N2Z 3G1

AAPT-ONTARIO ANNUAL CONFERENCE
14-16 June, 1984
For Information: Brenda Molloy
Bayridge S. S.
1059 Taylor Blvd.
Kingston, Ontario K7M 6J9

AAPT Summer Meeting
25-29 June, 1984
College Park, Maryland
For Information: See AAPT ANNOUNCER

AAPT-APS-CAP Winter Meeting
20-24 January, 1985
Toronto, Ontario
Information Available in Sept. issue of
AAPT ANNOUNCER

ANNUAL WINTER MEETING OF AAPT
SAN ANTONIO, TEXAS
30 JANUARY-2 FEBRUARY, '84

Begun with numerous workshops, this winter meeting of AAPT was held in sunny, warm San Antonio, Texas. Numerous sessions of contributed and invited papers almost ovrwhelmed the participants but "something for everyone" was the certain outcome. Coffee hour, lunch time and corridor talk with new and old friends continues to make these meetings so profitable for all those attending. Having a joint meting with the American Physical Society allows one to interact fully with physicists at all levels and brings exposure to people like Sheldon Glashow discussing "Neutrino Exploration of the Earth" and John Wheeler on "The Mystery and the Message of the Qunatum".

Surprising news was the June relocation of the AAPT Executive Office from SUNY at Stony Brook to the University of Maryland and the resignation of Cliff Swartz as Editor of The Physics Teacher. Membership in AAPT appears to be attractive to many physics teachers as a 17% increase in active members was noted for '83 over '82. A new discount rate for Sky and Telescope magazine will soon be made available to AAPT members.

Dean Gaily, Ernie McFarland and Doug Fox attended this meeting in the sunny south. Dean was busy with the activities of the Nominating Committee (he was Chairman) and the Committees on International Education and Membership and Benefits. He also filled in for Neves Pereira as our Section Representative. Ernie gave a paper about Teaching Statistical Analysis in the Undergraduate Laboratory, chaired the Apparatus Committee and then left early to witness the Space Shuttle launch. Doug attended the Section Officers Exchange, the Test Pool Advisory Committee meeting, presented a paper about a new teaching strategy, and attended a luncheon for members of the Editorial Board of The Physics Teacher.

It was a good meeting, well planned and interesting to all.

You might find it easier to attend the next winter meeting of AAPT. It will be held in Toronto in January, 1985. AAPT-Ontario will not be holding its regular June meeting that year (1985) but will, instead, merge wth the annual winter meeting. Watch this Newsletter for details. If you wish to present a paper at this meeting you should contact a member of AAPT NOW about the procedure.

THE NOBEL PRIZE IN PHYSICS

The 1983 Nobel Prize for Physics was awarded jointly to Subrahmanyan Chandrasekhar of the University of Chicago and William A. Fowler of the California Institute of Technology, for work relating to the evolution of stars.

Explication of stellar evolution has been one of the greatest scientific success stories of the past half century. The transformations of stars, including our sun, are now better understood than the transformation of a tadpole into a frog. Two points of view have driven this advance; the microscopic, studying events on an atomic scale, and the macroscopic, treating a star as a whole.

In the microscopic domain it has been found that the process from which stars draw their energy--the fusion of light elements to form heavier elements--can take place along various pathways. Nuclei of elements like carbon and nitrogen can function much as catalysts do in a chemical reaction, accreting hydrogen nuclei and eventually returning them, fused into helium, to the gas. In other cases the intermediate nuclei may themselves be transformed. The amount of energy that a star can produce, and, hence, its temperature and general configuration, depends on a complex balance among the various processes.

At the time of the original Big Bang, almost no matter was created in the Universe except hydrogen and helium. In the furnaces at the centers of ordinary stars, these elements were forged into heavier nuclei. The elements were spewed back into space when the stars exploded, eventually forming the gas clouds that coalesced to make our solar system and, utimately, the substance of our bodies. Nucleosynthesis processes are so delicately balanced that if certain nuclei such as carbon had slightly different properties, most elements would never have been produced in abundance and life could not exist.

Very heavy elements like gold and uranium cannot be built up at the temperatures that prevail within an ordinary star. They must be created dring the giant explosions of supernovas, when tremendous swarms of neutrons pile onto nuclei and build up massive clumps, before the unstable intermediate nuclei have time to disintegrate.

Once one knows the amount of energy that nucleosynthesis will yield under given conditions, one can calculate how the entire star will behave. The calculations are complex. It turns out that as a star burns up its initial stock of hydrogen it must contract, growing hotter and denser. Meanwhile the outer layers cool and expand, so the star appears as a red giant. As the last of the hydrogen is used up the star begins a complex evolution, perhaps including explosions, eventually turning into a super-dense white dwarf. At each point there must be a balance between the gravitational force that pulls the mass together and the gas pressure that tends to blow it apart (it is the failure of this balance that causes supernovas). In the more massive stars, ordinary gas pressure cannot hold out against gravity. These stars contract until the nuclei touch one another, merge with electrons, and form a solid body--a neutron star.

The greater the mass of a star, the higher must be its temperature if it is to maintain enough pressure to hold up its outer layers against gravitational collapse. In particularly massive stars, the temperature may get so high that many of the electrons move at velocities near the velocity of light. Therefore, they show an increase of mass, following the laws of relativity. The extra, relativistic mass has all the properties of ordinary mass, including gravitational influence. Thus even as the temperature increases under the pressure of gravity, the pull of gravity itself increases. For a star whose mass is above a certain limit, roughly 1.5 times the mass of our sun, equilibrium is impossible and the star must collapse into a point, a black hole.

Fowler's contributions to our understanding of stellar evolution have been in the microscopic domain and have included both theoretical calculations and laboratory experiments on nuclear interactions. During the 1950s he and his co-workers helped to fill in many of the details of the main pathways of nucleosynthesis. His work has ranged from studies of the way particles in ordinary stars can build up intermediate elements such as carbon, to explication of the swift heavy-element processes in supernovas.

Chandrasekhar has done mathematical work, mostly in the macroscopic domain, covering many areas of astrophysics. In the field of stellar evolution he helped to explain how stars evolve into red giants and under what conditions neutron stars are formed. When he was a student in the 1930s he deduced that stars must collapse when their mass is beyond the limit mentioned above--"Chandrasekhar's Limit". In recent years he has returned to the study of how the equations of relativity may be applied to very massive stars.

From "Physics News in 1983", in Physics Today, January 1984

STAR GAZING

by Doug Cunningham

I recollect a night of broken clouds
And underfoot snow melted to ice,
And melted further in the wind to mud.
Bradford and I had out the telescope.
We spread our two legs as we spread its three,
Pointed our thoughts the way we pointed it,
And standing at our leisure till day broke,
Said some of the best things we ever said.
Robert Frost

Midnight was approaching on this unseasonably warm March night...the smell of spring was in the air as Jamie, one of my Grade 11 students began to assemble the telescopes for a search which we hoped would end in the location of the earth crossing asteroid, Geographos. Initial studies have suggested a cigar shape for Geographos and its rapid rotation causes periodic variations in brightness that take it from a visual magnitude of 11.5 to 13.5. We had hoped to construct a light curve and perhaps model the asteroid's shape to match the light variations. It took us an hour to locate the star field that matched the maps we received from Tonight's Asteroids, a newsletter produced by Jay Gunter of Durham, North Carolina. The star field was searched with various magnifications until 4:00 am but not a trace of the asteroid was detected. As the telescopes were disassembled we concluded that the asteroid was either near the minimum brightness or the map supplied by Tonight's Asteroids was in error. We attempted to find Geographos on one other night but again no success...by then the asteroid's predicted motion had moved it out of star fields for which we had detailed maps. Only later did we learn that the published map was in error. Such are the problems of the amateur astronomer...one who pursues a love affair with the stars and is rewarded for his efforts by an intellectual and spiritual exposure to wondrous and beautiful celestial sights.

In a recent issue of the Journal of Variable Star Observers an article appeared intitled "Astronomers as Amateurs" by Thomas Williams. One of the athor's main points concerned a perception by amateurs that they cannot contribute to the science of astronomy in any substantive way; this at a time when opportunities for contributions are large and growing. As I read the article, thoughts of recent amateur contributions to the science of astronomy rapidly came to mind: the Problicom sky survey to detect Novae, the regular monitoring of literally thousands of fascinating variable stars, the dedicated efforts of an increasing number of amateurs to timing the occultations of distant stars by various solar system objects, the growing numbers of amateurs using photoelectric photometry to measure light variations of everything from asteroids to eclipsing binaries, the army of amateurs preparing to participate in the International Comet Halley Watch, just to cite some of the more active areas of interest.

The February, 1984 issue of Astronomy Magazine contained an article by Paul Maley on the recent successful attempt by amateur astronomers to measure the diameter of Pallas, the solar system's second largest asteroid. On May 29, 1983 this asteroid would pass in front of the 4th magnitude star 1-Vulpecula. The goemetry of the earth, asteroid, and star would produce an occultation shadow across North America somewhere between Mexico and Canada...across the greatest concentration of amateur astronomers in the world, in prime observing time and on a holiday weekend. Organization for this appulse (the close approach of a star or planet as seen from the earth) was conducted by IOTA, the International Occultation Timing Asociation, under the leadership of Dr. David Dunham and a group of regional coordinators. Because the asteroid lacks an atmosphere, an observer in the occultation zone will observe a sharp cut-off of the starlight, in the case of Pallas the light drop would be almost 5 magnitudes. Amateur astronomers, by positioning themselves within various sections of the predicted occultation zone and timing the star's disappearance and reappearance, can accumulate enough data to map the shape and size of the asteroid. It turned out that the occultation path crossed the southern States and close to 500 amateur astronomers, organized into various groups, set up observing fences. Despite numerous cloudouts and observers positioned outside the occultation path reporting misses, a record 124 successful timings were reported. Approximately 80% of the limb of Pallas was observed. The asteroid's profile was found to be slightly elliptical with preliminary measurements of a 520 kM major axis and a 516 kM minor axis. It is interesting to note that more than 90% of all data obtained was by amateur astronomers.

Clear skies and Good Observing!

MARCH

Fri, Mar 2: New Moon
Sat, Mar 10: First Quarter Moon
Sat, Mar 17: Full Moon
Tue, Mar 20: Srping begins-Vernal Equinox; Saturn 0.6° N of Moon
Wed, Mar 21: Mars 0.4° N of Moon
Thu, Mar 22: Uranus 0.5° N of Moon
Sat, Mar 24: Last Quarter Moon; Jupiter 3° N of Moon
Sun, Mar 25: Occultation of 8.8 mag star by Saturn beginning at 1:00 am, this occultation will last about 4 hr.
Fri, Mar 30: Venus 4° N of Moon

APRIL

Sun, Apr 1: New Moon
Tue, Apr 3: Mercury 6° N of Moon
Mon, Apr 9: First Quarter Moon
Sun, Apr 15: Full Moon
Tue, Apr 17: Saturn 0.6° N of Moon: Mars 0.04° S of Moon
Thu, Apr 19: Uranus 0.6° N of Moon
Fri, Apr 20: Neptune 3° N of Moon
Sat, Apr 21: Jupiter 3° N of Moon
Sun, Apr 22: Lyrid Meteor Shower, 15 meteors per hour, best observed before moon rise Sat night-Sun morning
Mon, Apr 23: Last Quarter Moon
Mon, Apr 30: Mercury 0.7° N of Venus

SELECTIONS from the SCIENCE CORNER
Volume 3

Since 1977 Nigel Bunce and Jim Hunt, Professors of Chemistry and Physics respectively at the University of Guelph, have been writing a weekly column "The Science Corner" in The Guelph Daily Mercury. In 1981 their first collection of articles appeared in the form of "Selections from the Science Corner"; this selection contained articles dealing with physics and chemistry as applied to medicine and biology. A year later a seond volume appeared--articles relating chemistry and physics to astronomy and earth science.

These collections of articles, well written and informative, have been tremendously popular: requests for them have poured in from all over Canada, from the U.S., Britain, and even from distant coutries such as Israel and Chile. The Ontario Science Centre uses them in its Science School, and many Ontario schools have requested class sets. With such a response, it is not surprising that "Volume 3" of "Selections from the Science Corner" has been produced.

The present volume, while still concerned with science, has as its focus, "People, Places and Things". Fascinating stories are told of people such as Galileo, Lavoisier, Einstein, and Newton ("Was Newton Mad?"). In the section on "Places and Things", we read about items as diverse as margarine, the Manhattan Project, and Troy. This selection of articles is sure to provide something interest for everyone.

To obtain your free copy of "Selections from the Science Corner, Volume 3", write to

Ernie McFarland
Coordinator of Student Relations
Department of Physics
University of Guelph
Guelph, Ontario N1G 2W1

"A ROUND TUIT"

At long last we have a sufficient quantity of these so that each person may have one of his own. Guard it with your life. These "Tuits" have been hard to come by. Especially the round ones. This is an indispensable item. It will help you become a much more efficient worker. For years you have been saying: "I'll do that as soon as I get a "round tuit". Now that you have a "Round Tuit" of your very own all those things that have been needing to be accomplished will really get done.

Merlan Scientific Ltd.

247 Armstrong Ave., Georgetown, Ontario L7G 4X6
(416) 877-0171 846-0646