



American Association of Physics Teachers

Ontario Section NEWSLETTER

Volume V, Number 2

December 1983

Editor: Dean Gaily

AAPT-ONTARIO ANNUAL CONFERENCE
JUNE 14-16, 1984 (THURSDAY THROUGH SATURDAY)
ROYAL MILITARY COLLEGE, KINGSTON

Features
 All-day workshop on Thursday
 Contributed papers
 Invited speakers
 "My Favourite Demonstration"

Good food, inexpensive accommodation and an excellent
 chance to renew old friendships and make new ones!

Plan now to attend--Get release time--Request travel support--
 Arrange coverage for your classes/exams--Make travel arrangements

DO IT NOW!!!

GRADE ELEVEN PRIZE PHYSICS CONTEST

The 1983 edition of the Contest was dedicated to Dr. Donald Ainslie who passed away in January of 1983. Dr. Ainslie was well known to anyone who has attended AAPT-Ontario Conferences. Somehow Dr. Ainslie's enthusiasm for physics might have generated the huge interest in this year's Contest. Three thousand three hundred copies of the Contest were ordered. Most went to Ontario schools but interest from outside the province is increasing. Any school is welcome to participate in the Contest.

A great deal of credit must go to the University Physics Departments for their support. Particular mention must be made of the University of Guelph and the University of Waterloo. As well, the Universities listed below showed their interest in physics education by sponsoring provincial certificates and provincial prizes.

- | | |
|-------------------------------|----------------------------|
| University of Guelph | Brock University |
| University of Ottawa | Carleton University |
| Queen's University | Laurentian University |
| University of Toronto | McMaster University |
| University of Waterloo | Trent University |
| University of Windsor | Wilfred Laurier University |
| University of Western Ontario | |

This year ten students showed their expertise beyond two and a half thousand others who were graded and achieved recognition as provincial winners. For this they received gold certificates and TI-35 calculators. Congratulation to them and to their teachers.

PROVINCIAL WINNERS

1983

SCORE (OUT OF 25)	STUDENT	SCHOOL	TEACHER
21	V. Mak	Malvern C.I.	W.R.C. Prior
20	M. Lee	Woburn C.I. Scarborough	D.H Bell
	P. Kupchak	Nickel Dist. S.S. Sudbury	V. Bene
18	E. M. Brenner	Hill Park S.S. Hamilton	C.F. Reid
	A. P. Clarke	Nepean H.S. Ottawa	D. Ramsden
	D. J. Deforge	Westlane S.S. Niagara Falls	C.D. Malkiewich
	C. E. Harper	Notre Dame Coll. Welland	S. V. Speranzini
	J. K. Marshall	Loyalist CI & VS Kingston	R. Phillips
	P. R. C. Nelson	North Park CI & VS Brantford	M. Oates
	A. J. Pak	Woburn CI Scarborough	

In addition, the top two students in each of the 217 participating schools received certificates from AAPT-Ontario. The top student in each school received a prize from the school, usually a book.

The 1984 edition of the Contest will take place on Tuesday, May 1.

Doug Fox
Essex County Board of Ed.

From the Editor..

It's "Go to Meetin'" time again. The Annual Joint meeting of AAPT and the American Physical Society will be held in San Antonio, Texas from 30 January to 2 February, 1984. Highlights of the program include:

The Ceremonial Session, featuring the presentation of the Oersted Medal to Frank Oppenheimer (the Exploratorium-San Francisco) and the Richtmeyer Lecture, "On the Matter of the Universe" by David N. Schramm of the U. of Chicago.

Symposia featuring Steven Weinberg, Sheldon Glashow and John Wheeler.

A symposium on the next generation of accelerators that will present some aspects of the plans for the Superconducting Super-collider.

A session sponsored by the AAPM on "Medical Imaging" as well as two refresher courses: "Thermoluminescent Dosimetry and Its Applications in Cancer Therapy" and "Computers in Medical Physics".

Symposia on: The Crisis in Science Education; Advanced Undergraduate Laboratories with Computers; Innovations in Physics Education; Women in Research; Computers in Physics Education; Minorities in Research; History of Physics; etc., etc.

An evening Demonstration Show.

Workshops on Microcomputers, Advanced Interfacing, Apple Interfacing, Introduction to BASIC, Physics of Toys and Building Student Confidence in Physics plus numerous Commercially Sponsored workshops.

Open Houses sponsored by several AAPT Area Committees.

Apparatus and Textbook Show

And much, much more...

All of this will take place in the January climate of the deep south...need I say more? For anyone who attends one of these meetings, the opportunity to charge your Physics Teaching batteries is beyond question. Meeting new friends, including some of those "big names" in the field, exchanging ideas and techniques with them and finding out that your ideas and problems are in many instances shared with others can be one of the most rewarding experiences in a career. I know that it is difficult and sometimes seemingly impossible to get away or to find the \$ support needed to attend these far away meetings, but as anyone like Doug Fox, George Kelly, Neves Pereira or Ernie McFarland can tell you, the return is well worth the effort.

This leads me to a reminder to you that in January, 1985, this Annual Meeting will be held close to home in Toronto, so by all means, begin to plan now to attend this "Once in a lifetime opportunity". And.."See you in San Antonio".

Dean Gailly

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
Warton District High School
Box 580
Warton, Ontario NOH 2T0

NAME.....
SCHOOL (UNIVERSITY).....
ADDRESS.....
CITY.....
POSTAL CODE.....RENEWAL.....NEW MEMBER ?.....

(Ed. Note: The following is excerpted from the above Ministry publication.)

Additional Writers Needed

We were most pleased with the writing that took place this summer towards the new science curriculum guideline. However, there are still some courses for which no writing has been done, and creative writers are needed to work on these courses before and/or during next summer. The following list of courses indicates the areas where writers are needed.

A. General Level Courses

1. Applied Physics - Grade 12

This course should approach the study of Physics from the perspective of applications of physical laws and principles to everyday life. It will include some mathematical applications but with a minimum of abstract problem solving.

2. Applied Physics/Chemistry - Grade 12

This course is renamed from the Technical Science suggested in SCINFO 4, but the intent is similar. It would be recommended for students at the general level who have taken Applied Chemistry and/or Applied Physics and who may be considering courses at Community Colleges. It would likely include some topics not found in traditional Chemistry and Physics courses. It could be taken concurrently with the Grade 12 Applied Physics course.

3. Applied Biology - Grade 11

4. Applied Chemistry - Grade 11

B. Advanced Level Courses

1. Technological Science - Grade 12

This course is perceived as a course for those advanced-level students who are considering taking one or more of the new Technological OACs and possibly heading for courses at University or Community College. It would contain some topics which are not in Advanced-level Chemistry or Physics.

2. Geology - Grade 12

This course will be developed jointly under the Science and Geography guidelines. Two or three science teachers with background and experience in Geology are needed to serve on this writing team. The level of difficulty has not yet been determined but it will probably be offered at the advanced and general levels.

C. OAC

1. Integrated Science

To date, this course is just an idea. It is intended primarily for students going on to University in fields other than science, but may be interested in a science course that is more issue-oriented than the traditional courses at this level. It would allow a mix of all the disciplines in science as they are needed to deal with social issues that can best be understood with a knowledge of some basic scientific principles.

Teachers who are interested in writing for any of the above courses are invited to write to:

Don Garratt
Science Project Leader
Senior and Continuing Education Branch
Ministry of Education
17th Floor, Mowat Block
Queen's Park
Toronto, Ontario M7A 1L2

Please include the following information in your application:

- . Name, address, telephone number
- . School (name, address)
- . The courses and levels you are interested in writing for
- . Background - academic and teaching (courses taught)
- . Writing experience (texts, board writing teams, articles)

Please note that you are not eligible to write for the Ministry if you are currently under contract to write or revise materials for a publisher.

KEPLER'S THIRD LAW

by Eknath V. Marathé,
St. Catharines, Ont.

For the week of Nov. 15 to Nov. 22, 1983, I gave to my Grade 13 Physics class the following assignment, as one of my weekly assignments to them. I am very happy to state that the students completed the task successfully to my and their satisfaction.

ASSIGNMENT

- 1.(a) Calculate the Kepler constants for the following Central Force Systems by calculating R^3/T^2 values for each of their satellites; (1) Earth, (2) Mars, (3) Jupiter, (4) Saturn, (5) Uranus, (6) Neptune, (7) Pluto.
- (b) Investigate, with the help of a graph, whether there is any systematic relation between the K values and the masses of the corresponding Central bodies of the above seven Central Force Systems.
- (c) If the graph shows that there is a systematic relation, express the relation in a mathematical form.

*

NATURAL SATELLITES IN THE SOLAR SYSTEM

Name or #	Orbital radius (10^3 km)	Orbital Period (days)
Satellite of Earth, M = 1		
Moon	384.4	27.322
Satellites of Mars (2), M = 0.107 x Earth's		
Phobos	9.38	.319
Deimos	23.46	1.262
Satellites of Jupiter (16), M = 318 x Earth's		
(Metis)	127.96	.295
(Adrastea)	128.98	.298
Amalthea	181.3	.498
Thebe	221.9	.675
Io	421.6	1.769
Europa	670.9	3.551
Ganymede	1,070	7.155
Callisto	1,880	16.689
Leda	11,094	238.7
Himalia	11,480	250.6
Lysithea	11,720	259.2
Elara	11,737	259.7
Ananke	21,200	631
Carne	22,600	692
Pasiphae	23,500	735
Sinope	23,700	758

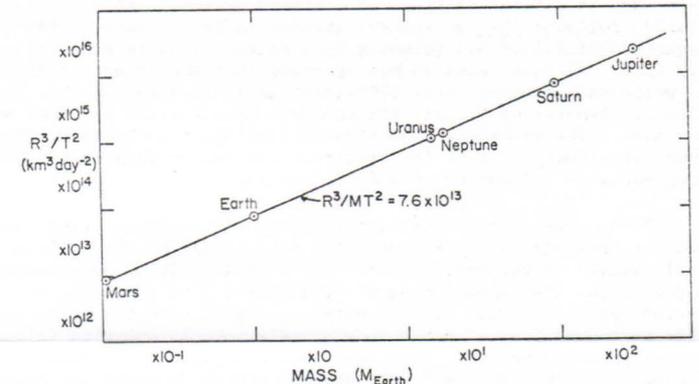
Satellites of Saturn (17), M = 95.2 x Earth's		
(Atlas)	137.67	.602
1980S26	139.35	.613
1980S26	141.35	.629
Janus	151.47	.695
Epimetheus	151.42	.694
Mimas	185.54	.942
Enceladus	238.04	1.370
Tethys	294.67	1.888
Telest	294.67	1.888
Calypso	294.67	1.888
Dione	377.42	2.737
1980S6	377.42	2.737
Rhea	527.04	4.518
Titan	1,221.86	15.945
Hyperion	1,481.1	21.277
Iapetus	3,561.3	79.331
Phobe	12,954	550.4

Satellites of Uranus (5), M = 14.6 x Earth's		
Miranda	129.4	1.414
Ariel	191.0	2.520
Umbriel	266.3	4.144
Titania	435.9	8.706
Oberon	583.5	13.463

Satellites of Neptune (2), M = 17.2 x Earth's		
Triton	355.3	5.877
Nereid	5,510	360.21

Satellite of Pluto, M = 0.002 x Earth's		
Charon	19.7	6.387

- * (1) "Planetary Satellites: An Update", Sky & Telescope, November 1983.
- (2) "Orbital and Physical Characteristics of Planets and their Satellites", Astronomical Society of the Pacific, 1983, San Francisco, CA 94122.



A New Career Guidance Poster from AAPT—

Who Needs Physics?

You do . . . if you want to be a nuclear scientist * chemist * engineer * physicist * computer designer * doctor . . .
Come see your physics teacher: Let's talk about the physics in your future.

The above message (and more) appears on a new student career guidance poster produced by AAPT with the help of Sargent-Welch Scientific Company. In October, all U.S. high schools will be sent one copy of this poster: watch for it!

The poster is 44 cm wide by 61 cm high, printed in red and black on glossy stock. Space is provided to attach the physics teacher's picture to the poster.

To order more posters, send \$1.00 per poster (check or money order only; no stamps, please) to: PHYSICS FUTURE POSTERS, AAPT Publications Dept., Graduate Physics Building, SUNY, Stony Brook, NY 11794.

STAR GAZING

by Doug Cunningham

THE DEMON STARS

To the casual observer of the heavens the stars that appear sprinkled over the celestial sphere are fixed and unchanging...except of course for the seasonal variations and the normal atmospheric causes of twinkling. Indeed, for most of the 3000 or so naked eye stars the brightness remains constant. Although Wordsworth was referring to the north star, Polaris, his words certainly reflect this sentiment.

"...the pole star, as a guide
And guardian of thir course, that never closed
His steadfast eye".

There are, however, a group of stars that literally "close their eyes" and whose variations in brightness are a regular as clockwork. These stars are referred to as Eclipsing Binaries or Demon Stars. Imagine two stars born from the same cloud of gas and dust that are so close together that even the best of our earth based telescopes cannot reveal the duplicity. These stars revolve about a common center of gravity with periods measured in days and therein lies the key to determine their duplicity. If their orbital plane lies on, or very close to, the line of sight as seen from the earth then during the course of their orbital motion the components will mutually eclipse one another and an earth based observer will detect a diminishing of light. In the instance where the orbital plane does not lie close to the line of sight, astronomers can still determine the duplicity by observing the Doppler Shift in the spectral lines. The most famous of the Eclipsing Binaries and the first to be discovered is a naked eye star in the constellation Perseus called Algol, the "Demon Star". To ancient writers this star represented the serpent-haired head of Medusa whose mere glance would turn one to stone. Although the light variations were known to the medieval Arabs it was a young Englishman, John Goodricke, who in 1782 determined the period and suggested that the light variations were due to partial eclipses in a binary system. Algol can be easily followed by an amateur astronomer as it fades from a magnitude of 2.1 to 3.4 (dimming by a factor of 3) in a period of 2.9 days. Recent research has revealed that the primary star is a white main sequence star 100 times the luminosity of the sun with a diameter of 4.2 million km and a mass 4 times the mass of our sun. The secondary companion responsible for the deep minimum at primary eclipse is similar to our sun in brightness and mass but with a diameter of 4.8 million km.

There are other eclipsing binaries with deeper minima and shorter periods...one of particular interest during the Fall and early Winter is the rapid binary X Trianguli. This fascinating Algol-type star experiences a 7 fold dimming in its light in a period of 0.97 days. Unfortunately the star is not a naked eye star so one must have access to a 6" telescope in order to follow the brightness changes. The fascinating feature about this particular star is that the 7 fold dimming occurs in about 1.5 hours and in the space of just 4 hours the entire eclipse is finished. Needless to say, the sight of a star "winking" at you in real time is impressive.

Eclipsing Binaries have provided invaluable information to the astronomer...particularly information concerning the masses, diameters, and densities of a wide variety of stars. For those readers interested in observing and timing the eclipses of these Demon Stars, simply write to:

American Association of Variable Star Observers
187 Concord Avenue
Cambridge, Massachusetts, 02138

The months of December and January bring to the familiar winter constellations a number of close approaches by the moon to some of the familiar planets, two faithful meteor showers, and an annular solar eclipse (best observed in Africa, Europe and the North Atlantic), and a penumbral lunar eclipse. Clear Skies and Good Observing!

Celestial Events for December

Wed, Dec 14: Geminid Meteor Shower; (50 meteors per hour; best observed during the early morning hours of Dec 13, 14, 15).
Sat, Dec 17: Venus 0.2 deg N of Saturn.
Mon, Dec 19: Full Moon; Penumbral eclipse of the Moon..middle of the eclipse is 8hr, 49min PM.
Thur, Dec 22: Winter Solstice..winter begins.
Fri, Dec 23: Ursid Meteor Shower; (15 meteors per hour, best observed during the early morning of Dec 23..full Moon will interfere).
Mon, Dec 26: Last quarter Moon.
Wed, Dec 28: Mars 4 deg S of the Moon.
Thur, Dec 29: Saturn 0.6 deg S of the Moon.
Fri, Dec 30: Venus 0.7 deg N of the Moon.
Sun, Jan 4: Quadrantid Meteor Shower (40 meteors per hour; best observed in the early morning hours of Jan 4).

A NOTE FROM YOUR AAPT-ONTARIO ARCHIVIST

The job of the archivist for AAPT-Ont is to maintain records of historical interest to the association. In this regard photographs/slides/minutes of meetings/letters/conference anecdotes, etc. are desired. If you have any items relevant to the activities of AAPT-Ont that would/should be preserved in our archives would you kindly send them to:

Doug Cunningham
PO Box 35
Lion's Head, Ont. NOH 1W0

THE BACK OF THE ENVELOPE

- (1) The carton containing a 50-watt light bulb promises an output of 900 lumens and a life of 750 hours. Is this bulb destined to emit as much as one mole of photons during its life?
- (2) When you put cream in your coffee, which causes the larger increase in entropy, the mixing of cream and water or the heat exchange between cream and water?
- (3) In order of magnitude, the energy stored in ocean waves is as much as the earth receives from the sun in what length of time?

Do you enjoy this kind of problem? Would your students be challenged by these problems? But you don't know the answer or how to solve them, you say? In each issue of the American Journal of Physics, Professor E. M. Purcell of Harvard University edits a column devoted to these and similar problems and their solutions. The column began in January, 1983 with a "Round Number Handbook of Physics" which in itself is a very useful compendium of data.