



NEWSLETTER

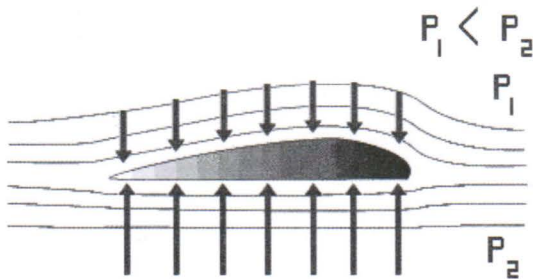
ONTARIO ASSOCIATION OF PHYSICS TEACHERS
(An Affiliate of the American Association of Physics Teachers)
Volume XXII, Number 2 Winter, 2001

Textbook Misconceptions: Misconception #1 How an Airplane Flies.

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Many introductory texts in physics explain the lift generated by an airfoil solely in terms of Bernoulli's principle. The following is quoted from a sample text. The identity has been withheld to protect the reputation of the author:

"Lift is produced by a lower pressure created on the upper surface of an airplane's wing compared to the pressure on the wing's lower surface, causing the wing to be "lifted" upward. The special shape of the airplane wing (airfoil) is designed so that air flowing over it will have to travel a greater distance faster, resulting in a lower pressure area (see illustration) thus lifting the wing upward. Lift is that force which opposes the force of gravity (or weight)."



If we consider the diagram, we can see that there is no possible way that lift can be produced from an airfoil under these conditions. The reason harks back to a violation of Newton's Third Law of Motion. In order to produce an upward force on the wing, there must be a downward force on the air flowing past the wing. This would give the air a downward acceleration, and result in a downward movement of the airflow, which is not shown in the diagram. In fact, the airfoil cannot produce any lift unless it is angled upward a bit, the so-called "angle of attack". This results in air being deflected downward by the airfoil, and creates an upward force on the wing, satisfying the Third Law in the bargain.

In addition, the air moving over the top of the wing ends up with a downward component to its motion for reasons a bit too wordy to include in this short article, adding to the lift and increasing the efficiency of the airfoil.

Surprisingly, it is not necessary to use the classic airfoil shape at all. If enough power is available, a flat board can be used as a "wing" for an aircraft, although the drag induced would make such an aircraft very thirsty for fuel. As a last point, the above textbook explanation would preclude this aircraft from ever flying upside down, which is never-the-less a common mode of flight for many aircraft which possess the necessary structural strength.

Those who wish more discussion on this topic may consult the eminently readable "Stick and Rudder" by Wolfgang Langewiesche, or almost any text on fluid dynamics.

Implementation of the Grade 10 Motion Topic

By John Caranci
physix@iprimus.ca

Earl Haig Secondary School is one of the largest secondary schools in the province.. We have 25 sections of Grade 10 Science non-semestered of which 3 are congregated ESL classes, 2 are Applied classes and 8 are Enriched classes. Eleven teachers of the staff of 20 science teachers have Grade 10s. Some of these teachers are very young with less than four years in the teaching profession, some are nearing retirement, and only three have a physics background. All eleven have now started Motion as their third topic or had completed Motion as one of their first two topics. I am very proud of the staff of the science department because they did not shy away, in any way, from accepting suggestions in Motion.

Budget and timetable restrictions do not allow us the luxury of having all classes doing the same topics at the same time. There is little money for additional equipment other than what was ordered through the ministry two years ago. Photocopying also comes directly out of the science budget. Because of these factors, we decided to go with a flexible model that involved flexible sequencing of units. Some teachers started with a topic with which they were familiar. Some chose a less familiar topic because their energy was higher at the beginning of year.

One of our experienced physics teachers, generously, set up a day-to-day implementation guide for teachers unfamiliar with the topic. The other two physics teachers and myself reviewed the guide. There was also an exchange of assessment instruments, teaching hints, and project rubrics.

One of the key things that assisted teachers was having carts or trolleys dedicated to Motion with boards and equipment. These carts and trolleys have to remain intact throughout three-quarters of the year. A second physics teacher set up the carts and gave teachers a 'quick and easy' in-service (sometimes happening just minutes before the activity was to take place in class). We set up the physics prep room with the same activities so that if the teacher is teaching in a non-science classroom they could rotate their class through. This happens in our school a lot. This Prep room set-up also helps students that missed activities in class due to absence. This was necessary because our school has 550 Grade 10 Science students.

Since the topic of Motion has so many misconceptions associated with it, we followed the principle of simple and clear concepts (KISS). As all physics teachers know, developing a conceptual understanding in the minds of the students is key. Many staff teaching this topic may not have experienced physics activities of this type since their own high school years. A gentle approach works exceptionally well. We tried to keep the number of concepts delivered to a minimum.

We have a January assessment timetable. Four days are set aside for assessments. In senior, this is considered the mid-year exams. Assessment activities in January for 10's were different for each class and provided an opportunity for a topic assessment without using class time. Since these are not at the end of year they were topic tests generated by the individual teachers for their own classes. Some of the assessments are still to be decided on, like the summative assessment.

Culminating activities and projects were many and varied. Some teachers decided on having students do a presentation on parts of the topic (eg. an interesting one using PowerPoint to relate advertising of cars to the actual motion and performance of cars). Some were products like a car, a hovercraft, or a roller coaster. Some teachers still rely on a culminating test.

Here are some anecdotal observations. Some of the strategies teachers used for coping with the new curriculum were: sticking to the text, accessing the experience of physics teachers, and completing the minimum set of expectations. The most difficult parts for teachers to deliver were: developing pedagogical methods for presenting vectors, relating direction of acceleration with the direction of the velocity, and relating graphs to velocity direction. Most difficult parts for students were: the relative amount of mathematics for students weak in mathematics, relating experiments to concepts, and the obvious - putting the time into their homework. As a physics teacher, I found that I was doing more than the required expectations. Surprisingly, it was also noticed that teachers whose background is physics took longer to implement the topic.

As an organizational model, having one lead teacher with experience in each topic setting the framework for that topic was successful. After discussions with the teachers, we found that the lead teacher must be teaching Grade 10 to understand the difficulties of the students. Even though the topic is very similar to Grade 12 Kinematics, the level of conceptual understanding of students does not seem to be very different. And this level of the conceptual understanding is paramount, when learning the topic of kinematics. Demonstrations, kinesthetic presentations, and cooperative small group instruction were very successful. Less successful was the effort by teachers and students to relate experiments to conceptual understanding. Implementing mathematical algorithms, as expected, did not help conceptual understanding either. An interesting side point was that drilling mathematical problems seemed to increase student confidence!

I would like to acknowledge two physics teachers whose selfless work made the implementation of the Grade 10 Motion topic smooth: Donald Rallis and Tony Kwan. I also thank Doug Hayhoe for giving me some assistance with this article.

NEWS

AAPT APPARATUS COMPETITION

Applications are now being solicited for the annual AAPT Apparatus Competition. Entries will be displayed and judged at the 123rd AAPT National Meeting, July 21-25, 2001. Prizes are \$100 each in the Low-Cost category

(\$65 or less to build), and up to 6 low-cost prizes may be awarded. In the Lecture Demo / Advanced Lab category the prizes are 1st: \$1000, 2nd: \$600, and 3rd: \$200. PASCO Scientific provides the prize money for the apparatus competition.

The application deadline is May 1, 2001. The application, contest rules, and additional information are available at <http://www.rose-hulman.edu/~moloney/AppComp/CompetitionPage.htm>

PHYSICS VIDEO CONTEST

The video contest is open to any student or faculty member. Videos should be sent to Beverly T. Cannon, 4220 Emerson Ave., Dallas, TX 75205-1099, to be received no later than May 15. Entries will be displayed and judged at the 123rd AAPT National Meeting, July 21–25, 2001. For additional information and contest rules, see the AAPT website at <http://www.aapt.org/programs/HSphoto.html>

HIGH SCHOOL PHYSICS PHOTO CONTEST

There are two categories: Natural and Contrived. Vernier Software & Technology has contributed prizes for first, second, third places, and a certificate for honorable mention, as well as prizes for the teachers of winning students. Photo submissions should be sent to: Mary M. Winn, 2623 Watrous Ave., Tampa, FL 33629 no later than June 10, 2001. Entries will be displayed and judged at the 123rd AAPT National Meeting, July 21–25, 2001. For additional information and contest rules, visit the AAPT website at <http://www.aapt.org/programs/HSphoto.html>

ARIZONA STATE UNIVERSITY IN TEMPE OFFERS:

A new summer program of graduate courses for inservice high school physics and physical science teachers. It can lead to a Master of Natural Science degree. Two sessions: June 11-29 and July 2 - Aug. 3. The program includes a Modeling Workshop on June 11-29. A pending grant may defray costs. Contact Jane.Jackson@asu.edu, 480-965-8438, <http://modeling.asu.edu>.

and

A Modeling Workshop for post-secondary physics instructors on June 4-22. Contact Michael.Politano@asu.edu, 480-965-3214, <http://modeling.asu.edu>.

AAPT NATIONAL MEETING

Will be held in Rochester from July 21-25

2001 OAPT CONFERENCE:

"2001 Physics Odyssey"

Trent University May 24-26, 2001

Join us at the conference!

See the OAPT Website

<http://www.physics.uoguelph.ca/OAPT>

THE DEMONSTRATION CORNER

CALL FOR PAPERS

Do you wish to share an idea technique of interest with your fellow teachers? Have you a special demonstration, computer program or teaching concept? Do you have interesting ideas and results from, and for, student's projects, or from studies you have done related to teaching and physics? Please consider sharing these with your colleagues by making a contributed presentation at the conference.

Membership

Join the Ontario Association of Physics Teachers

Members receive a Newsletter and **reduced registration rates at the annual conference**. As well, from time to time, the Association makes available special resources; examples have included reprints of "**Demonstration Corner**" articles from the **Newsletter**, and the videotape, "**The Physics of Dance**," from a presentation at one of the annual conferences.

To become a member of the OAPT, send a cheque for \$8 (or a multiple thereof) payable to OAPT to:

Ernie McFarland
OAPT Membership Secretary
Department of Physics
University of Guelph
Guelph, Ontario
N1G 2W1

Find the Ontario Association Of Physics Teachers

WEB SITE at:

<http://www.physics.uoguelph.ca/OAPT>

Find out about:

International Conferences like Physics Teacher Education Beyond 2000

Geophysics Workshop (to Introduce Geophysics and Its Career

Past Conferences

Opportunities -- for Junior and High School Science Teachers)

Grade 12 Physics Contest held in April

THE EXECUTIVE

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“AN ELECTRIC GUITAR PICKUP”

by

Peter Scovil

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I like music, and enjoy playing the guitar, so the following demo caught my eye (or ear?). It was in the Jan. '95 issue of *The Physics Teacher* (p.58) by G.R. Davies of South Africa. It is a good example of electromagnetic induction that is easy for students to understand. I use my sonometer (which conveniently has a steel wire) and a coil with a magnet inserted inside it. The pole of the magnet and the coil are placed very close to the wire. Davies suggested a bar magnet (see diagram), but I have a strong horseshoe magnet, and it works fine. I run the wires from the coil to a Radio Shack mini amplifier-speaker (cat #227-1008C), and get a good sound out of it. A better amplifier is even more impressive. The students can easily understand that the magnet magnetizes the portion of the steel wire near the magnet. The vibrating magnetized wire provides a changing magnetic field that will induce an alternating voltage in the coil at the same frequency as the wire itself. The magnet and coil form essentially an electric guitar pickup.

Last year, as I was teaching harmonics on a vibrating string, I was (after 32 years teaching physics!) trying to think of a better way to show nodes and antinodes on a vibrating string when the amplitudes involved are too tiny to see. Obviously, a microphone will only pick up the dominant sound of the resonance box. But the guitar pickup only responds to the vibrations of the string, not the sound itself. I connected the coil to the mini amplifier input, but then connected the output to an oscilloscope. Then, when the coil was placed near a node, no wave patterns were seen, whereas at an antinode,

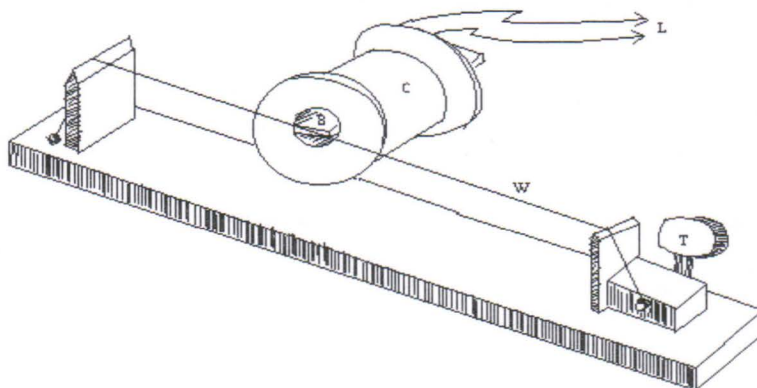


Fig. 1: ELECTRIC GUITAR PICKUP MODEL

W: wire ; C: coil ; B: bar magnet ; T: tensioner ;

L: leads from coil to power amplifier and loudspeaker

the waves had a reasonable amplitude. This can be confirmed by replacing the oscilloscope with a speaker. With an understanding of harmonics, students should be able to predict where nodes and antinodes occur, and then test their predictions. This set-up is good for showing the vibration of the string right at the point where the pickup is located. A microphone is better for showing overall waveform of the sound that you actually hear.

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

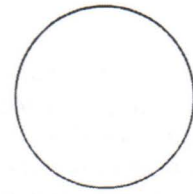
Email: elm@physics.uoguelph.ca

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

ERRATA: The Banquet Dinner on the Ontario Association of Physics Teachers Conference Options Sheet for 2001 a physics odyssey is for Friday not Saturday.

2001

a physics odyssey



**Ontario Association of Physics Teachers Conference
Trent University - Peterborough - May 24,25,26, 2001**

Last Name: _____ First Name: _____

Address to which conference material will be sent:

School/Institution _____
Street/PO Box/Dept _____
City _____
Province/State _____
Postal/Zip Code _____

Attendance Fees

Registration (includes cruise)	\$90	_____
Banquet	\$25 per person	_____
Extra cruise tickets	\$15 per guest	_____
Thursday overnight residence	\$70	_____
Friday overnight residence	\$70	_____
Friday non-residence ancillary	\$8	_____
Saturday non-residence ancillary	\$8	_____
OAPT one year membership	\$8	_____
Total		_____

The non-residence ancillary fees cover break supplies, parking etc., which are already included in residence fees.

Please submit Registration Forms **by April 6, 2001** to:

David Marshall
Physics Department
Trent University
Peterborough ON K9J7B8

Fax: 705 748-1652

Make cheques payable to Trent University OAPT 2001 Conference

Questions? David Marshall, telephone 705 748-1461, email: dmarshall@trentu.ca

Be sure to also complete the Workshop / Tour Options sheet and fax to:

Diana Hall (613) 828-9022
diana_hall@ocdsb.edu.on.ca



Annual Meeting
 May 24-26, 2001
 Trent University, Peterborough

CALL FOR PAPERS

Do you wish to share an idea technique of interest with your fellow teachers? Have you a special demonstration, computer program or teaching concept? Do you have interesting ideas and results from, and for, student's projects, or from studies you have done related to teaching and physics? Please consider sharing these with your colleagues by making a contributed presentation at the conference.

If you wish to make a presentation at the 2001 OAPT Conference, please return this form to:

Diana Hall
 Conference Coordinator
 Bell High School
 40 Cassidy Road
 Nepean, Ontario
 K2H 6K1

Or FAX to 613-828-9022
 Or E-mail to: diana_hall@ocdsb.edu.on.ca

Name: _____

School or Institution: _____

E-mail address: (I need this) _____

Phone: (home) _____ (school) _____ (fax) _____

TITLE OF PRESENTATION: _____

Time Required: 10 min: _____ 15 min: _____ 20 min: _____ 30 min: _____

SPECIAL NEEDS:

Do you require any audio-visual or special equipment besides an overhead projector? yes ___ no ___

If yes, please describe your needs _____

Will you be bringing any equipment yourself? yes ___ no ___

If yes, describe what you will be bringing:

ABSTRACT: Please include a brief summary of the specifics of your presentation on the back of this form. (*If faxing, be sure to fax both sides)

2001

a physics odyssey



Ontario Association of Physics Teachers Conference

Options Sheet

Please fax this sheet to: Diana Hall (613-828-9022)

Name: _____

School and Address: _____

E-mail address (please include in case communication re workshops is required): _____

Phone Number: () _____

WORKSHOP Selection [Please indicate 1st, 2nd and 3rd choice]

- Grade 10 Motion Unit (Kevin Soltes)
- Scanning Tunneling Microscope (Alan Slavin)
- Starry Night Software Hands on Workshop,
followed by Real life Observatory Viewing (John Earnshaw)
- Weather Station

TOUR Selection [Please indicate 1st, 2nd and 3rd choice]

- General Electric – Large Motors Division
- General Electric – Nuclear Division
- Bryston Amplifier Technology
- Trent University Power Dam

BANQUET

Do you plan to attend the Banquet Dinner Friday Night? Yes No

Will you be bringing a guest(s)? If so how many guests will accompany you? _____



OAPT Annual Meeting Feedback / Input

Please Fax or email to: **Diana Hall**
613-828-9022 or diana_hall@ocdsb.edu.on.ca

This year's Annual Meeting will be held at Trent University in Peterborough, May 24 – 26. In order to provide a program that meets your needs and interests, we invite you to provide some feedback and/or input. In order that your ideas and opinions can be considered, please submit this form as soon as possible.

Did you attend last year's meeting at McMaster? YES NO

If YES to above.....

Please check each of the following:	Didn't Like			Liked	
Talks on current research at McMaster	1	2	3	4	5
My Favourite Demo	1	2	3	4	5
Invited Speakers	1	2	3	4	5
Contributed Papers	1	2	3	4	5
Banquet Speaker	1	2	3	4	5
Other: _____	1	2	3	4	5

What, if anything, disappointed you about the conference?

Please comment on the workshop(s) you attended.

Do you plan to attend this year's meeting at Trent? YES NO NOT SURE

What workshop(s) would you like to see offered?

What topics would you like to see highlighted in the program?

Do you know of a Banquet Speaker that you would like us to invite? (Please give details)

We welcome any further comments you may have about the annual meetings.

(Feel free to add a page if this space is insufficient)

Name (optional): _____