VERNIER SOFTWARE & TECHNOLOGY

The Caliper

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Vernier

The Caliper is a publication for users of Vernier products

2004 OREGON BUSINESS 100 BEST COMPANIES TO WORK FOR

OREGON TECHNOLOGY FAST 50

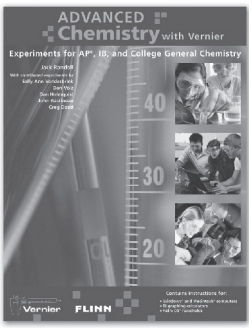
Media & Methods AWARDS PORTFOLIO WINNER 2003

TECHNOLOGY & LEARNING WINNER AWARDS OF EXCELLENCE 2003

IN THIS ISSUE

New! *Advanced Chemistry with Vernier*

Experiments for AP®, IB, and College General Chemistry by Jack Randall



This exciting new lab book has 35 advanced chemistry experiments designed for use with Vernier data-collection technology, including one lab for each of the 22 AP recommended experiments. There are four versions included for each experiment: computer (Logger *Pro* 3), calculator, Palm OS® handhelds, and a generic version that covers all platforms. Experiments are included for 10 Vernier sensors: Stainless Steel Temperature Probe, pH Sensor, Conductivity Probe, Drop Counter, Colorimeter, Gas Pressure Sensor, Current Probe, ORP Sensor, and Radiation Monitor.

Here are just a few highlights of experiments in this book. You can view the entire table of contents at www.vernier.com/cmat/chema.html

- **Kinetics**—Three new experiments for determining rate and order of reaction, using the method of initial rates (using a Gas Pressure Sensor, a Conductivity Probe, and a Colorimeter). We have also included one experiment for determining the activation energy by varying the temperature.
- **Stoichiometry**—Determine the optimal mole ratio of the reactants in a chemical reaction.
- **Potentiometric Titrations for Oxidation-Reduction Reactions**—Two experiments use our ORP Sensor, including the titration of hydrogen peroxide, using potassium permanganate.
- **Titrations**—There are a wide variety of titration experiments (acid-base, conductimetric, potentiometric), including directions with and without a Vernier Drop Counter.
- **Equilibrium**—There are several equilibrium experiments, including K_c, K_a, K_{sp}, as well as additional experiments for acid-base indicators and buffers.
- **Electrochemistry**—Two experiments use the Current Probe; one to monitor current during the electroplating of copper, and another that has students determine Avogadro's number.

Advanced Chemistry with Vernier **| Order Code CHEM-A | $45**

(Continued on page 2)

Vernier Sensors Featured in JASON Expedition to Panama

How do you measure the air temperature and relative humidity in the rainforest canopy when howler monkeys are throwing sticks at you? It's easy! Use Vernier and Texas Instruments equipment! That's what the JASON Foundation chose to use on their January 2004 expedition to Barro Colorado Island (BCI) in the Panama Canal.

Research scientists, students, and teachers gathered to explore and study this unique and beautiful island, managed by the Smithsonian Tropical Research Institute. Vernier and TI employees accompanied the expedition to Panama, providing on-site training and support.

Students gathered temperature, relative humidity data, light level, pH, CO_2 gas and O_2 gas concentration data. The durability, portability, and kid-friendliness of the equipment made it easy for them to collect data from the forest floor to the top of the canopy.

Dr. Robert Ballard shows a student how to use a Vernier CO_2 Sensor in the Panamanian rainforest.

(Continued on page 3)

(Continued from page 1)

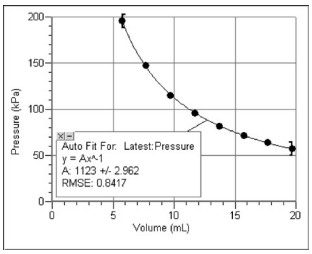
Advanced Chemistry with Vernier

Experiment 30: Exploring the Properties of Gases

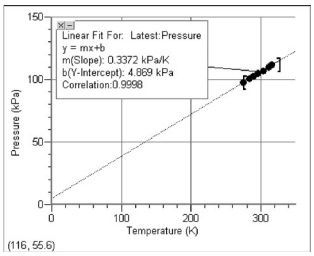
This guided-inquiry investigation has students conduct a series of four experiments, each illustrating a different gas law. Students are given a list of equipment and materials, including a Temperature Probe and Gas Pressure Sensor, along with some general guidelines to help them get started with each experiment. Four properties of gases are investigated:

- **Part 1** Pressure, *P*, and volume, *V* (temperature and number of molecules constant)
- **Part 2** Pressure, *P*, and absolute temperature, *T* (volume and number of molecules constant)
- **Part 3** Volume, *V*, and absolute temperature, *T* (pressure and number of molecules constant)
- **Part 4** Pressure, *P*, and number of molecules, *n* (volume and absolute temperature constant)

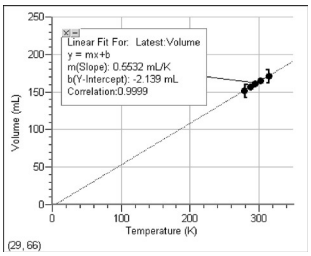
Students may have previously done parts 1 and 2 in their first-year classes. (P-V and P-T experiments are included in our *Chemistry with Computers* lab book.) However, this inquiry experiment provides a great review of gases for an advanced chemistry course. Parts 3 and 4, in particular, will provide new challenges. In part 3, students are asked to determine the relationship between gas volume and absolute temperature (Charles's law); to do this, they will need to submerge their apparatus (the 20 mL syringe mounted on a 125 mL Erlenmeyer flask) in different water baths. The gas volume is varied using the syringe, and the gas pressure is monitored to ensure that it remains constant each time they vary the temperature. Part 4 has students add increasing numbers of molecules to the apparatus using a syringe, and subsequently determine the relationship between the number of molecules, *n*, and pressure (according to Avogadro's hypothesis, numbers of molecules are assumed to be proportional to incremental syringe gas volumes added). Sample data from the four experiments are shown here:



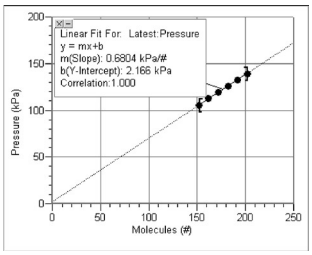
Pressure *vs.* volume (Part I)



Pressure *vs.* absolute temperature (Part II)



Volume *vs.* absolute temperature (Part III)



Pressure *vs.* number of molecules (Part IV)

Students are asked to combine the results from the four parts of the experiments, and determine the relationship between *P*, *V*, *n*, *T*, and the proportionality constant, *K*:

PV = *KnT*, corresponding to the ideal gas law, *PV* = *nRT*

To learn more about Vernier products required to perform these and other chemistry experiments, go to www.vernier.com/pkgs and click on "Advanced Chemistry".

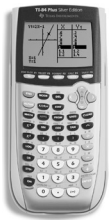
New! TI Graphing Calculators

Texas Instruments continues to improve its line of calculators. The new TI-84 line of calculators are improved TI-83 Plus calculators, and are 100% keystroke-for-keystroke compatible with the TI-83 Plus. All existing TI-83 Plus applications and programs can be used with the TI-84 Plus calculators.

TI-84 Plus—order code TI-84PL, $108 *(available April, 2004)*

The TI-84 Plus is an enhanced version of the TI-83 Plus. It has 2.5 times the speed of a TI-83 Plus, 3 times the memory, a high contrast display, and a USB port and USB cable for easy connectivity to a computer. The TI-84 Plus comes preloaded with 13 applications, including Cabri® Jr. A teacher pack of 10 TI-84 Plus calculators, USB cables, unit-to-unit cables, and batteries is available (order code TI-84PLTP, $1080).

TI-84 Plus Silver Edition—order code TI-84PSE, $129 *(available April, 2004)*



The TI-84 Plus Silver Edition replaces the TI-83 Plus Silver Edition. It features a new style and improved LCD. It has 2.5 times the speed of a TI-83 Plus, 9 times the memory, and a USB port and USB cable for easy connectivity to a computer. It comes preloaded with 30 applications, including Cabri® Jr. and Periodic Table. A teacher pack of 10 TI-84 Plus Silver Edition calculators, USB cables, unit-to-unit cables, and batteries is available (order code TI-84SETP, $1290).

TI has also announced the TI-89 Titanium, which is an improved TI-89. The TI-89 Titanium is 100% keystroke-for-keystroke compatible with the TI-89.

TI-89 Titanium—order code TI-89TN, $138 *(Available May, 2004)*

The TI-89 Titanium features a new style, improved LCD display, and 3 times the memory of the TI-89. It includes a USB port and USB cable for easy connectivity to a computer, and it comes pre-loaded with 16 applications, including an Electrical Engineering application. The TI-89 Titanium's advanced functionality and 3-D graphing make problem-solving for advanced math and science courses and engineering much easier.

(Continued from page 1)

Dr. Robert D. Ballard founded the JASON Foundation in 1989 after receiving thousands of letters from school children wanting to know how he discovered the RMS Titanic. The JASON Foundation is a non-profit educational organization working in partnership with teachers, students, corporations, educational institutions, and government to inspire in students a lifelong passion to pursue learning in science, math, and technology through exploration and discovery. **Coming up next**—JASON Expedition: Disappearing Wetlands. Check it out at www.jason.org

Students using Vernier CO_2 Sensors to study leaf litter on the forest floor. An ice bath was used to vary the temperature of the experiment.

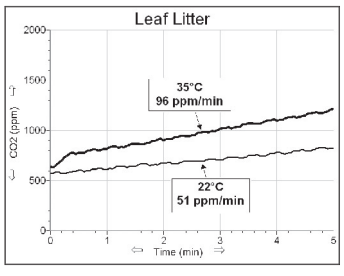
Try It Yourself!

Leaf Litter Experiment

The decomposition of plant material is a very important part of the brown food web. The microbes that decompose dead leaves and other forest floor detritus provide nutrients for new plants to grow. CO_2 gas is one of the products of this process.

In Panama, students used a CO_2 Gas Sensor, Vernier LabPro, and a TI graphing calculator to measure the amount of CO_2 gas being produced by leaf litter. Once the CO_2 production rate was clear, they varied the temperature and the moisture content, and found very interesting patterns emerging. You can do the same thing in your home ecosystem.

General Procedure

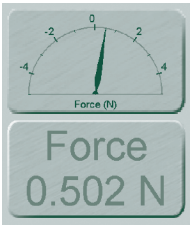


1. Prepare a Vernier CO_2 Gas Sensor, LabPro, and TI graphing calculator, computer, or Palm handheld.
2. Collect a handful of leaf litter and place it in the CO_2 chamber.
3. Collect data for 5 minutes.
4. Determine the CO_2 production rate by calculating the slope of the resulting graph.

Extensions

Vary the temperature by placing the chamber in various water baths. Vary the moisture content by adding known amounts of water to the chamber.

Logger *Pro*® 3 Keeps Getting Better with Logger *Pro* 3.3



What's better about Logger *Pro* 3.3? The biggest change is support for multiple interfaces. You can use our new Go! Temp and Go! Link devices, as well as the Ohaus® Scout® Pro balances. If you want, you can even use several LabPro interfaces at the same time.

Other new features include:

- Redesigned Toolbar
- Export to GIS software
- Analog dial meters and thermometer
- Curve fits can be displayed without parameters
- Keyboard triggering
- Recently opened files list

Logger *Pro* 3.3 will be available in May. The update from any version of Logger *Pro* 3 to version 3.3 is free.

Check out www.vernier.com/loggerpro for more information.

Everyone Can Replay Movies Synchronized with Your Data

Did you know that calculator data can be imported to Logger *Pro* 3 from LabPro, CBL 2, and even the original CBL? Thanks to this feature, calculator users can take advantage of the new video synchronization features in Logger *Pro* 3. It's as easy as this:

1. Collect data from the sensors as you normally would, while simultaneously videotaping your experiment.
2. Import your sensor data to Logger *Pro* 3.
3. Transfer the video to your computer.
4. Insert the video to your Logger *Pro* 3 data file.
5. Synchronize the movie and the data.

You now have a movie and sensor data that can be replayed together (at any speed). This is a great way to show students the relationship between what happened during the experiment and the graph.

Our Sensors are Smart—Very Smart

Did you know you can store a custom calibration directly on many Vernier sensors? For most purposes, it is not necessary to calibrate Vernier sensors, but if you do choose to calibrate, here's how it works: There is a chip in most analog sensors that can store calibration information. If you use Logger *Pro* 3, you can write information to that chip. For example, you could calibrate a Force Sensor, and then store the calibration to the sensor. Next time you use that sensor, using Logger *Pro* 3 (DataMate on the calculators, or DataPro on Palm), you'll automatically be using that calibration. You can always go back to the factory calibration, if you prefer. Check the online help index for "calibration storage" and you'll find all you need to know.

Rave Review for our Middle School Books

The April 2004 issue of *The Physics Teacher* includes a review of our two Middle School books, *Middle School Science with Computers* and *Middle School Science with Calculators*. The reviewer, John Hubisz, summarizes his review by saying, "This material is excellent." He recommends the books for teachers interested in improving the laboratory experiences of their middle school students.

Vernier Textbook Correlation Project

Match Vernier lab book activities to the concepts presented in your science text! In this ongoing project, we are correlating our experiments with popular textbooks in the following subject areas: biology, chemistry, physics, environmental science, physical science, Earth science, and life science. We have already completed many correlations for biology, chemistry and physics texts and we are continuing to add to the list. We will post additional correlations as they become available. To view correlations of Vernier activities with your text, visit www.vernier.com/textbooks

Congratulations to Vernier Technology Award Winners!

Thanks to all of you who applied for the first Vernier Technology Award. This annual award rewards excellence in the teaching of science using data-collection technology. Your applications were reviewed by a committee appointed by NSTA, which selected the following winners. The winners were honored at a banquet at the NSTA Convention in Atlanta. Read more about the winning projects at www.vernier.com/grants/nstaawards.html

Nancy Elliott
Chillicothe Middle School
"*Can You Hear Me Now?*"

Michael Farmer
South Carolina Governor's School for the Arts and Humanities
"*The Pinhole Camera*"

Eric Muhs
Roosevelt High School
"Counting Cosmic Rays"

Edward Wyrembeck
Howards Grove High School
"Bridge Swinging and the Maximum Tension in a Pendulum String"

Michael Columbia
Indiana University-Purdue University, Ft. Wayne
"Molar Mass Determination by Depression of a Freezing Point"

Apply now for the 2005 award! The deadline for applications is October 15, 2004. Seven $3000 prizes are offered ($1000 towards travel to attend the NSTA Convention where the awards are presented, $1000 in cash, and $1000 in Vernier equipment).

For information about applying for next year's award, visit www.vernier.com/grants/nsta.html

Data Collection at Amusement Parks

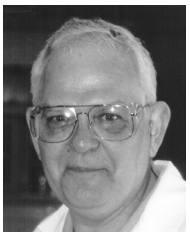
It's spring and that means it's time for a physics field trip to a local amusement park. We have lots of good stuff to help make your trip successful.

A new, free download is Clarence Bakken's guide *Data Collection at the Amusement Park*. There are tips for everyone, including Palm OS handheld, TI graphing calculator, and computer users. For more information, see www.vernier.com/datapark

To have a good day at the park, you will want some or all of the following equipment: The Low-g Accelerometer (order code LGA-BTA) is the basic tool, but the 3-Axis Accelerometer (order code 3D-BTA) lets you measure all three components of the acceleration. Note that all of our accelerometers are now individually calibrated, so you generally need only zero the devices. If your accelerometer has a BT (flat white) connector directly on the cable, it is factory calibrated.

A Barometer is another good sensor to bring along, because it can function as an altimeter. A record of the height of the ride as a function of time makes it much easier to understand the acceleration data.

Finally, you can put it all together with a Data Vest (order code DV). The Data Vest carries a LabPro or CBL 2, and includes internal pockets for several sensors.



Featured Teacher: Walter Rohr

As we travel around the country, we have the privilege of coming into contact with many excellent educators. Some have won prestigious awards; others have spent their careers largely unsung. The names of some, when mentioned to others, evoke unsolicited testimonials. One such individual, who inspired the idea for this story, is Walter Rohr.

Walter is a "retired" chemistry teacher who now performs occasional Vernier trainings. During his 37 years as a chemistry teacher (over 30 of them at Eastchester High School, in Eastchester, NY), Walter spent nearly as many hours mentoring colleagues as he did in the classroom. He participated for several years in the "New Teachers in Regent's Chemistry" mentor program, and worked with a group of other teachers in Westchester County to bring the "Chemistry Teachers Alliance" into being in 1989. Still active, this group meets several times a year to promote excellence in chemistry education.

In his "retirement," Walter continues to work to make things better for science students and teachers. A current project involves using probeware technology to improve the instructional value of demonstrations in the classroom. (Watch for these ideas in future *Calipers*!)

We at Vernier congratulate Walter on a long and illustrious career, and thank him for the many contributions he has made to science teaching.

LabVIEW™ Updates

We have recently updated our LabVIEW samples posted at www.vernier.com/labview. We now have a LabPro Toolkit that includes Express VIs, a palette of LabPro subVIs, and examples. This Toolkit eliminates the need to learn the low-level LabPro commands in writing programs. You can quickly create a LabPro program by linking just a few Toolkit VIs on a block diagram. We think this LabPro Toolkit makes LabPro programming easier than ever before. Windows, Mac, and Linux versions are available. Check it out at www.vernier.com/labview

We will have a 2-day "LabVIEW with LabPro" workshop at our office in Oregon on August 9-10. This is for novice or intermediate LabVIEW programmers who want to write programs controlling data collection and the output lines of LabPro. To register, go to www.vernier.com/workshop

LabPro's Antarctic Adventure

Heike Robinson, physics teacher and sea kayaker, measures the temperature of Antarctic waters with a LabPro, Palm, and Stainless Steel Temperature Probe.

Four years ago, Heike Robinson started sea kayaking. The more she learned about paddling, the more she discovered about the physics behind it. She started using examples from boating to help her students visualize many concepts such as force, resistance, heat-flow rate (hypothermia), vector addition, and moment of inertia. In February 2004, Robinson and several companions paddled on an unsupported expedition to the Antarctic Peninsula. Fewer than 20 people in the world have ever taken on this challenge, and she wanted to take Vernier sensors with her!

Using a Palm handheld with a LabPro, Heike measured temperature and conductivity of the water, temperature of the air, and visible, UVA and UVB light intensities.

"The UVA and UVB data will be incorporated into my unit on radiation," she says. "I will also share these data with our environmental science classes, where I make presentations on the ozone holes in the Arctic and Antarctic. One of my classes builds a flexible solar charger for kayak decks. The light intensity measurements will help them determine if solar panels can be used as power source on these kayak expeditions."

The conductivity of the water is interesting, because the meltwater released from icebergs, ice flows, and glaciers freezes at a higher temperature than the saltwater of the bay.

Heike Robinson is a physics teacher with Mentor Public Schools at Lakeland Community College, Kirtland, OH. The journal of her trip can be found at http://www.mentorhigh.com/teacher/robinson/

Science Humor

(according to David Vernier)

We have been producing this newsletter for 20 years—usually two issues per year. I can honestly say that one of the hardest things about doing it has been coming up with science-related jokes that do not offend anyone, and are at least a little funny. So, I am going to take this opportunity to repeat my favorite science jokes from twenty years of searching.

Joke #1

Three brothers went out west to establish a cattle ranch. They could not think of an appropriate name for the ranch. They called their physicist father back east and he suggested the name "Focus," for that's "where the sun's rays meet."

(I first saw this triple pun in Isaac Asimov's *Treasury of Humor*.) Al Bartlett turned this into a quadruple pun by a clever addition:

When their father died, the name took on added significance as it was now, "where the morning sun's rays meet."

Joke #2

The museum guard proudly told the visitors that the dinosaur bones on display were "60,000,005 years old." When asked how the age could be known so precisely, the guard said, "I don't know how they do it, but when I started working here five years ago, they told me that the bones were 60 million years old." (This lesson in significant digits came from John McGervey's book *Probabilities in Everyday Life*, 1986, Nelson-Hall, Inc.)

Joke #3

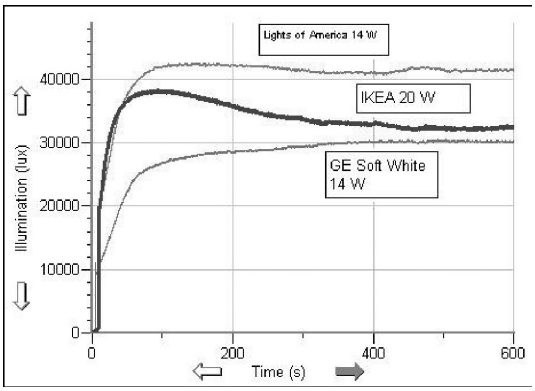
After he received his Nobel Physics Award in 1927, Arthur Compton was very much in demand as a speaker at universities and conferences. He wasn't really very interested in public speaking, so he developed a standard speech which he repeated whenever necessary. To make these public speaking obligations more tolerable to Compton, he was provided with a chauffeur who drove him to the site, and who then sat in the back of the hall until the speech was over. One night on the way to a talk, Compton was complaining about having to deliver the speech again. The chauffeur responded, "If you think it's boring giving that speech over and over, think about how boring it is for me having to listen to it. I know the whole speech word for word."

Well, that got Compton thinking. It occurred to him that nobody at the lecture hall knew what he looked like. He arranged to trade clothes with the chauffeur and let him give the speech. Compton took a seat at the back of the hall as the chauffeur began to speak. The speech was given flawlessly. Thunderous applause followed. The master of ceremonies then called the speaker back for a short question-and-answer session. The first question was on the kinetic energy of the recoiling electron in X-ray scattering experiments. The chauffeur listened carefully to the question and then responded, "That is a really dumb question. In fact, that question is so dumb, I think I'll have my chauffeur answer it."

. . . And Now for Some Light Reading

Compact fluorescent lamps (CFLs) have become a popular choice among energy-conscious homeowners. CFLs consume as little as one-fifth the power and last up to 13 times longer than incandescent lamps. A single CFL can save enough electricity (coal-fired) to keep a ton of carbon dioxide out of the atmosphere.[1]

While CFLs may save a lot of energy, some people comment that they are not as bright as they would like when they first turn them on. We decided to put some bulbs to the test to see how long it takes for various CFLs to reach maximum brightness, using our Light Sensor. We tested a 14 W GE Soft White 60 Energy Saving Bulb, a 14 W Lights of America® Mini Twister, and a 20 W IKEA® bulb.



We found that the Lights of America CFL took about 100 seconds to reach maximum brightness, and it stayed at that brightness for the remainder of the experiment. The GE Soft White CFL took about 360 seconds to reach maximum brightness. The IKEA light settled in at its operating brightness at about 470 seconds, after reaching a maximum, and then decreasing to its operating brightness.

[1] Compact Fluorescent Lamps: What You Should Know, D.W. Finn and M.J. Ouellette, http://irc.nrc-cnrc.gc.ca/practice/lig3_E.html

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Be the first to learn about what's happening at Vernier!

- Learn innovative ways to use data-collection technology in your classroom.
- Find out about software updates as soon as they are released.
- Be the first to receive free sample labs from our popular lab books.
- Receive a schedule of free hands-on workshops in your area.

Sign up at www.vernier.com/info.html. No more than 5 per year—we promise!

Sound Level Meter Experiments

Our Sound Level Meter (SLM-BTA, $209) offers lots of possibilities for the kind of investigations that students really get into. Here are some ideas:

- Some hair dryers are really noisy, and the noise source is right next to your ear. This inspired us to do a little checking. We tested five hair dryers, recording the sound level with the dryer about 2 cm from our Sound Level Meter (about the closest distance the hair dryer gets to your ear). The noisiest hair dryer read around 101 decibels and the quietest read near 90 dB.
- We went to a "Battle of the Bands" concert a few months ago, and recorded sound levels of 104 to 110 dB during performances.
- The October issue of *Physics Today* had a small article on sound levels in aerobics and other exercise classes in fitness clubs. They report levels as high as 120 decibels.
- Other noise situations that might be interesting for student investigations include headsets, pep rallies, and traffic.

It is easy to find OSHA noise standards on the internet for comparison with measured levels.

Independent Workshops

Physics Modeling Workshops

Modeling Workshops for high school physics and physical science teachers will be held this summer in multiple states. Most carry graduate credit, and they provide stipends and/or free tuition. For more information, visit http://modeling.asu.edu

Promoting Active Learning in Introductory Physics Courses

There are two Chatauqua Short Courses coming up this summer. Promoting Active Learning I will take place June 10-12 at the University of Oregon in Eugene, OR. Promoting Active Learning II will take place June 3-5 at Dickinson College in Carlisle, PA. Priscilla Laws, David Sokoloff, and Ron Thornton will be presenting these workshops. For more information, see http://darkwing.uoregon.edu/~sokoloff/physcourse.htm

If you are hosting a workshop using Vernier equipment and would like us to advertise it, e-mail us the details at workshop@vernier.com

20 years ago in The Caliper

This is the 20th anniversary of this newsletter. In the first issue, which was printed by an IBM Selectric typewriter controlled by an Apple II computer, we announced our Frequency Meter program for Apple II and our first (and only) Commodore 64 program, Precision Timer.

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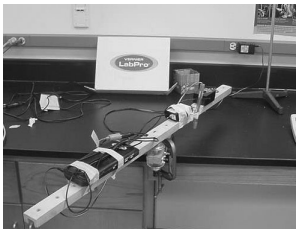
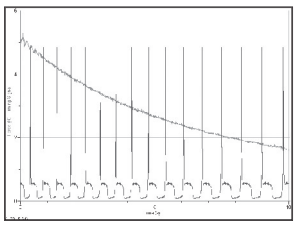
Innovative Uses

Bill Jameson (DeForest Area HS, DeForest, WI) sent us a clever, inexpensive lab idea for studying centripetal force. This is an improvement on an idea he had written for *The Physics Teacher* in December 1999. The photo shows the setup. A Dual-Range Force Sensor is mounted on the rotating board. A Light Sensor is fastened near it, pointing down. On the other end of the board, the LabPro is taped to counterweight the system. A mass has been attached to the force sensor. When the system is spun, the Light Sensor passes over a flashlight, which allows the students to determine the time for one rotation. In one run, you can measure the centripetal force for several different angular speeds as the device slows down in its rotation. One graph gives you the force data for many different rotation speeds. The period can be determined from the time between peaks from the Light Sensor, and the force is measured directly.





Police Car and Speeder

Ralph Newell, (South Portland HS, South Portland, ME) has developed an exercise using toy cars, which he reports has been a real hit with his students. Students use a Photogate to measure the speed of two constant-velocity toy cars. The challenge to the students is to predict where the faster (police) car will catch the slower (speeder) car if they start at the same instant, with the faster car one meter behind. The students are encouraged to solve this problem graphically, with Graphical Analysis or Logger *Pro*. Their grade depends partly on how close their prediction comes when the race is tried with the two cars.

High Flying Physics

Eric Muhs and his physics students (Roosevelt HS, Seattle WA) constructed a portable cosmic ray detector and sent it 35 kilometers into the atmosphere, recreating Victor Hess' Nobel Prize winning discovery of cosmic rays. The cosmic ray detector took two trips aboard a NASA high altitude balloon, along with a Temperature Probe, Magnetic Field Sensor, Barometer, and Relative Humidity Sensor. The data were recorded by a Vernier LabPro and transferred to a computer upon the balloon's recovery. The entire C.H.E.S.S. (Cosmic ray High-altitude Experiment by Science Students) project is wonderfully documented on Eric's web site, along with countless other creative ways to teach physics. See www.invisiblemoose.org/site_material/front_pages/teaching_projects.html

Connie Johnsen and Trena Wilkerson developed a set of lessons aimed at helping students better understand slope. They did this by using hands-on activities and real-world situations. For example, in one lesson the students analyze the motion experienced on roller coaster rides. In another lesson, the students use a Motion Detector to study walking students. The article, entitled "My Journey toward a New Slant on Slope," appeared in the October, 2003 edition of *The Mathematics Teacher*.

Brian E. Martin (The Kings College, Edmonton, AB) and Martin Connors (Athabasca University, AB) had an article in the Dec. 2003 *The Physics Teacher* titled "Testing a Model for Sliding Motion on an Incline." It explains how to use our Logger *Pro* and a Photogate to do a very nice modeling exercise.

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June 28	Arlington, VA	Aug. 6	Denver, CO
June 30	Baltimore, MD	Aug. 11	Beaverton, OR
July 12	La Crosse, WI	Aug. 12	Beaverton, OR
July 12	Atlanta, GA	Aug. 16	Provo, UT
July 14	Orlando, FL	Aug. 18	Salt Lake City, UT
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