

# The CALIPER



THE CALIPER IS A PUBLICATION FOR USERS OF VERNIER PRODUCTS

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The freedom to inquire. The technology to excel.



We are pleased to announce our most exciting product in our 26-year history—Vernier LabQuest. This powerful new interface is designed for versatility. Use it as a stand-alone device, a computer interface, or in the field. Here are a few key features:

- Color touch screen
- Rechargeable internal battery
- Works with existing Vernier sensors
- Splash proof
- Rugged design—built for student use
- Built-in sound and temperature sensors
- Comprehensive curriculum
- Built-in graphing and analysis software
  - Powerful and easy to use
  - Loaded with analytical features
- On-board applications, including stopwatch, periodic table, and scientific calculator

More details and technical specifications on pages 6-7 or available online at

[www.vernier.com/labquest](http://www.vernier.com/labquest)





## VERNIER EasyLink® Wins Award

We are pleased to announce that EasyLink, our USB interface for use with TI-84 Plus graphing calculators, received an Award of Excellence from *Technology & Learning*. The Award of Excellence recognizes products that help educators teach with technology.

EasyLink was given a rigorous test drive by qualified educators. Evaluation criteria included quality and effectiveness, ease of use, and suitability for use in an educational environment. Priced at just \$58, EasyLink is an affordable way to get started with calculator-based data collection. To find out more about EasyLink and our other products for TI-84 graphing calculators, visit [www.vernier.com/easy](http://www.vernier.com/easy)

## What To Do With Old CBLs?

Nüsret Hisim (Walkersville HS, Walkersville, MD) was in the same situation as many other customers: He long ago updated his interfaces to newer LabPros or CBL 2s. Here are some creative ways he makes use of those older, original CBLs:

- Use them as stand-alone meters. The original CBL not only had a meter screen on the unit, but it also came with three inexpensive sensors—temperature, light, and voltage. Simply turn on the CBL, connect one of these sensors to Channel 1 of the CBL, and press the Mode button. You will have a great digital meter. No calculator program is necessary. Nüsret keeps one at each lab station to use as a digital thermometer.
- Use CBL sensors with newer interfaces. The CBL's temperature, light, and voltage probes all have BTA connectors and are auto ID. Simply connect them to a LabQuest, LabPro, or CBL 2, and start up your Vernier data-collection program. Make sure you gather up these very useful sensors before storing those CBLs on the back shelf!
- Put the CBLs back into service. We have customers who are new to a school who have found CBLs on a back shelf. They are unsure how to use them and give us a call. We are happy to help them set up their TI calculators with a data-collection program for their CBLs.

## Data Collection Workshops with Texas Instruments

This summer, Texas Instruments is offering 3-, 4-, and 5-day training opportunities focusing on data collection with TI graphing calculators.

Watkinsville, GA	June 4-6	Norwich, CT	July 16-20
College Park, GA	June 18-22	Melbourne, AR	July 23-25
West Chester, PA	June 25-29	Coppell, TX	July 30-Aug 1
Hicksville, NY	July 9-13	Melbourne, AR	July 30-Aug 1
Lebanon, KY	July 9-13	Daytona Beach, FL	Aug 6-10
Warwick, RI	July 9-13	Worcester, MA	Aug 6-8

Dates and locations are subject to change. For more details and other professional development opportunities from TI, visit <http://education.ti.com/go/t3summer>

## What's NEW at Vernier?

### NEW BioChambers



Designing and conducting experiments using our CO<sub>2</sub> and O<sub>2</sub> Gas Sensors is easier than ever with our new BioChambers.

Order Code  
BC-250 | \$5

These versatile chambers come in two sizes: 250 mL and 2 L. Both can accommodate our CO<sub>2</sub> and O<sub>2</sub> Gas Sensors for studying the gas composition during photosynthesis or respiration. Use the 250 for small samples, such as peas, crickets, or leaves. Use the 2000 for plants or larger samples.



Order Code  
BC-2000 | \$15

### NEW Improved CO<sub>2</sub> Gas Sensor

Our CO<sub>2</sub> Gas Sensor has been redesigned with several great improvements, including an expanded range to accommodate human respiration,

lower power requirements allowing it to be used with a Go!Link, and a new sleek form factor.



The new CO<sub>2</sub> Gas Sensor has

Order Code  
CO2-BTA | \$249

two ranges for optimum resolution in each range. The low setting has a range of 0 to 10,000 ppm CO<sub>2</sub>. This provides good resolution for small changes in CO<sub>2</sub> levels, such as the respiration of peas, photosynthesis of plants, or respiration of insects. The high setting has a range of 0 to 100,000 ppm, making it perfect for measuring the concentration of CO<sub>2</sub> gas in human respiration. The new CO<sub>2</sub> Gas Sensor can be used with a LabQuest, LabPro, Go!Link, or CBL 2.



## Experiments for Engineering Education Using SensorDAQ

The Vernier SensorDAQ, our new interface designed for engineering educators, is now shipping. This USB interface, created in collaboration with National Instruments,

combines the ease of use of Vernier sensors, the versatility of screw-terminal connectors for custom inputs and outputs, and the programming and analysis power of National Instruments LabVIEW® software. Sample VIs, sample experiments for SensorDAQ, can now be found on our web site. In these experiments, we start with an engineering concept, discuss detailed steps for testing or performing the concept, and provide LabVIEW steps and final VIs for creating the required program. The SensorDAQ experiments provide a great way for students to learn LabVIEW and become familiar with controlling a data-acquisition instrument—all while examining an engineering concept in a hands-on environment. To learn more about SensorDAQ and to download the free experiments, go to [www.vernier.com/sensordaq](http://www.vernier.com/sensordaq)

SensorDAQ | Order code SDAQ | \$189

## What Can I Do with a Vernier Charge Sensor?

The Vernier Charge Sensor is essentially an electroscope, but since it connects to a computer, you can do many more experiments than with the traditional device. There's an excellent and detailed article titled "Electrostatics with Computer-Interfaced Charge Sensors" by Robert Morse in *The Physics Teacher*, vol 44, November 2006, pages 498-502.



Order Code  
CRG-BTA | \$69

### Get FREE Spectrometers!

Purchase **9** Vernier Spectrometers at \$1199 each and get **1 unit FREE!**  
Purchase **10** Red Tide Spectrometers at \$1499 each and get **2 units FREE!**

Go to [www.vernier.com/spectrometer](http://www.vernier.com/spectrometer) for details.



Offer good until May 15, 2007

## NEW Activities for the Wireless Dynamics Sensor System

We now have data-collection activities available for the WDSS on our web site. The 40-page booklet contains seven activities that investigate force, acceleration, and their interrelationship, all using the WDSS. The seven activities include Vernier standards, such as Newton's Second Law, Newton's Third Law, and Bungee Jump. There are also some new activities, such as Investigating Crumple Zones and Mission to Titan, adapted from teacher training materials created by Chris Butlin, Educational Consultant, York, UK. These free activities are a great way to get your students started with the WDSS. Go to [www.vernier.com/WDSS](http://www.vernier.com/WDSS)

## NEW Pulley Bracket for Vernier Dynamics System

We now have a simple bracket for attaching a pulley to the end of the track from a Vernier Dynamics System. The Pulley Bracket fastens to the underside of a Vernier Track and accepts the Vernier Ultra Pulley (order code SPA, \$23) or other popular low-friction pulleys. Use the bracket to create a half-Atwood machine. Monitor the pulley rotation with a Photogate if



you want, or use a Motion Detector to follow the cart.

Order Code  
B-SPA | \$12



### Free Spectrometer Labs

We have six lab experiments posted on our web site for use with the Vernier Spectrometer. These labs will introduce your students to the common use of a spectrometer, from the classic Beer's law to emissions from discharge tubes, to a novel look at theatrical lighting filters. Visit [www.vernier.com/spectrometer](http://www.vernier.com/spectrometer)

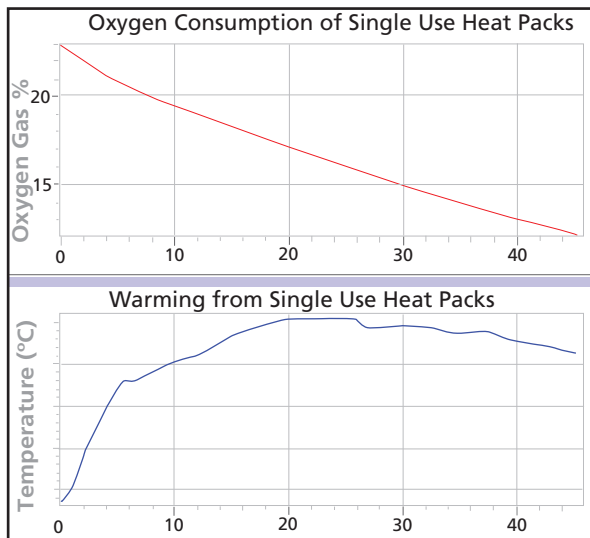
# Testing Heat Packs

A popular, inexpensive, product sold in northern climes is a single-use packet that warms up upon "activation" and stays warm for a few hours. They come in different sizes, most are small enough to fit in an adult palm, and they're advertised as "hand warmers," "feet warmers," or generically as heat packs. The label of these heat packs tells the user to simply open the outer package before use, and the packet will warm gradually to about 38°C. It will remain warm for up to six hours.

The exothermic reaction that most of these hand warmers use is the simple rusting of iron. The package's label hints at this in the list of ingredients: iron, water, activated carbon, and salt. Some heat packs also list vermiculite as an ingredient. Those of us who have owned certain models of cars or trucks appreciate the psychological heat generated by our vehicles rusting away before our eyes, and now this vile chemical reaction has been packaged to do good.

There are two common heat pack products—reusable and single use. In this experiment, we tested the single-use heat packs.

We placed a heat pack in one of our new BioChamber 2000 units and measured the temperature ~1 cm above the heat pack. Because another word for rusting is oxidation, and oxidation sometimes involves oxygen, we used an Oxygen Gas Sensor to measure the change in O<sub>2</sub> concentration in the sealed BioChamber.



Investigating single-use heat packs

The Logger Pro graph here shows some typical data for our experiment. We see this simple setup as a jumping-off point for several investigations, including

- Maximum temperature reached by a single-use heat pack
- Total time a heat pack stays warm
- Comparing a commercial heat pack vs. "homemade" heat pack
- Comparing a single-use heat pack vs. a reusable heat pack
- Determining the amount of iron in a heat pack
- Kinetic study of the redox reaction in a heat pack

This is a fun and easy experiment. Try it today and encourage your students to conduct their own research to discover how heat packs work.

## Overstock SALE!

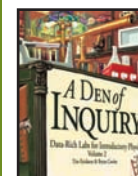
Are you looking for deals on Vernier products? Check out the overstock page on our web site. That's where we sell older models, overstocked items, or loaner equipment at reduced prices. All products carry our normal new product warranty, so you can't go wrong! We currently have older-style Motion Detectors available for \$25 and TI-84 Plus Teacher Packs for only \$1230, plus lots of loaner equipment available for 25% off our regular prices. Go to [www.vernier.com/overstock](http://www.vernier.com/overstock)

## NEW Fathom 2.1 Software Supports Vernier Sensors

If you teach mathematics or statistics, you may be familiar with Fathom Dynamic Data™ Software. Fathom allows you and your students to analyze, manipulate and display data in many revealing ways. In the past, Fathom users imported sensor data from web sites or other external sources; now you can collect data from most Vernier sensors directly into Fathom using a LabPro, Go!Link, Go!Temp, or Go!Motion. A complement to Logger Pro, Fathom is a perfect way to add extended statistical analysis tools to your classes. For more information, see [www.vernier.com/fathom](http://www.vernier.com/fathom)

- Single User | FATHOM-1 | \$129.95
- 10 User | FATHOM-10 | \$449.95
- 50 User | FATHOM-50 | \$999.95
- Unlimited User | FATHOM-U | \$1499.95

## NEW Den of Inquiry Volume 2



The Den of Inquiry books are data-driven inquiry experiments that encourage students to ask questions, make predictions, and create and apply models. Each book has about 15

activities for either Fathom Dynamic Data Software or Logger Pro. The first volume has experiments that do not require sensors. This new, second volume offers a selection of sensor-based experiments in introductory physics. If you're looking for inquiry-based activities for your physics or mathematics classes, take a look at these books. Both include CDs with electronic versions of the activities, experiment files, and other information. Visit [www.vernier.com/cmat/den2.html](http://www.vernier.com/cmat/den2.html) for further information, including a list of activities.

**A Den of Inquiry Volume 1**  
Order code DEN | \$40

**A Den of Inquiry Volume 2**  
Order code DEN2 | \$40

# Logger Pro Version 3.5

*Available in May*

Logger Pro is being updated, adding new features, and improved compatibility with modern operating systems, such as Windows Vista. Graph matching has always been a popular activity; now Logger Pro can automatically generate new match problems. Calibration of Vernier/Ocean Optics Spectrometers is optimized, giving lower noise in absorbance graphs. Intel-based Macs can now be used with spectrometers. Additional GPS models can be used with Logger Pro for Windows. There's an extended data-collection mode, allowing Logger Pro to collect data indefinitely, slowing the data rate if too many points accumulate; now you don't have to decide in advance how long to collect data. If you haven't updated your copy of Logger Pro 3 in a while, there are other features, new in recent versions, that may be just what you have been wanting. These newer features include time-offset curve fits, enhanced text editing and character display, the ability to combine results from different students into one file, log graphs, and video capture and analysis. Version 3.5 is a free update if you have any earlier version of Logger Pro 3. See [www.vernier.com/tech/lpupdates.html](http://www.vernier.com/tech/lpupdates.html) for more information. Version 3.5 will be available mid-May.



## **NEW** Ciencias con lo Mejor de Vernier (Science with the Best from Vernier)

We took 42 of our best experiments from five subject areas and translated them into Spanish. Contents of the lab book include

- Introducción a la Adquisición de Datos—1 experiment
- Biología (Biology/Life Sciences)—9 experiments
- Química (Chemistry)—9 experiment
- Ciencias de la Tierra (Earth Science)—9 experiments
- Física (Physics)—9 experiments
- Calidad del Agua (Water Quality)—9 experiments

The book includes complete student experiments with materials list, step-by-step instructions, data tables, and questions. It has a Teacher Information section for each experiment, with complete directions for setting up experiments, helpful hints, and sample graphs and data. A CD is included in the back of the book with word-processing files of the student pages, so that you can easily edit them to your specifications.

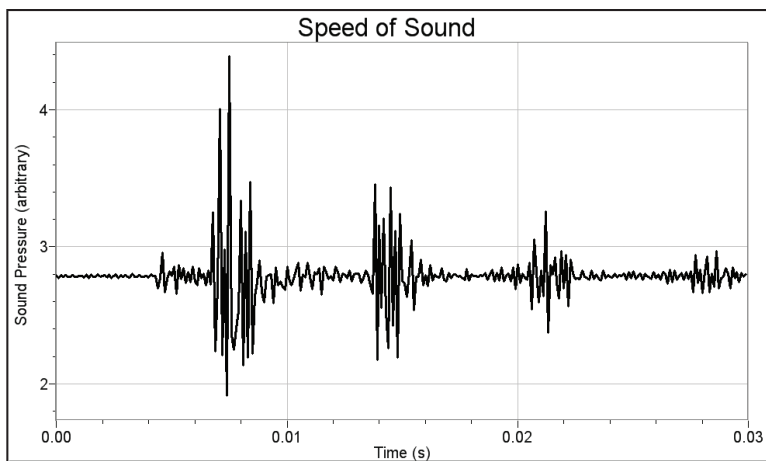
**Order code CMV-LP \$45**

## 10 Years Ago in The CALIPER

We announced the first Logger Pro for Windows.

## Speed of Sound in a Snap

One of the experiments in our physics lab manuals has students determine the speed of sound in air by creating a short sound in a column of air, such as a hollow tube. A Vernier Microphone is used to pick up the initial sound and the echo of the sound from the end of the tube. A graph of the data allows the student to determine the round-trip time for the sound. Knowing the time and the round-trip distance, they calculate the speed of sound. One challenge in the experiment is to create a short enough sound that it dies out before the echo is received. We used to recommend snapping your fingers to create the sound, but some students struggle with that. We've come up with a better solution: Use a dog training clicker, readily available at pet supply stores. It creates a nice sharp sound that dies out quickly. Here are some sample data collected with a clicker and a fluorescent tube guard cut off to 1.165 m. From this data, the speed of sound was determined to be 332 m/s at room temperature.



Sample data collected with a clicker and a fluorescent tube guard

## 20 Years Ago in The CALIPER

We proudly announced that our software and hardware worked on the new version of the Apple IIe and the all-new Apple IIGS and Laser 128.



The freedom to inquire. The technology to excel.

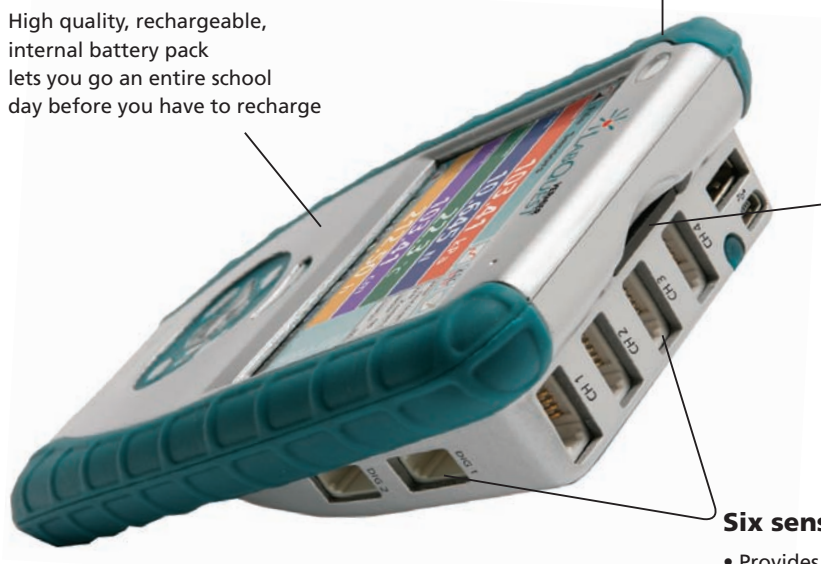
- Introducing the most powerful and intuitive interface for science education. Engage your students with hands-on science in your classroom or in the field.
- Take the LabQuest product tour and watch a video demonstration with Dave Vernier
- [www.vernier.com/labquest](http://www.vernier.com/labquest)

### Built tough. Built to last.

Designed with students in mind, the rubber overmolding and rugged mechanical design provide protection against everyday bumps, falls, and splashes

### Rechargeable battery

High quality, rechargeable, internal battery pack lets you go an entire school day before you have to recharge



### Storage

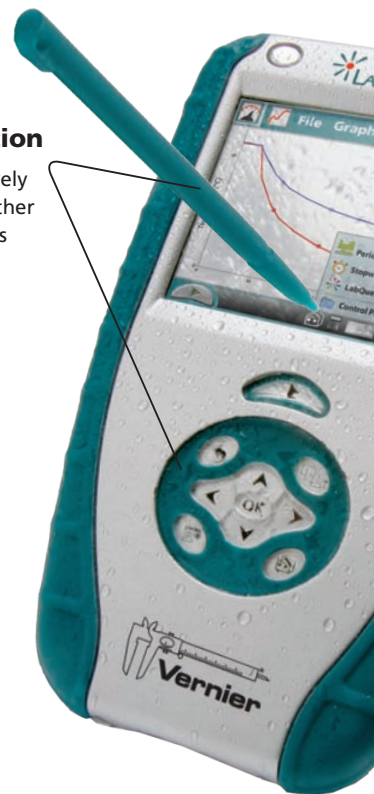
- 40 MB built-in storage
- Further expansion through SD/MMC card or USB drive

### Six sensor ports

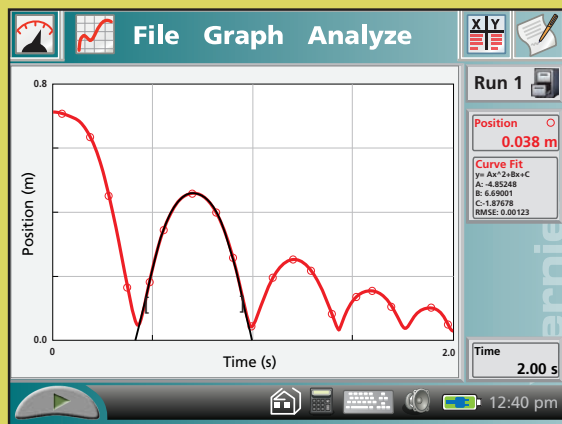
- Provides maximum versatility
- Compatible with your Vernier sensors

### Easy navigation

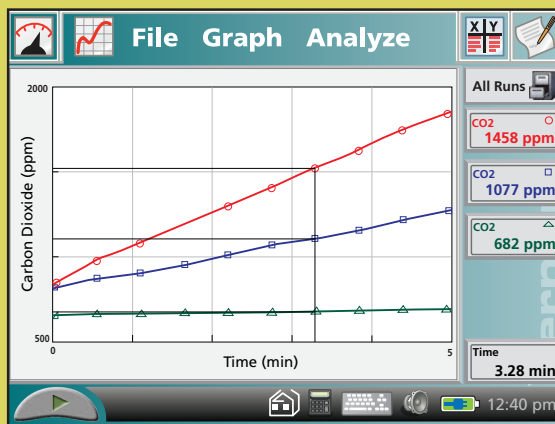
Easily and intuitively navigate using either a stylus or buttons



## DATA ANALYSIS AT YOUR FINGERTIPS.



Collect position data. Show students just how the ball bounces and fit a curve to your data.



Collect and display data for several sensors or runs or several sensors on one graph.

PERIODIC TABLE															
H															
Li	Be														
Na	Mg														
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt							
		Ln	Ce	Pr	Nd	Pm	Sm	Eu	Gd						
		Ac	Th	Pa	U	Ac	Pu	Am	Cm						

On-board Periodic Table.



**WITH A COMPUTER**



**STAND ALONE**



**IN THE FIELD**

**Built-in microphone & sound sensor**

- Record voice annotations
- Visualize sound waves

**Touch screen**

- 320 x 240 color graphic display
- LED backlighting provides you with outstanding clarity in the classroom or in the field

**Peripherals expansion**

Connect to a printer or other devices using USB

**Computer Interface**

Windows & Macintosh USB connectivity

**Built-in temperature sensor**

Provides readings of ambient temperature

**Audio in**

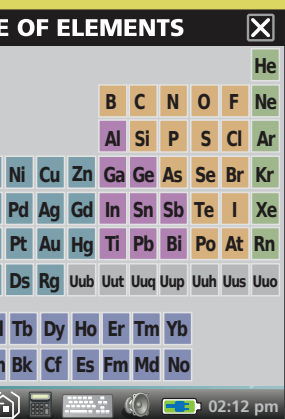
**Audio out**

Use audio out to connect headphones or speakers

**Power**

Connect to power and recharge LabQuest's built-in batteries

**Ships in August**  
**Vernier LabQuest**  
 Order Code **LABQ** | \$329  
**ONLY \$299 WHEN YOU BUY 8 OR MORE**



**File Notes**

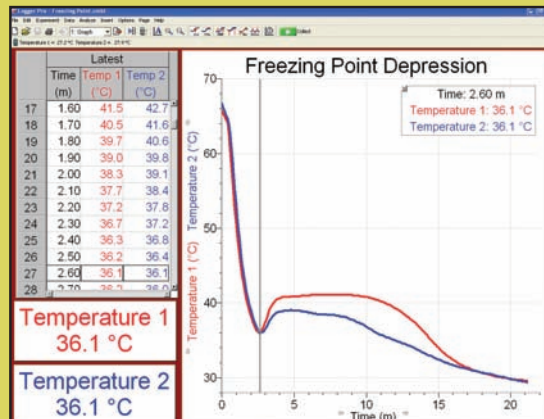
**Bounce Back**

In this exercise, you will collect motion data for a bouncing ball using a Motion Detector. You will then analyze the data to test the model  $y = hp^x$ .

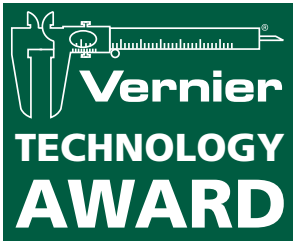
**MATERIALS**  
 Motion Detector  
 ball

**PROCEDURE**  
 1. Position the Motion Detector about 1.5 m above the floor, so that the disc is

More than 50 on-board labs included.



Use LabQuest as a computer interface, and get all the power of Logger Pro.



# NSTA/Vernier Technology Award

The Vernier/  
NSTA  
Technology

Award is an NSTA Teacher Award Program co-sponsored by Vernier and NSTA. Each year, educators are recognized for their planned or current innovative use of data-collection technology. Seven awards are available—one elementary, two middle school, three high school, and one college level. Each award is valued at over \$3,000 and includes \$1,000 in cash, \$1,000 in Vernier technology, and up to \$1,000 in expenses for attending an NSTA convention. The awards are judged by a panel of experts, appointed by NSTA, with recognition given to the top entries in each category.

Christine and David Vernier presented the 2007 awards to the winners at the recent NSTA National Convention in St. Louis. Below are brief synopses of the 2007 award-winning entries. Detailed descriptions of these projects are available on our web site, at [www.vernier.com/nstaawards](http://www.vernier.com/nstaawards)

## Elementary Level (Grades K – 5)

**"Investigating Seasonal Changes"**  
Wendy Smith, from Klem Road South Elementary School in Webster, NY, has her students be environmental scientists as they investigate seasonal changes in nearby North Ponds Park.

## Middle School Level (Grades 6 – 8)

**"Learning Physics at the Ballpark"**  
Michael Breslow, from Belhaven Middle School in Linwood, NJ, takes

his physical science students to a local baseball stadium to study physics principles associated with pitching.

**"Biotic Indexing and Stream Water Quality"** Thomas Eddy, from Green Lake School District in Green Lake, WI, involved his students in a semi-annual monitoring of the several streams in the 55,000+ acre Green Lakes Watershed.

## High School Level (Grades 9 – 12)

**"In the Footsteps of Galileo: The James River Pumpkin Drop"** Timothy Couillard, from James River High School in Midlothian, VA, combines a study of free fall with a pumpkin drop concept to introduce concepts in scientific inquiry.

**"A Flashlight without Batteries! How does that Work?"** Michael Liebl, from Mount Michael Benedictine School in Elkhorn, NE, motivates experimentation and discussion of energy production, storage, and transfer using the "battery-less" LED flashlight.

**"Investigating Pinecroft Natural Area Preserve"** Brent Osborn, from North Central High School in Spokane, WA, boosts his students' self-image by having them conduct environmental research studies at the Pinecroft Natural Area Preserve.

## College Level

**"Implementing Data-Collection Technology at Central Methodist University"** James "Tiger" Gordon, from Central Methodist University in Fayette, MO, has implemented data-acquisition technology in courses from General Chemistry to Quantitative Analysis with phenomenal success.

# Lemelson-MIT InvenTeams Grant Program

InvenTeams is a national grant initiative sponsored by the Lemelson Foundation and MIT. The goal of the program is to excite high school students about science, math, engineering, entrepreneurship, and invention. Grants of up to \$10,000 support each team's efforts. InvenTeams are encouraged to work with community partners, specifically the potential beneficiaries of their invention. Science, mathematics, and technology teachers are invited to apply.

Steve Scannell, physics teacher at Gresham High School, Gresham, OR, is investigating an automatic watering system. Steve's team came up with the idea while visiting our lab last September and experimenting with our Soil Moisture Sensor and Digital Control Unit. The team is using Vernier technology for their prototype, and will build the final project using a microcontroller. Vernier products have been used by several other InvenTeams.

The deadline for submitting an application for the 2007-08 school year is April 27. For more information and an online application, visit <http://web.mit.edu/inventeams>



It's not too early to start thinking about your 2008 entry.  
[www.vernier.com/nstaawards](http://www.vernier.com/nstaawards)



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All other marks not owned by us that appear herein are the property of their respective owners.

Vernier is proud to be recognized for its philanthropic commitment, steady growth, and as one of the Best 100 Companies to Work For in Oregon—for 8 years in a row.



# Innovative Uses from the Journals

Three physics instructors from the University of British Columbia (Marina Milner-Bolotin, Andrzej Kotlicki, and Georg Rieger) conducted a survey to answer the question, "Can Students Learn from Lecture Demonstrations?" The lecture demonstrations used by these instructors are similar to the Interactive Lecture Demonstrations developed by David Sokoloff, Ron Thornton, and Priscilla Laws. They compared traditional demonstrations with "Interactive Lecture Experiments (ILE)". They found that the students learned more when the ILE process was followed as compared to traditional demonstrations. (*Journal of College Science Teaching*, Jan/Feb 2007).

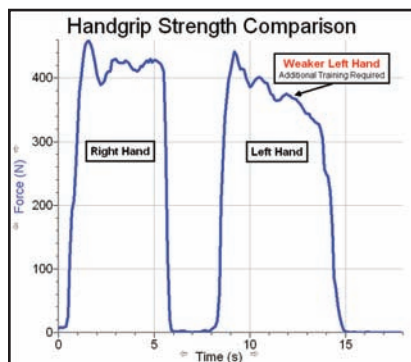
The February 2007 issue of *Mathematics Teacher* included the article "Imagine Yourself in This Calculus Classroom," by Luajean Bryan, Walker Valley High School, Cleveland, TN. The article describes how her students gathered data during a hot-air balloon ride to explore concepts in calculus. They used a TI calculator and CBL to collect temperature data. They modeled the temperature data in *Logger Pro*. They also used the video analysis features of *Logger Pro* to analyze the motion of the shadow of a balloon.

## Get Ready for the Ring

Nick La Rosa, a Level 2 boxing coach from Victoria, Australia, found he could use Vernier data-collection technology to improve the performance of his boxers. Nick has developed various tests to help him evaluate fitness levels of the boxers, as well as effectiveness of the training program. Nick uses the Force Plate to evaluate

jump and arm strength power rates. One boxer more than doubled his vertical jumping power, which Nick has attributed to the boxer's ranking as national champion.

Nick also uses *Logger Pro* video analysis to compare a boxer's jab during strike and recoil. Using this technique, Nick has been able to identify and correct inefficient technique that could leave a boxer open to counter punches or lessen the effectiveness of a counter attack. The graph above shows differences in grip strength using each hand, measured using a Vernier Hand Dynamometer. Studies have shown a direct correlation between grip strength and success in elite boxers.



Comparing hand strength

## Great Ideas from *The Physics Teacher*

Recent issues of *The Physics Teacher* have had many good ideas for teaching physics with our products:

**"Experimenting with Guitar Strings,"** by Michael C. LoPresto, Henry Ford Community College (November 2006). This is a great article showing how to use *Logger Pro* and *LabPro* to do a study of the length of guitar strings and the frequencies they produce.

**"The Energetics of Bouncing (Revisited),"** by Eric Gettrust, West High School, Madison, WI (October 2006), explains how to use *Logger Pro* to graph and study the changes in energy as a dynamics cart bounces off a force sensor.

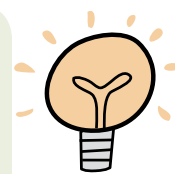
**"Remote Experimentation Made Easy with LabVIEW™,"** by Perry A. Tompkins, Samford University (October 2006), explains how to publish data on a web site easily by using the National Instruments programming language LabVIEW. We have supported LabVIEW with all of our interfaces for years, so if you want a quick way to put data on a web site as it is collected, check out this article, or contact us.

**"Recoil Experiments Using a Compressed Air Cannon,"** by Brett Taylor, Radford University, VA, (December 2006), shows how to use our Force Plate and *Logger Pro* to measure the impulse when launching various items like potatoes, wooden balls, and ping-pong balls from air cannons.

**"A Demonstration of the Work-Kinetic Energy Theorem,"** by Martin Kamela, Elon University, NC (December 2006), shows how our *Logger Pro*, Motion Detector, and Dual-Range Force Sensor can be used to demonstrate this sometimes confusing concept.

**"An Oscillating System with Sliding Friction,"** by Martin Kamela, Elon University, NC (February 2007), shows how to use *Logger Pro*, a Motion Detector, and a dynamics cart to study harmonic oscillation with damping. This system can be thought of as the mechanical equivalent of an LRC circuit.

**"Playground Physics: Determining the Moment of Inertia of a Merry-Go-Round,"** by Stephen Van Hook, Adam Lark, Jeff Hodges, Eric Celebrezze, and Lindsey Channels, Bowling Green State University, OH (February 2007), shows how to use a portable data-collection system to make a real-world measurement of the moment of inertia. They calculated the result using both acceleration data and video analysis. They used a *LabPro* and a TI graphing calculator for the acceleration measurements, but you could soon use a *LabQuest* for this lab activity.



innovative uses



More innovative uses at [www.vernier.com/innovate](http://www.vernier.com/innovate)

# Professional Development



## Vernier Summer Hands-On Workshops

These are 1-day, general data-collection workshops that feature a wide variety of activities in chemistry, biology, physics, math, middle school science, physical science, and Earth science. The \$50 fee includes training, lunch, and lab handouts.

- This is a great opportunity for teachers who
- want to evaluate our award-winning data collection technology;
  - are new to data collection;
  - need a refresher course on their Vernier equipment;
  - want to learn from the experts.

June 4: Albuquerque, NM  
 June 6: Amarillo, TX  
 June 13: Houston, TX  
 June 15: Baton Rouge, LA  
 June 21: Boise, ID  
 June 28: Denver, CO

July 9: Minneapolis, MN  
 July 11: Green Bay, WI  
 July 16: Las Vegas, NV  
 July 18: Los Angeles, CA  
 July 19: Nashville, TN  
 July 21: Montgomery, AL

Aug 10: Albany, NY  
 Aug 13: Rochester, NY  
 Aug 14: Seattle, WA  
 Aug 17: Beaverton, OR

## Do You Teach Biology/AP\* Biology, AP Chemistry, or Physics?

### Biology/AP Biology Workshops with Vernier, TI, and Wards

At these 2-day summer workshops, teachers will receive hands-on training in biology including seven of the AP Biology lab activities recommended by The College Board. The \$99 registration fee includes a copy of our *Biology with Computers* lab book.

June 25-26: Dallas, TX  
 July 16-17: Chicago, IL  
 August 6-7: Washington, DC



THE TECHNOLOGY TRIO

### AP Chemistry Workshops with Vernier and Flinn

During these 2-day summer workshops, teachers will do many of the 22 experiments recommended by The College Board. The \$99 registration fee includes a free copy of *Advanced Chemistry with Vernier*.

June 27-28: Dallas, TX  
 July 18-19: Chicago, IL  
 August 8-9: Washington, DC



### Vernier Physics Workshops

These 2-day hands-on workshops give novice and experienced users an opportunity to explore the use of technology in the teaching of physics. The \$99 registration fee includes a free copy of *Physics with Computers* lab book.

June 29-30: Dallas, TX  
 July 20-21: Chicago, IL  
 August 10-11: Washington, DC



## Workshops at Vernier

### Using Video Capture and Analysis in Introductory Physics Classes

This workshop is for physics teachers who wish to explore the use of video capture and analysis. Participants will learn how to use the *Logger Pro* software and *VideoPoint* software to create and analyze short movies. Participants will learn how to combine data obtained using video analysis with sensor data.

Instructors: Priscilla Laws, Dickinson College; and Robert Teese, Rochester Institute of Technology

June 20-21 at Vernier Software & Technology, Beaverton, OR

To register go to [www.vernier.com/workshop](http://www.vernier.com/workshop)

### Chautauqua Short Course: Using Research-Based Curricula and Tools to Promote Active Learning in Introductory Physics Courses

In this NSF-sponsored workshop, participants will be introduced to physics education research-based strategies for each component of the introductory course: Interactive Lecture Demonstrations (ILDs), Web-Based ILDs, RealTime Physics labs, Activity Based Tutorials, Collaborative Problem-Solving Tutorials and Workshop Physics, as well as modeling and video analysis tools. Second semester topics will be covered. Open to teachers of undergraduate students in institutions of higher education in the U.S. High school teachers and faculty from outside the U.S. are also admitted if space is available. There is a \$50 application fee, but no tuition. Participants are responsible for their transportation, lodging and meals.

Instructors: Priscilla Laws, Dickinson College; David Sokoloff, University of Oregon; and Ronald Thornton, Tufts University.

June 9-11, 2007 at Vernier Software & Technology

For more information, go to <http://darkwing.uoregon.edu/~sokoloff/physcourse.htm>



More information on summer workshops at [www.vernier.com/workshop](http://www.vernier.com/workshop)

\*AP and Advanced Placement Program are registered trademarks of the College Entrance Examination Board, which was not involved in the production of and does not endorse this product.

## LEED EB Gold Certification



We are proud to announce that our company's sustainable operating and building maintenance practices have earned an Existing Building

(EB) Gold Certification from the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System™. Vernier Software & Technology is committed to providing an exceptional workplace for our employees, so when we began recent renovations on our current facility, the pursuit of a LEED EB Gold certification was a natural progression to quantify our accomplishments, learn how to further enhance our building's operations and maintenance, and inspire others to adopt sustainable practices.

Here are a few of our actions to achieve the gold certification:

- Replaced the roofing system with upgraded insulation and a high-albedo roof membrane.
- Exchanged 20-year-old equipment for five new high-efficiency roof-top HVAC units.
- Installed 68 photovoltaic panels for an annual predicted energy production of 14,267 kWh.
- Retrofitted dual-flush toilets and low-flow fixtures for a water reduction of over 30%.

- Began purchasing wind-turbine-generated power through a local utility.
- Reduced our energy consumption to an estimated EPA Energy Star rating of 86.
- Conducted a waste stream audit to identify and boost our recycling efforts.
- Implemented a sustainable janitorial program to eliminate harmful chemical contaminants.
- Provided an exercise room and gym for weekly yoga classes, weight training, and basketball.
- Encouraged alternative transportation to our workplace with free passes for public transportation, bicycle parking with lockers and on-site showers, and free use of a shared-car for employees who use public transportation.

All of our customers who attend a workshop at our office are invited to tour our sustainable building and see our official LEED EB Gold plaque. Even if you are just in the neighborhood, you are welcome to stop by and see what we have accomplished.

For more information about our certification, visit [www.vernier.com/leed](http://www.vernier.com/leed)

For more information on the LEED certification process, visit the USGBC at [www.usgbc.org](http://www.usgbc.org)

For EPA Energy Star information, visit [www.energystar.gov](http://www.energystar.gov)



View of Mt. Hood and the new solar panels on our roof

## Vernier Partners with the Green Chemistry Education Network



Green Chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. The incorporation

to green chemistry principles into chemistry curriculum has fueled a fundamentally new approach to the teaching of chemistry that incorporates inherent safety and environmental responsibility within scientific practice and the curriculum. Vernier is collaborating with green chemistry educators to facilitate the development of new laboratory exercises that incorporate Vernier's data-collection technology.

A key to sustaining the development of new educational materials is to actively

involve educators from across the country in developing these materials. This community-based approach not only enhances the capabilities of the members through the exchange of knowledge and experience, but also provides unique opportunities for innovation and rapid change. As a result, we see a growing number of high school, community college and university faculty who have adopted the curriculum and are now interested in contributing to the development of new educational materials.

Members of this community have joined to form the Green Chemistry Education Network (GCEdNet). Today the network includes 20 faculty members from six states who are working together to facilitate the development of new educational

HA!  
HA!  
HA!

Here are some answers submitted by students on math tests:

1. Find  $x$ .

2. Expand  $(a+b)^n$

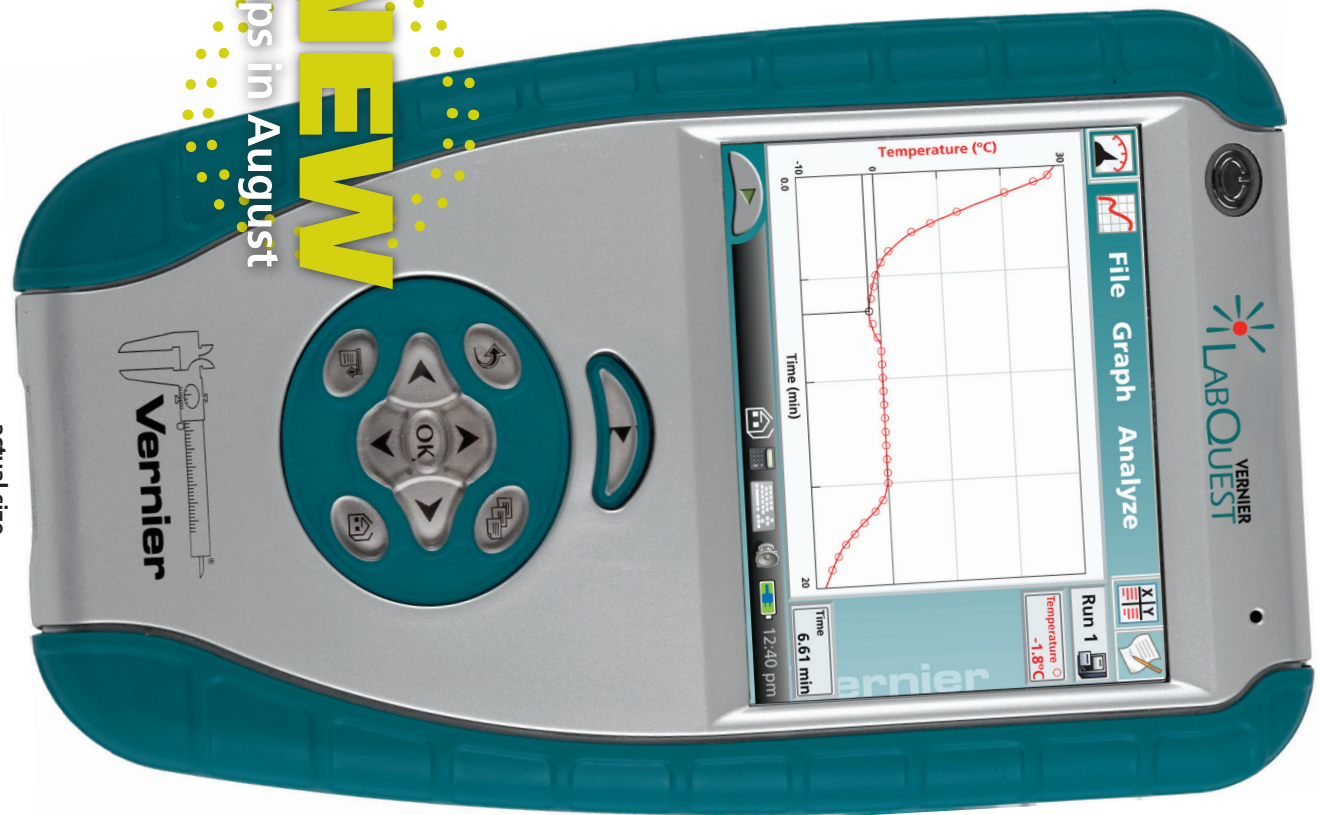
$$(a + b)^n$$

$$(a + b)^n$$

$$(a + b)^n$$

materials in the area of green chemistry by creating regional networks of "ambassador sites" focused on collaborative curriculum development. The goal of the GCEdNet is to coordinate curriculum development efforts at high schools, community colleges, and universities. If you are interested in participating in Vernier's collaboration with the GCEdNet, contact Nadine Fattaleh at Clark College (WA) at [NFattaleh@clark.edu](mailto:NFattaleh@clark.edu)

For more information about green chemistry, visit the American Chemical Society Green Chemistry Institute and to access a database of green chemistry education materials visit GEMs at <http://greenchem.uoregon.edu/gems.html>

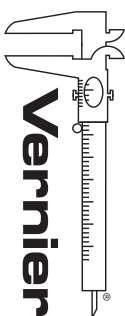


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