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LabQuest Stream™ Wins a Tech & Learning Best of Show Award at ISTE 2016

LabQuest Stream, our latest data-collection interface for science and STEM education, was honored with a *Tech & Learning* ISTE 2016 Best of Show Award. The awards program highlights game-changing technology exhibited at ISTE. Judges individually rate products, evaluating areas such as quality and effectiveness, ease of use, and creative use of technology, and then they decide which products will have the most impact in the classroom and deserve the Best of Show recognition.

LabQuest Stream is a wireless and USB sensor interface that expands data-collection opportunities by allowing students to collect scientific data from multiple sensors with an iOS or Android™ mobile device, a Chromebook™, or a computer. Students can use Vernier Graphical Analysis™, Logger Pro®, or Logger Lite®.

Learn more about LabQuest Stream and watch it in action at www.vernier.com/lq-stream

Vernier Celebrates 35 Years

Founded by a Science Teacher,
Vernier Puts Teacher
Support and Student
Learning First

Just after graduating from Ohio State University, Dave Vernier (pictured here) took a job as a high school physics and physical science teacher in Cleveland's inner city. His biggest challenge was keeping his students engaged in science. He found that he could hold their attention through a combination of daily demonstrations and highly creative, interactive labs.

Today, Dave's years in the classroom continue to guide the development of all Vernier technology. Dave and Christine, his wife and co-founder of the company, remain mindful of the unique needs of educators. Curriculum and products, including data-collection software, sensors, and interfaces that are dynamic and relevant for students, yet are easy for teachers to use, are developed with teachers' needs in mind. Now, Christine and Dave are joined by more than 100 employees, many of whom are former teachers and professors, who talk with educators everyday and use that feedback to guide the company.

Discover more about our commitment to science educators at www.vernier.com/company



Investigating Thermal Stratification/De-stratification in Buildings

**Richard Born, Associate Professor Emeritus,
Northern Illinois University**

Nature has its way with air. Warm air rises (less dense), and cold air sinks (denser). This natural thermal stratification in buildings has its disadvantages. During the winter, it causes heating systems to produce more heat than is necessary for comfort by continuously replacing heat that rises away from floors to ceiling spaces that are not occupied.

Thermal destratification fans, such as paddle fans, box fans, and the more modern and energy efficient axial turbine fans, are commonly used to even out the temperature from floor to ceiling. This results in keeping the thermostat satisfied, without the heating system overproducing heat and without wasting energy. Reduced energy also means a reduction in carbon emissions to the environment, as well as reduced energy costs for home and business owners.



In the “Investigating Thermal Stratification/De-stratification in Buildings” experiment, students use the FLIR ONE™ Thermal Camera for iOS (FLIRONE-IOS, \$249), available from Vernier, and the free Vernier Thermal Analysis app to study thermal stratification and destratification of air in a room.

Learn more at www.vernier.com/r1610

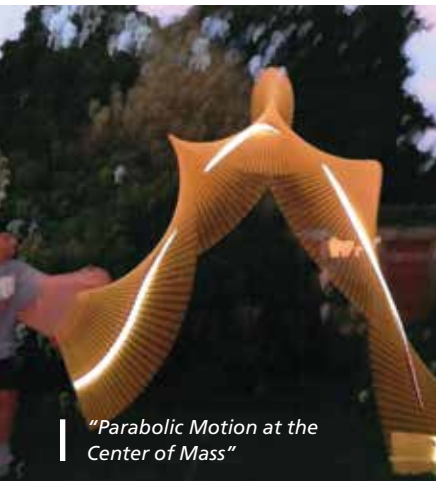
AAPT Photo Contest

The 2016 AAPT Photo Contest, sponsored by Vernier, was held at the summer meeting of the American Association of Physics Teachers in Sacramento, California. Students submitted photos that demonstrate physics concepts, along with essays that explain them. AAPT members voted on the entries. Each year we are impressed by the creativity of the students who enter this contest. The eye-drawing composition of these images reminds us that art has both an important role in our lives and a valuable connection to science.

The winner in the Contrived Category is Jacob Lev Amme for his photo “Parabolic Motion at the Center of Mass.”

Jacques Abou-Rjeili won the Natural Category with his photo “Snow Sheet.”

For details about the contest and to see all the photo winners for 2016, go to www.vernier.com/r1611



“Parabolic Motion at the Center of Mass”



“Snow Sheet”



INNOVATIVE USE

The Sound of the Crack of the Bat

Dave Kagen, physics professor at California State University, Chico, is a serious baseball fan—he goes by Twitter username @DrBaseballPhD. Kagen and Paul Robinson—a retired physics teacher, author, and baseball fan—used a computer with a LabQuest Mini interface and one of our Microphones at a San Francisco Giants spring training game to study the “crack of the bat” sound that happens when a baseball is hit. They investigated the frequency spectra of the sounds from well-hit home runs and compared them to the sounds of poorly-hit grounders. They wrote an article that has sample graphs and FFTs. The article discusses theories of what causes the sound and what frequencies one can expect. They even distinguish between the sounds of metals bats and wooden bats. There is room for more investigation, and anyone who loves baseball and physics will find the article interesting. It appeared in *The Hardball Times*, and can be viewed at www.vernier.com/r1612



Science Humor

I was having trouble figuring out what time the sun would rise until it dawned on me.

Two red blood cells met and fell in love.
But alas, it was in vein.

There have been some complaints that I do not put in enough chemistry jokes, but I do periodically.

Digital Control Unit with LabQuest App 2.7

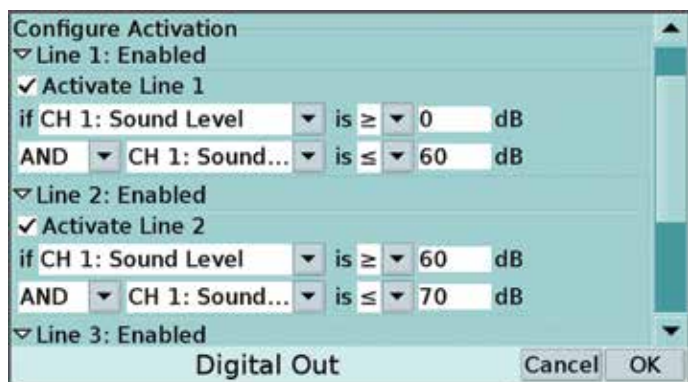


■ *Sound Level Meter Engineering Extension Activity with LabQuest 2*

Our Digital Control Unit (DCU, \$61) is a nifty little controller that allows you to operate simple electronic devices, such as LEDs and buzzers, in response to data from your Vernier sensors. Want an LED to light up when your titration is finished? With a few simple steps, the DCU can do that. Need a sound-level-controlled stoplight? The DCU can do that, too! In addition to these projects, you can find a variety of DCU projects at www.vernier.com/extensions

The latest update to LabQuest 2 includes support for the DCU; you are no longer tethered to a computer running Logger Pro. If you want to move your sound-level-controlled stoplight closer to the talkative corner of your classroom, the size and mobility of LabQuest 2 makes it easy.

The Digital Out controls in LabQuest App 2.7 can be accessed from the Sensors menu on the Meter screen. Just as in the Logger Pro Digital Out dialog, you can test your output devices, configure them to activate in response to sensor data, and specify when to start activation.



■ *Digital Out screen on LabQuest App 2.7*

If you already use Vernier sensors in your classroom, the DCU allows you to put them to new use by adding engineering activities to your curriculum. With the release of LabQuest App 2.7, the DCU becomes even more useful.

Find Vernier on Thingiverse

Vernier now has a Thingiverse page! Thingiverse is an online repository to collect and share 3D-printable designs. On our page, you'll find a variety of designs you can print to use with your Vernier sensors and equipment. For instance, you'll find an extra mass tray for our Standard Cart (DTS-CART-S) for the Dynamics Cart and Track System, a widget that centers a burette above a Vernier Drop Counter (VDC-BTD), and the wind turbine nose cones used in the Spring 2016 *Caliper* article "Can Adding a Nose Cone Improve Turbine Efficiency?" Find these designs and more at www.thingiverse.com/vernier

Do you have a 3D design for an accessory to Vernier equipment you would like to share? You can tag your file on Thingiverse with VernierST or email us at engineering@vernier.com

■ *From our Thingiverse page: an extra mass tray for a DTS cart*



Vernier Engineering Award

Win a \$5,500 Award from Vernier

Are your students using Vernier sensors in the engineering design process? Maybe you are challenging your students to control digital output based on sensor input. Perhaps your students are writing NI LabVIEW™ or ROBOTC® code to read a Vernier sensor from a robotics platform such as LEGO®, VEX®, or Arduino™. Tell us about how you are using Vernier technology in your classroom or lab and you could win one of two \$5,500 awards (one for middle school and one for high school)!

Each award consists of \$1,000 in cash, \$3,000 in Vernier technology, and \$1,500 toward expenses to attend either the 2017 NSTA STEM Forum or the 2017 ASEE Annual Conference.

For complete rules, examples from past winners, and an online application, go to www.vernier.com/grants/engineering



NEW LabVIEW™ Support for LabQuest Stream

Vernier strives to help teachers introduce programming, engineering, and STEM into their science and engineering classrooms. One way we do this is by regularly releasing updated LabVIEW files so that you can use your new Vernier products with National Instruments LabVIEW and LabVIEW for Education software. With our latest LabVIEW files, we have introduced support for the new LabQuest Stream (connected to your computer via USB). Included in our LabVIEW files are Express VIs that make it quick and easy to create custom programs to collect sensor data, control small electronics, or automate your science experiment.

For more information on using LabVIEW for Education in your classroom, visit www.vernier.com/labview

For an easy way to learn and introduce LabVIEW, consider our *Hands-On Introduction to NI LabVIEW™ with Vernier lab book* (LWV, \$25), or visit www.vernier.com/lwv



Required Update for Current LabVIEW™ Users

If you update your Windows® computer with Logger Pro version 3.11 or newer, a new device driver is installed that is incompatible with the old LabVIEW files for LabQuest Mini and original LabQuest. You must update with the latest LabVIEW files to fix this issue.

To download the new LabVIEW files, go to www.vernier.com/r1613

Scratch and Go!

Scratch is a free, browser-based programming language supported by an active community of millions of users that is designed for students ages 8 to 16. Students can use Scratch to design music videos, animations, and video games while learning the fundamentals of coding. Scratch encourages you to share your work and “remix” others’ projects to create something new.

We recently collaborated with the Scratch Foundation to create an extension that allows you to bring real world Go!Temp and Go! Motion data into your Scratch project. You can have a sprite move in response to the position data from a Go! Motion or change costumes (appearance) when the temperature measured by the Go!Temp increases. Our extension adds a new way to interact with your code.

Christian Rodegerdts, a science teacher at Lake Oswego Junior High in Oregon, shared the extension with his extracurricular STEM club. His students produced a variety of cool projects that used the Go!Temp, including a “love meter” that measured the user’s temperature and then rated him/her on a love scale accordingly—as if romantic relationships in junior high aren’t complicated enough!

Learn more at www.vernier.com/scratch



A New Face in Our Chemistry Department



We are excited to announce that Nüsret Hisim has joined the Vernier team as a Chemistry Educational Technology Specialist after 34 years of teaching chemistry and physics in Frederick County, Maryland. Nüs taught all levels of physical science, from ninth grade introductory courses to Advanced Placement chemistry. He has been using Vernier products with his students for over 20 years and has helped many other teachers integrate Vernier technology into their classrooms. Starting in the early 1990s, Nüs sponsored a Chemistry Club at his school where students brought science-related activities and demonstrations out to the community. At Vernier, he is looking forward to new challenges as he helps teachers bring technology to their own students.

How do I edit Vernier experiments in Google Docs™?

Have you ever wanted to edit Vernier experiments in Google Docs? You can easily edit Microsoft® Word® .docx files in Google Docs:

1. In Google Drive™, click the **gear icon** (Settings).
2. Choose **Settings** from the menu, and then select “**Convert uploaded files to Google Docs editor format.**” Click **Done**.
3. **Drag and drop** Word files into Google Drive. Files will automatically start to upload and convert to Google Doc format (in Google Drive the file name will include .docx).

Note: This process works very well for files with a .docx extension. Files with a .doc extension will open cleanly most of the time. However, if there is text wrapping around a figure, the figure may not appear in the Google Doc. In this situation, convert the .doc file to a .docx file before adding it to Google Drive.

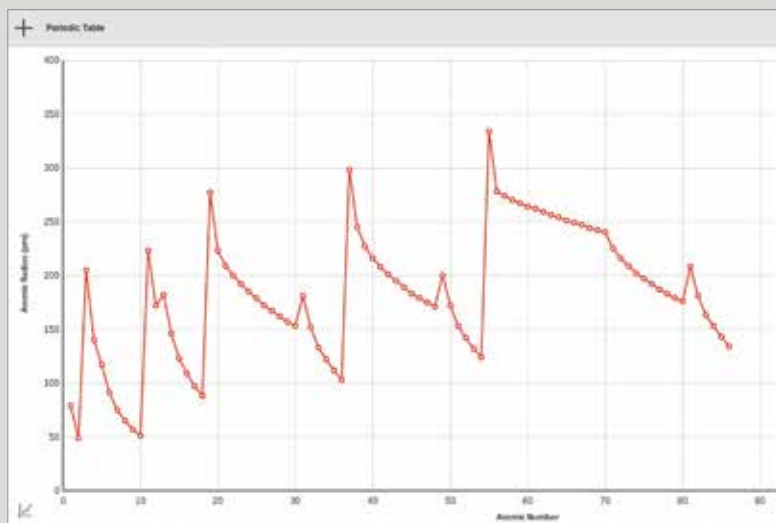


Graphing Periodic Trends Using LabQuest or the Graphical Analysis App

The periodic table is a tabular representation of the chemical elements and their characteristics. When elements are arranged in order of increasing atomic number, their chemical and physical properties show a periodic pattern. Students can discover these patterns by examining the changes in properties of elements on the periodic table.

LabQuest includes the Periodic Table application and graphs of the periodic trends, such as atomic radius vs. atomic number. The graphs of the periodic trends are also available in the Graphical Analysis app for Chrome™, iOS, and Android™ so you can integrate these graphs into discussions with students about the recurring trends. Start with examining the shape of the first graph, atomic radius vs. atomic number, and have students explore the relationships among atomic radius, ionization energy, and electronegativity.

We think you and your students will enjoy incorporating this useful tool into a periodic table discovery exercise. For detailed instructions, see www.vernier.com/r1614



Periodic trend of atomic radius vs. atomic number

Price Reduction on Gas Chromatograph

**\$300
SAVINGS**

Introducing your students to gas chromatography has just become more affordable. We have lowered the price of the Vernier Mini GC Plus from **\$2289 to \$1989**, giving you a \$300 per unit cost savings. And remember, our GC2-MINI uses room air as the carrier gas, so no gas tanks are required! For more information on this unique instrument, visit www.vernier.com/gc2-mini



Free Tech Tip Videos to Enhance AP* Chemistry

Vernier is committed to providing educators with resources for successfully using our technology. Our free Video Training Library includes introductory and advanced Tech Tip videos featuring experiments and product demonstrations. Many of these videos provide instructions for experiments from Vernier lab books that can supplement your student instructions.

The Video Training Library contains several videos appropriate for AP Chemistry. These videos provide guidance for you and your students whether you're using Logger Pro or LabQuest App. For example, you can pair the "Investigating Food Dyes in Sports Beverages" experiment from the *Chemistry Investigations for Use with AP* Chemistry* (APCHEM, \$48) lab book with the Tech Tip video, Determine the Amount of Dye in a Sports Beverage, located at www.vernier.com/r1615

An important part of this experiment is using units of percent transmittance (%T) instead of absorbance, which allows students to discover the relationship between the concentration of a

solution and the amount of light transmitted through the solution. The information in this video can help you and your students understand the operating procedure for the SpectroVis Plus Spectrophotometer (SVIS-PL, \$399). Our expert chemist explains the steps to set up the spectrophotometer and how to change the units from Absorbance to %T. The video also demonstrates how to calibrate with DI water and collect a full wavelength spectrum. Students can apply this information when designing their inquiry investigation for determining the concentration of an FD&C food dye in a sports beverage.

Do you have suggestions for our Video Training Library? Email us at chemistry@vernier.com

* 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.

Use the FLIR ONE™ Thermal Camera to Investigate Skin Vascularity



FLIRONE-10S \$249

The Physics Department at Vernier challenged the Biology Department to develop an experiment for the FLIR ONE Thermal Camera and the Vernier Thermal Analysis app. Our physiologist realized that Experiment 2, “Effect of Skin Vascularity on Temperature Recovery,” in *Human Physiology with Vernier* would be perfect. The experiment uses a Surface Temperature Sensor to look at the rate at which the skin warms after being cooled by an ice cube. Areas with more vascularity recover faster than areas with less vascularity.



Thermal imaging of finger (left) and bicep (right) after cooling with ice

After testing the FLIR ONE Thermal Camera, we determined that it can be used to perform this popular lab activity instead of using the Surface Temperature Sensor. The data indicate that the fingertip warms much faster than the skin of the bicep after cooling, as shown in the pictures above. To determine the actual rate of warming, data from the Vernier Thermal Analysis app were exported to Graphical Analysis, where a linear fit could be applied. This analysis showed that the fingertip warmed almost twice as fast as the skin of the bicep after 60 s of recovery.

A version of this experiment, written for the FLIR ONE Thermal Camera and the Vernier Thermal Analysis app for iOS, along with updated versions using the Surface Temperature Sensor for Logger Pro and LabQuest App, can be found on our website at www.vernier.com/r1616

If you have any questions about this modified activity or other questions about human physiology, feel free to contact physiology@vernier.com

Tips for Measuring Oxygen Consumption and VO₂ Max

Many instructors ask us how to measure VO₂ max, the maximum volume of oxygen that a subject can utilize per unit time. Our physiologist has developed a simple activity for measuring oxygen consumption using our O₂ Gas Sensor and has found some solutions for estimating VO₂ max that only require a heart rate monitor.

To investigate oxygen consumption after exercise, we have modified Experiment 22, “Oxygen and Aerobic

Metabolism” from *Human Physiology with Vernier*. This activity uses an O₂ Gas Sensor, Spirometer, and an adapter that connects the sensors together. The subject exhales through the adapter while at rest and again after exercise. As shown in the graph on the next page, exhaled air after exercise has much less oxygen content than exhaled air at rest. If you do not have a Spirometer, a version of this activity is available that only requires the O₂ Gas Sensor and our small

BioChamber (BC-250, \$6). Both versions of this activity (with and without Spirometer) can be found on our website at www.vernier.com/r1617

To determine VO₂ max, oxygen consumption should be measured directly during vigorous exercise for an extended period of time. As a result, most direct measurements of VO₂ max require research-quality instrumentation and the presence of a trained health care professional to make sure the test

A high school student from New York and a Cheetah Conservation Fund intern measure the air temperature of a potential cheetah resting site in Namibia. Photo credit: Donna Rainboth

Students Explore Cheetah Habitats

Animal behavior can sometimes be predicted, and Vernier technology can help students make those predictions. In Namibia, the Cheetah Conservation Fund (CCF) is using LabQuest and a variety of Vernier sensors at their Field Research and Education Center to help students study the local ecology, including learning about and exploring the habitat preferences of cheetahs.

Cheetahs tend to hunt in the early morning or late afternoon to avoid the hottest time of the day. Once they have made a kill, they find a relatively cool and secluded place to rest, cool off from the exertion of the hunt, and consume their prey. In this guided inquiry activity, students compared three locations to determine which one would be the best choice for a cheetah to rest and eat on a hot day. Using LabQuest 2 and Vernier sensors, the students measured temperature, relative humidity, soil moisture, and light level. They also made general observations on the amount of cover provided in each area. Based on their data, they were asked to choose which of the three sites would be preferable for the cheetah and to defend their choice.

This is just one of the activities co-developed by Stephanie Bradley, Education Manager at CCF, and Donna Rainboth, a visiting professor from Eastern Oregon University. As part of Rainboth's sabbatical, she traveled to Namibia with a mission to develop STEM education activities. At CCF, Namibian students and teachers, many with limited or no access to technology, are given the opportunity to use the equipment while expanding their knowledge about the local habitat and its wildlife. International student groups can also use the Vernier equipment at CCF to experience hands-on, relevant learning opportunities focused on cheetahs.

Every habitat is unique. Can you think of a way your students could use probeware to investigate a nearby habitat?

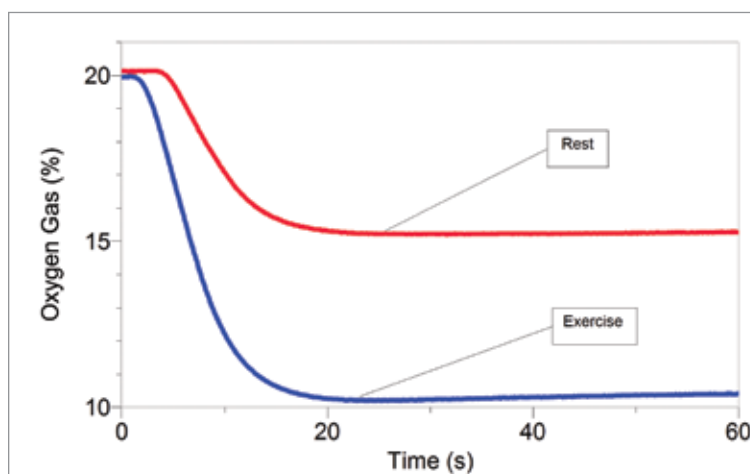
To download this lesson along with sample data, visit www.vernier.com/r1618

For more information on the Cheetah Conservation Fund, including their educational initiatives, visit www.cheetah.org

30 Years Ago in this Newsletter

In the Fall 1986 issue of this newsletter, we announced Graphical Analysis III, our third major revision of that Apple II program. It is pretty amazing that 30 years later, we now have Graphical Analysis™ for iOS and Android™ devices, Chromebook™ notebook computers, and Macintosh® and Windows® computers. A lot of graphs have been made using software with that name in 30 years.

is conducted safely. Luckily, there are many ways to estimate VO_2 max. Three common tests are the George Jog Test, the Cooper Run Test, and the Rockport Walk Test. A heart rate monitor is required for each test. We recommend our Go Wireless Exercise Heart Rate (GW-EHR, \$79), as it is hands-free and can be used with mobile devices.



■ Oxygen gas concentrations for exhalations at rest and after exercise



NEW Environmental Data Logger: Kestrel® DROP



Many of you have requested a way to log temperature, relative humidity, and atmospheric pressure out in the elements for long periods of time without tying up a computer or

LabQuest. We are happy to now offer Kestrel® DROP Wireless Environmental Data Loggers. These small, rugged, and accurate data loggers are the perfect choice for environmental data logging outside, in the classroom, or inside an environmental chamber. Use an iOS or Android device to monitor data in real time or to examine logged data. Choose from three models starting as low as \$69.

Visit www.vernier.com/kestrel for more information.

Vernier Sponsors NABT Ecology/Environmental Science Teaching Award

Each year, Vernier sponsors the NABT Ecology/Environmental Science Teaching Award. The award includes \$500 toward travel to the NABT Professional Development Conference and \$1,000 of Vernier equipment. Applications for the 2017 Award will be available on the NABT website soon after the November conference, and the deadline for submission is March 15, 2017.

Details are available at www.vernier.com/grants

Logger Pro Power User Features

Expand your use of *Logger Pro* by exploring some features of the software that deserve more attention.

- 1 Use the current version of *Logger Pro*. Updates are free; the best way to get them is to log into your account at www.vernier.com/account
- 2 Choose Text Annotation from the Insert menu to annotate your graphs. Insert extra arrows as needed, or hide the floating box border. You can make text bold or italic. You can also insert Greek characters, change font size, and add sub/superscripts.
- 3 Insert photos of your experimental apparatus into the *Logger Pro* experiment file. Or, insert videos of your experiment and sync your data to the video. See the Insert menu for commands.
- 4 Show or hide uncertainties in fitted parameters for your curve fits. After adding a curve fit, double-click the fit information box to make adjustments.
- 5 Use an appropriate number of points for derivative calculations by choosing Settings For (filename)... from the File menu. Appropriate use of this setting is critical for good Motion Detector velocity data—use bigger numbers for more smoothing and smaller numbers for more detail.
- 6 When using the Video Analysis feature, sometimes your points don't get placed correctly. If this happens, you can nudge the point. Click the Select Point button, and select the point you want to alter. Drag or use the cursor keys to move the point.
- 7 Start video analysis in Video Physics for iOS app and finish in *Logger Pro*. After recording a video of an experiment on your iOS device, you can perform basic video analysis in our Video Physics app. Then, take advantage of the advanced video analysis features of *Logger Pro* by emailing the video and analysis to yourself as a *Logger Pro* file and video.



Software Updates

We regularly release software updates to add new features, support new sensors and operating systems, and to fix the occasional bug. Keeping up to date with software releases is one way to keep things running smoothly in your classroom or lab. Have you updated your Vernier applications in the last few months? We've updated nearly all our titles since the last newsletter—some several times.

Download updates for computer and LabQuest software directly from our website and find links to the appropriate app stores for updates to Chrome™, iOS®, and Android™ applications at www.vernier.com/downloads

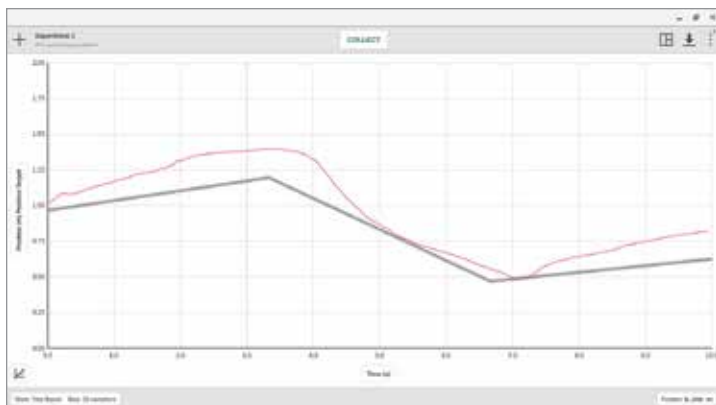
Note that with an account on the Vernier website and a purchase history of *Logger Pro*, you can download the *Logger Pro* full installer at any time—you don't have to wait for a CD or download link.

Graphical Analysis™ for Chrome™ Now Features Graph Match

Just in time for start-of-the-year graphing exercises, Graphical Analysis for Chrome v2.7 includes the ability to generate position and velocity target graphs for your students to match using a Motion Detector.

Graph matching is an excellent activity to teach students how to read graphs—you have to both read the y-intercept on a graph and understand its interpretation to know where to stand at the start of a position vs. time match trial.

A typical graph match activity works like this: A student sets up Graphical Analysis for use with a Motion Detector by connecting the equipment and launching the app. The student walks towards and away from the Motion Detector and observes the graph, getting a feel for what the sensor is measuring. Then, the student selects Graph Match and Graphical Analysis draws a multiple-segment function on the position vs. time axes. Again, the student moves towards and away from the Motion Detector, this time attempting to reproduce the target graph as closely as possible with real data.



A student (red line) does pretty well at matching a target position graph (gray line). A follow-up discussion might include ideas such as this: at 4.5 seconds, the student was both too far away and moving too quickly to match the target.

After a match attempt, students learn a great deal by discussing the physical difference between the motion described by the target graph and what was actually performed.

Use position graph matching to teach graph interpretation, even before having students construct their own graphs. Later, drive home the meaning of velocity with velocity matches.

Graphical Analysis on a Chromebook™ works with a Go! Motion motion detector or a Vernier Motion Detector with any LabQuest interface (LabQuest Mini, LabQuest Stream, LabQuest 2, or original LabQuest). Graphical Analysis is available as a free download in the Chrome Web Store.

Vernier in the Journals

Development and Implementation of a Simple, Engaging Acid Rain Neutralization Experiment and Corresponding Animated Instructional Video for Introductory Chemistry Students

Danielle Rand, Craig J. Yennie, Patrick Lynch, Gregory Lowry, James Budarz, Wenlei Zhu, and Li-Qiong Wang; *J. Chem. Educ.* 2016, 93, 722–728.

Featured: Conductivity Probe

Evaluation of Existing and New Periodic Tables of the Elements for the Chemistry Education of Blind Students

Dennis Fantin, Marc Sutton, Lena J. Daumann, and Kael F. Fischer; *J. Chem. Educ.* 2016, 93, 1039–1048.

Featured: Sci-Voice Talking LabQuest

Visualization of Kinetics: Stimulating Higher-Order Thinking via Visualization

Julie B. Ealy; *J. Chem. Educ.* 2016, 93, 394–396.

Featured: SpectroVis Plus Spectrophotometer

Simple Battery Experiment Reveals the Surprising Cost of Portable Electric Energy

John Lewis; *The Physics Teacher.* 2016, 54, 248.

Featured: Differential Voltage Probe, Current Probe

Evaluation of Rodent Spaceflight in the NASA Animal Enclosure Module for an Extended Operational Period (Up to 35 Days)

Eric L. Moyer, Paula M. Dumars, Gwo-Shing Sun, Kara J. Martin, David G. Heathcote, Richard D. Boyle, and Mike G. Skidmore; *npj Microgravity.* 2016, 1–7.

Featured: Relative Humidity Sensor, Stainless Steel Temperature Probe

Transient-Absorption Spectroscopy of Cis–Trans Isomerization of N,N-Dimethyl- 4,4'-azodianiline with 3D-Printed Temperature-Controlled Sample Holder

Dmytro Kosenkov, James Shaw, Jennifer Zuczek, and Yana Kholod; *J. Chem. Educ.* 2016, 93, 1299–1304.

Related product: Flash Photolysis Spectrometer

For full descriptions of Vernier in the Journals, visit www.vernier.com/r1619



Vernier Makes a Measurable Difference

Sharing the Wealth: UNC Wilmington's Technology Loan Program

Christopher Gordon
 Assistant Director of the Center for Education in Science,
 Technology, Engineering and Mathematics (CESTEM)
 University of North Carolina Wilmington

The University of North Carolina Wilmington's Center for Education in Science, Technology, Engineering and Mathematics (CESTEM) is committed to providing professional development opportunities for regional K–16 instructors and educational opportunities for regional K–12 students to improve the quality of pre-college STEM education. One of the ways we do this is through our technology loan program, which has benefitted thousands of students and teachers across the southeast portion of North Carolina. A key part of this loan program includes Vernier technology.

Servicing 13 counties in our region, some of which are more than two hours away, our technology loan program allows teachers to borrow various technologies, lab books, and more to use with their students. As a grant winner, we were fortunate to receive \$10,000 worth of Vernier lab equipment to add to our growing technology collection. This provided a big boost to the program, and since then Vernier has been one of the most popular technology choices among teachers in our region. In the 2015–16 school year alone, we serviced a total of more than 570 teachers and 8,100 students through the program. And of those educators, more than a hundred of them checked out Vernier equipment—from LabQuests to Go! Links to Motion Detectors to various lab books—to use with a total of almost 1,500 students.

Programs such as ours help to improve STEM education and provide teachers and students with much needed access to technology for hands-on learning. As we continue to grow our program each year, we look forward to reaching more and more students of all ages.

Learn more about CESTEM at uncw.edu/cestem

When Teachers Succeed, Students Succeed

Vernier Resources and Support Make Probeware Integration Effective for Hands-On Learning

Looking for information about the services you can expect from Vernier? The new Stellar Service section of our website gives you direct access to the tools we offer to science and engineering educators. It's your on-demand hub for finding resources and learning more about the many ways Vernier supports you and your students in lab and in the field. We hope you'll visit often and share your experiences with Vernier technology with our thriving community of educators.



Innovative Technology



Experiments



Technical Support Team



Technical Information Library



Webinars



Grants



Workshops



Innovative Uses



Supporting Research



Newsletter



Warranty



Tech Tip Videos

How does Vernier make a difference for you and your students?

Winning stories will be chosen monthly, published by Vernier, and awarded a \$100 Vernier gift certificate.

www.vernier.com/stellar-service

FREE Hands-On, Data-Collection Workshops

Calling all science educators! Join us for a four-hour exploration of the latest and greatest in Vernier probeware and data-collection technology. You will conduct hands-on experiments using various sensors with the LabQuest 2 interface, as well as our Go Wireless sensors and LabQuest Stream with mobile devices.

Perfect for science educators interested in

- Evaluating our award-winning data-collection technology
- Getting started with probeware and data collection
- Refreshing their knowledge of Vernier equipment
- Learning from the experts

Attendees receive

- Four hours of free training
- Light lunch or dinner
- Workshop Training Manual download
- Discount on an equipment package

Workshop Schedule

IL Chicago 10/17; Chicago 10/18; Springfield 10/15

KS Wichita 9/29

MA Boston 10/1; Boston 10/4; Springfield 9/29

ME Portland 10/5

MI Detroit 10/24; Lansing 10/25

MN Minneapolis 9/29

MO Kansas City 10/1; St Louis 10/12; St Louis 10/13

NE Lincoln 10/3

NY Albany 9/28; Buffalo 10/18

OH Cleveland 10/20; Columbus 9/17; Toledo 10/22

OK Oklahoma City 9/28; Tulsa 9/27

PA Erie 10/19; Pittsburgh 9/19

SD Sioux Falls 10/1

NSTA Comes to Portland, Oregon

Visit Vernier While You Are in Portland

The 2016 NSTA “Exploring Mountains: Guiding Science Teaching and Learning” conference will be held November 10–12 in Portland, Oregon. At the exhibit hall, we are offering workshops and hosting a booth. You can also sign up to take an NSTA field trip to the Vernier office on November 11. Come check out our LEED-certified building with cool science features such as solar panels, electrochromic windows, a saltwater aquarium, an augmented-reality sandbox, and an indoor slide that is perfect for fun-loving science teachers!

During the field trip, you will tour the office with David Vernier, former physics teacher and founder of the company. You will visit our on-site Technology Museum, discover a bit about the company’s history, see new products, receive a bag of science goodies, and have a relaxing lunch. Sign up through NSTA at www.nsta.org

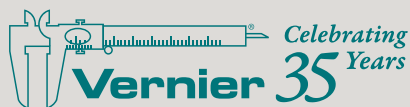
Applications Open for Annual Vernier/NSTA Technology Awards

Vernier Software & Technology and the National Science Teachers Association (NSTA) are now accepting applications for the annual Vernier/NSTA Technology Awards. The 2017 awards program will recognize up to seven educators—one elementary teacher, two middle school teachers, three high school teachers, and one college-level educator—who promote the innovative use of data-collection technology.

Prizes include \$1,000 in cash, \$3,000 in Vernier products, and up to \$1,500 toward expenses to attend the 2017 NSTA National Conference in Los Angeles, CA. Award recipients are chosen based on their application, which is judged by a panel of NSTA-appointed experts.

All applications must be submitted by November 30, 2016.

For more information about the award and to read about this year’s winners, visit www.vernier.com/grants





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Making & Science

Google and Vernier Team Together to Integrate Vernier Sensors with Google Science Notebook

Coming Soon