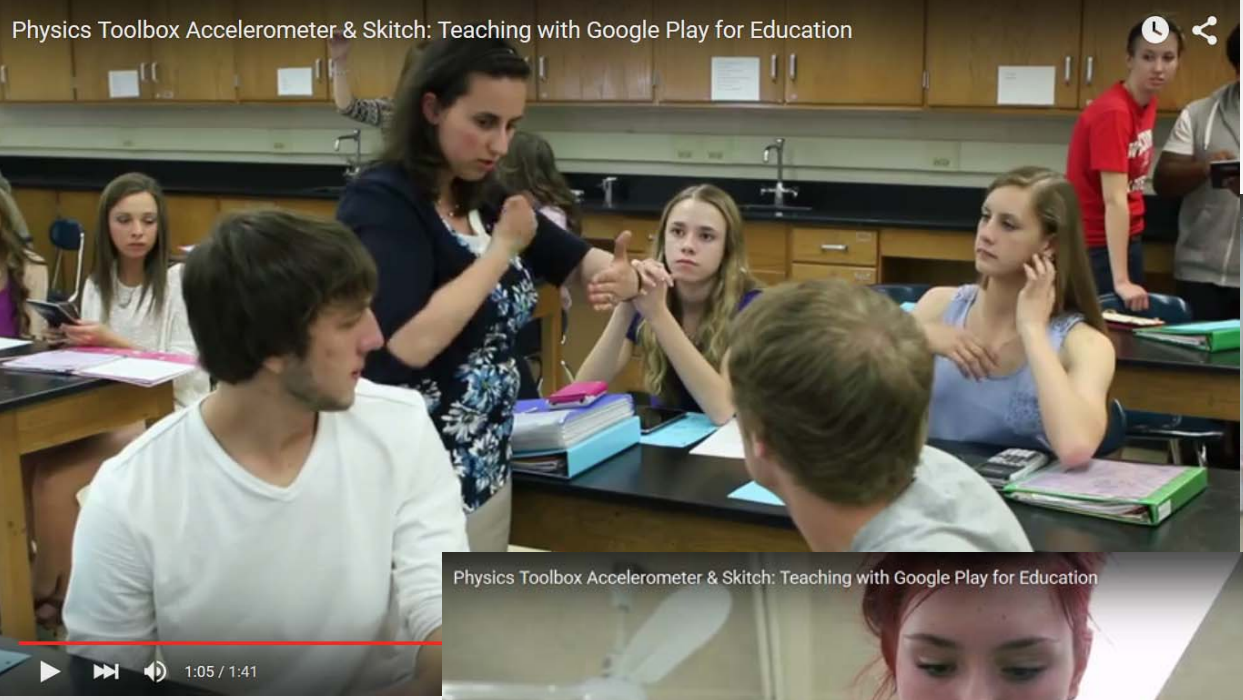
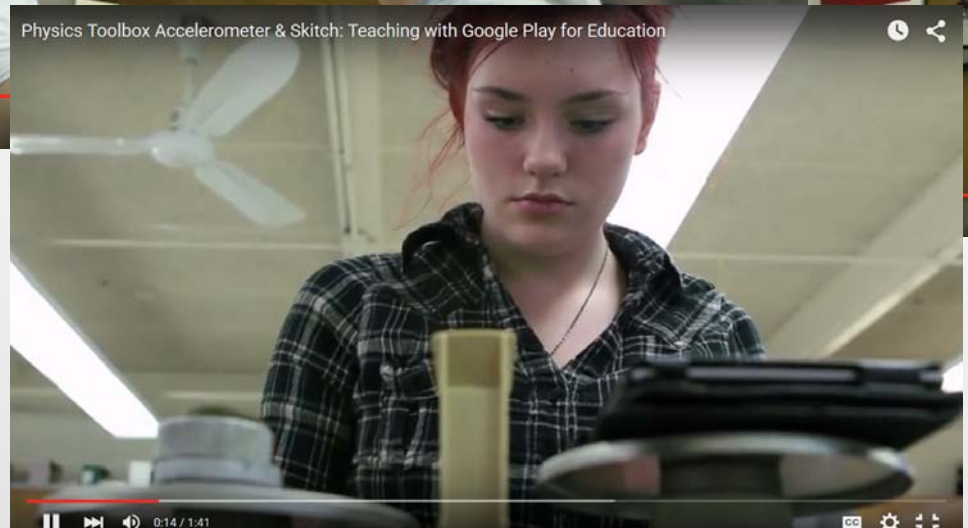
Free Physics Toolbox sensor apps for experimentation:
Turn your mobile device into a laboratory

Rebecca Vieyra
Physics Teacher, K-12 Program Manager at the AAPT
Chrystian Vieyra
Software developer, Vieyra Software


Physics Toolbox Accelerometer & Skitch: Teaching with Google Play for Education
1:05 / 1:41


Teaching with Google Play for Education
POWER-VT
Amber
Devries


Physics Toolbox Accelerometer & Skitch: Teaching with Google Play for Education
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What can your mobile device do?

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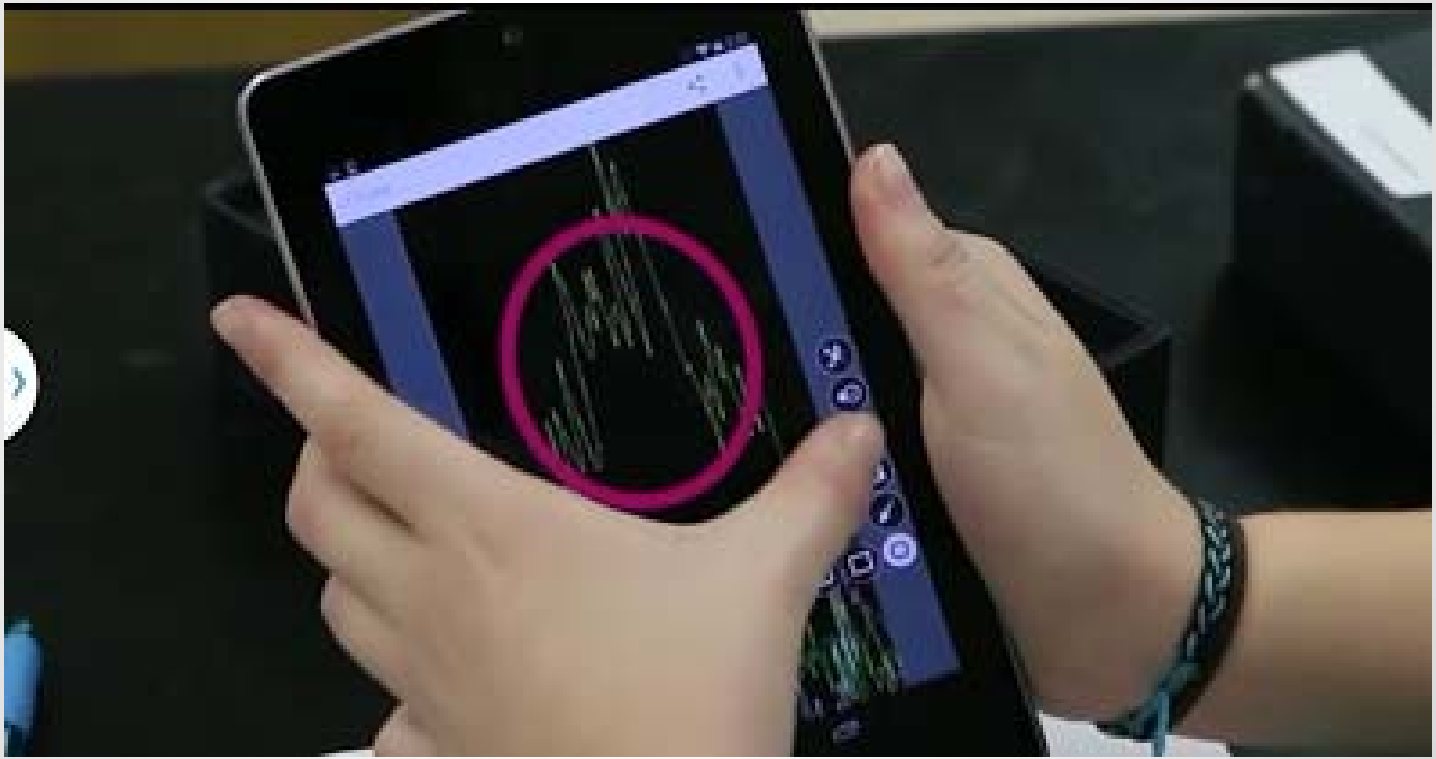
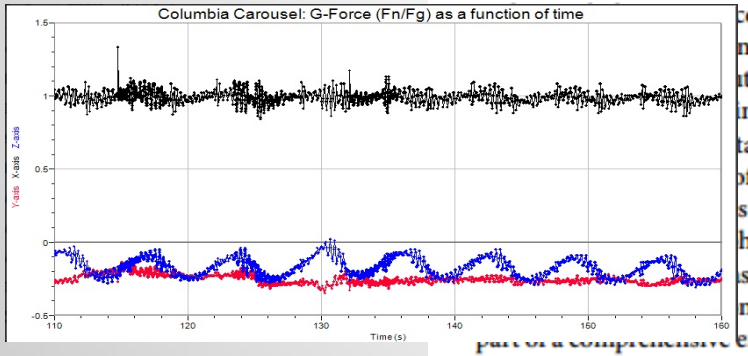


What can your mobile device do?

Analyzing Forces on Amusement Park Rides with Mobile Devices

Rebecca E. Vieyra, Cary-Grove High School, Cary, IL
Chrystian Vieyra, Vieyra Software, Crystal Lake, IL



Mobile device accelerometers are a simple and easy way for students to collect accurate and detailed data on an amusement park ride. The resulting data can be graphed to assist in the creation of force diagrams to help students explain their physical sensations while on the ride. This type of activity can help students overcome some of the conceptual difficulties often associated with understanding centripetal force and typical "elevator-type problems" that are inherent in so many amusement park rides that move, lift, and drop riders. This article provides some sample data and examples from a visit to Six Flags Great America.

Recent contributions to *The Physics Teacher* have been concerning the use of cellphones,[1-3] ng controllers[6-8] to directly measure t relatively few articles have ad- n measuring *g*-forces as a way for tative force diagrams. f Cary-Grove High School annually students to an amusement park for hysics of thrill rides. Students in the sked to analyze linear acceleration n, and energy transformations as end-of-year project—the project de-

sion if not addressed carefully.) The expression for *g*-force can be derived as follows from a linearly accelerating system on a flat surface (such as a rider in contact with a seat), where $g = 9.8\ \text{m/s}^2$, m is mass, and a is acceleration, and from Newton's second law of motion (where $F_{\text{net}} = F_N - F_g$):

$$F_N - F_g = ma.$$

Rewriting the above equation to solve for F_N, we can divide both sides by F_g to derive what is known as *g*-force:

$$\frac{F_N}{F_g} = \frac{ma + F_g}{F_g} = \frac{ma + mg}{mg} = \frac{a + g}{g}.$$

This ratio of F_N/F_g shows the dependence of *g*-force on acceleration of a system, as well as its independence from the system mass. Unlike simple normal force or weight, the *g*-force is the same for both the rider and the measurement tool, although the rider weighs considerably more.


MOBILE SENSOR APPS
9:30 a.m.-1 p.m. Sensors for Science
12-12:30 p.m. OpenSignal Apps
HOSTED BY
ISTE
Physics Toolbox Apps
Physics Toolbox
Chrystian Vieyra


B-5
B-6
Coaches for Physics Online
"Undergraduate
LISTEN!
ATTRACT!
RIMP!
Where is the strongest part of the magnet?
What happens to the forces on pins when you change the velocity?
Get to know your mobile device's
Picture layout and variable names are easily changed.
Chrystian
Vieyra


What European teachers can learn from each other
English
Smartphones in Science Teaching
iStage 2
SCIENCE ON STAGE
GERMANY
The European Platform for Science Teachers

Mission

Sfruttare la potenza dei sensori degli smartphone

Migliorare l’educazione scientifica

Facilitare la ricerca e l’uso industriale

Apps

Categories | Home | Top Charts | New Releases

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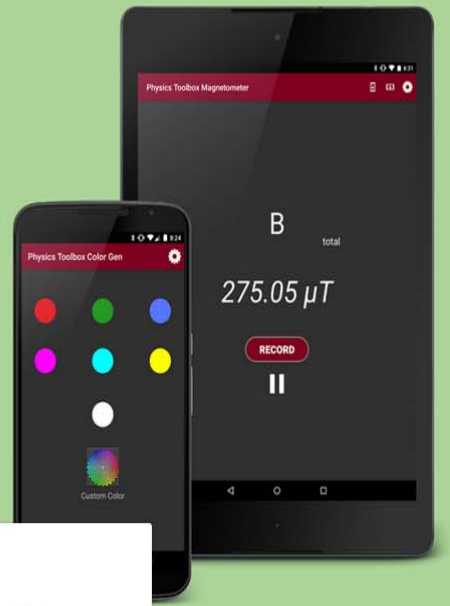
Editors' Choice

Harness the power of mobile sensors.

Enhance science education.

Facilitate research and industrial use.



Physics Toolbox Vieyra Software

Vieyra Software

Vieyra Software aims to make data collection accessible to anyone who owns a modern Android device.

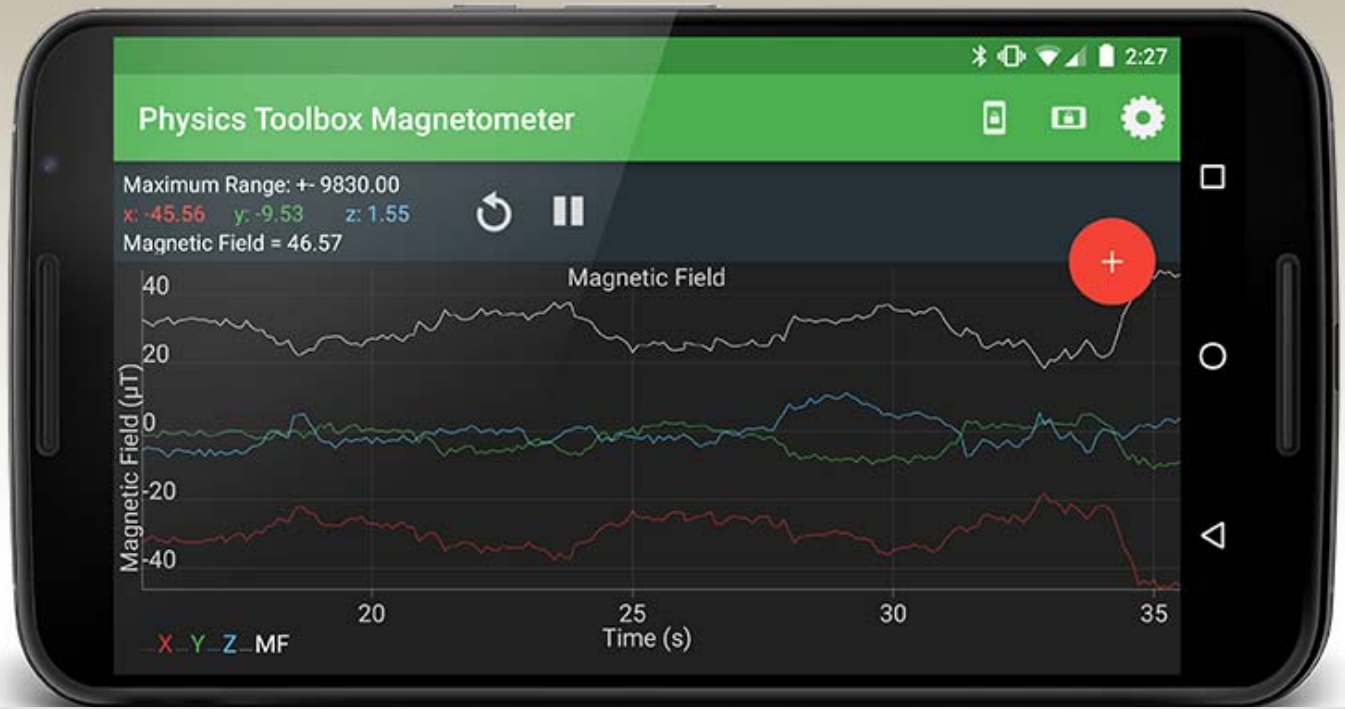
Featured

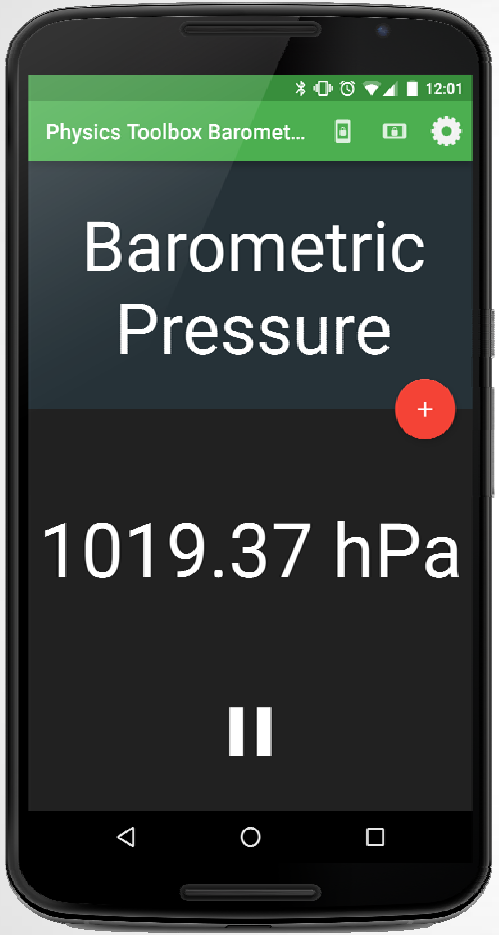
Physics Toolbox Suite

Physics Toolbox S

Useful for education, academia, and industry, this app uses device sensor inputs to collect, record, and export data in comma separated value (csv) format

Physics Toolbox Magnetometer

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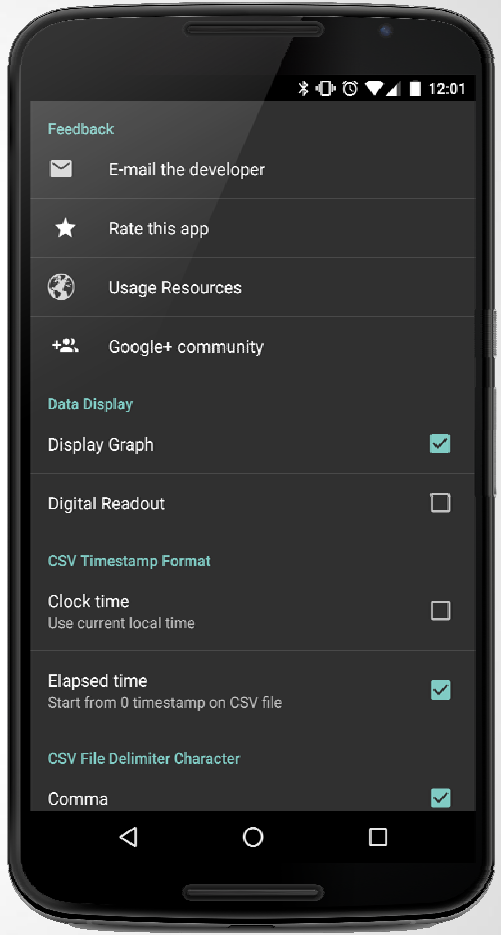
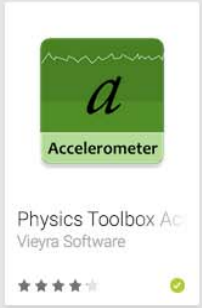
Physics Toolbox Baromet...
Barometric Pressure
1019.37 hPa


12:01
Feedback
E-mail the developer
Rate this app
Usage Resources
Google+ community
Data Display
Display Graph
Digital Readout
CSV Timestamp Format
Clock time
Use current local time
Elapsed time
Start from 0 timestamp on CSV file
CSV File Delimiter Character
Comma

Physics Toolbox Apps - Android

Apps



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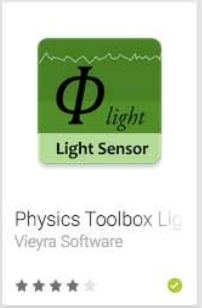

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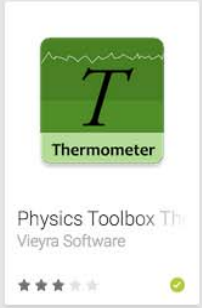

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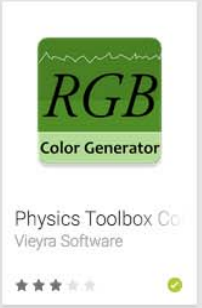

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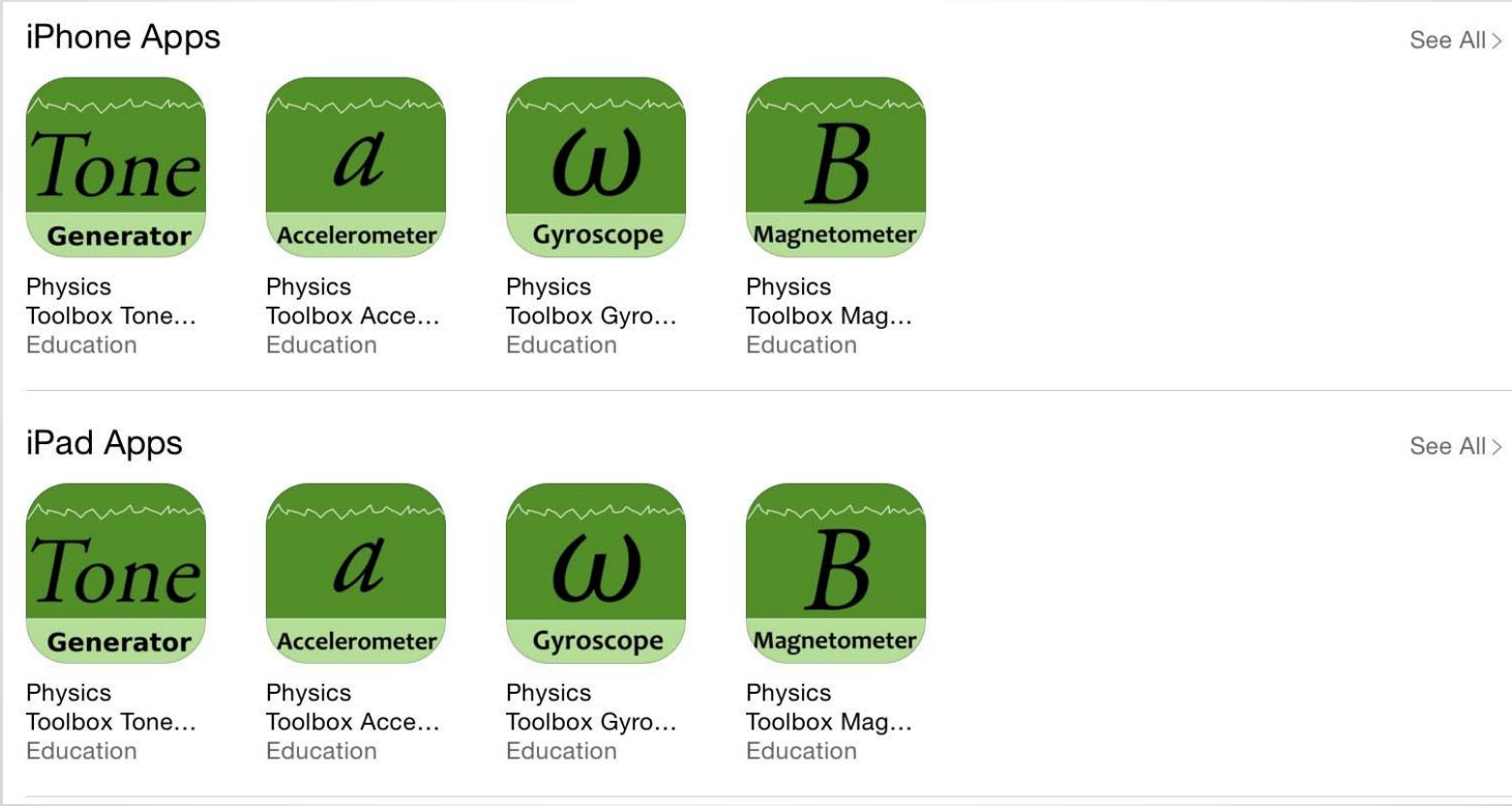
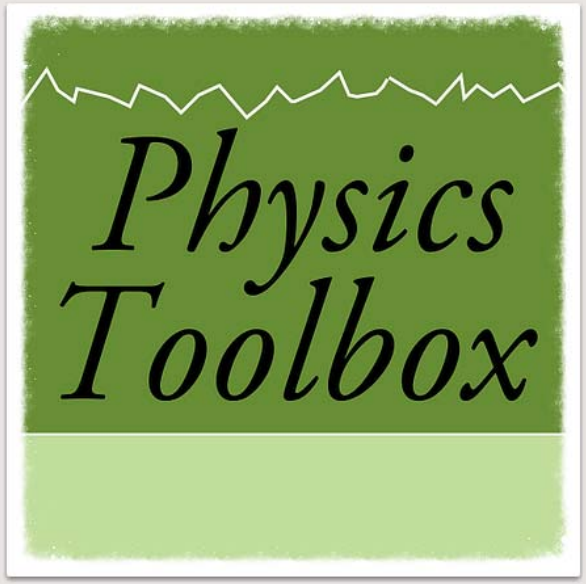
Physics Toolbox Apps - iOS



Physics Toolbox Apps

by Vieyra Software

HOME About Contact Apps Lessons Resources Citations



Apps

Lessons

Resources

Citations

Vieyra Software is a member of :
Google Developers Launchpad
Microsoft BizSpark

www.vieyrasoftware.net

Contact
vieyrasoft@gmail.com

Join our Community
Mobile Sensor Apps for Learning

Physics Toolbox Apps

by Vieyra Software

Lessons

Click on the lessons below to learn about some ideas for using these apps for teaching introductory physics.

"Identifying Gait Metrics"

Teach Engineering (External Citation)

App: Physics Toolbox Accelerometer

Topics: Kinematics, Biomechanics

Additional Materials: none

Students use an accelerometer attached to the lower back of each subject and compare dynamicity, gait, metrics, symmetry, and variability. Students make comparisons between characteristics of gait between subjects of different heights. Video analysis can be used to compare data to visual observations.

Lesson Plan

Additional Resources:
Four Questions Visual Aid
Identifying Gait Metrics Activity Assessment
Identifying Gait Metrics Activity Assessment Answer Key

"Measuring the World Around Us"

Smartphones in Science Teaching: iStage2 (External Citation)

Apps: Physics Toolbox Orientation, Physics Toolbox Barometer

Topics: Measurement, Pressure

Additional Materials: meter stick

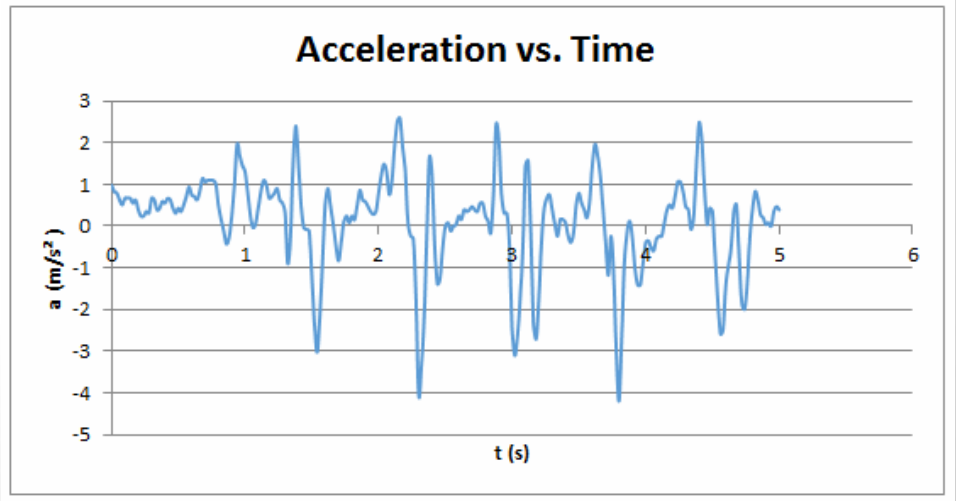
Students estimate the height of various objects using meter sticks, perspective, inclinometers, and barometers. Students must decide which tool is most appropriate for the job.

Identificare il modo di camminare

Dove mettere il sensore?

Come si confronta la camminata degli studenti bassi e alti?

Possiamo prevedere l'altezza degli studenti?



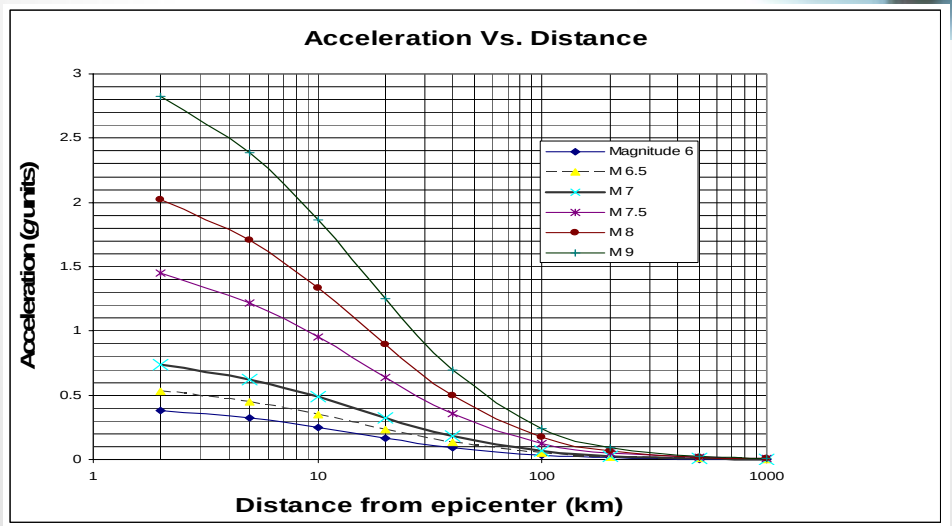
TEACHENGINEERING
curriculum for k-12 teachers

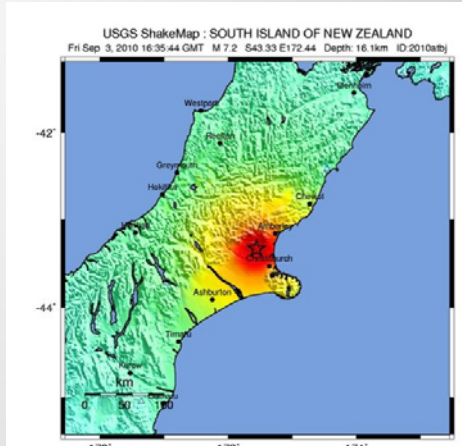
https://www.teachengineering.org/view_activity.php?url=collection/uno_/activities/uno_walk/uno_walk_lesson01_activity1.xml

Prevedere la forza di un terremoto

Da dove provengono i terremoti?

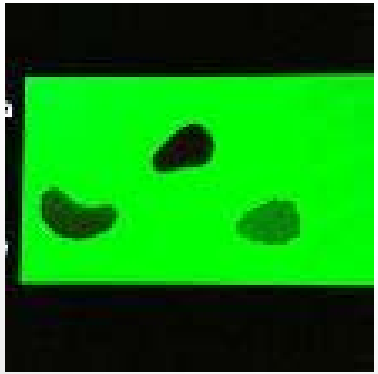
Come si misura la forza?

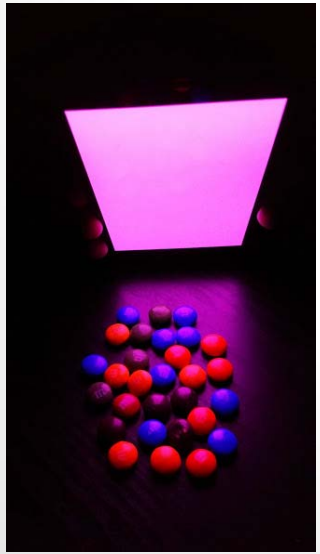


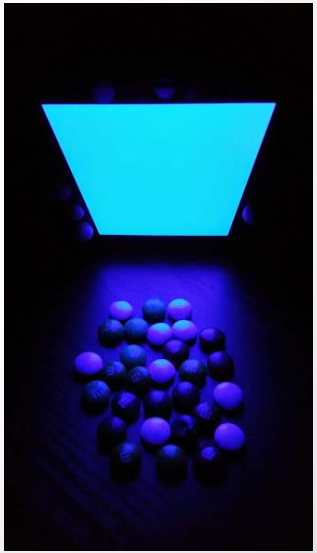


www.iris.edu/

Non dobbiamo ignorare i generatori…





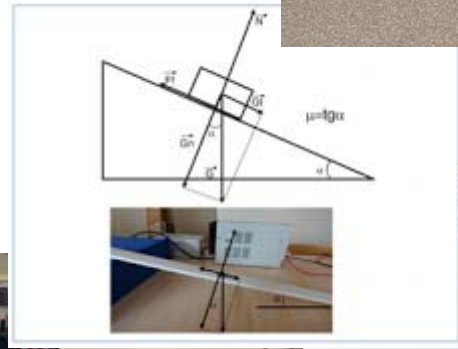


Comunità di Google+

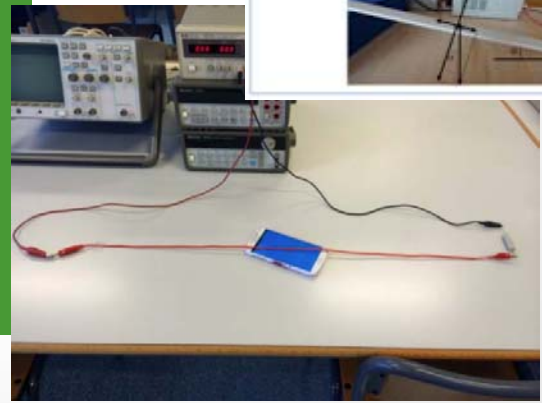
Mobile Sensor Apps for Learning

A community for sharing Android sensor apps and ideas for education, research, and industry, using phones, tablets, GGlass, and Android wear

View community



http://www.rrp.infim.ro/2014_66_4/A30.pdf



http://ocs.editorial.upv.es/index.php/HEAD/HEAD15/paper/viewFile/332/211

Comunità di MPTL

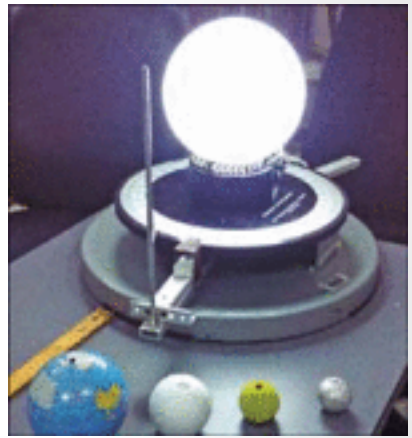
Multimedia in Physics Teaching and Learning

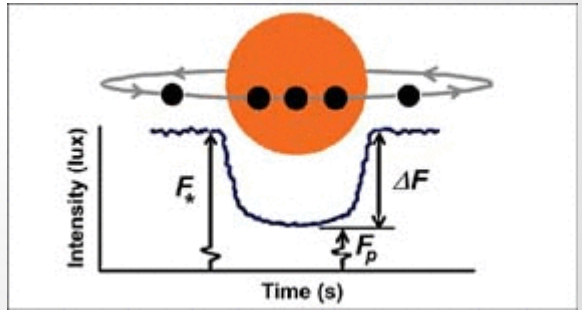
AAPT PHYSICS EDUCATION
The Physics Teacher

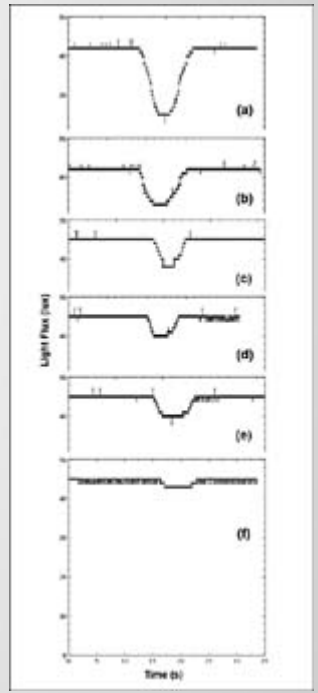
Analyzing Planetary Transits with a Smartphone

Azael Barrera-Garrido

http://dx.doi.org/10.1119/1.4908091







AAPT PHYSICS EDUCATION | The Physics Teacher

The Atwood Machine Revisited with a Smartphone

Martin Monteiro, Cecili Stari, Cecilia Cabeza, Arturo Marti.

http://dx.doi.org/10.1119/1.4928357

Si prega di condividere le vostre idee con noi!

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