websights

Dan MacIsaac, Column Editor, Physics Department, SUNY-Buffalo State University, Buffalo, NY 14222; macisadl@buffalostate.edu

WebSights features announcements and reviews of select sites of interest to physics teachers. All sites are copyrighted by their authors. This column is available as a web page at PhysicsEd.BuffaloState.Edu/pubs/WebSights/. If you have successfully used a physics website that you feel is outstanding and appropriate for WebSights, please email me the URL and describe how you use it to teach or learn physics—macisadl@buffalostate.edu.

• Learning About Voltage: Humor and Reality for a Difficult Topic

https://tinyurl.com/WS-whatIsV
https://www.youtube.com/@eigenchris/videos
https://www.modelinginstruction.org/
https://doi.org/10.1119/1.2432088
https://tinyurl.com/WS-EugeneKV

This past summer, one of my "E&M for HS Teachers" course students pointed out a quite humorous "joke video" by @eigenchris tracking a student struggling to learn about voltage through middle school science class, high school physics class, and university circuits class and finally arriving at a "ball rolling down a hill" model, with much self-reflection about his learning process. Eigenchris's YouTube channel has similarly humorous "April Fools" videos reflecting on learning ever more complex multilevel ideas like momentum, doing hard integrals, and topology. His channel is quite impressive with a collection of videos dedicated to special and general relativity, tensors and tensor calculus, and spinors, all delivered with deadpan humor.

The voltage video arose when a colleague was teaching the concept of electric potential (widely referred to as voltage) using the famous introductory modeling physics "bleacher" activity—students sit on athletic bleachers or stairs, calculate their individual gravitational potential energy (GPE) $mg\Delta h$ in joules, and then divide by their mass to determine the GPE/mass or "liftage" assignable to each level on the bleachers. This "liftage" in J/kg is next explored at length in this teacher-led activity, and a modeling worksheet discussed by students on whiteboards develops the analogy between "liftage" and potential in uniform fields, before moving on to more complex fields (where topographical map analogies are exploited).

When working with students, I interpret "voltage" as a vague label for a delightfully rich and complex collection of often nebulous physical ideas including units, measurements, stuff written on batteries and appliances, electric potential, magnetically induced EMF, and chemical potential energy that physics majors pick apart over several semesters. So for me, it's very important to keep appropriate pedagogical goals, models, and analogies for appropriate students at appropriate times; sometimes balls and ramps are enough. Humorous and not-so-humorous videos and visualizations have their place.

• Coherers: Radio Detection Before Diodes

https://en.wikipedia.org/wiki/Heinrich_Hertz
https://en.wikipedia.org/wiki/Coherer
https://en.wikipedia.org/wiki/Guglielmo_Marconi
https://en.wikipedia.org/wiki/Signal_Hill,_St._John%27s
https://tinyurl.com/WS-EBcoherer
https://www.youtube.com/@ElectroBOOM/videos

Long before semiconductor diodes, before vacuum tubes, crystal detectors, and even electrolytic detectors, back in the days of Hertz and Marconi, radio operators used *coherers* to detect radio signals. Herr Prof. Dr. Hertz actually used an optical microscope or a magnifying glass in a darkened room to view small sparks between electrodes of his receiving antenna for his initial radio wave reception experiments. Marconi was famous for assembling many technical innovations in his drive to develop wireless radio, including the use of the already known coherer. A coherer is a sealed glass tube with electrodes at both ends filled with iron filings and trade secrets, and when exposed to a radio frequency signal, the contents become highly conductive—it turns "on" when detecting an RF pulse. Coherers must be mechanically reset by tapping the tube to render them much less conductive, and this device sufficed to receive continuous-wave Morse code radio signals across the Atlantic in 1901 and 1902, to the consternation of the corporate owners of undersea transatlantic telegraph cables.

I saw my first rather mysterious coherer decades ago in Cabot Tower on Signal Hill in St. John's, Newfoundland, Canada, and was recently delighted to see ElectroBOOM's video replicating coherer-like effects with an LED, coin cell, aluminum foil, tape, and a piezoelectric lighter, then doing limited experiments with the device. When not clowning around, electrical engineer and YouTuber Mehdi Sadaghdar often builds odd electronic devices and debunks YouTube myths, and he showed us a glimpse into radio history we can replicate today. Bravo Mehdi S.

• Videos Helping Plan Physics Instruction for Blind Students

https://www.youtube.com/@Blindonthemove
https://tinyurl.com/WS-blindnessSpectrum

I discovered Mike Mulligan's YouTube channel recently following up on his excellent short "Blindness is not all or nothing… It is a spectrum." Mulligan does nice work showing the impact of various visual impairment conditions experienced by blind people who nonetheless have some vision, and therefore can participate in physics classroom and laboratory experiences with appropriate affordances and accommodations. His website demonstrates many products for the blind, and gives tips on making many situations friendlier to sight-impaired people. In particular, these videos are helpful for physics instructors and curricular activity designers, who can simulate visual impairment while trying their classroom experiments ahead of time, and modify practices accordingly. And yes, you can make similar glasses from old sunglasses for your own use.