

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.

• **“Understanding Car Crashes: It’s Basic Physics”**
“Understanding Car Crashes: When Physics Meets Biology”
(US) Insurance Institute for Highway Safety

classroom.iihs.org
vimeo.com/412778886

This oldie but goodie MS/HS physics video resource was updated and extended last year to include NGSS and pandemic-parent suitable hands-on at home lessons including viewing sheets, lesson plans, kitchen table experiments with video teacher guidance, activity sheets and keys—all accessed by special registration. *“What happens to vehicles and their occupants in crashes is determined by science. You can’t argue with the laws of physics,”* says Griff Jones, award-winning high school physics teacher who goes behind the scenes at the Institute’s Vehicle Research Center to explore the basic science behind car crashes. Using a series of vehicle maneuvers on a test track plus filmed results of vehicle crash tests, Jones explains in anything but lecture style the concept of inertia, the relationship between crash forces and inertia, momentum and impulse, and more. There is also now a related video including biological physics.

Updated lessons and supporting materials from the free website include a worthwhile 20-minute video tour overview of the site, which “now features 14 lessons covering topics such as inertia, momentum, impulse and energy. Aligned with Next Generation Science Standards, the experiments primarily use common household items like pennies, pencils and masking tape.”

DOI: 10.1119/10.0004169

• **Perseverance: The New Rover on Mars**

mars.nasa.gov/mars2020/
tinyurl.com/WS-TMUplaylist
tinyurl.com/WS-MarsCopterVeritasium
<https://tinyurl.com/WS-PerseveranceRE>
airspacemag.com/daily-planet/new-ar-app-coolest-way-follow-mars-landing-180977007/

The Perseverance rover just landed in an ancient lakebed on Mars, a technical mission rife with cool and interesting physics, including the physics of space flight and navigation, an exciting landing and the deployment of much interesting new technology in the rover itself (such as a tech demo robot drone helicopter). Though dated, The Mechanical Universe is always excellent viewing for introductory Kepler’s laws and spacecraft navigation, particularly the discussion of opportunities, Hohmann transfer orbits and gravity assists in “Episode 24: Navigating in Space.”

Veritasium’s “This Helicopter Is Now on Mars!” does a nice discussion of the free flying powered drone Ingenuity helicopter, designed to use solar energy to fly in an atmospheric density about 1% of that of the Earth. Apparently not freezing

to death will require most of the helicopter’s energy. “The Insane Engineering of the Perseverance Rover” by the Real Engineering channel also discusses the rover itself, including improvements from the preceding Curiosity rover. The improved rover RTG design, MOXIE O₂ generation experiment and robotic sample collection / analysis / processing / preparation for a future return mission are also discussed and animated by the RE folks. These Martian exploration devices are both tours-de-force of engineering design and development for off-world conditions via advanced manufacturing including exotic materials.

Finally, to round out the Mars fever, check out the freely downloadable seven scene augmented reality adventure “Mission to Mars AR” for iOS and Android devices. Just step through the portal to Mars then drive a rover through your living room (or the set, or fly Ingenuity), walk the surface, play robot geologist, pilot Perseverance’s landing (in your backyard), view much footage about Mars science and culture. So all your home-bound students can play astronauts on Mars with cool augmented reality tools.

DOI: 10.1119/10.0004170

• **“The Stars Within Us: How the elements inside you, and everything were forged”**
“T01-178 Orbits” and Triple Binaries

beta.nsf.gov/science-matters/stars-within-us
en.wikipedia.org/wiki/The_First_Three_Minutes
www.eso.org/public/videos/eso2102b/
tinyurl.com/WS-triplebinaries
www.nasa.gov/tess-transiting-exoplanet-survey-satellite

“The Stars Within Us” is a four-minute general audience video from NSF’s “Science Matters” series presenting the recent astrophysical amendments made to our understanding of nuclear cosmogenesis from gravitational and multimodal astronomy observations of colliding neutron stars. Think of an animated, updated video version of Weinberg’s “The First Three Minutes,” that includes neutron stars and jets of cosmic rays emerging near supermassive black holes. An imagination satisfying video sure to please intro school students of astronomy, chemistry and physics.

Some impressive extrasolar system animations show a resonant exoplanetary system and a sextuple star system. First, a video from the European Southern Observatory (ESO) animates the orbits of the six exoplanets of the TOI-178 system, whose outer five planets are all in orbital resonance, here nicely set to musical chords for a music-box like show. Then, a nice animation of the triple eclipsing binary system TYC 7037-89-1 found by NASA’s Transiting Exoplanet Surveying Satellite (TESS) is presented in a video and webpage dedicated to this fascinating system.

DOI: 10.1119/10.0004171