

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.

• **Visualizing Introductory Physics: Desmos Card Sorts for Teaching Introductory Physics Online & Stickman Physics Animated GIFs**

<https://tinyurl.com/WS-BFrankCardSort1>

<https://tinyurl.com/WS-BFrankCardSort2>

<https://www.stickmanphysics.com/stickman-physics-animated-gallery>

I have recently received three separate emails from folk who are raving about Brian Frank's Desmos card sorts for teaching introductory mechanics (Physics 1) and the remainder of the introductory course (Physics 2). These are excellent resources for use in online instruction, particularly in individual instruction (Desmos is really intended as individual instruction and has a nice teacher proctoring interface), or to inspire and drive small group or whole classroom discourse, and I plan to use them myself. Thank you and kudos to Mr. Frank.

Bree Barnett Dreyfus recently tweeted about using "Stickman Physics," which presents a nice collection of compelling, simple animated GIFs and MP4s useful for slides and online teaching.

• **Fluid Dynamics and Paper Airplane Design "Aerodynamics Explained by a World Record Paper Airplane Designer" with an Introduction to the Coandă Effect**

https://www.youtube.com/watch?v=3KqjRPV9_PY

<https://tinyurl.com/WS-paperplanes>

John Collins calls himself "The Paper Airplane Guy" and holds a world record for farthest flight in his oeuvre. His 17-minute WIRED video "Aerodynamics Explained by a World Record Paper Airplane Designer" demonstrates building and flying five different plane designs and analyzes each. Along with each plane design, he briefly introduces partially relevant physics concepts like the free-body diagram for (powered) flight, mechanisms of drag, center of lift, center of gravity, dihedral, gliding, Coandă effect (engaging the always-popular Bernoulli controversy while including the overriding Newton's third law), lift and wing loading, elevator function, glide ratio, canard wings, stalling, tube plane/flying cylinder, boundary layer (reminiscent of the Magnus effect), Reynolds number, and applications of fluid dynamics to weather modeling and wind turbines. An appealing physics of fluids introductory conceptual/vocabulary tutorial illustrated with paper airplanes. His video is accompanied by several others with greater detail on folding his planes. The video is somewhat reminiscent of similar videos on pine-wood derby car physics, though it is more conceptually driven and less competitive in nature.

Posted to the phys-1 mailing list by Bernard Cleyet

• **"Understanding Rolling Resistance"**

https://www.youtube.com/watch?v=_S2lyaMgBQ8

<https://www.youtube.com/c/LearnEngineering/videos>

A Learn Engineering video discussing rolling "friction" due to hysteresis deformation of rubber-tired wheels extracting work from kinetic energy during rolling. The animated presentation will thrill car aficionados and includes a discussion of materials, idealized contact regions, real contact patches with asymmetric normal forces, etc. The channel has a number of animation engineering videos on automobile physics and engineering, discussions of PN junctions, MOSFETS and electronics, electric motors, batteries, gear systems, airfoils ("debunking" the infamous Bernoulli controversy for Coandă / N3 in "How Do Wings Generate Lift") and more. Some spelling issues but fun watching.

• **Docking with the ISS, Introductory Orbits and "Orbital Maths at NASA with Chris Hadfield"**

<https://tinyurl.com/WS-ParkerOrbit>

<https://www.youtube.com/user/standupmaths/>

<http://festivalofthespokennerd.com/>

<https://tinyurl.com/WS-BowieSO>

chrishadfield.ca

<https://iss-sim.spacex.com/>

<https://tinyurl.com/WS-CHroceqtn>

Matt Parker hosts the "Stand-Up Maths" Youtube channel combining mathematics and stand-up comedy. That work includes tricks, games, history, technology and puzzles, but he also does a fair amount of physics mathematics and is a mathematics entertainer via podcasts, books and another group, the "Festival of the Spoken Nerd."

His "Orbital Maths at NASA with Chris Hadfield" 16 min video is a fairly standard introduction to freshman orbits by equating centripetal and universal gravitational forces on an orbiting body cotaught with Commander Hadfield of the International Space Station on a flipchart pad in the NASA Rocket Garden at Kennedy Space Centre. Hadfield is a past ISS commander and spaceflight popularizer famous for his zero-gee rendition of Bowie's "Space Oddity" and recent (paywall) masterclass series on Space Exploration. The video includes the vector geometric derivation of centripetal acceleration, then establishes the relationship between orbital speed and orbital radius before moving inside the Atlantis Space Shuttle exhibit to discuss the nonintuitive aspects of shuttle docking approach in terms of speed and orbital height. SpaceX has a free online Dragon 2 docking simulation game to the ISS that's also fun to play for the final brute-force docking (proximity docking zone). Parker and Hadley have another 20 min video on the rocket equation as well.