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Claire A. Marrache-Kikuchi,[a] Raina Olsen,[b] Beth Parks,[c] Donald Salisbury,[d] and Keith Zengel,[e] *Editors*

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These brief summaries are designed to help readers easily see which articles will be most valuable to them. The online version contains links to the articles.

Letters to the editor

"Who discovered angular momentum of the photon?"
Ajoy Ghatak
92(8), p. 567. https://doi.org/10.1119/5.0191372

"Comment on 'Dynamics of a bouncing capsule: An impulse model vs a Hertzian model' "
Rod Cross
92(8), p. 568. https://doi.org/10.1119/5.0220437

Please enjoy these letters and consider writing one yourself. I'd love to hear from you.

2024 AAPT award citations at the summer meeting in Boston, Massachusetts

92(8), p. 569. https://doi.org/10.1119/5.0225393
We are delighted to present award citations from the summer meeting. Additional citations will appear in *The Physics Teacher*.

Transition from bouncing to rolling on a horizontal surface

Rod Cross
92(8), p. 571. https://doi.org/10.1119/5.0160345
When a ball is dropped on a horizontal surface with no initial spin, previous studies have found that its bouncing behavior can be simply described using a coefficient of restitution, which gives the ratio of the velocity after the bounce to before the bounce. The value of this coefficient is -1 for a perfectly elastic ball/surface, with a smaller magnitude for any real ball. In many sports, like golf, basketball, or bowling, balls are thrown at an angle and are often given some initial spin by the player. Depending on initial conditions, these balls can bounce, roll, or start by bouncing and then transition to rolling. Here, the transition from bouncing to rolling is shown to be described by using both a vertical and horizontal coefficient of restitution, with the horizontal velocity defined at the spinning edge of the ball rather than its center. Videos of undergraduate level experiments are included, with results used to validate the model.

Understanding two-dimensional tractor magnets: theory and realizations

Michael P. Adams
92(8), p. 576. https://doi.org/10.1119/5.0198262
Have you heard about tractor magnets? Certain fixed arrangements of three cylindrical magnets on a tabletop surface result in a stable equilibrium for a fourth follower magnet. In this article you will find the theoretical basis for this curious stability, a thorough experimental analysis of the stability of different possible magnet arrangements, and supplemental videos and 3-D printing plans so you and your students can create and study your own tractor magnets. The link to the paper will also take readers to a video abstract.

A taxonomy of magnetostatic field lines

Joel Franklin, David Griffiths, and Darrell Schroeter
92(8), p. 583. https://doi.org/10.1119/5.0186335
Many accepted truths about field lines are not actually correct. Magnetic field lines can actually start and stop, and there is generally no relation between the density of magnetic field lines and the strength of the magnetic field. These points are made in the more complicated electric current configurations that are presented here and they can easily be demonstrated in upper-level undergraduate electromagnetism courses. The linked Mathematica techniques will enable instructors to construct their own innovative models.

A simulation of diffraction patterns using a lock-in detection code

M. Kolmanovsky, T. Hill, W. J. Kim
92(8), p. 593. https://doi.org/10.1119/5.0128143
Did you know that you could simulate a single-slit diffraction experiment using a lock-in amplifier? If not, you can read through this paper, which shows how using a rectangular time window when playing with a lock-in is the time-equivalent of the rectangular aperture in the optics experiment: The properties of Fourier transform guarantee that you will obtain a sinc function either in frequency for the lock-in experiment or in wave vector for the light diffraction experiment. Appropriate for undergraduate optics or instrumentation classes.

Rutherford scattering of quantum and classical fields

Martin Pijnenburg, Giulia Cusin, Cyril Pitrou, and Jean-Philippe Uzan
92(8), p. 597. https://doi.org/10.1119/5.0175025
Rutherford scattering, named after the famous gold-foil experiment designer, is the scattering of one charged particle by another charged particle of fixed position. The authors here present a new approximation for this quantum scattering process, discuss the shortcomings of the traditional Born approximation approach found in many quantum mechanics textbooks, and show how their new techniques may be applied to the problem of the scattering of classical waves by black holes.

Four interacting spins: Addition of angular momenta, spin-spin correlation functions, and entanglement

Raimundo R. dos Santos, Lucas Alves Oliveira, and Natanael C. Costa
92(8), p. 606. https://doi.org/10.1119/5.0150433

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Entanglement is often an elusive property for students. This paper, appropriate for advanced quantum mechanics class, shows on a practical example how to calculate entanglement. It considers four spins-1/2 that are evenly distributed on a ring and coupled to one another though competing nearest- and next-nearest-neighbor interactions. After determining the eigenstates and their energies, which is in itself a nice example of addition of more than two angular momenta, one can determine the entanglement of two subsystems. Spoiler: It depends on how you partition the system.

Splitting the second: Designing a physics course with an emphasis on timescales of ultrafast phenomena

Igor P. Ivanov
92(8), p. 616. https://doi.org/10.1119/5.0133767

Did you know that state-of-the-art experiments could measure timescales down to a few rontoseconds (such things do actually exist and correspond to 10^{-27} s)? In the spirit of *Physics for Future Presidents*, this paper uses the theme of fast timescales to build a semester-long syllabus to introduce undergraduate science majors to various physics concepts, ranging from condensed matter to particle physics, and to examples of commonly used technology including ink-jet printing, ultrasound imaging, and high-speed cameras. Such a course could also be used for outreach, and it emphasizes the use of dimensional analysis and orders of magnitude. The link to the paper will also take readers to a video abstract.

Landau levels for charged particles with anisotropic mass

Orion Ciftja
92(8), p. 625. https://doi.org/10.1119/5.0123039

The behavior of an electron confined to move in two dimensions in the presence of a perpendicular magnetic field underlies the quantum Hall effect. This is also an analytically solvable problem, so it is valuable to quantum mechanics pedagogy. This paper reviews the solution and then shows a neat trick for solving the problem when the electron's effective mass is anisotropic, a situation that is fairly common in solid-state systems.

The role of the Silberstein/Thomas/Wigner-rotation in the rod and slit paradox

Mads Vestergaard Schmidt and Erich Schoedl
92(8), p. 630. https://doi.org/10.1119/5.0175922

Readers who are familiar with the "barn door" paradox will enjoy this 2-D version of it. Imagine a rod, thrown like a javelin, moving at a constant horizontal speed and also falling at a constant vertical speed. As it reaches ground level, it falls precisely through a javelin-length slit in the floor. However, in the reference frame of the javelin, the slit will be length-contracted and the javelin will have its (longer) proper length. So as the ground rises up to meet it, how does it pass through? The authors revisit this classic paradox and present new ideas on its resolution, including the concept of relativistic boost-induced rotations. The link to the paper will also take readers to a video abstract.

Comment on "On the linearity of the generalized Lorentz transformation" [Am. J. Phys. 90(6), 425-429 (2022)]

Justo Pastor Lambare
92(8), p. 635. https://doi.org/10.1119/5.0185737

This Comment expands on a recent article on the Lorentz transformation, clearly explaining the roles in the transformation of the light principle, the limiting speed *c*, and linearity.

Review of *Is Einstein Still Right? Black Holes, Gravitational Waves, and the Quest to Verify Einstein's Greatest Creation* by Clifford M. Will and Nicolas Yunes

David Derbes, Reviewer
92(9), p. 639. https://doi.org/10.1119/5.0226178

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