

## The Rocker (An Easy Anharmonic Oscillator for Classroom Demonstration)

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Citation: *Phys. Teach.* **51**, 231 (2013); doi: 10.1119/1.4795368

View online: <http://dx.doi.org/10.1119/1.4795368>

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Published by the [American Association of Physics Teachers](#)

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# The Rocker (An Easy Anharmonic Oscillator for Classroom Demonstration)

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Every instructor should know some easy examples of anharmonic oscillations. The rocking of an empty wine bottle or a slender beer glass is one of those: The angle is not a sinusoidal function of time and the period is not independent of the amplitude, not even for small amplitudes. But care has to be taken that the glass does not slip or rotate around a vertical axis. LEGO rockers (see Fig. 1) are much more reliable and versatile.

For small amplitudes, the angular orientation  $\varphi(t)$  of a rocker is a piecewise sum of hyperbolic cosines (see Fig. 2). The theory is accessible to university undergraduate students. Details can be found in the supplement to the online version of this note.<sup>1</sup>

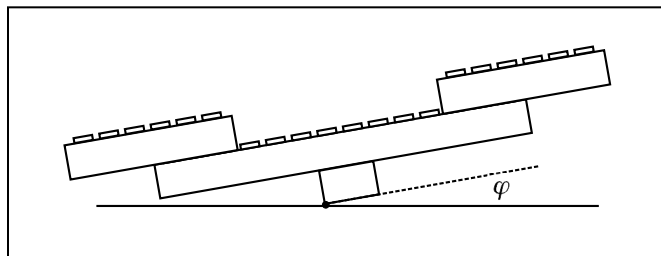


Fig. 1. A rocker is built with long and short LEGO™ bricks. Additional bricks on the arms increase the period. The bottom of the rocker includes an angle  $\varphi(t)$  with the horizontal table. The rocking frequency rises as the amplitude of the oscillation decreases.

## Reference

1. See <http://dx.doi.org/EPAPS>.

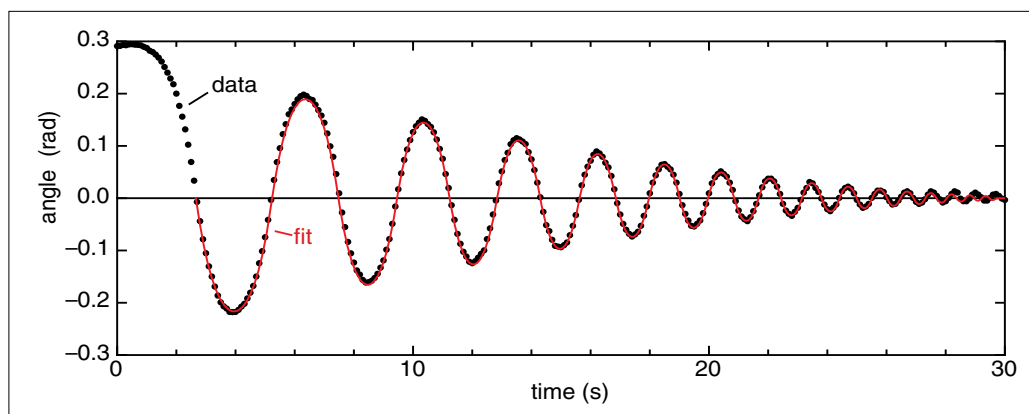


Fig. 2. A LEGO rocker oscillates for several seconds. The period depends on the amplitude.