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**Deterministic chaos in the elastic pendulum: a simple laboratory for nonlinear dynamics.**

(English) [Zbl 1219.70060](#)

*Am. J. Phys.* 60, No. 1, 73-79 (1992).

Summary: The chaotic motion of the elastic pendulum is studied by means of four indicators, the Poincaré section, the maximum Lyapunov exponent, the correlation function, and the power spectrum. It is shown that for very low and very large energies the motion is regular while it is very irregular for intermediate energies. Analytical considerations and graphical representations concerning the applicability of the KAM theorem are also presented. This system and the type of description used are very suitable to introduce undergraduate students to nonlinear dynamics.

**MSC:**

[70K50](#) Bifurcations and instability for nonlinear problems in mechanics

[34C15](#) Nonlinear oscillations and coupled oscillators for ordinary differential equations

[70H05](#) Hamilton's equations

Cited in **5** Documents

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