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Hunting for ghosts in elastic snap-through MICHAEL GOMEZ, DEREK E. MOULTON, DOMINIC VELLA, Mathematical Institute, University of Oxford — Elastic 'snap-through' is a striking instability often seen when an elastic system loses bistability, e.g. due to a change in geometry or external loading. The switch from one state to another is generally rapid and hence is used to generate fast motions in biology and engineering. While the onset of instability has been well studied, the dynamics of the transition itself remain much less well understood. For example, the dynamics exhibited by children's jumping popper toys, or the leaves of the Venus flytrap plant, are much slower than would be expected based on a naive estimate of the elastic timescales. To explain this discrepancy, the natural conclusion has been drawn that some other effect, such as viscoelasticity, must play a role. We demonstrate here that purely elastic systems may show similar 'slow' dynamics during snap-through. This behaviour is due to a remnant (or 'ghost') of the snap-through bifurcation underlying the instability, analogously to bottleneck phenomena in 1-D dynamical systems. This slowness is a generic consequence of being close to bifurcation — it does not require dissipation. We obtain scaling laws for the length of the delay and compare these to numerical simulations and experiments on real samples.

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