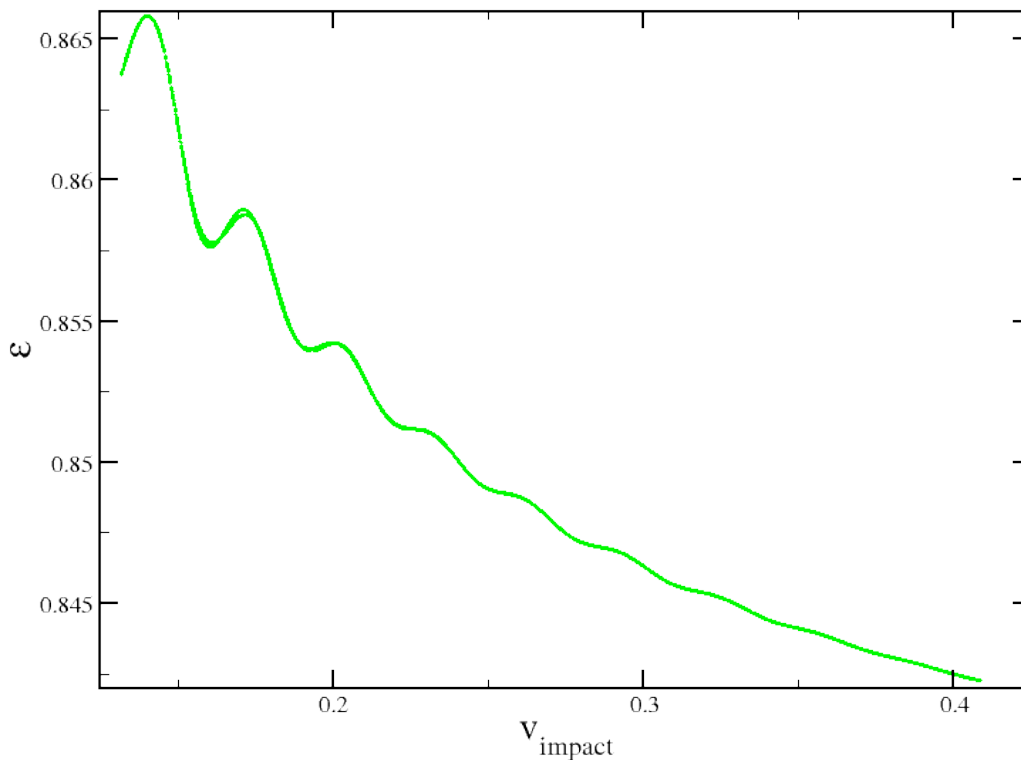


## Quantized coefficient of restitution

How the excitation of vibrational degrees of freedom affects impact dynamics.

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Measurements of the normal coefficient of restitution of a steel sphere impacting a glass plate reveal a regular/oscillatory, steplike behavior of the coefficient of restitution as a function of the impact velocity. Using a simple one dimensional model of a body with a vibrational degree of freedom, falling down on a rigid plate within gravity, we show that the above described steplike structure arises from excited vibrational degrees of freedom. By extending our simplified model to a three dimensional elastic sphere colliding with a rigid baseplate, we finally show that all the results of the simplified one dimensional model may be generalized to the real system.

