May 8th, 9:30 AM - 4:30 PM

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The damped simple harmonic oscillator is the quintessential example used to introduce physics students to dissipative dynamics. Texts currently in use at leading institutions follow this time honored pedagogical tradition and always discuss the case where the damping force is proportional to the velocity of the particle. The case of a damping force that is constant in magnitude (Coulombic friction being a garden variety example) is simply ignored. We found this problem to be simple and yet quite interesting. In particular, it is easy enough to be discussed in introductory physics courses.

The basic result is that the amplitude of the oscillator decreases linearly, as opposed to the ubiquitous exponential decay that every textbook dutifully displays for the case of velocity dependent damping. We also performed experiments using mass on a spring on an airtrack where the air pressure was reduced so that the glider was lightly rubbing against the track. Video recording of the low frequency oscillations followed by analysis of the images gave us the time dependence of the amplitude. The linearly decreasing amplitude was in excellent agreement with the prediction of our model. By controlling the pressure, we could adjust the ratio of Coulombic and velocity dependent damping. It was possible to cross over from the linear regime at one extreme to the exponential regime at the other extreme. We intend to share these results with authors of college physics texts.