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The Not-So-Simple Harmonic Oscillator WILLIAM SEARS, G. WHITMORE HANCOCK, Marietta College — The study of simple harmonic oscillators is a staple of physics courses and laboratories at the introductory level. We consider a system consisting of a vertical spring with a suspended mass. One typical laboratory experiment is the demonstration of Hooke's law using static measurements of extension vs. force. Another is the demonstration of simple harmonic motion using dynamic measurements of T^2 vs. the effective system mass. Theoretical analyses predict linear relationships for both experiments. The slopes of the best-fit lines are g/k for Hooke's law, where g is the gravitational field strength and k is the force constant, and $(4\pi^2)$/k for simple harmonic motion. It would appear that these results provide a straightforward way of calculating a value for g. The work done for this senior capstone project strongly suggests that it may not be feasible to determine a reliable value of g using these two experiments alone. Some ideas for alternative formulations of these experiments at the level of intermediate and advanced physics laboratories will be suggested. An additional set of experiments involving magnetic damping of the same system was performed with excellent results.

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