What's in Your Wineglasss STEPHEN WOOLBRIGHT, RICH SCHELP, Erskine College — You probably have done the trick of rubbing the rim of a wineglass, partially filled with water, to produce a crisp tone. We took this old instrument and applied a new question: What would happen to the frequency if we used liquids with different densities? A.P. French constructed a wineglass model which predicts that $(f_0/f)^2 = 1 + kF^4$, where f_0 is the frequency of the empty wineglass, F is the wineglass fullness fraction, f is the frequency at that fullness fraction, and k is a constant that is proportional to the density of the liquid [1]. We addressed this question experimentally using five liquids with densities varying from $0.7 - 1.4 \, \text{g/cm}^3$. To determine how the frequency changed, we filled a wineglass to several different heights for each liquid. At each height, we made a digital recording of the sound produced and used FFT analysis software to determine its frequency. Our results show that the denser a liquid is the lower the frequency of the sound the wineglass produces. The results also confirm that A.P. French's model correctly predicts the relationship between frequency and density.

[1] A.P. French, *In Vino Veritas: A Study of Wineglass Acoustics*, Am. J. Phys. 51, 8 (1983).

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