8.03 at ESG **Spring 2003**

Supplemental Notes

For Andrew, Peter, and anyone else involved in 8.03:

Different versions of French's text have different versions of an error in Problem 6-13. In some, the symbols v and ν have been horribly confused. In others, an attempt was made to eliminate the confusion by switching to ω, but the typesetter didn't do it (and dropped a factor of 8 as well).

Of the many possible ways to express the desired result, one is to use ω exclusively, so that the frequency range is between ω and $\omega + d\omega$ and the result is

$$\frac{L^3\omega^2}{2\pi^2 v^3} \quad \text{if} \quad \frac{\pi v}{L} \ll \Delta\omega \ll \omega.$$

Then, in the problem's notation, $r = \frac{\omega L}{\pi v}$.

In another version, the factors of 8 and π are ok, but the symbols ν and v have been switched, but not consistently. The frequency range is indeed ν to $\nu + d\nu$, but after that, ν and v have been switched. (Check the dimensions of any expressions to make sure.) That is, the desired result is

$$\frac{4\pi L^3 \nu^2 \Delta\nu}{v^3} \quad \text{if} \quad \frac{v}{2L} \ll \Delta\nu \ll \nu.$$

That extra factor of 2 in the range of $\Delta\nu$ doesn't matter, but some of us find it bothersome. Other intermediate results should be

$$k^2 L^2 = \frac{4\pi^2 \nu^2 L^2}{v^2} = \left(n_1^2 + n_2^2 + n_3^2\right) r^2 \, \pi^2, \quad r = 2\nu L/v.$$

This is one of the best arguments I've seen for (a) never using ν and v in the same problem, and for (b) using ω instead of ν consistently.