Liu and Stern Respond: Johnson's point[1] is well taken. He has convincingly shown that the chemical potential does oscillate at the diaphragm. As a result, the first-sound amplitude, a quantity we took to be small and neglected in our discussion of the second-sound driving efficiency, is reduced by another order of magnitude. This puts on a firmer ground our conclusion that, if nuisance effects are suppressed, the oscillating superleak transducer generates second sound with a driving efficiency comparable to that of an ordinary electroacoustic transducer generating first sound.

The last equation of the preceding Comment is not more general than the discussion in our Letter, though this seems to be claimed by the author. In fact, by employing $\mu_e = \mu_i$, the lengthy expression in the curly brackets is easily reduced to the pressure difference, $P_i - P_e$, and hence shown to be identical to our expressions.

The Comment restricts itself to ^{4}He, but pertains also to ^{3}He-A_1. With Eqs. (3) and (11) of our Letter, we have

$$\int \dot{\rho}/\rho\, dV = -\oint \vec{v} \cdot d\vec{s}, \quad \int \dot{x}_p\, dV = -\oint \vec{w} \cdot d\vec{s}.$$

Behind the diaphragm, ρ and x_p can be taken as constant throughout the volume V; in addition, $v = v_0$, $w = w_0$ on the diaphragm surface (of area A) and $v = w = 0$ elsewhere at the surface. Therefore, with $L = V/A$,

$$v_0 = (\Delta\rho/\rho) i\omega L, \quad w_0 = \Delta x_p\, i\omega L.$$

In Johnson's one-dimensional calculation, the constancy of ρ and x_p corresponds to the approximation of retaining only terms to lowest order in $q_1 L$ and $q_{st} L = \omega L / c_{st}$. Right in front of the diaphragm, we have

$$v_0/c_1 = \delta\rho/\rho = A_1 \exp(-i\omega t),$$

$$w_0/c_{st} = \delta x_p = A_2 \exp(-i\omega t).$$

The continuity of v_0 and w_0 then yields

$$\Delta\rho = \delta\rho / i q_1 L, \quad \Delta x_p = \delta x_p / i q_{st} L.$$

The constancy of the quantity $\mu + (\hbar/2m) M_s \omega$ across the membrane now determines the ratio of the two amplitudes, again to lowest order,

$$A_1/A_2 = \chi_p (\chi_T^{-1} + \chi_m^{-1}) c_{st}/c_1.$$

And finally, with $v_n(x=0) = v_M$, we obtain

$$A_2 = v_M / [1 + \chi_p(\chi_T^{-1} + \chi_m^{-1})] c_{st} \simeq v_M / c_{st}.$$

The ensuing discussions on the nuisance effects and on the drastic influence of a magnetically active layer remain unaffected.

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[1]D. L. Johnson, preceding Comment [Phys. Rev. Lett. 49, 1361 (1982)].