# ERRATA

**Quantum Noise and the Threshold of Hearing.** WILLIAM BIALEK and ALLAN SCHWEITZER [Phys. Rev. Lett. **54**, 725 (1985)].

We discussed a model auditory receptor cell which makes amplitude and phase measurements on the motion of stereocilia which are driven through fluid viscosity. The effective quantum noise level in such a system depends on the degree of impedance mismatch between the cilia and the fluid, or equivalently on the relative magnitude of stiffness and damping; unfortunately, the parameters we chose probably overestimate this mismatch. Better estimates come from Flock and Strelioff,[1] who directly measured the stiffness $\kappa \sim 10^{-3}$ N/m for ciliary bundles sensitive to frequencies $\omega \sim 2\pi$ (1 kHz) in the guinea pig cochlea. These authors also give a bound on the bundle displacement produced by calibrated fluid streams, and this observation can be used to give an upper bound on the damping constant $\gamma$. This estimate is most stringent for longer, less stiff bundles, and if we assume that $\gamma$ scales with ciliary length we find $\delta \lesssim 10^{-8}$ N·s/m for 1-kHz cells. With these parameters the effective quantum noise in fluid displacement becomes $\gamma x_{\text{fl}} \sim 5 \times 10^{-14}$ m, substantially smaller than our estimates of the threshold displacement.

We conclude that this model, with realistic parameters, does not provide adequate motivation for the hypothesis of quantum-limited measurement in the auditory system. Analysis of more realistic models—including, for example, the fact that high-frequency receptors cannot make reliable amplitude and phase measurements; their small-amplitude response is dominated by a low-pass filtered version of the *square* of the signal[2]—suggests that this hypothesis is viable, but new experiments are required to decide the issue. A detailed discussion of quantum and thermal noise in the inner ear will be given elsewhere.

We thank J. Deutsch, N. Goldenfeld, N. Turok, and especially R. Drever for helpful comments.

[1]A. Flock and R. Strelioff, Hear. Res. **15**, 11, 19 (1984).
[2]D. S. Goodman *et al.*, Hear. Res. **7**, 161 (1982).

**Antiferromagnetic Spin the Fluctuations in the Heavy-Fermion Superconductor UPt$_3$** W. J. L. BUYERS, J. K. KJEMS, and J. D. GARRETT [Phys. Rev. Lett. **55**, 1223 (1985)].

In our Letter unusual thermally activated scattering was reported around 1.5 K in UPt$_3$. In a new experiment at the Institut Laue-Langevin a signal was observed with the same energy, wave vector, and temperature dependence as the activated scattering observed earlier; the signal was found to be proportional to the pressure of the helium exchange gas. Its origin has been established to be the recoil scattering from helium atoms; it disappears at temperatures below the condensation point.

Scattering from helium gas is not normally detectable in neutron scattering even though helium is commonly used as an exchange gas by the filling of the specimen chamber with an atmosphere of helium at room temperature. The extremely weak signal was only observable in the present experiments because of the very high sensitivity that was achieved by using a cold source, a vertically focusing monochromator, and a horizontally focusing analyzer. Sensitivities of the order of $0.01\mu_B^2$/meV are thereby obtained. The conclusions of the previous experiment that involve the temperature variation should therefore be disregarded. Experimenters carrying out high-sensitivity neutron measurements should estimate the exchange gas contribution and take steps to minimize it. Discussions at conferences have revealed that helium-gas scattering has been found to be a problem also at other laboratories.

**Global Phase Coherence in Two-Dimensional Granular Superconductors.** B. G. ORR, H. M. JAEGER, A. M. GOLDMAN, and C. G. KUPER [Phys. Rev. Lett. **56**, 378 (1986)].

The conditions on the junction capacitance which have been given are incorrect. The relationship, $\Delta\phi = \gamma\,\Delta t$, used in the argument to obtain a threshold