# The Auditory System and Human Sound-Localization Behavior

## Exercises Chapter 11

**Problem 11-1**

Eqn. 11.4 appears to contain two free parameters (p and q), but in fact, these must be related. Simplify Eqn. 11.4 to incorporate the constraint that the ILD change corresponds to a given velocity.

**Problem 11-2**

Gain fields (Eqn. 11.7) may follow from a first-order Taylor approximation.

**a** First approximate the Gaussian tuning characteristic in *(u,v)* coordinates to a first-order Taylor expansion.

**b** Then calculate the derivative for $F(u, \Delta E_0)$ by assuming an eye-position sensitivity along the u-direction only.

**c** Now express $F(u, \Delta E_0)$ as function of stimulus eccentricity, $R$, by applying the (1D) complex-log map, to show that

$$F(R, E_0) \approx F(R, 0) \cdot (1 - 2\alpha A B_u \cdot \Delta E_0) \equiv (1 + \varepsilon E_0) \cdot F(R, 0)$$

**Problem 11-3**

Estimate the ILDs and ITDs produced by a stationary auditory target in the world when the burst durations are 0.5, 1.0, 3.0, 5.0, or 10.0 ms, and the chair moves at a 100 deg/s rightward or leftward. When will it not be possible to tell the difference between head-fixed and world-fixed sounds? Use the reported resolution of the azimuth angle (Chapter 7).