17-51)

First, let's find the speed of sound in air at 37°C:

$$v = \left(331\,\frac{m}{s}\right)\sqrt{\frac{T_{\text{in K}}}{273}} = 331\sqrt{\frac{37+273}{273}} = 353\,\frac{m}{s}.$$

If we treat the ear canal as a tube of length L open at one end and closed at the other, we apply the relationship

$$f_n = \frac{nv}{4L} \quad , \quad n = 1, 3, 5, 7, \ldots$$

to find the allowed resonances. The lowest such is

$$f_1 = \frac{(1)353}{4(0.024)} = 3674\ \text{Hz} \quad .$$

Let's look at Figure 17.36 and follow the 0 phon line, which we see has a noticeable dip at about 3700 Hz. Apparently, this resonance due to the ear canal gives a slight advantage in hearing at that frequency. We might note that there is a less pronounced effect around roughly 10,000 Hz. Is this also a resonance effect?

$$f_3 = \frac{(3)353}{4(0.024)} = 11{,}022\ Hz.$$

Well, could be.