

## Some simple physiology and the ear-eye connection

This is an excerpt from an excellent book which I recommend to you: Neil Shubin's *Your Inner Fish: A Journey into the 3.5 Billion-Year History of the Human Body* (2009. New York: Vintage Books.).

“An easy way to understand the ear-eye connection is to interfere with it. One way humans do this is to imbibe too much alcohol. Drinking too much ethanol leads us to do silly things because our inhibitions are lowered. Drinking way too much gives us the spins. And the spins often predict a lousy morning ahead, hungover, with more spins, nausea, and headache.

When we drink too much, we are putting lots of ethanol into our bloodstream, but the fluid inside our ear tubes initially contains very little. As time passes, however, the alcohol diffuses from our blood into the fluid of the inner ear. Alcohol is lighter than the fluid, so the result of the diffusion is that the fluid in our inner ear becomes less dense. This change in density wreaks havoc on the intemperate among us. Our hair cells are stimulated and our brain thinks we are moving. But we are not moving; we are slumped in a corner or hunched on a barstool. Our brain has been tricked.

The problem extends to our eyes. Our brain thinks we are spinning, and it passes this information on to our eye muscles. The eyes twitch in one direction (usually to the right) as we try to track an object moving from side to side. If you prop open the eyes of some one who is stone drunk, you might see this stereotypical twitch, called nystagmus. Police know this well. and often look for nystagmus in people whom they have stopped for driving erratically.

Massive hangovers involve a slightly different response. The day after binge, your liver has done a remarkably efficient job of removing the alcohol from your bloodstream. Too efficient, for we still have alcohol in the tubes in our ears. That alcohol then diffuses back into the bloodstream, and in doing so it once more sets the gel in motion: the spins again. take the same heavy drinker whose eyes you saw twitch to the right the night before and look at him during the hangover. His eyes might still twitch, but in the opposite direction.”