

November 2016

The Amazing Ear: Evidence for Design

By Elizabeth McVeigh, MD

One's perspective makes a big difference in how one sees the function of the human body. An evolutionist looks at the human body as a collection of organs pieced together by random processes selected for survival by the challenges of the environment, while the creationist sees marvelous evidence for design and information that shout evidence of an omniscient creator.

Evolution theoretically occurs when mutations result in new traits. Advantageous traits increase an organism's chance of survival and reproduction, thus preserving the trait. A trait that is neutral may or may not be preserved. Numerous traits are selected because their advantages for survival lead to the evolution of new organs and new species according to the theory. This is called natural selection.

In his book *The Origin of Species*, Darwin stated, "If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down."

Michael Behe, in his book, *Darwin's Black Box*, claims the data of biochemistry argues strongly that many of the molecular machines in the cell could not have arisen through a step-by-step process of random mutation/natural selection. In contrast, Behe claims that much of the molecular machinery in the cell is irreducibly complex. Something is irreducibly complex if it's composed of several integrated parts and each part is absolutely necessary for the structure to function. The implication is that such irreducibly complex structures or machines cannot be built by a gradual mutation/natural selection process because the absence of any part would lead to cessation of function. For natural selection to retain a structure, each component must be useful to the organism as the molecular machine is built. Behe gives several examples of irreducibly complex machines including the blood coagulation cascade and the bacterial flagellum. Irreducible complexity defies the theory of evolution and supports the need for an intelligent designer.^{1,2}

¹ Bolin, R. Review of *Darwin's Black Box*. <<http://www.leaderu.com/orgs/probe/docs/darwinbx.html>> Accessed 2016 Oct 28.

Evolutionists have tried to combat this idea of intelligent design, by changing their terminology and by trying to find fault in design. When confronted with the marvelous mechanisms and function found in living organisms, they are encouraging scientists to avoid using terms that imply design or creation and replace those terms with phrases like "it evolved" or "it was shaped by selection pressure."³ Evolutionists have looked at structures such as the human eye and claimed it is poorly designed even though engineers have applauded the ingenious methods in which the eye has overcome many constraints with incredible functionality.⁴ There is now a field of engineering called bio-inspired robotics, which uses designs found in nature to solve engineering design problems.

With these different perspectives in mind, one can look at any molecular mechanism or organ in a living organism and think, "Could this have come about through 'numerous, successive, slight modifications' as Darwin postulated or is this an example of 'irreducible complexity' that points to an intelligent designer?"

I would like to take you through the ear and our ability to hear and interpret sound. As you consider the many mechanisms that work together so that we can hear music and voices and laughter, think about how it all came to be. As you are reading, it is not necessary to understand every part. Just understand how many different mechanisms are necessary in order for us to interpret vibrations as sound and think about the possibility that these mechanisms all could have arisen through a random nondirected process such as evolution.

To begin to understand the functioning of the ear, it is necessary to understand not only the anatomy of the ear, but its physics and electrochemistry. The ear is acting

² Behe, M (1996) *Darwin's Black Box*. Free Press, New York, NY.

³ Bergman, J. (2011) Scientists urge censorship of terms implying design and purpose when describing life, <<https://answersingenesis.org/charles-darwin/darwinism/scientists-urge-censorship-of-terms-implying-design-in-life/>> Accessed 2016 Oct 28.

⁴ Guliuzza RJ. Major evolutionary blunders: Evolutionists can't see eye design, *Acts & Facts* 45 (10). <<http://www.icr.org/article/9589>> Accessed 2016 Oct 28

like a microphone on a stereo system, collecting the vibration that constitutes sound and converting these vibrations into an electrical signal in order to transmit that signal. The ear does this without using metal pieces that must be constructed by human engineering. All of the parts are constructed under the direction of DNA that is passed down from generation to generation. People seem to appreciate the technology of a smart phone, but imagine that the software initiated and directed the reproduction and repair of the technology itself. Then, it is possible that it might be approaching the same league as the living body.

The External Ear

The external ear acts as a funnel, collecting sound waves and directing them toward the tympanic membrane, also called the eardrum. The human ear canal acts as a tube with the tympanic membrane forming its closed end (Fig. 1). Closed-end tubes have a resonance frequency, a specific frequency of sound that is amplified. This resonance frequency is dependent upon the length of the tube. The length of an ear canal is such that sound resonates at a frequency around 2000 to 4000 Hz, which amplifies the sound by about 20 dB.

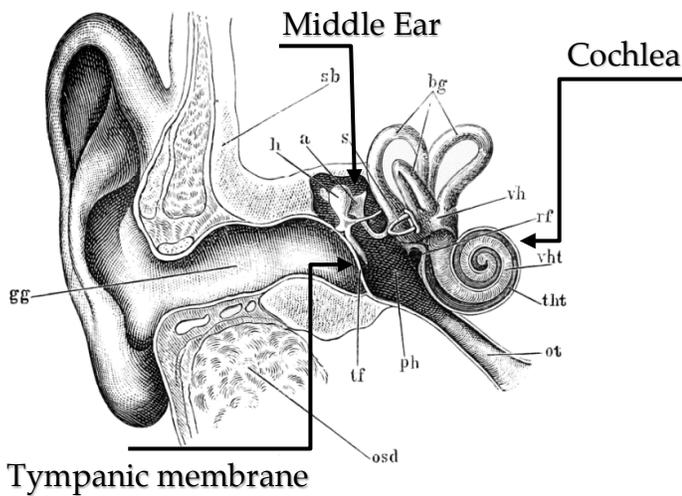


Figure 1. "Tidens naturlære fig40" by Morten Bisgaard. From the book *Tidens naturlære* 1903 by Poul la Cour. Licensed under Public Domain via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Tidens_naturl%C3%A6re_fig40.png#/media/File:Tidens_naturl%C3%A6re_fig40.png

Our sense of hearing is an amazing miracle, but what if we had to rely on evolution to hear the frequencies that are most important to us. The human ear hears sounds from around 20 Hz to 20,000 Hz. By the time we are 25 years old, we start to lose the ability to hear higher frequencies above 10,000 to 12,000 Hz. The fundamental frequency range of human speech is from 125 to 400 Hz, but the harmonics (multiples of the fundamental) extend the frequency range of human speech and singing. Harmonics around 3000 Hz are important for distinguishing between different vowel sounds, and the

higher frequencies are important for enriching the quality of the sounds, especially in music.

The most important frequencies involved in understanding human speech are in the 2000 to 4000 Hz range. It also happens that these higher pitched sounds are more difficult for us to speak loudly because these sounds are made by blocking air movement with our lips, teeth, and tongue. Could it be a matter of chance that the frequencies of sound that are most difficult for us to speak loudly and are most important for our understanding of speech just happen to be the same frequencies that are amplified by the resonance of our ear canal?

The Middle Ear

Sound waves travel through air in the external canal and through fluid in the inner ear. Normally when sound waves hit a liquid interface, most of the acoustic energy is reflected off the surface of the liquid. If it weren't for the three of the smallest bones in the human body acting to overcome this obstacle or impedance, humans would lose about 30 dB of sound energy as it is transferred into the inner ear (Fig. 2).

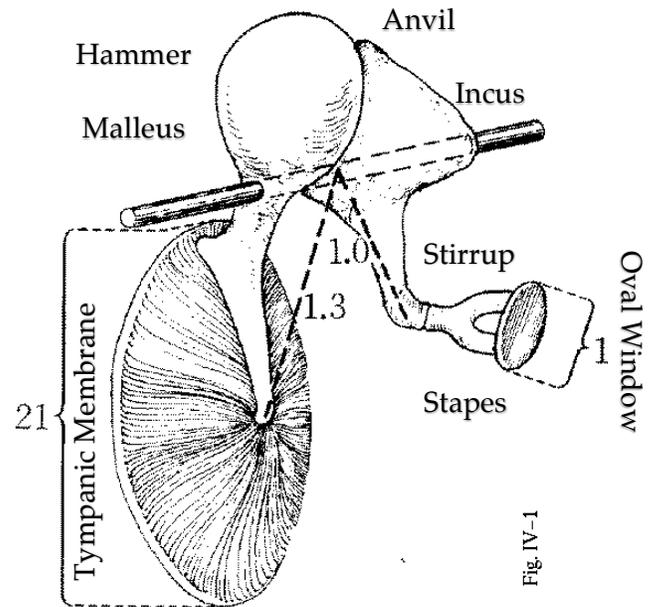


Figure 2

These interconnected bones, commonly known as the hammer, the anvil, and the stapes, are suspended by ligaments at the appropriate angles to create a lever. The hammer is connected to the relatively large eardrum, and the stirrup contacts the fluid in the inner ear through the relatively small oval window. Because of the difference in length of the arms of the lever and the difference in size between the eardrum and the oval window, the force transferred between the two membranes is increased, amplifying the sound by about 30 dB, just enough to overcome the loss that would be present at the air/liquid interface. This would be incredible if this ingenious use of levers and areal forces were to have evolved by random processes to perfectly balance

out the sound energy lost by refraction. One might even call it a miracle.

The Inner Ear

To convert the acoustic vibrations into an electrical signal, the inner ear utilizes a hydraulic chamber called the cochlea (Fig. 1). The cochlea is composed of ducts that twist around in the shape of a snail. It is filled with fluid that moves in response to sound waves. Special channels and pumps in the membranes of the cells that form the walls of these ducts move potassium and sodium ions from one duct to the other, creating an ion gradient between the ducts and special sensory cells called hair cells. Because these ions are charged, there is a polarization of charges across the cell membrane.

When the stirrup pushes on the cochlea, it causes movement of the fluid in the ducts, which causes a membrane to push against specialized hair-like projections, which trigger the influx of potassium through special channels into the cells (Figs. 3 and 4). As potassium is positively charged, its movement across the membrane depolarizes the electrical gradient across the membrane. This depolarization is passed along a neuron, which intersects with other neurons as the signal is passed to the cerebral cortex of the brain. These neurons are organized in a tonotopic fashion. For any given sound frequency, auditory nerve fibers from a specific part of the cochlea are active. Information about pitch can be derived from knowing which fibers are active, especially the relative amounts of activity in different fibers across the population. The nerve may also fire in phase with the sound waves.

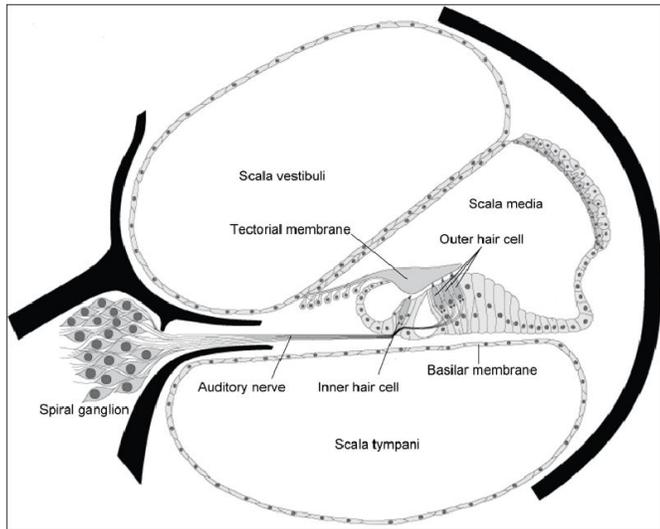


Figure 3

Here again is another irreducibly complex mechanism in which sound waves traveling through fluid are converted into electrochemical signals.

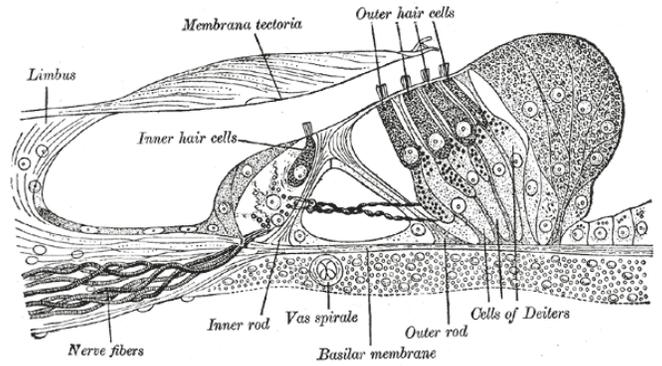


Figure 4

Auditory Nerve and Auditory Cortex

Each neuron exits the cochlea through its own canal through the bone that encases the cochlea joining the other 30,000 auditory neurons to form the auditory nerve, which travels to the brain (Fig. 5). Neurons from the auditory nerve intersect with other neurons at several nuclei and through several pathways. These nuclei are important for analyzing the intensity and determining the location of sound. Finally the signal is transferred to the cerebral cortex where the signal is interpreted as sound. Neuronal computations are used to determine from which direction a sound is coming. These pathways are like the wiring in a computer and are yet another step that is irreducibly complex in itself. Without these pathways that lead to conscious perception of sound, the rest of the ear would be meaningless and useless and would convey no advantage that would be selected to evolve.

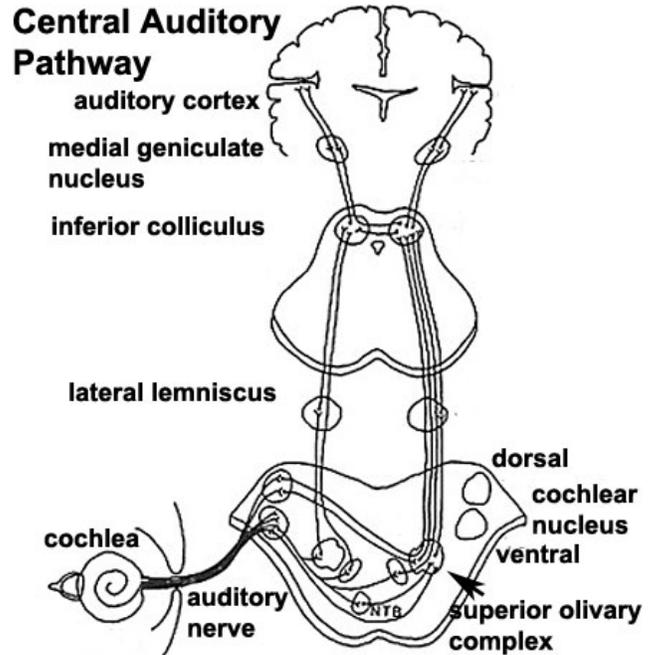


Figure 5

The ear is a marvelous example of evidence for a Creator. The complex mechanism that converts sound waves traveling through air to hydraulic waves traveling

through liquid to electrochemical signals that travel through the central nervous system defies explanation of origin through evolutionary means. Each portion is irreducibly complex in itself and combined are strong evidence against natural selection of small gradual changes. This elaborate system—created so that we can appreciate music, communicate with each other, and be alerted to eminent danger—is just one example of how God demonstrates his wisdom and knowledge. ☩

COMING EVENTS

Thursday, November 10, 7:00 pm, Providence Baptist Church, 6339 Glenwood Ave., Raleigh, Room 207

We are proud to announce that guest speaker Brian Mariani (<http://www.discovercreation.org/about/our-speakers/brian-aimee-mariani/>) of the Alpha Omega Institute (discovercreation.org) will present a talk entitled “Astronomy: Declaring the Glory of God!” at our November meeting. Astronomy is the study of the galaxies, stars, planets, moons and ultimately the whole universe. In this presentation, you will learn how the wrong assumptions lead to wrong conclusions that don’t fit the observations. We will consider questions like: Was there really a Big Bang? How do stars, planets, and moons form? What is Dark Matter and Dark Energy? Learn some of the biggest challenges to the naturalistic/evolutionary perspectives that could demolish the supposed billions of years of history.