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The Road to the Truth

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I mean looking for the way to the truth in relation to hearing. The truth can be sought and it should be done. There is a lot of ambiguity in Bekesy's theory [1]. There is new knowledge that Bekesy did not have, there are new research opportunities. Looking through foreign papers, one can believe that faith in Bekesy's theory still reigns. Complex examinations of the basilar membrane are performed. The reason for the lack of a good stapedotomy result is investigated by increasing the piston diameter from 0.4 to 0.6 mm. Increasing the piston surface area by 100% does not result in a significant improvement in audibility. Since high tones of 10 or 20 dB can be heard with bone conduction, also in otosclerosis, but 90 dB cannot be heard with a 0.4 or 0.6 mm piston after stapedotomy, increasing the wave energy flux by 70 dB has no impact on hearing high tones [2]. Maybe it doesn't involve transferring energy to the cochlear fluids and the basilar membrane? There must be another straight path, besides the one determined by Helmholtz and Bekesy - the bony path through the bone of the cochlear casing. It probably exists. Why can't this be examined? Is it impossible to put forward such a thesis? Because it is inconsistent with the traveling wave theory? Awarded with the Nobel Prize in 1961? The analyses, collected material, and evidence confirm my belief that we hear high-pitched sounds independently of the basilar membrane and the tip-links mechanism. If someone believes in something, they should defend their views. Science is moving forward and we know more and more about hearing. Prof. Kotarbiński wrote a very wise sentence: " Let's try to undermine everything, because only in this way can we say what cannot be undermined." I do not seek to refute Bekesy's theory, but to learn the truth. Years later, the more I know about hearing, the more gaps I see in Bekesy's theory. That's why I try to analyze all aspects of hearing down to the smallest detail. Bekesy did not have access to such knowledge as we have now, even at universities in Hungary, Sweden and Harvard.

The advantage of the new research is that vibrometric tests are performed on humans when the central nervous system is working, OHC is working, centrifugal inhibition through nerve V and VII is working. Flat bone is perfect for examination. Vibrometric tests can be performed on teeth. The ABR test is not expensive and feasible. Simultaneous laser vibrometric testing - at various frequencies and intensities, especially those frequencies that are not available after stapedotomy. Examine the movements of healthy stapes, in a patient operated on for another reason, not otosclerosis.

Time is a physical or philosophical concept. Result of auditory reaction time test – receptor and action potential: 1.5 - 1.9 ms. What is the signal travel time for low-pitched sounds according to the traveling wave when mechanical amplification is in effect? You can count it. What is the frequency resolution at the basilar membrane? What does the reception of polytones with aliquots of different intensities look like? Explain the possibility of preserving existing hearing after basilar membrane immobilization during cochlear implantation for partial deafness. Explain the lack of reception of high frequencies of sound in stapedotomy. Explain the mechanism of high-frequency amplification by mechanical method. Explain ion channel gating by tip-links mechanism.

The soft tones are amplified by 40-50 dB, and we still hear the soft tones. Each contraction of OHC is a source of sound wave in the outer ear in a child up to 20 dB. Is it not possible to test it with vibrometry on the bone?? Explain why Nature endowed OHC with afferent innervation? Explain what is the maximum frequency of OHC contractions? Explain if the entire cell shrinks after OHC depolarization? Describe what happens to the synapses at the lower pole of the OHC during contraction? Explain why there is no otoemission caused in the absence of an eardrum? What does the action potential look like during spontaneous otoemission? What does the signal amplification adjustment - mechanical, look like? What is the traveling wave in threshold hearing? At an amplitude of 0.01 nm? Explain the path and timing of the signal in bone hearing. Explain why there is no otoemission caused at the given tone of 500 Hz? OHC contractions are at this frequency, the basilar membrane vibrates. Explain what a traveling wave looks like in the case of polytones with numerous aliquots and phase shifts? The OHC contraction lasts over time – how long does one contraction last at a frequency of 10 kHz? How are phase shifts and harmonic

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components encoded in the fluid? Young people can hear 20 Hz. The wave in fluid is 72 m long. Does the entire membrane vibrate evenly? OHC at 60 dB, 80 dB, 100 dB contract the same as at 20 dB. Do they still amplify the sound? Why is otoemission caused by using sound delivered through the bone conduction is not examined? Explain such a large difference in amplitude on both sides of the stapes plate. Explain why Bekesy discarded Reissner's membrane and connected two independent ducts together? For what purpose? Did he straighten the cochlea? To simplify his own calculations? Can such results be true? How does a baby in the second half of pregnancy hear sounds and recognize voice timbre? Explain how the natural frequency of the basilar membrane is calculated? Is there resonance compatibility in other mammals hearing up to 100 kHz? Explain the need for 10 energy conversions at low signal intensity – counting the amplification of soft sounds. Explain the significance of the temporal splitting of a soft signal – amplified and loud. Explain the effect of rocking movements on hearing. Calculate inertia in the middle and inner ear. Explain threshold hearing, when wave energy decays on its way to the receptor. Explain the significance of the difference in the speed of a sound wave in the cochlear fluid compared to the variable speed of a traveling wave on the basilar membrane. Explain where a traveling wave is generated if the organ of Corti is adjacent to the basilar membrane. Explain the mechanism of frequency resolution for waves with frequencies between 16 Hz and 1000 Hz. Can the cadherin filament regulate the receptor processor at the electron level? Is the functioning of the receptor well described? [3]. Is the functioning of the auditory cell well described – in Bekesy's theory? Is the mechanism of encoding information by cochlear fluid flows described? Is it possible to transmit quantized sound wave energy by continuous method according to classical physics? If contraction of the OHC pulls up the basilar membrane along with the organ of Corti, it also pulls up the OHC (itself) along with the hairs of these cells, which vibrate in concert with the cochlear fluid, along with the IHC, along with the tectorial membrane. A kind of "panta rei" in the ear [4]. How are these hairs tilted or bent if they vibrate in sync with each wave and contraction of the OHC? What energy is needed to trigger such vibrations at high frequencies? If the operating time of the ion channels in the hair cell wall is limited to a few milliseconds, can the entire cell undergo depolarization and contraction up to 100 kHz? Why was electric current used to examine the frequency of OHC contractions? It's a mistake!

As you can see, there are many questions about Bekesy's theory of hearing. I assure you that there are many more. If one link in a chain does not hold, then the chain is useless. In this chain, many links are very weak and do not withstand pressure. The supporters of this theory should stand on their heads and refute all accusations. This is missing. So how are we to get to the truth? Only in such a fog can the truth be ground and born. If the proponents clear up all doubts, then of course we are happy to stick to the traveling wave theory. You have to explain and answer each question step by step. Otherwise, it will remain a black art based solely on belief, not knowledge.

I play the role of devil's advocate, which is also practiced even during the ordination of saints. The collected material, analyses and evidence authorize the formulation of new theses, which make up the new theory of hearing under the name: "Submolecular theory of hearing". It does not contain the errors of the Bekesy's theory. It is difficult, requires more knowledge, but not only because of this, it is reluctantly accepted. The origins of this theory, well documented, date back to 2000 [5]. Since then, there has been more general knowledge, arguments and evidence confirming the compatibility of the new theory with the Science of the 21st century. The only thing missing is greater acceptance of the new theory. A well-known phenomenon from history. There will come a time when this will change. The truth usually defends itself. The new paradigm of hearing theory, despite resistance, will be accepted [6].

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