

The Wonder of Hearing

This talk addresses the intricacy in the design of the mammalian ear, and in particular the human ear. There is minute and detailed engineering involved in the movement in air of acoustic waves which then transmit vibrations through to the mechanical movement of three tiny bones in the ear, then to movement in liquid, then movement of a special membrane splitting the sound into its component parts by frequency, then movement of very tiny hairs, and finally through electro-chemical bonds generating electrical signals to go to the brain. In this workshop, Professor McIntosh brings to bear his acoustic engineering background to show that the frequency analyser we all have in our ears is not only an example of brilliant engineering design, but is also a tribute to the beauty of what the Lord has made in sound sensory mechanisms, and the ability to appreciate voice and music.

Andy McIntosh now retired from the University of Leeds, holds a visiting chair in Thermodynamics and Combustion Theory, and is adjunct Professor at Mississippi State University. He has lectured and researched in these fields for over 30 years. He has a PhD in Combustion Theory from the Aerodynamics Department of what was then Cranfield Institute of Technology (now Cranfield University), a DSc in Applied Mathematics from the University of Wales and worked for a number of years at the Royal Aircraft Establishment. He is a Fellow of the Institute of Mathematics and its Applications, the Institute of Energy, the Institute of Physics, and the Royal Aeronautical Society. A chartered mathematician and engineer, and author of over 195 papers, articles, and patents, his work has included the study of the interaction of acoustics and combustion. His work has also included the investigations into the fundamental link between thermodynamics and information, and he has been involved in the area of biomimetics where the minute combustion chamber of the bombardier beetle has inspired a novel spray technology. He now lectures widely on origins, and has authored the book *Genesis for Today* (Day One, 6th Edition, 2017), *Genesis 1-11 – a verse by verse commentary* (Day One, 2016), *Wonders of Creation – Design in a fallen world* (with Stuart Burgess and Brian Edwards, Day One, 2017), and contributed to the books *In Six Days* (Master Books, 2009), *Should Christians Embrace Evolution?* (IVP, 2009), and *Origins – Examining the evidence* (Truth in Science, 2011). He is co director of the UK education think tank Truth in Science and married, with 3 children and 6 grandchildren.

I. What is sound?

II. How do we hear?

A. Outer Ear

1. Ear Canal Resonance
2. Direction assessment with 2 ears

B. Middle Ear Ear

1. Ossicle Bones
2. Evolutionary ideas as to the origin of ossicle bones from reptile jaw.

C. Inner Ear

1. Oval and round windows
2. Basilar Membrane
3. Frequency analyser
4. Harmonics and music – Overdesign
5. Organ of Corti
6. Stereocilia - trapdoor and spring system
7. Electrical excitation of Spiral Ganglion nerve
8. Auditory Cortex - Logical LHS and Art on RHS

III. Irreducible Complexity

IV. Conclusion - We are fearfully and wonderfully made - Psalm 139:14, Hearing ear - Prov 20:12. The glory of the Lord is shown in His brilliant engineering work. Rom 1:20

Suggested Readings

Wonders of Creation – Design in a Fallen World, Stuart Burgess, Andy McIntosh and Brian Edwards (Ed.) (Day One 2017)

The Ear and Hearing -- <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html>
Sensitivity of Human Ear -- <http://hyperphysics.phy-astr.gsu.edu/hbase/Sound/earsens.html>