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Concert Hall Acoustics

Researchers at Aalto University in Finland have developed a method that allows accurate comparisons of concert hall acoustics. The leader of the research group, Associate Professor Tapio Lokki, was presented with an International Commission for Acoustic Early Career Award at the ICA meeting in Montreal, Canada. The award was given to professor Lokki for outstanding contributions to room acoustics, and in particular for the novel subjective and objective assessment methods of concert halls. “People have different tastes and unique preferences when it comes to the acoustics of concert halls,” says Lokki. Thus, we cannot say which concert hall is better than another, but we certainly have learned why concert halls are different, and we are learning how to make a hall sound a certain way.”

Researchers have developed a new way to capture the acoustics of a concert hall with a symphony orchestra simulator. It consists of 34 loudspeakers reproducing synchronized recordings of individual musicians playing parts of symphonies in an anechoic chamber. The symphony orchestra simulator has been played in many famous European concert halls, and that music has been recorded in different locations within the halls and analyzed. The simulator is necessary because it guarantees that the concert hall is the only changing factor influencing sound in these analyses. Later in the laboratory, the objective recordings allow very accurate comparisons of the characteristics of the acoustics.

When listening to different halls with spatial sound reproduction in the laboratory, subjective listening tests have also been conducted with sensory evaluation methods that provide revealing, differentiating, perceptual factors among concert halls. With this combination of objective and subjective sensory data, professor Lokki’s team has been able to explain the preference ratings of concert hall acoustics. The goal of this research is to better understand why we hear sounds differently in different spaces. According to Lokki, this will lead to research that focuses on analyzing exactly how humans perceive sound.

The International Commission for Acoustics (ICA) is a global forum of researchers active in the field of acoustics. The ICA Early Career Award is presented once every three years to an individual who has contributed substantially, through published papers, to the advancement of theoretical or applied acoustics. A video on building a symphony orchestra simulator can be viewed at www.youtube.com/watch?v=cjdgzZ3Bez0.

TDL Note: A more detailed video on the simulator (more than 18 minutes) titled *Virtual Acoustics* can be viewed at www.youtube.com/watch?v=kY8JjBaJppA.