

# Computational Models for Predicting Sound Quality



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**主办单位:** 中国矿业大学机电工程学院

**报告人简介:** 英国皇家科学院院士 (Fellow of the Royal Society of London)、美国声学学会会士 (Fellow of the Acoustical Society of America)、国际音频工程学会会士 (Fellow of the Audio Engineering Society), 英国剑桥大学教授。研究领域主要包括声音响度、噪声评估、人工听觉, 主持了英国工程与自然科学研究委员会项目等 40 余项。提出的 Moore 响度理论被列为国际标准 (ISO 532-2:2017、ISO 532-3: 2023、ANSI/ASA S3.4-2007), 被工业界 (波音、三星、Bose 等)、军事领域大量采用, 用于机电装备声学性能评估及降噪技术开发。在 NATURE 等国际顶级期刊上发表学术论文 600 多篇, 被引 6 万多次。先后担任 Journal of the Acoustical Society of America 等国际顶级期刊副主编。荣获美国声学学会金奖、Hugh Knowles Prize、Thomas Simm Littler 等国际奖。

**报告内容简介:** This talk will introduce computational models for predicting the perceived sound quality of mechanical system, and discuss how these models are built upon the functional principles of the peripheral auditory system. We will see that sound analysis in the cochlea can be represented through a bank of bandpass auditory filters and excitation patterns, which serve as an internal representation of a sound's spectrum . We will also learn that a critical distinction must be made between linear distortion, which alters the timbre or tone quality, and nonlinear distortion, which adds new frequency components perceived as harshness or noise. In addition, we will find that while linear effects are modeled using steady-state excitation pattern differences, predicting nonlinear distortion requires a time-domain analysis utilizing gamma-tone filters and cross-correlation of temporal fine structure and envelopes . Finally, I will

identify how these two approaches are combined into a unified quality score that achieves exceptionally high correlations with human subjective ratings, and I will share how companies have applied these models to ensure their devices meet performance specifications.