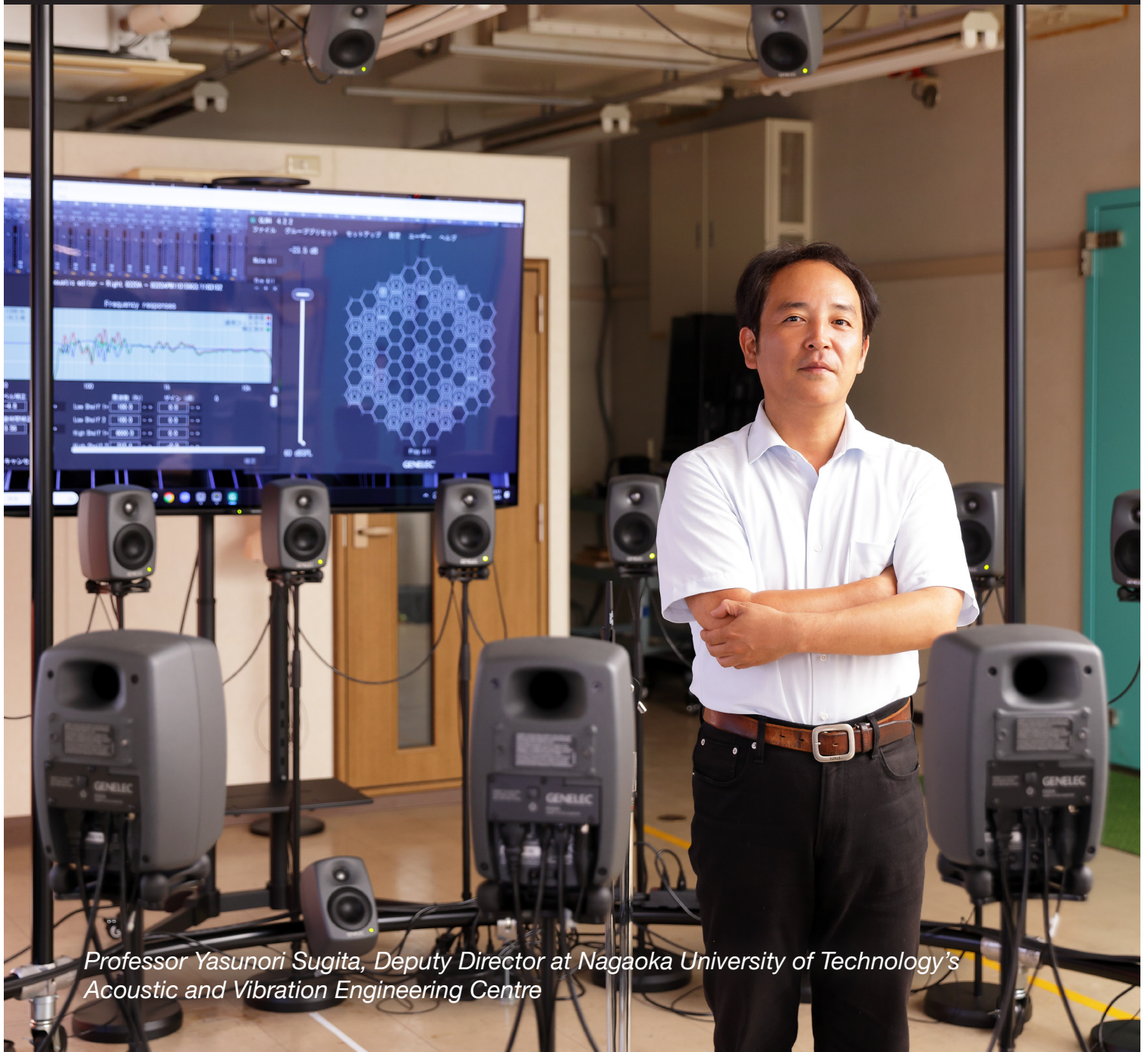


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CASE STUDY

The Sound of Science

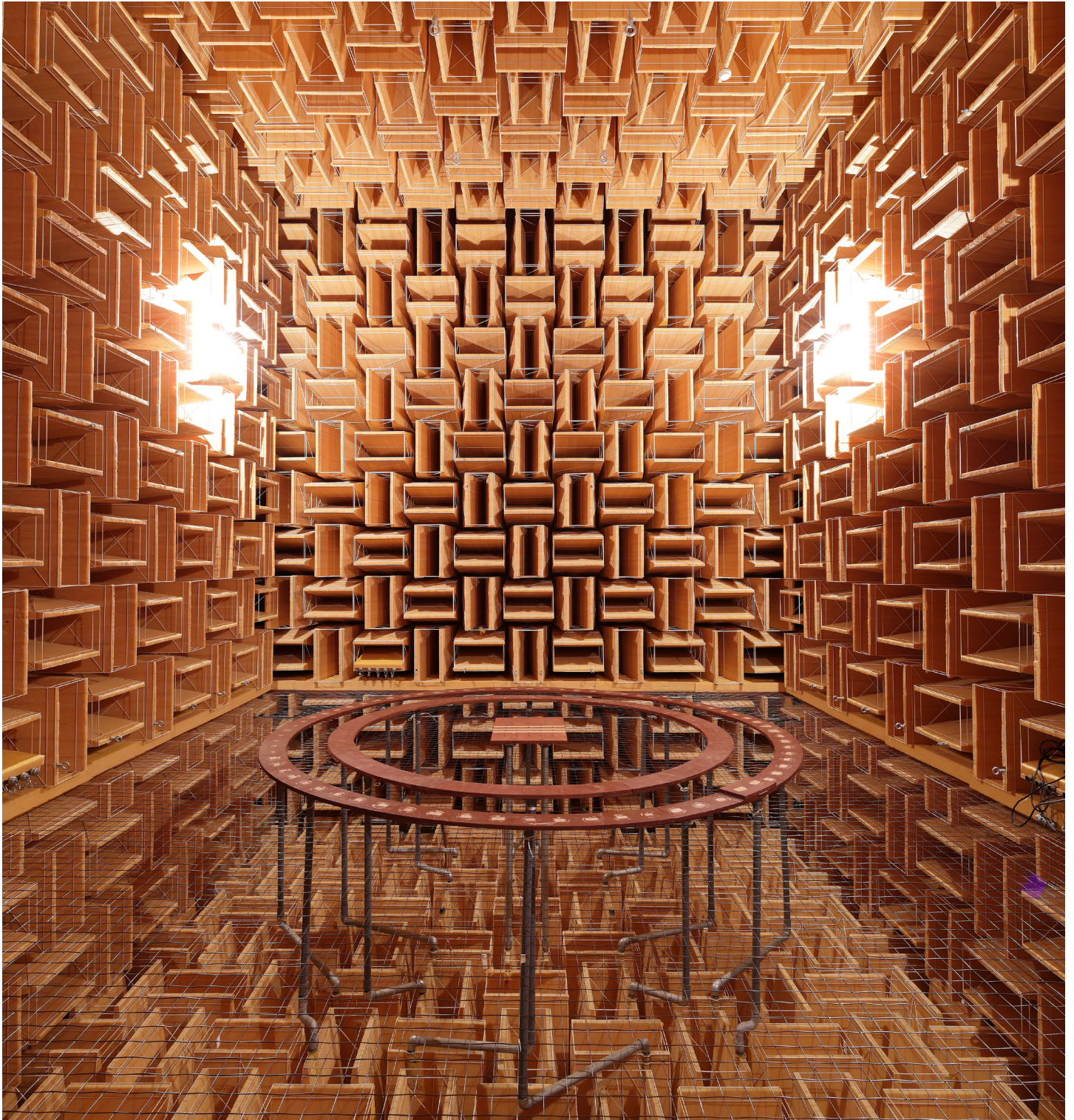
GENELEC ENABLES
SCIENTIFIC BREAKTHROUGH
AT JAPAN'S NAGAOKA
UNIVERSITY OF
TECHNOLOGY



Professor Yasunori Sugita, Deputy Director at Nagaoka University of Technology's Acoustic and Vibration Engineering Centre



NAGAOKA TECH'S ACOUSTIC AND VIBRATION ENGINEERING CENTRE ADDS 41.2 IMMERSIVE AUDIO SYSTEM



Auditory research has made remarkable strides in recent years, ushering in a new era in the understanding of sound perception and its diverse applications. From unravelling the intricacies of human hearing to the discoveries of audio technology, researchers worldwide have delved deep into the complexities of sound, uncovering its profound impact on various aspects

of human life. Japan's [Nagaoka University of Technology](#), fondly known as 'Nagaoka Tech,' is at the forefront of this field.

Nestled in the vibrant city of Nagaoka, the university has earned domestic and international acclaim for its innovative curriculum and commitment to practical training. With 80% of its students hailing

” GENELEC MONITORS OFFER THE EASE OF CALIBRATION ESSENTIAL FOR OUR RESEARCH NEEDS.

from technical colleges and offering integrated education up to the master’s degree level, the university has a well-deserved reputation for nurturing the next generation of aspiring engineers.

At the heart of Nagaoka Tech lies the Acoustic and Vibration Engineering Centre; a research hub dedicated to advancing the understanding of sound and its myriad applications. Established in 1984, the Centre houses a comprehensive suite of resources, including two reverberation chambers, an electromechanical acoustics laboratory and a psychological auditory laboratory. Among its features, the large anechoic chamber stands as the flagship of the Centre, designed to minimise sound reflections and provide an ideal

environment for conducting precise acoustic experiments.

“We’re dedicated to creating immersive sound experiences using a minimal number of loudspeakers,” explains Professor Yasunori Sugita, Deputy Director of the university’s Acoustic and Vibration Engineering Centre. “Understanding human auditory perception is paramount, driving us to explore technologies such as stereophonic sound through bone conduction – to aid visually impaired navigation and wheelchair control – through to sound localisation and recognition. Our students engage in diverse projects, from out-of-head sound image localisation to stereo acoustics, aiming to unravel the mysteries of sound



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perception and tackle real-world challenges.”

Marking a significant upgrade for the university, a large-scale 3D loudspeaker system, specifically a 41.2-channel configuration, was installed at the Acoustic and Vibration Engineering Centre at the end of 2022. The system serves as the cornerstone for various research endeavours, spanning sound field reproduction to the remote control of robots using virtual and augmented reality.

Professor Sugita intends to use this technology to create immersive audio environments mirroring real-world scenarios: “Although it’s now possible to reproduce visual information three-dimensionally

using head-mounted displays, it’s not yet been possible to reproduce sound, which is also crucial for remote control. We wanted to analyse the sound of the space in which a person is present and then reproduce it in a different space, so we ultimately focused on the importance of sound.

“I’ve been researching stereophonic sound for some time, and when it comes to measuring Head Related Transfer Functions, I need loudspeakers with completely flat characteristics that I can then easily tweak if needed. This is why we introduced a multi-channel 3D loudspeaker system that could reproduce the sound field more accurately, and this ultimately led us to collaborate with Genelec.”



Comprising Genelec's [8320](#) Smart Active Monitors and [7380](#) Subwoofers, the system is designed to meet the rigorous demands of the university's cutting-edge auditory research. "Genelec monitors not only meet our criteria but also offer the flexibility and ease of calibration essential for our research needs," states Professor Sugita. "Their scalability and stability as well as their compatibility with RME audio interfaces make them ideal for the precision needed in our research."

The implementation of the 41.2-channel system wasn't without its challenges.

Originally planned for installation inside an anechoic chamber, logistical challenges arose, necessitating a redesign. Thankfully, the installation frame was ingeniously transformed into a movable type, with the mid-layer mounted on a stand, allowing the system to be repositioned as per the demands of various experiments.

Elevating the system's capabilities is Genelec's [GLM](#) loudspeaker management software, facilitating precise control of individual loudspeakers. "GLM simplifies the calibration process, ensuring consistent performance across all channels," notes Professor Sugita. "This level of control is indispensable for our research, where accuracy and reliability are paramount."

User feedback echoes the sentiments of Professor Sugita, with many expressing admiration for the fidelity and immersive quality of sound reproduction. "Genelec monitors have surpassed our expectations. Their seamless integration and

intuitive operation make them indispensable for this type of research."

Looking ahead, Professor Sugita plans to deploy the immersive system for in-depth research initiatives such as 'Audio Spot' – which is aimed at delivering tailored sound experiences within shared spaces. By harnessing sound localisation and personalised audio delivery, this initiative has the potential to revolutionise industries spanning automotive to entertainment, offering exceptional levels of customisation and immersion.

Professor Sugita concludes: "I know that our students will make good use of this Genelec monitoring system for their auditory experiments, and I look forward to seeing how it will contribute to society at large."



KIT LIST

- 41 x 8320A
- 2 x 7380A
- 1 x GLM software

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