

ENCOMIUM FOR PETER D'ANTONIO

...for contributions to theory, design, and application of acoustic diffusers

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Peter D'Antonio was born in Brooklyn, New York. His family introduced him to the music of the big bands and close vocal harmony groups, and he also played French horn in a competing parish drum and bugle corps. His love of music continued into the doo-wop era of the 1950's, when he formed an acapella group called the Dialtones, and in later years,



he sang and played guitar in a cover band. He earned a B.S. in Physical Chemistry from St. John's University (1959-1963). His graduate studies were at the Polytechnic Institute of Brooklyn, where he graduated with a Ph.D. in Infrared Spectroscopy and a minor in X-ray crystallography. Following graduation, he began his professional career as a diffraction physicist at the Naval Research Laboratory in Washington, D.C. under the supervision of Nobel Laureate Dr. Jerome Karle. Peter studied the structure of matter in gaseous, amorphous, and crystalline phases, using electron, x-ray, and neutron diffraction, as well as electron and atomic force microscopy. He retired in 1996 following a distinguished career in fundamental structural research to focus on his passion for music composition, performance, recording, and a new career in architectural acoustics.

Peter began recording his compositions informally in his home in the early 1970s. As the music evolved and collaborators increased, there was a need for a soundproof recording studio, which he planned to locate in the basement of his residence. Never having designed a recording studio, his literature search revealed an article by Manfred Schroeder in the October 1980 issue of *Physics Today*, which described number-theoretic reflection phase grating (RPG) diffusers that were capable of uniformly scattering sound in concert halls. Inspired by these concepts and additional information on the acoustics of larger performance spaces he created a novel design for critical listening rooms. The design utilized a reflection-free zone, surrounding the listener to minimize interfering early reflections and simulate the initial time delay in larger spaces, and a diffuse field zone created with RPG diffusers on the rear wall to uniformly scatter incident sound and create an enveloping passive "surround" sound. Delving deeper into RPG theory, he surprisingly discovered that these diffusers were 2-dimensional periodic arrays similar to the 3-dimensional periodic crystal lattices he had been studying as a diffraction physicist. Peter was then able to design and model diffuser systems for recording studios using the Fraunhofer diffraction theory. The new design evolved into a commercial recording studio called Underground Sound.

Peter founded RPG Diffusor Systems in 1983 to evolve diffusive technology and manufacture commercial products. The first professional installation of the RPG diffusers was on the rear wall of the Oak Ridge Boys' Acorn Sound Recorders in Henderson, TN, in 1984. The new design became the standard in the recording industry.

Dr. D'Antonio was invited to join a team making acoustic measurements at Carnegie Hall for its 100th anniversary in 1989. These measurements resulted in the installation of RPG diffusers on the rear wall to remove a problematic slapback echo.

To verify the performance of diffusing surfaces, he designed and built the first experimental goniometer in 1993 to measure scattered polar responses at various angles of incidence. He and Trevor Cox developed a new diffusion coefficient from these polar responses, which was eventually standardized as ISO 17497-2 in 2012. Their collaboration also created three editions of the definitive text on sound absorbing and diffusing materials *Acoustic Absorbers and Diffusers: Theory, Design, and Application*. This notable effort is somewhat similar to the efforts made by Wallace Clement Sabine to quantify the acoustical properties of building materials as a major contribution to the field of architectural acoustics.

Dr. D'Antonio was invited to join the faculty at the Cleveland Institute of Music in 1991. During his tenure, he designed and experimentally evaluated a new variable acoustic modular performance shell (VAMPS) to provide variable local acoustics on stage. Following stage acoustic measurements at the Meyerhoff Symphony Hall in 2008, where Telarc was recording the Baltimore Symphony Orchestra, this new VAMPS design was installed to rave reviews from the orchestra and the conductor David Zinman.

Peter became Director of Research for a new company named RPG Acoustical Systems in 2017. He designed an Acoustical Research Center at the new facility incorporating a new experimental goniometer in addition to classical tools and the first virtual goniometer software (VIRGO), a Finite Element Model that predicts the polar responses and diffusion coefficient of a diffuser design. He also formed a company called REDI Acoustics with John Storyk and PK Pandey to create NIRO, the first AI Non-cuboid Iterative Room Optimizer software, to optimize critical listening rooms.

Beyond his professional accomplishments, Peter's original music library on Soundcloud and scholarly publications on Google Scholar serve as testaments to his enduring passion for both music and acoustics. His research methods have become the standards by which professionals and researchers around the world measure and model sound diffusion in rooms. His projects and publications established the state-of-the-art in the field of sound diffusion for decades. His willingness to discuss his research with students and practitioners in humble and forthright ways truly attests to his genuine and inspired desire to spread knowledge of architectural acoustics to the broadest possible audience. He has truly contributed in significant ways to the development of the "science of sound as it pertains to buildings" as defined by Wallace Clement Sabine.

Dr. D'Antonio constructively combined his passion for music and his diffraction physics experience to create an innovative career in architectural acoustics and pioneered the science of sound diffusion. His theories and innovations led to practical applications, transforming recording studios, educational facilities, worship spaces, performance venues, and home theaters. Peter was inducted into the recording industry's TECnology Hall of Fame in 2013. We are delighted and privileged that the Acoustical Society of America recognizes and honors Dr. Peter D'Antonio with this distinguished Wallace Clement Sabine Medal for contributions to the field of architectural acoustics.

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