CONVENTION REPORT

144TH

AES CONVENTION

Milan, Italy

May 23–26, 2018

Promoting this year's theme of "The Power of Sound," the AES 144th Convention, which took place 23–26 May in Milan, Italy, brought together audio industry professionals, students, educators, as well as top brands and audio service providers from around the world for the purpose of advancing the art and science of audio engineering. A dedicated committee of volunteers led by Alberto Pinto and Nadja Wallaszkovits, convention cochairs, had worked hard over the foregoing months to prepare a rewarding and comprehensive program of events.

OPENING CEREMONIES

AES Executive Director Bob Moses began the opening ceremonies by welcoming attendees and praising the volunteers and staff who make AES conventions possible. The spirit and dedication of those people was remarkable, he said, particularly thanking the convention chairs for their hard work in bringing the event together. Moses introduced AES President David Scheirman, who highlighted the attraction of the Milan region as having been rich with historical people significant at the intersection of arts and sciences, led by visionaries including Leonardo Da Vinci and Marconi. AES conventions, noted Scheirman, fulfill the AES's mission of promoting advancements in the science and practice of professional audio, "bringing leading people and ideas together."

2018 marks the 70th Anniversary of the Society, and Scheirman reminded the assembled delegates that in 1948, five individuals gathered to form the AES, which now counts over 12,500 members worldwide. In the past year, the AES has seen the creation of new professional sections in Nigeria

President, David Scheirman, opens the convention

Crowds at the opening ceremonies

and Taiwan, along with a new student section in Quito, Ecuador, the first AES sections in these countries. The AES has seen an eight-percent membership growth in the first quarter of 2018 compared to 2017. While highlighting the benefits of membership, including the largest repository of audio knowledge on the planet, Scheirman encouraged all audio professionals to become members and for all members to "get involved."

Scheirman in turn introduced the cochairs of the convention, Nadja Wallaszkovits (also AES president-elect) and Alberto Pinto, who thanked their convention committee members, sponsors, and supporters for bringing AES Milan to life. Pinto particularly welcomed those assembled to a city of art, design and culture, heritage, and indeed sound. He mentioned early electrical technology bringing light into La Scala opera house as early as 1883, from Milan's first power plant. Nadja Wallaszkovits was keen to highlight the 3D audio demo area at the convention, thanking those who had worked so hard to facilitate this, including Franz Zotter and colleagues from IABM in Graz.

Alberto Pinto and Nadja Wallaszkovits, convention cochairs, address the crowd at the opening ceremonies, explaining the program.

Bob Moses, executive director, welcomes delegates to Milan.

David Scheirman, AES president, speaks of the rich cultural history of Milan.

AWARDS

AES awards are presented to those who have rendered conspicuous service or made outstanding contributions to the field of audio in engineering, technology, service, and the arts. The ceremony in Milan, forming part of the opening ceremonies, began with recognition for convention papers presented by Bozena Kostek, editor of the AES *Journal*, and Sascha Spors,

Alex Case chairs the awards presentation.

papers cochair. The Best Student Paper Award went to Qingbo Huang, Xihong Wu, and Tianshu Qu, all of Peking University, for the paper "Bandwidth Extension Method Based on Generative Adversarial Nets for Audio Compression." The Best Peer-Reviewed Paper Award went to Leo McCormack, Symeon Delikaris-Manias, Angelo Farina, Daniel Pinardi, and Ville Pulkki for their paper "Real-Time Conversion of Sensor Array Signals into Spherical Harmonic Signals with Applications to Spatially Localized Sub-Band Sound-Field Analysis." (You can find a video interview with Leo as part of July's "Inside Track" magazine for AES members on the website.)

Four Board of Governors Awards, given for outstanding contributions to the Society, were also presented. The recipients were Maurycy Kin, for his work in support of the Polish professional audio community, to Sascha Spors and Nadja Wallaszkovits for co-chairing the 142nd AES Convention in Berlin, Germany, and to Toon Van Waterschoot for chairing the 60th International Conference on Dereverberation and Reverberation of Audio, Music, and Speech.

KEYNOTE

Rounding out the opening ceremonies was the keynote address by Marina Bosi, who provided an insider's view of the history of the science of perceptual audio coding, from its beginnings in the 1980s to the current state of the art, and giving a peek ahead to the future. "We see, more and more, compression as a technology enabler," she suggested. Data compression efficiencies along with improved audio quality at lower data rates have accommodated the moves to

Marina Bosi explains the history and science of perceptual coding during her keynote.

surround sound—first 5.1 and now extending to even 22.2-channel immersive surround. More channels are accommodated at higher compression rates with excellent audio quality, involving more control with flexible rendering to allow adaptation to whatever configurations a consumer might be using.

PSE AND EXHIBITION

World-renowned manufacturers of processors, amplifiers, transducers, and loudspeaker systems exhibited at and sponsored AES Milan, including Contralto Audio, Faital, ITEK, K-Array, PowerSoft, and Teknosign. Also in AES Milan's Exhibition Hall, in addition to exhibiting manufacturers, were Italian distribution companies AudioSales, ARET, Digiland, Midiware, Mogar Music, SMAPaudio, TEDES, and VD Music Group. Contributing to the technical program's Audio Applications Forum was K-Array's Daniele Mochi, addressing the topic "How Line Array Technology Has Inspired a New Approach to Microphones," while Claudio Lastrucci of Powersoft presented a case study on powering subwoofer cabinets at high levels with the title "Mains to Acoustic Efficiency."

Close to the exhibition area, and led by Glenn Lorbecki, the Professional Sound Expo (PSE) provided learning opportunities for

144TH CONVENTION AWARDS PRESENTATION

Best Peer-Reviewed Paper Award presented to Leo McCormack (T-shirt) and his colleagues.

Best Student Paper Award presented to Qingbo Huang, Xihong Wu and Tianshu Qu

David Scheirman presents Board of Governors Award to Sascha Spors.

Board of Governors Award presented to Nadja Wallaszkovits.

Board of Governors Award presented to Toon van Waterschoot.

Board of Governors Award presented to Maurycy Kin.

Attentive listeners in Genelec's demonstration room.

Top: Glenn Lorbecki speaking during the Professional Sound Expo. Bottom: Daniele Mochi, left, and Claudio Lastrucci provide lively explanations during the Audio Applications Forum.

anyone registered with an Exhibits-Plus badge. Short practical engineering talks and demos led by experienced industry professionals included themes of sound reinforcement, studio recording, and audio networking. Jan Lykke of NTP introduced visitors on a couple of occasions to the question of "The Networked Studio: A Dream or Reality?" looking at the use of technologies such as Dante and AES67 in music and postproduction studios. In "The Italian Way," Marco Borsatti, Sabino Cannone, and Luca Pilla explained how two of the very best Italian sound engineers work for international productions while staying in Italy. Technology has radically changed and enabled their current workflow, it emerged. Italian manufacturers were strongly in evidence during the PSE. Faital's Marco Baratelli and Grazia Spatafora presented on "The Importance of Thermal Simulation in Loudspeaker Design: Case Study for a Compression Driver." K-Array's Mochi discussed "The Advantages of Electronic Beam Steering and Its Relation with FIR Filters" and "The Longer, the Better: K-array's Pure Array Technology Explained."

SPECIAL EVENTS

Available to all attendees, the program of special events in Milan included an extensive organ concert, this time given by convention cochair Alberto Pinto at the Chiesa Cristiana Protestante in central Milan. The organ in the Protestant Church of Milan is one of the most interesting instruments of Northern Italy. Designed under the consultancy of Prof. Luigi Ferdinando Tagliavini in 1969 and built by one of the major Italian organ builders, the Tamburini Pontifical Organ building firm of Crema, it represents the first example in the country of a modern organ endowed with a Rückpositiv (a division of pipes behind the back of the player, and usually closest to the listeners). Pinto's comprehensive program included works by Pachelbel, Buxtehude, and Bach, well suited to this instrument of varied tone colors and detailed articulation.

Immersive Audio – "Does it Make a Difference?" (chair Daniel Duboy)

Recent AES Gold Medal awardee, Malcolm Hawksford, was the speaker for the Technical Council's Richard C. Heyser Memorial Lecture at the 144th Convention. Malcolm's lecture, entitled "Understanding High Quality Audio—A Personal Journey," was a tour of his life's work on the factors that really affect sound quality, both analog and digital. Early on he made clear the basis of the "Hawksford Conjecture" about the effect of sampling rates on digital audio, suggesting that we only hear signals within the audible band—perhaps being generous this could be up to 25 kHz. The advantages of using higher sampling rates are not to be confused with hearing ultrasonic signals, he proposed. It's also possible that the state of electronic systems can alter in the absence of ultrasonic signals due to non-linearity, power supply issues, and jitter. Jitter is essentially an effect on the timing of audio signals that is both unavoidable and unwelcome, said Malcolm, who proceeded to debunk a number of hi-res audio myths and look at some clever new approaches to sample-rate conversion. Among the many topics covered were novel RIAA preamps and amplifier error correction, just a few of the things to which our

Heyser Lecturer Malcolm Hawksford (left) is presented with a certificate by Technical Council officers Francis Rumsey (center) and Jürgen Herre.

David Scheirman goes "Back to the Future" for his special event talk.

Heyser lecturer had applied his lively brain over the course of an academic career.

Toward the end of the Friday morning, current AES President David Scheirman offered a talk in the special events hall titled "Back to the Future, a Technology Project Review: Outdoor Sound Reinforcement of Symphony and Opera for Extremely Large Audiences." From 1991–95, Scheirman had led a team to deploy and operate a futuristic outdoor sound reinforcement system, pioneering innovative and advanced technologies now taken for granted. During his talk he described system design attributes and operating principles of a fully-distributed portable sound reinforcement system deployed in public parks throughout New York City.

Entirely appropriate for a convention in a city so closely associated with design in all its forms, Jacob Mathew and Andrea Pivetta delivered a session dedicated to the aesthetics of audio design and in particular the innovative world of loudspeaker design aesthetics. Focusing on the work of a selection of inspirational audio designers, the session introduced a brief history of audio design principles, processes, and technologies, as well as the materials that are used to develop these icons of audio.

The convention banquet on Friday evening was enjoyed by a large number of people, held at the famous Grand Hotel Et De Milan. The hotel is an 18th-century mansion best known as the Milanese house to Giuseppe Verdi, where the composer wrote the operas *Othello* and *Falstaff*. After an aperitif served in the large Chimney Hall and in the adjacent Gerry's bar, the assembled company moved to the Puccini lounge for dinner, which included a selection of traditional Milanese dishes. Decorated with a prestigious collection of paintings by Maria Luigia d'Austria, the Puccini lounge was seen to be a classic example of nineteenth century liberty architecture.

PAPERS AND ENGINEERING BRIEFS

Brought together by the good offices of papers chairs Ville Pulkki and Sascha Spors, presentations from more than 100 authors from around the world covered topics including loudspeakers, audio quality, applications, spatial audio, processing, perception, audio education, and more. Twenty-five paper and poster sessions and 5 engineering brief sessions provided a forum for the world's audio researchers and developers to share the results of their most recent work. Presentations took place in one of the many meeting rooms and also around a busy poster area, where people gathered to discuss aspects of presenters' work, perhaps hearing some examples on a laptop and headphones.

As is often and still the case at AES conventions, loudspeaker-related work was very much in evidence, with particular emphasis in Milan on measurement and testing regimes, including end-of-line tests for the many production situations where time is a crucial factor. "Fast and Sensitive End-of-Line Testing," a presentation by Stefan Irrgang and Wolfgang Klippel, for example, discussed new strategies minimizing the test time for transducers and audio systems while ensuring high sensitivity of defect detection. There were also a number of papers and e-briefs on topics related to acoustical modeling, both of large and small room systems, including car cabins and sound systems.

Spatial audio and perception continue to be popular topics for AES convention authors, and Milan was no exception here. Spatial audio research has for some time moved well beyond horizontal surround sound and has become concerned with representing depth and height in the sound field. There's the big challenge of how to generate sound that suits the growing number of different reproduction formats possible, as well as how to handle workflows and rendering for situations

where the listener is not stationary, such as in virtual reality. A poster from Enda Bates and his colleagues from Dublin, for example, highlighted the challenges of the latter in "A Recording Technique for 6 Degrees of Freedom VR," where a new microphone technique and reproduction approach that can support listener movement within sound fields was discussed.

You can find the full listing of all the papers presented at the 144th Convention in the abstracts starting on p. 648 in this issue of the *Journal*.

WORKSHOPS AND TUTORIALS

Magdalena Piotrowska and Natanya Ford, as workshops and tutorials chairs, had coordinated a remarkable 33 workshops and nearly 30 tutorials to be presented during the four days of the event. These sessions tend to be less based on the results of personal research than papers, and more intended to communicate the expertise of individuals or panels on a topic of current importance to audio engineering. As such they offer outstanding educational opportunities for a wide range of delegates.

Among the many offerings available in Milan, Nuno Fonseca's "Crash Course in 3D Audio" provided a primer for the confused as an opener for the convention. Although most 3D audio concepts have already existed for decades, he pointed out, the interest in 3D audio has increased in recent years, with the new immersive formats for cinema or the rebirth of VR. The tutorial presented the most common 3D audio concepts, formats, and technologies allowing the audience to understand buzzwords like Ambisonics/HOA, binaural, HRTF/HRIR, channel-based audio, object-based audio, and Atmos, among others.
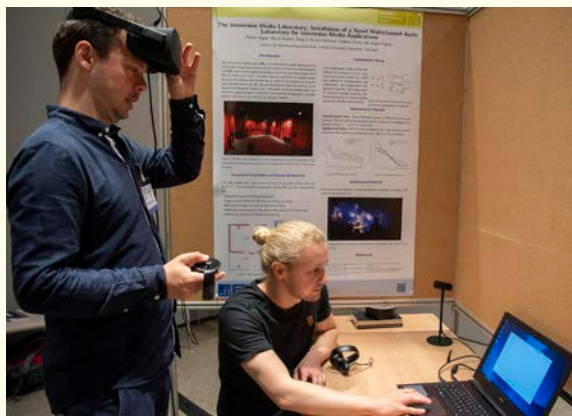
Special tracks designed by the program committee enabled visitors to plan their program around themes of their particular

Papers authors busy on the stage: Annika Neihardt (top), Leo McCormack (left), and Filippo Fazi (above).

A packed audience for Hyunkook Lee's tutorial on the psychoacoustics of 3D audio

Demonstrating immersive audio on a VR headset during a poster presentation on "The Immersive Media Laboratory"

interest, including game audio and VR, immersive audio, recording and production, sound reinforcement, product development, signal processing, networked audio, and "The Power of Sound." Importantly for a European Convention, a Product Development track ran over all four days, including a comprehensive program of workshops and tutorials to do with designing and making audio equipment. "Build a Synth for Android" with developer Don Turner built a synthesizer app from scratch on the widely used Android platform that has over 2 billion users. He demonstrated methods for obtaining the best performance from the widest range of devices, as well as how to take advantage of the new breed of low-latency Android pro audio devices. Alfred Svobodnik of the Technical Committee on Automotive Audio gave a fascinating insight into "The Challenge of Loudspeaker Integration in Automotive Audio Applications," discussing the major challenges of automotive loudspeaker packaging and possible solutions to improve the acoustical quality.

STUDENT EVENTS

The student program at conventions has grown into a large and successful operation led by the Education Committee and the Student Delegate Assembly. Kyle Snyder had worked hard with the student body to put together a complete track of events including on career development. Student recording critiques and competitions form a large part of this activ-

A surprise guest appearance from the first ever Student Delegate Assembly chairs, Frank Swarte and Roelien Gorter.

A hive of activity at the Saul Walker Design Competition.

Prizes from PSP Audio for student competition winners, with Education chair Kyle Snyder.

ity, during which students can get feedback on their work or be judged on the results. A distinguished panel of judges participates in critiquing finalists of each category in an interactive presentation and discussion.

The Student Design Competition was recently renamed in memory of Saul Walker. Students were given the opportunity to show off their designs at this poster/tabletop exhibition, which was free and open to all convention attendees. Presenting an opportunity for aspiring student hardware and software engineers to have their projects seen by the AES design community, it was an invaluable career-building event and a great place for companies to identify their next employees. Students from both audio and non-audio backgrounds were encouraged to participate.

TECHNICAL TOURS

Milan is not short of interesting places to visit for those wishing to take time away from the convention center. Tours chair Giacomo De Caterini had organized five tours, one of which took visitors to the famous Tetro Alla Scala opera house. La Scala was founded under the auspices of the Empress Maria Theresa of Austria in order to replace the Royal Ducal Theatre which was destroyed by fire on 26 February 1776 and had until then been the home of opera in Milan. Delegates could also visit the Sforza Castle in the heart of Milan, which now houses several museums and art collections, as well as a large collection of musical instruments and the restored equipment of RAI's experimental electronic music studio, founded by Luciano Berio and Bruno Maderna in the 1950s. Nearby was the church of San Maurizio al Monastero Maggiore, which hosts the oldest Milanese pipe organ, built in 1554 by Gian Giacomo Antegnati. Visitors could experience the present organ, which is a partial reconstruction made by the famous Italian organ builder Famiglia Artigiana Vincenzo Mascioni.

Further tours during the convention included the Violin Museum, exploring five centuries of violin making in Cremona, coupled with a visit to the electroacoustic music labs at the Politecnico di Milano. A visit to the Italian headquarters of the European broadcaster Sky TV followed on Friday. The tour began with a visit to the TV studios, control rooms, and everything related to production, after which visitors explored the postproduction workflow and MCR up to the final play-out. Finally, on Friday afternoon, one could enjoy a visit to INRIM, a public research center acting as Italy's national metrology institute. The tour included the Electroacoustic Institute "Galileo Ferraris" including the electroacoustic laboratory where acoustic experiments are conducted. Following this, delegates were taken on to RAI (Italian Radio Television) Centre for Research and Technological Innovation, completing the tour at the RAI auditorium "Arturo Toscanini." The Auditorium was built in 1856 and worked under the name Teatro Vittorio until 1952 when RAI rebuilt it and made it the house of the RAI Symphonic Orchestra of Turin and from 1994 the house of the unified RAI National Symphonic Orchestra.

TECHNICAL COUNCIL AND STANDARDS MEETINGS

An AES Convention would not be complete without the series of Standards Committee meetings, where the industry's leading

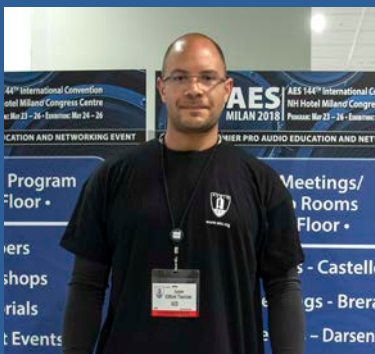Convention cochairs: Nadja Wallaszkovits and Alberto Pinto

Papers chairs: Ville Pulkki and Sascha Spors

Convention advisor: Umberto Zanghieri

Student and career events chair: Kyle Snyder

Facilities chair: Layan Thornton

Professional Sound Expo chair: Glenn Lorbecki

Tutorials and workshops cochair: Magdalena Piotrowska

AES THANKS THE 144TH CONVENTION COMMITTEE

Students with volunteers chair Michele Marino Gallina (right, standing)

Tech Tour group before departure, with chair Giacomo De Caterini, center

Top: Education Committee chaired by Kyle Snyder
Middle: Technical Council chaired by Francis Rumsey
Bottom: Standards Meeting chaired by Bruce Olson and Rich Cabot

Top: Regions and Sections forum chaired by Tony Schultz
Middle: Diversity and Inclusion Committee chaired by Leslie Gaston-Bird
Bottom: Publications Policy Committee chaired by Josh Reiss

systems and product engineers come together to chart a course for interoperability in the market place. With Richard Cabot now fully in place as AES Standards Manager, the new Standards Sustainer program is going from strength to strength. Unlike other organizations, the AES does not charge individuals or their companies for participating in standards development. This helps AES standards reflect a consensus between all interested parties, not just the largest and best funded. From the beginning of the AES Standards activities it was felt that open participation would yield better standards. Even small companies who couldn't afford to pay for participation would have a voice and insure that standards served broader applications than just what their major proponents could foresee. This openness also encourages innovation. Many of the brightest people are in small companies or are independent. Becoming an AES Standards Sustainer provides much needed funding, allowing the AES to continue this open development model and insures that these standards are in place when the industry needs them.

In addition, the series of AES Technical Council meetings bring together the leaders in each audio field to discuss trends, bring together the results of study groups, and develop themes for upcoming convention and conference events. A full program

of these meetings took place in Berlin, culminating in a plenary committee meeting on the last day chaired by Francis Rumsey.

IN CONCLUSION

AES conventions do not happen of their own accord. They invariably involve months of dedication and hard work by a mostly volunteer workforce that brings about research dissemination and educational opportunities for the industry and academia at large. This is partnered by the vital process of bringing together exhibitors and sponsors to create an exhibition for the latest audio technology and services. Thanks to the dedication of the volunteers involved, supported by a lot of hard work from headquarters staff and contractors, the AES Milan Convention can be hailed as a resounding success.

Editors note: papers from this convention can be downloaded from the AES E-Library at www.aes.org/e-lib.

The AES Board of Governors meets at the end of the convention.