



# AUDITORIUM ACOUSTICS 2023

28–30 September 2023

Stavros Niarchos Foundation Cultural Center, Athens, Greece

## WEDNESDAY 27 SEPTEMBER 2023

17:00 Early registration and meet up at the bar at the Athens Marriott Hotel

19:00 Registration closes

## THURSDAY 28 SEPTEMBER 2023

09:00 Refreshments and Registration

10:20 Welcome: Raf Orlowski, Conference Chair

### Opera House Acoustics

Chair: Eckhard Kahle

10:30 Acoustical challenges in horse shoe shaped opera houses

Anders Christian Gade, Gade & Mortensen Akustik, Denmark

10:50 Subjective listening studies conducted by Arup at a leading Western opera house

Philip Wright, Arup, UK

11:10 Absence of seat-dip in the stalls of the Teatro Colón in Buenos Aires

Gustavo Basso, National University of La Plata, Argentina

11:30 Teatro São Carlos – another opportunity for improvement of the main Portuguese Opera House

Octávio Inácio & Daniel José, InAcoustics, Portugal

11:50 Refreshments & Posters

### The Design of the Stavros Niarchos Foundation Cultural Center

Chair: Anne Minors

12:10 The design of the opera theater auditorium and a reflection on the reciprocal influence between opera house and concert hall design

Alban Bassuett, Arup, USA

12:30 Flexible acoustics and sound system design to accommodate programming inside and Outside the Venue Spaces

Ryan Bizorek, Arup, USA

12:50 The Architectural Design of the Stavros Niarchos Foundation Cultural Center

Vassily Laffineur, RPBW Architects, France

13:10 Lunch & Posters

14:00 Auditorium Visit

15:00 Sound isolation and HVAC noise control: design versus practical challenges and constructability

Rachid Abu-Hassan, Arup, USA

### Auditorium Acoustics

Chair: Philip Wright

15:20 Thoughts on whole stage imaging for theatres

Peter Exton, Marshall Day Acoustics, Australia

15:40 Perception of musical dynamics: orchestra spectra combined with auditory modeling

Tapio Lokki & Pedro Llado, Aalto University, Finland

16:00 Biometric evolution of space

Paul Bavister, University College London, UK

16:20 Refreshments & Posters

17:00 Good view or good acoustics? Can I have both?

Yuxiao Chen, Marshall Day Acoustics & Densil Cabrera, University of Sydney, Australia

17:20 Music, room, two ears, design and paradigms

Magne Skålevik, AKUTEK and Brekke & Strand, Norway

17:40 The influence of early reflection surface size in concert halls

Evan Green, Vincent Berrier, Thomas Wulfrank, Eckhard Kahle, Kahle Acoustics, Belgium

18:00 Close

## FRIDAY 29 SEPTEMBER 2023

### 09:00 Refreshments

#### Concert Hall Acoustics

Chair: Mike Barron

#### 09:30 Acoustic effects of long-delayed reflections from rear walls in a shoebox hall

Toshiki Hanyu, Akane Kawai, Ryoichi Suzuki, Kazuma Hoshi, Nihon University, Japan

#### 09:50 Why do large concert halls need to be optimized for early reflection coverage?

Eckhard Kahle, Yann Jurkiewicz, Evan Green, Vincent Berrier, Kahle Acoustics, Belgium

#### 10:10 Zone to zone reflector optimisation using a genetic algorithm

John O'Keefe, O'Keefe Acoustics, Canada

#### 10:30 Early reflector geometry optimization methodology

Alexandros Galatas & Konstantinos Dadiotis, ACC Acoustics Consultancy Company, Greece

### 10:50 Refreshments & Posters

#### Concert Hall Acoustics

Chair: Anders Gade

#### 11:40 Acoustics upgrade for the Concert Hall of the Sydney Opera House

Gunter Engel & Jürgen Reinhold, Müller-BBM Building Solutions, Germany

#### 12:00 Transforming David Geffen Hall – a story of the world's most infamous concert hall

José A. Nepomuceno, Akustiks, Brazil & Christopher N. Blair, Akustiks, USA

#### 12:20 Fine tuning of Sibelius Hall stage acoustics

Petri Lehto, Henrik Møller, Jukka Pätynen, Javier Gómez Bolaños, Perttu Laukkanen, Sara Vehiläinen, Akukon, Finland

#### 12:40 Listening and dynamics – some challenges with a highly absorptive stage environment

Svein Folkvord, COWI, Norway

#### 13:00 Appreciation of Russell Johnson 1923–2007 Acoustician and Architect

Bob Essert & Anne Minors, Imagine Sound, UK

### 13:10 Lunch

#### Classical Theatres

Chair: Raf Orłowski

#### 14:10 Connection between iconography and reverberation performance of Byzantine temples: experimental investigation

Panagiotis Karampatzakis, Aristotelian University, Greece

#### 14:30 How did Epidaurus sound when it was full? Directional measurement of impulse response for an improved computer model

Ian Rees, Adrian James Acoustics Ltd, UK

#### 14:50 Open-air Amphitheatre in Andros

Konstantinos Dadiotis, Alexandros Galatas, ACC Acoustics Consultancy Company, Koula Kondylatou, Kostas Loukos, K Loukas and Partners, Greece

#### 15:10 The acoustic design of Amphitheatre 'Ioannis Despotopoulos' in Athens Conservatoire, Athens, Greece

Theo I. Niaounakis, Theta Acoustics, UK

### 15:30 Refreshments & Posters

#### Small Auditoria/Rehearsal Rooms

Chair: Henrik Møller

#### 16:30 A 350 seats concert hall auditorium with 'budget' version concrete side walls: acoustics design and performance

Andrzej Klosak, Cracow University of Technology, Poland & Anders Christian Gade, Gade & Mortensen Akustik, Denmark

#### 16:50 In situ acoustic efficiency of variable broadband absorption in music rehearsal studio's and music halls

Maarten Luykx, Peutz Consultants, Netherlands

#### 17:10 Optimizing (too) small ensemble rehearsal rooms for acoustic loud music

Bård Støfringsdal, COWI AS, Norway

#### 17:30 The research behind the design of a new variable acoustics technology

Niels W. Adelman-Larsen, Flex Acoustics, Denmark

### 17:50 Close

#### Conference Dinner – The Orizontes Lycabettus Restaurant, Lycabettus Hill

Please see the website for more details



## SATURDAY 30 SEPTEMBER 2023

### 09:00 Refreshments

#### Measurements

Chair: Tapio Lokki

#### 09:30 Size matters: new ways of working with scale models

Brian FG Katz, Peter Stitt & Antoine Weber, Sorbonne University, France

#### 09:50 Auralization of orchestra based on 1/10 scale model experiment

Takayuki Hidada, Kazunori Suzuki & Shin-ichiro Koyanagi, Takenaka Research & Development Institute, Japan

#### 10:10 Immersive auralisation for choral ensembles

Sarabeth S Mullins & Brian FG Katz, Sorbonne University, France

#### 10:30 A software tool for auralization of simulated sound fields

Jens Ahrens, Chalmers University of Technology, Sweden

### 10:50 Refreshments & Posters

#### Measurements & Theory

Chair: Evan Green

#### 11:50 Measurements in room acoustics – How good are we at it?

Ingo B. Witew & Michael Vorländer, RWTH Aachen University, Germany

#### 12:10 Lateral fraction or cross-correlation for spatial impression?

Mike Barron, Consultant, UK

#### 12:30 Revisiting Sabine's formula

Jean-Dominique Polack, Sorbonne University, France

#### 12:50 Efficiency and uncertainties of sound energy decay analysis in auditoria

Ning Xiang, Rensselaer Polytechnic Institute, USA & Zuhre Su-Gul, Bilkent University, Turkey

### 13:10 Lunch

#### Intelligibility

Chair: Alban Bassuet

#### 14:10 Imagine sound – Combining natural acoustics and audio in a debating chamber

Bob Essert, Imagine Sound, UK

#### 14:30 Round and round we go: Intelligibility and localization for in-the-round spaces

Luca Dellatorre, Charcoalblue, UK

#### 14:50 The Shakespeare North – Acoustic design of a Jacobean Theatre in Liverpool

Onur Gulen, AECOM, UK

#### 15:10 Covid, separation & all that Jazz

Anne Minors, Imagine Sound, UK

### 15:30 Refreshments & Posters

#### Active Acoustics

Chair: Bob Essert

#### 16:30 Room acoustic measurements in halls with electro-acoustic enhancement systems

Henrik Möller, Aalto University, Finland and Lukasz Blasiński, Adam Mickiewicz University, Poland

#### 16:50 Evaluation of a geometric approach to active acoustics

Volker Werner, Fabio Kaiser, Clemens Frischmann, Amadeus Acoustics, Austria

#### 17:10 A comparison of musical performances in different acoustic environments created with an active acoustics system

Benedikt Roß, Amadeus Acoustics, Germany

#### 17:30 The significance of excellent concert hall acoustics for audio recordings of classical music

Pauline Heister, University of Music and Performing Arts Vienna, Austria

#### 17:50 Room acoustic design of a 15000-capacity multipurpose arena

Perttu Laukkanen, Janne Riionheimo, Jukka Pätynen, Akukon, Finland

### 18:10 Closing Remarks

### 18:20 Close of Conference

### Thursday Posters

#### Remedial Acoustics in Monumental Lecture Auditoria of Neoclassicism in Athens

George Xanthoulis, Atkins, UK, Giannis Karagiannis, George Poulakos & Alexandra Sotiropoulou, National Technical University of Athens, Greece

#### Acoustic discovery of the Roman theatre of Volterra: two reconstruction hypotheses in comparison

Antonella Bevilacqua, Wlodek Fuchs, University of Parma, Italy

#### Acoustic Assessment of Argos Ancient Theatre in Greece

George Cambourakis, Giannis Karagiannis, Alexandra Sotiropoulou, Panos Koukoutas, National Technical University of Athens, Greece

#### Homeric sounds: recording, classification and comparison of sound phenomena in Iliad and Odyssey

Ilias Papageorgiou, NTUA, Greece; Fotis Papegeorgiou, GISMA University of Applied Sciences, Germany

#### Classical auditoria in the Mediterranean of universally acknowledged acoustics: evaluation of the use of electroacoustic amplification

Giasemi Kilaidoni, Actress, Alexandra Sotiropoulou, Giannis Karagiannis, National Technical University of Athens, Greece

#### New Academy of Music in the suburbs of Athens: architectural language and acoustical solutions

Aikaterini Bousia Alexaki, Tasis Papaioannou, Giannis Karagiannis, Alexandra Sotiropoulou, National Technical University of Athens, Greece

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### Chopin musical scales: architecture and acoustic design of new opera house in Poland

Kassandra Christoula, Elora Christoula, Vassiliki Giannoutsou, Vassilios Ghikapeppas, Giannis Karagiannis, Alexandra Sotiropoulou, National Technical University of Athens

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### Sound strength measurements using a pre-calibrated omni-directional source

George Koutsouris, Claus Lynge Christensen, Antoine Richard, Jens Holger Rindel, Odeon, Denmark

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### Development of an omnidirectional source for acoustical scale-model measurements

Etienne Larochelle, Vincent Berrier, Thomas Wulfrank, Evan Green, Kahle Acoustics, Belgium

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## Friday Posters

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### Converting an office building into a Chamber Hall – the CBSO Academy, West Bromwich, UK

Michael Whitcroft, Hoare Lea, UK

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### Acoustic renovation of a circular-shaped small music hall

Ok Cheol Ahn, Yong Hee Kim, Youngsan University, Republic of Korea, Sang Eun Jeon, Pusan National University, Republic of Korea

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### Measurements of auditorium seats "in the time of Cholera" – challenges in design concert hall auditorium seats during pandemic

Andrzej Klosak, Cracow University of Technology, Poland; Anders Christian Gade, Gade & Mortensen, Akustik, Denmark; B Ziarko, Cracow University of Technology, Poland

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### Brazilian performing arts center acoustical and architectural database

José Augusto Nepomuceno, Acústica & Sônica, Brazil & Akustiks, USA

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### Placement of absorption material: DIN 18041 is totally misleading

Tapio Lokki, Aalto University, Finland

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### Room acoustics mismatches of rehearsal spaces and concert halls and their impact on music performance

Giorgos Dedousis, Konstantinos Bakogiannis, Areti Andreopoulou, Anastasia Georgaki, National and Kapodistrian University of Athens, Greece

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### Single-value frequency-average measures of early decay time and clarity index to predict reverberance and clarity

Fernando del Solar Dorrego & Michelle C Vigeant, Penn State University, USA

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### On the seat-dip effect and seating area design

Henna Tahvanainen & Tapio Lokki, Aalto University, Finland

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### A method for automated system calibration in active acoustics systems

Clemens Frischmann, Fabio Kaiser, Volker Werner, Gernot Kubin, Amadeus Acoustics, Austria

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## Saturday Posters

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### herisSon – an innovative tool for Spatial Room Impulse Response (SRIR) measurements

Serafino Di Rosario, Johan Sick, Romain Darracq, Sylvain Guitton, LINK Acoustique, France

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### Concert halls in virtual reality – From audio-visual perception to a common vocabulary

Jonas Heck, Josep Llorca-Bofi, Michael Vorländer, RWTH Aachen University

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### Improvement of stage-to-pit balance using computer simulation in a multi-purpose hall without an orchestra pit

Sang Eun Jeon, Pusan National University, Republic of Korea and Yong Hee Kim, Youngsan University, Republic of Korea

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### Finding early Time Limits with Nonlinear Regression on Energy Decay Curves

Chang-Qing Xia, Hong Kong Polytechnic University, Hong Kong

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### Using non-wave based modelling to explore how much acoustic diffusion is too much in a concert hall

Michael Fort, Ramboll, UK

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### Objective room acoustics parameters and the use of simple mathematical formulas as design inducers: a practical tool for architects in the beginning of performance halls design

Lineu Passeri Júnior, Passeri Acústica, Brazil; Stelamaris Rolla Bertoli, University of Campinas, Brazil

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### Subjective localization of a sound source in immersive sound system and stereophonic loudspeakers system

Łukasz Blasiński, Adam Mickiewicz University, Poland

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### Comparing measured sound strength to theory as a function of reverberation time and room volume

Joshua Dunham, Tenor Engineering, USA

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### Spatial articulation and acoustics: an educational perspective

Kalliopi Chourmouziadou, International Hellenic University, Greece

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