

Curriculum Vitae: Stefan Bilbao

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04/09/2020

Employment History

2017- Professor, Reid School of Music, University of Edinburgh (formerly Reader, 2013-2017, Senior Lecturer, 2007-2013, and Lecturer, 2005-2007).
2002-2005 Lecturer, School of Music/Sonic Arts Research Centre, Queen's University Belfast.
2001-2002 Postdoctoral Research Fellow, Space Telecommunications and Radioscience Laboratory, Stanford University.

Education

2001 Ph.D. Electrical Engineering, Stanford University.
1996 MSc. Electrical Engineering, Stanford University.
1992 B.A. Physics, Harvard University.

Research Interests

Numerical Method Design: Time domain methods for distributed systems, including: geometric and Hamiltonian integration techniques; passive numerical models of viscothermal effects; stability verification; implicit methods; modeling of complex boundary conditions; fluid/structure interaction; parameterized and optimised methods; perceptual constraints on numerical methods in audio.

Digital Sound Synthesis: Digital sound synthesis methods based on acoustic models, for nearly all instrument families: brass, woodwind, percussion, plucked string, bowed string, keyboard.

Audio Effect Design: Digital audio effect design based on physical models of electromechanical analog audio effects, including plate and spring reverberation. Antialiasing methods in audio.

Architectural and Virtual Acoustics: Wave based simulation of large acoustic spaces in 3D, suitable for high-quality artificial reverberation, concert hall prototyping, and spatial audio in virtual environments.

Highly Parallel Algorithms: Parallelization of time stepping algorithms, including fast linear system solvers for large sparse, structured systems. Applications to very large problems in architectural acoustics, and to highly nonlinear systems.

Nonlinear Systems: Robust numerical design suited to highly nonlinear systems in musical acoustics/audio, including phenomena such as: shock wave formation in acoustic tubes; transition to turbulence in nonlinear plate and shell structures; nonlinearities in string vibration.

Joint Work with Composers: Work with composers on creating synthetic pieces of multichannel music, performed on approximately 70 occasions worldwide. Individual assistance, as well as workshops.

Research Grants

2017 Staff mentor, Leverhulme Trust Early Career Fellowship for Dr. Michele Ducceschi. *Modeling of the Double Bass*. Project duration: 3 years. £90 000.
2016 Principal investigator, European Research Council Proof of Concept Grant. *Wave-based Room Acoustics Modeling (WRAM)*. ERC-2016-PoC-737574-WRAM. Project duration: 1.5 years. 149 348 Euro.
2014 Staff mentor, Royal Society/British Academy Newton International Fellowship for Dr. Michele Ducceschi. *Real-time Sound Synthesis of Impacted String Instruments with Sophisticated Nonlinear Contact Laws*. Project duration: 2 years. £96 750.

- 2013 Researcher, Marie Skłodowska Curie Initial Training Network. *Basic Acoustics Training and Workprogram On Methodologies for Acoustics Network (BATWOMAN)*. FP7-PEOPLE-ITN-2013, number 605867. Project duration: 4 years. 3.8 million Euro (UoE share: £240 000).
- 2011 Principal investigator, European Research Council Starting Grant. *Listening to the Future: Next-generation Sound Synthesis and Audio Processing through Simulation (NESS)*. ERC-2011-StG-279068-NESS. Project duration: 5 years. 1.48 million Euro.
- 2011 Principal investigator, Knowledge Transfer Fund, University of Edinburgh. UoE Internal funding, IKTF 8P-2603. *Real time implementation of physical audio effects*. Project duration: 4 months. £10 000.
- 2010 Principal investigator, IDEALab project. UoE Internal funding. Topic: Large-scale physical modeling sound synthesis on GPGPUs. Project duration: 4 months. £12 000.
- 2009 Principal investigator, Carnegie Trust Grant. *Spatialised physical modeling sound synthesis*. Project duration: 6 months. £2 500.
- 2006 Principal investigator, Digital Music Research Network/SpaceNet call for works. *Spatialised physical modeling sound synthesis*. Project duration: 4 months. £1 000.
- 2006 Principal investigator, Leverhulme Research Grant. *Creative use of advanced digital sound synthesis*. RF/6/RFG/2006/0232. Project duration: 2 years. £24 474.
- 2005 Co-investigator, Agence Nationale de la Recherche (French government) grant. *Consonnes*. Project duration: 3 years. 430 000 Euro.
- 2005 Principal investigator, EPSRC First Grant. *Novel Numerical Approaches for Physical Modelling Sound Synthesis*. EP/C007328/1. Project duration: 3 years. £83 500.
- 2004 Co-investigator, Joint Digital Theatre Systems/Invest Northern Ireland funded project. Audio source separation, and dereverberation. Project duration: 3 years. £1 million.
- 1998 Bosack Kruger Foundation Fellowship. Sum awarded: Fees for PhD study for three years, and stipend of 18 000 USD annually.
- 1994 Stanford University CCRMA Industrial Affiliates Fellowship. Sum awarded: Fees for MSc/PhD study for three years, and stipend of 18 000 USD annually.
- 1992 Harvard University/Ecole Normale Supérieure Exchange Fellowship. Topic: Computer Music. Awarded to one graduating student at Harvard University annually, allowing for living quarters and a stipend in at the Ecole Normale Supérieure in Paris for one year. Sum awarded: 10 000 USD and living expenses for one year.

Research Supervision

PhD students (*graduated)

- 2018- Silvin Willemsen (Aalborg University Copenhagen). Second supervisor. Topic: machine learning for physical modeling sound synthesis (funded through internal grant at Aalborg University Copenhagen).
- 2017- Samuel Poirot (Universite Aix-Marseille II). Second supervisor. Topic: physical modeling sound synthesis (funded through internal grant at the Ecole Normale Supérieure de Cachan).
- 2016-2018 *Fabian Esqueda (Aalto University of Technology). Second supervisor. Topic: aliasing reduction in audio (funded through internal grant at Aalto University of Technology).
- 2015- Larisa Stoltzfus (Informatics, University of Edinburgh). Second supervisor. Topic: pervasive parallelism in audio (funded through EPSRC Centre for Doctoral Training in Pervasive Parallelism).
- 2013-2018 *Charlotte Desvages (Music, University of Edinburgh). Co-supervisor. Topic: violin modeling (funded through Audio Engineering Society Educational Foundation Award, ECA award and ERC Starting Grant).
- 2013-2017 *Reginald Harrison (Music, University of Edinburgh). First supervisor. Topic: brass instrument sound synthesis (funded through ERC Starting Grant).

- 2012-2016 *Brian Hamilton (Music, University of Edinburgh). First supervisor. Topic: large scale room acoustics simulation (funded through ERC Starting Grant).
- 2012-2016 *Alberto Torin (Music, University of Edinburgh). First supervisor. Topic: percussion instrument sound synthesis (funded through ERC Starting Grant).
- 2010-2014 *Craig Webb (Music, University of Edinburgh). First supervisor. Topic: GPGPUs for sound synthesis (funded through ERC Starting Grant and CAHSS award).
- 2006-2010 *Sam Stevenson (School of Physics, University of Edinburgh). Second supervisor. Topic: Musical acoustics (funded through EPSRC block grant).
- 2004-2005 *Martin Kuster (Electrical and Electronic Engineering, Queen's University Belfast). Second supervisor. Topic: Room modelling (funded through DTS/INI grant).
- 2003-2006 *Erdem Motuk (Electrical and Electronic Engineering, Queen's University Belfast). Second supervisor. Topic: Hardware implementaion of physical modelling algorithms.
- 2002-2006 *David Fee (Electrical and Electronic Engineering, Queen's University Belfast). Second supervisor. Topic: Audio dereverberation.

Postdoctoral Fellows/Research Assistants

- 2016 Craig Webb (Acoustics and Audio Group, University of Edinburgh). Postdoctoral research assistant. Topic: real time applications of physical modeling synthesis (funded through ERC Starting Grant).
- 2016-2018 Brian Hamilton (Acoustics and Audio Group, University of Edinburgh). Postdoctoral research assistant. Topic: room acoustics modeling (funded through ERC Starting Grant and ERC Proof of Concept Grant).
- 2016 Angels Aragonés (Acoustics and Audio Group, University of Edinburgh and the Ecole Nationale Supérieure de Techniques Avancées). Postdoctoral research assistant. Topic: plate modeling for sound synthesis (funded through EU FP7 Marie Curie ITN).
- 2015-2020 Michele Ducceschi (Acoustics and Audio Group, University of Edinburgh). Postdoctoral research fellow. Topic: string modeling for sound synthesis (funded through Royal Society/British Academy Newton International Fellowship and Leverhulme Early Career Research Fellowship).
- 2012-2016 Paul Graham (Edinburgh Parallel Computing Centre, University of Edinburgh). Software engineer. Topic: large scale parallel algorithms or sound synthesis (funded through ERC Starting Grant).
- 2012-2016 Alan Gray (Edinburgh Parallel Computing Centre, University of Edinburgh). Software engineer. Topic: large scale parallel algorithms or sound synthesis (funded through ERC Starting Grant).
- 2012-2016 James Perry (Edinburgh Parallel Computing Centre, University of Edinburgh). Software engineer. Topic: large scale parallel algorithms or sound synthesis (funded through ERC Starting Grant).
- 2012 Adrian Mouat (Edinburgh Parallel Computing Centre, University of Edinburgh). Software engineer. Topic: large scale parallel algorithms or sound synthesis (funded through ERC Starting Grant).
- 2010 Savvas Petrou (Edinburgh Parallel Computing Centre, University of Edinburgh). Software engineer. Topic: Large scale parallel algorithms for sound synthesis (funded through IDEALab project).
- 2010 Nichola McDonnell (Edinburgh Parallel Computing Centre, University of Edinburgh). Software engineer. Topic: Parallel algorithms for sound synthesis (funded through IDEALab project).
- 2004-2005 Izzet Ozelik (Sonic Arts Research Centre, Queen's University Belfast). Postdoctoral research assistant. Topic: Audio dereverberation techniques (funded through Digital Theatre Systems/Invest Northern Ireland grant).
- 2004-2005 Liz O'Sullivan (Sonic Arts Research Centre, Queen's University Belfast). Postdoctoral research assistant. Topic: Audio source separation (funded through Digital Theatre Systems/Invest Northern Ireland grant).

Teaching

- 2005- Reid School of Music, University of Edinburgh. Courses taught:
- MUSI11047 Acoustics (Music, PG), 2011--. Course designer and organizer 2011. Sole lecturer in 2011, with contributed lectures 2012--.
 - MUSI11049 MSc Acoustics and Music Technology Special Project (Music, PG), 2011--. Course organizer, 2011. Approximately 3-4 student supervisions annually.
 - PHYS11086 Physics Senior Honours Project (Physics, UG), 2008-2010. Approximately one student supervision annually.
 - MUSI08024 Introductory Musical Acoustics (Music, UG). 2008--2010. Course organizer, 2011. Contributed lectures, 2008--2011.
 - MUSI11055 Musical Applications of Fourier Theory and Digital Signal Processing (Music, Maths and Music, Physics with Music, UG), 2008--. Course designer and organizer, sole lecturer, 2008--2011. Contributed lectures, 2012--.
 - MUSI11034 Musical Applications of Fourier Theory and Digital Signal Processing (Music, PG), 2008--. Course designer and organizer, sole lecturer, 2008--2011. Contributed lectures, 2012--.
 - MUSI11065 Music Technology Final Projects (Music, UG). Course organizer, 2009—2012, 2017-. Approximately 3-6 students annually.
 - MUSI11035 MSc. Acoustics and Music Technology Dissertation (Music, PG), 2007--. Course organizer, 2008--2011, 2017-. Approximately 7-15 students annually.
 - MUSI08012 Music 1B, 2016-2018. Contributed lectures.
- 2004 Qualification obtained (Maître de Conference) to teach in areas of digital signal processing (Section 61) and mechanical engineering (Section 26) in French higher educational system. National competition.
- 2002--2005 School of Music, Queen's University, Belfast. Courses taught annually:
- Musical Acoustics (UG). Course designer, organizer and all lectures, 2002--2005.
 - Perceptual Acoustics (UG). Course designer, organizer and all lectures, 2003--2005.
 - Musical Applications of Fourier Theory (UG). Course designer, organizer and all lectures, 2003--2005.
 - Digital Signal Processing (PG). Course designer, organizer and all lectures, 2003—2005.
 - Special Projects (UG, PG, individual supervision), 2003-2005.
 - Dissertation (UG, individual supervision), 2003—2005.

Master Dissertation Supervision:

- 2020 Kartikay Golcha, MSc. Acoustics and Music Technology
- 2020 Songyang Gan, MSc. Acoustics and Music Technology
- 2020 Alistair Carson, MSc. Acoustics and Music Technology
- 2019 Mac Porter, MSc. Acoustics and Music Technology
- 2019 Aayush Choudhury, MSc. Acoustics and Music Technology
- 2018 Alexandros Gounis, MSc. Acoustics and Music Technology
- 2018 Valeria Villareal, MSc. Acoustics and Music Technology
- 2018 Alec Wright, MSc. Acoustics and Music Technology
- 2018 Michael Bowie, MSc. Acoustics and Music Technology
- 2017 Jacob Webber, MSc. High Performance Computing
- 2017 Matthew Hamilton, MSc. Acoustics and Music Technology
- 2017 Carlos Rodriguez, MSc. Acoustics and Music Technology
- 2017 Joey Hook, MSc. Acoustics and Music Technology
- 2017 Chad McKell, MSc. Acoustics and Music Technology
- 2017 Alessandro Bonvolenta, MSc. Acoustics and Music Technology
- 2016 Haris Neilas, MSc. Acoustics and Music Technology
- 2016 Daniel Wolff, MSc. Acoustics and Music Technology
- 2016 Larisa Stolzhus, MSc. High-performance Computing
- 2016 Nicholas Kournotos, MSc. Acoustics and Music Technology
- 2015 Konstantinos Tsiplakos, MSc. Acoustics and Music Technology
- 2014 Ross Taylor, MSc. Acoustics and Music Technology

2013 Charlotte Desvages, MSc. Acoustics and Music Technology
2013 Onur Gulen, MSc. Acoustics and Music Technology
2013 Fabian Esqueda, MSc. Acoustics and Music Technology
2012 Paul Daly, MSc. Acoustics and Music Technology
2012 Stephen Oxnard, MSc. Acoustics and Music Technology
2012 Tobias Carpenter, MSc. Acoustics and Music Technology
2011 Benoit Alary, MSc. Acoustics and Music Technology
2011 William Knight, MSc. Acoustics and Music Technology
2011 Adomas Zvirzdinas, MSc. Acoustics and Music Technology
2010 Craig Webb, MSc. Acoustics and Music Technology
2010 Michele Ducceschi, MSc. Acoustics and Music Technology
2010 Adel Salman, MSc. Acoustics and Music Technology
2010 Andreas Ntroulias, MSc. Acoustics and Music Technology
2009 Craig Wilson, MPhys. project supervisor
2009 Alan Boyd, MSc. Acoustics and Music Technology
2009 Christian Baker, MSc. Acoustics and Music Technology
2009 Alice Clifford, MSc. Acoustics and Music Technology
2008 Julian Parker, MSc. Acoustics and Music Technology

Visiting Research Students:

2019 Gokul Srinivasan, Birla University of Technology
2019 Giulia Fratoni, University of Bologna
2019 Iain Henderson, Ecole Centrale de Paris
2018 Danish Mohammed, Birla University of Technology
2018 Jane Templier, Université du Maine
2017 Samuel Poirot, CNRS Marseille
2017 Sacha Landre, Ecole Centrale de Lyon
2017 Sara Martin, Department of Acoustics, Norwegian Technical University
2016 Jukka Rauhala, Department of Computer Science, Aalto University
2016 Sebastian Prepelita, Department of Computer Science, Aalto University
2016 Hugo Coste-Dombre, Laboratoire de Mécanique/Acoustique, CNRS-Marseille
2015 Hugo Caracalla, Ecole Normale Supérieure de Cachan
2015 Clara Issanchou, Université de Paris VI
2014 Olivier Jacquet, Ecole Normale Supérieure de Cachan.
2009 Cedric Camier, Ecole Polytechnique
2009 Kevin Arcas, Ecole Polytechnique

Academic Leadership, Management and Service:

University of Edinburgh:

2017-2021	Research Excellence Framework (REF) coordinator, UoA33 (Music and Film) CAHSS.
2017-2018	Research Director, Reid School of Music.
2017-	Director, MSc program in Acoustics and Music Technology.
2016-2017	Technology Strategy Group, Edinburgh College of Art.
2016-	Mentoring of academic staff under Mid-career Research Development Fellowship Scheme.
2014-	Lectures at the University of Edinburgh for the European Research Council, and the UK Research Office
2014-	University-wide grant application reviewing across CAHSS and CSE
2013-	Founder and director of the multichannel audio research space
2013-	Founder and director, Acoustics and Audio Group.
2012-2016	Group leader, NESS project (EU funded).
2012-	Founder and co-organiser, MUSICA (Music Informatics, Cognition and Acoustics) seminar series
2009-2011	Examination Board Convenor, Music, board Member, Maths and Music
2009-	Director of Studies, Music
2008	Research Director, School of Arts Culture and Environment
2007-2009	Research Director, Music

Editorial Duties:

2019-	Associate editor, IEEE/ACM Transactions on Audio Speech and Language Processing.
2011	Guest editor, special issue on wind instrument modeling, Acta Acustica united with Acustica.

Board Memberships:

2016-	Board member, International Conference on Digital Audio Effects.
2015-2018	Founding Member, Special Area Group on Audio Signal Processing, European Signal Processing Society.

Reviewing Duties:

Journals:

- ACM Transactions on Applied Perception
- Acustica united with Acta Acustica
- AEU International Journal of Electronics and Communications
- Applied Acoustics
- Applied Mathematics and Computation
- Applied Sciences
- ASME Journal of Mechanical Design
- Communications in Nonlinear Science and Numerical Simulations
- Computational and Applied Mathematics
- Computer Music Journal
- Computer Speech and Language
- EURASIP Journal on Applied Signal Processing
- Frontiers of Mechanical Engineering
- IEEE Journal of Selected Topics in Signal Processing
- IEEE Signal Processing Letters
- IEEE Signal Processing Magazine
- IEEE Transactions on Circuits and Systems I
- IEEE Transactions on Signal Processing
- IEEE/ACM Transactions on Audio Speech and Language Processing
- Journal of the Acoustical Society of America
- Journal of Applied Mechanics
- Journal of the Audio Engineering Society
- Journal of New Music Research
- Journal of Sound and Vibration

- Mathematical Modelling and Numerical Analysis
- Multidimensional Systems and Signal Processing
- Physica Scripta
- Proceedings of the Royal Society A

Conferences

- International Digital Audio Effects Conference (DAFX)
- International Congress on Acoustics (ICA)
- International Symposium on Computer Music Multidisciplinary Research (CMMR)
- European Acoustical Association Auralization Symposium
- European Signal Processing Conference (EUSIPCO)
- Forum Acusticum
- IEEE Workshop on Applications of Signal Processing to Audio and Acoustics
- IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)
- International Computer Music Conference (ICMC)
- ACM SIGCHI
- ACM SIGGRAPH
- Sound and Music Computing Conference (SMC)
- Stockholm Musical Acoustics Conference (SMAC)
- ViennaTalk

Publishers

- John Wiley and Sons
- CRC Press
- Oxford University Press

Funding Bodies

- CONICYT (Chilean Research Council)
- Arts and Humanities Research Council UK
- Engineering and Physical Sciences Research Council UK
- European Research Council
- Fondazione Cassa di Risparmio di Padova e Rovigo
- Irish Research Council
- Leverhulme Trust
- Natural Sciences Research Council of Canada (NSERC)
- Research Grants Council of Hong Kong

Conference Organisation:

2020	Program Committee, 23 rd International Conference on Digital Audio Effects, Vienna, Austria.
2020	Program Committee, 4th ViennaTalk, Vienna, Austria.
2020	Program Committee, 16th Sound and Music Computing Conference, Torino, Italy.
2020	Special session organiser, Forum Acusticum, Lyon, France.
2020	Special session organiser, European Nonlinear Dynamics Conference, Lyon, France.
2019	Program Committee, 16th Sound and Music Computing Conference, Malaga, Spain.
2019	Special session organiser, International Congress on Acoustics, Aachen, Germany.
2018	Program Committee, 21st International Digital Audio Effects Conference, Aveiro, Portugal.
2017	Program Committee, 13th Sound and Music Computing Conference, Espoo, Finland.
2017	General chair, 20th International Digital Audio Effects Conference, Edinburgh, UK.
2017	Scientific Committee, International Symposium on Musical Acoustics, Montreal, Canada.
2016	Program Committee, 19th International Digital Audio Effects Conference, Brno, Czech Republic.
2015	Scientific Committee, 3rd Vienna Talk, Vienna, Austria.
2015	Program Committee, 11th Sound and Music Computing Conference, Maynooth, Ireland.
2015	Papers Committee, 41st International Computer Music Conference, University of North Texas, USA.

2015	Papers Committee, 12th Computer Music Multidisciplinary Research Conference, Plymouth, UK.
2014	Scientific Committee, 40th International Computer Music Conference, Athens, Greece.
2014	Program Committee, 17th International Digital Audio Effects Conference, Erlangen, Germany.
2013	Program Committee, 10th Computer Music Multidisciplinary Research Conference, Marseille, France.
2013	Program Committee, 16th International Digital Audio Effects Conference, Maynooth, Ireland.
2012	Scientific Committee, 15th International Digital Audio Effects Conference, York, UK.
2011	Technical Program Committee, 7th Sound and Music Computing Conference, Padova, Italy.
2009	Technical Committee, 12th International Digital Audio Effects Conference, Como, Italy.
2008	Program Committee, 11th International Digital Audio Effects Conference, Helsinki, Finland.
2007	Papers Committee, 33rd International Computer Music Conference, Copenhagen.
2006	Papers Committee, 32nd International Computer Music Conference, New Orleans.

Chairing at Conferences:

2020, Sept.	Session Chair, 23rd International Conference on Digital Audio Effects, Vienna, Austria
2020, Jun.	Session Chair, Sound and Music Computing Conference, Torino, Italy
2019, Sept.	Session Chair, 22nd International Conference on Digital Audio Effects, Birmingham, UK
2019, Sept.	Session Organiser/Chair, International Congress on Acoustics, Aachen, Germany
2017, Sept.	Session Organiser/Chair, 20th International Conference on Digital Audio Effects, Edinburgh, UK
2015, Sept.	Session Organiser/Chair, 3rd Vienna Talk, Vienna, Austria
2015, Dec.	Session Chair, 18th International Digital Audio Effects Conference, Trondheim, Norway
2014, Sept.	Session Chair, 40th International Computer Music Conference, Athens, Greece
2014, Sept.	Session Chair, 17th International Digital Audio Effects Conference, Erlangen, Germany
2014, Jul.	Session Chair, International Symposium on Musical Acoustics, LeMans, France
2013, Sept.	Session Chair, 16th International Digital Audio Effects Conference, Maynooth, Ireland
2013, Jun.	Session Organizer/Chair, 21st International Congress on Acoustics, Montreal, Canada
2012, Apr.	Session Organizer/Chair, 11th Congres Francais d'Acoustique, Nantes, France
2011, Sept.	Session Chair, 14th International Digital Audio Effects Conference, Paris, France
2011, Jul.	Session Organizer/Chair, Forum Acusticum, Aalborg, Denmark
2009, Sept.	Session Chair, 12th International Digital Audio Effects Conference, Como, Italy
2008, Sept.	Session Chair, 11th International Digital Audio Effects Conference, Helsinki, Finland
2006, Sept.	Session Chair, 9th International Digital Audio Effects Conference, Montreal, Canada
2005, Sept.	Session Chair, 31st International Computer Music Conference, Barcelona, Spain

PhD/Habilitation Examinations:

2007	PhD, Alastair Braden, Physics, University of Edinburgh.
2009	PhD, Kevin Arcas, Mechanical Engineering, Ecole Nationale Supérieure de Techniques Avancées, Palaiseau, France.
2010	Habilitation, Philippe Guillemain, Mechanical Engineering, Centre Nationale de Recherche Scientifique, Marseille, France.
2010	PhD, David Roze, Institut de Recherche et Coordination Acoustique/Musique, Paris, France.
2012	PhD, Juliette Chabassier, Mechanical Engineering, Ecole Nationale Supérieure de Techniques Avancées, Palaiseau, France.
2012	PhD, Ivan Cohen, Institut de Recherche et Coordination Acoustique/Musique, Paris, France.
2014	PhD, Michele Ducceschi, Ecole Nationale Supérieure de Techniques Avancées, Palaiseau, France.
2016	PhD, Antoine Falaize-Skrzek, Institut de Recherche et Coordination Acoustique/Musique, Paris, France.
2016	PhD, Linan Tao, Electrical and Electronic Engineering, University of Manchester.
2017	PhD, Clara Issanchou, Mechanical Engineering, Ecole Nationale Supérieure de Techniques Avancées, Palaiseau, France.
2017	PhD, Zufahldi Mohamed, Electronic Engineering, Queen Mary University of London, UK.
2018	PhD, Nuno Ferreira, Architecture, University of Liverpool.
2018	PhD, Rod Selfridge, Electronic Engineering, Queen Mary University of London, UK.
2018	PhD, Alberto Bernardini, Electronic Engineering, Univerista Politecnico di Milano, Italy.

Membership of Societies:

- Member, Audio Engineering Society
- Member, Institute of Electrical and Electronic Engineers (IEEE). Elevation to Senior Member in 2015.
- Member, Acoustical Society of America

Invited Talks:

Keynote Lectures:

- 2012, Dec Keynote lecture, Journées Jeunes Chercheurs en Audition, Acoustique Musicale, et Signal Audio, Laboratoire de Mécanique et Acoustique, CNRS Marseille. Title: *Synthèse Sonore Numérique par Moaèles Physiques*. In French. Marseille, France.
- 2014, Jul. Keynote lecture, International Symposium on Musical Acoustics. Title: *The Changing Picture of Nonlinearity in Musical Instruments*. Le Mans, France.
- 2015, Jul. Keynote lecture, 12th Sound and Music Computing Conference. Title: *Perspectives on Physical Modelling Synthesis*, Maynooth, Ireland.
- 2020, Sept. Keynote lecture, Timbre2020. Title: *Physical Modeling Sound Synthesis: Natural Sound and Timbre*. Thessaloniki, Greece (via videoconference).

Invited Papers and Lectures at Conferences, Symposia and Festivals:

- 2006, May Invited lecture, DAAD Inventionen Symposium, Technical University of Berlin. Title: *Physical Modeling Sound Synthesis*. Berlin, Germany.
- 2006, June Invited paper, 151st Meeting of the Acoustical Society of America. Title: *Conservation Methods for Musical Sound Synthesis*. Providence, RI, USA.
- 2006, Dec. Invited paper, 152nd Meeting of the Acoustical Society of America. Title: *Percussion Sound Synthesis*. Honolulu, Hawaii, USA.
- 2007, Sept. Invited paper, 19th International Congress on Acoustics. Title: *Modal Representations and Computational Complexity in Physical Modeling Sound Synthesis Applications*. Madrid, Spain.
- 2007, Sept. Invited paper, 19th International Congress on Acoustics. Title: *Some Comments on Computational Issues in Modularized Physical Modeling Sound Synthesis*. Madrid, Spain.
- 2007, Nov. Invited lecture, Sounds Electric Festival of Electronic Music, Dundalk Institute of Technology. Title: *Numerical Sound Synthesis*. Dundalk, Ireland.
- 2008, July Invited paper, Acoustics 08: Joint Meeting of the Acoustical Society of America, the Société Française d'Acoustique and the European Acoustical Association. Title: *Cymbal Synthesis*. Paris, France.
- 2008, Nov. Invited tutorial session, SC08: International Conference for High-performance Computing, Networking, Storage and Analysis. Title: *Large-scale Physical Modeling Synthesis*, Austin, Texas, USA.
- 2009, Aug. Invited tutorial session, IEEE Consumer Electronics Society's Games Innovation Conference. Title: *Numerical Sound Synthesis*, London, UK.
- 2010, May Invited lecture, 9th Workshop on Quality Improvement Methods. Title: *Numerical Sound Synthesis*, Dortmund, Germany.
- 2011, June Invited paper, Forum Acusticum. Title: *Time Domain Simulation of Brass Instruments*. Aalborg, Denmark.
- 2012, Jan. Invited lecture, European Commission Career Fair, Massachusetts Institute of Technology. Title: *Non standard Research Funding*. Cambridge, MA, USA.
- 2012, Jun. Invited lecture, HPC Workshop, City University of New York. Title: *Large-scale Audio Rendering Using Graphics Processing Units*. New York, NY, USA.
- 2012, Sept. Invited workshop, 15th International Digital Audio Effects Conference. Title: *FDTD Methods in Physical Modeling Sound Synthesis and Effects Processing*, York, UK.
- 2013, June Invited talk, 21st International Congress on Acoustics. Title: *Construction and Optimization Techniques for High Order Schemes for the Two-dimensional Wave Equation*, Montreal, Canada.

- 2013, Dec. Invited talk, 166th Meeting of the Acoustical Society of America. Title: *Embedded Physical Modeling Synthesis in 3D Environments on GPGPU*, San Francisco, CA, USA.
- 2014, May Invited lecture, Life in 3D Symposium. Title: *Large Scale 3D Sound Synthesis*, Edinburgh, UK.
- 2015, May Invited lecture, Audio Engineering Society Scotland. Title: *The NESS Project: Large Scale Physical Modeling Sound Synthesis*, Edinburgh, UK.
- 2015, June Invited lecture, Art and Science Symposium. Title: *Working at the Art/Science Interface: The NESS Project*, Edinburgh, UK.
- 2016, June Invited workshop, IX Symposium. Title: *Multichannel Physical Modeling Sound Synthesis*, Montreal, Canada.
- 2016, Oct. Invited lecture, sIREN Seminar workshop. Title: *Multidisciplinary Work under the NESS Project*, Edinburgh, UK.
- 2018, May Invited lecture, Audio Engineering Society Convention. Title: *Physical Modeling Sound Synthesis and Virtual Acoustics*, Milan, Italy.

Invited lectures at University Departments/Research Laboratories:

- 2004, Apr. Invited lecture, Helsinki University of Technology, Acoustics Laboratory. Title: *Energy-conserving Methods for Nonlinear Strings*, Espoo, Finland.
- 2005, Dec. Invited lecture, Sonic Arts Research Centre, Queen's University Belfast. Title: *Physical Modeling Sound Synthesis*, Belfast, UK.
- 2006, Feb. Invited lecture, Department of Music and Performing Arts Professions, New York University. Title: *Direct Numerical Simulation for Musical Sound Synthesis*, New York, NY, USA.
- 2006, Nov. Invited lecture, and performance, Center for Computer Research in Music and Acoustics, Stanford University. Title: *Direct Numerical Simulation for Musical Sound Synthesis*, Stanford, CA, USA.
- 2006, Dec. Invited lecture and performance, as above, Physical Modeling Workshop, Digital Music Research Network/Sonic Arts Research Centre, Queen's University Belfast. Title: *Physical Modelling Sound Synthesis in Practice*, Belfast, UK.
- 2007, Jan. Invited lecture, Technical University of Berlin. Title: *Direct Numerical Simulation for Musical Sound Synthesis*, Berlin, Germany.
- 2007, Jan. Invited performance of commissioned work and lecture, Digital Music Research Network/SpaceNet Program, University of York. (With Gordon Delap, NUI Maynooth.) Title: *Physical Modelling Sound Synthesis in Practice*, York, UK.
- 2007, Mar. Research visit and invited lecture, University of Manchester. Title: *Physical Modelling Sound Synthesis in Practice*, Manchester, UK.
- 2007, May Research visit and invited lecture, Ecole Normale Supérieure de Techniques Avancées. Title: *Enjeux numériques dans la simulation des plaques nonlinéaires*. In French. Palaiseau, France.
- 2007, May Invited lecture, Institut de Recherche et Coordination Acoustique/Musique (IRCAM). Title: *Complexité et coût de calcul pour les modèles physiques*. In French. Paris, France.
- 2008, May Invited workshop on Physical Modeling Synthesis, Technical University of Berlin. Title: *Numerical Sound Synthesis*, Berlin, Germany.
- 2008, Nov. Invited lecture, Department of Music, NUI Maynooth. Title: *Large-scale Physical Modeling Synthesis*, Maynooth, Ireland.
- 2008, Dec. Invited lecture/Engineer in Residence, NOVARS Research Centre, University of Manchester. Title: *Large-scale Physical Modeling Synthesis*, Manchester, UK.
- 2009, Oct. Invited lecture, Department of Medialogy, University of Aalborg-Copenhagen. Title: *Numerical Sound Synthesis*, Copenhagen, Denmark.

- 2009, Dec. Invited lecture and workshop, Music Technology Group, University Pompeu-Fabra. Title: *Numerical Sound Synthesis*, Barcelona, Spain.
- 2010, Feb. Research visit, lectures, and performance, CCRMA, Stanford University. Titles: *Numerical Sound Synthesis*, *Finite Difference Schemes for Sound Synthesis: Computational Issues*, Stanford, CA, USA.
- 2010, Feb. Invited lecture, Department of Music, University of California San Diego. Title: *Numerical Sound Synthesis*, San Diego, CA, USA.
- 2010, June Invited lecture, Department of Acoustics and Signal Processing, Aalto University of Technology. Title: *Numerical Sound Synthesis*, Espoo, Finland.
- 2012, Feb. Invited lecture, University of York. Title: *The NESS Project*, York, UK.
- 2012, May Invited lecture, Laboratoire d'Acoustique Musicale, Université de Paris VI. Title: *Synthèse sonore par modèles physiques: systèmes non linéaires et à grande échelle*. In French. Paris, France.
- 2012, Dec. Invited lecture, Institute for Sound and Vibration Research, University of Southampton. Title: *Computational Acoustics and Large Scale Sound Synthesis on GPGPUs*, Southampton, UK.
- 2013, Apr. Invited lecture, Department of Media Technology, Aalto University. Title: *The NESS Project*, Espoo, Finland.
- 2013, Apr. Invited lecture, Department of Acoustics and Signal Processing, Aalto University. Title: *FDTD Methods in Physical Modeling Sound Synthesis and Effects Processing*, Espoo, Finland.
- 2013, Nov. Invited lecture, Mathematics Department, Heriot Watt University. Title: *The NESS Project: Numerical Simulation and Sound Synthesis*, Edinburgh, UK.
- 2013, Dec. Invited lecture, Center for Computer Research in Music and Acoustics, Stanford University. Title: *The NESS Project: Large Scale Physical Modeling Synthesis*, Stanford, CA, USA.
- 2014, Mar. Invited lecture, Department of Music, National University of Ireland Maynooth. Title: *The NESS Project*, Maynooth, Ireland.
- 2015, Jan. Invited lectures, Helmut Schmidt University. Titles: *Numerical Simulation of Spring Reverberation*, *The NESS Project*, Hamburg, Germany.
- 2015, Mar. Invited lecture, Institut de Recherche et Coordination Acoustique/Musique. Title: *NESS: Modèles physiques à grande échelle*. In French. Paris, France.
- 2015, Apr. Invited lecture, Laboratoire de Mécanique et Acoustique, Centre Nationale de Recherche Scientifique. Title: *The Changing Picture of Nonlinearity in Musical Instruments*, Marseille, France.
- 2015, Apr. Invited lecture, Ecole Centrale de Marseille. Title: *NESS: Modèles physiques à grande échelle*. In French. Marseille, France.
- 2015, June Invited lecture, Department of Computer Science, Aalto University of Technology. Title: *Finite Volume Methods in Room Acoustics*, Espoo, Finland.
- 2016, May Invited lecture, Department of Computer Science, Aalto University of Technology. Title: *Finite Difference and Finite Volume Methods in Room Acoustics*, Espoo, Finland.
- 2016, Oct. Invited lecture, Institut de Recherche et Coordination Acoustique/Musique. Title: *The NESS Project*, Paris, France.
- 2016, Nov. Invited lecture, Department of Medialogy, Aalborg University-Copenhagen. Title: *The NESS Project*, Copenhagen, Denmark.
- 2017, Apr. Invited lecture, Electrical Engineering, Aalto University of Technology. Title: *Antiderivative Antialiasing*, Espoo, Finland.
- 2018, May Invited lecture, Aalto University of Technology, Espoo, Finland.
- 2020, Jan. Invited lecture, Institut de Recherche et Coordination Acoustique/Musique, Paris, France.

Invited Panel Presentations:

- 2003, Sept. Panelist, MIT Media Lab Europe Showcase, Dublin, Ireland.
- 2005, May Panelist, Audio Engineering Society Conference Workshop on Physical Modeling Sound Synthesis, Barcelona, Spain.
- 2007, May Panelist, Audio Engineering Society Conference Workshop on Audio for Computer Games, Vienna, Austria.
- 2012, May Panelist, HPC Workshop, City University of New York. New York, NY, USA.

Invited Industrial Presentations:

- 2013, Mar. Invited presentation, Yamaha. Title: *The NESS Project*, Edinburgh, UK.
- 2013, Aug. Invited presentation, Native Instruments. Title: *The NESS Project*, Berlin, Germany.
- 2015, Sept. Invited presentation, ARUP. Title: *Recent Advances in FDTD/FVTD-based Room Acoustics Modelling*, Manchester, UK.
- 2016, June Invited presentation, Sandy Brown and Associates. Title: *Recent Advances in FDTD/FVTD-based Room Acoustics Modelling*, Edinburgh, UK.

Awards

- 2008, Sept. Best paper award, 11th International Digital Audio Effects Conference. Paper: S. Bilbao, *Direct Simulation for Wind Synthesis*. Espoo, Finland.
- 2012, Sept. Best paper award, 15th International Digital Audio Effects Conference. Paper: S. Bilbao and C. Webb, *Timpani Drum Synthesis in 3D on GPGPUs*, York, UK.
- 2014, Sept. Best paper award, 17th International Digital Audio Effects Conference. Paper: S. Bilbao and A. Torin, *Numerical Modeling of String/Barrier Collisions: The Fretboard*. Erlangen, Germany.
- 2015, Dec. Best paper award, 18th International Digital Audio Effects Conference. Paper: C. Desvages and S. Bilbao, *Two-polarisation finite difference model of bowed strings with nonlinear contact and friction forces*, Trondheim, Norway.
- 2017, Jul. Best paper award, 14th Sound and Music Computing Conference. Paper: F. Esqueda, H. Pontynen, J. Parker and S. Bilbao, *Virtual Analog Model of the Lockhart Wave Folder*.

Knowledge Exchange/Industrial Engagement

Spinout Companies:

Two Big Ears, based in Edinburgh was founded by a graduate of the MSc in Acoustics and Music Technology. The start-up phase of the company was funded by UoE incubator funding, and hosted by the Acoustics and Audio Group. It has gone on to employ two further graduates of the MSc in Acoustics and Music Technology. Acquired by Facebook in May, 2016.

Physical Audio, based in Edinburgh was founded in 2016 by two postdoctoral researchers and myself in the Acoustics and Audio Group. Its first product is undergoing beta testing and will be released in late 2016. Web: <http://www.physicalaudio.co.uk/>

Roomerical, based in Edinburgh was founded in 2016 by a postdoctoral researcher and myself in the Acoustics and Audio Group. It is an architectural acoustics consultancy.

Software Releases and Web-based Service:

- 2018 Plate reverb plugin PA1 (Physical Audio release)
- 2018 Modular synthesis PA3 (Physical Audio release)
- 2016 Net1 modular percussion synthesis (web-based service on NESSGPU)
- 2015 Brass synthesis package. C ports for Linux, Mac and Windows
- 2015 Brass synthesis package. Incorporated into Composer's Desktop Project (T. Wishart)
- 2014 Snare drum emulator (web-based service on NESSGPU)
- 2013 Bass Drum (web-based service on NESSGPU)
- 2013 Brass Synthesis (web-based service on NESSGPU)
- 2013 Multiplate 3D code (web-based service on NESSGPU)
- 2012 Modular Plate Network (web-based service on NESSGPU)

Workshop Activities/Engagement with Musicians:

I have run various workshops for groups of musicians, internationally, and also have engaged in many extended one-on-one training sessions for visiting composers, often lasting for days or weeks.

- 2020, Mar. Group workshop, Hong Kong
- 2018, Apr. Gadi Sassoon (composer visit)
- 2017, Nov. Samson Young (composer visit)
- 2017, Nov. Gadi Sassoon (composer visit)
- 2017, Jul. Gadi Sassoon (composer visit)
- 2016, Dec. Gadi Sassoon (composer visit)
- 2016, Dec. Gordon Delap (composer visit)
- 2016, Jul. Gadi Sassoon (composer visit)
- 2016, Apr. Gordon Delap (composer visit)
- 2016, Mar. Gordon Delap (composer visit)
- 2016, Jan. Gadi Sassoon (composer visit)
- 2015, May Chris Chafe (composer visit)
- 2015, Mar. Gordon Delap (composer visit)
- 2014, Aug. Trevor Wishart (composer visit)
- 2014, Mar. Trevor Wishart (composer visit)
- 2013, Nov. Gordon Delap (composer visit)
- 2013, Oct. Gordon Delap (composer visit)
- 2013, Sept. Gordon Delap (composer visit)
- 2013, June Iain McCurdy (composer visit)
- 2013, June Gordon Delap (composer visit)
- 2013, May Ricardo Climent (composer visit)
- 2009, Dec. Group workshop, University Pompeu Fabra, Barcelona, Spain
- 2008, Aug. Group workshop, Technical University Berlin, Berlin, Germany
- 2008, Nov. Group workshop, University of Manchester, Manchester, UK
- 2007, Aug. Gordon Delap (composer visit)

Pieces/Performances/Video Art Using Synthesis Software:

Multiverse, G. Sassoon, 2018. **2019**: Sonar D, Barcelona, Spain, Center for Computer Research in Music and Acoustics, Stanford University, MTF, Stockholm, Sweden. **2018**: New Instruments for Musical Expression, Virginia, USA, BASE, Milan, Italy, SAE Institute, Milan, Italy, Electrowerks, London, Nova Batida, Lisbon, Macao, Milan, Italy.

Impossible Instruments/Possible Music #1, S. Young, 2018. Guggenheim Museum, New York.

NESS, T. Mudd, 2017. **2018**: Dialogues Festival, Edinburgh.

Moto Perpetuo, G. Sassoon, 2017.

Black Hole Fanfare, G. Sassoon, 2016. **2017**: Center for Computer Research in Music and Acoustics, Stanford University. Berklee College of Music, Boston, USA.

From Inner to Outer Shadow, G. Delap, 2016.

Collision Suite, G. Sassoon, 2016. **2018**: SoundForm Live, Hong Kong. **2017**: Center for Computer Research in Music and Acoustics, Stanford University, Stanford, USA, Berklee College of Music, Boston, USA. **2016**: Institut de Recherche et Coordination Acoustique/Musique, Paris, France.

Black Dog, G. Delap, 2016. **2016**: Institut de Recherche et Coordination Acoustique/Musique, Paris, France, IX Symposium, Montreal, Canada, Directions Concert Series, Dublin, Ireland

The Secret Resonance of Things (part 3: Dithyramb - Kepler 63e), T. Wishart, 2014. **2020**: Norwegian Academy of Music, Oslo, Norway. **2019**: Symphony Hall, Thessaloniki, Greece, Musica Viva festival, Portugal. **2018**: SoundForm Live, Hong Kong, CCRMIT, University of McGill, Montreal, Canada. **2017**: Auditorama, Stockholm, Sweden. **2016**: Beyond Techno, Tempo Reale, Florence, Italy, De Koffie Fabriek, Amsterdam, the Netherlands, Arnold Schönberg Zaal of the Royal Conservatory, Den Haag, the Netherlands, Institut de Recherche et Coordination Acoustique/Musique, Paris, France. **2015**: AKOUSMA series, Multiphonie 15/16 cycle, of the INA/GRM, Paris, France, d'Bâle Festival, Haus der Elektronischen Kunst, Basel, Switzerland, Hochschule für Musik Franz Liszt, Weimar, Germany, Logos Foundation, Gent, Belgium, MUSLAB, Memorial auditorium, Centro de Cultura Digital, Mexico City, Mexico, MUSLAB, Centro Cultura Recoleta, Buenos Aires, Argentina, International Festival for Innovations in Music Production and Composition, Leeds, UK, Octaphonic Event at Swansea University Trinity of St David's, Swansea, UK, 12th Sound and Music Computing Conference, Maynooth, Ireland. **2014**: Jacqueline du Pré Concert Hall, St Hilda's College, Oxford, UK, Royal Conservatory, Den Haag, the Netherlands, Musicon Concert Series, Durham Town Hall, Durham, UK.

Su Brain, C. Chafe, 2014.

Ashes to Ashes, G. Delap, 2013. **2018**: SoundForm Live, Hong Kong. **2017**: Dublin Science Gallery, Dublin, Ireland. **2016**: Institut de Recherche et Coordination Acoustique/Musique, Paris, France. **2015**: 12th Sound and Music Computing Conference, Maynooth, Ireland, Contemporanea Music Festival, Udine, Italy, Not a Concert, Edinburgh, UK. **2013**: Center for Computer Research in Music and Acoustics, Stanford University, Stanford, USA.

Orbit, G. Delap, 2009. **2011**: MANTIS Festival, Manchester, UK. **2010**: Center for Computer Research in Music and Acoustics, Stanford University, Stanford, USA, S. Low Festival, Berlin, Germany. **2009**: Soundings Festival, Edinburgh, UK

Vapour Collisions, H. Vega, 2006. **2007**: DNK, Amsterdam, the Netherlands. **2006**: Gaudeamus Live Electroacoustic Festival, Amsterdam, the Netherlands, Belfast Festival, Belfast, UK

Schlesinger's Forge, G. Delap, 2006. **2007**: SpaceNET, York, UK. **2006**: Das Festival, Berlin, Germany

Erdem's Nightmare, G. Delap, 2005. **2005**: Sonorities Music Festival, Belfast, UK

Wall Woodpeckers, R. Climent, 2005. **2008**: Sounds Only, Zentrum für Kunst und Medientechnologie, Karlsruhe, Germany. **2007**: Integra Conference, Belfast, UK, Zentrum für Kunst und Medientechnologie, Karlsruhe, Germany, Encuentro composición, Costa Rica, Fünf + 1 Festival, Berlin, Germany. **2006**: MANTIS Festival, Manchester, UK, Physical Modeling Network, Belfast, UK, Basilica San Francisco, Cuba, Cech's 50th, Chile, Sonorities Music Festival, Belfast, UK. **2005**: Kunitachi Hall, Tokyo, Japan.

Graduating MSc. Acoustics and Music Technology Student Industrial Placements:

- AKRF (New York). Nate Fletcher, 2016.
- Applied Research in Acoustics (Washington D.C.). Chad McKell, 2017.
- Arturia (Grenoble, France). Toby Carpenter, 2012.
- Arup (Singapore). Yong Yeo, 2009, Ida Mae Larrazabal, 2009.
- Atlatl Al Qurum Trading and Contracting (Oman). Sanju Thomas, 2017.
- AudioKinetic (Montreal, Canada). Benoit Alary, 2011.
- Cass Allen (Milton Keynes, UK). Dominic Perrett, 2018.
- Cereproc (Edinburgh, UK). Chris Buchanan, 2016.
- Clement Acoustics (Bristol, UK). Peter Shakeshaft, 2018.
- Corti (Copenhagen, Denmark). Akihiro Inui, 2017.
- Facebook (San Francisco, California). Abesh Thakur, 2012, Ross Taylor, 2014.
- Goodhertz Inc. (Pasadena, California). Chris Buchanan, 2016.
- GN (Copenhagen, Denmark). Christina Hardister, 2017, Foivos Gkouvas, 2016, Mac Porter, 2019, Kartikay Golcha, 2020.
- Hann-Tucker Assoc. (London, UK). Lewis Stonehouse, 2014.
- Hoare Lee (London, UK). Celia Diaz-Brito, 2018.
- Krotos (Edinburgh, UK). Toby Carpenter, 2012, Foivas Gkouvas, 2016.
- LG Electronics (Seoul, South Korea). Yongyuhuk Na, 2007.
- Liveworks (Latnikar, Nepal). Sunny Rajkarnikar, 2016.
- KPMG (London). Aayush Choudhury, 2019.
- Meridian Audio (Cambridge, UK). Calum Jamieson, 2018.
- Metropolitan Acoustics (Philadelphia, USA). Nathaniel Fletcher, 2016.
- Microsoft (Redmond, Washington). Ayaka Hara, 2017.
- Moog (Philadelphia, USA). Chad McKell, 2017.
- MQA Ltd. (Edinburgh, UK). Daniel Wolff, 2016.
- Native Instruments (Berlin, Germany). Julian Parker, 2008, Toby Carpenter, 2012, Fabian Esqueda, 2013.
- NUGEN Audio (Leeds, UK). Adel Salman, 2010.
- Photonic Solutions (Aberdeen, UK). Paul Scullion, 2007.
- Piezo Composite Ltd (Aberdeen, UK). Martin Wilson, 2009.
- Prase Engineering (Venice, Italy). Miltiadis Christodoulakis, 2007.
- Qinetiq (Farnborough, UK). Paul Daly, 2012.
- RMP Acoustics (Edinburgh, UK). Eleni Kontesidou, 2010.
- Royer Labs (Los Angeles). Chistina Hardister, 2017.
- Signum Audio (Edinburgh, UK). Chris Buchanan, 2016, Mangesh Sonawane, 2019.
- Spectral Labs (San Diego, USA). William Knight, 2011.
- Swell Energy (San Francisco, USA). Jonathan Bate, 2007.
- Talayman Acoustics (Istanbul, Turkey). Onur Gulen, 2013.
- Two Big Ears (Edinburgh). Ross Taylor, 2014.
- Vanguardia (London). Konstantinos Tsiplakos, 2015.
- Viacoustics. Joey Hook, 2017.
- Wootpix (Spain). Lara Diaz-Garcia, 2017.
- Xi Acoustics (Edinburgh). Alessandro Rodriguez, 2017.
- Wood Acoustics (Edinburgh). Michael Bowie, 2018, Robin Bolt, 2018.
- WSP (UAE). Ida Mae Larrazabal, 2009.
- WSP (UK). Robbie Christie, 2014.
- Yamaha (Hamamatsu, Japan). Alejandro Delgado, 2017, Calum Jamieson, 2018.

Publications

Monographs (2):

- [M1] S. Bilbao, *Wave and Scattering Methods for Numerical Simulation*, John Wiley and Sons, Chichester, UK, 2004. 380 pp. [Publisher webpage](#)
- [M2] S. Bilbao, *Numerical Sound Synthesis: Finite Difference Schemes and Simulation in Musical Acoustics*, John Wiley and Sons, Chichester, UK, 2009. 456 pp. [Publisher webpage](#)

Journal Articles (51):

- [J1] S. Bilbao and J. O. Smith III, "Finite Difference Schemes for the Wave Equation: Stability, Passivity and Numerical Dispersion," *IEEE Transactions on Speech and Audio Processing*, 11(3):255–266, 2003. 12 pp. [.pdf](#)
- [J2] J. Bensa, S. Bilbao, R. Kronland-Martinet, and J. O. Smith III, "The Simulation of Piano String Vibration: From Physical Models to Finite Difference Schemes and Digital Waveguides," *Journal of the Acoustical Society of America*, 114(2):1095–1107, 2003. 13 pp. [.pdf](#)
- [J3] S. Bilbao, "Parameterized Families of Finite Difference Schemes for the Wave Equation," *Numerical Methods for Partial Differential Equations*, 20(3):463–480, 2004. 18 pp. [Publisher webpage](#)
- [J4] S. Bilbao and J. O. Smith III, "Energy-conserving Finite Difference Schemes for Nonlinear Strings," *Acta Acustica united with Acustica*, 91(2):299–311, 2005. 13 pp. [.pdf](#)
- [J5] J. Bensa, S. Bilbao, R. Kronland-Martinet, J.O. Smith III, and T. Voinier, "Computational Modeling of Stiff Piano Strings Using Digital Waveguides and Finite Differences," *Acta Acustica united with Acustica*, 91(2):289–298, 2005. 10 pp. [.pdf](#)
- [J6] S. Bilbao, "Time-varying Generalizations of Allpass Filters," *IEEE Signal Processing Letters*, 12(5):376–379, 2005. 4 pp. [.pdf](#)
- [J7] S. Bilbao, "Conservative Numerical Methods for Nonlinear Strings," *Journal of the Acoustical Society of America*, 118(5):3316–3327, 2005. 12 pp. [.pdf](#)
- [J8] S. Bilbao, "Fast Modal Synthesis by Digital Waveguide Extraction," *IEEE Signal Processing Letters*, 13(1):1–4, 2006. 4 pp. [ResearchGate](#)
- [J9] S. Bilbao, L. Savioja, and J. O. Smith III, "Parameterized Finite Difference Schemes for Plates: Stability, the Reduction of Numerical Dispersion, and Frequency Warping," *IEEE Transactions on Audio, Speech and Language Processing*, 15(4):1488–1495, 2007. 8 pp. [ResearchGate](#)
- [J10] S. Bilbao, "A Digital Plate Reverberation Algorithm," *Journal of the Audio Engineering Society*, 55(3):135–144, 2007. 10 pp. [Publisher webpage](#)
- [J11] S. Bilbao, "Robust Physical Modeling Sound Synthesis for Nonlinear Systems," *IEEE Signal Processing Magazine*, 24(2):32–41, 2007. 10 pp. [ResearchGate](#)
- [J12] E. Motuk, R. Woods, S. Bilbao and J. McAllister, "Design Methodology for Real-Time FPGA-Based Sound Synthesis," *IEEE Transactions on Signal Processing*, 15(12):5833–5845, 2007. 13 pp. [ResearchGate](#)
- [J13] S. Bilbao, "A Family of Conservative Finite Difference Schemes for the Dynamical von Kármán Plate Equations," *Numerical Methods for Partial Differential Equations*, 24(1):193–216, 2008. 24 pp. [Publisher webpage](#)
- [J14] O. Thomas and S. Bilbao, "Geometrically Nonlinear Flexural Vibrations of Plates: In-plane Boundary Conditions and Some Symmetry Properties," *Journal of Sound and Vibration*, 315(3):569–590, 2008. 22 pp. [Publisher webpage](#)
- [J15] S. Bilbao, "Direct Simulation of Reed Wind Instruments," *Computer Music Journal*, 33(4):43–55, 2009. 13 pp. [.pdf](#)

- [J16] S. Bilbao, "Percussion Synthesis Based on Models of Nonlinear Shell Vibration," *IEEE Transactions on Speech and Audio Processing*, 18(4):872–880, 2010. 9 pp. [ResearchGate](#)
- [J17] S. Bilbao and J. Parker, "A Virtual Model of Spring Reverberation," *IEEE Transactions on Speech and Audio Processing*, 18(4):799–808, 2010. 10 pp. [Publisher webpage](#)
- [J18] S. Bilbao, "Time Domain Simulation and Sound Synthesis for the Snare Drum," *Journal of the Acoustical Society of America*, 131(1):914–925, 2012. 12 pp. [.pdf](#)
- [J19] S. Bilbao, "Optimized FDTD Schemes for 3D Acoustic Wave Propagation," *IEEE Transactions on Audio Speech and Language Processing*, 20(5):1658–1663, 2012. 6 pp. [.pdf](#)
- [J20] C. Touzé, S. Bilbao and O. Cadot, "Transition Scenario to Turbulence in Thin Vibrating Plates," *Journal of Sound and Vibration*, 331(2):412–433, 2012. 22 pp. [.pdf](#)
- [J21] S. Bilbao and C. Webb, "Physical Modeling of Timpani Drums in 3D on GPGPUs," *Journal of the Audio Engineering Society*, 61(10):737–748, 2013. 12 pp. [ResearchGate](#)
- [J22] L. Gabrieli, V. Välimäki, H. Penttinen, S. Squartini, and S. Bilbao, "A Digital Waveguide Based Approach for Clavinet Modeling and Synthesis," *EURASIP Journal on Advances in Signal Processing*, 103:1–14, 2013. 14 pp. [.pdf](#)
- [J23] S. Bilbao, "Modeling of Complex Geometries and Boundary Conditions in Finite Difference/Finite Volume Time Domain Room Acoustics Simulation," *IEEE Transactions on Audio Speech and Language Processing*, 21(7):1524–1533, 2013. 10 pp. [.pdf](#)
- [J24] J. Kemp, S. Bilbao, J. McMaster, and R. Smith, "Wave Separation in the Trumpet under Playing Conditions and Comparison with Time Domain Finite Difference Simulation," *Journal of the Acoustical Society of America*, 134(2):1395–1406, 2013. 12 pp. [.pdf](#)
- [J25] S. Bilbao and J. Chick, "Finite Difference Time Domain Simulation for the Brass Instrument Bore," *Journal of the Acoustical Society of America*, 134(6):3860–3871, 2013. 12 pp. [.pdf](#)
- [J26] M. Ducceschi, Cyril Touzé, S. Bilbao and C. Webb, "Nonlinear Vibrations of Rectangular Plates: Investigation of Modal Interaction and Coupling Rules," *Acta Mechanica*, 225(1):213–232, 2014. 20 pp. [ResearchGate](#)
- [J27] M. Ducceschi, O. Cadot, C. Touzé and S. Bilbao, "Dynamics of the Wave Turbulence Spectrum in Vibrating Plates: a Numerical Investigation using a Conservative Finite Difference Scheme," *Physica D*, 280-281:73–85, 2014. 13 pp. [.pdf](#)
- [J28] S. Bilbao and A. Torin and V. Chatziioannou, "Numerical Modeling of Collisions in Musical Instruments," *Acta Acustica united with Acustica*, 101(1):155–173, 2015. 19 pp. [ResearchGate](#)
- [J29] S. Bilbao and A. Torin, "Numerical Modeling and Sound Synthesis for Articulated String/Fretboard Interactions," *Journal of the Audio Engineering Society*, 63(5):336–347, 2015. 12 pp.
- [J30] S. Bilbao, O. Thomas, C. Touzé and M. Ducceschi, "Conservative Numerical Methods for the Full von Kármán Plate Equations," *Numerical Methods for Partial Differential Equations*, 31(6):1948–1970, 2015. 23 pp. [.pdf](#)
- [J31] S. Bilbao, R. Harrison, J. Kergomard, B. Lombard and C. Vergez, "Passive Models of Viscothermal Wave Propagation in Acoustic Tubes," *Journal of the Acoustical Society of America*, 138(5):, 2015. [.pdf](#)
- [J32] R. Harrison, S. Bilbao, J. Perry and T. Wishart, "An Environment for Physical Modeling of Articulated Brass Instruments," *Computer Music Journal*, 39(4):80–95, 2015. 16 pp. [.pdf](#)
- [J33] S. Bilbao, B. Hamilton, J. Botts and L. Savioja, "Finite Volume Time Domain Room Acoustics Simulation under General Impedance Boundary Conditions," *IEEE Transactions on Audio Speech and Language Processing*, 24(1):161–173, 2016. 13 pp. [.pdf](#)

- [J34] F. Esqueda, V. Välimäki and S. Bilbao, “Aliasing Reduction in Clipped Signals,” *IEEE Transactions on Signal Processing*, 60(4):5255–5267, 2016. 13 pp. [.pdf](#)
- [J35] C. Desvages and S. Bilbao, “Two-polarisation Physical Model of Bowed Strings with Nonlinear Contact and Friction Forces, and Application to Gesture-based Sound Synthesis,” *Applied Sciences*, 6(5):2016. 32 pp. [.pdf](#)
- [J36] S. Bilbao and R. Harrison, “Passive Time-domain Numerical Models of Viscothermal Wave Propagation in Acoustic Tubes of Variable Cross Section,” *Journal of the Acoustical Society of America*, 140:728–740, 2016. 13 pp. [.pdf](#)
- [J37] M. Ducceschi and S. Bilbao, “Linear Stiff String Vibrations in Musical Acoustics: Assessment and Comparison of Models,” *Journal of the Acoustical Society of America*, 140(4):2445–2456, 2016. 12 pp. [.pdf](#)
- [J38] C. Issanchou, S. Bilbao, J.-L. Le Carrou, C. Touzé, and O. Doaré, “A Modal-based Approach for the Nonlinear Vibration of Strings against a Unilateral Obstacle: Simulations and Experiments in the Pointwise Case,” *Journal of Sound and Vibration*, 393:229–251, 2017. 23 pp. [.pdf](#)
- [J39] S. Bilbao and B. Hamilton, “Wave-based Room Acoustics Simulation: Explicit/Implicit Finite Volume Modeling of Viscothermal Losses and Frequency-dependent Boundaries,” *Journal of the Audio Engineering Society*, 65(1/2):78–89, 2017. 12 pp.
- [J40] S. Bilbao, F. Esqueda, J. Parker and V. Välimäki, “Antiderivative Antialiasing for Memoryless Nonlinearities,” *IEEE Signal Processing Letters*, 24(7):1049–1053, 2017. 5 pp. [.pdf](#)
- [J41] B. Hamilton and S. Bilbao, “FDTD Methods for 3-D Room Acoustics Simulation with High-order Accuracy in Space and Time,” *IEEE/ACM Transactions on Audio Speech and Language Processing*, 25(11):2112–2124, 2017. 13 pp. [.pdf](#)
- [J42] F. Esqueda, H. Pontynen, J. Parker and S. Bilbao, “Virtual Analog Model of the Lockhart and Serge Wave Folders,” *Applied Sciences*, 7:1–23, 2017. 23 pp. [.pdf](#)
- [J43] S. Bilbao and B. Hamilton, “Higher Order Accurate Two-step Finite Difference Schemes for the Many Dimensional Wave Equation,” *Journal of Computational Physics*, 367:134–165 2018. 32 pp. [.pdf](#)
- [J44] R. Harrison-Harsley and S. Bilbao, “Separability of Wave Solutions in Nonlinear Brass Instrument Modelling,” *Journal of the Acoustical Society of America*, 143(6):3654–3657, 2018. 4 pp. [.pdf](#)
- [J45] S. Bilbao and B. Hamilton, “Passive Volumetric Time Domain Simulation for Room Acoustics Applications,” *Journal of the Acoustical Society of America*, 145(4):2613–2624, 2019. 12 pp. [.pdf](#)
- [J46] M. Ducceschi and S. Bilbao, “Conservative Finite Difference Time Domain Schemes for the Prestressed Timoshenko Beam Equations,” *Wave Motion*, 89:142–165, 2019. 24 pp. [.pdf](#)
- [J47] S. Bilbao, J. Ahrens and B. Hamilton, “Incorporating Source Directivity in Wave-based Virtual Acoustics: Time-domain Models and Fitting to Measured Data,” *Journal of the Acoustical Society of America*, 146(4):2692–2703, 2019. 12 pp. [.pdf](#)
- [J48] S. Bilbao, A. Politis and B. Hamilton, “Local Time-domain Spherical Harmonic Spatial Encoding for Wave-based Acoustic Simulation,” *IEEE Signal Processing Letters*, 26(4):617–621, 2019. 5 pp. [.pdf](#)
- [J49] S. Bilbao and B. Hamilton, “Directional Sources in Wave-based Acoustic Simulation,” *IEEE/ACM Transactions on Audio Speech and Language Processing*, 27(2):415–428, 2019. 14 pp. [.pdf](#)
- [J50] S. Bilbao, C. Desvages, M. Ducceschi, B. Hamilton, R. Harrison, A. Torin and C. Webb, “The NESS Project: Physical Modeling, Algorithms and Sound Synthesis,” in press, *Computer Music Journal*, 2020. 16 pp. [.pdf](#)
- [J51] S. Bilbao, J. Perry, P. Graham, A. Gray, K. Kavoussanakis, G. Delap, T. Mudd, G. Sassoon, T. Wishart and S. Young, “The NESS Project: Large Scale Physical Modeling Synthesis, Parallel Computing, and Musical Experimentation,” in press, *Computer Music Journal*, 2020. 17 pp. [.pdf](#)

Conference Proceedings Articles (114):

- [P1] T. Verma, S. Bilbao, and T. Meng, "The Digital Prolate Spheroidal Window," in *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing*, volume 3, pages 1351–1354, Atlanta, Georgia, May 1996. 4 pp. [ResearchGate](#)
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