

Prof Andrew McPherson

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School of Electronic Engineering and Computer Science
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Lab: <http://instrumentslab.org/>
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EMPLOYMENT

Queen Mary University of London, London, UK 2011-present
School of Electronic Engineering and Computer Science
Professor of Musical Interaction, Centre for Digital Music (C4DM)
(Lecturer 2011-2014, Senior Lecturer 2014-2016, Reader 2016-21)

Drexel University, Philadelphia, PA, USA 2009-2011
Department of Electrical & Computer Engineering
Post-Doc, US National Science Foundation Computing Innovation Fellows program
Mentor: Youngmoo Kim, Music and Entertainment Technology Laboratory (MET-lab)

EDUCATION

University of Pennsylvania, Philadelphia, PA, USA
Ph.D., Music Composition August 2009
GPA 4.0/4.0; Benjamin Franklin Fellowship, 9/2005 to 5/2009.
Dissertation: (1) The magnetic resonator piano: electronic augmentation of an acoustic grand piano; (2) Composition, *Secrets of Antikythera*, for MRP.
Composition teachers: James Primosch, Jay Reise, Anna Weesner, Maurice Wright.

Massachusetts Institute of Technology, Cambridge, MA, USA
M.Eng., Electrical Engineering June 2005
Thesis: "Interconnectable Blocks for Music and Audio Processing"
Advisor: Barry Vercoe, MIT Media Lab

S.B., Electrical Engineering June 2005
S.B., Music June 2004
Graduated Phi Beta Kappa (top 2% of MIT undergraduates); GPA 5.0/5.0 across all degrees.
Composition teachers: Peter Child, John Harbison, Charles Shadle.

FUNDING

Research Fellowships

European Research Council, "RUDIMENTS: Reflective Understanding of Digital Instruments as Musical Entanglements", 2022-27 (PI, €2m).

Royal Academy of Engineering, "Bela / Royal Academy of Engineering Senior Research Fellow in Embedded Music Computing", 2021-26 (PI, £208k + £510k cash/in-kind from 3 industry partners: Augmented Instruments Ltd, BeagleBoard.org, Texas Instruments)

EPSRC Fellowship, "Design for Virtuosity: Modelling and Supporting Expertise in Digital Musical Interaction", 2016-21 (PI, £897k)

Computing Innovation Fellows postdoctoral fellowship, Computing Research Association, 2009-2011 (PI, US\$257,688)

Centres for Doctoral Training

UKRI Centre for Doctoral Training in Artificial Intelligence and Music, 2019-27 (Co-I and Deputy Director, £6.2m)

EPSRC Centre for Doctoral Training in Media and Arts Technology, 2014-22 (Co-I, £3.7m)

Research Grants

AHRC Research Grant, "Bridging the gap: Visually Impaired And Sighted Music Industry Professionals Working Side By Side", 2021-24 (Co-I, lead for QMUL; £172k to QMUL).
 Ableton industrial research grant, "Investigating Mental Models Of DAW Software Use By Visually-impaired Musicians", 2022-23 (PI, £97k).
 UKRI Future Leaders Fellowship, "Designing new music technologies for older adults", 2021-23 (Co-I, £25k to QMUL including 10% of my time; PI J. MacRitchie, Sheffield)
 UKRI-Globalink Doctoral Exchange Scheme, 2020-21 (PI for PhD student Adan Benito, £11k)
 Chelsea and Westminster Hospital Foundation (CW+), "Musical instruments for upper limb rehabilitation", 2019-20 (PI, £25k)
 EPSRC Research Grant, "Hackable Instruments: Musical Interface Design for Appropriation, Modification and Creative Destruction", 2013-14 (PI, £122k)
 Swiss National Science Foundation, "Touch, Expression and Constraint in Piano Performance", International Short Visit grant, 2013 (Co-PI, CHF 3510)
 AHRC Research Grant, "Measuring and Enhancing Expressive Musical Performance with Digital Instruments", 2012 (PI, £30k)
 Royal Society Research Grant, "Adaptive Computational Interfaces for Creative Musical Expression", 2012-13 (PI, £14k)

Commercialisation Grants

Queen Mary Innovation, Proof-of-Concept Fund award, "Novel optical sensor technology for piano keyboards", 2022 (PI, £7k).
 Innovate UK, "Enabling Accessible, High-Performance Digital Crafts for Makers and Artists", 2018-19 (PI as industrial lead, £70k)
 Innovate UK, "High performance embedded computing for makers and artists", 2017 (PI as academic partner, £9k)
 Queen Mary Innovation, Proof-of-Concept Fund award, "Precision optical sensing on the piano keyboard", 2019 (PI, £10k)
 Queen Mary Innovation, QTech award, "Digital foley artistry", 2017 (PI, £50k)
 Queen Mary Centre for Public Engagement, "Building a community around BeagleRT, an open-source platform for interactive audio", 2015-16 (PI, £11k)
 Queen Mary Innovation, Innovation Fund, "Commercialisation of a digital bagpipe chanter", 2015-6 (PI, £8.3k)
 Queen Mary Innovation, Innovation Fund, "Digital foley artistry", 2015 (PI, £9.2k)
 Queen Mary Innovation, QTech Award, TouchKeys commercialisation, 2014-15 (PI, £40.5k)
 Queen Mary Innovation, Innovation Fund, TouchKeys (PI; £3.5k), February-August 2013.
 Queen Mary Centre for Public Engagement, "LCO New: Inspired by Digital" with London Chamber Orchestra, Sep 2012-May 2013 (co-I; £10k).
 Queen Mary Innovation, Proof-of-Concept Fund award (PI; £18k), May-August 2012.

Music Composition Funding

American Composers Forum, Subito Grant,, 2011 (\$2k).
 American Music Center, CAP Recording Grant,, 2010 (\$5k).
 American Composers Forum, Subito Grant, 2009.
 American Composers Forum, Encore Grant, 2009.
 American Academy of Arts and Letters, Charles Ives Scholarship, 2008.

AWARDS

Bruce Dickinson Entrepreneurship Award, Queen Mary University of London, 2021.
 Honourable Mention Best Paper, ACM Conference on Designing Interactive Systems (DIS), 2020 (with PhD student Giacomo Lepri).
 Best Workshop, International Conference on New Interfaces for Musical Expression, 2020 (with PhD student Giacomo Lepri).
 Best Paper and Best Poster, International Conference on New Interfaces for Musical Expression, 2018 (with PhD students Robert Jack, Jacob Harrison and Jon Pigrem).
 Science & Engineering Research Performance Award, Queen Mary University of London, 2016.
 Entrepreneur of the Year Award, Queen Mary University of London, 2015.
 Finalist, Guthman Musical Instrument Competition, Georgia Tech, 2015 (with Victor Zappi).
 Best Paper Award, International Conference on New Interfaces for Musical Expression, 2013.
 Postgraduate Teaching Award, Queen Mary University of London, 2013.
 Finalist, Guthman Musical Instrument Competition, Georgia Tech, 2010.
 Symphony in C Young Composers's Competition Winner, 2009-2010.
 GAPSA-Provost's Award for Interdisciplinary Research, University of Pennsylvania, 2009.
 Jacob Druckman Prize, Aspen Music Festival, 2009.
 David Halstead Prize, University of Pennsylvania Music Department, 2009.
 Dean's Scholar, University of Pennsylvania School of Arts and Sciences, 2008.
 Helen L. Weiss Prize in Composition, University of Pennsylvania Music Department, 2008.
 Louis Sudler Prize in the Arts, MIT, 2004.
 Tau Beta Pi, Eta Kappa Nu (engineering honour societies), MIT, 2003-2004.

SPINOUT COMPANIES AND PATENTS

Augmented Instruments Ltd -- <http://bela.io> (founded 2016)

Founder and Chairman

Maker technology company producing the *Bela* open-source embedded audio platform
 QMUL submitted my founding and leadership of AIL as a **2021 REF Impact Case Study**.

TouchKeys Instruments Ltd -- <http://touchkeys.co.uk> (founded 2015)

Founder and CTO

Music technology company producing *TouchKeys* augmented keyboard instruments

Crowdfunding campaign, "Trill: Touch Sensing for Makers", Kickstarter, 2019. Raised £25k in 35 days from backers worldwide

Crowdfunding campaign, "Bela: an Embedded Platform for Low-Latency Interactive Audio", Kickstarter, 2016. Raised £55k in 35 days from backers worldwide

Crowdfunding campaign, "TouchKeys Multi-Touch Keyboard", Kickstarter, 2013. Raised £46k in 35 days from backers worldwide

European patent EP3039671, "Control methods for musical performance", granted 17/10/2018.

US patent 9,761,210, "Control methods for musical performance", granted 12/09/2017.

European patent EP2729932, "Multi-touch piano keyboard"; granted 04/05/2017.

US patent 9,324,310, "Multi-touch piano keyboard", granted 26/04/2016.

RESEARCH MENTORSHIP

PhD Supervision (current)

Lia Mice; funded by EPSRC Media and Arts Technology CDT, 2018-

Andrea Guidi; funded by EPSRC Media and Arts Technology CDT, 2018-

Charlotte Nordmoen; funded by EPSRC Media and Arts Technology CDT, co-supervision with Ildar Farkhatdinov, 2018-

Courtney Reed; funded by QMUL Principal's Studentship, 2019-

Nicole Robson; funded by EPSRC Media and Arts Technology CDT, co-supervision with Nick Bryan-Kinns, 2019-

Adan Benito Temprano; funded by UKRI AI and Music CDT, 2019-

Andrea Martelloni; funded by UKRI AI and Music CDT, co-supervision with Mathieu Barthet, 2019-

Eevee Zayas Garin; funded by EPSRC Media and Arts Technology CDT, 2019-

Lewis Wolstanholme; funded by UKRI AI and Music CDT, 2020-

Teresa Pelinski; funded by Augmented Instruments Ltd and UKRI AI CDT, 2021-

Franco Caspe; funded by UKRI AI and Music CDT, co-supervision with Mark Sandler, 2021-

PhD Supervision (completed)

Dr Duncan Menzies: "Technological support for Highland piping tuition and practice", funded by EPSRC Media and Arts Technology CDT, 2011-15.

Dr Laurel Pardue: "Violin augmentation techniques for learning assistance", funded by QMUL Principal's Studentship, 2012-17.

Dr Christian Heinrichs: "Human Expressivity in the Control and Integration of Computationally Generated Audio", funded by EPSRC Media and Arts Technology CDT, 2012-17.

Dr Astrid Bin: "The Show Must Go Wrong: Towards an understanding of audience perception of error in digital musical instrument performance", funded by EPSRC Media and Arts Technology CDT, co-supervision with Nick Bryan-Kinns, 2014-18.

Dr Liam Donovan: "Travelling Wave Control of Stringed Musical Instruments", funded by EPSRC Media and Arts Technology CDT, 2013-18.

Dr Robert Jack: "Tangibility and Richness in the Design of Digital Musical Instruments", funded by EPSRC Media and Arts Technology CDT, co-supervision with Tony Stockman, 2014-19.

Dr Giulio Moro: "Beyond key velocity: continuous sensing for expressive control on the Hammond organ and digital keyboards", funded by QMUL Principal's Studentship, co-supervision with Mark Sandler, 2015-20.

Dr Jacob Harrison: "Instruments and Access: The Role of Instruments in Music and Disability", funded by EPSRC Media and Arts Technology CDT, 2015-20.

Dr Jack Armitage; "Subtlety and detail in digital musical instrument design", funded by EPSRC Media and Arts Technology CDT, 2016-21.

Dr Giacomo Lepri; "Play-Make-Believe: discovering the values inscribed into digital instruments", funded by EPSRC Media and Arts Technology CDT, 2017-22.

Postdoctoral Supervision (current)

Dr Jacob Harrison, funded by EPSRC, AHRC and Ableton, 2020-

Postdoctoral Supervision (completed)

Dr Adam Stark, funded by Queen Mary Innovation, 2012.

Dr Victor Zappi, funded by EPSRC, 2013-14. Now Assistant Professor, Northeastern University, Boston, MA, USA.

Dr Fabio Morreale, funded by EPSRC, 2016-19. Now Lecturer, University of Auckland, NZ.

Dr Kuriijn Buys, funded by EPSRC, 2017-19.

Dr Laurel Pardue, funded by EPSRC, 2017-19.

Dr Robert Jack, funded by QMUL and CW+ Foundation, 2018-20.

Dr Giulio Moro, funded by Queen Mary Innovation, 2019-20.

Awards to PhD Students and Postdocs

Adan Benito: UKRI-Globalink Doctoral Exchange grant supporting visit to McGill University, Montreal, 2020-21.

Laurel Pardue: 3rd place, Guthman Musical Instrument Competition, Georgia Tech, 2020.

Laurel Pardue: Best oral presentation, International Conference on New Interfaces for Musical

Expression (NIME), Porto Alegre, Brazil, 2019.
 Duncan Menzies: One-Handed Musical Instrument Trust (music charity) Playable Award, 2017.
 Jacob Harrison: Best demo award, International Conference on New Interfaces for Musical Expression (NIME), Copenhagen, 2017.
 Astrid Bin: Google EMEA Anita Borg Memorial Scholarship, 2015.
 Liam Donovan: Makerversity MVworks creative technology residency, 2016.
 Laurel Pardue: One-Handed Musical Instrument Trust (music charity) Concept Award, 2013.

PhD Examinations: 15+ in total, including Drexel University (USA), University of Calgary (Canada), Victoria University of Wellington (NZ), Norwegian Academy of Music (Norway), KTH Stockholm (Sweden), TU Vienna (Austria), Goldsmiths University of London (UK), University of the West of England (UK), Queen's University Belfast (UK), University of York (UK), Queen Mary University of London (UK). Also 2 MSc by Research examinations.

PUBLICATIONS

Google Scholar: <https://scholar.google.com/citations?user=9Je-3c4AAAAJ&hl=en>

Journal Papers

- N. Robson, N. Bryan-Kinns and A. McPherson. On mediating sound, space and experience: interviews with situated sound art practitioners. *Organised Sound*, 2021 (in press).
- G. Moro and A. McPherson. Performer experience on a continuous keyboard instrument. *Computer Music Journal*, 2021 (invited paper following top NIME 2020 paper; in press).
- A. McPherson and K. Tahiroglu. Idiomatic Patterns and Aesthetic Influence in Computer Music Languages. *Organised Sound* 25(1), 2020.
- L. S. Pardue and A. McPherson. Real-Time Aural and Visual Feedback for Improving Violin Intonation. *Frontiers in Psychology* 10(627), 2019.
- F. Morreale, J. Armitage and A. McPherson. Effect of Instrument Structure Alterations on Violin Performance. *Frontiers in Psychology* 9(2436), 2018.
- V. Zappi and A. McPherson. Hackable Instruments: Supporting Appropriation and Modification in Digital Musical Interaction. *Frontiers in ICT* 5(26), 2018 (invited paper for special issue).
- R. H. Jack, A. Mehrabi, T. Stockman and A. McPherson. Action-sound Latency and the Perceived Quality of Digital Musical Instruments: Comparing Professional Percussionists and Amateur Musicians. *Music Perception* 36(1), 2018.
- G. Moro, A. P. McPherson, M. B. Sandler. Dynamic temporal behaviour of the keyboard action on the Hammond organ and its perceptual significance. *Journal of Acoustical Society of America* 142(5), pp. 2808-2822, 2017.
- J. Harrison and A. McPherson. Adapting the bass guitar for one-handed playing. *Journal of New Music Research* 46(3), pp. 270-285, 2017.
- C. Sulyok, A. McPherson and C. Harte. Evolving the process of a virtual composer. *Natural Computing* 18(1), 2016.
- A. McPherson. Buttons, handles, and keys: advances in continuous-control keyboard instruments. *Computer Music Journal* 39(2), 2015 (invited paper following NIME 2013 best paper award).
- J. MacRitchie and A. McPherson. Integrating optical finger motion tracking with surface touch events. *Frontiers in Psychology* 6(702), 2015.
- L. Pardue, C. Harte and A. McPherson. A low-cost real-time tracking system for violin. *Journal of New Music Research*, 44(4), pp. 305-323, 2015.
- C. Heinrichs, A. McPherson and A. Farnell. Human performance of computational sound models for immersive environments. *The New Soundtrack Journal*, 2014.
- A. McPherson and Y. Kim. The problem of the second performer: building a community around an augmented piano. *Computer Music Journal* 34(4), 2012.

A. McPherson. The magnetic resonator piano: electronic augmentation of an acoustic musical instrument. *Journal of New Music Research*, 39(3), pp. 189-202, 2010.

Peer-Reviewed Conference Papers [my research field is primarily conference-driven]

- L. Mice and A. McPherson. Super Size Me: interface size, identity and embodiment in digital musical instrument design. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI)*, New Orleans, USA. 2022.
- C. Nordmoen and A. McPherson. Making space for material entanglements: A diffractive analysis of woodwork and the practice of making an interactive system. *Proc. ACM Designing Interactive Systems (DIS)*. 2022.
- L. Mice and A. McPherson. The M in NIME: Motivic analysis and the case for a musicology of NIME performances. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2022.
- E. Zayas-Garin and A. McPherson. Dialogic Design of Accessible Digital Musical Instruments: Investigating Performer Experience. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2022.
- N. Robson, A. McPherson and N. Bryan-Kinns. Being With The Waves: An Ultrasonic Art Installation Enabling Rich Interaction Without Sensors. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2022.
- C. Reed, C. Nordmoen, A. Martelloni, G. Lepri, N. Robson, E. Zayas-Garin, K. Cotton, L. Mice and A. McPherson. Exploring Experiences with New Musical Instruments through Micro-phenomenology. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2022.
- G. Lepri, J. Bowers, S. Topley, P. Stapleton, P. Bennett, K. Andersen and A. McPherson. The 10,000 Instruments Workshop - (Im)practical Research for Critical Speculation. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2022.
- A. Guidi and A. McPherson. Quantitative evaluation of aspects of embodiment in new digital musical instruments. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2022.
- C. Reed, S. Skach, P. Strohmeier and A. McPherson. Singing Knit: Soft Knit Biosensing for Augmenting Vocal Performances. *Proc. Augmented Humans Conference*. 2022.
- A. Benito Temprano and A. McPherson. A TMR angle sensor for gesture acquisition and disambiguation on the electric guitar. *Proceedings of the Audio Mostly conference*, 2021.
- C. N. Reed and A. McPherson. Surface electromyography for sensing performance intention and musical imagery in vocalists. *Proceedings of the International Conference on Tangible, Embedded and Embodied Interaction (TEI)*, Salzburg, Austria, 2021.
- A. Martelloni, A. McPherson and M. Barthet. Guitar augmentation for Percussive Fingerstyle: Combining self-reflexive practice and user-centred design. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2021.
- L. Zayas Garin, J. Harrison, R. Jack and A. McPherson. DMI Apprenticeship: Sharing and Replicating Musical Artefacts. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2021.
- C. N. Reed and A. P. McPherson.. Surface Electromyography for Direct Vocal Control. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)* Birmingham, UK. 2020.
- A. Martelloni, A. P. McPherson and M. Barthet. Percussive Fingerstyle Guitar through the Lens of NIME: an Interview Study. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2020.
- A. Guidi, F. Morreale and A. P. McPherson. Design for Auditory Imagery: Altering Instruments to Explore Performer Fluency. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Birmingham, UK. 2020.

- F. Morreale S. M. A. Bin, A. P. McPherson, P. Stapleton and M. M. Wanderley. A NIME of the Times: Developing an Outward-Looking Political Agenda For This Community. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2020.
- L. Mice and A. P. McPherson.. From Miming to NIMEing: the Development of Idiomatic Gestural Language on Large Scale DMI. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2020.
- J. Martinez Avila, V. Tsaknaki, P. Karpashevich, C. Windlin, N. Valenti, K. Höök, A. P. McPherson and S. Benford. Soma Design for NIME. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2020.
- G. Moro and A. P. McPherson. A Platform for Low-latency Continuous Keyboard Sensing and Sound Generation. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2020.
- A. P. McPherson and G. Lepri. Beholden to Our Tools: Negotiating with Technology while Sketching Digital Instruments. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*. 2020.
- G. Lepri, A. P. McPherson and J. Bowers. Useless, not Worthless: Absurd Making as Critical Practice. *Proc. ACM Designing Interactive Systems (DIS)* - **Honourable Mention Award**, Eindhoven University of Technology, Eindhoven, The Netherlands. 2020.
- R. Jack, J. Harrison and A. McPherson. Digital Musical Instruments as Research Products. *Proc. New Interfaces for Musical Expression (NIME)*, Royal Birmingham Conservatoire, Birmingham, UK. 2020.
- L. S. Pardue, K. Buys, M. Edinger, D. Overholt, A. McPherson. Separating sound from source: sonic transformation of the violin through electrodynamic pickups and acoustic actuation. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Porto Alegre, Brazil. 2019.
- C. Nordmoen, J. Armitage, F. Morreale, R. Stewart, A. McPherson. Making Sense of Sensors: Discovery through Craft Practice with an Open-Ended Sensor Material. *Proceedings of ACM Conference on Designing Interactive Systems (DIS)*, San Diego, CA, USA. 2019.
- G. Lepri and A. P. McPherson. Making Up Instruments: Design Fiction for Value Discovery in Communities of Musical Practice. *Proceedings of ACM Conference on Designing Interactive Systems (DIS)*, San Diego, CA, USA. 2019.
- G. Lepri and A. P. McPherson. Fictional Instruments, Real Values: Discovering Musical Backgrounds with Non-Functional Prototypes. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Porto Alegre, Brazil. 2019.
- F. Morreale, A. Guidi, A. P. McPherson. Magpick: an Augmented Guitar Pick for Nuanced Control. *Proc. Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Porto Alegre, Brazil. 2019.
- J. Armitage and A. McPherson. Bricolage in a hybrid digital lutherie context: a workshop study. *Proceedings of the Audio Mostly Conference*, Nottingham, UK, 2019.
- A. Hazzard, C. Greenhalgh, M. Kallionpää, S. Benford, A. Veinberg, Z. Kanga and A. McPherson. Failing with style: designing for aesthetic failure in interactive performance. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI)*, Glasgow, Scotland, UK, 2019.
- J. Harrison, A. Chamberlain, A. P. McPherson. Accessible Instruments in the Wild: Engaging with a Community of Learning-Disabled Musicians. *ACM SIGCHI Conference for Human Computer Interaction (CHI) Extended Abstracts*, Glasgow, Scotland, UK. 2019.
- S. M. A. Bin, N. Bryan-Kinns, A. P. McPherson. Risky business: Disfluency as a design strategy. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Blacksburg, VA, USA. 2018.
- G. Lepri, A. P. McPherson. Mirroring the past, from typewriting to interactive art: an approach to the re-design of a vintage technology. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Blacksburg, VA, USA. 2018.

- J. Armitage and A. McPherson. Crafting Digital Musical Instruments: An Exploratory Workshop Study. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Blacksburg, VA, USA. 2018.
- J. Harrison, R. Jack, F. Morreale and A. McPherson. When is a Guitar not a Guitar? Cultural Form, Input Modality and Expertise. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Blacksburg, VA, USA. 2018.
- R. Jack, J. Harrison, F. Morreale and A. McPherson. Democratising DMIs: the relationship of expertise and control intimacy. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Blacksburg, VA, USA. 2018. **Best paper award**
- J. Pigrem and A. McPherson. Do We Speak Sensor? Cultural Constraints of Embodied Interaction. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Blacksburg, VA, USA. 2018.
- K. Buys and A. McPherson. Real-time bowed string feature extraction for performance applications. *Proceedings of the International Conference on Sound and Music Computing (SMC)*, Limassol, Cyprus. 2018.
- L. Pardue, A. McPherson and D. Overholt. Improving the Instrumental Learning Experience through Complexity Management. *Proceedings of the International Conference on Sound and Music Computing (SMC)*, Limassol, Cyprus. 2018.
- L. Donovan, S. M. A. Bin, J. Armitage, A. P. McPherson. Building an IDE for an embedded system using web technologies. *Proceedings of the Audio Mostly Conference*, London, UK. 2017.
- S. M. A. Bin, N. Bryan-Kinns and A. P. McPherson. Hands where we can see them! Investigating the impact of gesture size on audience perception. *Proceedings of the International Computer Music Conference (ICMC)*, Shanghai, China. 2017.
- S. A. Bin, N. Bryan-Kinns and A. McPherson. Hands where we can see them! Investigating the impact of gesture size on audience perception. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Copenhagen, Denmark, 2017.
- J. Harrison and A. McPherson. An adapted bass guitar for one-handed playing. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Copenhagen, Denmark, 2017.
- J. Armitage, F. Morreale and A. McPherson. The finer the musician, the smaller the details: NIMEcraft under the microscope. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Copenhagen, Denmark, 2017.
- F. Morreale and A. McPherson. Design for Longevity: Ongoing Use of Instruments from NIME 2010-14. *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME)*, Copenhagen, Denmark, 2017.
- R. Jack, T. Stockman and A. McPherson. Rich gesture, reduced control: the influence of constrained mappings on performance technique. *Proceedings of the International Conference on Movement and Computing (MOCO)*, London, UK, 2017.
- S. A. Bin, N. Bryan-Kinns and A. McPherson. In-the-moment and beyond: Combining post-hoc and real-time data for the study of audience perception of electronic music performance. *Proceedings of the ACM INTERACT conference*, Mumbai, India, 2017.
- F. Morreale, G. Moro, A. Chamberlain, S. Benford and A. McPherson. Building a maker community around an open hardware platform. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems*, Denver, USA, 2017.
- R. Jack, T. Stockman and A. McPherson. Effect of latency on performer interaction and subjective quality assessment of a digital musical instrument. *Proceedings of the ACM Audio Mostly Conference*, Norrköping, Sweden, 2016.
- A. McPherson, R. Jack and G. Moro. Action-Sound Latency: Are Our Tools Fast Enough? *Proceedings of the 16th International Conference on New Interfaces for Musical Expression (NIME)*, Brisbane, Australia, 2016.
- S. A. Bin, N. Bryan-Kinns and A. McPherson. Skip the pre-concert demo: how technical

- familiarity and musical style affect audience response. *Proceedings of the 16th International Conference on New Interfaces for Musical Expression (NIME)*, Brisbane, Australia, 2016.
- G. Moro, S. A. Bin, R. H. Jack, C. Heinrichs and A. McPherson. Making high-performance embedded instruments with Bela and Pure Data. *Proceedings of the International Conference on Live Interfaces (ICLI)*, Brighton, UK, 2016.
- A. McPherson, A. Chamberlain, A. Hazzard, S. McGrath and S. Benford. Designing for exploratory play with a hackable digital musical instrument. *Proc. ACM Designing Interactive Systems (DIS)*, Brisbane, Australia, 2016.
- R. Jack, T. Stockman and A. McPherson. Navigation of pitch space on a digital musical instrument with dynamic tactile feedback. *Proceedings of the International Conference on Tangible, Embedded and Embodied Interaction (TEI)*, Eindhoven, Netherlands, 2016.
- V. Zappi and A. McPherson. The D-Box: how to rethink a digital musical instrument. *Proceedings of the International Symposium on Electronic Art (ISEA)*, Vancouver, BC, Canada, 2015.
- G. Moro and A. McPherson. Approximating non-linear inductors using time-variant linear filters. *Proceedings of the International Conference on Digital Audio Effects (DAFx)*, Trondheim, Norway, 2015.
- R. Jack, A. McPherson and T. Stockman. The design of tactile musical devices for the deaf. *Proceedings of the International Conference on the Multimodal Experience of Music*, Sheffield, UK, 2015.
- A. McPherson and V. Zappi. Exposing the scaffolding of digital instruments with hardware-software feedback loops. *Proceedings of the 15th International Conference on New Interfaces for Musical Expression (NIME)*, Baton Rouge, USA, 2015.
- D. W. H. Menzies and A. McPherson. Highland piping ornament recognition using Dynamic Time Warping. *Proceedings of the 15th International Conference on New Interfaces for Musical Expression (NIME)*, Baton Rouge, USA, 2015.
- A. McPherson and V. Zappi. An environment for submillisecond-latency audio and sensor processing on BeagleBone Black. *Proc. 138th AES Convention*, Warsaw, Poland, 2015.
- V. Zappi and A. McPherson. Design and use of a hackable digital instrument. *Proceedings of the International Conference on Live Interfaces (ICLI)*, Lisbon, Portugal, 2015.
- V. Zappi and A. McPherson. Dimensionality and appropriation in digital musical instrument design. *Proceedings of the 14th International Conference on New Interfaces for Musical Expression (NIME)*, London, UK, 2014.
- L. Pardue, D. Nian, C. Harte and A. McPherson. Low-latency audio pitch tracking: a multi-modal sensor-assisted approach. *Proceedings of the 14th International Conference on New Interfaces for Musical Expression (NIME)*, London, UK, 2014.
- D. Menzies and A. McPherson. A digital bagpipe chanter system to assist in one-to-one piping tuition. In *Proceedings of the 10th Sound and Music Computing Conference (SMC 2013)*, Stockholm, Sweden.
- T. Hedges and A. McPherson. 3D gestural interaction with harmonic pitch space. In *Proceedings of the 10th Sound and Music Computing Conference (SMC 2013)*, Stockholm, Sweden.
- A. McPherson. Portable measurement and mapping of continuous piano gesture. *Proceedings of the 13th International Conference on New Interfaces for Musical Expression (NIME)*, Seoul, South Korea, 2013, **best paper award**.
- L. Pardue and A. McPherson. Near-field optical reflective sensing for bow tracking. *Proceedings of the 13th International Conference on New Interfaces for Musical Expression (NIME)*, Seoul, South Korea, 2013.
- L. Vetter, M. Terrell, A. Simpson and A. McPherson. Estimation of overdrive in music signals. In *Proceedings of the 134th AES Convention*, May 2013, Rome. Italy.
- A. McPherson, A. Gierakowski and A. Stark. The space between the notes: adding expressive

- pitch control to the piano keyboard. In *Proceedings of the 31st ACM Conference on Human Factors in Computing Systems (CHI)* 2013, Paris, France.
- C. Heinrichs and A. McPherson. Recreating the parallax effect associated with Fishtank VR in a real-time telepresence system using head-tracking and a robotic camera. In *Proceedings of the International Symposium on Mixed and Augmented Reality*, 2012, Atlanta, GA, USA.
- E. Oreggia, N. Pinks and A. McPherson. Touch-controlled panoramic video streaming for film directing. In *Proceedings of the 3rd Digital Economy All Hands Conference* 2012, Edinburgh, UK.
- C. Heinrichs and A. McPherson. A hybrid keyboard-guitar interface using capacitive touch sensing and physical modeling. In *Proceedings of the 9th Sound and Music Computing Conference (SMC 2012)*, Copenhagen, Denmark.
- E. Burdiel, L. Vetter, A. Simpson, M. Terrell, A. McPherson and M. Sandler. Real-time implementation of Glasberg & Moore's loudness model for time-varying sounds. In *Proceedings of the 133rd AES Convention*, October 2012, San Francisco, CA, USA.
- A. McPherson. TouchKeys: capacitive multi-touch sensing on a physical keyboard." In *Proceedings of the 12th International Conference on New Interfaces for Musical Expression (NIME)*, Ann Arbor, MI, USA.
- A. McPherson. Techniques and circuits for electromagnetic instrument actuation. In *Proceedings of the 12th International Conference on New Interfaces for Musical Expression (NIME)*, Ann Arbor, MI, USA.
- D. Menzies and A. McPherson. An electronic bagpipe chanter for automatic recognition of Highland piping ornamentation. In *Proceedings of the 12th International Conference on New Interfaces for Musical Expression (NIME)*, Ann Arbor, MI, USA.
- J. Snyder and A. McPherson. The JD-1: an implementation of a hybrid keyboard/sequencer controller for analog synthesizers. In *Proceedings of the 12th International Conference on New Interfaces for Musical Expression (NIME)*, Ann Arbor, MI, USA.
- N. C. Britt, J. Snyder and A. McPherson. The EMvibe: an electromagnetically actuated vibraphone. In *Proceedings of the 12th International Conference on New Interfaces for Musical Expression (NIME)*, Ann Arbor, MI, USA.
- A. McPherson and Y. Kim. Design and applications of a multi-touch musical keyboard. In *Proceedings of the 8th Sound and Music Computing Conference (SMC 2011)*, Padova, Italy.
- B. Dolhansky, A. McPherson and Y. Kim. Designing an expressive virtual percussion instrument. In *Proceedings of the 8th Sound and Music Computing Conference (SMC 2011)*, Padova, Italy.
- A. McPherson and Y. Kim. Multidimensional gesture sensing at the piano keyboard. In *Proceedings of the 29th ACM Conference on Human Factors in Computing Systems (CHI 2011)*, Atlanta, GA.
- A. McPherson and Y. Kim. Augmenting the acoustic piano with electromagnetic string actuation and continuous key position sensing. In *Proceedings of the 2010 International Conference on New Interfaces for Musical Expression (NIME)*, Sydney, Australia.

Books and Book Chapters

- A. McPherson, F. Morreale, J. Harrison. Musical instruments for novices: comparing NIME, HCI and Crowdfunding approaches. In Holland, S., Mudd, T., Wilkie-McKenna, K., McPherson, A., Wanderley, M. M., eds., *New Directions Music and Human-Computer Interaction*; Springer, 2019.
- A. McPherson, S. Benford. Music, design and ethnography: an interview with Steve Benford. In Holland, S., Mudd, T., Wilkie-McKenna, K., McPherson, A., Wanderley, M. M., eds., *New Directions Music and Human-Computer Interaction*, Springer, 2019.
- A. McPherson, B. Verplank. The poetry of strange connections: an interview with Bill Verplank. In Holland, S., Mudd, T., Wilkie-McKenna, K., McPherson, A., Wanderley, M. M., eds., *New Directions Music and Human-Computer Interaction*, Springer, 2019.

- S. Holland, T. Mudd, K. Wilkie-McKenna, A. McPherson, M. M. Wanderley. Understanding Music Interaction, and Why It Matters. In Holland, S., Mudd, T., Wilkie-McKenna, K., McPherson, A., Wanderley, M. M., eds., *New Directions Music and Human-Computer Interaction*, Springer, 2019.
- E. Chew and A. McPherson. Performing music: humans, computers and electronics. In R. Timmers and R. Ashley, eds., *The Routledge Companion to Music Cognition*, New York: Routledge, 2017.
- J. Reiss and A. McPherson. *Audio Effects: Theory, Implementation and Application*. CRC Press, 2014.
- A. McPherson and Y. Kim. Piano touch as a case study in expressive gestural interaction. In S. Holland, K. Wilkie, P. Mulholland and A. Seago (eds.), *Music and Human-Computer Interaction*. London: Springer 2013, pp. 123-138.

KEYNOTES AND INVITED LECTURES

- McGill University, Montreal, Canada, September 2022 (distinguished lecture).
- Keynote**, Haptic & Auditory Interaction Design, London, UK, August 2022.
- Sound and Music Computing Conference (industry talk), Saint-Étienne, France, June 2022.
- New York University, NY, USA, May 2022 (online).
- Orpheus Institute, Ghent, Belgium, May 2022.
- Cornell University, Ithaca, NY, USA, February 2022 (online).
- University of Nottingham, Nottingham, UK, December 2021 (online).
- Iklectik Art Lab, London, UK, November 2021.
- University of Bristol, Bristol, UK, September 2021 (online).
- Royal Academy of Engineering, London, UK, June 2021 (online).
- Keynote**, International Conference on Auditory Display, June 2021 (online).
- Temple University, Philadelphia, PA, USA, April 2021 (online).
- Music Hackspace, London, UK, June 2020 (online).
- KTH University, Stockholm, Sweden, January 2020.
- University of Southampton, UK, December 2019.
- Northwestern University, Chicago, USA, October 2019.
- Keynote**, AudioMostly Conference, Nottingham, UK, 2019.
- Ars Electronica Festival, Linz, Austria, September 2019.
- IET Essex branch, April 2019.
- Approximation Festival, Duesseldorf, Germany, February 2019.
- Aalto University, Helsinki, Finland, November 2018.
- Audio Developer Conference, invited panellist, London, UK, November 2018.
- Keynote**, International Conference on Live Interfaces, Porto, Portugal, May 2018.
- Imperial College, London, UK, March 2018.
- Queens University Belfast, UK, February 2018.
- IET London branch, December 2017.
- University of Nottingham, UK, November 2017.
- University of Oslo, Norway, November 2017.
- Hochschule für Musik, Karlsruhe, Germany, April 2017.
- Keynote**, Colloquium on Music Informatics, Cagliari, Italy, September 2016.
- Shenzhen DIY Maker Space, Shenzhen, China, July 2016.
- IRCAM, Paris, France, June 2016.
- GREAM Centre, University of Strasbourg, France, March 2016.
- Harvey Mudd College, Claremont, CA, USA, April 2015.
- University of Sussex, UK, March 2015.
- Royal Northern College of Music, Manchester, UK, February 2015.

Cardiff Metropolitan University, UK, November 2014.
 Cornell University, Ithaca, NY, USA, October 2014.
 Audio Engineering Society UK chapter, London, September 2014.
 Ars Electronica Festival, Linz, Austria, September 2014.
 Aalborg University, Copenhagen, Denmark, May 2014.
 Moogfest music festival, Asheville, NC, USA, April 2014.
 Conservatorio della Svizzera Italiana, Lugano, Switzerland, April 2014.
 University of Edinburgh, UK, February 2014.
 Innovation in Music conference, invited talk, York, UK, December 2013.
 EarZoom music festival, Ljubljana, Slovenia, October 2013.
 Barbican Centre, London, UK, August 2013.

TEACHING

Postgraduate Certificate in Academic Practice (PGCAP), QMUL, 2014.
 Textbook: J. Reiss and A. McPherson, *Audio Effects: Theory, Implementation and Application*.
 CRC Press, 2014.
 Free YouTube course: C++ Real-Time Audio Programming with Bela, 2020-21. >30k views as of
 June 2021. See youtube.com/belaPlatform
 ECS742: Interactive Digital Multimedia Techniques (QMUL), autumn semester, 2011-2018
 Contents: introduction to arts programming and physical computing using Arduino,
 Processing, Max/MSP. Hands-on class features two independent projects per term.
 ECS7012: Music and Audio Programming (QMUL), 2020, 2021, 2022
 ECS732: Real-Time Digital Signal Processing (QMUL), 2014, 2015, 2019
 Contents: signal processing and audio programming on embedded devices using Bela.
 ECS730: Digital Audio Effects (QMUL), 2012-2013
 Contents: DSP theory of audio effects, and implementation as VST plug-ins.
 ECE 121: Introduction to Entertainment Engineering (Drexel), spring 2010, spring 2011
 Music 070: Theory & Musicianship I (University of Pennsylvania), fall 2006, fall 2009
 Music 170: Theory & Musicianship III, Aural Skills Lab (U.Penn.), fall 2007
 Music 171: Theory & Musicianship IV, Aural Skills Lab (U.Penn.), spring 2008
 6.101: Analog Electronics Laboratory (MIT), teaching assistant, fall 2004
 Private music composition lessons, 2008-2011.

ORGANISATION AND PROFESSIONAL SERVICE

Paper chair (with E. Frid), New Interfaces for Musical Expression conference, 2022.
 Guest editor (with T. Smyth), *Computer Music Journal* 41(2), 2017.
 Book editor (with S. Holland, 3 others), *New Directions in Music and Human-Computer
 Interaction*, research text published by Springer, 2019.
 Workshop co-organiser, "10,000 Instruments for a Semi-Connected World" (with 7 others),
 New Interfaces for Musical Expression conference, 2020. Best workshop award.
 Workshop co-organiser, "NIME Publication Ecosystem Workshop" (with 7 others), New
 Interfaces for Musical Expression conference, 2020.
 Workshop co-organiser, "Open research strategies and tools in the NIME community" (with 7
 others), New Interfaces for Musical Expression conference, 2019, Porto Alegre, Brazil.
 Workshop organiser, "NIMEcraft Workshop: Exploring the Subtleties of Digital Lutherie" (with 4
 others), New Interfaces for Musical Expression conference, 2017, Copenhagen,
 Denmark.
 Workshop co-organiser, "Skill Learning through Interactive Music Technology" (with 4 others),
 New Interfaces for Musical Expression conference, 2017, Copenhagen, Denmark.

Paper chair (with T. Smyth), New Interfaces for Musical Expression conference, 2016.

Workshop organiser, "NIMEhub: Toward a Repository for Sharing and Archiving Instrument Designs" (with 5 others), New Interfaces for Musical Expression conference, 2016, Brisbane, Australia.

Workshop co-organiser, "Music and HCI" (primary organiser S. Holland), ACM Conference on Human Factors in Computing Systems (CHI) 2016, San Diego, USA.

Workshop organiser, "BeagleRT Embedded Audio Workshop" (with V. Zappi), New Interfaces for Musical Expression conference, 2015, Baton Rouge, USA.

Workshop organiser, "Keyboard Salon: Connecting Instrument Designers and Artistic Practitioners" (with X. Xiao, T. Walther), New Interfaces for Musical Expression conference, 2014, London, UK.

Workshop organiser, "Actuated Acoustic Instruments Workshop" (with 3 others), New Interfaces for Musical Expression conference, 2012, Ann Arbor, USA.

Music chair, Computer Music Modeling and Retrieval conference, 2012.

Reviewing: Computer Music Journal, Journal of New Music Research, Frontiers in Psychology, IJHCS, CHI, NIME, SMC, TEI, ICMC, ICLI, CMMR, MOCO, ACM MM.

Member of the EPSRC Peer Review College.

MUSICAL ACTIVITIES

Instrument Design

Magnetic Resonator Piano (created 2009): used in 30+ compositions; 6+ commercial albums including UK top 100 album *Field of Reeds* by These New Puritans (2014); the score of the major Disney movie *Christopher Robin* (music by Jon Brion). 100+ performances worldwide including Barbican Hall, Cadogan Hall, LSO St. Luke's (London), Opera Theatre of Rome, Approximation Festival (Duesseldorf). Featured on BBC Radio 3 and Radio Eins (Berlin).

TouchKeys multi-touch keyboard (created 2011): raised £46k on Kickstarter, led to spinout TouchKeys Instruments Ltd, hundreds of instruments sold. (see touchkeys.co.uk).

Arduinitar build-it-yourself educational guitar kit (created 2012): featured in TeenTech school science events around the UK (dozens of events since 2012) using music to teach principles of electronic engineering.

Finalist in the Guthman Musical Instrument Competition (Atlanta, GA, USA) 3 times: 2010 (*magnetic resonator piano*); 2015 (*D-Box*, with postdoc Victor Zappi); 2019 (*Svampolin*, with postdoc Laurel Pardue; 3rd place winner).

4 PhD supervisees have won musical instrument awards from the OHMI Trust (disability arts charity), 2014-19: Duncan Menzies, Callum Goddard, Lia Mice, Rishi Shukla.

Composition [see andrewmcpherson.org]

30 pieces (5 large ensemble / orchestral, 19 chamber / solo, 3 vocal, 4 electronic), 2003-13.

Music festivals: Bowdoin (Brunswick, ME, 2006); Tanglewood (Lenox, MA, 2007); Aspen (Aspen, CO, 2008); NEON (Las Vegas, NV, 2009); Cabrillo (Santa Cruz, CA, 2010).

Performance

Viola player. Studies with Marcus Thompson. Performing with Kensington Symphony Orchestra.

ADDITIONAL AFFILIATIONS

Trustee, the OHMI Trust (ohmi.org.uk), UK disability arts charity, 2021-present. Co-founder of the OHMI Research Partnership (ohmirp.org.uk), 2020.

Associate member, Centre for Interdisciplinary Research in Music, Media and Technology (CIRMMT), Montreal, Canada, 2020-present.

Professional memberships: Association for Computing Machinery; Fellow of the Higher Education Academy.