

## GARY PAUL SCAVONE

Music Technology Area Chair  
Schulich School of Music at McGill University  
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### EDUCATION:

- 1992–1997      Stanford University, Stanford, California.  
Ph.D., Computer-Based Music Theory & Acoustics (1997)  
M.S., Electrical Engineering (1995)
- 1989–1990      Conservatoire National de Région de Bordeaux, Bordeaux, France.  
Saxophone studies with Jean-Marie Londeix, attended under Fulbright Scholarship.
- 1984–1988      Syracuse University, Syracuse, New York.  
B.S., Electrical Engineering, Magna Cum Laude  
B.A., Music, Magna Cum Laude, Performance Honors

### PROFESSIONAL EXPERIENCE:

- 2003–current      ASSISTANT PROFESSOR, (Tenure Track, 2005–current; Special Category, 2003–2005), Music Technology (Area Chair, 2006–current), Schulich School of Music, McGill University. Audio DSP and acoustic research, graduate/undergraduate teaching and supervision.
- 1997–2003      TECHNICAL DIRECTOR/RESEARCH ASSOCIATE/LECTURER, Center for Computer Research in Music & Acoustics (CCRMA), Stanford University. Audio DSP, acoustic, and psychoacoustic research; Industrial relations.
- 1999–2004      PROGRAMMING CONSULTANT, Kind of Loud Technologies/Universal Audio. Reverberation design, implementation, and voicing.
- 1999–2000      PROGRAMMING CONSULTANT, Staccato Systems, Inc. DSP algorithm development.
- 1997              PROGRAMMING CONSULTANT, Signal Processing Associates, Inc. Speech codec implementations in C/C++ based on ITU-T specifications.
- 1994–1995      PROGRAMMING CONSULTANT, Sondius Project, Office of Technology Licensing, Stanford University. Objective C/C and Motorola DSP56000 programming and digital waveguide musical instrument design.
- 1991              SYSTEMS ENGINEER, Electronic Data Systems (EDS), Lockport, NY. Engineering computer support for a General Motors manufacturing facility.
- 1989              SYSTEMS ENGINEER, General Electric, Government Electronic Systems Department, Syracuse, NY. Firmware specifications documentation.

### PUBLICATIONS:

#### Book Chapter

- Cook, P. R. and Scavone, G. (2004). “The Synthesis ToolKit (STK) in C++.” In *Audio Anecdotes: A Cookbook of Audio Algorithms and Techniques*, edited by Ken Greenbaum, A.K. Peters, pp. 237–253.

**Peer-Reviewed Journal Articles**

- da Silva, Scavone, G., and Lefebvre, A. (2008). “Pressure reflection coefficient at the open end of pipes terminated by horns issuing a subsonic mean flow: A numerical study.” Submitted to the *Journal of Sound and Vibration*.
- Scavone, G., Lefebvre, A., and da Silva, A. (2008a). “Measurement of vocal-tract influence during saxophone performance.” *Journal of the Acoustical Society of America*, **123**, pp. 2391–2400.
- da Silva, A., Scavone, G. and van Walstijn, M. (2007). “Numerical simulations of fluid-structure interactions in single-reed mouthpieces.” *Journal of the Acoustical Society of America*, **122**, pp. 1798–1810.
- da Silva, A. and Scavone, G. (2007a). “Lattice Boltzmann simulations of the acoustic radiation from waveguides.” *Journal of Physics A: Mathematical and Theoretical*, **40**, pp. 397–408.
- Lakatos, S., Cook, P. R., and Scavone, G. (2000). “Selective attention to the parameters of a physically informed sonic model.” *Journal of the Acoustical Society of America*, **107**, pp. L31–36.
- Scavone, G. (1998). “The Musical Acoustics Research Library.” *Journal of the Catgut Acoustical Society*, Vol. 3, No. 6 (Series II), pp. 24–26.

**Peer-Reviewed Articles in Conference Proceedings**

- Zadel, M. and Scavone, G. (2008). “Recent developments in the Different Strokes environment.” In *Proceedings of 2008 International Computer Music Conference*, Belfast, N. Ireland, pp. 1–4.
- Scavone, G. and Whetsell, N. (2008). “The Music Technology program at McGill University.” In *Proceedings of 2008 International Computer Music Conference*, Belfast, N. Ireland, pp. 327–330.
- Lagrange, M., Scavone, G., and Depalle, P. (2008a). “Time-domain analysis / synthesis of the excitation signal in a source / filter model of contact sounds.” In *Proceedings of the 2008 International Conference on Auditory Display*, Paris, France.
- Lefebvre, A. and Scavone, G. (2007). “Wind instrument acoustic research in the Computational Acoustic Modeling Laboratory, McGill University.”, *Canadian Acoustics*, **35**, No. 3, pp. 52-53.
- da Silva, A., Kuehnelt, H. and Scavone, G. (2007). “A brief survey of the lattice Boltzmann method in musical acoustics.” In *Proceedings of the 19th International Congress on Acoustics*, Madrid, Spain.
- da Silva, A. and Scavone, G. (2007c). “Coupling lattice Boltzmann models to digital waveguides for wind instrument simulations.” In *Proceedings of the 2007 International Symposium on Musical Acoustics*, Barcelona, Spain.
- Lefebvre, A., Scavone, G., Abel, J. and Buckiewicz-Smith, A. (2007). “A comparison of impedance measurements using one and two microphones.” In *Proceedings of the 2007 International Symposium on Musical Acoustics*, Barcelona, Spain.
- de Leon, S. and Scavone, G. (2007). “Coupled time-domain simulation of linear acoustic systems by boundary integration.” In *Proceedings of the 2007 International Symposium on Musical Acoustics*, Barcelona, Spain.
- Matthews, T. and Scavone, G. (2007). “An online system for viewing the input impedance of saxophones.” In *Proceedings of the 2007 International Symposium on Musical Acoustics*, Barcelona, Spain.
- Zadel, M. and Scavone, G. (2006b). “Laptop performance: techniques, tools, and a new interface design.” In *Proceedings of 2006 International Computer Music Conference*, New Orleans, USA, pp. 643–648.
- Scavone, G. and Smith, J. O. (2006). “A stable acoustic impedance model of the clarinet using digital waveguides.” In *Proceedings of the 2006 International Conference on Digital Audio Effects (DAFx-06)*, Montreal, Canada, pp. 89–94.

- Zadel, M. and Scavone, G. (2006a). “Different Strokes: a prototype software system for laptop performance and improvisation.” In *Proceedings of 2006 Conference on New Interfaces for Musical Expression (NIME-06)*, Paris, France, pp. 168–171.
- da Silva, A. and Scavone, G. (2005). “Characterizing impedance of woodwind instruments with the lattice-Boltzmann method.” In *Proceedings of the 2005 Brazilian Symposium of Computer Music (SBCM)*, Belo Horizonte, Brazil.
- Scavone, G. and Cook P. R. (2005). “RtMidi, RtAudio, and a Synthesis ToolKit (STK) update.” In *Proceedings of the 2005 International Computer Music Conference*, Barcelona, Spain, pp. 327–330.
- Scavone, G. and da Silva, A. (2005). “Frequency content of breath pressure and implications for use in control.” In *Proceedings of the 2005 Conference on New Interfaces for Musical Expression (NIME-05)*, Vancouver, Canada, pp. 93–96.
- da Silva, A., Wanderley, M. and Scavone, G. (2005). “On the use of flute air jet as a musical control variable.” In *Proceedings of the 2005 Conference on New Interfaces for Musical Expression (NIME-05)*, Vancouver, Canada, pp. 105–108.
- Scavone, G. and Wanderley, M. (2004). “The Music Technology program at McGill University.” In *Proceedings of the 2004 International Computer Music Conference*, Miami, USA, pp. 264–267.
- Scavone, G. (2003). “Modeling vocal-tract influence in reed wind instruments.” In *Proceedings of the 2003 Stockholm Music Acoustics Conference*, Stockholm, Sweden, pp. 291–294.
- Scavone, G. (2003). “THE PIPE: explorations with breath control.” In *Proceedings of the 2003 Conference on New Instruments for Musical Expression (NIME-03)*, Montreal, Canada, pp. 15–18.
- Scavone, G. (2002b). “Time-domain synthesis of conical bore instrument sounds.” In *Proceedings of the 2002 International Computer Music Conference*, Göteborg, Sweden, pp. 9–15.
- Scavone, G. and Karjalainen, M. (2002). “Tonehole radiation directivity: A comparison of theory to measurements.” In *Proceedings of the 2002 International Computer Music Conference*, Göteborg, Sweden, pp. 325–329.
- Scavone, G. (2002a). “RtAudio: A cross-platform C++ class for realtime audio input/output.” In *Proceedings of the 2002 International Computer Music Conference*, Göteborg, Sweden, pp. 196–199.
- Scavone, G., Lakatos, S., and Harbke, C. (2002). “The Sonic Mapper: An interactive program for obtaining similarity ratings with auditory stimuli.” In *Proceedings of the 2002 International Conference on Auditory Display*, Kyoto, Japan, pp. 368–371.
- Ben-Tal, O., Berger, J., Cook, B., Daniels, M., Scavone, G., and Cook, P. (2002). “SONART: The sonification application research toolbox.” In *Proceedings of the 2002 International Conference on Auditory Display*, Kyoto, Japan, pp. 368–371.
- Scavone, G., Lakatos, S., Cook, P. R., and Harbke, C. (2001). “Perceptual spaces for sound effects obtained with an interactive similarity rating program.” In *Proceedings of the International Symposium on Musical Acoustics*, Perugia, Italy, pp. 487–490.
- Scavone, G. and Lakatos, S. (2001). “Recent developments in woodwind instrument physical modeling.” In *Proceedings of the 17th International Congress on Acoustics*, Rome, Italy.
- Chafe, C., Wilson, S., Leistikow, R., Chisholm, D. and Scavone, G. (2000). “A simplified approach to high quality music and sound over IP.” In *Proceedings of the COST G-6 Conference on Digital Audio Effects*, Verona, Italy, pp. 159–163.

- Lakatos, S., Scavone, G., and Cook, P. R. (2000). “Obtaining perceptual spaces for large numbers of complex sounds: Sensory, cognitive, and decisional constraints.” In C. Bonnet (Ed.), *Proceedings of the Sixteenth Annual Meeting of the International Psychophysics Society*, pp. 245–250.
- van Walstijn, M. and Scavone, G. (2000). “The wave digital tonehole model.” *Proceedings of the 2000 International Computer Music Conference*, Berlin, Germany, pp. 465–468.
- Scavone, G. (1999). “Modeling wind instrument sound radiation using digital waveguides.” In *Proceedings of the 1999 International Computer Music Conference*, Beijing, China, pp. 355–358.
- Cook, P. R. and Scavone, G. (1999). “The Synthesis ToolKit (STK).” In *Proceedings of the 1999 International Computer Music Conference*, Beijing, China, pp. 164–166.
- Scavone, G. and Cook, P. R. (1998). “Real-time computer modeling of woodwind instruments.” In *Proceedings of the 1998 International Symposium on Musical Acoustics*, Leavenworth, WA, pp. 197–202.
- Scavone, G. and Mathews, M. (1998). “The Musical Acoustics Research Library.” In *Proceedings of the 1998 International Symposium on Musical Acoustics*, Leavenworth, WA, pp. 359–363.
- Smith, J. O. and Scavone, G. (1997). “The one-filter Keefe clarinet tonehole.” In *Proceedings of the IEEE Workshop on Applied Signal Processing to Audio and Acoustics*, New York, pp. 19–22.
- Scavone, G. and Smith, J. O. (1997b). “Scattering parameters for the Keefe clarinet tonehole model.” In *Proceedings of the 1997 International Symposium on Musical Acoustics*, Edinburgh, Scotland, pp. 433–438.
- Scavone, G. and Smith, J. O. (1997a). “Digital waveguide modeling of woodwind toneholes.” In *Proceedings of the 1997 International Computer Music Conference*, Thessaloniki, Greece, pp. 260–263.
- Scavone, G. (1996). “Modeling and control of performance expression in digital waveguide models of woodwind instruments.” In *Proceedings of the 1996 International Computer Music Conference*, Hong Kong, pp. 224–227.
- Scavone, G. (1995b). “Digital waveguide modeling of the non-linear excitation of single-reed woodwind instruments.” In *Proceedings of the 1995 International Computer Music Conference*, Banff, Canada, pp. 521–524.
- Scavone, G. (1995a). “Digital waveguide modeling of air-driven reed generators for the synthesis of brass and woodwind instrument sounds.” In *Proceedings of the Second Brazilian Symposium on Computer Music*, Canela, Brazil, pp. 132–138.
- Scavone, G. and Cook, P. R. (1994). “Combined linear and non-linear periodic prediction in calibrating models of musical instruments to recordings.” In *Proceedings of the 1994 International Computer Music Conference*, Århus, Denmark, pp. 433–434.

### Invited Conference Presentations

- Scavone, G., Lefebvre, A., and da Silva, A. (2008b). “Evaluating vocal-tract influence in the production of saxophone multiphonics (A).” *Journal of the Acoustical Soc. of America*, **123**, p. 3123.
- Lefebvre, A. and Scavone, G. (2008). “Input impedance measurements of conical acoustic systems using the two-microphone technique (A).” *Journal of the Acoustical Soc. of America*, **123**, p. 3015 (paper in *Proceedings of the Acoustics '08 Conference*).
- Lefebvre, A. and Scavone, G. (2006). “Input impedance measurements of alto saxophones with a calibration error analysis (A).” *Journal of the Acoustical Soc. of America*, **120**, p. 3332.
- da Silva, A. and Scavone, G. (2006). “A hybrid approach for simulating clarinet-like systems involving the lattice Boltzmann method and a finite difference scheme (A).” *Journal of the Acoustical Soc. of America*, **120**, p. 3362.

Scavone, G. (2005). “A unified digital waveguide (infra)structure for synthesizing wind instrument sounds (A).” *Journal of the Acoustical Soc. of America*, **117**, p. 2415.

Lakatos, S., Scavone, G., and Cook, P. R. (2000). “Knowledge acquisition by listeners in a source learning task using physical models (A).” *Journal of the Acoustical Soc. of America*, **107**, p. 2817.

### Conference Presentations

da Silva, A. and Scavone, G. (2008). “The influence of the mean flow on the transmission properties of wind instruments (A).” *Journal of the Acoustical Soc. of America*, **123**, p. 3447.

da Silva, A. and Scavone, G. (2007b). “The influence of the acoustic feedback on the fluid-structure interaction within single-reed mouthpieces: A numerical investigation (A).” *Journal of the Acoustical Soc. of America*, **122**, p. 3056.

Scavone, G. (2006). “Real-time measurement/viewing of vocal-tract influence during wind instrument performance (A).” *Journal of the Acoustical Soc. of America*, **119**, p. 3382.

Scavone, G. and Karjalainen, M. (2001). “Tonehole radiation directivity measurements (A).” *Journal of the Acoustical Soc. of America*, **110**, p. 2754.

Scavone, G. (2001). “Time-domain synthesis of conical bore instruments (A).” *Journal of the Acoustical Soc. of America*, **110**, p. 2754.

Lakatos, S., Scavone, G., Cook, P. R., and Harbke, C. (2001). “An interactive similarity rating program for large timbre sets (A).” *Journal of the Acoustical Soc. of America*, **109**, p. 2468.

Scavone, G. and Smith, J. O. (1996). “Digital waveguide modeling of woodwind toneholes (A).” *Journal of the Acoustical Soc. of America*, **100**, p. 2812.

### GRANTS AWARDED:

- |           |   |
|-----------|---|
| 2008–2009 | CENTRE FOR INTERDISCIPLINARY RESEARCH IN MUSIC MEDIA AND TECHNOLOGY, STRATEGIC INNOVATION FUND, with Larry Lessard (PI) and Luc Mongeau, <i>Composite Musical Instrument Design</i> , \$10,000 CAD.   |
| 2007–2008 | HEXAGRAM RESEARCH / CREATION PROJECT, with pk langshaw (PI), Ana Cappelluto, Michael Montenaro, and Oana Suteu, <i>d_verse: transitional algorithms of gesture</i> , \$73,483 CAD.  |
| 2006–2008 | NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA, SPECIAL RESEARCH OPPORTUNITY, with Marcelo Wanderley (PI), Stephen McAdams, Vincent Hayward, Philippe Depalle, and Catherine Guastavino, <i>Haptics, Sound and Interaction in the Design of Enactive Interfaces</i> , \$479,651 CAD. |
| 2005–2010 | NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA, DISCOVERY GRANT, <i>Signal Processing Methods and Tools for Acoustic Modeling of Music Instruments</i> , \$80,000 CAD.   |
| 2005–2006 | NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA, RESEARCH TOOLS AND INSTRUMENTS, <i>Laboratory Equipment for Research in Signal Processing Methods in Musical Acoustics</i> , \$33,341 CAD  |
| 2005–2008 | QUEBEC FONDS DE RECHERCHE SUR LA SOCIÉTÉ ET LA CULTURE, PROGRAMME D’APPUI À LA RECHERCHE-CRÉATION, with Denys Bouliane (PI), Sean Ferguson, Philippe Depalle, Marcelo Wanderley, and André Roy, <i>The Digital Orchestra</i> , \$152,320 CAD  |

- 2004–2009 CANADIAN FOUNDATION FOR INNOVATION, NEW OPPORTUNITIES, *Measurement and Development Tools for Computational Acoustic Modeling of Music Instruments and Sounding Objects*, \$438,508 CAD.
- 2004–2009 CANADIAN FOUNDATION FOR INNOVATION, INFRASTRUCTURE OPERATION FUND, *Measurement and Development Tools for Computational Acoustic Modeling of Music Instruments and Sounding Objects*, \$52,621 CAD.
- 1999–2002 UNITED STATES AIR FORCE, with Stephen Lakatos (PI) and James Beauchamp, *Mental Representation of Auditory Sources*, \$592,926 US.

### **TEACHING EXPERIENCE:**

- 2003–current ASSISTANT PROFESSOR, Schulich School of Music, McGill University.
- MUMT 306: Music and Audio Computing I
  - MUMT 307: Music and Audio Computing II
  - MUMT 502: Special Project in Music Technology
  - MUMT 614: Seminar on Computational Modeling of Musical Acoustic Systems
- 2006 INVITED LECTURER, Workshop on Music Controller Technologies, Faculty of Human and Social Sciences, Universidade Nova de Lisboa, Lisbon, Portugal.
- 1998–2003 LECTURER, MUS 150: Musical Acoustics, CCRMA, Dept. of Music, Stanford University.
- 2001 VISITING LECTURER, Seminar on Music Controllers, Institut Universitari de l'Audiovisual (IUA), Universitat Pompeu Fabra, Barcelona, Spain.
- 1999 LECTURER, MUS 320: Introduction to Digital Audio Signal Processing, CCRMA, Dept. of Music, Stanford University.
- 1995–2003 SAXOPHONE INSTRUCTOR, Dept. of Music, Stanford University.
- 1992–1994 TEACHING ASSISTANT, CCRMA, Dept. of Music, Stanford University.
- MUS 421: Signal Processing Methods in Musical Acoustics
  - MUS 420: Applications of the Fast Fourier Transform (FFT)
  - MUS 320: The Discrete Fourier Transform (DFT)
  - MUS 154: Introduction to Computer Music
  - MUS 21: Musicianship

### **ACADEMIC & PROFESSIONAL SERVICE:**

- RESEARCH AXIS CO-LEADER, “Sound modeling, acoustics and signal processing” research axis, Centre for Research in Music Media and Technology (CIRMMT), 2007–ongoing.
- MUSIC TECHNOLOGY AREA CHAIR, Schulich School of Music, McGill University, January 2006–ongoing
- DIRECTOR AND FOUNDER, *Computational Acoustic Modeling Laboratory (CAML)*, Music Technology, McGill University, January 2004–ongoing.
- CONFERENCE ORGANIZER AND CHAIR, The International Computer Music Conference (ICMC), McGill University, 16–21 August 2009.
- CONFERENCE CO-ORGANIZER, (with Stephen McAdams and Sean Ferguson) of the CIRMMT Music+Technology Incubator III: The Future of Computer Music workshop, 18–20 April 2008.
- CONFERENCE PAPER CHAIR, The International Conference on Auditory Display (ICAD), McGill University, 26–29 June 2007.

- VICE-PRESIDENT FOR THE AMERICAS, 2004–ongoing, VICE-PRESIDENT FOR CONFERENCES, 2006–2007, International Computer Music Association.
- TECHNICAL COMMITTEE ON MUSICAL ACOUSTICS, The Acoustical Society of America, 1999–ongoing.
- BOARD OF DIRECTORS, The Catgut Acoustical Society Forum, 1996–ongoing.
- DIRECTOR, The Musical Acoustics Research Library at The Center for Computer Research in Music and Acoustics, Stanford University, 1995–ongoing.
- SESSION CHAIR, ACOUSTICAL SOCIETY OF AMERICA MEETINGS, 2005, 2006, 2008
- CONFERENCE PROGRAM COMMITTEE MEMBER AND PAPER REVIEWER:
  - International Computer Music Conference, 2004–2008
  - Conference on Digital Audio Effects (DAFx), 2006 and 2008
  - Conference on New Interfaces for Musical Expression, 2006
  - European Signal Processing Conference, 2005
  - Computer Music Modeling and Retrieval Workshop, 2005
- PAPER REVIEWER FOR VARIOUS JOURNALS:
  - *Journal of the Acoustical Society of America*, 1998 (1), 2002 (2), 2003 (1), 2006 (2), 2007 (1)
  - *IEEE Transactions on Speech and Audio Processing*, 1998–2000 (1 each year)
  - *Computer Music Journal*, 2002
  - *Software–Practice and Experience*, 2004
- EXTERNAL GRANT REVIEWS:
  - Natural Sciences and Engineering Research Council of Canada (NSERC), 2005 (1), 2006 (3), 2007 (1),
  - Engineering and Physical Sciences Research Council, United Kingdom, 2004
- MCGILL UNIVERSITY NSERC PGS-D APPLICATION EXAMINER, Computer Science, Electrical Engineering, Math, Music fields, 40 applications, Fall 2006.
- MUSIC FACULTY COMMITTEES:
  - Committee of Area Chairs (2006–ongoing)
  - Theory / Music Research Graduate Sub-Committee (2003–ongoing)
  - Physical Development Committee (2006–2007)
  - Information Systems and Technology Committee (2004–2006)
  - Technical Committee on Network Management and Development (2004–2006)
  - Student Progress Committee (2004–2005)

### **CURRENT MEMBERSHIPS:**

- Acoustical Society of America
- International Computer Music Association
- The Violin Society of America (Catgut Forum)