Ten years of research in Piano Pedagogy

• 10th Anniversary •

2005 - 2015

Opening of a new lab

In 2005, the University of Ottawa officially established a unique research laboratory specializing in piano pedagogy, thanks to a $1.2 million grant from the **Canada Foundation for Innovation,** the **Ontario Innovation Trust**, the **University of Ottawa** and the **private sector.**

Mission

Promote scientific research in the field of piano pedagogy in order to establish a better understanding of piano learning and piano teaching processes.

Goals

Establish a common field of interest and facilitate collaborations among researchers in a variety of disciplines: music, education, cognitive sciences, psychology, neuroscience, audiology, health sciences, engineering, and information technology.

Offer academic programs which allow students to train in piano pedagogy research and actively participate in the multidisciplinary research projects of the Piano Lab.

Vision

Become the foremost authority in piano pedagogy research by building a world-class laboratory distinguished for

- its advanced scientific research in piano pedagogy
- its passion for knowledge and innovative thinking
- its unique specialized training in multidisciplinary piano pedagogy research

Gilles Comeau, Director
Yuanyuan Lu, Administrative Assistant
Mikael Swirp, Research Coordinator

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50 University - Room 204
Ottawa, Ontario K1N 6N5
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www.piano.uOttawa.ca

The Piano Lab celebrates 10 years!

Message from the President and CEO of Canada Foundation for Innovation

It is with great pride that I celebrated on October 14, 2005, as President and Vice-Chancellor of the University of Ottawa, the opening of the **Piano Pedagogy Research Laboratory**. Funded in 2002 by the Canada Foundation for Innovation as part of the "New Opportunities Fund", the Piano Pedagogy Research Laboratory brought together state-of-the-art equipment that allowed experts to observe, under ideal conditions, visual and auditory phenomena in order to measure the complex activity of learning to play the piano. Whether it is the sophisticated nature of the equipment, the modern design of the space, the energy conveyed by the vibrant colours of the room or the enthusiasm of the students and researchers, the Piano Pedagogy Research Laboratory was one of the research landmarks of the University of Ottawa. In fact, the laboratory always figured on the agenda of dignitaries that visited our campus. By bringing together experts in music, computer science, education, psychology, rehabilitation sciences and engineering, this inter-faculty project was one of the signature elements of our strategic academic and research plan.

Today, it is as President and CEO of the Canada Foundation for Innovation that I celebrate with you the 10th anniversary of the Piano Pedagogy Research Laboratory. I am delighted to see the extraordinary achievements of the students and researchers that have used this exceptional facility. For the CFI, this was seen as a high-risk/high impact project – the type of project we like to fund. Ten years later, I am pleased to witness first-hand, that the investment is paying dividends.

I am honoured to have been able to play a small role in the creation of this unique project. My sincere best wishes to the students, staff and professors of the Laboratory.

Sincerely,

Gilles Patry
President and CEO
Canada Foundation for Innovation

Message from the Dean of the Faculty of Arts

When I began in my role as dean this year, I was impressed with the Piano Pedagogy Research Laboratory — its infrastructure, state-of-the-art research technology and amount of valuable advanced research and knowledge disseminated. The study of music, and specifically, of piano learning, opens the door to questions that span many research areas.

For our students, this high level of teaching and research excellence represents an ideal place for intellectual challenge and discovery. For pianists, music teachers, young piano students and music prodigies, as well as for health scientists, mathematicians, psychologists and other professionals, it means a better understanding of the complexities of piano learning, teaching, practice and mastery.

This fall marks the lab's tenth anniversary. It is the perfect time and place to celebrate scientific knowledge, technology and artistic advancement being combined to push back boundaries. In the Faculty of Arts, we value and educate the whole person, addressing both feeling and thought. The laboratory is a microcosm of the Faculty. Thanks to Professor Gilles Comeau and his team, the lab has established an international reputation for its significant research impact and development of expertise.

And I believe that this is just the beginning.

Kevin Kee
Dean of the Faculty of Arts

"A $1.2-million laboratory for research into piano pedagogy officially opened at the University of Ottawa's School of music in October, in a celebratory mood. There was gratitude to spare, there was awe and delight as guests toured the colourful five-room facility, with its "smart" pianos, its infrared cameras, recording devices and custom software providing precise feedback on a pianist's sound, touch, tempo and arm motion."

- Peggy Berkowitz
University Affairs

"The University of Ottawa has put together the world's first lab focused exclusively on the scientific study of piano pedagogy. Methods for learning the piano abound. Now University of Ottawa researcher Gilles Comeau is applying advanced science to discover what really works."

- Ontario Innovation Trust

The Piano Lab celebrates 10 years!

A recognized leader: Under the guidance of its creator and director, Gilles Comeau, this lab has become one of the foremost research laboratories for the study of piano learning and piano teaching.

An incredible staff: Our three regular staff members have become an integral part of the Piano Lab. They bring an indispensable set of skills and provide cohesiveness and continuity to the lab's operation. They create an environment where researchers and students enjoy coming.

Director of the Piano Lab

Gilles Comeau has been the beneficiary of many research grants, including that from the Canadian Foundation for Innovation to set up a 1.2 million dollar research laboratory in piano pedagogy. As head of this facility, he has established partnerships with many other research laboratories and institutes and set up different multidisciplinary research groups to study various aspects of piano learning and piano teaching: music reading, motivation, physiological aspects of piano performance, piano-playing health injuries, and video-mediated learning.

Administrative Assistant

Yuanyuan Lu has been working in the Piano Lab as an administrative officer since 2009. Her MA in Piano Pedagogy is an ideal qualification for her current position. Her work involves dealing with every aspect of the day-to-day administration of the Lab as well as a coordination of the Lab's ongoing research activities.

Research Coordinator

Mikael Swirp started working at the Piano Lab in April 2014. He earned a B.Sc. in mechanical engineering in Calgary, and also completed his Licentiate with Trinity College London in piano performance. This combination of music and engineering is well-suited to his role at the Piano Lab. He is responsible for the technical elements of the operation of the lab, as well as contributing to various aspects of the research activities.

Technician

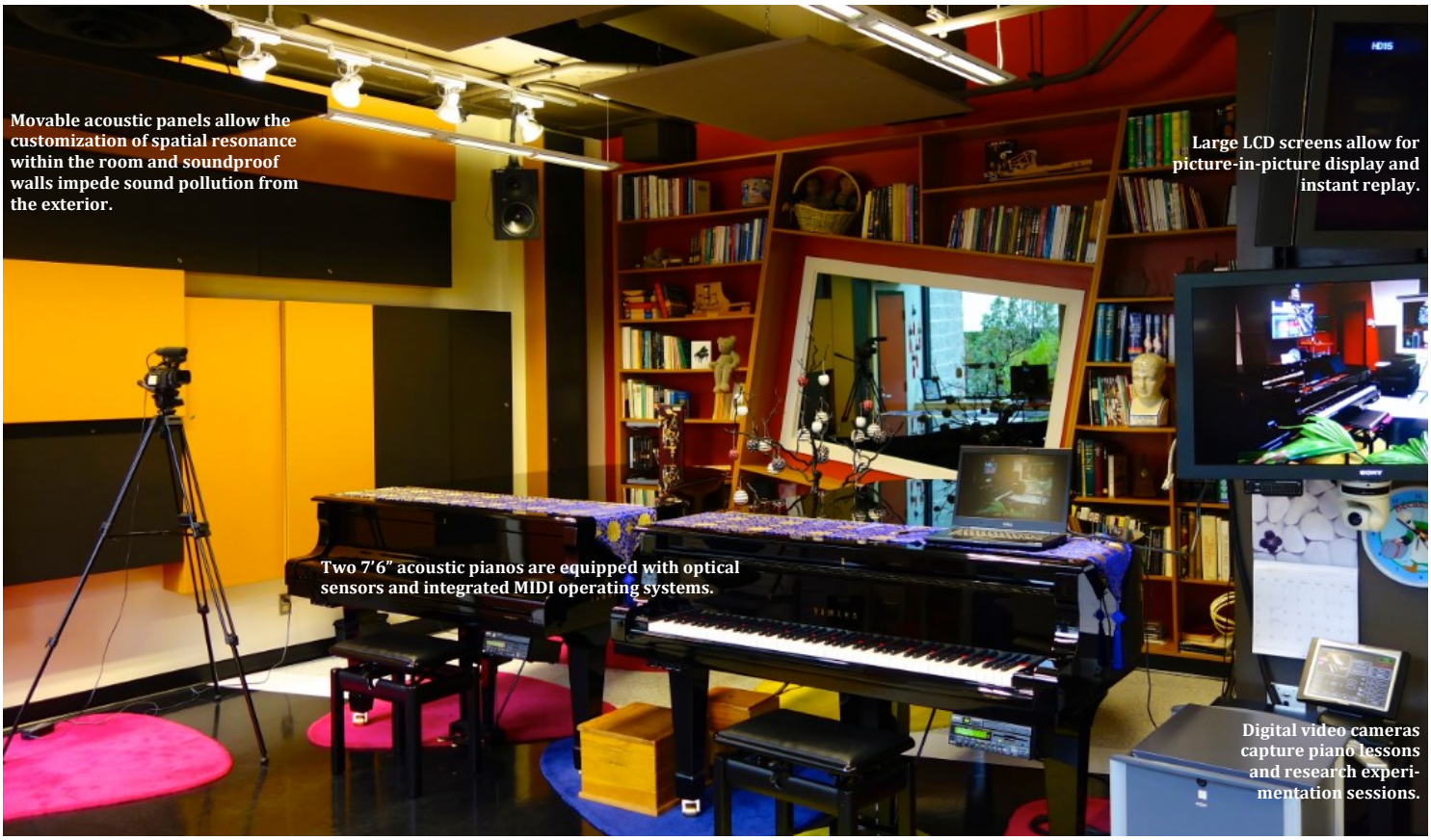
Yixiao Chen started as a technician assistant at the Lab in May 2014. After completing his Master's degree in Electrical and Computer Engineering last summer, he became the Piano Lab's primary technician. Chen played the Erhu (traditional Chinese musical instrument) for over 10 years, and his unique experiences in music and audio engineering help him with his work. He is responsible for the website, the on-line data bases and is involved in many research projects being conducted at the Piano Lab.

"On October 14 (2005), I was thrilled and honored to have had the opportunity to attend the Official opening of the first research laboratory in the world specializing in piano pedagogy at the University of Ottawa. This project, headed by Dr. Gilles Comeau, was definitely an extraordinary undertaking and has opened the door to so many possibilities – I'm still overwhelmed by my experience… As this laboratory is of global importance, located right here in our own backyard, I highly recommend that you go and visit this futuristic home of piano pedagogy."

- Ann Empey

The ORBit – Newsletter of the Ottawa Region Branch of the Ontario Registered Music Teachers' Association

Infrastructure



Sylva M. Gelber Studio

Piano learning is a complex and sophisticated phenomenon. Although keyboard playing has been taught for more than four centuries, piano pedagogy has not been greatly influenced by a scientific analysis of its foundations or methods. The Piano Pedagogy Research Laboratory was established to enhance understanding of piano instruction.

"If there was an award for the coolest lab on campus, uOttawa's Piano Pedagogy Research Laboratory would be a definite contender. Its colours, natural light and whimsical artistic touches instill a sense of calm to a background buzz of creative energy. The Piano Pedagogy Research Laboratory is advancing pioneering research that will have a significant impact on current and future generations of music teachers and piano students."

- Phil Jenkins
The Gazette

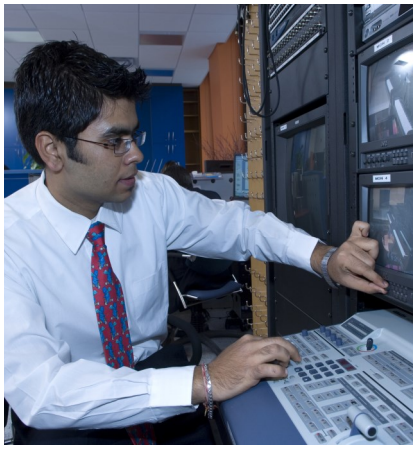
The Piano Lab provides an exciting and stimulating environment for graduate students and lab workers.

Ann Southam Multi-Media Control Centre

The Piano Lab infrastructure makes it possible to directly observe specific visual or auditory phenomena in order to measure the complex activity of learning to play the piano. The laboratory's sophisticated hardware enables a variety of experiments in a controlled environment.

A student's performance can be digitized, saved on computer or on videotape, and converted into statistical graphs and measurements. The enhanced access to multi-media technology has resulted in new levels of excellence in teaching and research.

The production centre enables timely and cost-effective management of all audio and visual files-recording, editing, formatting, transferring.



"The first thing that hits you when you walk in this lab is how inviting and colourful and friendly it is here. Because of how everything is set up...you really get the impression that incredible things are happening here… Piano Pedagogy hasn't really changed in a long time. Here at the Piano Pedagogy Research Laboratory they're actually finding new information, bringing new data to teachers and pianists, and teaching us new techniques. This is extraordinary."

- Jon Kimura Parker
Pianist

Infrastructure

Conference Room

This **multi-purpose environment** is ideal for seminars, lectures, workshops, video conferencing and distance education.

Video conferencing capacity connects international research teams via MIDI transfer and facilitates two-way piano teaching between the laboratory and distant locations.

"In October 2005, the University of Ottawa got a new research laboratory. On the cutting edge of technology, the laboratory is bringing together nearly 25 researchers from several fields… Camera, precision instruments to measure the various parameters involved in piano playing, software capable of analyzing these measurements—nothing is left to chance."

- Isabelle Maltais
Le Devoir [Translation]

"At the University of Ottawa, when you enter the world of the piano, you get out the research tools: computers and technology are being used to find an explanation for the phenomenon of playing the piano."

- Normand Thériault
Le Devoir [Translation]

Resource Centre

The Piano Pedagogy Resource Centre has one the largest collections of piano method books in North America. It also houses an extensive collection of reference materials for researchers and students in piano pedagogy.

Materials include:

- North American piano teaching methods
- European piano teaching methods
- Musical tests and psychometric tests
- Theses, dissertations and research reports
- Piano scores with a strong focus on student music
- Teaching materials
- Pedagogical aids

"The lab's resource center houses what may be the world most diverse and complete collection of children's music teaching handbooks, enabling comparison and critique as never before."

- Tim Lougheed
Canada Foundation For Innovation

"Piano teaching is probably the only field that is still using teaching materials more than 50 years old. This seemingly insignificant observation is nonetheless a revealing point of departure to explain the existence of the Piano Pedagogy Research Laboratory in the Music Department at the University of Ottawa. The lack of empirical studies and scientific data actually makes previous research on piano learning seem rather simplistic."

- Jean-Guy Bruneau
Perpsectives sur la recherche [Translation]

Infrastructure

Period Instrument Studio

The Period Instruments Studio provides a firsthand opportunity for students to experience music in its historical context.

Open to students and researchers, this instrument collection has become a great asset to the Piano Lab.

Morley clavichord model purchased as a kit in the UK and put together by Canadian physicist Hugh LeCaine.

Five-and-a-half octave **Lindholm-Söderström** Clavichord. This instrument is known for its ability to stay tuned longer and play louder than the average clavichord.

The collection includes:

- Graf pianoforte (6-octave Viennese model built by R. J. Regier)
- John Morley clavichord (4½-octave model)
- Lindholm-Söderström clavichord (5½-octave model from 1806 built by A. Lagerquist)
- Broadwood pianoforte (built in 1829 by John Broadwood and Sons Piano Company)

Six octave original **Broadwood** pianoforte. Established in 1728, John Broadwood and Sons is one of the oldest and most prestigious piano companies.

Six octave **Viennese Graf** pianoforte. Graf pianoforte were prominent at the highest level of early 19th century musical life: Beethoven, Chopin, Liszt, Clara Wieck and Brahms owned or played them.

Highlights

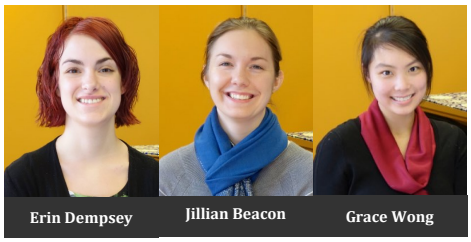
In 2009, Mr. Peter Mansfield graciously donated a 19th century pianoforte. The instrument is a Broadwood built in London, England, ca. 1829. It is an example of the English school of pianoforte construction, which had a very different and stronger hammer mechanism from those built in Vienna. This gift has broadened the School of Music's collection and allows the students to compare the two types of pianoforte and to have experience with the kind of instrument that was the direct ancestor of the modern piano. The inscription inside of the **Broadwood** pianoforte reads: "Patent, John Broadwood And Sons, Makers to His Majesty And the Princesses, Great Pulteney Street, Golden Square, London 1829."

Current Students

The Piano Lab is recognized for the quality of its learning environment. The Lab's students and researchers work collaboratively on multidisciplinary projects to understand the effects of different teaching methods, the motivational stages of piano playing, the prevention of piano playing health problems, the effects of technology, and other aspects of piano learning.

PhD in Human Kinetics
with Research Topic in Piano Pedagogy

Erin Dempsey
Jillian Beacon
Grace Wong


Erin Dempsey | Jillian Beacon | Grace Wong

Master of Arts in Music
with a thesis in Piano Pedagogy

Teri Slade
Research topic: *Somatic training for musicians*

Mélina Dalaire
Research topic: *Dalcroze Eurythmics*

Mary Claire Jensen
Thesis: *The compilation and classification of music reading assessments*

Meir Sung (Hong Kong, distance student)
Thesis: *A survey of technique elements in beginner piano method books and technique books*

Sandra Markovic
Thesis: *Music recognition and performance reproduction abilities of prelingually deaf children with cochlear implants after six months of formal music instruction*

Meganne Woronchak
Thesis: *Reflective journaling: Preparing undergraduate piano students for professions in music*

Karen King (Calgary, distance student)
Thesis: *Parting ways with piano lessons: Declining motivation and piano student dropouts*

Susan Mielke
Thesis: *Mental practice in music performance: A literature-based terminology and taxonomy*

Master of Arts in Music
with a Major Research Paper in Piano Pedagogy

Joanna Phua
Research topic: *Music reading*

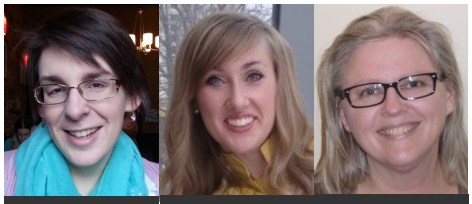
Paula Lin
Research topic: *The working memory of the child prodigy*

Graduate Diploma in Piano Pedagogy Research

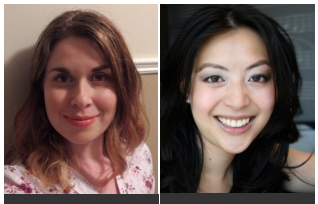
Kelsey Ross
Andrea Yau (Toronto, distance student)


Teri Slade | Mélina Dalaire | Mary Claire Jensen


Meir Sung | Sandra Markovic


Meganne Woronchak | Karen King | Susan Mielke


Joanna Phua | Paula Lin

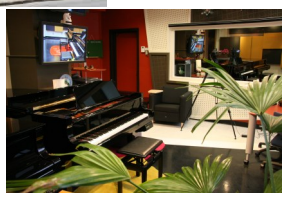

Kelsey Ross | Andrea Yau

Milestones

2007 — New partnership is created with the PhD program in Human Kinetics at the University of Ottawa allowing students to pursue their research interest in piano pedagogy-related topics.
2004 — Undergraduate Certificate in Piano Pedagogy Research approved.
2003 — Graduate Diploma in Piano Pedagogy Research approved.

Student Involvement

uOttawa



Student Alumni

The academic programs associated with the Piano Pedagogy Research Laboratory are research driven. They provide students with an opportunity to develop research skills and gain leadership in establishing piano pedagogy as a research discipline.

Graduate students under the supervision of Gilles Comeau are conducting research that enriches our understanding of piano learning and its impact on piano teaching.

The program encourages and supports interaction and cooperative effort between students and researchers, which promotes diversified modes of learning.

Kimberley Sundell | Yuanyuan Lu | Julia Brook | Ann Babin | Jason Ray

Research on piano teaching

Kimberley Sundell (MA 2012)
Thesis: *Comprehensive musicianship and beginner piano method books: A content analysis*

Yuanyuan Lu (MA 2012)
Thesis: *Survey of eighteen North American piano method books: Repertoire selection and categories*

Julia Brook (MA 2007)
Thesis: *An on-line digital video library of piano teaching: A case study with five teachers*

Jason Ray (MMus 2007)
Major Research Paper: *The use of technology for the measurement and analysis of piano performance with a discussion of the implications for piano pedagogy*

Ann Babin (MA 2005)
Thesis: *Music conservatories in Canada and the piano examination system for the preparatory student: A historical survey and comparative analysis*

Line Morais (MA 2005)
Thesis: *L'analogie comme stratégie d'enseignement en pédagogie du piano*

"Comeau regards the lab as a challenge to the many widely held notions about the nature of music and musical talent, raising questions that have seldom been asked by authorities in the field. This work may sound far removed from helping kids enjoy the piano, but the tools being created and tested at the laboratory ultimately serve that purpose. Comeau expects to learn a great deal more about the mechanics of music-making, and is confident that this new-found knowledge will not taint the romance surrounding innate musical talent. Music can stay mysterious, he insists, but the learning of it can be scientifically studied. Comeau firmly believes that by better understanding how to teach and learn the playing of the piano, more people would experience success with this instrument. That would be good news for legions of hopeful young players who often find little more than frustration at the keyboard and simply give up."

- Tim Lougheed
Canada Foundation For Innovation

Catherine Lemay | Yifei Liu | Nisreen Jardaneh | Grace Bruno

Research on piano learning

Catherine Lemay (MA 2008)
Thesis: *Sight-reading for piano students: Comparing three methods of assessment*

Yifei Liu (MMus 2007)
Major Research Paper: *Cross-cultural analysis of motivation levels of piano students in China and in North America*

Nisreen Jardaneh (MA 2007)
Thesis: *Exploring young piano students' perceptions of effective practice strategies*

Grace Bruno (MA 2004)
Major Research Paper: *Behind the scenes of musical expertise: Genes, environment, personality, motivation and cognition*

Karine Larochelle (MMus 2003)
Major Research Paper: *L'impact de la musique dans le développement géneral de l'enfant de 6 à 2 ans*

Research on piano playing

Erin Dempsey (MA 2015)
Thesis: *Music performance anxiety in children and teenagers: Effects of perfectionism, self-efficacy, and gender*

Jillian Beacon (MA 2015)
Thesis: *Assessing 2D and 3D motion-tracking technologies for measuring the immediate impact of Feldenkrais training on the playing postures of pianists*

Grace Wong (MA 2015)
Thesis: *The immediate effects of somatic approach workshops on the body usage and musical quality of pianists*

Audrey Mo (MA 2015)
Major Research Paper: *Pedagogical implications for piano teachers and students: Addressing negative cognition in MPA with sports psychology principles*

Michèle Wheatley-Brown (MA 2011)
Thesis: *An analysis of terminology describing the physical aspect of piano technique*

Flora Nassrallah (MSc 2010)
Thesis: *Breathing patterns of pianists while executing four performing tasks*

Audrey Mo | Michèle Wheatley-Brown | Flora Nassrallah

"Learning music is not always easy, and this lab is discovering things about learning to play the piano that are astonishing."

- Mme Aline Chrétien
Co-president of the Friends of the Piano Lab [Translation]

Student Involvement

Graduate Diploma in Piano Pedagogy Research

This diploma enables piano teachers to incorporate scientific knowledge into their practice and develops highly qualified professionals with a strong interest in piano pedagogy research.

Joanna Phua (2015)
Karen King (2014)*
Elizabeth Szczepanski (2014)
Jillian Beacon (2013)
Lindsay Hamilton (2013)
Meir Sung (2013)*
Grace Wong (2013)
Shannon Maertens (2012)
Vanessa Rektor (2012)*
Yuanyuan Lu (2010)
Ivea Mark (2010)*
Michèle Wheatley-Brown (2010)*
Shirley Ho (2009)
Marie-Claire Lazure (2008)
Mélina Dalaire (2007)
Erin Parkes (2007)
Leana Azerral (2006)
Julia Brook (2006)
Hoaden Brown (2006)
Nisreen Jardaneh (2006)

*Distance students

Undergraduate Certificate in Piano Pedagogy Research

A considerable number of musicians are trained through the conservatory system and then become teachers without getting a university degree. Others get a university degree in performance without any music education courses. The Undergraduate Certificate in Piano Pedagogy offers professional training and courses with a practical orientation to piano teachers who are already giving lessons in private studios and music schools in order to provide them with the opportunity to improve their skills and knowledge in their chosen field.

Beverley McKiver (in progress)
Susan Mielke (2014)
Paula Croucher (2013)*
Sandra Markovic (2013)
Émilie Bertrand-Plouffe (2011)
Esther Jean-Charles (2010)*

*Distance students

Highlights

2008 Graduate Diploma and Undergraduate Certificate programs become available via audio-video-internet technology, extending the Lab's reach outside Ottawa to Canadian students across the country as well as international students from all over the globe.

2008-2015 Over 20 courses for a total of 275 classes have been offered to Canadian and International distance students.

"In September 2008, the University of Ottawa launched two innovative new programs available through audio-video conferencing: an Undergraduate Certificate in Piano Pedagogy and a Graduate Diploma in Piano Pedagogy Research. These programs were promoted to piano teachers nationwide as a way of upgrading their qualifications. Students from across the country registered for the courses. 'This is the only way I could have taken a course like this,' said one participant from Calgary. 'Moving to Ottawa to take the course could never have been an option for me'."

- Lara Wellman
The uOttawa Gazette

Student Researchers

Students from other research labs and other institutions have been coming to the Piano Lab to complete part of their research work for their thesis or research project.

Marie Jehu
Master of Health Sciences in Audiology, University of Ottawa (2015)
Supervisor: Gilles Comeau
L'efficacité des microphones directionnels: une revue de la littérature

Karen McCarthy
Master of Applied Science in Biomedical Engineering, Carleton University (in progress)
Supervisors: Adrian Chan, Donald Russell, Gilles Comeau
Detection of forearm muscle fatigue during piano playing using surface electromyography analysis

Caroline Andison
Master of Applied Science in Mechanical and Aerospace Engineering, Carleton University (2011)
Supervisor: Donald Russell
EMG-based assessment of cocontraction in forearm muscles while playing the piano

Safaa Mohamed
Master of Applied Science in Biomedical Engineering, Carleton University (2011)
Supervisor: Monique Frize
Evaluation of piano-related injuries using infrared imaging

Josée Vaillancourt
PhD in Éducation, Université Laval (2010)
Supervisor: Denis Simard
Co-supervisor: Gilles Comeau
Élaboration d'un cadre d'analyse pour la sélection d'un répertoire de chansons et de pièces vocales utilisées en contexte pédagogique d'éducation musicale à l'école primaire

Christophe Herry
PhD in Electrical Engineering, Carleton University (2008)
Supervisor: Donald Russell
Segmentation and extraction of regions of interest for automated detection of anomalies in clinical thermal infrared images

Silvain Bériault
Master of Applied Science in Electrical Engineering, University of Ottawa (2008)
Supervisor: Pierre Payeur
Multi-camera system design, calibration and 3D reconstruction for markerless motion capture

Martin Côté
Master of Applied Science in Electrical Engineering, University of Ottawa (2007)
Supervisor: Pierre Payeur
Video segmentation for markerless motion capture in unconstrained environments

Christy Vant
Master of Applied Science in Mechanical and Aerospace Engineering, Carleton University (2007)
Supervisor: Donald Russell
Driving point impedance measurements during piano playing

Javier Mora
Master of Computer Science, University of Ottawa (2008)
Supervisor: WonSook Lee
Hapto-visual representation of three dimensional incompressible flows

Student participation made it possible to conduct innovative projects.

- The effects of piano lessons on the central auditory system in hearing-impaired children
- Thermal imaging for monitoring the temperature of a performer's body
- The effects of somatic approaches on the physiology of pianists

Student Involvement

Internships (Brazil)

Engineering
Caio Elais
Gabriel Nascimento

Medicine
Nathalia Canabarro
Rodrigo Tolio

Music
Matheus Rocha

Research assistants

Computer Sciences
Allyshia Sewdat

Sciences
Stephanie Ahken
Hoang Pham

Music
Jacinda Chapman
Sean Done
Edana Higham

Volunteers

Biomedical Sciences
Yuji Jeong

Health Sciences
Mariana Essa

Mathematics
Wenqian Li

Music
Emma Fleet
Heinrick Gonneville
Nourjahan Sattari
Dominique Trudel

Theatre
Lisa Pitre

Psychology
Evgeniya Nazarnaya
Kimberly Pereira
Eva Nadon
Stéphanie Monette
Meriem Ferkli

Second Language Teaching
Catherine Mongrain

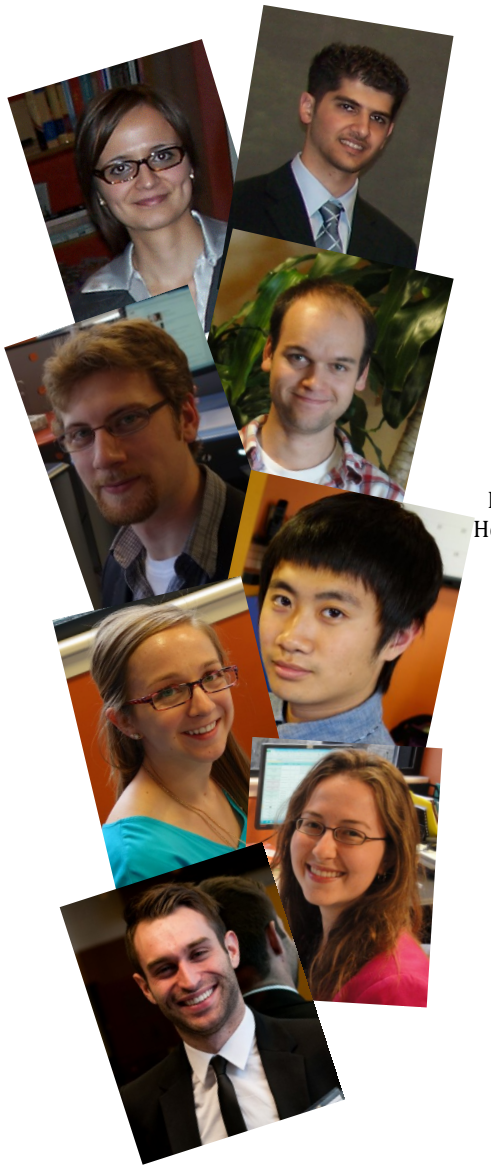
Secondary School
Tamara Brown
Marie-Bé Leduc
Cindy Li

Students contributed to the following research and measurement tools:

- Survey of Musical Interests
- Music reading rating scale
- MIDIator
- Software for music symbols inventory
- Visualization software
- Video database with over 700 clips

Student Staff

Graduate and undergraduate students from various disciplines have been an integral part of the Piano Lab since its opening.



Communications
Shaun Elie

Engineering
Huthaifa Abderahman
Tanveer Ali
Baruyr Baghdasarian
Zacharie Brunet
Pei Cao
Yixiao Chen
Dharmesh Dhakan
Nikhil Enmudi
Bowei Han
Nimeesh Kaushal
Ali Khanafer
Hanieh Khamseh-Zadeh
Houman Khamseh-Zadeh
Michel Khoury
Daniyal Khurram
Joshua Kotwas
Nimieesh Kaushal
Mathieu Ku hn
Jonathon Lam
Jonathon Neva
Jan Pachla
Mihir Sharma
Junaid Oosman Thair
Arjun Yogeswaran
Samira Zabhi
Xi Zhang

Film & Sonic Design
Christian Delahousse

Health Sciences
Marie-Josee Charette
Brian Richard
Michael Watson

Information Studies
Jada Watson

Marketing
Lina Ji

Mathematics
Daniel de Repentigny

Music
Alicia Desjardins
Matthieu Deveau
Tamar Dubuc
Emily Gale
Rosemary Harden
Bonnie Huor
Megan Johnson
Danielle Lanteigne
Lauren McGee
Milada Medinic
Joel Scott-Mignon
Aaron Mogenson
Nicole Pachla
Adam Saikaley
Michelle Vandal
Craig Visser
Sylvain Wellman-Frenette

Psychology
Runa Das
Michelle Iznardo
Jacklynne Smith

Statistics - 10 years of student involvement

- Students currently in a piano pedagogy program: 16
- Students who have already completed a program in piano pedagogy: 41
- Non-music students who have conducted their research thesis project at the Piano Lab: 10
- Students who have worked for the Piano Lab: 82

Total number of students involved with Piano Lab over the last 10 years: 149

Research Partners

The Piano lab has brought together researchers from different fields and forged unique and productive partnerships that bring together the forces of knowledge, innovation and development in order to study the intricacies involved in how young musicians learn piano. By ensuring high-quality national and international ties with partners from various institutions, we strengthen our competitive edge and cultivate innovative multidisciplinary research.

Research on Piano Teaching

Video-Mediated Teaching

WonSook Lee (Engineering, University of Ottawa)
Abdulmotaleb El Saddik (Engineering, University of Ottawa)
Shervin Shirmohammadi (Engineering, University of Ottawa)
John Spence (Communications, Communications Research Centre)

Distance Education

Martin Brooks (Engineering, National Research Council)*
William Budai (Music, Indiana University-Purdue University at Indianapolis, IUPUI)
Philip Donner (Music, Virtuosi, Finland)
Matti Ruippo (Music, Pirkanmaa University of Applied Sciences, Finland)*
Lauri Väinmaa (Music, Pirkanmaa University of Applied Sciences, Finland)

Martin Brooks managing a videoconferencing session with our research partners in Finland

Isabelle Peretz presenting at the symposium on music prodigies

*Currently working on projects

Research on Piano Learning

Motivation

Alain Desrochers (Psychology, University of Ottawa)
Isabelle Green-Demers (Psychology, Université du Québec en Outaouais)
Veronika Huta (Psychology, University of Ottawa)*

Music Reading

Ramesh Balasubramaniam (Neurosciences, University of California, Merced)
Bruno Emond (Engineering, National Research Council)*
Elaine Keillor (Music, Carleton University)*

Music Prodigies

Virginia Penhune (Psychology, Concordia University)*
Isabelle Peretz (Psychology, Université de Montréal)*
Laurel Trainor (Psychology, McMaster University)*

Highlights

In ten years, the Piano Lab has brought together over 28 researchers from 12 separate institutions and forged unique partnerships with many laboratories and research institutes.

Research on Piano Playing

Health Issues

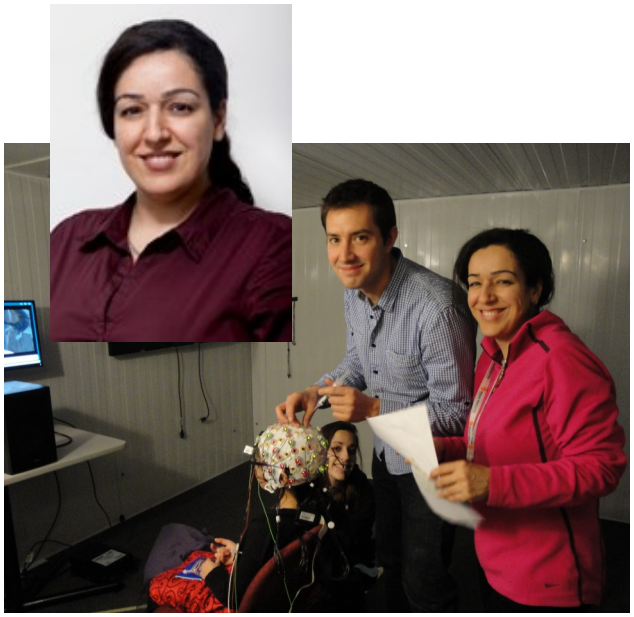
Isabelle Cossette (Music, McGill University)
Monique Frize (Engineering, University of Ottawa)
Amineh Koravand (Neurosciences, University of Ottawa)*
Jaruno Perttunen (Music, Pirkanmaa University of Applied Sciences, Finland)*

Physical Aspects

Nadine Bressler (Health Sciences, Epidemiology, Toronto)
Ursula Stuber (Music, Université Laval)
Pierre Payeur (Engineering, University of Ottawa)*
Donald Russell (Engineering, Carleton University)*
Louise Mathieu (Music, Université Laval)

Donald Russell with a special device detecting forearm muscle fatigue during piano playing

Ursula Stuber offering a workshop in Eutony



Amineh Koravand recording cortical neurophysiological data from deaf children with cochlear implants who are learning to play the piano

***Currently working on projects**

"A team of musicians, psychologists and engineers are studying piano pedagogy. This is an admittedly uncommon alliance, but a very successful one, led by Gilles Comeau at the University of Ottawa's Department of Music. In this highly technological music laboratory, the multidisciplinary team of researchers is measuring teaching that traditionally is done primarily by intuition."

- *Jocelyne Morin-Nurse Tabaret* [Translation]

Research

Research on Piano Teaching

Methods and Curriculum
- Piano Book Series
- Suzuki Method
- Piano Examination System

Technology-Mediated Teaching
- Piano Performance Measurement
- Digital Video Database
- Motion-Visualizing Software

Distance Education
- Distance Keyboard Lessons in an Inuit Community
- On-Site and Distance Piano Teaching

Research on Piano Learning

Music Reading
- Music Reading in Method Books
- Measuring Music Reading Performance
- Eye-Movement Patterns

Practice Strategies
- Students' Strategies
- Mental Practice
- Reflective Journaling

Student Characteristics
- Music Prodigies
- Deaf Children

Motivation
- Measuring Students' Motivation
- Parental Influences
- Chinese Students
- Student Dropouts

Research on Piano Playing

Health Issues
- Playing-Related Injuries
- Performance Anxiety
- Hearing Sensitivity Among Student Musicians

Physical Aspects of Performing
- Investigating Breathing Patterns
- Describing Piano Technique
- Evaluating Somatic Training
- Measuring the Impact of Feldenkrais Training

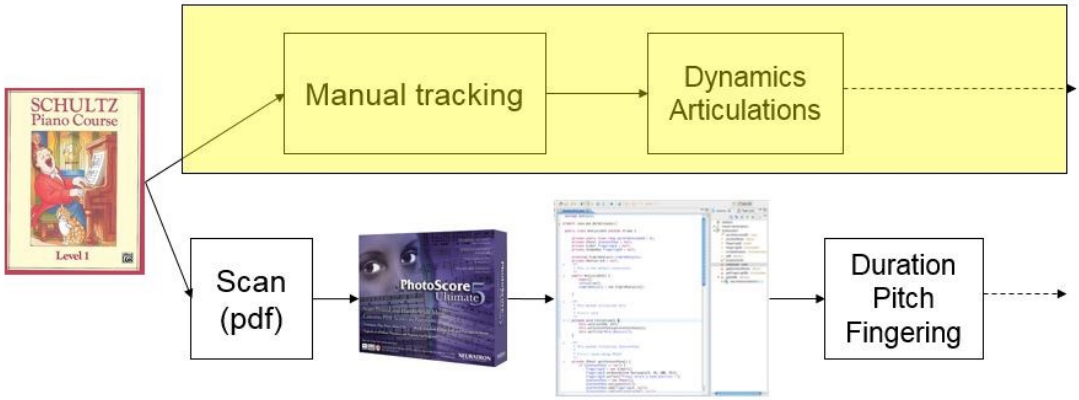
Statistics

Research on Piano Teaching		Research on Piano Learning		Research on Piano Playing	
Publications	12	Publications	10	Publications	8
Oral Communications	23	Oral Communications	30	Oral Communications	27
Theses and Research Papers	6	Theses and Research Papers	5	Theses and Research Papers	6

Piano Book Series

Despite the popularity of method books in everyday music lessons, the **type of repertoire** found in each series had not been systematically analysed. An inventory of pieces found in North-American method books was undertaken to identify the type of music considered most important in each series. The results are a valuable source of information for teachers who are concerned about providing a variety of repertoire to their students (Lu, 2012).

Another study investigated whether piano method books are including the **types of activities central to a well-rounded music education**. A content analysis showed that while some activities (theory and teacher's duets) are consistently valued by most manuals, there was a noticeable lack of creative activities like improvisation and composition and these tended not to be integrated within the main curriculum, but presented in accompanying books (Sundell, 2012).



Flow chart showing the process for extracting music symbols in method books

The presence of **analogy** in the piano manuals was studied to evaluate the importance placed on this teaching strategy and to identify the most common types of analogy being used (bodily, visual, functional and relational). The benefits of analogy for learning are many. Unfortunately, our study found that the use of analogy in piano books is often hidden or implicit (titles of pieces, illustrations, song lyrics) and rarely integrated as an informative tool (Morais, 2005).

Acquiring good **technical skills** is one of the main goals pursued by piano teachers. It was therefore important to investigate the technical elements included in piano method books in order to fully understand how they are introduced and find out which technical elements are missing in some particular manuals. These results provide piano teachers with thorough information on the elements of technique found in different method books and can help them to select the most appropriate method books for their students (Sung, 2015).

Future project: Following these detailed analyses of the main North American piano manuals, our next project is to publish a comprehensive content analysis and a comparison of the different book series commonly used for piano teaching. This book will be a valuable resource for researchers and an excellent textbook for graduate and undergraduate students studying piano pedagogy.

Piano teaching manuals are the basic learning tool that structure and provide content for most piano lessons and for that reason, they deserve to be analyzed carefully.

The questions we were able to address

- What are the technical elements taught in the different piano series? What is the importance given to each one, how are they presented and which ones are missing?
- What types of repertoire are most frequently found in piano manuals? Which piano series offers the most varied repertoire? Which manuals include ethnocultural repertoire?
- Which method books include the principles of the Comprehensive Musicianship approach? Are these principles integrated into the main curriculum or are they presented as an add-on to the basic program?

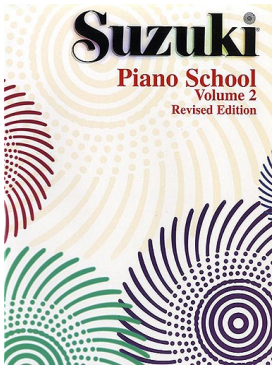
Research on Piano Teaching

Methods and Curriculum

Kamal learning "The Happy Farmer" by ear

Robbie preparing for a piano examination with the Royal Conservatory of Music

Suzuki Method



Ear playing and the **natural learning process** are at the core of the Suzuki method, but few researchers have investigated whether the initial process of playing by ear is supported by existing theoretical and empirical literature or whether the natural learning process, as it is understood in language learning and reading acquisition, is applicable to musical training. By addressing this research gap, we were able to highlight the benefits of learning by ear and to demonstrate that there are no reasons to associate ear playing with poor reading skills. However, our research also showed that there are many reasons why it is misleading to suggest that learning to play a musical instrument can unfold in the most natural way as it would with learning a mother tongue. The relevance of this study stems from the popularity of the Suzuki method (Comeau, 2012).

Piano Examination System

Seeing the lack of a comprehensive study of the Canadian **piano examination curriculum**, we undertook to explore the historical origins and evolutionary development of music conservatory examination systems. This historical study revealed a continually evolving process with a shift from more technique-based curricula to more emphasis on theory as well as a general expansion in repertoire selection. This survey provides interesting insights on the music syllabi and the examination system followed by many young piano students (Babin, 2005).

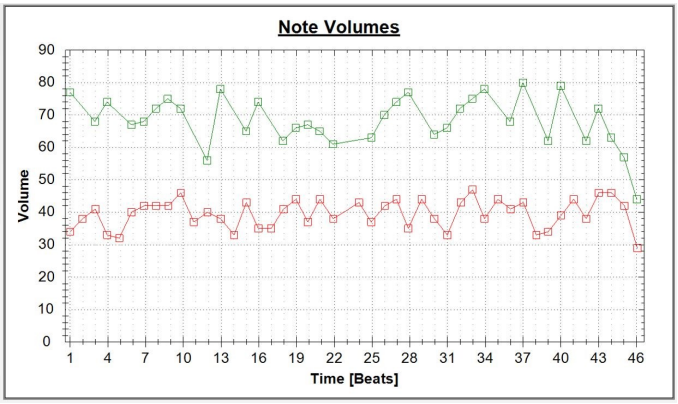
The questions we were able to address

- What are the real effects of learning by ear? To what extent can the natural learning process be applied to music instrumental learning?
- How do the different Canadian piano examination systems compare to one another? What are their standard of musical accomplishment?

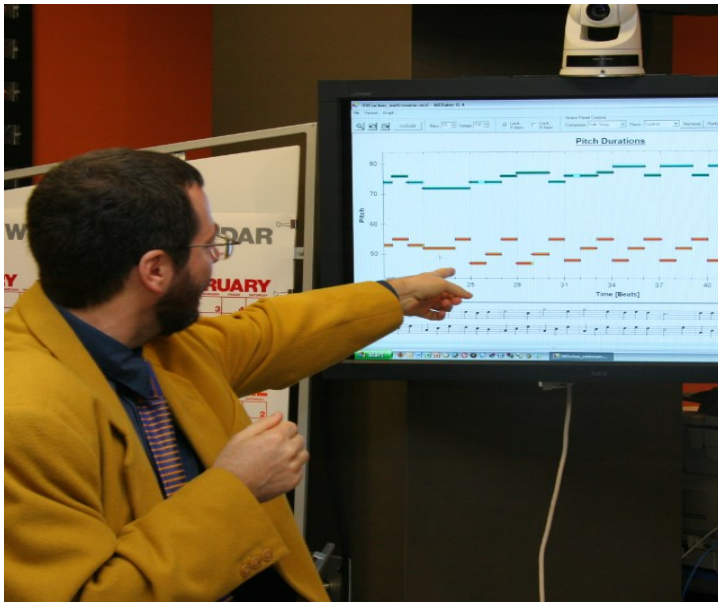
Technology-Mediated Teaching

Piano Performance Measurement

The **MIDIator** is a software tool that has been developed at the Piano Lab to analyze a student's piano performance. With the MIDIator, researchers, teachers and students have an objective measurement of a performance that can be used as a basis for studying the accuracy of the playing and the quality of the expressive elements. This tool can also be useful to follow progress over time (Comeau, Khanafar, & Shirmohammadi, 2006).



Data on note volumes collected from the MIDIator



Gilles Comeau explaining how the MIDIator software can be used

The online digital video library webpage

Digital Video Database

An **online digital video library** of piano teaching was developed and a multiple case study methodology was employed to examine the experiences of five piano teachers as they interacted with this tool for four weeks. Findings from this study indicated that viewing the online videos was a beneficial professional development activity, which facilitated teacher learning and which could be immediately carried over into their teaching situation resulting in increased student success (Brook, 2007).

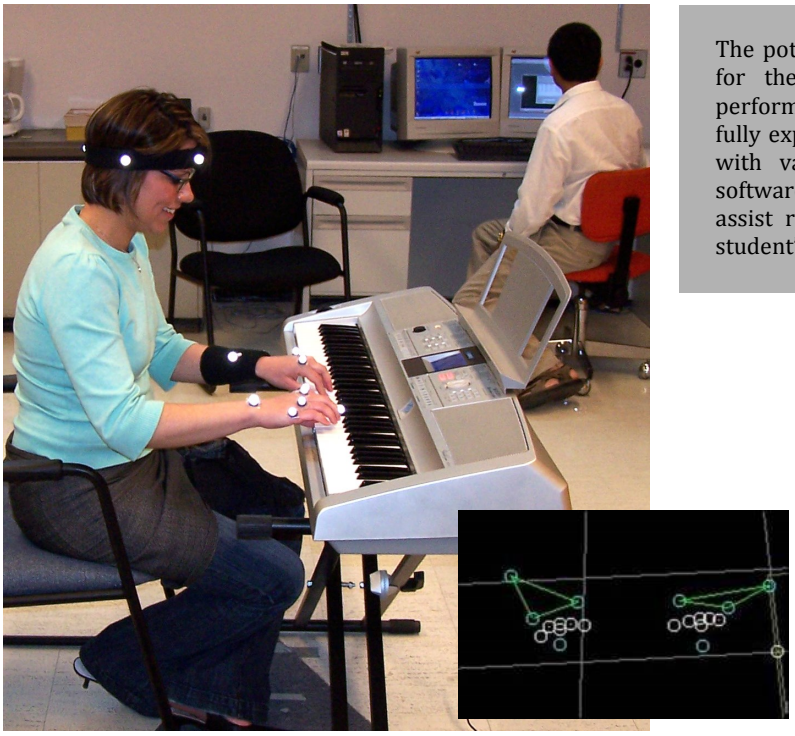
Following the success of this initial study, more than 700 piano teaching video clips were filmed and categorized at the Piano Lab, and an **online video database** created. These videos show multiple teaching strategies, various approaches to piano technique, activities in music reading, presentations of period instruments and examples of technology usage in the piano studio. The value and the benefits of this resources for research and teacher-training purposes is now being evaluated.

The development of new tools for research and teaching

- Software that provides an objective measurement of a performance
- A collection of video clips that assist students training to become piano teachers

Research on Piano Teaching

Technology-Mediated Teaching



Tamar Dubuc being recorded and the 3-D reconstruction of her movement that was created

The potential of motion capture presents important opportunities for the analysis of human movement, whether to improve performance or prevent injuries, but these tools have not yet been fully exploited in music pedagogy. The Piano Lab is experimenting with various tracking systems and is developing specialized software in order to identify how these technologies could best assist researchers and teachers interested in analysing a piano student's patterns of movement.

Donald Himes participating in a 3D motion-tracking project

Motion-Visualising Software

In a first project, we looked at the design and implementation of a flexible and easy-to-use multi-camera acquisition setup for **markerless human gesture monitoring** that could provide non-invasive observations of a pianist's fingers, hands and body movement. We were then able to highlight the advantages and limitations of such a system for assisting in piano pedagogy research (Côté, Payeur, & Comeau, 2007).

Using three-dimensional motion tracking, we developed two innovative applications to explore how **3D visual feedback** could help with maintaining a good posture at the piano. First, through basic motion-capture techniques, we were able to create a 3D skeletal reconstruction of a student performing at the piano. This reconstruction could then be displayed through an interactive user interface that permits the visualisation from any angle, making it possible to observe the performer from any possible view. In a second project, we reconstructed in three dimensions the posture and body motions of a professional piano player so that it could be compared to the posture and movements of various students, by simply overlaying the reconstructed model over two-dimensional videos of students playing the piano. We were then able to study how this visual feedback can help a student noticing potential postural problems when playing the instrument. The possibility of using motion-capture technology to record piano posture and then to impose the 3D reconstruction above a range of available video performances proved to be an innovative application that can enhance and offer an additional teaching aid for the instructor (Mora, Lee, & Comeau, 2007).

The questions we were able to address

- How could motion-capture technology be integrated into piano pedagogy research?
- Could 3D visualisation technology improve piano performance and help prevent injuries?
- To what extent could this technology become a teaching aid?

"The pianos are wired with infra-red sensors that can create a computer sequence of whatever is played, so it can be played back electronically. Students get to see their errors, analyse them in 3-D and then watch an identical playback by the piano."

- Matt Goerzen
The Ottawa Citizen

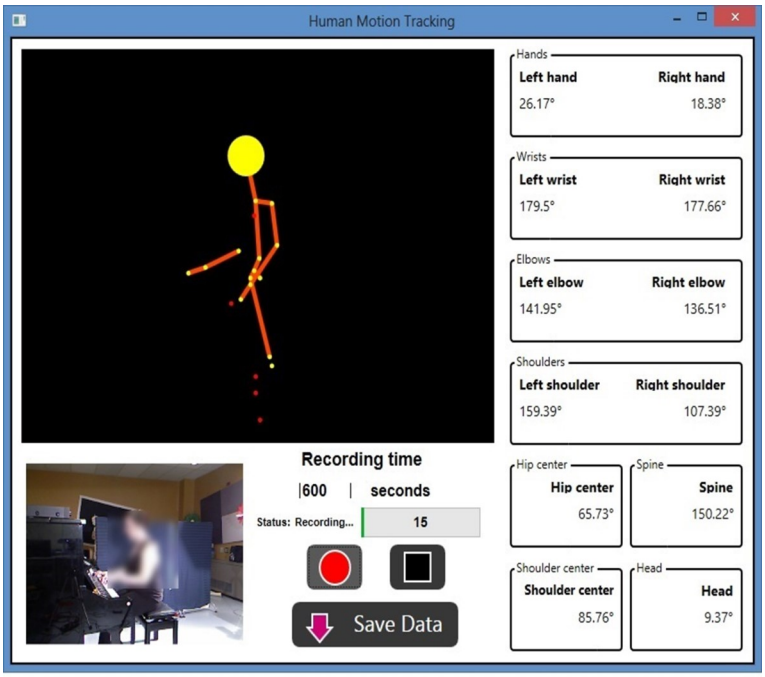
Technology-Mediated Teaching

We studied the **Microsoft Kinect** sensor to find out if it is able to track and quantify the characteristics of the upright posture of pianists. We wanted to find out under what condition Kinect would be a useful tool in tracking the characteristics of the neutral postures specific to different performers. Up to now, results indicates that Kinect does not have a high enough resolution for measuring posture variables involving head, shoulder, and spine positions for the purpose of comparing the measurements over multiple trials. Presently, the technology is best suited for gaining qualitative information about the position of the head and shoulder, or general movement trajectories that involve large range of motion (Beacon, Payeur, & Comeau 2015).

We are also exploring whether **Dartfish,** video-based motion-tracking software used in elite and professional sports, could provide an effective tool for quantitatively tracking and measuring a pianist's body position during live performance in order to compare posture variables before and after somatic training interventions. We have tested the reliability and repeatability of distance and angle measurements in a controlled lab situation. So far, the results indicate that Dartfish measurement error is small enough to permit quantitative measurement of pianists' body postures and could be used effectively in studies with live subjects (Beacon, 2015).

Future project: We have examined Dartfish in its capacity as a quantitative measurement tool to analyse piano performance. We now want to investigate its suitability as a **feedback tool for teaching somatic training** in piano pedagogy. Since webcams, smartphones and portable video cameras provide widely available devices for collecting video date quickly and easily, Dartfish could be used to help piano teachers instruct students about body positioning during piano lessons.

Jillian Beacon testing the Microsoft Kinect sensor



Kinect interface — A digital representation of the performer is created

The questions we were able to address

- Could Microsoft Kinect, a popular software program for video games, and Dartfish software used regularly in elite sports, be effective in tracking and measuring the body movement of pianists during live performances?
- Could these software programs become reliable motion tracking tools to pursue research on playing-related injuries and somatic education?

Research on Piano Teaching

Distance Education

Distance Keyboard Lessons in an Inuit Community

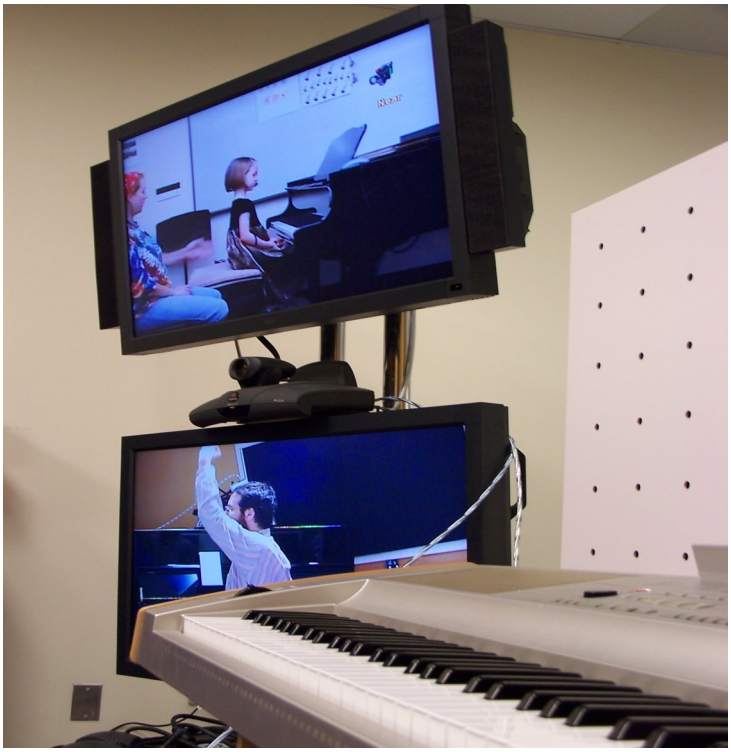
Using **videoconference technology**, a group of young Inuit students were taught weekly music keyboard lessons over a four-year period. A study was designed to examine how technological and cultural aspects prompted changes in the teaching strategies, and how this affected student achievement. Results indicate that although teaching techniques needed to be altered in order to accommodate the medium and allow for cultural specificities, the students were able to achieve a high level of success. The reasons for their progress offer much insight into distance teaching under these conditions (Parkes & Comeau, 2015).

Erin Parkes teaching a distance keyboard lesson to Inuit children in Northern Quebec

On-Site and Distance Piano Teaching

This study was designed to examine how distance piano teaching might affect the verbal and physical behaviours of the teacher, the student and the participating parent during a piano lesson. Over a year, weekly 30-minute piano lessons were taught to two young beginner students, one on-site and one at a distance. The analysis showed that distance teaching did not slow down a beginner student's progress and the physical contact often given by a teacher during on-site lessons did not seem to be necessary for the natural development of the distance student. The behavioral analysis revealed that in most aspects, distance and in-studio teaching were remarkably similar. However, it was observed that during distance lessons the parent's participation was greatly increased. Therefore we concluded that in the case of individual piano lessons, additional assistance is required from the parent to overcome restrictions imposed by distance (Comeau, 2015).

Distance piano lessons question the current notions about the traditional framework of piano teaching and has led to a reassessment of the teaching studio as the only educational context.



The Cross Border Piano Teaching project connected the Piano Lab at the University of Ottawa and the Department of Music and Arts Technology at Indiana University.

"Since September, some interesting sounds have been coming out of the Ulluriaq school in the village of Kangiqsualujjuaq in Quebec's far north. For an hour every week, a handful of young Inuit are singing, clapping their hands, beginning to learn piano, thanks to the satellite.... Learning piano 1600 km away from your teacher is quite an unusual experience, but one that a group of seven-year-old Inuit students are currently going through. The music class is being given at the Piano Pedagogy Research Laboratory in Ottawa, and on a screen in Kangiqsualujjuaq the students are following the explanations of their teacher, Erin Parkes, a master's student in music. In communities so far away, learning to play piano is like learning to ski in the desert. Videoconferencing opens new pathways by allowing isolated communities to have access to the same services as people in the South."

- France Pilon
Le Droit, 2004 [Translation]

Music Reading

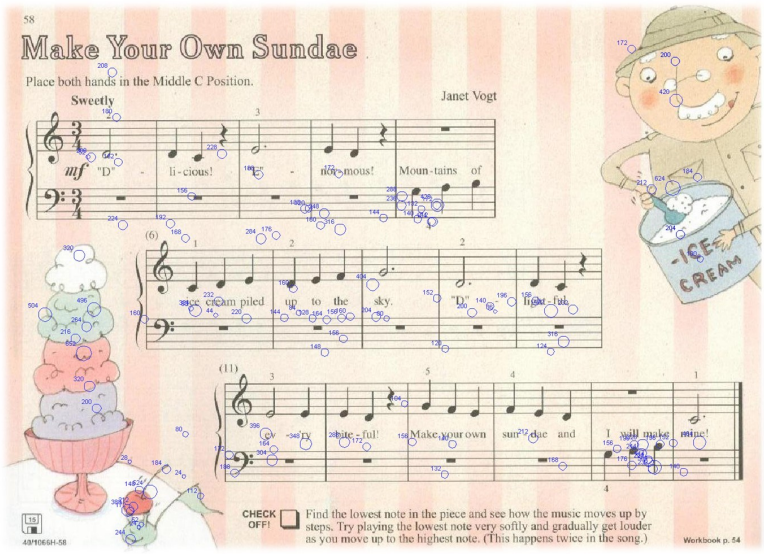
Music Reading in Method Books

In the classical music tradition, knowing how to read music is seen as an essential skill and a fundamental component to develop when learning to play the piano. The piano method book plays a central role in the acquisition of music reading.

A first study investigated how music reading is being taught through an **inventory of musical signs and reading concepts** found in most common piano method books. Each musical piece was scanned and with the help of software developed at the Piano Laboratory, we were able to get a complete inventory of all music notation symbols. A detailed analysis of this inventory provided a framework to classify the types of symbols and to examine the frequency of each symbol's occurrence. The results showed a wide variety from one method book to another in the number of symbols introduced, which ranged from 62 to 262 (Nassrallah & Comeau, 2010). We are now conducting a systematic content analysis of the same popular piano method books to find out how music symbols are **paced, sequenced and reinforced**. With this codification, it will be possible to compare how the learners' visual environment is different from one method to another.

Young children beginning piano lessons are presented with music-reading materials that contain a wide variety of **colorful illustrations**. However, no one seems to be concerned about the instructional value of these illustrations or question whether they affect reading. Since it has been demonstrated that there is a close relationship between where the eyes are fixated and where the cognitive attention is engaged while processing visual information, we decided to investigate where young piano students are looking when they are reading from a page in a piano method book to find out to what extent illustrations are attracting a learner's attention. In a first pilot project, we analysed young piano students' eye movements when previewing a piece for performance and when playing that piece at sight and we measured the length of time they inspect the illustration zones and the music zones. The results showed clear indication that students are dividing their cognitive attention between processing the musical signs on the page and processing the various colourful illustrations. Based on the results of this first project, we are presently engaged in a larger study to understand the extent to which decorative illustrations are directing the participants' attention to evaluate the effect those illustrations might have on the development of music-reading skills. We need empirical evidence to clarify the real impact of decorative illustrations on music-reading outcomes.

Baruyr Baghdasarian using the eye-tracking device



Results produced by the eye-tracker: the blue dots represent where the participant's eyes tend to focus, which, in this case, is on both the music and pictures

Another study addressed early music-reading skill acquisition and the possible impact of two different music-reading teaching approaches found in method books, **Middle-C and Intervallic**. Using cognitive modeling, we observed through computer simulation the problem-solving and decision-making tasks involved in decoding a simple musical score. Inspection of the simulation results revealed differences in terms of cognitive processing demands. In particular, the Intervallic method required a larger amount of declarative knowledge related to notes and more execution planning than the Middle-C method (Emond & Comeau, 2013).

The questions we were able to address

- To what kind of visual environment is a piano student learning to read music exposed?
- How does the reading content change from one method to another?
- What is the evidence that colourful illustrations in method books attract a student's attention while performing a reading task?

Highlights

Colorful illustrations in piano method books: A pilot project investigating eye focus has just won the 2015 *MTNA e-Journal* Article of the Year. (Music Teachers National Association — USA)

Research on Piano Learning

Music Reading

Catherine Lemay presenting her thesis on a comparison of sight-reading assessment methods at the JFREM conference

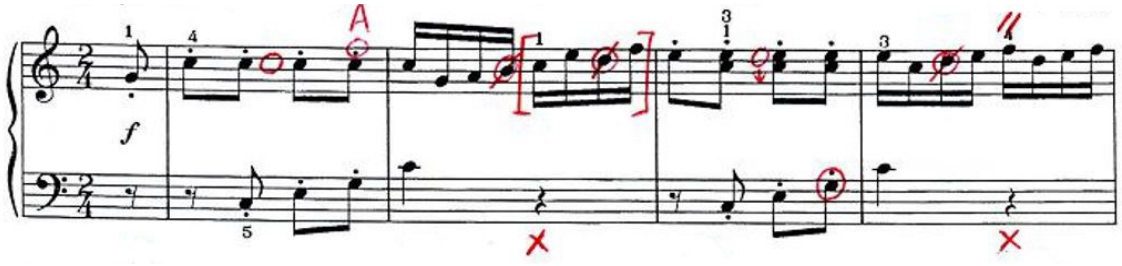
Measuring Music-Reading Performance

In order to **compare three common methods of sight-reading assessment**, the well-known Watkins-Farnum Performance Scale for assessing wind instrumentalists was adapted for pianists and then compared with two other assessment methods, a scoring algorithm and expert examiners. It was found that these methods, regularly used in music-reading research, differed greatly in their assessment results. Therefore these assessment methods used to rank research participants are not comparable and should be used with great caution when conducting research on music reading (Lemay, 2008).

Considering the variety of tests used to evaluate music-reading performances, we have undertaken a **classification of the existing measurement methods.** By providing a similar and consistent body of information on each one, this compilation and classification will provide direction and stability for future research (Jensen, 2015).

Evaluating a performance excerpt with the Music Reading Scale

Having demonstrated the inconsistencies between the different assessment methods and the limitations and drawbacks of the various approaches to music -reading assessment, we knew that no reliable tool existed to measure music-reading performances by pianists. So, the Piano Lab undertook the **development of a test to measure music-reading skills.** Using original musical stimuli of increasing difficulty, a system for codifying errors and a scoring grid for evaluating music-reading performances of beginning to advanced-level pianists, this assessment tool is presently being tested. It will be the first measuring instrument specifically designed to evaluate a pianist's reading skills and will become a valuable tool as reading assessment is essential for measuring teaching strategies or developing research protocols.



Example of evaluation markings on a score using the Music Reading Scale

The questions we were able to address

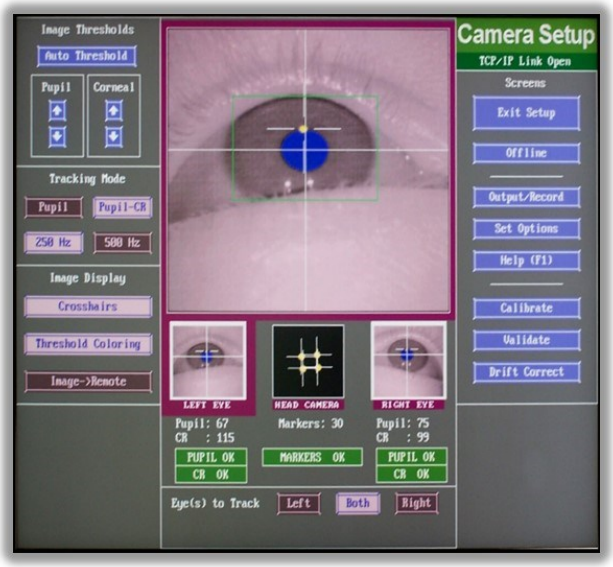
- What are the existing approaches to assess music reading skills?
- To what extent do these approaches differ?
- Why do we need a new test to measure music-reading skills for pianists and how could we develop such a test?

Eye-Movement Patterns

To understand the eye-movement patterns of piano students reading a musical score, a series of experiments were undertaken using eye-tracking. The first project was designed to study the **perceptual span** of university piano students during a sight-playing activity. A moving window ensures that the reader sees only the section of the musical score where the eyes are fixating. The player must move the eyes to see the following notes. Eye movements were recorded and analysed, and we found that contrary to popular belief, sight readers benefit from a similar field of vision, no matter their level of competence. In order words, expert sight readers do not use a wider perceptual span to be successful in the reading task (Liu, Comeau, & Balasubramaniam, 2013).

Based on the assumption of a probable link between the way the brain processes language syntax and music syntax, we studied the processing of **musical and linguistic syntactic incongruities**. Participants would read aloud phrases whose syntax is either correct or deliberately incongruous and would play on the piano musical sequences that were also correct or incongruous. The eye tracker made it possible to study the effects of incongruous language and music syntax on eye movements and on reading time. It was found that syntactic incongruities in both domains were associated with an increase in the duration of fixations in the region of interest. The results are consistent with the growing evidence of a shared network of neural structures for syntactic processing in music and in language, while not ruling out the possibility of independent networks for each domain (Ahken, Comeau, Hébert, & Balasubramaniam, 2012).

Lauren McGee participating in the Eye-Movement project



The eye-tracker display screen during the calibration process

Future project: We aim to develop a theoretical model that would explain the development of the processes involved in the acquisition of music reading. Such a model would deepen our understanding of the precursors of musical literacy, the factors and skills necessary to succeed, the growth trajectory, and the consequences of different types of teaching approaches. This study on music reading will offer a unique perspective on the acquisition of a writing system; clarifying the learning process required to master a skill learned sequentially and progressively will illuminate the important components for a unified theory of the acquisition of complex skills in different learning contexts.

The questions we were able to address

- Can eye-tracking technology help us understand the processes involved in music reading?
- Could the study of eye-movement patterns challenge the common belief on perceptual span and level of competence?

Research on Piano Learning

Practice Strategies

Music performance in general, and piano playing in particular, require an extended period of technical and artistic skill development. Both cognitive and motoric demands are involved and the use of good practice strategies is important for effective acquisition of performance skills.

Students' Strategies

To understand how young students perceive piano practice, we invited young students between the ages of 7 to 12 to answer a questionnaire. We discovered that participants employed very few practice strategies; the study also showed that the use of effective strategies may not be linked to age and/or level, but rather to the way students learned these strategies. In other words, students of different ages are able to control, regulate, and exploit the application of individual **meta-strategies** during their practice. This reinforces the notion that students' cognitive processing may not be correlated with age, as some researchers have suggested, but that proper exposure to these strategies and support in using them may facilitate their use at any age. The project will continue focusing on new variables in relation to effective practice strategies (Jardaneh, 2007).

Nisreen Jardaneh explaining survey questions

Mental Practice

The use of mental practice, a form of mental imagery skills without physical activity, can be an important tool for piano training. However, a problem in the **use of terminology** is evident in the pedagogical and empirical literature on mental practice as multiple terms are used interchangeably and many terms are never defined. In order to provide more clarity around mental practice, we are working on producing an empirically based glossary of the key terms, both simple and complex, and a taxonomy to show the hierarchical classification of key terms. Given the benefits of mental practice in learning to play music it is important to develop and maintain language that will facilitate both the understanding of existing literature and the design of future studies on mental practice (Mielke, 2015).

Reflective Journaling

The reflective journal has been used in many domains to train undergraduate students for their respective professions. Benefits of using a reflective journal include the development of critical awareness and new perspectives, problem-solving skills, and independent learning skills. The training of undergraduate piano students preparing for a music profession could be enhanced by the addition of journals to assist with their piano practice, specifically when learning new repertoire. A current study is investigating whether we can observe, over a short period of time, a development in reflective thinking skills in the journal entries of undergraduate piano students and if these students perceive benefits from using a journal to assist in their practice (Woronchak, 2015).

The questions we were able to address

- What do piano students consider good practice strategies?
- Is the use of meta-strategies realistic for young piano students?
- How could mental practice and reflective journaling be integrated into piano practice?

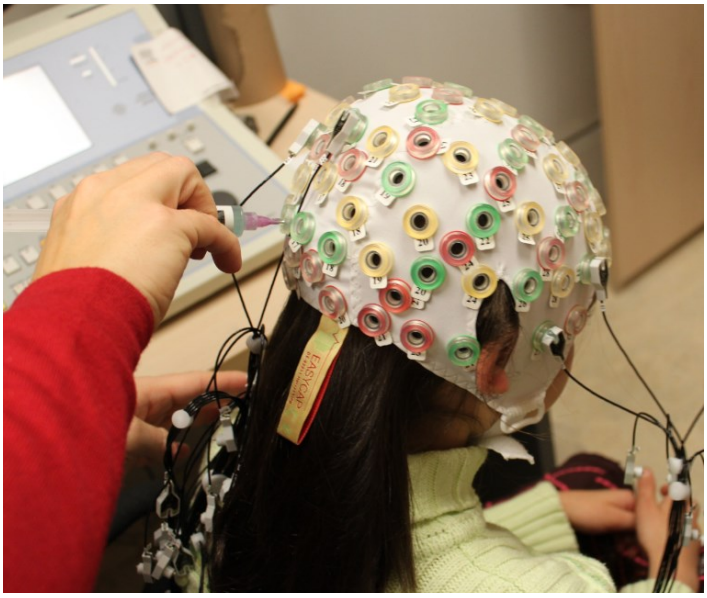
Student Characteristics

Music Prodigies

A prodigy is described as "a child who, at a very young age (typically younger than 10 years old), performs at an adult professional level in a highly demanding, culturally recognized field of endeavor." We tested this definition by asking musical experts to **evaluate the performances of music prodigies** to determine if their abilities are indeed comparable to professionals. The panel of experts listened to randomly distributed audio clips of prodigies and professionals playing the same pieces and identified the performer as either a prodigy or a professional. Preliminary results are consistent with the definition; in many cases even musical experts are unable to distinguish the audio recording of a prodigy from a professional performer above chance (Comeau & Peretz, 2015).

We compared prodigies' starting age and **rate of progress** with a large sample of piano students to quantify the acquisition of advanced musical skills and determine whether these skills can be explained by practice. Based on preliminary results, it appears that musical prodigies move to the most advanced levels in record time as they are progressing by 1.5 to 2.5 grade levels per year compared to 0.5 to 1 grade level for regular piano students. Furthermore, it seems that practice alone cannot account for their faster learning (Comeau & Peretz, 2015).

Gilles Comeau and music prodigy Leonid Nediak converse during a series of test trials



Sandra Markovic is installing electrodes on the head of a deaf child

Deaf Children

Several studies suggest that deaf children with **cochlear implants** who are exposed daily to music enhance their ability to recognize, enjoy, and reproduce music. However, no studies have yet focused on teaching music outcomes and then assessing those skills. This experiment is using a multi-sensory (auditory, visual and tactile) approach to teach piano to a group of cochlear-implant children. After six months of individual formal piano training, they will be evaluated on their performance skills as well as their ability to identify melody contour and pitch discrimination (Markovic, 2015).

The questions we were able to address

- What characterises the phenomenon of music prodigy?
- Could the study of music prodigies help us understand the development of music skills?
- How can deaf children with cochlear implants acquire piano performance skills?
- Could learning piano have an impact on a deaf child's pitch discrimination?

Research on Piano Learning

Motivation

Measuring Students' Motivation

One of piano teachers' major concerns is the challenge of motivating students to continue learning music. A high percentage of young students stop piano lessons before mastering the instrument. A likely correlate of this dropout rate is insufficient motivation. To provide better support for children's piano learning, we developed the **Survey of Musical Interest** to measure young piano students' degree of motivation and their interest in piano-related activities. We now have a version in English, French, Chinese and Finnish. The data collected from more than 300 students are already available. A new cohort of students will participate in this survey in the coming years. This scale was used for the three projects presented below.

Parental Influences

The importance of parental influence on academic and musical achievement is well recognized, but its impact on piano students' motivation is not as well documented. This research aimed to look more closely at three specific areas of parental influences: **basic parental choices** regarding their child's music lessons, including the age of starting lessons, the method of instruction, and the age of ending lessons; **parental behaviors regarding their child's music studies**, including helping the child with practice, sitting in on the child's lessons, and giving the child rewards for practising; and **parental beliefs concerning their child's piano-playing ability**. This study confirmed that parents indeed play an important role in a child's piano education, but not always in the ways that are assumed. Instead of being so preoccupied about choosing the best music method or placing too much stock in exams and group lessons, it may be most worthwhile for parents to actively participate in their child's piano lessons and daily practice and to show genuine belief in their child's abilities. This is important for piano teachers to know and is a call to more actively include parents as part of the child's music education team (Comeau & Huta, 2015).

Yifei Liu presenting the motivation project at the 29th conference of the International Society for Music Education

Chinese Students

Our survey of international music competitions has shown that **winners of Asian origin** rose from 23% of the total in the 1990s to more than 35% after 2000. South Korea is ranked first, Japan second and China third, and it is China that has seen the most marked progress. (Rocha, 2013) And anyone who has taught piano to students of Asian origin was certainly struck by their remarkable success: they study assiduously and obtain very good results in examinations and competitions. According to several authors, that success could be linked to their level of motivation. There is an extensive literature on motivation and on intercultural differences, but comparative studies on the motivation of children learning music are rare. Therefore, this comparative study was designed to compare **the degree of motivation of young piano students in the People's Republic of China** and North America by means of a questionnaire. Our results showed that Chinese children and parents believed more strongly that musical ability requires hard work, and Chinese children were more interested in working hard at piano practice, and practised nearly twice as much. Differences were also found in autonomous motivation: compared to Caucasians, Chinese children identified more with playing the piano, found it more intrinsically enjoyable, and pressured themselves less by shame or guilt, though they were more motivated by a desire to please their teachers and parents. Furthermore, Chinese parents more frequently sat in on their child's piano lessons. These findings suggest several reasons that may contribute to the success of Chinese musicians (Comeau, Huta, & Liu, 2014).

Student Dropouts

The topic of piano student dropouts is often discussed but there is no significant amount of scientific research to uphold popular opinion. This study was undertaken to explore whether piano student dropouts show trends in their **type of motivation**, and additionally discover how **supporting factors**—or the lack of—may influence dropping out. The findings of this study should support earlier research on orchestral and band students which suggests that students who have low levels of intrinsic motivation and insufficient supporting factors typically drop out of music lessons. Further, this study will contribute new knowledge about other circumstantial reasons in the landscape of why students quit piano lessons. The goal of this project is to understand why students leave piano lessons before reaching a moderate mastery of the instrument and to offer recommendations to teachers and parents on how to support student learning (King, 2015).

"One of the lab's projects is a study of what motivates some piano players—despite long hours practising—while others drop out. Comeau's team of researchers are studying a number of factors, including internal dedication, family support and natural musicality, in an international sampling of students. The results may help them find new ways of encouraging and appealing to students."

- Matt Goerzen
The Ottawa Citizen

Health Issues

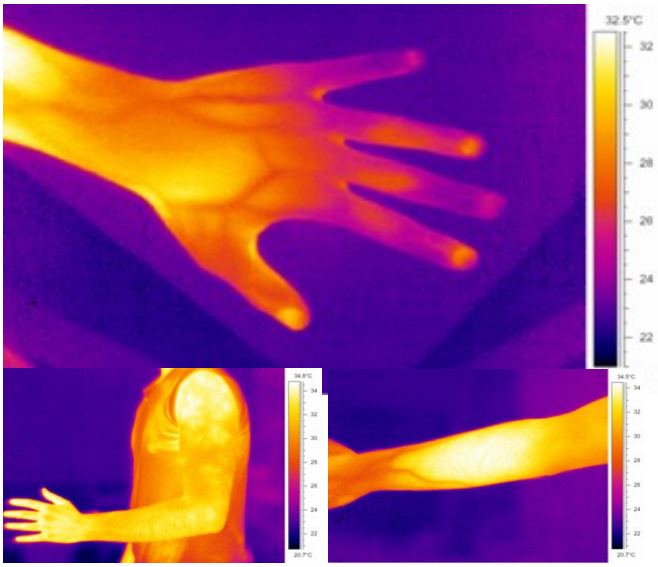
Playing-Related Injuries

Muscle activity during the playing of an instrument is an important parameter for the identification of the first signs of musculoskeletal disorders. Various techniques exist to record the activity of the muscles, the most common being electromyography (EMG). In order to assess **co-contraction in the forearm muscles** while playing the piano, EMG measurements were used to quantify changes in active muscle stiffness during performance. We noticed significant but steady levels of co-contraction when playing scales at the keyboard, while significant variation in co-contraction, corresponding to faster note rates and increased loudness, was observed while performing repertoire. Co-contraction was not directly related to feelings of discomfort. Contrary to what many experts believe, results from this study indicate that the presence of co-contraction is fundamental to piano playing (Andison & Russell, 2011).

The infrared camera can remotely measure the temperature of the superficial muscles of the arm and hand of a musician performing at the piano. In a first study, we were able to demonstrate that infrared thermography can be an important tool in the study of piano playing by providing **information on the evolution of muscle temperatures**; the interpretation of the evolution of the temperature of muscle tissue has a potentially important role for understanding interactions between muscles, the effects of warming up and muscle technique during performance (Herry, Frize, Goubran, & Comeau, 2005). In a second study using infrared imaging, we examined the **difference in heat temperature** between pianists with pain related to piano-playing and pianists without pain. We found that there is a statistically significant difference in hand temperature between the two groups. In addition, pianists with pain had higher hand temperatures relative to their arms (Mohamed, 2011). These two studies demonstrated that tracking muscle temperatures can provide important information on physical warm-up and may help identify early signs of inflammatory musculoskeletal disorders. Our studies aim to capture the biomechanical significance of warming during piano playing and evaluate its impact on muscles, joints and the nervous system.

Caroline Andison explaining the project

Future project: Rigidity, relaxation, co-contraction and pluri-articulation problems are key notions in piano pedagogy. To play the piano, musicians can choose the big, powerful extrinsic muscles of the forearm or the small intrinsic muscles of the palm in order to vary the quality of their playing. Also, a concept as central as warming up is linked to many different meanings and phenomena. Our current work already focuses on these aspects and aims to capture the biomechanical significance of warming and evaluate the impact of piano playing on muscles, joints and the nervous system. Our next objective is to produce a book for researchers and piano teachers on the biomechanics of piano playing.



Infrared reading of muscle temperatures in the hand and arm

The existence and specificity of musicians' medical problems was recognized by the medical and scientific community in the 1980s and numerous studies have been undertaken on the subject since. Many gaps nevertheless remain, particularly in regard to understanding the mechanisms and the evolution of playing-related pathologies among musicians.

"The Piano Pedagogy Research Laboratory is the only lab in the world devoted to studying piano instruction, with a core focus on health. The lab has teamed up with other departments at the university to use video imaging to obtain accurate pictures of the biomechanics of playing. It's tragic that people stop playing because of an injury caused by the very thing they love to do. The Piano Lab, at least, is orchestrating a solution."

- Chris Daniels
Time Magazine

"It is fantastic that this lab is looking at biomedical practice habits."

- Dr. John Chong
Medical director of the Musicians' Clinic of Canada

Research on Piano Playing

Health Issues

Performance Anxiety

A number of musicians are affected by music performance anxiety and we still know little about the cognitive aspects related to that condition. In a first study, we examined the **signs and symptoms** that children (ages 8-12) and teenagers (ages 13-17) experience and the levels of performance anxiety they perceive. The biggest contribution of this research was to demonstrate an increase in anxiety with age, while differentiating between emotional anxiety and physical anxiety, and between boys and girls. A strong relationship between **perfectionism and self-efficacy** with anxiety indicated that students with high levels of perfectionism and low levels of self-efficacy are more likely to suffer from performance anxiety (Dempsey, 2015). A follow-up study looked into the impact **negative thoughts** can have on performance anxiety. Based on the framework of sports psychology, adaptive coping strategies were presented and the importance of the teacher-student relationship on developing a positive and healthier perspective towards performance was discussed (Mo, 2015).

Piano student Emma Huang performs at a Piano Lab event at the residence of the German Ambassador.

Hearing Sensitivity Among Student Musicians

There has been extensive research conducted on musicians and hearing loss showing that musicians are often exposed to sound levels above safe limits for prolonged periods of time. However, most of these studies were done with middle-aged (professional) musicians and they were all carried out before the proliferation of personal music systems (iPods, smart phones, etc.). The study we are conducting has three main objectives. First, we are examining the hearing sensitivity in music students (age 17–24) to determine if there is greater incidence of hearing loss among music students as compared to the average population. Secondly, considering the prevalence of personal music systems among young people, we are asking if this is a potentially significant contributor to hearing loss in student musicians. Finally, we are questioning whether there are correlations between the auditory threshold of music students' hearing and the instruments in which they specialize, the amount of time they practise, the location in which they normally practise and the amount of time they practise/ perform with other musicians.

Headphones are being put in before the hearing test is conducted.

Performance anxiety and hearing loss are two conditions that often affect musicians, which can have a detrimental effect on their career.

The questions we were able to address

- How could we develop an enhanced measure of performance anxiety that could be used in future research to capture both the emotional and the physical aspects of performance anxiety?
- How do piano students experience performance anxiety and how is that experience affected by age?
- Is it true that musicians are more affected by hearing loss than the general population because of the sound levels associated with playing their instrument?
- Has the proliferation of personal music systems affected the new generation of music students?

Physical Aspects of Performing

Yuanyuan Lu participating in the Breathing Project

Investigating Breathing Patterns

Over the last fifty years, researchers have taken an interest in the breathing of different musicians, but little is known about the breathing patterns of pianists. A first study investigated whether a relationship exists between **pianists' respiratory cycles and the movements they make** when playing. The results showed that breathing rate increased significantly when pianists were performing, compared to breathing rate at rest. Surprisingly, however, results did not confirm a significant increase of breathing rate during the performance of the exercises across different tempi, even though the speeds at which the pianists played were purposely chosen to force extreme performance conditions—from very slow to very fast (Nassrallah, 2010).

A second study explored the **coordinative relations of breathing with three different finger-movement markers** (pitch, meter, and thumb passage) to study the extent to which different musical elements such as tempo, meter, rhythm, accented notes, melodic complexity and phrasing exert an influence on breathing. Analysis showed that the breathing varied between participants, but in most cases no coordination or relation occurred between breathing and finger movement. These studies are contributing to a better understanding of the physiological dimensions of piano performance and are establishing a new methodology to measure the respiration of pianists during a performance (Nassrallah, Comeau, Russell, & Cossette, 2013).

Every pianist aims to achieve fluid playing and believes that this will come from a great technical mastery. However, the opinions of performers and pedagogues about how to reach this goal vary greatly, especially with regard to the management of muscle tension related to performance. These conflicting opinions arise primarily from ignorance of anatomical and biomechanical principles necessary to piano playing.

Describing Piano Technique

Despite the many contributions from pedagogues and scholars towards developing a better understanding of piano technique, **language issues** have often caused more confusion than clarity. This study identified the main sources of semantic confusion in the use of language: inconsistent and inaccurate use of terms; wavering between scientific, common, and invented language; challenges in describing opposing qualities that come from tension and relaxation; and failing to discern between the individual subjective experience and the mechanics of movement. By recognizing where the problems in language are, this study represents an important first step for researchers and pedagogues to reach a common understanding of the language used to describe the physical aspects of piano technique (Wheatley-Brown, 2011).

Following this first study, we looked more closely at the meaning and management of tension in current pedagogical approaches. The language used to **define and describe the positive and negative role of tension** was collected from five pedagogues who have developed approaches that reflect current trends in piano technique. The data was analyzed by examining both the meaning and management of tension in each approach. This study showed that the authors view tension very differently—either as an impediment to motion, and thus a quality that must be corrected—or as an essential component of control and activity, and thus a quality that must be carefully harnessed and managed. By recognizing where the problems in the varied meanings and management of tension exist, this study brings more clarity to how we teach the role and management of tension in piano technique (Wheatley-Brown, Comeau, & Russell, 2013).

The questions we were able to address

- How could we measure a pianist's respiration during a performance?
- What kind of connection (or disconnection) do we observe between breathing and piano playing?
- What are the main language issues that contribute to confusion in our understanding of piano technique?
- How can we better define and describe the role of tension during piano playing?

Research on Piano Playing

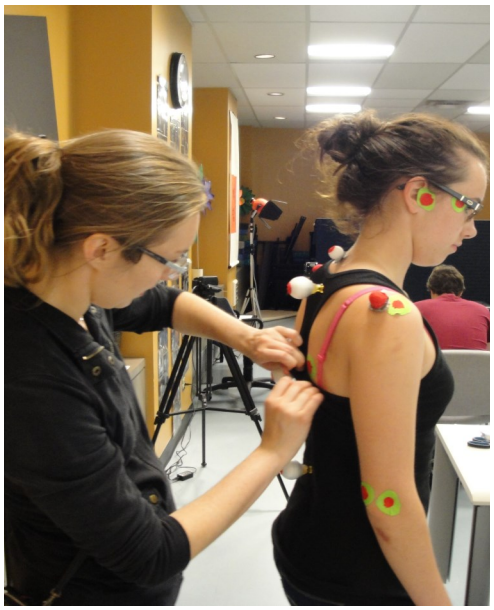
Physical Aspects of Performing

Evaluating Somatic Training

There is a growing popularity among musicians to turn to somatic approaches such as the Alexander technique, Body Mapping and the Feldenkrais method to improve posture and movement at the instrument to avoid injuries and to produce better tone quality. However, there is little **scientific and objective data to support the changes** that are apparently seen and heard in the performer after engaging in any of these somatic training methods. This study examined if a single somatic session had an immediate, perceivable effect on pianists' body usage and musical quality. Results indicated that there are perceivable changes in body usage and musical quality although those differences are not as apparent or easily detectable as is often believed. The findings also suggested that it is easier to identify post-somatic performances through body usage than musical quality (Wong, 2015).

Somatic approaches aim to improve body movement in order to promote muscular-skeletal welfare. The popular consensus is that this therapy is beneficial for musicians whose bad posture and poor playing technique might cause pain and injuries.

Corey Arnold coaching a participant using Alexander Technique



Jillian Beacon setting up marker devices on a participant

Measuring the Impact of Feldenkrais Training

Researchers wishing to assess the extent of somatic therapy face a shortage of reliable measurement tools. This research investigated motion-tracking technologies as a means to objectively assess the impact of Feldenkrais training on pianist posture. Dartfish 2D motion-tracking software was used to track head, shoulder, and spine positions of pianists as they performed at the piano after receiving a Feldenkrais Functional Integration Lesson. Comparisons of pre- and post-test measurements indicate no group trends in posture change. However, intriguing changes to movement quality in the head and torso were observable for two participants (Beacon, 2015).

Future project: Most of the case studies examining the impact of somatic training tend to contain only subjective impressions from practitioners and students and do not incorporate objectively measured data. As part of a **mixed-method research project**, we are considering using Dartfish in a series of case studies that would follow individual pianists during long-term participation in somatic training by tracking measurements of body positioning alongside practitioner and participant reports of personal experiences.

The questions we were able to address

- How could we measure the effect of somatic training on posture and movement while performing on the piano?
- What is the impact of somatic training on a musician's sound and motion?

Official Room Dedication in Memory of Canadian Composer Ann Southam

From the very beginning, Ann was a strong supporter of the Piano Pedagogy Research Laboratory. She attended the Lab's official opening ceremonies and became a member of the Friends of the Piano Pedagogy Research Laboratory. She attended many promotional and fundraising activities and was an enthusiastic advocate for the Lab among her contacts in the music community. She followed the Lab's research developments with keen interest, and even composed some original music to very specific requirements for one of the Lab's research projects; a few of the Lab's graduate students have completed their master's theses using her compositions to collect their data.

Eve Egoyan performing a piece by Ann Southam

The naming of the Ann Southam Room in 2011 was a way of further honouring Ann's continuous support of the Lab

Lecture Concert Series

In the fall of 2008, in cooperation with the Centre for Continuing Education, the Piano Lab offered a three-part series on the evolution of the keyboard lesson in the era of early instruments. The evenings combined a lecture by Dr. Comeau with Dr. Elaine Keillor's musical illustrations on various keyboards from the Piano Lab's period instrument collection. The series took place in the official residences of three ambassadors to Canada: the British High Commissioner; the Ambassador of Jordan; and the Ambassador of Germany.

Elaine Keillor playing a two-manual harpsichord at the residence of the Ambassador of Jordan

Elaine Keillor performing at the residence of the Ambassador of Germany

Media coverage

Radio Interviews	8
Television documentaries	10
Various media publications	42

Television documentaries

- Un laboratoire de recherche en pédagogie du piano, Canal Savoir, Campus, 2011
- La leçon de piano, Radio-Canada, Découverte, 2008
- Blessures chez les artistes, TFO, Panorama, 2007
- Le laboratoire de pédagogie du piano, TFO, Panorama, 2007
- Les mystères de l'apprentissage du piano, TVA, 2006
- Piano "keys", CTV News, National Edition, 2005
- Piano revolution, CBC News, The National, 2005

Symposia & Workshops

The Piano Lab has organized numerous symposia and workshops over the past years. While most of the events have taken place at the School of Music (University of Ottawa), the Lab has organized several symposia that have been part of larger conferences at other venues.

Symposia

Applying Movement Principles to Piano Playing: Bridging the Gap between Research & Practice, a two-day workshop and symposium exploring the relationship between music and the physical in piano technique (March 2009)

Piano Lab at University of Ottawa: Tour presented as part of the conference of the Canadian Universities Music Society, Ottawa, ON (May 2009)

Music and the Brain Conference Series (2006)

Part I: *Perspectives from the study of human motor control* with Ramesh Balasubramanium (Neuroscience, University of California, Merced)*

Part II with Isabelle Peretz (Psychology, Université de Montréal), Caroline Palmer (Psychology, McGill University), Laurel Trainor (Psychology, McMaster University) and Sylvie Hébert (Audiology, Université de Montréal)*

Challenging 300 Years of Piano Teaching Practices with 21st Century Research:
A three-part research panel organized by the Piano Lab

Part I: Piano Playing-Related Health Problems at the Canadian Medical & Biological Engineering Society, Québec, QC (September 2004)

Part II: *New Teaching and Research Tools in Piano Pedagogy* at the Canadian University Music Society, London, ON (May 2005)

Part III: *Round Table* at the Canadian University Music Society, Montréal, QC (May 2007)

Michael Fahey demonstrating a series of Yoga lessons for Musicians (2014)

Jennifer Johnson's Body Mapping workshop (2011)

Stephanie Ahken presenting the eye-tracking device at a research group (March 2009)

Guest Speakers:

Music and Breathing: An Overview
Isabelle Cossette, Music, McGill University (March 2007)*

Piano Score Memorization with the Aid of Micro-Structural References
Francis Dubé, Music, Université Laval (March 2007)*

Melody Sings First: Computational Approaches to Piano Performance
Werner Goebl, Music, McGill University (November 2006)

Workshops

Postural Awareness and Restorative Yoga for Musicians Workshop: A series of yoga lessons (2014)
Michael Fahey, Yoga and Guitar Teacher, Ottawa

Body Mapping Workshop (January 2011)
Jennifer Johnson, Violinist, Licensed Andover Educator, Author, St. John's

Piano Performance Under the Microscope (October 2007)*
Kathleen Riley, Music, New York University

Key-Read Workshop (March 2007)*
Jean Warner, Founder of the Key-Read music reading method, Florida

The Path to Pain-Free Performance (November 2006)
Donald Himes, Royal Conservatory of Music, Toronto

Alexander Technique Workshop (January 2006)**
Richard Albert, Founder of the Ottawa-Hull Centre for the Alexander Technique

Masterclass on the Walter Fortepiano (June 2005)
Cynthia Floyd, Music, University of Ottawa

Eutony Lecture and Workshop (November 2005)**
Ursula Stuber, Music, Université Laval

*** In collaboration with the School of Music, University of Ottawa**
****In collaboration with students from the School of Music**

"Playing the piano is one of the most complex activities that the human being can perform. It calls on many different skills, including the ability to read music, motor skills, rationality of interpretation, memory, and emotions. But scientific data about this is practically non-existent. The research being done at this new, cutting-edge laboratory will make it possible to fill that void at least in part on the basis of objective data, in particular by clearing up a large number of uncertainties and hypotheses about piano learning."

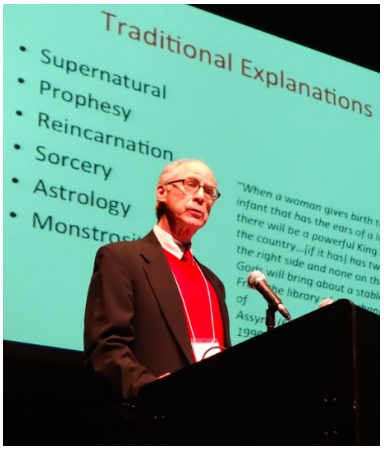
- Jean-Guy Bruneau
The uOttawa Gazette [Translation]

Musicians: Born or Made?* (2015)

In partnership with BRAMS

The role of natural endowment versus hard work in musical performance is one of the oldest and most contentious issues in both music and science. Up to the 20th century, musicianship was associated with innate talent. Over the last century, the prevalent view has been that intensive practice is key. The goal of this workshop was to examine whether music practice alone can account for individual differences in musical abilities or if we should also acknowledge the importance of innate predispositions. The conference included academic presentations by leading experts in the fields of music, child psychology and neuroscience, round table discussions and a public lecture/concert.

Keynote Speaker



Dr. Feldman giving the keynote presentation at the symposium

Music Prodigy Performer

Music prodigy Leonid Nediak performing at the opening concert

Symposium participants

Christine Beckett
Department of Music
Concordia University

Gilles Comeau
School of Music
University of Ottawa

David Henry Feldman
Eliot-Pearson Department of Child Study and Human Development
Tufts University

Sean Hutchins
Royal Conservatory of Music
Research Centre

Lisa McCormick
Department of Sociology
Haverford College

Laurent Mottron
Department of Psychiatry
Université de Montréal

Virginia Penhune
Department of Psychology
Concordia University

Isabelle Peretz
Department of Psychology
Université de Montréal

Caroline Traube
Faculty of Music
Université de Montréal

Sandra Trehub
Department of Psychology
University of Toronto

Arndt Wilcke
Fraunhofer Institute for Cell Therapy and Immunology
Leipzig, Saxony

2010 International Conference on Multidisciplinary Research in Music Pedagogy (2010)*

In partnership with Université Laval and the Université du Québec à Montréal

This conference brought leading researchers from various disciplines together with world-renowned pedagogues whose experience sheds light on instructional needs, thus enriching research development contributing to music pedagogy. Participants joined us from the Ivory Coast, China, Austria, Italy, Spain, the UK, Brazil and from 17 states and 7 provinces in North America.

Pete Jutras (Keynote Speaker)
Hugh Hodgson School of Music
University of Georgia

Jane Magrath (Workshop Presenter)
Piano Pedagogy
University of Oklahoma

Fred Rees (Keynote Speaker)
Department of Music and Arts Technology
Indiana University-Purdue University at Indianapolis (IUPUI)

Glenn Schellenberg (Keynote Speaker)
Department of Psychology
University of Toronto

Laurel Trainor (Keynote Speaker)
Department of Psychology, Neuroscience & Behaviour
McMaster University

Stanley and Kerson Leong performing at the opening concert

Journées francophones de recherche en éducation musicale (JFREM) (2009)*

In partnership with Université Laval and the Université du Québec à Montréal

The theme for the conference was Music Education in the 21st Century. Forty-seven participants from five countries gave papers and poster presentations on the current state of research and teaching in four main areas of music education: body awareness for the musician, instrumental pedagogy, teaching methods and approaches, and professional identity.

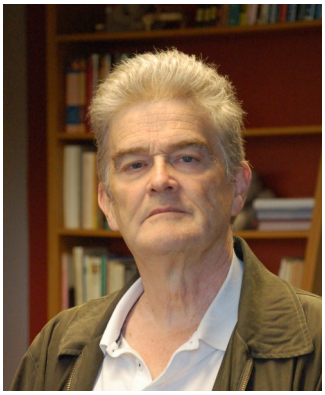
The conference ended with an address by Claude Dauphin of UQAM, given as part of an afternoon tea public event.

Social Sciences and Humanities Research Council (SSHRC) contributions

- Musicians: Born or Made? (2015) **$ 22 212**
- 2010 International Conference on Multidisciplinary Research in Music Pedagogy (2010) **$ 24 713**
- Journées francophones de recherche en éducation musicale (JFREM) (2009) **$ 20 950**

Our Supporters

Our ability to pursue the Lab's mission depends on the availability of financial resources. We are very grateful to all the Friends of the Piano Pedagogy Laboratory who have provided financial support to address the Lab's emerging needs and priorities.



Robert Taylor's Musician Health Fund was established in May 2013 to enable the Piano Lab to respond to the emerging difficulties encountered by musicians that are linked to piano playing-related health problems and injury preventions.

David and Shelagh Williams have been strong supporters of the Piano Lab and their contributions over the years have helped maintain equipment and update audio-visual and technology systems.

The Board of the **Sylva M. Gelber Foundation** approved a significant contribution towards an endowment fund to support the Piano Lab.

Ann Southam (1937-2010) was one of the Piano Lab's staunchest supporters over the years. Her particular interest in the Lab's research on music reading led her to establish the Ann Southam Music Reading Fund to promote the Lab's research in this area.

The Piano Lab is grateful to **Alan Merriam** for his generous financial support to help maintain operational costs and research.

"Students often have a wealth of research ideas, but without the right tools, it is difficult to see these ideas come to fruition. The Piano Pedagogy Research Laboratory provides this kind of opportunity, thanks to a legacy gift from the late Canadian composer Ann Southam. Normally an anonymous donor, Ann decided to publicize her name as a way to emphasizing her association with the Lab and promoting the research on music reading taking place as a results of her donation."

- *Enriching the Student Experience*
Donor Outcomes report, Fall 2012

Funding

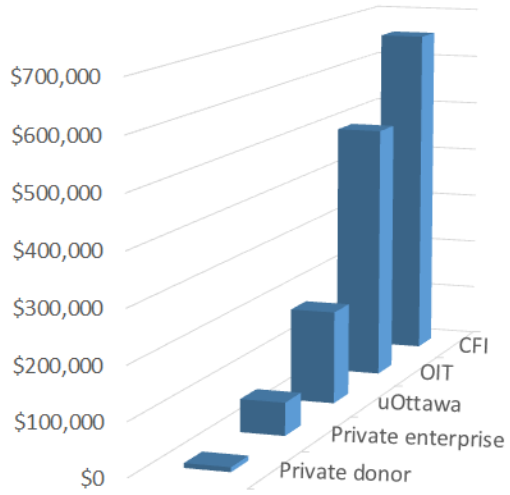
Total grants: $ 3 701 250

- **Total external research funding: $3 079 278**
- **Total internal research funding: $621 972**

Milestones

- **2002** Canada Foundation for Innovation (CFI) grant approved for the creation of the Piano Pedagogy Research Laboratory.
- **2003** Funding from Ontario Innovation Trust (OIT) matching grant and other partners brings the laboratory's total financial support to $1,202,202.
- **2004** Construction of the Piano Laboratory gets underway.
- **2005** Official opening of the Piano Laboratory.

Infrastructure Funding: $1.40M

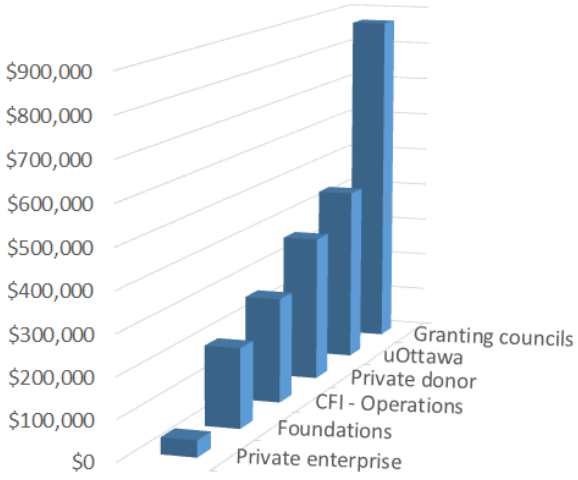


Since it opened its doors in 2005, the Piano Lab has established a reputation as a centre of excellence.
However,

- despite recognition for its pioneering work
- despite the quantity and the quality of its research projects
- despite the number of students and researchers gravitating to this research facility,

the Lab is among many research-focused programs that must compete for declining government funding. As such, help from our community of supporters is critical.

Research Funding: $2.30M



As we celebrate the Piano Lab's 10th anniversary, the University of Ottawa is committed to raising $450,000 to help the Lab build on its world-class research program and move forward into its second decade of fascinating research. Our partners can help us make key investments to respond to emerging needs and continue supporting new and exciting initiatives.

Real-world benefits of research conducted at the Piano Lab

- Greater effectiveness in pedagogical piano methods
- More effective outcomes for parents investing in music lessons
- Higher retention rate among piano students
- Reduction in repetitive stress injuries for piano students and pianists
- Enhanced understanding of piano instruction among the music community both in Canada and abroad
- Insights into learning that will enhance education in other fields

Source: Annual Report, Ontario Innovation Trust, 2007

Piano Lab: Making a Difference

"The key to better learning"
www.uottawa.ca

"Hitting the right notes: New lab sets its sights on getting kids to stick with piano lessons"
LAB BUSINESS

«Le pourquoi des fausses notes»
Le Devoir

"A high note for piano research"
University Affairs

"Keys to success"
Innovation Canada.ca

"Professors tune in to musicians' pain"
The Ottawa Citizen

«Inuits au *diapason* d'Ottawa»
Le Droit

"Science serving music"
Catalyst

"Why doesn't every good boy do fine?"
Ontario Innovation Trust, Annual Report

"Bridging the gap: Science serving music"
Research Perspectives

"The Piano Pedagogy Research Laboratory is advancing pioneering research that will have a significant impact on current and future generations of music teachers and piano students"

- *Gazette*