

## \$8m interactive lab at Mac tunes into musical mysteries



### [Hamilton Spectator](#)

By Meredith MacLeod

If great musical performances are magical, a newly finished one-of-a-kind lab at McMaster aims to uncover the science behind the spell.

The first research will soon begin at the \$8-million McMaster Institute for Music and the Mind's LIVE (Large Interactive Virtual Environment) Lab.

The LIVE Lab will study the neuroscience behind how performers interact, what moves audiences during performances and the social and emotional effects of the experience.

Audiences will be immersed in a 3D auditory experience in which their reactions are biometrically measured.

"Music is really a group activity," said Dan Bosnyak, the technical director of LIVE Lab. "The audience is a major component of that, but no one has really studied it before."

Up to 30 members of an audience (the space will hold about 100) can be wired up to monitors that will record their brain activity, heart rate, respiration and skin responses while they watch and listen to performances.

"The outcomes of what can be done in the lab will be truly remarkable," said Janice Shearer, a research assistant and communications associate for LIVE Lab. "To test 100 subjects at a time, 30 with physiology, would take months individually and it wouldn't have the group dynamic aspect."

The lab's equipment can capture motion, too — a foot tapping to music, the fingers of a pianist, how a dancer moves across a stage, for instance.

While music is the foundation, the lab can be used for explorations in many other fields. Some of the research will involve movement disorders, the development of hearing aids, how sound affects conditions such as autism and Parkinson's and the effectiveness of advertising or teaching methods.

More than 30 researchers, some from outside McMaster, are linked to the McMaster Institute for Music and the Mind (MIMM).

"Every time someone comes through, they give us a new idea of what they could do here," said Laurel Trainor, MIMM director and a professor of psychology, neuroscience and behaviour.

The lab's first research project has nothing to do with music at all. Instead, Hamilton residents will be studied for their reactions to urban settings for an initiative by creative accelerator Cobalt Connects.

The LIVE Lab, which officially opens in September, is built on the roof of the Psychology Building. The lab itself, which doesn't look much different from any small performance hall, is unique in the world.

Sound tiles, huge ventilation pipes that move air very slowly and a concrete wall suspended from the roof make the space "dead" acoustically. But thanks to 73 loudspeakers, 28 microphones and a highly sophisticated system of mixers and processors powering it all, the room can mimic a wide range of sound environments.

Those sitting in the theatre can be immersed in a restaurant, subway station, jazz club or soaring cathedral, for instance. It's all created by digitally changing the timing, reverberation, timbre and movement of echoes.

During a recent tour, technicians were putting the finishing touches on the sound system, which required stringing an estimated 80 kilometres of cable.

The virtual acoustics system is the same type used by Cirque du Soleil. There are fewer than 50 installed in the world and Mac's is the only neuroscience lab using it, said Tom Cavnar of Meyer Sound, who came from Berkeley, Calif., to test the system's performance.

Eventually, MIMM expects to host live music events. That could include artistic works where measured audience reactions change the course of the performance, and concerts featuring the lab's Yamaha concert grand piano — which is equipped with electronics that record and replay all key and pedal presses.

Jeremy Freiburger, cultural strategist at Cobalt Connects, says the lab and its research could make the city a centre for music and other arts.

"We wanted to get our foot in the door here early to make sure it's leveraged locally. We have a space that no one else in the country has, so what can we do with it?"