A MUSICIAN ENGINEERS A CAREER IN ACOUSTICS

Acoustic engineer Payam Ashtiani, P.Eng., turns his passion for music into a career that marries art and science.

By Marika Bigongiari

Payam Ashtiani, P.Eng., was 13 years old when he started studying classical guitar. By the time he was ready to graduate high school, he was faced with having to decide between pursuing music professionally or choosing another, more pragmatic career. "I really had to think about which one to go into," Ashtiani says. "I decided I would rather have music be a hobby than a profession so it wouldn't suck the life out of it."

Ashtiani comes from a family of engineers, so choosing engineering was a natural fit. He had a knack for computers and programming, and his father encouraged him to pursue the engineering version of whatever it was he had an interest in. He applied for engineering and science positions, and when he got accepted to a mechanical engineering program at the University of Toronto (U of T), that discipline sparked his interest. "What I like about mechanical engineering is the fact that it focuses on applied science and not science for science's sake," he explains. "It seemed like a very utilitarian degree. It had that appeal—that you could go and do something with it and apply it in the real world." Ashtiani explains that there are very few institutions that offer a degree in acoustic engineering: "You often get people coming into this field from mechanical or electrical engineering or sometimes with a degree in physics from the science side. You'll have the odd person who has a civil engineering degree, and then they'll do a masters in acoustics somewhere abroad, because, again, there are not that many masters programs here. But we'll hire new grads, and then we'll teach them the aspects of acoustic engineering as they get into it, which is how I learned when I started as well."

In fact, when Ashtiani began university, he had no idea that a field like acoustic engineering even existed. After graduation, he found himself doing automation work, which appealed to what he refers to as his "nerdy side." But there was something missing. "I was going through this search," he says. "You'd see articles everywhere online about finding your passion, about doing the things you're passionate about—and for me, that was a sore topic because I was passionate about music, and in my mind, the only way to pursue my passion was to quit everything and go be a classical musician." In a serendipitous turn, his younger sister, who was in her last year of materials engineering at U of T at the time, was having a similar dilemma. A conversation his sister had with a career counsellor changed Ashtiani's life. The counsellor simply pointed out that there are ways to approach almost anything from an engineering perspective. "I found that thought to be really exhilarating, because I was thinking the only way for me was to be a musician," Ashtiani says. "But then I realized, wait a minute, aren't there engineering aspects to music?" Around the same time, Ashtiani found a job posting for an acoustic engineering position. "And that's when it clicked for me," he says. "The more I looked into it, the more I thought, this is perfect: It brings together engineering, music and sound; and I'm passionate about all of these things." He was determined to get into the field and began reaching out to every engineering firm he could find that was involved with acoustic engineering, landing a position at Aercoustics in 2006, where he is now a principal.

Payam Ashtiani, P.Eng., is a principal at Aercoustics, a Toronto engineering firm that specializes in acoustics.

COMBINING ART AND SCIENCE

It was a perfect fit. Ashtiani's innate interest in sound and the way we experience the world sonically ensured the technical aspects of acoustic engineering would always fascinate him. His love for music showed him his work could be something that gave him—and those experiencing the product of his engineering work—pleasure. He continues to be enamored by how the discipline marries art and science: "What I really love about acoustic engineering is that it's a scientific pursuit of something that is ultimately very subjective," Ashtiani explains. "We talk about music sounding good or a place sounding restful or something being loud or quiet or powerful. All of these are emotional descriptors that usually don't translate well to the engineering side that says, 'Just tell me the equation—is it the numerator or the denominator? Is it a square, or is it a log?' Those two worlds often don't mix well. So, having a craft that's dedicated to metricizing and making scientific these emotional responses was something that made it really captivating for me. And through listening tests and the rigorous scientific method through which people have found, 'Okay, when we say loudness, this is how people rate loudness. This is why. This is the mechanism in the ear, and this is the wave

propagation that occurs.' And when it all comes together—that's what I love about it."

Ashtiani believes in the power of acoustic engineering and that, given the impact acoustics have on a space, he feels it's not always given the focus it deserves when spaces are being designed. "We have two eyes [and] we have two ears," he says. "However, when it comes to a project someone is trying to realize, the attention is more on the visual properties than the acoustics. But when we're in a space, we are wired in a much more primitive sense to respond to acoustics and to sound than we are to visual stimuli. If you think about going to a museum to look at paintings and see how paintings can illicit an emotional effect and then you think about the same thing for a piece of music, that piece of music is often able to illicit a much more intense emotional effect on a person, much more rapidly. I find the connection to the acoustics of a space and the auditory experience to be a lot more intense and visceral, and that's why it's important to have good acoustic engineering when you're designing spaces."

ADDRESSING ACOUSTIC CHALLENGES

For every project, Ashtiani enthusiastically explains, three aspects of acoustics are examined: The first is sound isolation, which means stopping exterior sounds from coming into the space and interior sounds from going out from the space and bothering neighbouring spaces. The second is ambient noise from building services, including heating, ventilation and air conditioning noise, airflow and the humming of lights. And the third aspect is room acoustics, which refers to the nature of how the sound is going to bounce around in that room, how reverberant it's going to be, what direction it's going in or where sound reflections are coming from. When thinking about a musical space, for example, the significance of room acoustics may quickly come to mind, but creating sound isolation and addressing ambient noise are equally important when considering its design. "In a musical space, what is quite important from a sound isolation perspective is to ensure that sounds from the outside are being mitigated as much as possible to ensure you're not getting disruption into the space you're focused on, the sound isolation space," Ashtiani explains. "That can involve anything from a subway going underneath the building, to having traffic noises outside, to having two spaces next to each other—like in a cinema, for example, where one is loud and the other needs to be quiet... The room acoustics part in performance spaces is a beast on its own, where you're working to enhance that acoustic environment for its intended purpose."

Considering the intended purpose of a space is key. The design process begins with talking to the end user and determining what sort of programming the space will be used for. Ashtiani asks: "Is it going to be used for lectures or TED talks? Theatre or music? If it's for music, is it chamber music? Will it be symphonic music or jazz? Is it rock? Will films be screened in there?" All of these things, while similar, have varied acoustic requirements. Ashtiani uses the example of a recording studio to explain how the focus of his team shifts depending on the space they're designing for: Their first concern is designing for the person using the space and their experience of the acoustics, and the second is designing for the microphone—which is a unique aspect compared to other types of musical spaces. "You want to make sure there are no artefacts in the recording because you may only have that one take—and if there's a helicopter flying overhead, and the microphone picked it up, and that ended up being your good take, then the room really disappointed you," he says. "So, from that perspective, special attention is made to sound isolation in recording studios."

Ashtiani's passion for the science behind the art comes through when he describes how his team creates structural separation between the different layers of a structure, from floating floors made with spring isolators designed to combat vibration to the same concept applied to walls to prevent the transferring of sound that may be impinging on one side. Whatever the space, attention to acoustics can make or break it. The soundscape, after all, has a profound effect on the way people experience spaces. "When you close your eyes and go into a space like a public washroom or a high school gym, or if you go into a theatre—you don't need the visual information to know that you've gone into an acoustically reverberant versus absorbent space," he says. "Similarly, you can tell if you're outdoors or indoors. Whether or not we're aware of it in an explicit sense, the soundscape affects the way we perceive and experience a space. It's information and input on a subconscious level determining which state we should be in. The soundscape affects us at a visceral, profound level." **e**