Editorial

Timbre

By Benjamin Bolden

There is something electrifying about the sound of a well-rosined bow biting into an open cello string.

The same pitch, let's say a D below middle C, produced by a piano, or a bassoon, or a kazoo, or indeed even by the cello plucked pizzicato rather than bowed is not nearly so compelling. It is the distinctive quality of the sound produced by the bowed cello—the timbre—that draws me.

What *is* timbre—this elusive construct identified by a phonetically challenged word that rhymes with amber but is incessantly confused with falling trees? What is it that makes an oboe 'sound' different than a clarinet?

The perception of timbre (identified by some as tone quality, or colour) results from the physical characteristics of sound waves. A host of attributes and variables are involved in the creation of timbres of potentially magnificent diversity—from cymbal crash to foghorn, explosion to whale call.

Psychoacoustician J.F. Schouten identified five principal acoustic parameters that differentiate one timbre from another:

- ***The range between tonal and noiselike character.*** The bowed cello string sound contains much 'noise'—such as the scratching of bow against string. A note produced by a piano involves considerably less noise.

- ***The spectral envelope.*** As the pressure of the bow sets the cello string vibrating, a fundamental pitch is produced, accompanied and coloured by many harmonic and partial overtones. These frequencies are accentuated or suppressed by the resonating body of the instrument and the acoustic environment in which it is played. The shape (e.g. conical, rectangular) and material (e.g. brass, wood, human tissue) of the chamber(s) in which the sound waves resonate will influence the spectrum of frequencies produced, and so the shape of the spectral envelope, and so the timbre of the sound.

- ***The changes both of spectral envelope (formant-glide) and fundamental frequency (micro-intonation).*** What make acoustic instruments so gorgeous to my ears are the multitude of unavoidable variations that occur over the course of each and every note's duration, resulting in the fascinating complexity of the sounds produced. As the bow is drawn across a cello string the sound's spectral envelope will inevitably change as myriad factors come into play: varying pressure applied by the performer holding the bow, for example, will cause different overtone frequencies to dominate, while minute changes in humidity will affect the tautness of the string and cause deviations in the fundamental pitch…

- ***The time envelope in terms of rise, duration, and decay.*** A sound's sound is greatly impacted by its amplitude structure—when it is loud and when it is soft. How sudden the attack? How prolonged the decay? How long and how consistently does the volume of the sound sustain? The same cello string plucked then bowed provides a dramatic example of how a sound's time envelope can influence perception of timbre. (Of course, in this example the noise from bow against string vs. finger against string is a significant factor, too.)

- ***The prefix, an onset of a sound quite dissimilar to the ensuing lasting vibration.*** Without the characteristic opening sounds (such as the 'blat' of a trumpet or the 'squawk' of an oboe) it is much more difficult to identify instrumental timbres.

The most significant factor in determining timbre (and therefore worthy of a little further discussion) is the spectrum of frequencies—the layers of pitches (fundamental, harmonic, and partial overtones) at various degrees of loudness that result in a key aspect of the sound's 'colour.' Resonance is significant here, shaving off certain overtones, accentuating others. Humans are expert at manipulating the resonant chambers in and around the mouth and vocal tract to produce a variety of spectra—we produce different vowel sounds by modifying the frequencies involved. Frequency content differentiates one vowel sound from another; the listener identifies vowels by the characteristic partial overtones produced by the speaker (or singer). This is why it is so much more difficult for multiple singers to sing in

tune if the shape of the vowel sound is not consistent between them. Speaking of singers, it is the trained singer's ability to activate frequency components at approximately 3000 Hz (such distinguishing frequency components of speech and singing are called formants) that enables her or his voice to cut through and to be heard above an orchestra (which generally has a formant of a mere 500 Hz). The increase in energy at 3000 Hz sends the voice spinning out above the orchestra.

All of these physical characteristics of sound can be quantified—this is what digital recording does: it identifies and measures the attributes and variables of a given sound or series of sounds, captures the data, and packages it, ready to be converted back to splendid sound in all its multi-timbral glory by our preferred media playing devices.

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I sometimes find myself craving sound, with a visceral need like hunger. And just as a craving for food is often a craving for not just any food, but for a variety of tastes, and for complex flavours, so too do I crave sounds both varied and complex. I remember as a teenager going to music stores and delighting in the systematic exploration (tasting) of a newly released synthesizer's bank of sound patches. A decade later I was exploring computer sound fonts and hungrily biting into the rich and sensuous complexity of digital audio samples. A decade later still, today, the potential for sound exploration (and gluttonous consumption) using such online tools as findsounds.com, or audio software such as Logic, simply boggles the mind.

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To extend the sound/food analogy even further, my craving for sound is often accompanied by the desire to manipulate sounds, just as my craving for food is often complemented by a desire to cook—to *create* the meal. My first proudly purchased electronic keyboard was an analog synthesizer; it enabled me to manufacture timbres. I remember the countless hours I spent trying to reproduce the sound of—of all things—bagpipes. A decade later I had the privilege, as a composition student at UBC, of learning and experiencing how to elicit different timbres from live acoustic instruments and voices. Today, creating, producing, recording, and manipulating all manner of acoustic and electronic sounds and timbres is brilliantly accessible, through such software as Audacity (free to download) and Garage Band (available on all Mac computers).

Perhaps it is worth remembering here that sound, like food, is not always enjoyable. Some timbres, as is the case with some tastes, are not pleasant at all—nails on a chalkboard, a fork scratching a plate… Certain timbres cause us to cringe, to wince, and even to feel physically ill. Some sounds are developed and used as military weapons and instruments of torture.

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I believe that my passion for the nuances of timbre is quite idiosyncratic. I remember, shortly before taking to the stage of our high school gym to perform the keyboard part in Steppenwolf's *Born to be Wild*, agonizing over the decision to use the sound patch 'roto-organ' or 'electric organ 6.' I consulted my drama teacher, a seasoned keyboard performer. He gave my query serious consideration. "You know," he finally said, "In my experience I've always found that the audience just doesn't care—they don't even notice the difference."

I recognize that not everyone will have, or be able to develop, great appreciation or understanding of the nuances of timbre. But I think that working with timbre—working to identify, understand, appreciate, and create it—has great potential as one of the means by which individuals may come closer to music. It is an area where particular people may discover the ability to be an expert, a connoisseur… and so to nurture and develop and advance their relationship with music, and perhaps even become musically beautiful. And this, I believe, is the role of a music educator—to help learners recognize and explore diverse ways to be beautiful in music.

I find most of my music teaching efforts tend to focus on developing and celebrating students' abilities to recognize and work with melodic, harmonic, rhythmic, and structural musical phenomena. Timbre, comparatively speaking, is neglected.

What role does timbre play in your appreciation and enjoyment of music? Of sound? How can music educators help students develop and enhance understanding and appreciation of timbre? What role does timbre play in your students' music learning experiences? What role might it play?

R. Murray Schafer's 'Ear Cleaning' comes to mind—how many different sounds *can* be made with a single sheet of paper? Many music educators address timbre, at least to some extent, in encouraging the development of good 'tone' from instruments or voices. How often, I wonder, are extended vocal and instrumental techniques examined and explored? Are students encouraged to design and build their own acoustic or electronic multi-timbral instruments? Are they invited to design and create sound fonts? Manipulate live or recorded sounds with audio effects? Compose sound collages? Sonically represent evocative images, like raindrops on roses, or sensations such as chewing on tin foil? Imagine and make real "what it sounds like/ when doves cry?" CME

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