The Wave Files

Joel S. Silver
24 Amroth Ave.
Toronto, On, M4C 4H2
(647)285-5635
joel.s.silver@me.com

Music is fun, feels good, and is great for the brain. Everyone likes music of some kind, but for many, it's too intimidating or complicated to understand, let alone make! The Wave Files breaks that down and gives everyone the basic tools and building blocks to follow their own musical journey!

The Wave Files is a fun, smart, and interactive show aimed at 7-12 year olds that explores the culture, history, and science of music in an exciting and accessible way. In each episode, we dig into a single musical concept, which can be specific - like "Pianos", "The Human Voice" and "Synthesizers", or broad, like "Recording Studios", "Hip Hop", and "Film Scores". There's there's a world of topics to explore!

Episodes usually begin in *The Studio Lab*, a comfy recording studio with a casual vibe that puts the audience in session with our host(s). Here, we introduce a topic, explain it, and make sure that everyone knows what we're talking about by providing familiar examples.

Then we explore the history of the topic with guests, interviews, animations, historical footage, mini-docs and even sketches. We learn how concepts came to be, how they've evolved, how different cultures adopt and adapt them, and how they are used today. In *The Studio Lab,* we learn the historical, cultural, political, and practical aspects of music.

Then, we go to *The Waveform Lab*, an electronics workshop / laboratory / jam space. Here, we explain the physics, math, technology, and psychology of music, giving it a scientific context. We'll do experiments, visualizations, talk with fellow nerds, and explore the latest technologies. If we need to put something to the test or hear a live example, we call on *The Lab Band*, a group of core and revolving musicians who are up for anything.

We finish the show by introducing the latest modules in *The Online Lab*, our mobile and web app that gives viewers the chance to explore their creativity in a digital studio of their own. It's a powerful but simple suite of modular tools that will have creative minds making music in no time, regardless of their previous experience. *The Online Lab* allows users to explore their inner musician, make, save and play their own music, and, if they choose, share it with the world. The *The Online Lab* also has links, additional information, full interviews, outtakes from the show, user content and more.

Episodes:

We'll kick Season One off by learning some of the rudiments, and as the show continues, we'll dig deeper into the vast world of music, culture, history and science.

Let's begin with…

1) "Synthesizers" - Synthesizers may be one of the newest instruments, but they are a lot older than most people realize! We'll learn about the last 150 years of electronic instruments, from Victorian parlours to Madison Avenue experiments to Prog-Rock to dance club anthems. Along the way, we'll also learn about filters, sequencers, arpeggiators, and drum machines. We'll visit the Ottawa Science Centre, where some important historical Canadian synthesizers are kept, including Hugh LeCaine's 1948 wonder, "The Electronic Sackbutt".

In *The Waveform Lab*, we'll learn about *basic waveforms* and how they relate to real world instruments. We'll introduce *subtractive synthesis, FM synthesis, granular synthesis, envelopes*, *white and pink noise*, and the all important *filter*. We'll visit with an obsessive synth collector and have them create some sounds. We'll recreate one of the oldest synths ever and give it to *The Lab Band* to play with.

In *The Online Lab*, we meet the Synth Module - a monophonic synthesizer that can be programmed to play patterns. We'll also look at the Drum Module, a drum synth with a built-in step sequencer.

2) "Piano" - The piano isn't just one of the most important instruments in Western Music - it's also an engineering wonder! We'll learn how the *dulcimer* immigrated from the Middle East to Europe where it inspired the *clavichord*, which inspired the *harpsichord*, which inspired the *gravicembalo col piano e forte…* aka, the *piano*. We'll learn about the masters, like Beethoven, Debussy, and Peterson - and the rebels - like Nancarrow, and Cage - who literally ruined the instrument for his music. We'll learn about Canadian icon Glenn Gould, whose variations on Bach shook the music world.

In *The Waveform Lab* we'll learn the complicated mechanism that gives the piano its unique control of dynamics, sustain, and timbre. We'll learn how the layout and range of the keyboard make it an ideal instrument for composing and learning on. We'll explore the basics of scales, chords and progressions and we'll "prepare" a grand piano - by destroying it. Then we'll give it to *The Lab Band* to play.

In *The Online Lab* we'll explore the Piano Module, a visual chord sequencer for making piano or synth parts.

3) “Electric Guitar” - Nothing defines 20th century Blues and Rock more than the Electric Guitar. We’re going to learn how it came to be and why it sounds the way it sounds. We’ll start by explaining the history of the guitar family and some of its international cousins. We’ll learn about different playing styles and how they’ve evolved, and how the invention of the electric pickup made it a whole new instrument with an exciting new sound. We’ll learn the difference between lead and rhythm guitar. We’ll talk about Muddy Waters and Eddie Van Halen, Jimi Hendrix and Canadian legend Alex Lifeson.

In *The Waveform Lab*, we’ll learn why a plucked string sounds the way it does and how distortion enhances it. We’ll learn about the harmonic series, and how this relates to a 1940 architectural disaster. We’ll learn how pickups turn vibrations into electric signals, and see how those signals can be manipulated with effects. Then *The Lab Band* is joined by some greats who’ll show us why the instrument is so beloved.

In *The Online Lab*, we’ll make some funky riffs with the Guitar Module and learn how to modulate them with distortion, delay, reverb, and filtering.

4) “Rock’n’Roll: Part 1” - As the Baby Boomers hit their teens, a sound was exploding on the airwaves that made feet move on the dance floor and struck fear in the hearts of parents. We’ll follow Rock’n’Roll from its roots in Blues, Folk, and Jazz, into the 50s and on to the present. We’ll learn about it’s many sub-genres, from the most mellow to the heaviest hardcore. We’ll see how different cultures adapted it by adding their own unique twists.

In *The Waveform Lab,* we’ll explore what makes a solid Rock groove with our friends in *The Lab Band*. We’ll see how a rhythm section is built and learn about how a lead guitar player improvises using scales and modes. We’ll explore the 3 chord anthem and we’ll find out why power chords are so, well, powerful. We’ll watch an experienced studio wizard effect, compress, EQ and master a track to make it as hard-hitting as possible. Then we’ll play it for a crowd to feel the energy live.

5) “Drums” - They’re one of the oldest and simplest instruments, and yet, one of the most complex. We’ll hear about drums from different eras and different parts of the world, and we’ll learn how different cultures use them for everything from entertainment to warfare. We’ll talk about how the standard drum kit evolved and how some artists are still finding new ways to play the oldest of instruments.

In *The Waveform Lab*, we’ll learn how drums bring energy - literally and figuratively - to a piece of music. We’ll feel how shakers and claves move us differently than kick drums or *bombos*. We’ll dig deep into how polyrhythms work and learn how every good groove is as as much about math as it is about heart. We’ll analyze how *jazz* rhythms differ from *rock*, which differs from *reggae*, which differs from *samba*. A *mrdungam* master shows us how beautiful arithmetic can sound, and *The Lab Band* jams with a unique percussionist who takes us on a journey with rhythm.

The Online Lab introduces an enhanced Percussion Module that featuring new kits, expanded world rhythms, and a unique engine that builds patterns from mathematical input.

6) “Bass” - When someone plays guitar, it’s just someone playing guitar. But if you add a bass, well, you’ve got yourself a band! What is it about this seemingly simple instrument that makes a song feel complete? We’ll do a deep dive into the world of bass, learning how cultures across the globe use low-end to make music more powerful. We’ll hear how Bach and his contemporaries made *ostinato* important, and see how Wagner invented the first sub-bass back in 1853. We’ll learn the difference between the schools of funk, and talk about Bootsy, Jaco, Kaye, and Canadian Legend Geddy Lee. A trained contra-baritone will show us how low he can go, and we’ll hear how a strange British Law spawned a style of music that put bass front and centre.

In *The Waveform Lab*, we’ll learn about the role the bass has of giving the rest of the music a harmonic and rhythmic context. We’ll learn about low frequencies, and how they travel and interact with their physical surroundings. We’ll learn about a WWII plan to build a bass so devastating it could knock planes out of the sky. We’ll see how bass sounds can be shaped with effects and synthesizers. We’ll construct funky basslines and give them flair using syncopation, octave jumps, slides and slaps. We’ll show how side-chaining a kick drum can turn a baseline into a dance floor destroyer. *The Lab Band* gives us some bass heavy music featuring a guest.

In *The Online Lab*, we’ll get to know the Bass Module, a monosynth/ROMpler focused on quick and fun bassline generation.

7) “Hip-Hop: Part 1” - In the mid-1970’s, something emerged from a party scene in New York City that changed the course of popular music forever… Hip-Hop. We’ll learn about the conditions that created it, and how it is connected to the dance-hall scene that was exploding in Jamaica. We’ll go crate diving with turntablists, go deep into drum-machines, and learn all about sampling. We’ll hear the different sounds that the West Coast introduced, and feel the bass as we branch off into Trap and its offsprings. We’ll talk about Africa Bambaata, Kool Herc, and Grandmaster Flash, and we’ll learn how important dance is to early spread of this game changing genre.

In *The Waveform Lab*, we’ll dive into song creation with a top notch producer and artist as they build a track from the ground up. We’ll make wicked beats on drum machines, learn about the intricate math of swing grooves, sample and manipulate old records, and find the right floor shaking bass to tie it all together. We”l see how a few different vocalists approach “top-lining” and adding hooks to turn it into a song, which they’ll perform with *The Lab Band.*

The Online Lab adds the Sample Module, sampler that comes with a large library of loops.

8) "Film Scores" - Whether it's front and centre, or quietly underscoring the action, nothing creates emotional atmosphere in a film like the right music. We'll go from campfires to theatre, from films to sporting events to see how music can make any drama more exciting! We'll learn about Wagner's use of *leit motifs* and Kubrick's last minute decision to scrap Alex North's original score for 2001: A Space Oddessy in favour of Strauss. We'll listen to Bernard Hermann's twisted strings and John Williams' triumphant horns. We'll see the range of Morricone and hear how Elfman fumbled his way into becoming one of the greats. We'll learn how synthesizers found their way into films scores in both obvious and surprising ways and we'll study how Canadian legend Howard Shore built literal worlds of music for the epic Lord of the Rings films.

In *The Waveform Lab*, we'll learn about the use of reoccurring themes, and how effective they can be at evoking emotion and connecting narratives. We'll expose how manipulative music can be in media, and see this in action by watching the same scene scored three different ways by three different composers. Then we'll meet the composers and hear about their creative and technical process.

The Online Lab adds a video player that has the ability to set marker points, click tracks, and streamers. Viewers can upload their own videos or use any of our library of original scenes to score their own shorts.

9) "Jazz" - In the late 19th Century, a new sound emerged from the streets of New Orleans that changed the way we used chords and progressions forever. We'll learn how Ragtime and Blues met Beguine and the Marching Bands, and how that lead to the Dance Hall Bands of the 1930's. We'll learn how it became smaller and focused in the 1940's, edgier in the 1950's, and how electric - and electronic - instruments have changed the landscape. We'll talk about Miles, Coltrane, Herbie, and, of course, Canadian legend Oscar Peterson.

In *The Waveform Lab*, we'll break down how Jazz - like all music - is a form of conversation. We'll build on what we already know about chords by introducing Jazz chords, inversions, voicing, and the importance of improvisation. We'll talk to a drummer and a bass player, and they'll explain their unique roles in holding everything together. Then, *The Lab Band* jams with some jazz greats.

The Online Lab adds the Jazz Chord Module, a unique chord sequencer that guides users through the 'conversation' of Jazz progressions.

10) "Human Voice" - From the moment we are born, we start expressing ourselves with the most versatile instrument of all… our voice. We'll learn about the incredible range of sounds we can create using our complex vocal cords, throats, mouths, nasal cavities, tongues, and lips. We'll learn about languages, what they have - and don't have - in common. We'll learn about pitch in some Asian languages, 'clicks' in the Khoisan languages, and how Sanskrit defines the tongue positions. We'll meet some unique vocal masters - like opera singers, blues singers, throat singers and Beat Boxers.

In *The Waveform Lab*, we'll learn about formants and vocal cords, and how the voice can be synthesized. We'll learn about explosive consonants and how vowels use our mouth as a filter. We'll learn about Yamaha's Vocaloid and how it voiced a Holographic Anime Superstar. We'll learn about editing, Autotune, and vocoders, and we'll meet a woman whose voice may sound just a little familiar. We'll sit in a recording session with some famous friends as they record a track with *The Lab Band*.

The Online Lab adds the Vox Module, a device that allows users to record, effect, manipulate, and share their own vocal phrases for others to use.

11) "Recording Studio" - It's the place where it all comes together. It's where the music we listen to is created, played, produced, recorded, mixed and mastered. We'll learn its humble beginnings in the 1890's making wax recordings, and we'll find out how magnetic tape gave us the ability to edit and multitrack. We'll learn how electronic composers like Stockhausen and pop producers like George Martin treated the studio as the ultimate instrument, and how the digital revolution made it accessible to everyone. We'll visit some of the most famous studios in the world and hear about the favourite tricks and techniques of the masters, including prolific Canadian producer, Daniel Lanois.

In *The Waveform Lab*, we'll go deeper in to the modern DAW and watch as a top notch producer takes on *The Lab Band* in their own unique way. We'll watch them manipulate samples, twist rhythms, tune vocals, compress, eq, edit and effect the music, as they produce their own unique version of *The Lab Band*'s track, turning a track on its head, much to the delight/chagrin of the band.

The Online Lab adds the Mix Module, which allows users to control the mix, eq, and compression settings of the other modules.

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This is just where we'll begin…. Future episodes will include (but not be limited to): Brass Instruments, Melodic Percussion, Music In Nature, Rock'n'Roll Part 2, Installation and Performance Art, Asian Music, Wind Instruments, Middle Eastern/North African Music, Origins of Electronic Music, North American Indigenous Music, Choral Music, Hip-Hop: Part 2, Bowed Instruments, Music as Protest, Plagiarism and Copyright (more exciting than it sounds), The Best Rock Drummers of all time, Music for Healing, Victorian Novelties, etc…

There is a whole world of music to explore, and we are looking forward to sharing it with you!

The Online Lab

For those inspired to dig deeper in to the world of music, we're building *The Online Lab*, a web/mobile app that allows curious minds to explore their own inner musicians in a modular environment that is straightforward and gives immediately satisfying results.

Each module gives users musical tools related to topics we've covered in our episodes. They are designed in such a manner that, for the most part, no matter how much experimentation they are subjected to, the modules remain in harmony and stay ynchronized with each other, so everything sounds at least a little bit good. It's not too complex, but there's lots to explore for those that are curious.

Once you've finished a song, there are ways to share it - personal and curated playlists that others can listen and subscribe to. And if you hear something you like in someone else's music, you can ask to borrow it for your own compositions - collaborations are easy and encouraged! It's an exciting way to journey into the world of music production.

These are some of the things we're planning:

Monosynth Module
- monophonic subtractive synth with ADSR envelope and VCF
- 16 step sequencer with interactive controls & LFO
- scale presets that keep the sequence in key
- save and arrange up to 8 sequences per song

Drum Module
- 6 channel, 16 step drum sequencer
- library of drum and percussion sounds
- save and arrange up to 8 sequences per song

Piano Module
- 16 step chord sequencer / ROMpler with VCF
- ability to program basic chord types and inversions
- visual display features a keyboard and piano-roll
- library of piano, electric piano, and synthesizer voices
- save and arrange up to 8 sequences per song

Guitar Module
- 16 step phrase & chord sequencer / ROMpler with VCF
- Multi FX module with Reverb, Delay, Distortion, and Filter
- easy-to-program loops and riffs
- library of guitar (and related) sounds
- save and arrange up to 8 sequences per song

Percussion Module
- 16 step rhythmic binary sequencer / ROMpler with VCF
- build rhythms based on mathematic groupS
- easy to program loops and breaks
- expanded percussion library with electronic and international sounds
- save and arrange up to 8 sequences per song

Bass Module
- monophonic low range ROMpler with VCF
- 16 step generative phrase sequencer
- quick pattern programming and variations
- expanded library of bass sounds, including acoustic and electric
- save and arrange up to 8 sequences per song

Sample Module
- loop player with VCF / Trance Gate
- library of samples and loops of all kinds
- record, upload, and edit samples
- save and arrange up to 8 sequences per song

Video Module
- synchronized video playback for scoring
- upload video or browse the library
- set marker points and tempo changes
- able to share completed videos.

Jazz Chord Module
- 16 step conversational chord meta-sequencer
- plugs directly in to the Piano Module
- guides the user in jazz progressions by showing the 'conversation'

Vox Module
- sampler with pitched playback control
- record samples or browse the vocal library
- edit and add effects
- play and record sequences
- save and arrange up to 8 sequences per song

Mix Module
- upgraded mixing board with automation and effects.
- save and arrange up to 8 sequences per song

As well, *The Online Lab* is a place to learn more about topics we've discussed. You can hear full, unedited interviews, watch outtakes from our show, check out some experiments our science team has designed, and dig deeper as you explore your own inner musician!

The Wave Files is being developed by Joel S. Silver, a Toronto based composer, producer, and writer with a broad set of interests. His love of music began early in life, where he would spend as much time with his head stuck in the piano as he would spend playing it. A classically trained pianist and percussionist, he soon discovered electronic music, which put him on the path to composition and production.

Joel furthered his studies at York University, where he studied Electroacoustic Composition and South Indian Rhythm, but his love of narrative storytelling soon lead him to the film and television world, where he has composed themes, scores, and libraries for a diverse set of clients, including “Spy Kids: Mission Critical” (Dimension Television / Netflix), “Paranormal Survivor” (Our House Media), “The Voice” (NBC), and the multi-award short winning short film series “Dead End”. Joel is also a sound designer and gear nerd who helped to launch a string of interesting devices from Yamaha Canada Music Ltd., including the revolutionary Tenori-On, and authoring “tEXtures”, a popular book on using the EX Series for sound design.

As a producer, Joel was part of the team that made the quirky Canadian Indie COmedy “Unlucky” (Breakthrough Films & TV), and was the English Language producer of the German animated classic, “Der 7bte Zwerg” (“The Seventh Dwarf”).