Play and record midi files and live midi instruments...

Change between dozens of SF2 sound fonts and VST instruments...

Filter the sound stream...

Create a cost-effective beginner's piano...

...all this with SynthFont2 and a few mouse clicks

A *SynthFont2* Quickstart Tutorial, Part 1

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At a price that is difficult to beat (15 EUR/$17), **SynthFont2** is one of the most powerful programs for exploring the midi world. Many people consider this to be simply the best midi player for Windows.

I work with sound and music all day long. For many years, I used the precursor program **SynthFont** (still available) to listen to my midi files. Recently, I have been impressed with the new features found in the new **SynthFont2** program. To explore **SynthFont2** more in detail, I share with you this quickstart tutorial to the key features of the program.

Download SynthFont2: http://www.synthfont.com/

What can SynthFont2 do?

The program is very flexible. It has many uses:

- ***It plays all types of midi files.*** A midi file contains a series of instructions to play a piece of music with one or several instruments. It does not contain the final sounds, just instructions which instrument(s) should be used and in which way the music should be played. To be able to listen to midi files, we need a program that translates the content of midi files into actual sounds. This is most often done with **SoundFont** files. This is the core task of SynthFont2.

- ***SynthFont2 makes handling SoundFont files easy and transparent.*** A SoundFont file is a collection of instrument sounds that are used to interpret a midi file. As the name suggests, a SoundFont file acts like a font used for text files: in interpreting the contents of a midi file, it can be simple and functional, or it can be sophisticated and powerful. A **g**eneral **m**idi SoundFont file (a "GM file") contains recordings for at least 128 melodic and 47 percussion instruments. Western melodic instruments are represented with half-tones, plus optionally, with extra versions for different sound durations and attack velocities. Each sound collection for an instrument is called "a preset" or "a patch".

- There are dozens, if not hundreds of free SoundFonts available on Internet. Not all are equally good. To find out which are the best for your purpose, one usually goes through lengthy comparisons. ***This means switching from one SoundFont to another.*** That is very easy to do in SynthFont2.

- ***You can also change instruments for an individual midi channel.*** SynthFont2 is thus great for experimenting with different instruments, for example when ***verifying a transposition to a different instrument.***

- SynthFont2 lets you examine the niggly innards of a SoundFont file. This makes the

program particularly helpful for those who wish to **build new SoundFont files**. A special program ("Viena") is also available on the SynthFont site exactly for that purpose.

- ***Next, you can filter or reproduce the sound with an ASIO/VST device.*** By plugging ASIO/VST devices into SynthFont2 (many of which are free), you can experiment with a wide variety of filters, for example to emphasize treble or bass, or to make the sound brighter or less intrusive, or you can listen to your midi files with a VST plugin.

- Let's define ASIO and VST. **ASIO** provides a direct internal interface between programs like SynthFont2 and the Windows sound system. This reduces latency* and provides greater flexibility of handling sound within the Windows system. **VST** is a wrapper for interfacing filter plug-ins, sound effects, instruments, or entire programs in the Windows environment. (*Latency = e.g. in a piano track, the time between hitting the key and the sound coming out of the loudspeaker.)

- Many companies have released ASIO/VST instruments and sound modification devices (filters) that can be used as plug-ins in SynthFont2. Some are commercial sound reproduction programs, like *Piantoteq*, *DSK* and *Addictive Keys*, while others have been produced by freeware developers (see e.g. Xavier Kalensky's substantial *kx77free* contributions).

- ***You can connect an electronic piano or other midi instrument to your computer and use SynthFont2 for real-time, live instrument practice or for giving concerts.*** Below we'll show you how to connect your piano to SynthFont2 and how to reduce the latency to acceptable levels. SynthFont2 is highly optimized to give you the best live instrument performance on your machine.

- ***The program produces sounds for your internal loudspeaker, for a headset, or for a file recorded in any of various file formats.*** In this way, you can listen to your midi files, or to your own performances, or you could even pool various instruments for a live performance. Moreover you can record midi files or live performances in various sound formats, such as MP3, WAV, OGG, MP4/M4A, FLAC or WMA at 16-, 24- or 32-bit precision.

- *Note 1: ASIO [Audio Stream Input/Output] and VST [Virtual Studio Technology] are formats defined by Steinberg Media Technologies GmbH.*

- *Note 2: MIDI should theoretically be spelled with capital letters, because it is the abbreviation of "Musical Instrument Digital Interface". But I follow common use and spell it in small case throughout this tutorial.*

- *Note 3: To edit midi files, many musicians use MuseScore 2, a powerful free music notation and editing system. The midi output of MuseScore 2 is directly compatible with SynthFont2.*

In short

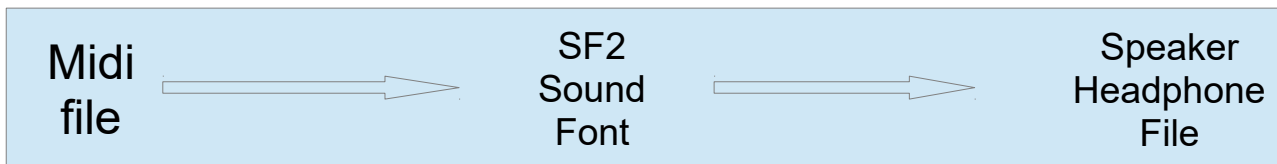**SynthFont2 lets you...**

...play and record midi files

...play midi instruments in real time for daily practice or for live performance

...filter the sound stream

...build new SoundFont files

...record your performances

Startup operation with an SF2 SoundFont

Midi file	SF2 Sound Font	Speaker Headphone File

SynthFont2 is ready to use as soon as you've installed it.

- Right out of the box, it plays a midi file to your currently selected **Windows playback device** (speakers or headphone). The midi file is **33H_R&P.mid,** found in the SynthFont program folder.

- For this, it uses a minimal **SoundFont file**, found in the same folder, called **GMGSx.sf2**.

- Launch SynthFont2 and click on *"Play to Speakers"* (button at center top). Click again to stop.

- You can change the midi input file with the menu *File/Open Midi or Arrangement* (Ctrl-O).

Change the SF2 SoundFont

You can set the default SoundFont under the File menu. It's a good idea to change to a more powerful SoundFont rapidly. Most are free of charge.

- A good and commonly used SoundFont for all instruments is the full **FluidR3 GM** font, found here (among other places): http://www.synthfont.com/SoundFonts.html

- Another good SoundFont for all instruments is the **SGMv2.01-JN-SMP** found here: https://sites.google.com/site/soundfonts4u/

- If you are on a computer with limited resources or are strapped for space, here is a smaller, but fairly good SoundFont file for all instruments: **General User GS** (http://www.schristiancollins.com/generaluser.php).

> **An important caution:** Different SoundFont files are recorded with different amplitudes. If you change from one to the other without reducing the amplitude, you are at a risk of damaging your hearing. **SO PLEASE, REDUCE YOUR OUTPUT VOLUME EVERY TIME THAT YOU CHANGE YOUR SOUNDFONT.**

SynthFont2 for everyone

SynthFont2 and its precursor **SynthFont** have found many different users. In Part 1 of this tutorial, we concentrate on a quick and easy application, those needed by a **piano learner**. Future sections of the **SynthFont2 Quickstart Tutorial** will address the needs of other and more advanced musicians.

Here are the users we distinguish:

1. **Piano and other keyboard users** (electronic synthesizers, harpsichords, organs). These users are looking for an easy way to connect the keyboard to the computer to obtain a variety of good instrument emulations. They generally look for the *highest and most appropriate sound quality at the lowest possible price*. Their

technical needs are relatively circumscribed, which is why we concentrate on this group in Part 1 of this tutorial.

2. **Composers.** They generally use other software (e.g. *MuseScore 2* or others) to create the composition, but they want to play it using ***SynthFont2***. There they have two options: either save the composition in midi format, or create a midi link between the design software and ***SynthFont2***. This is a bit trickier and needs some detailed explanations.

3. **Performers**. They may have a midi file of a piece for a performance. They use ***SynthFont2*** to evaluate the tune – in some cases even changing it (transposing it) – and making arrangements. Some like to mute a track and play an instrument of their own. Track changing can become relatively complex, and those details need to be explained.

4. **Choir directors**. This is a special but surprisingly sizeable group. They are similar to the above, but they do have some special needs.

5. **Karaoke fans.** This is another special group. Although ***SynthFont2*** supports Karaoke files, there are other and fancier Karaoke players around. However these other players don't support SoundFonts and VST instruments.

6. **Mr. or Ms. Everyone** who simply enjoys listening to midi files. For example, there is a user who has a collection of more than 5000 midi files with just piano music. Some are from old paper rolls, some are newer. Recently he needed to sample them all into MP3 files on a USB stick, since the media player in his car doesn't support any other format. Even that was possible with ***SynthFont2***.

SF2 Soundfonts for the piano, synthesizer, harpsichord or organ

Now let's see how SynthFont2 plays piano sounds with SoundFonts. Here are some SoundFonts that are noted for their piano presets:

- **The "Nice-Keys" range of SoundFonts at** https://sites.google.com/site/soundfonts4u/ (Eric's personal favorite because of the high-quality piano patch)
- **Timbres of Heaven** (a very bright and present sound) http://midkar.com/SoundFonts/
- **Maestro Concert Grand** http://sonimusicae.free.fr/matshelgesson-maestro-en.html (very nice sound)
- **Yamaha Disklavier Pro** http://www.vstplanet.com/Instruments/VST_Piano6.htm

As above, choose a midi file with *"Open Midi or Arrangement"*, click on *"Play to Speakers"*. Click again to stop.

Plug in a VST SoundFont program

Midi file	⟶	VST soundfont program	⟶	Speaker Headphone File
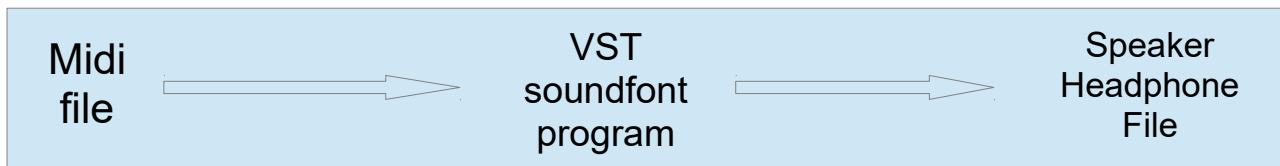
Soundfonts can also come in the form of a VST program for reproducing midi files with commercial products like *Pianoteq*, *Addictive Keys, Galaxy Pianos* or *Garritan's Aria Player*. Some VST programs (like *Pianoteq* or the *Aria Player*) contain a built-in midi player, but others like *Addictive Keys* or the *Galaxy Pianos* do not. **SynthFont2** lets you play your midi files with the advanced Addictive Keys or Galaxy VST program.

You may already have some VST plugins on your computer. Search your disk for "VST Plugins" and check your Program Files folders for commercial products such as these: AAS, Applied Acoustics Systems, Cakewalk, Steinberg, Native Instruments, Garritan, or others.

Insert a VST plugin into *SynthFont2*

- Inserting a VST plugin is a bit more complex than selecting a SoundFont.

- **Careful:** Currently SynthFont2 can only access **32-bit VST plugins**. So be sure to download and select a 32-bit (x86) version.

- Most VST SoundFonts are part of non-free commercial products, but here is one that is free and that we can use for illustration: http://www.dskmusic.com/dsk-sf2/.

- Download the file, unzip it, and move the entire folder into the Steinberg plugins folder in your Program Files folder (C:\Program Files). If the folder does not exist, create two subfolders structured like this: C:\Program Folder\Steinberg\VSTPlugins\. At the end it should look like this: C:\Program Folder\Steinberg\VSTPlugins\DSK SF2\.

- In SynthFont2, click on the *AddFx* button. It is in a frame in the center of the main screen, called *VST Effects ("Fx")*. This is a direct access to the **VST Instruments** tab in the *Setup and Options* dialog.

- First, enable the *"All"* button in the bottom panel. This assures that your instruments will automatically show up in the middle panel.

- Now select the VST Instruments tab. Click on *"Add..."* and navigate to your VST plugins folder. When asked "Do you want to add VST Instruments as well?", you can safely click "yes". A list of VST plugin folders is built up in the upper window in **green** and a list of VST instruments will appear in the main panel in **black**.

- If your instrument is not yet shown, select a **green** plugins folder, then load a midi file with the **red** *Add File* button in the bottom row.

- Now SynthFont2 knows where your VST plugin instruments are. At the end, be sure to save these folder references (*"Save" button* at the bottom).
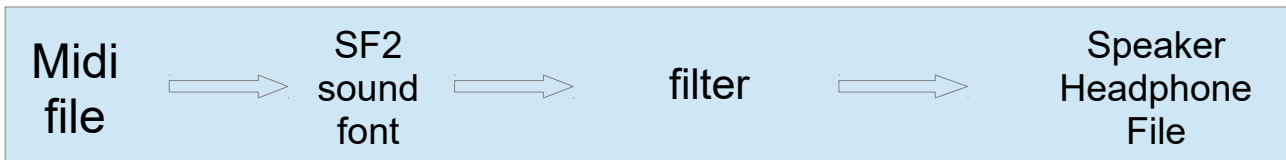
Play a VST plugin instrument

- Be sure that the *tracks button* is marked. This is easily forgotten and leads to great frustrations when you don't hear any sound!

- Select a midi file with the *Open Midi or Arrangement file* button in the top row. The relevant midi tracks show up in the tracks window at the bottom. If you don't see the tracks, be sure that you are in *Synth Rack* mode (left, third row of buttons).

- Click on the *VST Instr* button, found above the midi sound file. In our test case, this is DSK SF2.

- Click on the *VSTI Prog* button. This presents the graphical interface of the VST program. Now you can change individual parameters in the program.

- Click *"Play to Speakers"* (top row of buttons). You should now hear the midi file through the VST program.

- Here is a very nice and free **VST set of instruments,** the *WayPiano* on http://www.simonlarkin.net/releases.html. Be sure to get the X86 version.

Filtering

Midi file	SF2 sound font	filter	Speaker Headphone File

SynthFont2 makes filtering easy. Let's try a handy example.

- Go to http://sonimus.com/products/soneq/. This is the site for the freeware version of a simple-but-powerful equalizer. Of course, SynthFont2 already has a great equalizer (SynthRack/VST Effects panel), but the soneq equalizer is useful for a simple example.

- Click on *Downloads* and go through the procedure to obtain the VST effects module.

- During installation, feel free to deselect the 64-bit components of the module, since SynthFont2 works with the 32-bit versions.

- At the end of installation, the VST effect is found here: C:\Program Files (x86)\Steinberg\VSTPlugins\SonEQFree.dll.

- In SynthFont2, find your way back to the VST effects tab (Click on *Setup and Options*, select the *VST effects* tab).

- If necessary, add the VSTPlugins folder given above with the green ***Add...*** button, and likewise, add the SonEQfree VST effect with the red ***Add file...*** button.

- Save the modification and the SonEQfree title shows up in the central effects window. The checkmark shows that the modifications of this filter will henceforth apply to the midi-to-sound chain.

- You can modify the filter while the music is playing.

- Click on the title to present the equalizer interface. Many sound modifications are possible in this module, but here is an easy one to start with: In the high-frequency section, set the gain button to the top 12-o'clock position and click on the various numbers: 6, 8, 12, 15 kHz. Those frequencies will be boosted by the filter.

Filtering is quite a science, and many VST effects, from moderately to highly complex can

be found on Internet. There are few programs that make experimenting with these filtering modules much easier than **SynthFont2**. I can't think of any.

Live piano performance

Midi instru-ment	SF2 sound font	optional ASIO interface	Speaker Headphone File
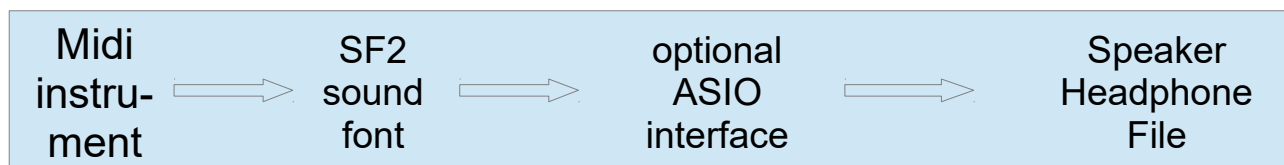
So far setting up SynthFont2 has been a piece of cake. This is about to change as we ready **SynthFont2** for a live performance. We'll take you through the setup for your daily instrument practice, or for a live concert performance. It may become a bit more complicated, but you'll probably like the result.

Connect your keyboard to the computer with the usual midi connection

Old style piano: If your piano has two round midi connectors, you need a midi-to-USB adaptor to translate the midi signal from the piano into an USB signal for the computer. Nowadays, this is no problem. Such adaptors sell for EUR/$10 or less and show very rapid conversion times. The signal arrives at the computer within 10 ms. The one thing to watch for is the IN and OUT labeling of your connectors. In the midi world, IN has to be connected to IN, and OUT has to be connected to OUT.

New style piano: Recent keyboards have been equipped with direct USB cable connections. This feeds the midi signal directly into the USB port on the computer.

It might happen that the computer does not recognize a piano when it's connected to a USB hub. This is particularly frustrating on portable computers or tablets that only have one USB slot. There is no magic solution. With my Surface Windows 10 laptop I had to try a whole series of USB adaptors to find one that reliably transmitted the midi signals. The one that finally worked was a passive portable hub from NTrust (about 40 EUR).

Find the midi signal and adjust the latency

Once your piano is correctly connected to the computer, the midi signal will be fed to **SynthFont2**.

- After connecting your keyboard, launch SynthFont2.
- If you haven't done so yet, select a SoundFont you want to use (*"Set default SoundFont file"* in File menu).
- Open *"Setup and Options"* (second button at the top left). In the top left panel of the IO Ports tab, you should see the name of your keyboard below the word [NONE].
- Before closing the Setup with "Save", we set up the latency. Look at the bottom of the IO Ports panel where you see the heading "Settings for playing from MIDI input in real time...".
- For the moment, make sure that "Use ASIO" is disabled.
- Look at the bottom right. Here are two editable boxes for specifying the latency. SynthFont2 has already filled them in with conservative values. On my Surface PC, the initial values were: Samples/buffer: 3072 and Number of buffers: 4. On your computer, this may be different.

- These numbers specify the delay between hitting a key and computer output. The lower the numbers, the better, but you must avoid crackling or skipping noises in the output. Be sure to take your time to get this adjustment just right, well before any public performance!

- Test the playback (press the button). You should hear a clear siren sound. If you hear any crackling or skipping in the sound, increase the number of samples and/or buffers. If you don't hear any problem, you can try lower values. Typical values are 2 buffers with 3072 samples, 3 buffers with 1536 samples or 4 buffers with 1024 samples. On my main computer, I use 4 buffers with 1024 samples.

- You may have to get back to this adjustment if you notice any crackling or skipping during sound reproduction.

- Now exit the *Setup and Options* window with "Save".

Play your instrument with a SoundFont file

- In the main panel, click on the second big button at the right, called *"Turn Midi Input ON"*. SynthFont2 reserves a whole series of midi channels for real-time performance.

- For any existing midi file, the track box(es) will be disabled. For clarity and to lighten memory load, it may be good to close any midi files that are already in SynthFont2.

- Play your instrument. You should hear the selected SoundFont for your keyboard instrument.

- If you do not hear any sound, turn the midi input off (again, second button from the right) and go back to the *Setup and Options* dialog, *IO Ports* tab. Check the fourth panel at the bottom right. Did you select the right output channel? Is the volume up? You may have to test the general sound output for your computer. Windows sometimes takes quite some time to change from one to another sound output channel.

Reduce the latency

If you're running **SynthFont2** on a reasonably modern desktop computer with just one instrument input, the above configuration should be good enough, even with very large SoundFonts. However, if you interface several midi instruments, and/or run on a computer with limited resources, and/or use a huge SoundFont, you may have to help the system reduce the latency. Otherwise you get unacceptable delays as you play your instrument(s). SynthFont2 solves this problem in an elegant fashion. Here is how:

- Download ASIO4ALL *from the original developer* at http://www.asio4all.com/, or from a reputable download company. **BE CAREFUL**: bad virus infections have been reported in versions downloaded from other sites!

- Install ASIO4ALL in the usual manner. After installation, you probably have to reboot the computer.

- Launch SynthFont2 and open the *Setup and Options* window (*IO Ports* tab).

- At the bottom of the window, enable "Use ASIO". ASIO4ALL shows up, together with the output channel.

- If you want to change any parameters, click on the *"Show ASIO details"* button. The ASIO4ALL graphic interface pops up to let you change the options.

- It is not guaranteed that the ASIO path will function, because ASIO4ALL may report that the only output path is already occupied by another application. Your mileage may vary, in which case you may have to disable ASIO.

Live performance with a VST instrument

Now let's use a VST instrument in a live performance.

- (As above) Your keyboard is visible in SynthFont2.

- (As above) No midi file is necessary.

- (As above) You have entered one or more VST instruments into SynthFont2 and it is visible in the **VST Instruments** tab in the *Setup and Options* dialog.

- Click the button *"Turn Midi Input ON"*.

- As with SoundFonts, SynthFont2 reserves several midi tracks for live performance. At first, the default SoundFont is entered as an instrument.

- Do not click on any channel track.

- To change to a VST instrument, click on the *"VST Instr"* button and select your VST Instrument. Then exit.

- The VST instrument of the main track has been changed. Since you are just playing a single keyboard instrument, the other channels have remained unaffected, i.e., they still show the SoundFont name. Don't let that bother you.

- You can now play with your VST Instrument.

How good is SynthFont2 real-time performance in surround sound?

Once all parameters in *SynthFont2* and in your computer sound system are well set up, the performance can be amazingly good. Let me give you a sense of how good it appears to my ears.

To compare *SynthFont2* live performance with a free SoundFont I reached into the high end of SoundFont construction.

Recently I got the *Galaxy II Grand Piano Collection* with a modern Bösendorfer Imperial, a 1929 Bösendorfer Baby Grand and a Steinway Grand Piano recorded in 5.1 surround sound (about 250 EUR). This is an awesome SoundFont collection with more than 6,000 samples in 24 bits, making 30 GB altogether. It boasts separate SoundFonts for up to 13 velocity zones (fast-slow/hard-soft combinations) to assure a wide dynamic range. It's hard to do much better in piano emulation at this time.

After much comparison between the three piano emulations using a series of headphones, the Bösendorfer Imperial won out. The low end was fine for all three pianos, but the high end remained relatively weak everywhere, in that the treble keys lacked the natural sound contours that I know from real grand pianos. The least deficient emulation was the Bösendorfer Imperial.

It's against this competition that I ranged the free SoundFont pianos used in *SynthFont2*. Out of the dozen or so SF2 pianos I compared for this tutorial, the SoundFont Nice-Keys-Sal-Giga-JNv2.0 stood out for me. It had an even response throughout the tonal range and to my ears presented the best audible texture at the high end. Given its substantial 900 Mb size, this is not surprising.

Moreover, the Nice-Keys – SynthFont2 combination scored better than the built-in piano

emulation found in my own keyboard, which is a highly-praised and recent P45 by Yamaha. So it seems to me that you can do very well with a **SynthFont2** SoundFont emulation.

But what do I get in my Bösendorfer Imperial emulation, which is still more than 10 times bigger than Nice Keys with its 10 Giga? In addition to even better texture in the higher keys, there are many more velocity zones, i.e. a better representation of different levels of attack, from soft to hard, and from slow to fast. Possibly there is also a better integration into the sequential evolution of sound events, but I found no documentation to support that hypothesis.

The wider perspective: *SynthFont2* in your piano learning path

Altogether, **SynthFont2 with Nice-Keys** is an estimable option for a close-to-zero dollar investment for piano practice software. Get a simple keyboard with at least 61 keys (preferably with weighted keys), hook it into **SynthFont2**, load the Nice-Keys SoundFont, get really good earphones and you have a very respectable initial piano learning environment.

Let me give you a few more details on this. After much testing over several years, here is what I found to be the best investment path for my own piano learning:

- Begin with the *best earphones* you can afford. Expect to spend about $/EUR 200 for solid earphones from Sennheiser, Bose or perhaps Audio Technica. An interesting surround sound can also be obtained from the new generation of virtual surround headphones. For example, the HyperX Cloud II Headset for about $100 shows excellent surround sound without noticeable latency, but it is still noticeably weaker in clarity than a Sennheiser HD598 Cs. Your hearing will become more discerning with time and you will be glad about your great attention to the selection of your earphones. To me, that was clearly the best initial bang for the bucks.

- By contrast, I would say, *take it easy on the loudspeakers*. I have experimented with many combinations reaching up to KEF monitors for EUR 1200 or more. Where a modest investment gets you top-notch earphones, even top-rated speakers can still not match the same quality when used in piano emulation. It's curious: speakers may sound fantastic for playing music recordings, but they very often fare poorly in normal piano practice where we listen very closely to each individual sound. For the money of the best speakers, one can still get a better-sounding acoustic piano!

- Another quality anomaly may come from *amplifiers* and *sampling rates*. In testing for this tutorial, I realized that my direct computer audio output was noticeably better than that of my somewhat aged post-computer amplifier. So I dropped the amplifier from the chain. Another surprising quality loss occurred with my DAC sound generator which runs at 44.1 kHz rather than the 48 kHz sampling rate used by my computer. Because the computer output was resampled at 44.1 kHz for the DAC, a slight, but audible quality loss was introduced. As a result, I now listen directly to the computer sound output, and the DAC generator has become useless. *Consequence:* it's a good idea to test every single step along the sound reproduction chain to obtain the best possible audio fidelity.

- With increasing competence in playing, the *quality of the keyboard* becomes more important. A weighted keyboard (lowest-priced $/EUR 400-500) gives your fingers a good sense of the action found on acoustic pianos. At a given point, that may be a good direction to take.

- When will you outgrow the best free SoundFont on **SynthFont2**? Your ears will

decide. Don't be rushed. Some excellent comparisons of high-end emulations are available on YouTube. I'd say, listen carefully, and buy only when you hear a clear difference to your SynthFont2 piano.

- *And finally:* nothing beats a top-notch teacher. Only a very good teacher can convincingly and safely guide you to your personal music destiny.

About the author: Audiophile and great lover of classical music, Eric Keller currently works full-time with musical sound synthesis. In tune with current trends, he favors all-digital computer software-centered solutions, using a great variety of programs. For special needs, he develops his own programs in Java. Years ago and now part of history, he developed *Signalyze*, a signal analysis program for speech analysis. In a realization of a life-long dream, he is learning to play the piano. Find out more on http://www.erickeller.ch.

About the co-author, Kenneth Rundt: Retired scientist and product developer. Main hobby during the last 15 years has been to develop the SynthFont range of tools. Lives in Finland, in the city of Turku.