
**The Wizoo Pro Guide
to
MetaSynth 2.5**

Len Sasso

MetaSynth

MetaSynth 2.5

(:wizoo:)

Imprint

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Author Len Sasso

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Welcome...

MetaSynth is an extremely versatile sound processing tool and like all complex tools, it takes some getting used to. Its look and feel is probably unlike any software you've used before and what it does is equally unique. The purpose of this book is to explore most of the mainstream as well as some of the more arcane ways you can use MetaSynth.

This is a book of tutorials. Each tutorial is intended as a recipe for using MetaSynth to accomplish a particular kind of task. My hope is that there is both enough detail for the first time MetaSynth user and a clear enough flow that seasoned MetaSynthesists can browse the tutorials, extracting whatever new ideas they find.

The tutorials are organized into four chapters: The Image Synth, the Filter Window, Sound Sources and The Sample Editor. Everything you do with MetaSynth involves one or more of these areas. Of course, they are not completely separate—tutorials in each section will use some concepts from the others—but they represent MetaSynth's centers of activity.

The first few tutorials in each chapter and especially in Chapter 1 are more detailed than the rest. These and the chapter introductions present the basic concepts and the later tutorials assume a familiarity with them. Veteran MetaSynth users can probably skim through them without worrying over each detail. If you're new to MetaSynth, a little time spent here is probably worth the effort.

Since the tutorials are interactive, you will want to have MetaSynth up and running. It's a good idea to save any files you are working on (presets and filter files are saved automatically) then quit and relaunch MetaSynth before starting a new tutorial.

This book comes with a mixed format Cd. First there are 51 audio tracks which illustrate the results of various tutorial steps. Inserting the Cd into any audio Cd player will play these tracks sequentially. Please note that the audio clips

start from track 2 because track 1 contains the data portion of the Cd-Rom. You can also select and play them from your computer's Cd drive as you work through the tutorials.

The data portion of the Cd contains folders for each of the eighteen tutorials. The contents of these folders is described below. Finally there is an Adobe Acrobat format ›PDF‹ file which contains additional color illustrations. This document, named ›Graphix.pdf‹, contains a page of special graphics for each tutorial and a few extra pages of useful, graphic information.

Although there is a separate folder for each tutorial, many samples, presets or filters are used in several different tutorials. Although there is a sacrifice in variety, this is done intentionally to facilitate comparisons between various processes—e.g. how different MetaSynth effects might alter the same sample.

Many of the samples and presets used here are from the MetaSynth factory Cd-Rom and provided courtesy of U&I Software. The groove samples used in Tutorials 3 and 10 are courtesy of Ernest Cholakakis at Numerical Sound.

At the time of this writing, MetaSynth 2.5 is about to be released. This is a major revision and there are many new features not found in the first release version, MetaSynth 2.0. These tutorials cover all features of version 2.5 and I am especially indebted to Eric Wenger for keeping me aware of the changes as well as patiently explaining the many things I didn't grasp at first glance.



Len Sasso

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Guide to the Tutorials

Each tutorial consists of a small number of steps—typically five or six (occasionally more). The steps are numbered and correspond to an overall task to be accomplished.

Usually several actions will be needed to accomplish a step and these are indicated by a ♦. Each of these sub-steps consists of a single action or keystroke.

Other things you will find in the tutorials are hints, tips and tricks—all indicated by a wedge, ►. Sometimes these will be short explanations worth remembering and other times they will be useful shortcuts or additional things you can do with a certain technique.

At the end of each tutorial there is a section called ›More Things to Try.‹ This section contains one or more, related ›mini-tutorials‹ in which the steps are only briefly spelled out. They are intended to show other applications for the techniques used in the tutorial.

After the ›More Things...‹ section there is a summary of the tutorial and a description of the things to be found in the tutorial folder. Each tutorial has its own folder containing all the files needed in the tutorial—see below.

The illustrations come in two forms: inline and sidebar. The sidebar illustrations show a button or control that is referred to in the adjacent step or sub-step. To ease the clutter, I have omitted buttons that have been displayed recently. There are also sidebar illustrations indicating when a Cd audio track corresponds to a particular step.

The inline illustrations are usually MetaSynth screenshots showing what a particular window will look like or how to set a specific set of controls. In general these are not labeled—their position should make their purpose clear.

Here is a mock tutorial to illustrate the format:

Tutorial #: Tutorial Name

A brief description of the tutorial (optional).

1 First step in the tutorial.

Comments and description of this step (optional).

❖ First action to take.

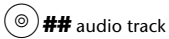
Comments and description of this action (optional).

❖ Next action to take.

▶ Hint, tip or trick relevant to this step or action.

❖ Next action to take.

Screenshot resulting from or used in this action.



2 Second step in tutorial.

...

More Things to Try

◆ First mini-tutorial.

□ First step or action.

□ Next step or action.

...

Summary

In this tutorial you learned how to:

◆ do this (step 1).

◆ do that (step 2).

...

What's in the ›Tutorial #‹ Folder

Name of File	Description
filename	file description

The Tutorials Folders

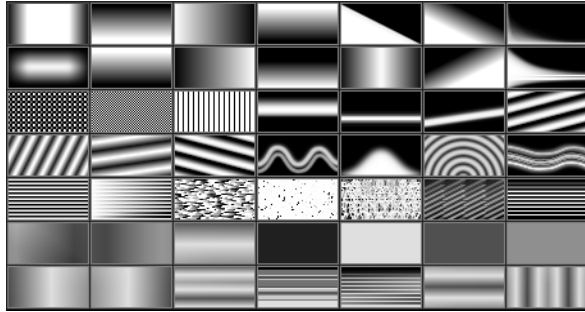
Each of the tutorials has an associated folder on the CD-ROM. A tutorial's folder might contain:

- ◆ MetaSynth preset files
 - ◆ MetaSynth filters files
 - ◆ MetaSynth DisplaceMap files
 - A DisplaceMap file is really just a preset file used in the Displacement tool window
 - ◆ Custom Scale Map files
 - ◆ Wave table files
 - ◆ FM Synth files
 - ◆ Instrument files
 - ◆ Sound files used by the Instruments
 - ◆ Sound files used in or resulting from steps of the tutorial.
 - ◆ Sound wave spectrum files
- Before starting a tutorial, copy its folder to your hard drive. This will allow you to freely use and change the files it contains.

Preset and Filter Banks

MetaSynth's Image Synth and Filter windows both use banks of filters and presets arranged in rows of seven pictures each.

An example filter bank—there are seven rows and each row contains seven pictures. Each picture is a separate filter.



In the tutorials, I will refer to the top row of pictures by single numbers—>filter #1< or >preset #6< for example. For all other rows I will use the row number followed by a dash—>filter #4-1< or >preset #3-6< for example.

1 The Image Synth

The Image Synth is the heart of MetaSynth—it's where pictures are created, manipulated and synthesized into sound files. MetaSynth's other windows fall into two categories: windows for creating source sounds to be used in synthesizing pictures and windows for sample processing. But since any sample can be used as a source for synthesizing pictures, these categories overlap.

Below is the Image Synth window. The picture in the ›Image Area‹ is surrounded by buttons and pop-up menus that affect the picture and how it is synthesized.

Unfortunately, beautiful pictures don't always make beautiful sounds. The illustration below shows a picture and six variations. From left to right, each picture is the result of applying one Image Synth process. The similarity between the second and third pictures is no accident. As the pictures become more abstract, the sounds become less cluttered and more interesting.

© 02—Clouds



See this image in color in the Special Graphics Pdf.

The tutorials in this section are intended as a starting point for your own graphic sound design experiments. They will familiarize you with the many tools for manipulating images within MetaSynth.

Image Synth Pictures

As with all computer graphics, pictures are made up of pixels—colored dots on the screen. When MetaSynth synthesizes a picture it uses each pixel's position for pitch and time and its color for volume and stereo placement.

A pixel's vertical position in the picture sets its ›pitch.‹ MetaSynth lets you set the reference pitch (A2 for example), the musical scale used (i.e. the interval between pixels one on top of the other) and the overall pitch range of the picture (i.e. the number of rows of pixels).

A pixel's horizontal position in the picture determines when it sounds. MetaSynth lets you set both how long one pixel lasts and how long the whole picture lasts (i.e. the number of columns of pixels).

A pixel's volume and stereo placement is determined by its brightness and color. Grayscale pictures produce mono sounds. Color is measured in red, green and blue components (RGB) but only red and green count as far as the sound goes—you can filter out all the blue without any affect. MetaSynth offers a variety of ›paste and transfer modes‹ for combining the individual pixels from two pictures and as we'll see in the tutorials, this is a very powerful sound design tool.

For a look at how RGB colors combine and how paste and transfer modes work, see the Special Graphics PDF.



Image Synth Buttons and Menus

You can accomplish most tasks using buttons and menus along the borders of the Image Synth Palette. These fall into several broad categories:

Moving Things Around

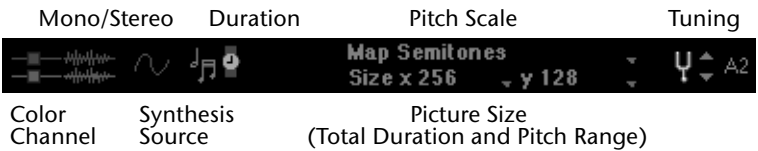


These buttons are for moving pictures between the clipboard, the Image Area, your hard drive and banks of ›presets‹ and ›filters.‹ There are two buttons each for the preset and filter banks. The smaller one on the left is for adding the picture from the Image Area to the bank and the larger one on the right is for selecting a preset or filter to apply to the picture in the Image Area.

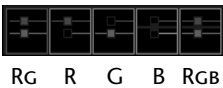
- ▶ Presets replace a picture while filters modify it. In fact, you can turn any filter into a picture by first filling the Image Area with white then applying the filter. Applying a filter is the same as pasting it from the clipboard using the ›Multiply‹ paste mode.
- ▶ Hold  while using the Select Preset menu to delete a preset. Hold  and click the Add Preset button to replace the last selected preset with the picture in the Image Area.
- ▶ Adding and deleting presets or filters changes the disk file and these changes are not undoable. If you're not sure you want to make changes to a preset or filter bank, make a copy before opening it in MetaSynth.



Setting Up The Image Area



Click the right portion of the Mono/Stereo button to select whether to synthesize a picture as a mono or stereo sound



file. Click the left portion of this button to select which color channel to edit: red and green, red only, green only, blue only or RGB (all color channels).

- ▶ Type **@** to cycle through the various channel options. Type **↔** to swap the red and green channels (i.e. swap stereo sides).

Use the Synthesis Source menu to select what sound source is used when synthesizing the picture. Each pixel in the picture is synthesized using this source—the pixel's vertical position, brightness and color determine the sounds pitch, volume and pan position.

- ▶ Hold **ctrl** and click on any row in the picture to hear the sound that MetaSynth will use to synthesize pixels in that row. If the sound source is an Instrument, the name of the sample will also appear in the Status display at the bottom right of the Image Synth.

You have a lot of choices for synthesis sources:

- ◆ A wavetable editor
 - ◆ A two operator FM Synthesizer
 - ◆ A sampler-style instrument to map samples across pitch zones
 - ◆ The sample currently in the Sample Editor
- ▶ You can create unbelievable effects by repeatedly resynthesizing the sample in the Sample Editor with the same or different pictures.

Use the Duration button or menu to set the sound file time for a single pixel. Settings can be made in any convenient unit: samples per pixel, total picture duration or BPM together with the number of pixels per beat. You can also have MetaSynth match the length of the sample in the Sample Editor.

- ▶ MetaSynth's time resolution is based on samples per pixel. The other settings will always be rounded to the nearest sample per pixel value.

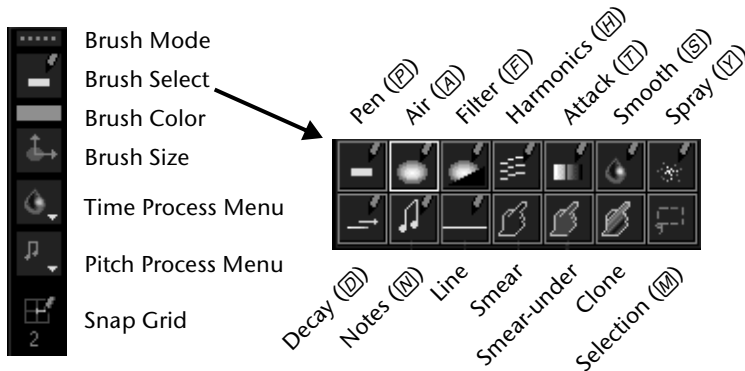
Use the pitch scale menu to select the pitch range and scale of the picture. Various macro and micro-tonal scales are provided and you can create your own scales.

Use Picture Size menus to set the overall width (x) and height (y) of the Image Area. This together with the pitch and duration determines the pitch and time range of the synthesized sound.

Use the Tuning menu to set the reference pitch of the Image Area. Choose ›Add Fundamental‹ from the Pitch Process Menu to see which row of the Image Area corresponds to the reference pitch.

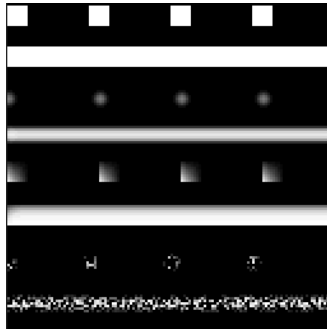
- Change the Tuning to transpose the picture while keeping its harmonic relations in tact. E.g. if you move a picture which uses a major scale map up or down, you will change the scale-modes, but if you change the Tuning, the mode will be preserved.

Draw and Paint Controls






Use the buttons and menus in this section to select brush styles and sizes for painting with the mouse in the Image Area. Some brushes add pixels to the picture while others only affect existing pixels. There's also a Selector tool for selecting parts of the picture for moving and editing.

For the brushes that add pixels to the picture, there are three ›Brush Modes:‹ dot, line and repeat. The illustration shows the difference between dot and line mode for the Pen, Air, Attack and Spray brushes. In each case the Brush Size is 8 over 8 and the ›minimum spacing‹ is 32. Repeat mode is the same as dot mode except all pixels are repeated at the interval of the ›grid‹ setting (see below).



The time and pitch processes offer various ways to modify the whole picture or selection.

- ▶ +Click in the Image Area to pop the brush palette or type +letter to select the brush by letter.
- ▶ Use  in the Image Area to temporarily activate the Selection tool (Marquee).
- ▶ Double-click on the Brush Size button to open the Brush Size menu.



View Options



Scroll

Zoom




Use the Scroll tool to move the area of the picture shown by the window. This has no effect on the picture! Holding down the space bar temporarily engages the Scroll tool.

Use the Grow Box in the bottom-right corner of the Image Synth to increase and decrease the window size. Using the Zoom buttons or typing the  or  keys will also zoom in and out but without changing the size of the viewing window.

Picture Manipulation Tools



Use the buttons in this section to manipulate the picture in real time. Click and hold then move the mouse around to see the effect—a picture is worth a thousand...

As you move the mouse over these buttons you will see three kinds of cursors. The four-way cursor (arrows in four directions) means the button's effect is two-dimensional. For these buttons, holding  disables the vertical direction and holding  and  disables the horizontal direction. The two-way cursor (right and left arrows) means the button has a one-dimensional effect. The standard, pointer-cursor means the button has a fixed effect—just click it.

- ▶ Double-click the Scale, Rotate and Move buttons to set numerical parameters for these actions. Double click the Contrast button to create contrast and color mapping curves.
- ▶ The Displace button is unique—double-click it to bring up a palette of displacement-source images. The bright and dark pixels in the source image cause the corresponding pixels in the picture to move the most while 50% gray pixels cause no movement at all. Try it, you'll like it.


The Synthesize and Preview Buttons

These buttons are what turns pictures into sounds. The Synthesize button creates a sound file and places it in the sample editor at the top of the screen. From there you can play, save and further manipulate the sound using MetaSynth's many DSP functions.

Synthesize



Preview

- ▶ -click the Synthesize or Preview button to reduce the volume of the upper (higher frequency) parts of the picture. Higher frequencies

generally have lower volume in natural sounds. Since the intensity range for graphics pixels is 0 to 255, keeping higher pixels darker limits amplitude variation in the upper parts of the picture. This option is meant to compensate.

Synthesizing a complex picture can take some time. If you just want a rough (mono with 22 k sample rate) idea of what you're getting or you want to preview only the selected part of the picture, use the Preview button.

- If you want to keep the sound file currently in the Sample Editor, either save it to disk or copy it to the clipboard before synthesizing the picture.

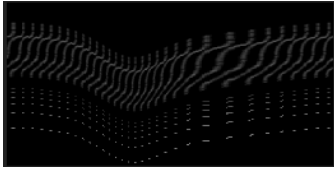


Hot Filters

The ›Hot Filters‹ are more picture manipulation tools but most of them are time based. Use the ›grid‹ setting at the bottom to set the pixel width of the process then click one of the Hot Filter buttons. Here are some examples:

- ◆ If you click the ›Pulse‹ button, the picture will be sliced up into vertical segments the width of one grid size with alternating segments deleted.
- ◆ If you click on the ›Echo‹ button, each pixel will be repeated one grid size to the right.
- ◆ If you click on the ›Quantize‹ button, each pixel will be extended to a line of the grid size. (⌘-click to delete all lines shorter than the grid size before quantizing.)

From Sound to Picture



Before



After

The last selection on the Disk Menu is called ›Analyze current sound... n.« (The ›... n« part means you can type **N** on the computer keyboard instead of using the menu.) Its purpose is to turn sounds into pictures. 'Nuff said?

© **03**—Before & After

The ›Before« picture in the illustration was used to make the first sound on Cd audio track 3. The ›After« picture resulted from analyzing the sound in the Image Synth. The second sound on Cd audio track 3 resulted from synthesizing the After picture.

Process Sequences

Many handy Image Synth processes involve repeated sequences of keystrokes and menu selections. You will find a list of some useful ones from page 199 onwards.

Tutorial 1: Something from Nothing (Almost)

In this tutorial we will start with the simplest of pictures—a straight line and use some of the Image Synth’s graphic tools to change it into a moderately amusing sound effect.

- 1 Start by loading the presets and filters and selecting the first preset.

❖ Load the preset bank named ›01.presets.<



❖ Load the filter bank named ›01.filters.<

❖ Select the first preset.





- 2 Use the Displacement tool to distort the line.



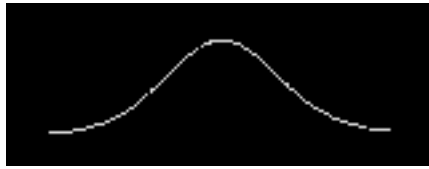
❖ Double-click on the Displace button to open the Displacement Map window. Then use its Disk menu to load the DisplaceMap preset bank named, ›01dmap.presets.<



Tutorial 1: Something from Nothing (Almost)

- ❖ After loading the file, close the window by clicking the green check mark in its bottom right corner.
- ❖ Hold  and  then click and drag downward on the Displace button.


The line in the Image Area will deform to look like the illustration:



- ❖ Release the mouse button then save the picture as the next preset (#2) by clicking the Add Preset button.



► This might be a good time to preview the sound.

3 Transpose and Stereoize the picture.

- ❖ Type  to raise the picture an octave.
- ❖ Select the first filter to pan the sound from left to right.



4 Reduce the picture intensity and save it as a preset.

- ❖ Select the entire sample area by typing .
- ❖ Use the color menu to select 50 % gray.
- ❖ Deselect everything by typing .

► You can click on any color in the color menu when something is selected in the Image Area to filter the selection by the selected color. In this case, we have reduced the intensity of the whole picture by 50% by clicking on the 50% gray color.





- ❖ Click the Add Preset button to save the picture as the next preset (#3).

5 Create another ›harmonic‹ an octave plus a fifth higher.

- ❖ Select the second preset (the original humped line) from the preset menu.
- ❖ Type **[8]** to raise the picture an octave.
- ❖ Hold **[⇧]** and type **[8]** to raise the picture a perfect fifth. (The picture is now an octave and a fifth above the original.)
- ❖ This time, select the second filter to pan the sound from right to left.
- ❖ Again select the whole picture by typing **[A]**; reduce it to 25 % by selecting the 50 % gray color twice and type **[D]** to deselect everything.
- ❖ Click the Add Preset button to save the picture as the next preset (#4).

6 Repeat this process two more times.

This will produce pictures two octaves and two octaves plus a Major third above the original.

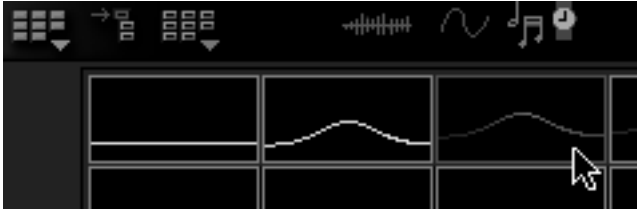
For two octaves, use **[8]** twice and click the 50 % gray color three times to reduce the intensity to eighth of the original. Pan it from left to right (using the first filter) then save it as the fifth preset.

For two octaves and a Major third, use **[8]** twice and the **[↑]** four times. Now click the 50 % gray color four times to reduce the intensity to sixteenth of the original and pan it from right to left (using the second filter). Then save it as the sixth preset.

These pictures may be barely visible but they *will* add to the sound.

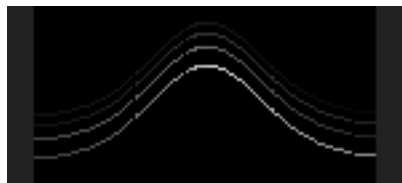
7 Combine these four new ›harmonic‹ presets.

- ❖ Select the third preset (the first harmonic) using the preset menu. This will bring the preset into the Image Area.



- ❖ Type **⌘** to copy the picture to the clipboard.
- ❖ Select the fourth preset (octave+fifth harmonic).
- ❖ Type **⌘** to add the clipboard image to it.
- ❖ Type **⌘** to copy this image to the clipboard.
- ❖ Select the fifth preset (two-octave harmonic).
- ❖ Type **⌘** to add the clipboard image to it.
- ❖ Type **⌘** to copy this image to the clipboard.
- ❖ Select the sixth preset (two-octave harmonic).
- ❖ Type **⌘** to add the clipboard image to it.
- ❖ Click the Add Preset button to save the picture as the next preset (#7). It should look like this:

The keyboard shortcuts in the Image Area are generally the same as in the Finder and other applications except that **⌘** is not used. **⌘** is used for similar commands in Meta-Synth's Sample Editor.



- Notice the pattern of this ›layering‹ process: Select, type **⌘**, type **⌘** repeated until all layers have been added.
- This might be a good time to preview the sound.









8 Flip and reverse the picture.

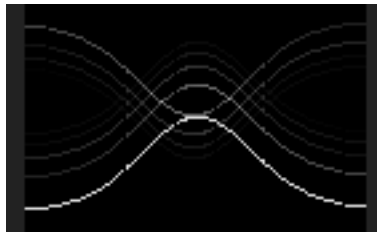
- ❖ Flip the picture upside down by selecting ›Invert Pitch‹ from the Pitch Process menu.
- ❖ Time-reverse the picture by clicking the ›Reverse‹ hot filter.

9 Layer the picture with preset #7 and layer that with the original.



- ❖ Type .
- ❖ Select preset #7 (the four harmonics).
- ❖ Type  then .
- ❖ Select preset #2 (the original curve).
- ❖ Type .
- ❖ Click the ›Add Preset‹ button to save the picture as preset #2-1.

© 04—Moderately Amusing

The picture in the Image Area should now look like this:




10 Synthesize the picture to hear it in true, CD-quality, living stereo.


- You don't have to create the harmonics one at a time if you don't want to process them separately. We did them separately here so that they could be panned in opposite directions. To add the first ten harmonics, type . To add the first thirty harmonics, hold  and select ›Add Harmonics‹ from the Pitch Processes menu.



More Things to Try

- ◆ Fade in/out the harmonics. Fade out/in the original.

05—Modestly Amusing





- ☐ Recall preset #2 (the humped line).
- ☐ Hold  and select filter #3 (fade in/out).

- ▶ Select a filter with  held down to use its ›inverse‹. In this case the fade in/out filter becomes a fade out/in filter.

- ☐ Type .
- ☐ Recall preset #7 (dual harmonics).
- ☐ Select filter #3 (fade in/out).
- ☐ Type .
- ☐ Click the Add Preset button.


- ◆ Barber pole harmonics.

06—More Amusing

- ☐ Recall preset #2-1 (the final result).
- ☐ Set the Hot Filter Grid Size to 8.
- ☐ Click the ›Blur‹ hot filter button.
- ☐ Type .
- ☐ Click the Add Preset button.
- ☐ Set the Grid Size to 64.
- ☐ Click the Hot Filter ›Repeat‹ button.
- ☐ Type  to subtract the original leaving only the repeat.
- ☐ Type .
- ☐ Select the preset you just added to the Preset menu.
- ☐ Click the Hot Filter ›Reverse‹ button.
- ☐ Click the Hot Filter ›Repeat‹ button.
- ☐ Click the Hot Filter ›Reverse‹ button.
- ☐ Type .
- ☐ Synthesize and save the preset.

- ◆ Here's a repeating version.

07—Most Amusing

- ☐ Recall preset #2 (the humped line).
- ☐ Type .
- ☐ Recall preset #2-1 (the final result).



Scale Tool

- ❑ Type [Z]. This leaves the dual harmonics without the line—you could have saved this as a preset in Step 9.
- ❑ Hold [⌘] and click the Scale tool twice.
- ❑ Hold [⌘] and [⌥] and click the Scale tool once.
- ❑ Synthesize and save the preset.

Summary

In this tutorial you learned how to:

- ◆ Use the Displace button to radically modify the shape of a picture. The bright and dark areas in the displacement map cause the picture to deform in opposite directions while the gray areas are neutral (Step 2).
- ◆ Use filters to ›stereoize‹ a sound (Step 3).
- ◆ Use the Color Menu to filter whole selections with a single color or shade of gray (Step 4).
- ◆ Use the Arrow and Page keys to move pictures by semitones, fifths and octaves. This works for selections, as well as the whole picture.
- ◆ Layer presets using select, copy and add (Step 7).
- ◆ Use Hot Filters and the Pitch Process menu to invert and reverse a picture (Step 8).

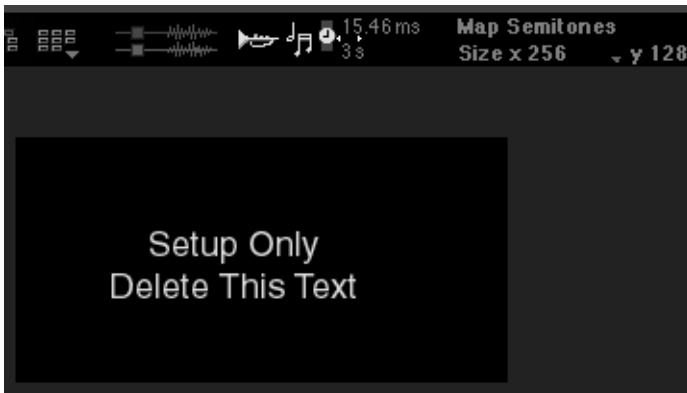
What's in the ›Tutorial 1‹ Folder

Name of File	Description
01.presets	Original preset bank. Load this at the start.
01a.presets	All presets developed during the tutorial
01.filters	Original filter bank. Load this at the start.
01dmap.presets	Displacement Maps

Tutorial 2: Rhythm & Blues

In this tutorial you will learn about various rhythm building techniques and how to use the silent, blue channel.

- 1 Start by loading the presets and filters and selecting the first preset.
 - ❖ Load the preset bank named ›02.presets.<
 - ❖ Load the filter bank named ›02.filters.<
 - ❖ Select the first preset.



When you select this preset MetaSynth will automatically bring up its Open Instrument dialog box and ask you to find the instrument named ›02.instrument.< This is located in the ›Tutorial 2< folder along with the presets and filters—select it and click the ›Open< button.

When MetaSynth has loaded this instrument it will open the Instrument window where you will see the samples and pitch-zone mapping for the instrument. This instrument uses three percussion sounds (low, medium and high congas) mapped across the lowest three octaves.

We'll get more into instruments later—for now just click the green check mark to close the window and take you back to the Image Synth window.




The purpose of selecting the first preset was just to set up some of the Image Synth parameters and load the instrument. The things included in the setup are:

- ➔ The Mono/Stereo toggle, set for stereo in this case.
- ➔ The synthesis source—this is the Instrument named ›02.instrument.‹

It includes the waveform if you are using this for the source and have checked the ›Include Wave Table with preset‹ in the Preferences window, but it does not include the **Fm Synth** patch if you are using the **Fm Synth** as the source—save these patches separately.

- ➔ The total duration (3.959 seconds)
- ➔ The scale map (Custom Scale...).
- ➔ The latter includes the tuning of the custom scale.
- ➔ The Image Area size (256 pixels wide × 128 pixels high).

Now that we have the setup, we don't need the text so get rid of it by pressing .

You can save a great deal of setup time by using presets to remember these settings.






The Rhythm Part

2 Enter a rhythmic sequence of notes.

- ❖ Select the Attack brush from the Brush Select menu.




The Attack brush is a natural choice for percussion sounds—each click creates a fade-out string of pixels.

- Remember you can open the brush palette from the Brush Select menu or by holding   and clicking in the Image Area. You can also select brushes using the keyboard shortcut with  (  in this case).

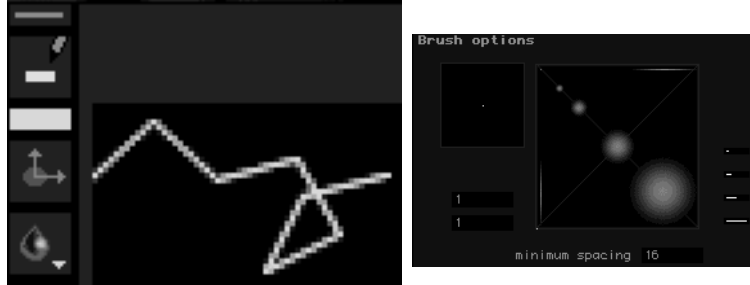


- ❖ Set the brush size for the Attack brush to ›24 over 1‹ using the Brush Size menu.

- ▶ The brush size is the number of pixels each mouse-click creates. The top number is for the horizontal dimension—set it by dragging right and left. The bottom number is for vertical dimension—set it by dragging up and down. You can also double-click the Brush Size button to open a window for selecting the brush size graphically.
- ▶ If (like me) you keep forgetting which number is which, just wiggle the mouse in the desired direction (left-right or up-down) and see which number changes.
 - ❖ Turn on Repeat mode by clicking the icon above the Brushes menu until the slanted dots appear.
 - ❖ Set the Grid Size to 64.

Repeat mode and the Grid Size work together. Each time you use a brush in repeat mode, the results are repeated at the interval set by the grid. A grid of 64 corresponds to half-note intervals.
 - ❖ Set the Snap Grid to 8 (corresponding to $\frac{1}{16}$ notes).
 - ❖ Enter half-note pulses for the low conga by clicking in the lowest octave of the Image Area (i.e. very low) as close to the left border as you can.
- ▶ Click the Snap Grid itself (not the number) to turn ›snap‹ on. The grid icon will turn green and all brushes will now be constrained to the Snap Grid. The Note-Entry brush is always constrained to the Snap Grid but is free to move vertically.
- ▶ Hold  whenever you use a brush or move a selection to both constrain the brush to the Snap Grid and restrict dragging to a horizontal line.
- ▶ Use the ›Minimum Size‹ setting in the Brush Size window (double-click the Brush Size button) to constrain the distance between new entries to a minimum size. Try this with any brush in line mode!





3 Enter three more series of notes.

- ❖ Enter a second series of notes using a brush size of 16 over 1 and a Grid Size of 32. Hold down \square (to snap to a $\frac{1}{16}$ note) and click somewhere in the second octave (med conga) but not at the very left edge.
- ❖ Enter a third series of notes using a brush size of 8 over 1 and a Grid Size of 16. Do this roughly in the middle of the Image Area for the high conga sound.
- ❖ Do it again at a slightly different position for a fourth series of notes (also high conga).

Your picture should look something like this. (You can get this exact picture by selecting preset #2.)



► This might be a good time to preview the sound.

4 Stereoize the sound.

- ❖ Select filter #2 from the Filters menu.

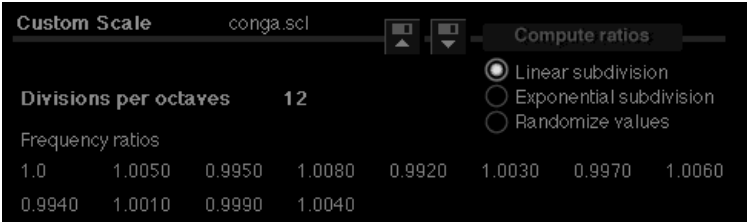


This yellow, red and green (middle, left and right) filter is designed to match the conga pitch zones—middle for the low conga, left for the middle conga and right for the high conga.

- Beware that the channel selection restricts any actions (including filtering) in the Image Area to the selected channels. For the red, yellow and green filter to work properly, make sure that RG or RGB channels is selected.

Recall that the Instrument used as the synthesis source uses three conga samples and maps them to the lowest three octaves of the Image Area. Since 64 pixels (five octaves plus a Major third) is the smallest vertical pitch area, most of the upper half of the Image Area will not get synthesized. Both the colored filter and the white filter to its left will blackout this unused area allowing you to see what part of the picture is actually producing sound.

- You can also hold **Ctrl** and click anywhere in the Image Area to hear what sound (if any) corresponds to a pixel row. When an Instrument is used as the source, you will also see the name of the sample in the Status display.
- You may notice that the two high conga sequences have nearly the same pitch though they are several vertical spaces apart. The custom scale shown below makes this possible.





- ▶ This scale divides the octave into twelve steps but each step has a ratio close to 1. Since all the ratios are close, the sounds are similar but not exactly the same—you get twelve ›flavors‹ for each conga without radical changes in tuning.
- ▶ Notice the name ›conga.scl‹ at the top of the Custom Scale window. Custom scales can be saved on disk and edited in any text editor. This is usually much faster than trying to type in all the individual ratios in the Custom Scale window.
- ▶ The scale used here is named ›conga.scl‹ and is in the ›Tutorial 2‹ folder. Since it is also saved with each of the presets, you don't need to load it separately.

❖ Synthesize the picture to hear it in stereo.

The Blues Part

5 Create a ›pitch zones‹ template.

- ❖ Clear the Image Area by pressing .
- ❖ Type  to invert the Image Area (i. e. turn it white).
- ❖ Select filter #2 to turn the three conga zones red, yellow and green.
- ❖ Select the Pen brush and set its brush size to 32 over 1.
- ❖ Ensure that Repeat mode is on and select the color black from the Brush Color menu.
- ❖ Enlarge the Image Area to get a clear view and use the Hand tool (or hold the space bar and click in the Image Area) to make sure the left edge is visible.



- ❖ Click on the top-left pixel of the red portion of the picture.
- ❖ Click on the top-left pixel of the yellow portion of the picture.
- ❖ Type **⌘C** to copy the image to the clipboard.
- ❖ Clear the Image Area by pressing **⌘A**.
- ❖ Type **⌘V** to paste the clipboard to the Blue channel.

The Image Area should look something like this.



- ▶ You have just created a blue template showing the three conga zones. If you synthesize or preview this picture, you will get silence—the blue will not interfere with anything you paint, copy or edit on top of it. (It will affect the coloration, though.)
- ▶ When you're finished with a template or want to get rid of it for any reason, use the Color Channel menu or type **⌘B** to select the blue-only channel then press **⌘A**. Alternatively, you can use a yellow filter on any color channel that includes blue—i.e. the B or RGB channels.
- ▶ You might want to try steps 2 and 3 again with this template in place.

More Things to Try



- ◆ Half 'n double.
 - ❑ Recall preset #3 (stereo version).
 - ❑ Use **⌘T** to raise it a couple of steps.
 - ❑ Type **⌘C** to copy it to the clipboard.
 - ❑ Recall preset #3 again.
 - ❑ Change the Image Area width (x) to 512.
 - ❑ Type **⌘R** to repeat the picture so that it fills the Image Area.
 - ❑ Type **⌘E** to add the raised, first picture. This has been saved as preset #5.

© **09**—Rhythm II

The loop repeats twice—this is the first repeat.

09—Rhythm II

The loop repeats twice—this is the second repeat.

- ▶ When you paste the clipboard into the Image Area it scales itself to fill the whole area. Copying the 256 wide pixel picture then changing the Image Area to 512 pixels causes the pasted picture to be doubled horizontally (i.e. to play at half speed).
- ◆ Half 'n double redux
 - ❑ Recall preset #5 (half 'n double).
 - ❑ Select the green portion (high congas) and delete it.
 - ❑ Synthesize the picture and save the sample to your hard drive.
 - ❑ Recall preset #5 again.
 - ❑ Select the yellow and red portion of the picture (low and mid congas) and delete it.
 - ❑ Select ›02.Instrument‹ from the Instrument menu in the Macintosh menu bar.
 - ❑ Check the check box labeled ›Randomize sample start.‹
 - ❑ Click the green check mark at the bottom to close the Instrument window.
 - ❑ Synthesize the picture. (Notice the variation in the high conga sound.)
 - ❑ Select ›Mix 50 %‹ from the Morph menu (or type M) and choose the sample you just saved to your hard drive.
- ◆ Quick templates (in stereo Image Areas).
 - ❑ Select the Pen brush.
 - ❑ Set its brush size to 1 over 1.
 - ❑ Turn repeat mode on.
 - ❑ Set the brush color to white (because there is no blue brush color).
 - ❑ Select the blue-only color channel.
 - ❑ Set both the Snap Grid and the Grid Size to the desired grid spacing.
 - ❑ Press  to turn Caps-Lock mode on.
 - ❑ Click anywhere in the Image Area.

- ▶ When you create pixels in Repeat Mode with Caps Lock turned on, the pixels are repeated horizontally at intervals of the Grid Size and vertically at octave intervals.
- ▶ You can create templates with vertical or horizontal lines instead of single pixel dots by using brush sizes of 1 over 64 (vertical) or 64 over 1 (horizontal). Do not try both at once, though—repeat the process with one dimension always set to 1.
- ▶ You can instantly create vertical grid lines at the Grid Size spacing by typing **⌘** or selecting ›Show Blue Grid‹ from the Time Process menu. This will erase whatever is currently on the Blue channel so copy and add it back if you want to overlay the grid.
- ▶ You can create blue pixels at octave intervals from all other pixels in the Image Area by typing **⌘** or selecting ›Show Octaves‹ from the Time Process menu. (This will also erase whatever is currently on the Blue channel.)

Summary

In this tutorial you learned how to:

- ◆ Use a preset as a setup template (Step 1).
- ◆ Use Instruments (Step 1) and Scale Maps (Step 4).
- ◆ Enter quantized, rhythmic patterns by using the brushes in conjunction with the Snap Grid, repeat mode and Grid Size (Step 2 and 3).
- ◆ Create pitch zone and rhythm pattern templates (Step 5 and More Things to Try).
- ◆ Repeat a picture and paste pictures at different tempi (More Things to Try).

What's in the ›Tutorial 2‹ Folder


Name of File	Description
02.presets	All presets
02.filters	All filters
02.Instrument	Three congas instrument used as sound source
conga.scl	Custom scale for the conga presets

Tutorial 3: Filters and Grooves

In this tutorial we'll start with a short percussion loop then create a blue template and several filters for ›regrooving‹ other pictures.

1 Load the presets, filters and percussion groove sound file.

- ❖ Load the preset bank named ›03.presets.‹
- ❖ Load the filter bank named ›03.filters.‹
- ❖ Load the sound file named ›Groove.‹

Sound files are loaded in MetaSynth's Sample Edit window which is always at the top of the screen. The Sample Edit window is not movable like all the other windows. You can either type  to open a sound file or click on the disk icon button in the upper left corner of your screen.

MetaSynth's Sample Edit window.

Notice the ›length‹ display in the upper right portion of the picture showing that the ›groove‹ sample is 6,210 milliseconds long.



2 Set the Image Area size and find the tempo.

Coming up with the Image Area size is easy because we're starting with an accurate loop—i.e. we know the number of beats (sixteen). Once we have that, MetaSynth will calculate the tempo for us.

- ❖ Choose the number of pixels for one beat and set the Image Area width.

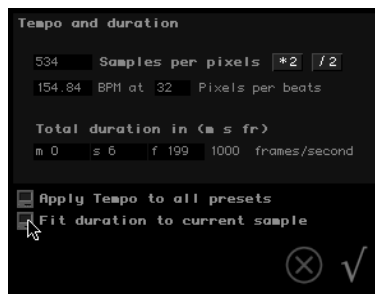
We'll use 32 pixels per beat so for sixteen beats we need 512 pixels (16×32). Set the Image Area width to 512.

Size x 512

- The default resolution in MetaSynth is 32 pixels per beat. But, you can use any resolution you wish and higher resolutions sometimes yield better grooves. The last two presets compare resolutions of 32 and 64 pixels per beat—the red vertical bars are quantized, quarter-note beats added for comparison.

You can find pictures of these presets in the Special Graphics Pdf.

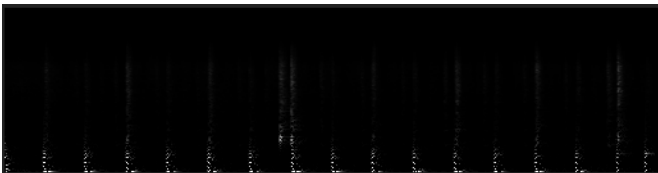
- ❖ Double-click the Duration button to open the Tempo and duration window.



- ❖ Set the Pixels per beat value to 32.
- ❖ Click the ›Fit duration to current sample‹ button.
MetaSynth calculates the Samples per pixel (534) and the corresponding tempo (154.84 BPM).

3 Analyze the sound file.

- ❖ Click the Mono/Stereo Toggle until the Image Area is in mono mode.
- ❖ Type **[N]** to convert the contents of the Sample Editor into a picture in the Image Area. You can also choose ›Analyze Current Sound ... n‹ from the Image Synth Disk menu.

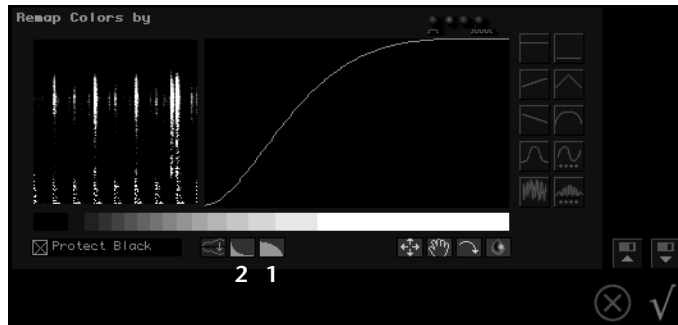


10—Groove & Re-groove



- The Scale Map setting influences how accurately the picture represents the sound. The Cd track contains the original groove, the groove synthesized from a semitone analyzed picture and the groove synthesized from a »Micro12« scale analyzed picture. The Micro12 analysis is much better but for extracting the rhythm from the groove, it doesn't make any difference.

4 Convert the picture to a filter and a blue template.

- ❖ Double-click the Contrast button to open the Remap Colors window.



You can drag the Contrast button to make instant changes in contrast and brightness but the Remap Colors window gives more accurate results. Here the bright pixels have been made brighter and the lowest luminosity pixels have been darkened. This makes the individual hits stand out. You can create many interesting and bizarre effects with Remap Colors.

- ❖ Click the »Square« button (labeled 1 in the illustration) twice.
- ❖ Click the »Square Root« button (labeled 2 in the illustration).
- ❖ Click the green check mark to apply the contrast map.
Typically you would want to save this as a preset and a filter. It has been saved as preset #1 and filter #1 in the tutorial files.
- ❖ Type  to copy the picture to the clipboard.
- ❖ Click the Mono/Stereo Toggle to turn the Image Area to stereo.
The gray pixels will now turn yellow because toggling to stereo automatically erases any blue in the picture.
- ❖ Delete the picture by pressing .

- ❖ Type **⌘** to paste the clipboard image to the blue channel.

This has been saved as preset #2.

5 Create beat and off-beat presets.

The filter you created in Step 4 can be an interesting groove filter but generally you'll want to use it as a starting point for more rhythm oriented filters.

- ❖ Recall preset #2 and zoom in so that you can clearly see the hard-edge lines which delineate the beats.
- ❖ Select the Pen brush and set its brush size to 4 over 64. (This will create columns four pixels wide and 64 pixels high with each mouse click.)
- ❖ Set the brush color to yellow and ensure that repeat mode is off.
- ❖ Carefully click at the bottom of the Image Area at each of the odd numbered beats (i.e. the first and third quarter-notes of each bar). Look for the hard-edges in the template.

If you accidentally create a column in the wrong place, type **⌘** immediately to undo it then try again.

The picture should look something like this:



This has been saved as preset #3.

- ❖ Repeat this process for the even numbered beats (i.e. the second and fourth quarter-notes of each bar). It has been saved as preset #4.
- ❖ Repeat the process for the hardest pushes before beats 8 and 16. Then change the brush size to 2 over 64 and


These choices are somewhat arbitrary. The point is to create separate column templates for interesting sub-parts of the rhythm.











create columns for the pushes before the beats 4 and 12.

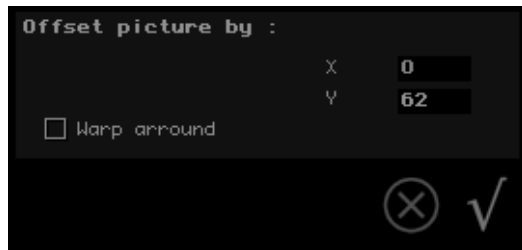
This has been saved as preset #5.

6 Combine these presets into interesting filters.

- ❖ Recall preset #3 (the odd beats).
- ❖ Select the blue-only color channel and press  to delete the blue template.

Remember you can step through the color channels by repeatedly typing .

- ❖ Select the RG or RGB channel and set the Grid Size to 4.
- ❖ Hold  and press . The columns will duplicate, becoming eight pixels wide.
- ❖ Set the Grid Size to 8.
- ❖ Click the Echo Hot Filter button.
- ❖ Click the Smooth button.
- ❖ Type  to select everything.
- ❖ Hold  and press .
- ❖ Double-click the Move button.



When the Offset Picture window appears, set the X-offset to 0, set the Y-offset to 62 and uncheck the Wrap Around box. Then click the green check mark to move the copied picture up 62 pixels.

This has been saved as filter #2. It should look something like this:



- ❖ Type **⌘C** to copy this picture to the clipboard.
- ❖ Recall preset #4 (the even beats).
- ❖ Select the blue-only color channel and press **⌘X** to delete the blue template.
- ❖ Select the RG or RGB channel and set the Grid Size to 2.
- ❖ Click the Echo Hot Filter button then click the Smooth button.
- ❖ Type **A** to select everything.
- ❖ Hold **⌘** and press **T**.
- ❖ Double-click the Move button.

As before, set the X-offset to 0, set the Y-offset to 62 and uncheck the Wrap Around box. Then click the green check mark to move the copied picture up 62 pixels.



- ❖ Type **E** to add the previous picture to it.
This has been saved as filter #3.
- ❖ Type **⌘C** to copy this picture to the clipboard.
- ❖ Recall preset #5 (the push beats).
- ❖ Type **A** to select everything.
- ❖ Click the 50 % gray brush color to lower the intensity of the bars.
- ❖ Hold **⌘** and press **T**.
- ❖ Double-click the Move button.

As before, set the X-offset to 0, set the Y-offset to 62 and uncheck the Wrap Around box. Then click the green check mark to move the copied picture up 62 pixels.

- ❖ Type **E** to add the previous picture to it.

This has been saved as filter #5.

► Ok, the drudge work is over—this is where the fun begins!

© 11—Guitar Regroove

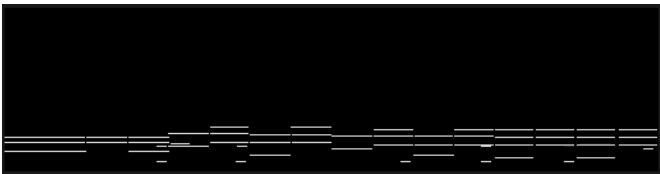
7 Groove some guitar chords.

- ❖ Load the sample named ›guitar G2‹ into the Sample Editor window. This is a sampled guitar note which we will use to synthesize all the examples in this step.
- To use a sample in the Sample Editor as a synthesis source, select the sample icon from the Source menu. Remember that the synthesis source is one of the things remembered by the presets—when you select the presets in this step, they will all be set to use the sample.

Select the synthesis source from the menu that opens when you click the Source button. The button's icon will indicate the current source.



- ❖ Select preset #6. These are some guitar voicings entered with the Pen brush at quantized quarter-note positions.



- ❖ Synthesize the picture.
- ❖ Load the sample, ›guitar C2‹ again.

- Once you have loaded a sample once, you can quickly load it again by clicking the Sounds menu and selecting it from the list at the bottom.

- ❖ Apply filter #2 by selecting it from the filter menu.
- ❖ Click the Smooth button.
- ❖ Synthesize the picture.

This has been saved as preset #7.

- ❖ Reload the guitar sample and select preset #6 again.
- ❖ Apply filter #3, click the smooth button and synthesize the picture.

This has been saved as preset #2-1.

- ❖ Reload the guitar sample and select preset #6 again.
- ❖ This time apply filter #4, click the smooth button and synthesize the picture.

This has been saved as preset #2-2.



- ❖ Reload the guitar sample.
- ❖ Apply filter #5 (the diagonal colored stripes) and synthesize the picture.

This has been saved as preset #2-3.

- ❖ Choose ›Mix 50 %...‹ from the Transform menu in the Macintosh menu bar at the top of the screen. When the Open dialog box appears, choose the sample named ›Groove‹—the original drum groove.

MetaSynth will play the mixed files after they have been merged.

8 Create a hybrid groove filter.

- ❖ Clear the Image Area by pressing .
- ❖ Type  to invert the picture (all white).
- ❖ Select filter #4.

- Applying a filter to a white picture turns the filter into a picture.

- ❖ Select filter #6 (low pass).



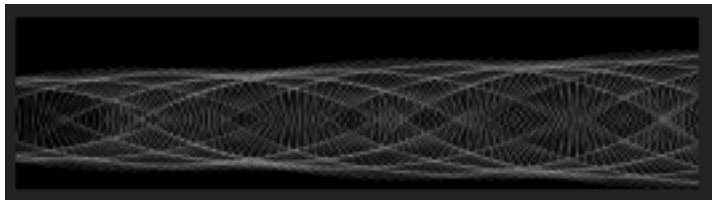
- ❖ Type **C** to copy this picture to the clipboard.
 - ❖ Clear and invert the Image Area so that it is white again.
 - ❖ Hold **⌘** and select filter #6 again.
- Using **⌘** with a filter reverses the effect. In this case the ›low pass‹ filter becomes a ›high pass‹ filter.
- ❖ Type **A** to select everything then select yellow from the Color menu. This turns the picture yellow.
 - ❖ Select the 50 % gray square from the Color menu. Do it again.
 - ❖ Type **M** to merge the previous picture with the current one. The picture should now look like this:




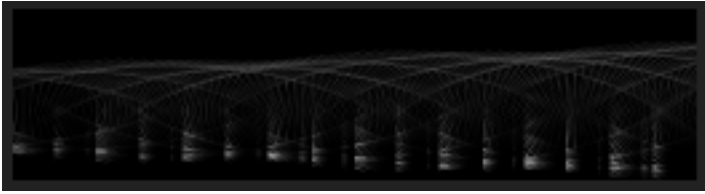
This has been saved as filter #7.

9 Filter an abstract sound.

- ❖ Select preset #2-4.



- ❖ Reload the guitar sample and either preview or synthesize the picture to hear the ›raw‹ version. If you synthesize it, recall the guitar sample again (or type Z right away).
- ❖ Apply filter #7 to this preset.




This has been saved as preset #2-5.

- ❖ Synthesize the picture.
 - ❖ Choose ›Mix 50 %...‹ from the Transform menu in the Macintosh menu bar at the top of the screen. When the Open dialog box appears, choose the sample named ›Groove‹—the original drum groove.
- MetaSynth will play the mixed files after they have been merged.

Notice that this preset uses a custom scale. The scale is a pentatonic scale named ›pentaCycle.scl‹ because the notes are in ›cycle of fifths‹ order. You'll find this scale in the ›Tutorial 3‹ folder. Have a look at the ratios involved by selecting ›Custom Scale‹ from the Scale Map menu.

More Things to Try

- ◆ Apply a groove filter directly to a sample.
 - ❑ Select preset #6 (ungrooved guitar chords).
 - ❑ Synthesize the picture with the guitar sample, ›guitar C2.‹
 - ❑ Open MetaSynth's Filter window by selecting ›Filter‹ from the Windows menu (or typing 4).
 - ❑ Select filter #4 from the Filter window's Filter palette.
- The filter bank is shared by the Image Synth and Filter windows. Any changes made in one are reflected in the other.
 - ❑ Click the Filter window's ›Apply Filter‹ button.
 - ❑ Repeat these steps with filter #7 instead of filter #4.



Xx is U&I Software's mini MIDI Sequencer. Among its many tricks, it is capable of converting MIDI files to MetaSynth pictures. If you want to do note based music with MetaSynth, Xx is worth considering.

- ▶ We'll get to the Filter window a little later. The thing to remember now is that graphic filters can be used to modify pictures or sound files. Sometimes (as here) the results are similar and other times, they are completely different.
- ❑ (Xx users) Convert the grooved guitar to a MIDI file.
 - ❑ Launch Xx to run simultaneously with MetaSynth.
 - ❑ Return to MetaSynth.
 - ❑ Select the grooved guitar picture (preset #2-2).
 - ❑ Type **⌘C** to copy it to the clipboard.
 - ❑ Change to Xx.
 - ❑ Choose ›Pict to MIDI...‹ from the File menu (or press **⌘B**).
 - ❑ When the Pict to MIDI dialog box opens, click the green check mark to convert the picture to MIDI notes in Xx.
 - ❑ Press **⌘F** twice to match MetaSynth's key range to Xx's.
 - ❑ Choose ›Time...‹ from the Format menu or type **⌘T**.
 - ❑ In the Time Modifications dialog box, check ›Scale Time‹ and set the value to 50 %.
 - ❑ Click the green check mark to scale the time to match MetaSynth's time scale.
- ▶ Xx uses sixteen pixels per quarter-note when converting between picture and MIDI.
- ❑ Play and edit the file in Xx and/or export it as a MIDI file to use in another sequencer.

Summary

In this tutorial you learned how to:

- ◆ Set the Image Area size and duration to match a sampled loop (Step 2).
- ◆ Analyze a sampled sound into a picture (Step 3).
- ◆ Create rhythm templates and filters from analyzed sounds (Step 4 to 6).
- ◆ Groove a picture with a filter (Step 7).

- ◆ Combine several filters into a complex hybrid filter (Step 8).
- ◆ Work with abstract pictures and custom scales (Step 9).

What’s in the ›Tutorial 3‹ Folder

Name of File	Description
03.presets	All presets
03.filters	All filters
Groove	Drum loop to be analyzed for its groove
guitar C2	Guitar sample used to synthesize pictures
GuitGroove.Xx	Xx file made from the guitar groove
GuitGroove.MID	Standard MIDI file made from the guitar groove
PentaCycle.scl	Custom scale for the abstract groove presets

© 13—That Sound

When you analyze a note from an acoustic instrument in the Image Synth, notice that the upper parts of the picture are barely visible.



Tutorial 4: That ›MetaSynth‹ Sound

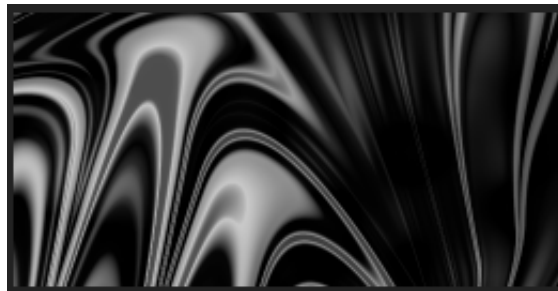
An alternative title for this tutorial might have been: ›How to turn an ugly sounding pretty picture into a pretty sounding ugly picture.‹ MetaSynth's greatest strength is also its greatest weakness—eyes are different than ears.

Pictures are composed of continuous lines and solid regions while the ear abhors clusters of closely pitched sounds. There is no graphically preferred region of intensity, but the harmonic content of natural sounds tends to decrease markedly in the higher registers.

In this tutorial we'll explore filters as weapons in the war between the eyes and ears. Along the way we'll add some Time and Pitch Processes.







1 Load that sound.

- ❖ Load the preset bank named ›04.presets.‹
- ❖ Load the filter bank named ›04.filters.‹
- ❖ Double-click on the Displace button to open the Displacement Map window. Then use its Disk menu to load the DisplaceMap preset bank named, ›04dmap.presets.‹ Click the green check mark to close the Displacement Map window and return to the Image Synth.
- ❖ Recall preset #1 (That Sound).



- ❖ Synthesize the picture.

Although this is the same picture used to create CD track 13, the duration has been considerably shortened. It makes a good percussive ›hit‹ but it could still use some work.

- ❖ Hold  and synthesize the picture again.
- ▶ Hold  while synthesizing or previewing a picture to reduce the volume of the higher frequencies. This allows you to use the full pixel brightness range to ›envelope‹ the higher frequencies while preserving the natural tendency for higher frequency components to have lower volume.
- ❖ Hold down  and recall filter #1.
- ❖ Hold  and synthesize the picture again.
- ▶ Filter #1 is a ›low pass‹ filter (see Step 2). Holding  while recalling it applies its inverse to the picture—i.e. it becomes a high pass filter. Synthesizing a picture with  emphasizes the lows so filtering them slightly often produces better results.

2 Apply a static filter

- ❖ Open the Filters menu and look at the first row of filters.



These are pictorial versions of typical synthesizer filters. From left to right they are: low pass, high pass, band pass, notch and narrow, medium and wide tooth comb filters.

- ❖ Filter and synthesize preset #1 with each of these filters.
These have been saved as presets #2 through 7 and #2-1.
- ▶ These filters are called ›static‹ because they do the same thing to the entire picture. They're like synthesizer filters with no envelopes. Static

14—Static Filters

This track starts with the original followed by each of the filtered versions.

15—Moving Filters —clip #1

filters are somewhat limited but they are often a good starting point before further processing a picture. In particular, you can use them to select separate parts of a picture for editing. Here are the steps:

- ➔ Select the picture.
- ➔ Apply the filter.
- ➔ Type **C** to copy it to the clipboard.
- ➔ Select the picture again.
- ➔ Type **L** to subtract the filtered part.
- ➔ Save the picture as a preset.
- ➔ Type **V** to restore the filtered picture.
- ➔ Edit and save it for use as a layer in the final result.

Preset #2-2 was created this way.

- ▶ Remember that selecting a filter while holding **⌘** inverts its action. You can, for example, apply a less radical low pass filter by **⌘**-selecting the high pass filter.

15—Moving Filters —clip #2

3 Apply a moving filter.

- ❖ Toggle the Mono/Stereo button to convert the Image Area to mono (gray scale).
- ❖ Press **⌘** to clear the image.
- ❖ Type **I** to invert the picture (all white).
- ❖ Select filter #3 (band pass).
- ❖ Select filter #6 (medium notch).

This ›combed band filter‹ has been saved as filter #2-1.



- ❖ Double-click on the Displace button to open the Displacement Map window and select the displacement map #6.

Make sure that the ›Smooth before displace‹ check box is checked then click the green check mark to close the window and return to the Image Synth.

- ❖ Hold **⌘****⌥** and drag down slightly on the Displace button until the picture looks like this:



This has been saved as filter #2-2.


- ❖ Type  to copy this filter to the clipboard.
- ❖ Recall preset #1.
- ❖ Type  to multiply the picture by the filter on the clipboard.

This has been saved as preset #2-3.


- Remember, multiplying from the clipboard is exactly the same as applying the filter from the filter menu. You don't have to save all your temporary experimental filters...

- ❖ Synthesize the picture.


4 Apply a harmonic filter.

- ❖ Toggle the Mono/Stereo button to convert the Image Area to mono (gray scale).
- ❖ Press  to clear the image.
- ❖ Select ›Add Fundamentak‹ from the Pitch Process menu.

- You can also use the Line tool to add horizontal lines to a picture. In this case the line is located wherever you click and its color and intensity are determined by the Brush Color setting.

- ❖ Press the ›Normalize‹ button to maximize the intensity of the fundamental line.
- ❖ Hold  and select ›Add Harmonics‹ from the Pitch Process menu.

This has been saved as filter #2-3.

 **15**—Moving Filters
—clip #3



- ▶ You can type **[H]** to add just the first ten harmonics. When you hold **[⌘]** and use the menu, you add thirty harmonics—a much richer spectrum and more appropriate as a filter.
- ▶ Keep in mind that you can move this filter vertically to ›tune in‹ on the harmonics of any pitch.



- ❖ Click and drag slightly left on the Rotate button to slant the filter downwards.
- ❖ This has been saved as filter #2-4.
- ❖ Recall preset #1 (that sound).
- ❖ Apply filter #2-4 (the down-sloping harmonic filter).
- ❖ Click the Reverse Hot Filter button to time-reverse the picture.
- ❖ Type **[C]** to copy it to the clipboard.
- ❖ Recall preset #1 (that sound, again).
- ❖ Apply filter #2-4.
- ❖ Type **[X]** to crossfade the clipboard with the picture.
This has been saved as preset #2-4.
- ❖ Synthesize the picture.

- ▶ Crossfading the reverse of a picture with itself usually makes a good loop.

© 15—Moving Filters
—clip #4

5 Try more harmonic filters.

- ❖ Toggle the Mono/Stereo button to convert the Image Area to mono (gray scale).
- ❖ Press **[⌘]** to clear the image.
- ❖ Type **[I]** to invert the picture (all white).
- ❖ Type **[F]** to open the Filter to Scale window.
- ❖ Set the twelve gray pitch selectors as shown here:



You'll recognize this as a major sixth chord.

Click the green check mark to apply this scale to the picture.



This has been saved as filter #2-5.

- ❖ Repeat this process using the scale shown here:



You'll recognize this as a diminished chord (a common substitute for a dominant seventh chord).


This has been saved as filter #13.

- ❖ Recall preset #1.
- ❖ Apply filter #2-5 (major sixth chord).
- ❖ Type  to copy it to the clipboard.
- ❖ Recall preset #1.
- ❖ Apply filter #13 (dominant seventh chord).
- ❖ Type  to crossfade.
- This has been saved as preset #2-5.
- ❖ Synthesize the picture.

- Use the Tuning button and menu to change keys.



More Things to Try

- ◆ Try other displace maps on any of the filters.
 - ❑ Toggle to mono (gray scale) mode.
 - ❑ Clear the Image Area.
 - ❑ Type  to invert it to white.
 - ❑ Apply the ›target‹ filter.
 - ❑ Select a displace map.
 - ❑ Displace the filter.
 - ❑ Save this new filter.
 - ❑ Try it on various pictures.
- ◆ Try filtering the filters.
 - ❑ Toggle to mono (gray scale) mode.

- ☐ Clear the Image Area.
- ☐ Type **I** to invert it to white.
- ☐ Apply the ›target‹ filter.
- ☐ Apply the second filter (i.e. filter the target with it).
- ☐ Save this new filter.
- ☐ Try it on various pictures.
- ◆ Experiment with other Hot Filters and Time Processes.
 - ☐ Toggle to stereo (color) mode.
 - ☐ Clear the Image Area.
 - ☐ Type **I** to invert it to yellow.
 - ☐ Apply the ›target‹ filter.
 - ☐ Type **@** until the red-only (left) channel is selected.
 - ☐ Set the Grid Size to 16 and apply the Saw Hot Filter.
 - ☐ Type **@** to select the green-only channel.
 - ☐ Set the Grid Size to 12 and apply the Saw Hot Filter.
 - ☐ Save this new filter.
 - ☐ Type **@** until the RG or RGB channels are selected.
 - ☐ Try this filter on various color pictures. (Longer durations illustrate this effect best.)
- ◆ Experiment with Transfer Modes.
 - ☐ Recall preset #1 (that sound).
 - ☐ Type **C** copy it to the clipboard.
 - ☐ Type **T** to reverse it in time.
 - ☐ Type **S** to swap stereo sides.
 - ☐ Type **I** to insert the clipboard as a selection.
 - ☐ Select the ›Differences‹ transfer mode from the Selection Transfer Mode menu (just below the Color Selector menu).
 - ☐ Set the Scale Map to ›Exponential.‹
This has been saved as preset #2-6.
 - ☐ Synthesize the picture.

◆ Insert and Displace

- ❑ Recall preset #1 (that sound).
- ❑ Type **⌘C** copy it to the clipboard.
- ❑ Type **⌘V** to insert the clipboard as a selection.
- ❑ Select the ›Subtractive‹ transfer mode from the Selection Transfer Mode menu (just below the Color Selector menu).
- ❑ Wiggle the Displace button a little.
- ❑ Set the Scale Map to ›Quartertones‹. This has been saved as preset #2-7.
- ❑ Synthesize the picture.

Summary

In this tutorial you learned how to:

- ◆ Create and apply static filters (Step 2).
- ◆ Create and use moving filters (Step 3).
- ◆ Create and use harmonic filters (Step 4 and 5).
- ◆ Combine and modify filters (More Things to Try).

What's in the ›Tutorial 4‹ Folder

Name of File	Description
04.presets	All presets
04.filters	All filters
04dmap.presets	Displacement Maps

Tutorial 5: Displaced Melodies

In this tutorial we will use displacement maps to create and alter melodies.

1 Set up the workspace.

- ❖ Load the preset bank named ›05.presets.‹
- ❖ Load the filter bank named ›05.filters.‹
- ❖ Double-click on the Displace button to open the Displacement Map window. Then use its Disk menu to load the DisplaceMap preset bank named ›05.presets.‹

This is not a mistake—the presets and the displacement maps are the same in this tutorial. The presets are stored in the last row.

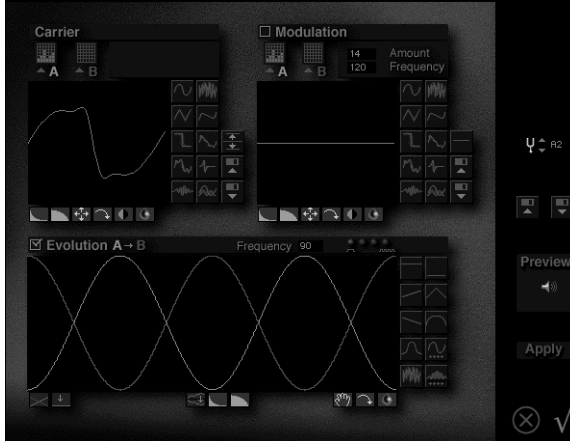
Notice that the rows of the preset bank alternate between gray-bar presets and colored presets. The colored presets show the effect of dragging upward (red) and downward (green) on a straight line (yellow) on the Displacement button using the displacement map directly above.

- When you load the same file as both presets and displacement maps, all changes to the presets will immediately show up in the displacement maps. This is a handy way to create or edit displacement maps because you can test the results immediately.

- ❖ Select displace map #1 and ensure that the ›Smooth before displace‹ check box *not* checked then click the green check mark to close the Displacement Map window and return to the Image Synth.
- ❖ Recall preset #7-1. This sets the workspace and places a continuous line at A2 (220.50 Hz) with a blue, dashed quarter-note grid.
- ❖ Select ›Procedural Synth‹ from the Sounds menu. This opens the FM Synth window shown below:



›Procedural Synth‹ and the ›FM Synth‹ are two names for the same thing.



- ❖ Click on the left diskette icon to open the FM Synth file named ›7-1.fm‹ then click the green check mark to close the FM Synth window.

- ❖ Preview the sound.

The FM Synth is the sound source for this preset. Recall that the source is one of the things that is automatically saved with a preset.



- One of the nice things about the FM Synth is that you can simulate a vibrato effect that doesn't change speed when you change the pitch. Press **[F]** a couple of times to raise the line two octaves and preview the sound again—the vibrato is still at the same rate. (Recall preset #7-1 after doing this.) We'll get deeper into the FM Synth and other sound sources in Chapter 3.

2 Displace a ›melody.‹

- ❖ Hold **[⌘]****[⌥]** and drag slowly upward on the Displace button until the straight line deforms to resemble the illustration:



This preset has been saved as #7-2.

Notice the difference between this and the displacement in Tutorial 1 (page 22) in which the line became a curve.

- Displacement moves pixels in the picture by an amount proportionate to the shade of gray of the corresponding pixels in the displacement map. 50% gray causes no movement while darker and lighter shades cause movement in opposite directions.



❖ Synthesize the picture.

3 Roll your own displacement maps.

❖ Recall preset #1.



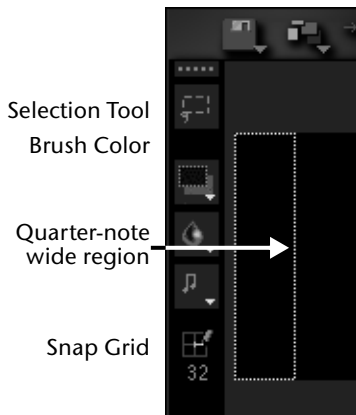
Remember the displacement map bank and the preset bank are the same in this tutorial.

This preset is the displacement map that was used to deform the straight line in Step 2. This displacement map consists of gray bars, each 32 pixels wide (a quarter-note). Each bar causes the picture's pixels in the matching region to move by the same amounts—this is why the line breaks up into quarter-notes rather than a curve.

The gray bars in this displacement map start at 50% gray at the ends and alternate lighter and darker toward the middle of the map. This is why the notes in the middle of the picture are further from the original line than the ones at the edges. It's also why there is a half-note in the middle of the picture—there are adjacent regions of the same shade (i.e. a half-note region).





- Displacement maps like this are surprisingly easy to make. Here's an example:






- ❖ Press **⌘** to clear the image area.
- ❖ Set both the Snap Grid and the Grid Size to 32.
- ❖ Choose the Selection tool and while holding **⌘**, select a quarter-note region at the left of the Image Area as in the illustration. You don't have to be exactly precise, the Snap Grid will affect both the starting position and the width of the region.



- ❖ Type **I** to invert the selection to white.
- ❖ Select filter #1 to filter the selection to 50 % gray.
- The filter bank, ›05.filters,‹ for this tutorial consists of precisely measured shades of gray designed to produce increasing displacements in opposite directions. Filter #1 is neutral and each pair of filters after that produce maximum displacements of four lines more than the previous pair. Maximum displacement means the displacement you get by dragging the Displace button as far as you can.
- ❖ Hold down **⌘** and **⌥** and press **⇨** key. The 50 % gray bar will be repeated right next to the original because the Grid Size is set to 32.



You can temporarily activate the Selection tool by holding **⌘**. Simultaneously holding **⌘** will still constrain the selection to points on the Snap Grid. In this case, we'll need to have the Selection tool active a little later so we've activated it permanently.

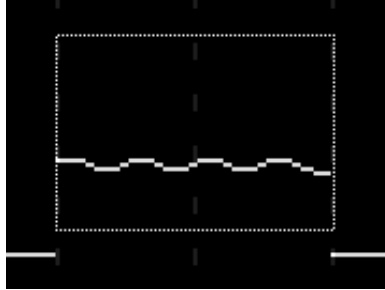
Notice the pattern for creating a new gray bar:    then choose brush color black then invert to white () then select the desired filter.

- ❖ Click on the Brush Color button and select the color black. This will turn the new bar (i.e. the selected region) black.
- ❖ Type  to invert the selection to white.
- ❖ Select filter #2.
- ❖ Repeat these steps until the Image Area is half full of gray bars. Use the next gray filter for each new bar.
- ▶ You can find the next filter when you open the filter bank by seeing which filter is surrounded by a red border. That is the filter you selected last. This works for presets, too.
- ❖ Type  to deselect everything.
- ❖ Type  to copy the picture to the clipboard.
- ❖ Type  to reverse the image at the other end of the Image Area. This is called ›Revert Time‹ on the Time Process menu.
- ❖ Type  to add the clipboard.
This is preset #1—the displacement map used to deform the straight line in Step 2.

4 Add some effects.

- ❖ Recall preset #7-2 (the displaced melody).
- ❖ Double-click on the Displacement button and select displacement map #2.
This displacement map has eight gray bars. These alternate between the shades of gray on either side of 50 %—i.e. they cause minimum displacement in opposite directions.
- ❖ Check the ›Smooth before displace‹ check box then click the green check mark to close the Displacement Map window and return to the Image Synth.
- ❖ Select half-note in the middle of the picture.

- ❖ Hold  and  and drag slowly down on the Displacement button. The half-note will deform to look like the illustration:




This has been saved as preset #7-3.



Notice that the deformations are wavy—not exactly individual notes as in Step 2. This is because ›Smooth before displace‹ is turned on.

- Smooth before displacement causes displacements at the edges of regions to blend smoothly with adjacent regions. In this example, smoothing results in a vibrato-like effect. With it turned off, the effect would be trill-like instead.

- ❖ Synthesize the picture.





5 Displace the melody some more.

- ❖ Recall preset #7-2 (the original displaced melody).
- ❖ Double-click on the Displacement button; uncheck the ›Smooth before displace‹ check box and click the green check mark to close the window.
We're still using displacement preset #2—the alternating bars.
- ❖ Select the four quarter-notes starting at the middle of the picture. This includes the last half of the half-note and the next three quarter-notes. Holding  while selecting makes this easier.

- ❖ Hold   and slowly drag upward on the Displacement button until this section looks something like this.



Notice that the quarter-notes have been broken into eighth-notes and further displaced—one higher and one lower than the original quarter-note.

- When you use a displacement map in a selection, it is scaled to fit the selection. The map we used here had eight gray bars, so the selection of four quarter-notes was divided evenly into eight sections—i.e. eighth-notes. This kind of scaling also happens when presets are pasted or filters are applied to selections.
- ❖ Double-click on the Displacement button; check the ›Smooth before displace‹ check box and click the green check mark to close the window.
- ❖ Select the last four quarter-notes.
- ❖ Hold   and slightly drag downward on the Displacement button.
- ❖ Select the last four eighth-notes.
- ❖ Hold   and again slightly drag downward on the Displacement button. The last half of the picture should look something like this.




This has been saved as preset #7-4.

- ❖ Synthesize the picture.

6 Ice the cake.

- ❖ Click the ›Size x‹ button and change the picture width to 576 pixels. This adds a little blank space onto the end.













► You can use the ›Other‹ choice from the menu to set any width you wish—576 was chosen here only for convenience.

- ❖ Select from the beginning of the eighth notes to the end of the Image Area.
- ❖ Use the Color Channel menu or type  until the red-only channel is selected.
- ❖ Set the Grid Size to 8.
- ❖ Click the Pre-Echo Hot Filter button.
- ❖ Click the Echo Hot Filter button.
- ❖ Select from the beginning of the last four eighth-note slurs to the end of the Image Area.
- ❖ Select the green-only channel.
- ❖ Set the Grid Size to 16.
- ❖ Click the Echo Hot Filter button.

This has been saved as preset #7-5.

Synthesize the sound.









7 Add more cake.

- ❖ Select the first eight quarter-notes.
- ❖ Hold  and press .
- ❖ Release  and press  three more times.
- ❖ Hold  and press .
- ❖ Release  and press  once more.
- ❖ Hold  and press the .
- ❖ Release  and press the  three more times.

The first half of the picture should look this:



You've just created four part harmony of a sort. Click the Preview button to hear how it sounds. Pretty ugly?

- ❖ Click on the Scale Map menu and select ›Custom Scale...‹.
- ❖ In the Custom Scale window click the Open button and load the custom scale named ›bopmaj.scl‹ from the Tutorial 5 folder. Then click the green check mark to close the window.
- ›bopmaj.scl‹ is an example of an eight-note scale commonly used in ›block chording‹ techniques. Alternate notes from the scale form two four-note chords ($4 + 4 = 8$) one of which is typically a diminished seventh chord. Two other examples are included in the folder: ›bop-min.scl‹ and ›bopdom.scl‹.
- ❖ Preview the picture again. Better?
- ❖ Select the eight eighth-notes in the middle of the picture.
- ❖ Hold  and press .
- ❖ Release  and press  twice.
- ❖ Select the last eight eighth-notes.
- ❖ Hold  and press .
- ❖ Release  and press  three times.
- ❖ Click the Smooth button.
- This has been saved as preset #7-6.
- ❖ Synthesize the sound.
- CD track 16 contains all the sounds created in this tutorial.



More Things to Try

- ◆ Use other scales to synthesize your melodies.
 - ❑ Create or import a melody or recall preset #7-4.
 - ❑ Choose ›Custom Scale...‹ from the Scale Map menu.
 - ❑ Click the Open button and load the scale named ›pentaCycle2x.scl.‹ This scale cycles twice through five steps of the cycle of fifths using true harmonic ratios.
 - ❑ Synthesize the sound.
 - ❑ Try the other scales in the ›Custom Scales‹ folder that came with MetaSynth.
 - ❑ Examine scales in SimpleText or any other basic word processor.

The first five lines describe the scale:

line 1: ›!‹ and Scale name
line 2: ›!‹
line 3: Scale description
line 4: Number of notes in the scale
line 5: ›!‹

The rest of the lines contain the ratios used in the scale—one line for each note in the scale. You can type in the ratios in any of three forms:

Decimal: 1.4983

Fraction: $3/2$

Cents: 700.000 cents

If you're using harmonic ratios, fractions are easiest— $3/2$ is the harmonic fifth. If you're using notes from the twelve-tone, equal tempered scale then cents are easiest—700 cents is the seventh step of this scale. If you're ripping the numbers from some other source, decimals might be useful—1.4983 is the ratio of the tempered fifth. (The harmonic fifth is 701.955 cents).

- Use the Tuning menu and Octave buttons to transpose pictures. Moving a picture around when a non equal tempered scale is used can



change the harmonic relationships. Using the Tuning menu and Octave buttons avoids this.

- ▶ The scale in the Tutorial 5 folder named ›semi440.scl‹ can be used to tune pictures synthesized with Wavetable or FM Synth sounds to A440. MetaSynth's default tuning is A441. This *does not* apply when samples or Instruments are used as the synthesis source.
- ◆ Try the other displacement maps in the ›05.presets‹ file.
Remember that the preset below the displacement map is a guide to how the map works.
Try maps #3-6 and #3-7 using horizontal instead of vertical displacement.
Try displacement with custom and microtonal scales.

Summary

In this tutorial you learned how to:

- ◆ Use the same file for presets and displacement maps (Step 1).
- ◆ Use the FM Synth as a synthesis source (Step 1).
- ◆ Displace lines into separate notes by turning ›Smooth before displace‹ off (Step 2).
- ◆ Make your own displacement maps (Step 3).
- ◆ Add vibrato and glissando effects using displacement with ›Smooth before displace‹ turned on (Step 4).
- ◆ Use displacement to enhance melodies (Step 5).
- ◆ Add blending and stereo echo to parts of a melody (Step 6).
- ◆ Expand a melody into block chords using custom scales (Step 7).
- ◆ Create custom scales (More Things to Try).

What's in the ›Tutorial 5‹ Folder

Name of File	Description
05.presets	All presets and displacements
05.filters	Shades of gray filters
7-1.fm	FM Synth preset for synthesizing pictures
bopmaj.scl	Bebop major custom scale map
bopmin.scl	Bebop minor custom scale map
bopdom.scl	Bebop dominant custom scale map
pentaCycle2x.scl	10 note/octave pentatonic custom scale map
semi440.scl	A440 tuning for waves and FM synth



Tutorial 6: Sound Painting 101

This tutorial features MetaSynth's brushes. There are two types of brushes in the MetaSynth palette: brushes for creating pixels and brushes for editing them (which may create new pixels in the process). We'll use both as well as some other editing techniques.

1 Load the presets.

- ❖ Load the preset bank named ›06.presets.<
- ❖ Load the filter bank named ›06.presets.<
- ❖ Double-click on the Displace button to open the Displacement Map window. Then use its Disk menu to load the DisplaceMap preset bank named ›06.presets.<






- ▶ The same file, ›06.presets,< is used for the presets, filters and displacement maps. This is often a convenient way to work when you're creating a sound. For one thing, everything you use is in one file. For another, you can create, store, recall and edit all three types of pictures without having to load different disk files. Here are three handy things to remember:
 - ➔ Hold  while selecting a preset to delete it.
 - ➔ Hold  while clicking the Add Preset button to replace the last selected preset.
 - ➔ Locate the last selected preset by looking for the preset with the red border.
- ▶ With these three tricks, you can store pictures in any preset location you wish—you're not limited to the default, consecutive order.

In the preset bank for this tutorial, the displacement maps are in the bottom row (#7) and the filters are in the next row up (#6).

2 Paint the basic pattern.

- ❖ Select the Paint brush from the Brush Select menu.

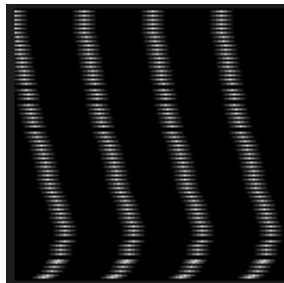


- Remember you can  +Click in the Image Area to pop the brush palette or type +letter to select the brush by letter.

- ❖ Set the brush size to 12 over 1.
- ❖ Set the brush color to maximum yellow.
- ❖ Set the Grid Size to 32.
- ❖ Click the Brush Mode button until it is in Repeat mode.
- ❖ Set the Image Area size to 128 wide (x) by 128 high (y).
- ❖ Double-click the Duration button and set the Samples per pixel to 344 (roughly one second).
- ❖ Choose the Micro16 scale.
- ❖ Set the Mono/Stereo toggle to stereo.
- ❖ Set the Color mode to Rg (red and green).
- ❖ Start in the top-left corner of the picture and paint a sharply sloping diagonal line with some wiggles which reaches the bottom at about a quarter of the Image Area width.



The picture should look something like this.



This has been saved as preset #1.


- Notice that the Paint brush creates horizontal lines that fade in and out rather than solid lines like the Pen brush. The lines will also blur vertically when the vertical brush size is bigger than 1.

3 Displace the red and green components in opposite directions.

- ❖ Double-click on the Displacement button to open the Displace Map window and choose displacement map #7-1.


This displacement map consists of narrow horizontal lines—it will move pixels right or left by row.

Ensure the ›Smooth before displace‹ check box is unchecked then click the green check mark to close the window.

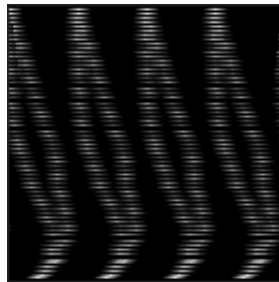
- ❖ Change the Color Mode to red-only.
- ❖ Hold  and click and drag to the left on the Displacement button.

Red bars will emerge making a kind of bubble to the left and right of the yellow bars and leaving behind green bars where the original yellow was.

This was saved as preset #2.

- ❖ Change the Color Mode to green-only.
- ❖ Hold down  and click and drag to the right on the Displacement button until the resulting green bars line up with the red bars you just created.

This was saved as preset #3 and should look like this:



Note that the picture has been brightened for display purposes—the lines created with the Paint brush are actually much less intense and we will use this feature next.

- ❖ Synthesize the picture to hear the stereo effect.



4 Lengthen some of the upper-middle lines.

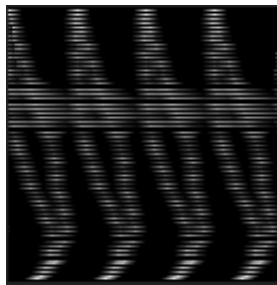
- ❖ Select the Decay brush.

Use this brush to stretch lines of pixels to the right (i.e. to add decay).



- ❖ Set the brush size to 32 over 32.
- ❖ Click just above the middle of the left side of the picture and drag a little to the right until the lines extend just into the next region.

This has been saved as preset #4 and should look something like this:

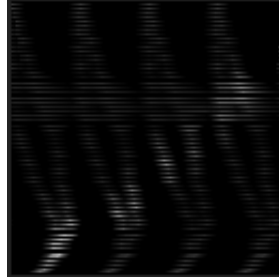


5 Create a bright swatch.

- ❖ Select the Filter brush.
- ❖ Set the brush size to 8 over 32.
- ❖ Turn Repeat mode off—this is called ›Dot‹ mode.
- ❖ Ensure that the maximum white brush color is selected.
- ❖ Start at the bottom-left corner and slowly drag to the upper-right corner. Wiggle a little as you go to leave brighter pixels behind.



This has been saved as preset #5 and should look like this:

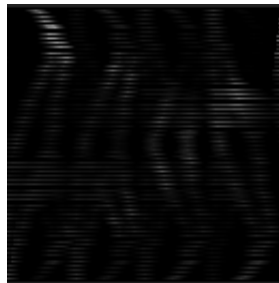


- ❖ Synthesize the picture.

6 Fade in an upside-down copy.

- ❖ Type **⌘C** to copy the picture to the clipboard.
- ❖ Select ›Invert Pitch‹ from the Pitch Process menu.
- ❖ Type **⌘V** to insert the clipboard as a selection.
- ❖ Select the ›Fade In‹ Transfer Mode.






This has been saved as preset #6 and should look like this.



- ❖ Synthesize the picture.

7 Extend and Repeat the picture at increasing speeds.

- ❖ Type **⌘C** to copy the picture to the clipboard.


- ❖ Change the Image Area width (x) to 1024.
This is eight times as wide and therefore eight times as long as the original (about eight seconds).
- ❖ Set the Snap Grid to 16 and set the Grid Size to 128.
- ❖ Choose the Selection tool.
- ❖ Hold  and select a region starting at the right edge of the original picture and slightly less wide than the original. Because of the Snap Grid, this will probably be 112 or 96 pixels wide.
- ❖ Type  to paste the clipboard into the selection area.
Because the selected area is narrower than the original, the picture will be scaled to fit. This section of the picture will therefore play a little faster.
- ❖ Repeat this process with slightly narrower regions each time to about the middle of the Image Area.
If the last copy is larger than sixteen pixels wide (the narrowest region you can select) then do it one more time to get a sixteen pixel wide copy.
- ❖ Set the Grid Size to 16.
- ❖ With the last copy still selected, hold  and  and press .
- ❖ Repeat this until the third quarter of the Image Area is filled.
- ❖ Change both the Snap Grid and Grid Size to 8.
- ❖ Create an eight pixel wide version of the original picture and copy it to fill the rest of the Image Area.
This has been saved as preset #7 and should look like this:



- ❖ Synthesize the picture.



8 Fade out and reverb the end of the picture.

- ❖ Select roughly the last eighth of the Image Area.
- ❖ Choose filter #6-1 to fade out the end of the picture.
This has been saved as preset #2-1.
- ❖ With this region still selected, set the Grid Size to 16 and click the Reverb Hot Filter button.
- ❖ Select roughly the last sixteenth of the Image Area, set the Grid Size to 32 and click the Reverb Hot Filter button again.
This has been saved as preset #2-2.
- ❖ Click the Tuning button and change the tuning from A3 to A#2.
This has been saved as preset #2-3.
- ❖ Synthesize the picture.
- ❖ Type  to copy the synthesized sample to the Sample Editor's clipboard.



9 Use a different scale to get a more ›tonal‹ version.

- ❖ Choose ›Custom Scale...‹ from the Scale Map menu.
When the Custom Scale window opens, click the disk load icon and load the scale in the Tutorial 6 folder named ›dimNat16.‹
This scale breaks the octave into sixteen steps but there are actually only four notes. These notes are close to a minor third apart but use natural harmonic ratios from the cycle of fifths. You can have a look at the scale by loading the file into any text editor. The two similarly named scale files show this scale displayed in cents rather than ratios and the scale using the equal tempered equivalent notes.

- You can use scales like this to add some degree of tonality to almost any picture and since you can create these scales in a text editor, they're easy to make:

- ➔ Choose a simple chord—three or four notes works well.
- ➔ Convert the scale degrees in the chord to cents: the root is 0 cents, a minor second is 100 cents, etc.
- ➔ Enter the notes of the chord in the scale list in any order you like.
- ➔ Copy the lines that make up the chord and paste them back in as many times as you need to create the size scale you want.

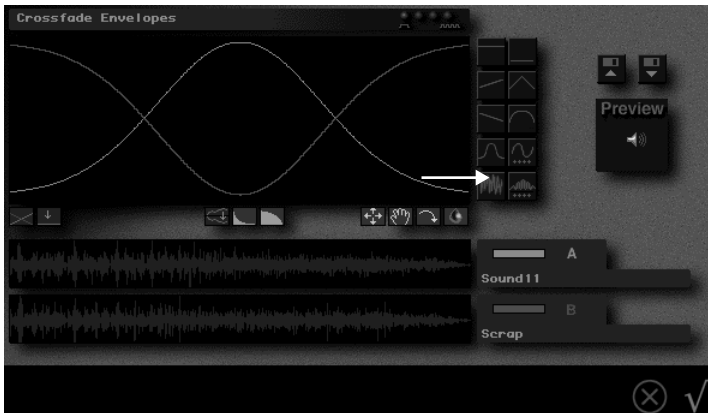
The reason for this last step is to decrease the pitch range of the Image Area. Scales with few notes result in many octaves in the image area—scales with many notes result in few octaves.

- ❖ Use the Tuning button to set the tuning to A1.
- This has been saved as preset #2-4.
- ❖ Synthesize the picture.



10 Merge the two synthesized versions.

- ❖ Choose ›Merge...‹ from the Sample Editor's Edit menu.



Use the Crossfade Envelopes window to create a mix of the sample on the Sample Editor's clipboard with the current sample. The green line represents the current sample's level and the red line indicates the clipboard sample's level.

You use the wave shaping tools along the right to shape the crossfade. You can also click and drag directly on the curves.

Several of MetaSynth's processes are controlled by windows like this and we'll look at them in more detail in later sections. For now, click on the humped-red-line icon (indicated by the white arrow) and drag to the right until the envelope looks like the illustration.

Click the green check mark to crossfade the samples together and listen to the result.

11 Bend the tail down.

- ❖ Choose >Pitch Envelope< from the Sample Editor's Transform menu.







The Pitch Envelopes window is used to change the pitch of the sample in the Sample Editor. The numerical in the top center determines the maximum pitch change—i.e. the envelope amount.

- ❖ Click and drag on the top-right icon (straight line) until you get a solid red line in the middle of the envelope area. This corresponds to no pitch bending.
- ❖ Grab the end of the red line and drag down a little until the shape resembles the illustration.
- ❖ Click the green check mark to apply the pitch envelope to the sample.


More Things to Try

◆ Other paint brushes.

- ❑ Recall preset #3-1 to set up the workspace. The blue grid dots are eight pixels apart. The custom scale is taken from a five-note chord voicing.
- ❑ Select the Spray Can brush; set the brush size to 16 over 16; turn Repeat Mode on and select the bright yellow brush color.
- ❑ Spray a snaking line from the upper-middle left edge to the lower-middle right edge (preset #3-2). Preview the picture.
- ❑ Set the Grid Size to 8 and click the Quantize Hot Filter button (preset #3-3). Preview the picture.
- ❑ Set the Grid Size to 8; select the red-only color channel; hold  and press .
- ❑ Select the green-only channel; hold  and press  (preset #3-4). Preview the picture.
- ❑ Select the Harmonics brush; set the brush size to 8 over 2; set the Grid Size to 64 and click in the first blue grid column about four dots up (preset #3-5). Preview the picture.
- ❑ Set the brush size to 4 over 1; set the Grid Size to 32; select a greenish-yellow brush color and click in the third blue grid column about six dots up from the bottom (preset #3-6). Preview the picture.
- ❑ Set the Grid Size to 24; select an orange brush color and click in the second blue grid column about seven dots up from the bottom (preset #3-7). Synthesize the picture.



Cd track 18 was built entirely from repeats and transposes of this picture.

 **18**—Painted Blues

◆ Painting notes over harmonic gridlines.

- ❑ Recall preset #4-1. This set of gridlines are in eight pixel columns and the rows are filtered to a seven-note scale.

When you recall this preset, MetaSynth will ask you to find the Instrument used. Select the Instrument named ›Bosen‹ in the Tutorial 6 folder. This is one of the piano instruments provided on your MetaSynth CD-ROM.

- ❑ Select the Note brush; set the brush size to 32 over 1; set the Grid Size to 128; set the brush color to red and click at the left edge of the Image Area in one of the lower blue rows (preset #4-2).

Use a high zoom and be sure the notes are entered on one of the blue rows and not in between. One way to tell is that the notes will be pink (blue mixed with red) instead of pure red.

If you accidentally click in between two rows, type **↵** and do it again.

- ❑ Change the brush size to 16 over 1; change the Grid Size to 112; change the color to green and again click on the left edge but this time in a little higher blue row (preset #4-3).
- ❑ Change the brush size to 8; change the Grid Size to 32 and click three more rows of notes a little bit higher. Make these notes adjacent in time and different in color—i.e. click once in the first column with red, once in the second column with green and once in the third column with yellow (preset #4-4).
- ❑ Choose the Spray Can brush; set the brush size to 32 over 16 and draw an undulating line all the way across the middle section of the picture (preset #4-5).
- ❑ Choose the Selection tool and select sections (roughly fourths) of the sprayed line being sure not to select any of the individual notes below it. Each time you select a



section, change the Grid Size then click the Pulse Hot Filter button. Grid sizes between 24 and 48 make good choices (preset #4-6).

- ❑ Set the Grid Size to 4; select all the sprayed notes (but none of the Note-brush notes) and click the Quantize Hot Filter button (preset #4-7).
- ❑ Type **⌘** to deselect everything; choose the red-only channel and type **F**. When the Filter to Scale window comes up enter the scale: C C D D E E G G G# A A B. Then click the green check mark to close the window. (This is the seven-note scale.)
- ❑ Select all the sprayed notes (but none of the Note-brush notes); choose the green-only channel and press **⌘** twice.
- ❑ Type **⌘** to deselect everything and type **F** to filter the green-only channel to the scale (preset #5-1).
- ❑ Synthesize the picture.
- ❑ To create variations on this picture, use displacement map #7-2 with small vertical displacement amounts. (Remember the displacement maps and the presets are in the same preset bank for this tutorial.)
You might want to type **F** to filter each displacement to the scale.

Cd track 19 was built from variations on this picture (presets #5-2 thru #5-6).



Summary

In this tutorial you learned how to:

- ◆ Use the same file for presets, filters and displacement maps (Step 1).
- ◆ Store pictures in any preset location (Step 1).
- ◆ Use the Paint brush to paint repeating patterns (Step 2).
- ◆ Use a displacement map to distort a picture horizontally (Step 3).

- ◆ Use the Decay brush to add decay by lengthening pixel lines (Step 4).
- ◆ Use the Filter brush to highlight areas for emphasis (Step 5).
- ◆ Fade in a pitch inverted copy with the original (Step 6).
- ◆ Extend a picture by repeating shorter and shorter copies of the original (Step 7).
- ◆ Create a faded and reverbed tail on a picture (Step 8).
- ◆ Use chord-derived scales to force tonality onto an abstract picture (Step 9).
- ◆ Create and use merge envelopes to merge two samples (Step 10).
- ◆ Create and use a pitch bend envelope (Step 11).
- ◆ Use the Spray Can and Harmonics brush together with a chord-derived scale to paint tonal abstracts (More Things to Try).
- ◆ Use harmonic gridlines and harmonic filters to create abstract tonal pictures (More Things to Try).

What’s in the ›Tutorial 6‹ Folder

Name of File	Description
06.presets	All presets, filters and displacements
dimNat16.scl	A sixteen-note scale using notes from the cycle of fifths that are close to a diminished seventh chord.
dimNat16¢.scl	The same scale with the numbers in cents
dim16¢.scl	An equal tempered version of the same scale.
Fourths.scl	Twenty-note scale derived from equal tempered stacked fourths
FourthsH.scl	Twenty-note scale derived from harmonic stacked fourths
PhryChord.scl	Sixteen-note scale based on a Phrygian mode scale
SemiCents.scl	The semitone scale in ›cents‹ text format

Name of File	Description
SoWhat.scl	Twenty-note scale based on the »So What« chord (P4 P4 P4 M3)—equal tempered version
SoWhatH.scl	Harmonic version of SoWhat scale
Bosen	Instrument file used in last More Things to Try section
Bosen A0f, etc.	Samples used in Bosen Instrument

Tutorial 7: Resynthesis

In Tutorial 3, we analyzed a drum loop to extract its ›groove.< In this tutorial we'll use MetaSynth's Analyze function to resynthesize a sample. In the process we'll explore some ›graphic DSP< possibilities.

1 Setting up the workspace.

- ❖ Load the preset bank named ›07.presets.<
- ❖ Load the filter bank named ›07.presets.<

As in Tutorial 6, the presets and filters are in the same file. The filters are in the last two rows.

2 Analyze the sample.

- ❖ Recall preset #1.

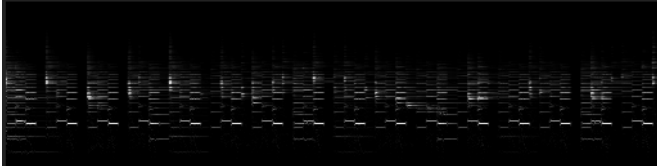
When you recall this preset, MetaSynth may ask you to find the Instrument. Select the Instrument named ›Bosen< in the Tutorial 7 folder.

If there's an Instrument already in memory, MetaSynth may assume it's the correct one and not ask. In this case, choose ›Open Instrument...< from the Instrument menu and open the Bosen Instrument manually.

This is the same preset and Instrument used in Tutorial 6.



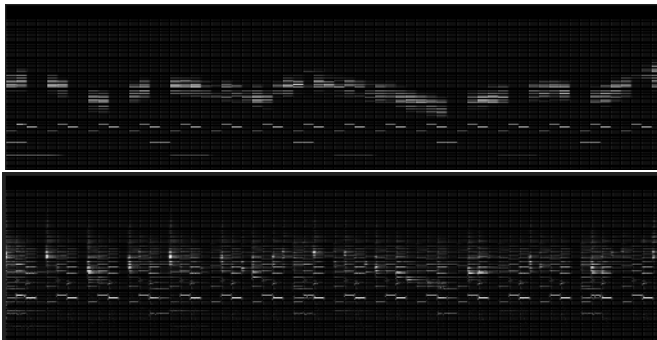
- ❖ Synthesize the picture.
- ❖ Select the blue-only channel.
- ❖ Type **⌘C** to copy the blue grid to the clipboard.
- ❖ Select the red and green channel.
- ❖ Type **⌘A** or select ›Analyze current sound ... n< from the Disk menu to analyze the sample you just synthesized.



This has been saved as preset #2.

- ❖ Select the blue-only channel.
- ❖ Type **E** to add the blue grid to the analyzed sample.

Since we started with a sound we synthesized, we can compare the original with the analysis. (See illustration below.)



The original picture from which the sample was synthesized is on top. The analyzed picture is on the bottom.

This has been saved as preset #3.

3 Resynthesize.

- »Resynthesis« simply means analyzing a sample then synthesizing the resulting picture to reproduce the original. There are several reasons you might want to do this:
 - ➔ To subject the sample to some pictorial modifications (i.e. »graphic DSP«).
 - ➔ To change the tempo of the sample.
 - ➔ To extract rhythmic information (see »Tutorial 3: Filters and Grooves« on page 38.)

- ➔ To create something related but entirely different.
- ➔ To do ›formant filtering.‹



- ❖ Synthesize the picture.

The first thing you'll probably notice is that the resynthesis is a lot more ›brittle‹ than the original. The reason for this is that the piano Instrument is still selected as the synthesis source.

- When MetaSynth analyzes a sample, it breaks it down into its frequency components—it analyzes its full harmonic spectrum. The piano samples used as the source have their own harmonic content which is already reflected in the analyzed picture. To get the best reproduction of the original, use a sinewave wave form for resynthesis.

- ❖ Change the synthesis source to the wave form editor. This should already contain a sine wave by default, but if you have changed it to some other wave form, change it back.



- ❖ Synthesize the picture again.

This should sound much closer to the original. One thing you'll probably hear is that the attacks are a bit mushy. This is an artifact of the analysis process which becomes most obvious with percussion sounds. There is a partial cure:

- ❖ Click the Attacks Hot Filter button and synthesize the picture again.

The Attacks Hot Filter intensifies the first pixel in any pixel line making the attacks brighter.

4 Try more frequency bands.

In step 2, we analyzed the sample with the Image Area's pitch resolution set to semitones—i.e. the Semitone scale map was used. The tuning was also set to D#2 because that was (for some inscrutable reason) the tuning of the original picture. When semitones are used the tuning re-

ally doesn't make any difference but for analysis, it does affect the range. We'll see below that this makes a difference when we want to use the analysis for formant filtering.

- ❖ Change the Scale Map to Whole Tones, then analyze and resynthesize the sound. This is preset #4. Presets #5 through #7 are analyses using the Quarter-tones, Micro8 and Micro50 scales. Notice that the pictures contain a lot more information, but when resynthesized they're not necessarily better.

Using scales with more closely spaced notes will usually produce more realistic analyses of non-tonal material like speech and percussion sounds. For tonal material, semitones is often a good choice.

5 Mess with the picture.

- ❖ Recall preset #2 (the original analysis).
- ❖ Type **⌘R** to reverse the sample picture in time.
- ❖ Select filter #6-1.
- ❖ Type **⌘C** to copy the picture to the clipboard.
- ❖ Recall preset #2 again.
- ❖ Type **⌘V** to insert the clipboard as a selection.
- ❖ Select the ›Fade In‹ Transfer Mode.
This has been saved as preset #2-1.
- ❖ Synthesize the picture.
- ❖ Select ›Trace Edges H‹ from the Time Processes menu and synthesize the picture again.
This has been saved as preset #2-2.
- ❖ Set the Grid Size to 32.
- ❖ Click the Saw Hot Filters button.
- ❖ Click the Echo Hot Filters button.
This has been saved as preset #2-3.
- ❖ Synthesize the picture.



When you load a sample into the Sample Editor, MetaSynth places its name at the bottom of the Sounds menu. This makes it easy to recall a sound you're working with.

If you won't be using the Sample Editor's clipboard for anything else, you can just copy the sample to the clipboard and paste it back when you need it.

6 Create some formant filters.

- ❖ Recall preset #1 and synthesize it.
This has been saved as a Sound Designer Interleaved Stereo file named ›Sound1.LR‹
- ❖ Open it again by clicking the Sample Editor's Open button.
- ❖ Change the tuning to A1.
- ❖ Set the Scale Map to Semitones.
- ❖ Analyze the sample again.
If you synthesize this the results will be the same as in step 2 but the picture is different—it is higher in the Image Area.
This has been saved as preset #7-1 (the first preset in the bottom row).

► MetaSynth's filter window is ›tuned‹ to A1 and its resolution is semitones. When you want to use an analyzed sample as a filter, always analyze it with these settings in the Image Synth.

- ❖ Apply filter #6-2 and preview the result.
This has been saved as preset (and filter) #7-2.
- ❖ Repeat this for filters #6-3 through #6-5.
Remember to recall preset #7-1 each time.
These have been saved as presets #7-3 through #7-5.

7 Filter some samples.

- ❖ Open MetaSynth's Filter window by selecting ›Filter‹ from the Windows menu or holding [⌘] and typing [F].
- ❖ Select ›Narrow Noise‹ from the Sample Editor's Sounds menu.
- ❖ Recall filter #7-1 from the Filter window's filter bank.
- ❖ Analyze the narrow noise sample by clicking the ›Analyze current sample‹ button or typing [N]. This works exactly the way it does in the Image Synth.



❖ Toggle the sample from stereo to mono.



► The Filter window is mono—it applies the same filtering to both sides of a stereo sample and filter images are always shown in light blue.

❖ Apply the filter to the sample by clicking the Apply Filter button.



► Although there is a preview button in the Filter window, it only previews the sound in the Sample editor—it doesn't preview the effect of the filter. To hear what the filter does, you have to actually apply it to the sample. This takes a while because a lot of calculation is involved.

► Notice that the filtered noise has a vocoder like sound to it. All formant filtering and convolution processes (of which vocoding is one example) have a similar quality—the timbral characteristics of the filter are transferred to the sample.

❖ In the Filter window, recall filter #7-2.

❖ In the Sample Editor recall the sample you saved to your hard drive (the original sample that was analyzed).

❖ Apply the filter to the sample.

❖ Repeat these three steps using filter #6-2.

Cd track 20 compares these two filtering processes with the result of synthesizing preset #7-2. First is the synthesis, next is the original sample filtered with filter #6-2 and last is the original sample filtered with filter #7-2. As you can hear they are the same, only different.

© 20—Synth Filter Filter

More Things to Try

◆ Resynthesize Instrument samples.

- ❑ Load the sample ›Bosen C2f.<
- ❑ Set the Image Synth's Scale Map to Micro8.
- ❑ Set the Image Area height (y) to 512.
- ❑ Double-click the Duration button and click ›Fit duration to current sample.<



- ❑ Type **W** to analyze the piano sample.
 - ❑ Press **⌘** to delete the column of start-up hash at the left (preset #2-4).
 - ❑ Change the Image Area width (x) to 1024.
 - ❑ Set the Grid Size to 256 and set the Snap Grid to 32.
 - ❑ Select all but the first 32 pixels of the Image Area. (Hold **⌘** and the Snap Grid will help.)
 - ❑ Hold **⌘** and press **⌘**. You will now have a gap of 256 pixels in the picture.
 - ❑ Change the Snap Grid to 4 and select the gap with a little overlap on each end.
 - ❑ Click the Interpolate button.

Interpolation fills in the horizontal area between pixels on the same row, fading as necessary to match both ends. In this case it has extended the sustain part of the piano note.
 - ❑ Select the left three quarter of the Image Area—in other words: all of the piano sound.
 - ❑ Apply filter #6-6. This picture has been saved as preset #2-6.
 - ❑ Type **C** to copy it to the clipboard.
 - ❑ Apply filter #6-4.
 - ❑ Type **I** to insert the clipboard as a selection.
 - ❑ Select the ›Fade Out‹ transfer mode (preset #2-7).
 - ❑ Synthesize the picture.
- You can create whole new Instruments by applying similar graphic DSP processing to the samples used in an Instrument.
- ◆ Resynthesize speech and other ›found‹ sounds.
- ❑ Load the speech sample named ›MetaVox.‹
 - ❑ Set the image width to 512; open the Duration window and click ›Fit duration to current sample.‹
 - ❑ Set both the image width and height to 1024 and select the Micro16 scale map.

- ❑ Type **[N]** to analyze the sample (preset #3-1).
- ❑ Select the Micro8 scale map and type **[N]** to analyze the sample again.
- ❑ Change the scale map to Micro16 and choose ›Expand 2‹ from the Pitch Process menu.
- ❑ Set the Grid Size to 144; hold **[⌘]** and press the **[⇨]** (preset #3-2).
- ❑ Select the quartertone scale map and type **[N]** to analyze the sample again.
- ❑ Change the scale map to Micro16 and choose ›Expand 4‹ from the Pitch Process menu.
- ❑ Hold **[⌘]** and press **[⇨]** twice.
- ❑ Press the Echo Hot Filter button (preset #3-3).
- ❑ Type **[C]** to copy the picture to the clipboard.
- ❑ Recall preset #3-2 and type **[M]** to merge the clipboard with it.
- ❑ Type **[C]** to copy the picture to the clipboard.
- ❑ Recall preset #3-1 and type **[M]** to merge the clipboard with it (preset #3-4).
- ❑ Synthesize the picture.

► Speech and sound effects make excellent targets for resynthesis.

Summary

In this tutorial you learned how to:

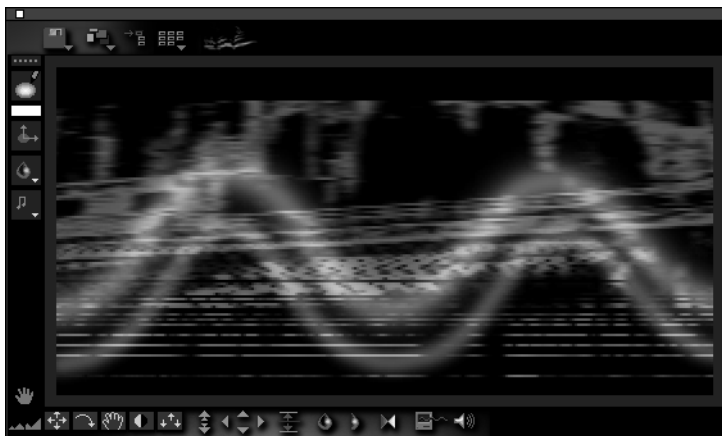
- ◆ Analyze a sample converting it to an Image Synth picture (Step 1).
- ◆ Resynthesize a sound from an analyzed picture (Step 2).
- ◆ Refine the analysis by adding more frequency bands (Step 3).
- ◆ Apply ›graphic DSP‹ to a sample by processing an analyzed picture (Step 4).
- ◆ Use analyzed pictures as formant filters in the Filter window (Steps 6 and 7).

What’s in the ›Tutorial 7‹ Folder

Name of File	Description
07.presets	All presets and displacements
TheScale.scl	The scale used to filter the original picture
Bosen	The Instrument used to synthesize the original picture
Bosen A0f, etc.	The samples used in the Instrument
MetaVox	Sample used in second ›More Things to Try‹
Sound1.LR	Synthesis of preset #1 in SD II stereo

2 The Filter Window

MetaSynth's Filter window is similar in appearance to the Image Synth window—it has an Image Area surrounded by buttons and menus. The Image Area is where you paint or import pictures to act as filters—what gets filtered is the sample in the Sample Editor. If only part of the sample is selected, only that part gets filtered.



The illustration above shows the Filter window. Notice that most of the menus along the top are gone—only the Filter bank and the Edit and Disk menus remain together with an icon that looks kind of like flames. Also there are no Hot Filters and no Snap Grid or Grid Size settings. Here are some things this tells you about the Filter window:

- ◆ It is always the same size: 256 pixels wide by 128 pixels high. The filter is scaled to fit the sample being filtered.
- ◆ It always has the same tuning: A1 (roughly 22 to 42,000 Hz). The Scale Map is always Semitones.

- ◆ All filters are mono—both sides of a stereo sample are filtered the same way.
- ◆ The Snap Grid from the Image Synth applies to the Filter window, too. The Grid Size is always fixed at 16.
- ▶ If you need some of the missing editing tools, simply copy the filter to the clipboard then paste it into the Image Synth where you can edit it and either copy it back or add it to the filter bank.

The buttons and menus that do remain function exactly as they do in the Image Synth, so you already know quite a lot about the Filter window. Here are a couple of new things:

- ◆ The flame-icon button performs a spectral analysis on the sample (or selected portion) in the Sample Editor. This is similar to the analysis you would get in the Image Synth if the Image Area had the same size and tuning and was in mono.
- ◆ Even though there is a Preview button, you can not preview the effect of a filter—you must actually apply the filter by clicking the button with the Computer icon. The preview button just plays the sample or selection in the Sample Editor.
- ◆ The Filter window and Image Synth interactively share the filter bank—any additions, deletions or changes made in one are reflected in the other and automatically saved to your hard drive.

You can think of the Filter window as a 128-band filter with semitone band spacing which is capable of 256 different but equally spaced settings over the duration of the sample—each pixel column in the filter picture is one of these settings.

Filtering pictures in the Image Synth and filtering samples in the Filter window can produce very different results. If, for example, you use a single line as a filter in the Filter window the result will be a narrow band of frequencies as in analog filtering. If you use a single line as a filter in the Image Synth,

all other pixels will be completely eliminated. In this sense filters in the Image Synth are more ›severe.‹

One of the recurring themes in Chapter 1 was that high-density pictures don't usually synthesize well. In the Filter window, it's almost the opposite—high density pictures can produce very interesting results. Another way of saying this is: picture synthesis is additive—filtering is subtractive.

Tutorial 8: Sound Sculpture

In Tutorial 4, we explored various filtering techniques in the Image Synth. In this tutorial we will explore these filters again in the context of the Filter window. The difference is that they now apply to samples, not pictures.

1 Set up the Sample Editor and Filter window.

- ❖ Load the filter bank named ›08.filters.<
This is the same filter bank that was used in Tutorial 4, except for the last row.
- ❖ In the Sample Editor, load the sample named ›construction.<
- ❖ Type **[N]** to analyze its spectrum. This is the same as in the Image Synth and also the same as clicking the flame-icon button.

This sample is generated from filter #7-1 in the filter bank. The picture is inset at the lower right of the illustration.



The orange lines are the result of clicking the ›Analyze current sample‹ button (the one with the flame-icon). They represent the frequency spectrum of the sample.

- ❖ Recall filter #7-1 from the filter bank.
Notice how closely the bluish image of the filter fits the orange image of the spectrum.

2 Apply a static filter.

- ❖ Open the Filters menu and look at the first row of filters.




These are pictorial versions of typical synthesizer filters. From left to right they are: low pass, high pass, band pass, notch and narrow, medium and wide tooth comb filters.

- ❖ Recall each of the filters in the top row and apply it to the sample by clicking the ›Apply Filters‹ button.

Notice where the picture of the filter lies in relation to the analyzed spectrum of the sample and how that relates to the resulting sound. You will quickly get a feeling how these filters work.

- ❖ After listening to the filtered sample, go to the Image Synth, recall preset #7-1.
- ❖ Apply the same filter to the picture; synthesize it and listen to the difference.

Type  to switch back and forth between the two samples. Remember to recall the original sample from the Sounds menu before applying each filter.

- Applying a filter to a picture has much more drastic results than applying it to the sample. If you are starting with a picture, it's usually better to filter the picture. If you're starting with a sample, it's usually

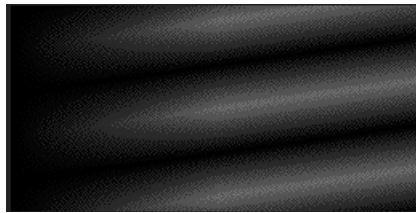


better to filter the sample rather than analyzing, filtering and resynthesizing. If you're going to resynthesize a sample for some other reason, it's usually better to apply the filter to the picture of the analyzed sound.

- ▶ You may want to try this same comparison with some of the other filters in the bank.

21—Filtered Chord

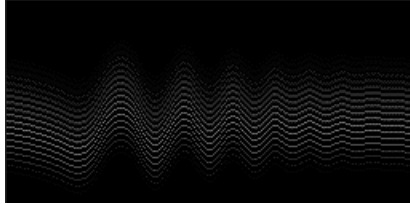
3 Sweep filter a vocal sample.



- ❖ Load the sample named ›vocal D-chord‹ into the Sample Editor.
- ❖ Type **[N]** to analyze its spectrum.
- ❖ In the Filter window, recall filter #3-2.
- ❖ Type **[C]** to copy it to the clipboard.
- ❖ Type **[E]** to add it to itself (doubling its intensity).
- ❖ Type **[C]** to copy it to the clipboard.
- ❖ Recall filter #4-5.
- ❖ Type **[*]** to multiply it by the clipboard.
This has been saved as filter #7-2. It is a faded-in version of filter #4-5.
- ❖ Filter the sample.



4 Wah-filter a guitar sample.

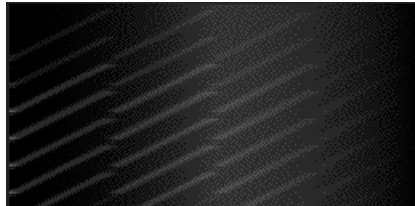


- ❖ Load the sample named ›guitar G2.<
- ❖ Type **[W]** to analyze its spectrum.
- ❖ Recall filter #2-2.
- ❖ Press **[F]** to lower the filter an octave. Notice how it better matches the samples spectrum.
- ❖ Type **[H]** to add harmonics bands to the filter.
This has been saved as filter #7-3.
- ❖ Filter the sample.

 **22**—Filtered Guitar










5 Blunt and twang a piano sample.



- ❖ Load the sample named ›Bosen C2f.<
- ❖ Type **[W]** to analyze its spectrum.
- ❖ Recall filter #4-7.
- ❖ Choose any brush (not the Selection tool).
- ❖ Hold **[B]** and click somewhere in the darker regions between the horizontal lines.



 **23**—Filtered Piano

- ▶ Holding  turns the cursor into an Eyedropper to pick up colors from the Image Area. The captured color is transferred to the Brush Color. (This doesn't work with the Selection tool.)

- ❖ Press  to clear the picture.
- ❖ Type  to invert the Image Area to white.
- ❖ Type  to select everything.
- ❖ Click on the Brush Color button.
- ❖ Type  to deselect everything.
- ❖ Type  to copy this gray wash to the clipboard.
- ❖ Recall filter #4-7 again.
- ❖ Type  to subtract the clipboard (gray wash) from it.
- ❖ Click the Normalize button.

This has been saved as filter #7-4.

- ▶ Subtracting a gray wash from a picture eliminates everything below that intensity. Normalizing then brings the remainder of the filter to maximum intensity.
- ▶ You can accomplish similar effects by double-clicking the Contrast button to open the Remap Colors window then dragging to the right on its Rotation button. This only works in the Image Synth, however.

- ❖ Recall filter #3-3 (fade in and out).
- ❖ Type  to copy it to the clipboard.
- ❖ Recall filter #7-4.
- ❖ Type  to crossfade the clipboard with it.

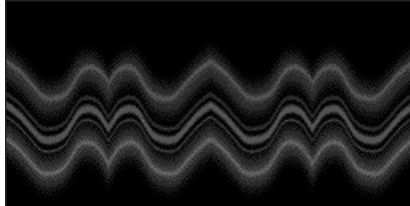
This has been saved as filter #7-5.

- ❖ Filter the sample.



6 Phase a voice sample.

24—Filtered Voice



- ❖ Load the sample named >MetaVox.<
- ❖ Type **W** to analyze its spectrum.
- ❖ Recall filter #5-5 (wiggly lines).
- ❖ Type **C** to copy this filter to the clipboard.
- ❖ Change to the Image Synth.
- ❖ Set its tuning to A1 and set its scale map to semitones.
- ❖ Set the Image Area width (x) to 64. Ensure the height is 128.
- ❖ Type **V** to paste the filter to the Image Area.
- ❖ Change the Image Area width to 128.
- ❖ Type **CRT** (copy/reverse time/add).
- ❖ Change the Image Area width to 256.
- ❖ Type **CRTC** (copy/reverse time/add/copy).
- ❖ Return to the Filter window.
- ❖ Type **V** to paste the new filter to the Image Area.
This has been saved as filter #7-6.
- ❖ Filter the sample.



- All the editing power of the Image Synth is available to the Filter window by copying and pasting pictures back and forth between them. Make sure the Image Synth is tuned to A1 and the semitone scale map.

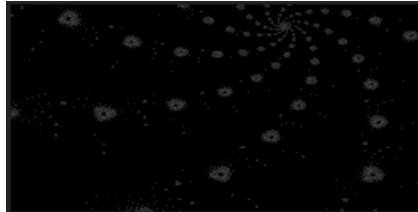
More Things to Try

- ◆ Root and Harmonics Filters.
 - ❑ Load the sample named ›vocal D-chord.<
 - ❑ Type **[N]** to analyze it's spectrum.
 - ❑ Select ›Add Fundamental< from the Pitch Process menu.
 - ❑ Hold **[⇧]** and press **[F]** to lower the fundamental a fifth to D (to match the root of the chord).
 - ❑ Type **[H]** to add harmonics above the fundamental.
 - ❑ Click the Normalize button.
 - ❑ Apply the filter to the sample.
 - ❑ Use **[F]** and **[B]** to move the filter up and down by octaves each time applying the filter to the original sample. Also try rotating the filter slightly using the Rotation button.



© 25—Fractal Chord








- ◆ Fractal Filters.





- ❑ Load the sample named ›vocal D-chord.<
- ❑ Type **[N]** to analyze it's spectrum.
- ❑ Recall filter #6-4.

This is one of several fractal images by Eric Wenger which are available from the U&I Software web site.
- ❑ Apply the filter.

Notice that there's not much effect. This is due to the high intensity of the background—there's not a lot of filtering going on. We'll use the trick from step 5 to get rid of it.

- ❑ Select any brush, then hold  and click in a bright portion of the background area of the filter.
- ❑ Press  to clear the picture.
- ❑ Type   to invert the Image Area to white and select everything.
- ❑ Click on the Brush Color button.
- ❑ Type   to deselect everything and copy the gray wash to the clipboard.
- ❑ Recall filter #6-4 again and type  to subtract the clipboard (gray wash) from it.

This has been saved as filter #6-5. Apply it to the original sample. Notice that most of the action is outside of the spectrum of the sample.
- ❑ Select Invert Pitch from the Pitch Process menu.
- ❑ Type  to reverse the time.

This has been saved as filter #6-6. Apply it to the original sample. Although more interesting, a lot of the filter is still >going to waste.<
- ❑ Select >Contract< from the Pitch Process menu then use  to raise the filter an octave.

This has been saved as filter #6-7. Apply it to the original sample.

Summary

In this tutorial you learned how to:

- ◆ Use the Filter window to analyze a sample (Step 1).
- ◆ Filter a sample in the Sample Editor (Step 2).
- ◆ Combine several filters in the Filter window (Step 3).
- ◆ Exchange pictures between the Image Synth and Filter window for enhanced editing (Step 5).
- ◆ Use harmonic and fractal filters to add interest to sustained samples (More Things to Try).

What's in the ›Tutorial 8‹ Folder

Name of File	Description
08.filters	All filters
construction	Sample used in step 2
vocal D-chord	Sample used in step 3
guitar G2	Sample used in step 4
Bosen C2f	Sample used in step 5
MetaVox	Sample used in step 6

Tutorial 9: Noise Sculpture

Noise can be a great starting point for radical filtering. In this tutorial we'll apply filters to MetaSynth's three built-in noise generators.

1 Load some filters and make some noise.

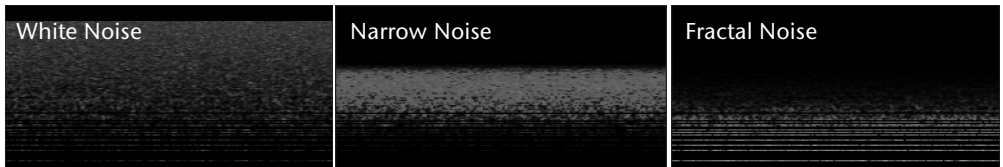
- ❖ Load the filters file named ›09.filters.<
- ❖ Change to the Image Synth.
- ❖ Click the Duration button and set the duration to 1.985 s (as close as you can get to 2 with this method).
- ❖ Synthesize the picture.

It doesn't make any difference what the picture is—in fact, it's fastest if it's empty (all black).

- ❖ Select ›WhiteNoise< from the Sample Editor's Sounds menu.

You will now have an approximately two-second noise sample.

2 Band filter three noises.



- ❖ Return to the Filter window.
- ❖ Type **[W]** to analyze the white noise sample.
- ❖ Select filter #1.
This is a single line at the frequency 441 Hz. A single line is the narrowest band filter you can apply to a sample.
- ❖ Filter the sample.
- ❖ Type **[W]** to analyze the filtered noise.



- ▶ One thing to keep in mind is that, unlike filtering pictures, when you filter a sample, each line produces a band of frequencies with ›roll off.‹ When you filter a picture with a line, everything else is eliminated.
 - ❖ Filter and analyze a couple more times and notice that the sound gets more pitched and the band gets narrower and lies mostly below the line.
 - ❖ Select ›Narrow Noise‹ from the Sample Editor's Sounds menu.
 - ❖ Play the sample and type **W** to analyze it.

Narrow noise is similar to white noise, only narrower—the higher frequencies are missing.
 - ❖ Select ›Fractal Noise‹ from the Sample Editor's Sounds menu.
 - ❖ Play the sample and type **W** to analyze it.


Fractal noise has most of its energy at the lower frequencies.
 - ▶ When you're using noise as a starting point, think in terms of the pitch range of the sound you're reaching for, then choose the appropriate type of noise.
- 3** Use some geometric filters.
- ❖ Select ›WhiteNoise‹ from the Sample Editor's Sounds menu to restore the white noise sample.
 - ❖ Recall filter #2.
 - ❖ Filter the sample.
 - ❖ Select ›Narrow Noise‹ from the Sample Editor's Sounds menu to restore the narrow noise sample.
 - ❖ Recall filter #3.
 - ❖ Filter the sample.
 - ❖ Select ›Fractal Noise‹ from the Sample Editor's Sounds menu to restore the fractal noise sample.
 - ❖ Recall filter #4.



- ❖ Filter the sample.

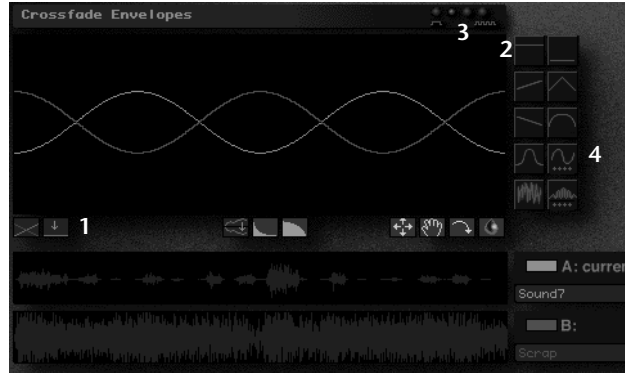
- Geometric and rhythmic patterns generally work well as noise filters. Try some from the presets files named ›AmbiendTextures.presets‹ and ›MetaMath.presets‹ that came on your MetaSynth CD-ROM.

4 Sculpt a noise-melody.

- ❖ Change to the Image Synth.
- ❖ Load the presets file named ›09.filters.‹ This is the same file you're using for the filters in this tutorial.
- ❖ Recall preset #7.
This preset was used in Tutorial 6.
- ❖ Synthesize this preset.
- ❖ Type  to copy the sample to the Sample Editor's clipboard.
- ❖ Change the sample from stereo to mono in the Sample Editor.
This will speed up the filtering process and won't make any difference in the sound since filters are always mono.
- ❖ Select ›WhiteNoise‹ from the Sample Editor's Sounds menu.
- ❖ Return to the Filter window. Select filter #5 here and apply it to the sample.

- You can use band filters to narrow a noise sample to a more useful range.

- ❖ Recall filter #6 and apply it to the sample.
This filter is the melody only from the picture we just synthesized in the Image Synth.
- ❖ Change the Sample Editor back to stereo.
We need a stereo sample because we're going to merge it with the original sample.
- ❖ Select ›Merge...‹ from the Sample Editor's Edit menu.



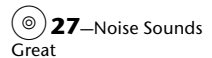
- ❖ Use the ›Flat Line Reset‹ button (#1 in the illustration) to create a crossfade with a red line at the top and a green line at the bottom. (I.e. no crossfade at all.)
 - ❖ Use the ›Line Up‹ button (#2 in the illustration) to move both the red and green lines to the middle of the window. (I.e. equal amounts of both samples.)
 - ❖ Click the Repetition Rate button labeled as #3 in the illustration.
 - ❖ Use the ›Sine Wave‹ button (#4 in the illustration) to create the undulating crossfade shown in the illustration.
 - ❖ Click the green check mark to merge the two samples.
- CD audio track 26 contains the original sample followed by the merged samples followed by the noise-melody by itself.

© 26—Noise Melody

5 Sculpt a whisper.

- ❖ Ensure that both the Sample Editor and Image Synth are toggled to mono.
- ❖ Load the sample named ›Nsg‹ into the Sample Editor.
- ❖ Change to the Image Synth and set the Image Area's size to a width (x) of 256 and a height (y) of 128.

- ❖ Double-click the Durations button and click the ›Fit duration to current sample‹ button.
- ❖ Select the Semitones scale map; set the tuning to A1.
The Image Area's resolution and scale now match the Filter window's.
- ❖ Type **M** to analyze the sample.
This has been saved as filter #2-1. If you resynthesize this picture you'll hear that the words are recognizable but there is a definite pitched quality to it.
- ❖ Return to the Filter window and recall filter #2-1.
- ❖ Select ›WhiteNoise‹ from the Sample Editor's Sounds menu.
- ❖ Filter the sample.
- ❖ Type **⌘C** to copy the sample to the Sample Editor's clipboard.
- ❖ Type **⌘V** to insert the copy after the original.
- ❖ Type **⌘A** to select the whole sample.
- ❖ Choose ›WhiteNoise‹ from the Sample Editor's Sounds menu.
We now have a noise sample twice as long.
- ❖ Recall filter #2-1 again and press **⌘I** to raise the filter an octave.
- ❖ Filter the sample.
CD audio track 27 contains the original, resynthesized and first and second noise-sculpted versions.



More Things to Try

- ◆ Apply geometric and analyzed vocal filters to other sustained samples.
 - In the Image Area, load preset #2-2.
This preset contains four quarter-note chords using one of the block chord scales from Tutorial 5. It also uses a more complex waveform to fatten up the sound.

- ❑ Synthesize the picture.
- ❑ Change to the Filter window and recall filter #2-1 (the vocal filter).
- ❑ Apply the filter to the sample.
- ❑ Type **⌘Z** to reinstate the original sound and try some of the other filters.

Summary

In this tutorial you learned how to:

- ◆ Create noise samples and apply band filters to them (Steps 1 and 2).
- ◆ Filter noise with geometric patterns (Step 3).
- ◆ Sculpt noise into melodies (Step 4).
- ◆ Sculpt noise into whispered speech (Step 5).

What's in the ›Tutorial 9‹ Folder

Name of File	Description
09.filters	Filters
NSG	Vocal sample

Tutorial 10: Rhythm Sculpture

This tutorial is the filter version of Tutorial 3. We'll analyze a percussion loop and make some filters out of it which can then be applied to groove other samples.

1 Load filters and groove sample.

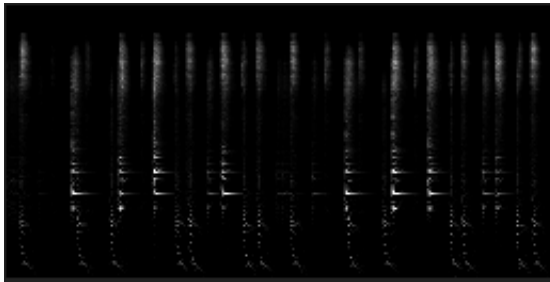
- ❖ In the Filter window, load the filters file named ›10.filters.<
- ❖ In the Image Synth load the presets file named ›10.filters.<

As before, the same bank is used for both the presets and filters.

- ❖ Load the sample named ›groove< into the Sample Editor.

2 Create some rhythm filters from the groove.

- ❖ Change to the Image Synth and recall preset #1.










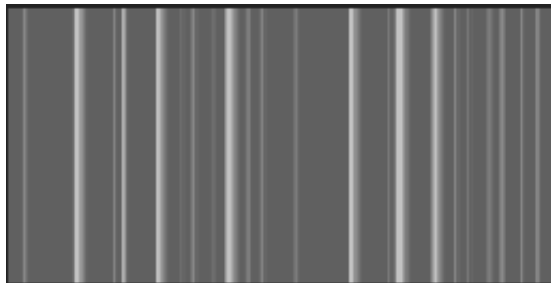
This is an analysis of the groove sample with the Image Synth window's tuning, size and scale map set to match the Filter window.

- ❖ Click the Max Hot Filter button.



This has been saved as filter #2.

- ❖ Press  to clear the Image Area.
- ❖ Type  to invert to white.
- ❖ Type  to select the whole Image Area.
- ❖ Select the darkest shade of gray.
- ❖ Type  to deselect everything.
- ❖ Type  to copy this gray wash to the clipboard.
- ❖ Recall filter #2 (the max bars).
- ❖ Type  to max the clipboard with the picture.
- ❖ Press  and drag slightly left on the Contrast button to reduce the contrast.



This has been saved as filter #3.

3 Filter some noise.

- ❖ Choose ›WhiteNoise‹ from the Sample Editor's Sounds menu.

The ›groove‹ sample should still be in the Sample Editor to guide the length of the noise sample. If it is not, reload it.

- ❖ Change to the Filter window.
- ❖ Recall filter #1.
- ❖ Filter the sample.



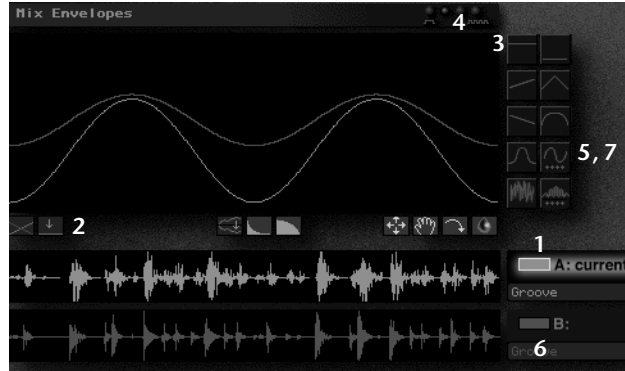
- ▶ Using the analysis on a white noise sample often gives a pretty good rendering of the groove. You may want to use other filters to color the noise before applying the groove.

- ▶ This technique is especially useful for quickly changing the tempo of the groove—just select the desired length of sample in the Sample Editor; type **⌘C** to crop to the selection and apply the filter.

- ❖ Choose ›Fractal Noise‹ from the Sample Editor's Sounds menu.
- ❖ Recall filter #2 (max bars).
- ❖ Filter the sample.

- ▶ Filtering fractal noise with a max bars filter provides a strong bass pulse under the groove.

- ❖ Choose ›Cross Mix...‹ from the Sample Editor's Morph menu.
- ❖ When the Open dialog appears, open the ›groove‹ sample.
- ❖ In the Cross Mix window, use the controls as numbered in the illustration to create the cross mix curve.



- ❖ Click the green check mark to close the Cross Mix window and process the mix.

28—Noise Grooves

CD audio track 28 contains the original groove, the white noise groove and the cross mix groove.

4 Filter a sound effect.


- ❖ Load the sample named ›Fx1‹ into the Sample Editor.
This sound effect was synthesized from picture #7-1 in the filters bank.
- ❖ In the Filter window, recall filter #3 (max bars with gray wash).
- ❖ Filter the sample.


29—Effect Groove

CD audio track 29 contains the original effect followed by the grooved version.

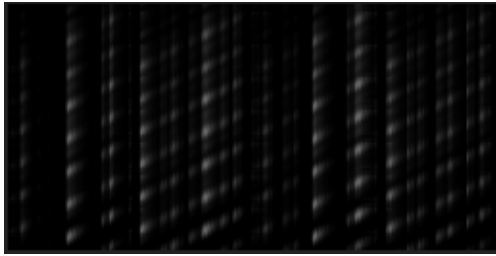
- Use a groove filter together with a gray wash to preserve the flow of the sound effect while still adding the pulse of the groove.

5 Filter an ambient melody.

- ❖ Recall filter #4 (diagonal lines).
- ❖ Type  to copy it to the Filter window's clipboard.
- ❖ Recall filter #2 (max bars).

- ❖ Type  to multiply (i.e. filter) the max bars filter by the filter on the clipboard.

This has been saved as filter #5.



- ❖ Load the stereo sample named ›mel1‹ into the Sample Editor.

This ambient melody was synthesized from picture #7-2 in the filter bank.

- ❖ Filter the sample.

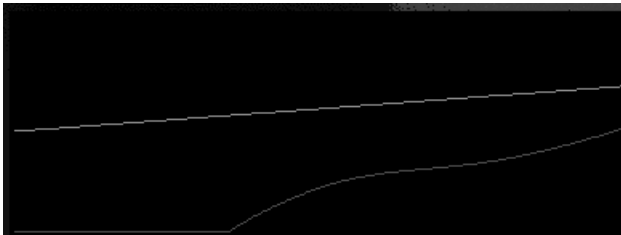
- ❖ Choose ›Cross Mix...‹ from the Sample Editor's Morph menu.

When the Open dialog appears, select the sample named ›mel2.‹ This melody was synthesized from picture #7-3 in the filter bank. It is the same as picture #7-2 except that a displacement map has been used to break up the horizontal regions.



- ❖ Use the Cross Mix buttons to create the mix envelope shown in the illustration.



© 30—Melodic Groove





Use the humped line button followed by the rotate button to create the red envelope then click the green check mark to cross mix the samples.

More Things to Try

- ◆ Modify ›max bar‹ filters by displacement.
 - ❑ Create a short, white noise sample (four seconds or so).
 - ❑ Recall filter #3 (max bars).
 - ❑ Select a displacement map. Almost any displacement map will produce interesting results.
 - ❑ Hold  and  and drag up or down on the Displacement button. Restricting the displacement to the vertical dimension helps keep the groove in tact.

Summary

In this tutorial you learned how to:

- ◆ Create groove filters from a percussion sample (Step 2).
- ◆ Groove noise samples with rhythm filters (Step 3).
- ◆ Groove sound effects with rhythm filters (Step 4).
- ◆ Groove melodies with rhythm filters (Step 5).

What's in the ›Tutorial 10‹ Folder

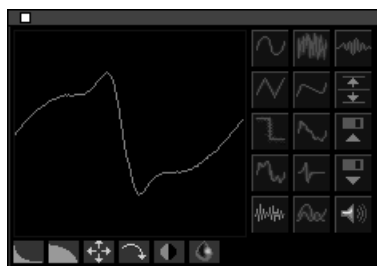
Name of File	Description
10.filters	Groove filters and presets
Groove	Percussion groove sample
fx1	Sound effect sample
mel1	Ambient melody
mel2	Displaced ambient melody

3 Sound Sources

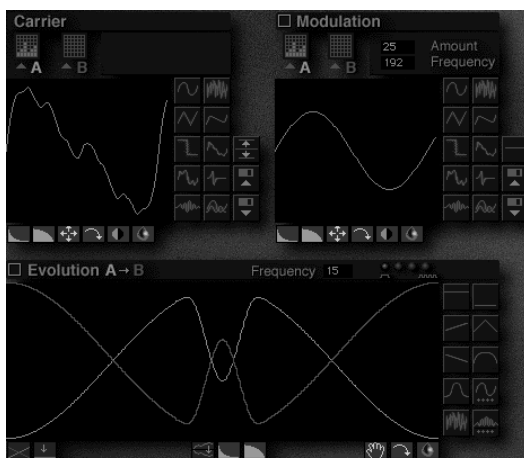
MetaSynth provides several sources of sounds for synthesizing Image Synth pictures. These fall into two basic categories: waveforms and samples.

Waveforms include:

- ◆ Single-cycle waveforms from the Wave Table Editor

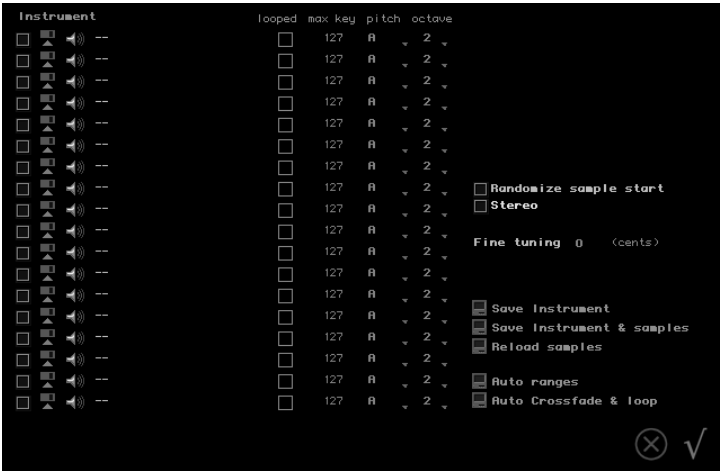


- ◆ Multi-cycle, crossfaded FM waveforms from the Procedural Synth



Samples include:

- ◆ Pitch-zone mapped, sampled Instruments




- ◆ Samples directly from the Sample Editor

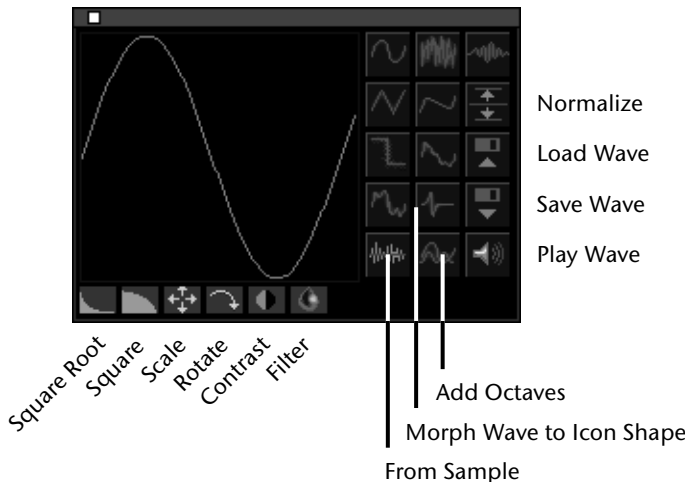
The tutorials in this chapter will explore each of these sound sources for synthesizing Image Synth pictures.

Tutorial 11: The Wave Table Editor

Wave tables are MetaSynth's simplest sound source, but with the Wave Table Editor's waveshaping tools and freehand editing, you can get many useful sounds. The Wave Table Editor is also great for exploring the relationship between wave shape and harmonic content. That's what we'll look at first.



1 Load the presets and open the Wave Table Editor.

- ❖ Go to the Image Synth and load the preset file named ›11.presets.<
- ❖ Recall preset #1.
This sets up the Image Synth's workspace to synthesize about one second of the waveform in the Wave Table Editor.
- ❖ Select ›Wave Table< from the Windows menu or type 2 to open the Wave Table Editor.




- Aside from the Play, Load and Save buttons, the Wave Table Editor's buttons behave in two ways: some morph between the current wave


table and a predefined shape while others modify the wave table in certain mathematical ways. The shaping buttons are indicated by the ›Morph wave to icon‹ label in the illustration. The individually labeled buttons are the ›modifiers.‹

- ▶ The top-left (sine wave) and top-right (cosmic or gaussian) buttons morph to two different wave forms an octave apart—holding  selects between them.
- ▶ You can preview the wave table as well as hear any changes in real time by clicking any of the buttons (except the Load and Save buttons). The preview button (speaker icon) is only for convenience.
- ▶ You can press  while in the Wave Table Editor to preview the picture in the Image Synth using the current wave table.

2 Synthesize and analyze some wave tables.



- ❖ Go to the Image Synth and synthesize the wave table.
The wave table is a sine wave which was saved along with preset #1.
 - ❖ Click the Sample Editor's Zoom button and drag to the right until you reach maximum magnification.
This allows you to view the actual waveform generated in the Sample Editor.
 - ❖ Click the Image Synth's Synthesize button a few more times and observe the changes in the Sample Editor.
- ▶ When the Image Synth synthesizes a pixel there is a brief fade-in period to avoid clicks. Also the phase (i.e. starting point) of the wave can change though this makes no audible difference (at least by itself).
- ❖ In the Image Synth, type  to analyze the sample.
Aside from the startup artifacts (pixels in the left-most column) the analysis produces the original line. Actually there are a few other very faint artifacts—selecting and normalizing a dark part of the picture makes them easier to see.

- ❖ Recall preset #2 and type  to copy it to the clipboard. This is a blue template of the harmonics of the line in preset #1. We'll use it to find the harmonics in various waveforms.

- ❖ Recall preset #1.

- ❖ Change to the Wave Table Editor and click and drag at various places in the wave table. Only up and down dragging matters.

As you do this, you'll hear the changes in the sound in real time.


- ❖ When you get a sound you like, return to the Image Synth and synthesize it.


If you want to restore the sine wave table and start over either click on the top-left morph button (sine wave icon) and drag to the right or change to the Image Synth and recall preset #1.

► If you want to save any wave table there are two ways:

- ➡ Save the preset in the Image Synth.
- ➡ Click the Wave Table Editor's Save button. This method also allows you to load the wave table into the FM Synth.



- ❖ Type  to analyze the sample.

- ❖ Switch to one of the stereo modes that includes blue (i.e. blue-alone or RGB) and type  to add the clipboard to the picture.

Ignoring the start-up hash in the left column, there will be horizontal lines in varying shades of blue. The whiter a line is the more that harmonic is present in the sample (i.e. the wave table used to synthesize it).

The blue template shows the fundamental together with the next ten harmonics (eleven lines total). There may be faint harmonics present above this—select everything above the top blue line and normalize to see.

- ❖ Repeat this process for different wave tables obtained using the various morph and modify buttons:
 - ➔ Recall preset #1 (very important to do this *first*).
 - ➔ Edit the wave table.
 - ➔ Synthesize a sample. (This is the time to save the wave table if you want to.)
 - ➔ Analyze the sample.
 - ➔ Add the blue, harmonics template to it. (You need to have the template on the clipboard and change to a stereo mode which includes blue to do this.)

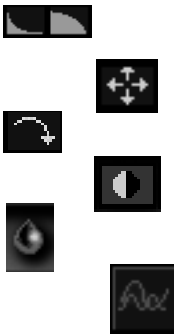
Here are some things to notice:

- ➔ The Square and Square Root buttons reduce the even harmonics.
- ➔ The Scale button reduces the lower harmonics.
- ➔ The Rotate button adds upper harmonics and in the extreme, reduces the fundamental.
- ➔ The Contrast button adds odd harmonics.
- ➔ The Filter button reduces upper harmonics.
- ➔ The Add Octaves button adds octaves above all harmonics present in the current wave table.

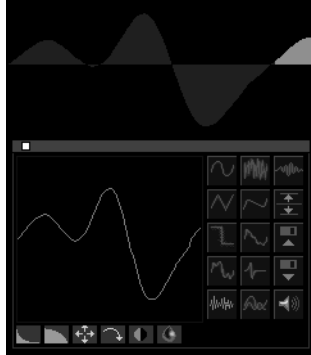
- ▶ The Add Octaves button is different than the ›Octaves‹ button diagonally above it. The Octaves button morphs to a wave table consisting entirely of octave harmonics. Try both buttons on a square wave—adding octaves results in a sawtooth while morphing to octaves results in only octave harmonics.

3 Swipe some waves.

- ❖ In the Sample Editor, load the sample named ›B3cycle.‹
- ❖ Select a few cycles at the beginning of the sample and drag right on the Zoom button to maximum zoom.
- ❖ Grab the sample and slide it slightly left until the beginning of an up-cycle is at the left edge of the sample area.



- ❖ Switch to the Wave Table Editor and drag left on the From Sample button as far as it will go.




This has been saved as preset #3.

- ▶ The From Sample button converts the leftmost few (about 200) samples from the Sample Editor into a wave table in the Wave Table Editor. Use this to capture synthesizer, single-cycle waveforms or to create synth-like wave tables from complex samples.
- ▶ To capture a more realistic, multi-cycle waveform from a complex sample, use the Sample Editor's ›Instant Spectrum...‹ function on the Morph menu.
- ❖ Preview the wave table or synthesize it from the Image Synth and compare it to the actual B3 sample.
- ❖ Load the sample named ›Guitar G2.‹ This is the same guitar sample used in Tutorial 3.
- ❖ Select a short section of the sample somewhere in the sustain portion of the sound and zoom to maximum magnification.
- ❖ Move the selection to the left until a cycle begins at the left edge of the sample area.

- ❖ Switch to the Wave Table Editor and again, capture this portion of the sample by dragging left on the From Sample button.

This has been saved as preset #4.

- ❖ Switch to the Image Synth and use  to move the white line down two semitones to G2 (the pitch of the guitar note).
- ❖ Synthesize the wave table and compare it to the sustain portion of the sample.



- Use the Sample Editor's loop button to play selected short portions of a sample—otherwise, you'll only hear an unrecognizable blip.

- ❖ Choose ›Synthesize Spectrum...‹ from the Sample Editor's Morph menu and select the file named ›guitar.spct‹ in the Tutorial 11 folder.

The Sample Editor will create a sample from a previously saved, analyzed portion of the guitar sample. Notice that the result is much more guitar like.

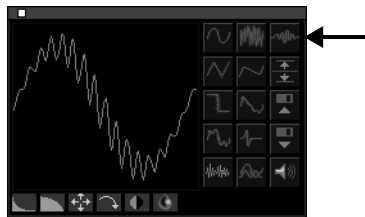
4 Synthesize some pictures with waves.

- For busy pictures, this is a case where less is definitely more. Remember when you use anything other than a sine wave you are adding harmonics to *every* pixel in the picture.
- ❖ In the Image Synth, recall preset #5.



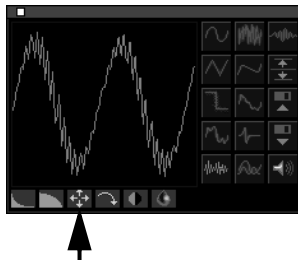
This preset uses a custom scale which divides the octave linearly into 48 pitches. Harmonic divisions of the octave are usually exponential.

- ❖ Synthesize the picture with sine waves (the default).
- ❖ In the Wave Table Editor, use the Cosmic button (upper-right) to add upper harmonics to the sine wave.



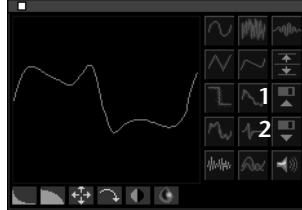
Then synthesize the picture and listen to the difference. This has been saved with preset #6.

- ❖ In the Wave Table Editor, use the Scale button to double the pitch.



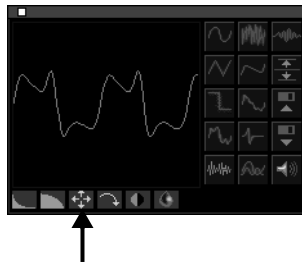
Then synthesize the picture and listen to the difference. This has been saved with preset #7.

- ❖ In the Image Synth recall preset #5 to restore the sine wave.
- ❖ In the Wave Table Editor, use the Minors button (1), then the Brass Like button (2) to morph the wave shown in the illustration.



Synthesize the picture and listen to the difference. This has been saved with preset #2-1.


- ❖ In the Wave Table Editor, use the Scale button to double the pitch.

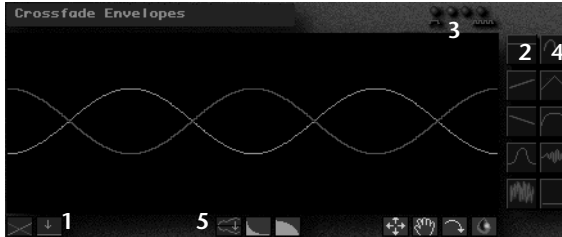


Relatively small changes in the wave table can cause large changes in the sound when synthesizing even fairly simple pictures.

Again, synthesize the picture and listen to the difference. This has been saved with preset #2-2.

5 Mix and match.

- ❖ Recall preset #2-3 and synthesize it.
This is the upper-green portion of the picture together with the first ›cosmic‹ wave from step 4.
- ❖ Type  to save the sample to the Sample Editor's clipboard.
- ❖ Recall preset #2-4 and synthesize it.
This is the lower-red portion of the picture together with the second ›cosmic‹ wave from step 4.
- ❖ Select ›Merge...‹ from the Sample Editor's Edit menu.




Use the buttons indicated by the numbers 1 to 4 to create the curve shown in the illustration. Then click the green check mark to create the mix.

This sample has been saved as ›GtRb‹ in the Tutorial 11 folder.

- ❖ Recall preset #2-5 and synthesize it.

This is the upper-red portion of the picture together with the first ›Brass like‹ wave from step 4.

- ❖ Type  to save the sample to the Sample Editor's clipboard.

- ❖ Recall preset #2-6 and synthesize it.

This is the lower-green portion of the picture together with the second ›Brass like‹ wave from step 4.

- ❖ Select ›Merge...‹ from the Sample Editor's Edit menu.

Use the button indicated by the number 5 to flip the curve shown in the illustration. Then click the green check mark to create the mix.

This sample has been saved as ›RtGb‹ in the Tutorial 11 folder.





- ❖ Select ›Mix 50 %...‹ from the Sample Editor's Morph menu and select the file ›GtRb‹ to mix with the current sample.

Cd audio track 31 contains sine wave, cosmic wave and brass wave versions as well as the above mix.

More Things to Try

- ◆ Create a multi-cycle wave sample.
 - ❑ In the Image Synth select preset #3-1.
 - ❑ Synthesize the picture.
 - ❑ Select two cycles of the resulting sine wave starting at an up zero-crossing.

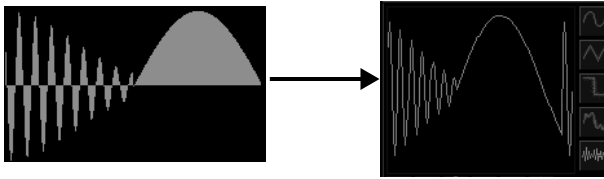


- ❑ Type  to crop the sample.
- ❑ Type  to copy it to the clipboard.
- ❑ Drag all the way right on the Wave Table Editor's Cosmic Wave button (upper-right).
- ❑ Synthesize the picture.
- ❑ Select two cycles of the resulting waveform.
- ❑ Type  to crop the sample.
- ❑ Type  to add the sine wave sample to the end.
This sample has been saved as ›MultiCycle.<



- Constructing multi-cycle wave forms in this way will generally lead to samples with a DC offset. Removing it (using the Sample Editor's Transform menu) can lead to a significant change of sound. Better results are often obtained by synthesizing pictures with the sample then removing any DC offset.
 - ❑ Recall preset #3-2.
 - ❑ Synthesize the picture to hear the MultiCycle wave sample.
 - ❑ Recall preset #3-3.

- ❑ Synthesize the picture.
This is the same picture as preset #5 but uses a cross-faded sample as its source instead of a sine wave. Compare the results with preset #5 synthesized using a sine wave table and using a cosmic wave table.
- ❑ Load the sample ›MultiCycle‹ into the Sample Editor.
- ❑ Select a region containing half a cycle of the cosmic wave and half a cycle of the sine wave.
- ❑ Use the Wave Table Editor's From Sample button to capture the wave.



- ❑ Change the Image Synth source to the wave table and synthesize the picture again.

► Some simple multi-cycle waves can be recaptured in the Wave Table Editor.

Summary

In this tutorial you learned how to:

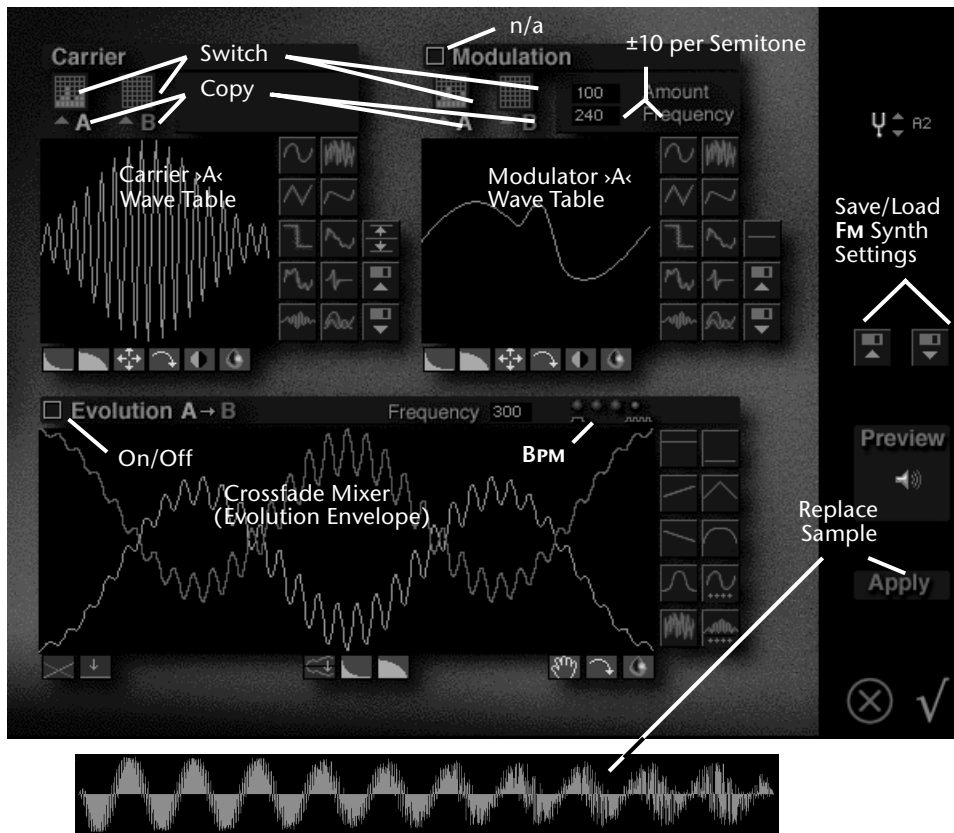
- ◆ Analyze wave tables in the Image Synth (Step 2).
- ◆ Extract wave tables from samples (Step 3).
- ◆ Synthesize pictures with different wave tables (Step 4).
- ◆ Layer samples synthesized from different parts of a picture using different wave tables (Step 5).

What's in the ›Tutorial 11‹ Folder

Name of File	Description
11.presets	All presets
B3 Cycle	Sample of a typical B3 waveform
B3Cycle.wave	Wave table extracted from B3 Cycle
guitar C2	Guitar Sample
guitar.wave	Wave table extracted from Guitar C2
guitar.spct	Spectrum analyzed from Guitar C2
GtRb	Submix of two pictures synthesized with different wave tables.
RtGb	Submix of two more pictures synthesized with different wave tables.
MultiCycle	Multi-cycle wave sample (sine + cosmic).

Tutorial 12: The Procedural (FM) Synth

Now that you know about the Wave Table Editor, you already know a great deal about the FM Synth. The FM Synth is four Wave Table Editors plus a crossfade mixer. Two of the wave tables are ›carriers‹ (sound sources) and the other two are modulators—each modulating the frequency of one of the carriers. The crossfade mixer controls the evolution (a.k.a. crossfade) between one carrier/modulator combination and the other.



The FM Synth window displays one carrier and one modulator wave table at a time. At first this can be confusing especially when they don't match—for example, when you're looking at carrier A and modulator B. Here are some things that make it easier:



- ◆ Click the grid buttons above the wave tables to switch views.
- ◆ Look for green bars in the grid to see which wave table is being displayed. (Green bars above the ›A‹ mean wave table A is being displayed, etc.)
- ◆ Click the letters ›A‹ or ›B‹ below the grid buttons to copy the other wave table into this wave table. For example, click the ›A‹ to copy wave table B into wave table A.

There is only one Preview button for the whole FM Synth and it's not always obvious what is being previewed. Here are some tips:



- ◆ Uncheck the Evolution check box at the top of the crossfade mixer to hear only the A side (the A carrier modulated by the A modulator.)
- ◆ Check the Evolution check box and click the ›B-only‹ button to hear only the B side.
- ◆ Check the Evolution check box and click the ›BAB‹ button to hear a smooth crossfade loop between the two sides.
- ◆ The crossfade ›Frequency‹ is set in beats per minute with a range of 1 (60 second cycle) to 300 (200 millisecond cycle).
- ▶ This rate is independent of the Image Synth ›pitch‹ when the FM Synth is used as a sound source. I.e. the crossfade will take the same amount of time no matter how you transpose the pitches of the wave tables. If you ›Apply‹ the FM Synth to create a sample then use that sample as a source, the crossfade rate *will* change with transposition. This is an important factor in deciding whether to use the FM Synth or its applied sample as a source.
- ▶ You can achieve higher ›LFO-crossfade‹ rates by using the Repetition Rate buttons at the top-right end of the crossfade mixer:




Although there are two modulator wave tables there is only one modulator amount and frequency. This can be confusing if you're listening to one modulation and changing these values—the new values will change the other modulation as well.

In the most brief terms, frequency modulation (FM) of one wave by another causes new frequencies (called ›sidebands‹) to be added to the sound—these may or may not bear any harmonic relation to the original sound. Here are some things to keep in mind:

- ◆ If the carrier frequency is **c** and the modulator frequency is **m** then the sideband frequencies are **$c \pm m$** , **$c \pm 2m$** , **$c \pm 3m$** etc. Negative numbers count—think of them as phase reversed positive numbers.
- ◆ The Modulation section's Frequency control is calibrated to tenth of a semitone with 240 corresponding to the pitch of the carrier (i.e. 220.5 Hz when the tuning is set to ›A2‹).
- ◆ When the carrier is not a sine wave, sidebands are created for every sine wave component of the carrier.
- ◆ When the modulator is not a sine wave, sidebands are created by every sine wave component of the modulator.
- ◆ Things get thick very fast.
- Like the crossfade frequency, the modulator frequency *does not* change with the pitch when you use the FM Synth as a sound source. Therefore, you will not get the same sound at different pitches. The only way around this is to convert the sound to a sample then use the sample as the source either directly or in an Instrument.



1 Create and analyze some FM waves.

- ❖ Load the presets file named ›12.presets‹ into the Image Synth.
- ❖ Select preset #1 and type  to copy it to the clipboard.

This is the blue harmonics template which we used in Tutorial 11 to analyze waves from the Wave Table Editor.
- ❖ Load preset #3.

This picture will synthesize whatever sound is in the FM Synth. We will then analyze the sound in the Image Synth.
- ❖ Choose ›Procedural Synth‹ from the Sounds menu to open the FM Synth. This menu is about the only place you'll see the name ›Procedural Synth.‹
- ❖ Use the Load Settings button on the right side of the FM Synth to load the setup named ›1.fm.‹

This is about the simplest FM setup. On the ›A‹ side a sine is being modulated by another sine wave. On the ›B‹ side there is a sine wave with no modulation. The crossfade mixer is set up to play only side A if the Evolution check box is unchecked and only side B if it is checked—use this check box to compare the effect of modulation.
- ❖ Make sure Evolution is off and click the green check mark to close the FM Synth.
- ❖ Synthesize the sound in the Image Synth.

The Sample Editor now contains a short version of the FM wave. Use maximum zoom to see what the actual wave form looks like.
- ❖ Type  to analyze the sample.
- ❖ Change the Image Area to stereo and select a color mode that includes blue (blue-only or RGB).
- ❖ Type  to add the blue template to the picture.

This has been saved as preset #4.



A simple FM wave and its Image Synth spectral analysis.

Notice from the illustration that this FM sound consists of a sine wave and a few lower harmonics. The reason is that the modulation frequency was the same as the carrier frequency. Remember a Modulator Frequency setting of 240 matches the carrier frequency.

- ❖ Open the FM Synth again and change the Modulator Frequency to 120.
- ❖ Repeat the above steps to analyze this FM sound.

The steps: Recall preset #3 \Rightarrow synthesize \Rightarrow analyze (**N**) \Rightarrow change to stereo with blue \Rightarrow add the blue template (**E**).

This time you'll find that some of the bands (those that remain yellow) are not on any of the harmonics. Here's what's happening:

- \rightarrow The modulator frequency is an octave below (i.e. one half of) the carrier frequency. Remember a modulator frequency setting of 240 equals the carrier frequency and there are ten frequency steps per semitone.
- \rightarrow The carrier is A220 and the modulator is A110.
- \rightarrow The first sidebands are at ± 110 Hz (A110 and E330).
- \rightarrow The second sidebands are at ± 220 (n/a and A440).
- \rightarrow The third sidebands are at ± 330 (A110 and C#550).
- \rightarrow The fourth sidebands are at ± 440 (A220 and E660).

This is very similar to the harmonic spectrum of a 110 Hz sawtooth wave. When FM synthesis produces a pitched sound, the fundamental will be highest frequency that divides both the carrier and the modulator—in this case 110 Hz.

- ❖ Try other Modulator Frequencies—the range between 200 and 300 is interesting as is the range near 0 and near 480.

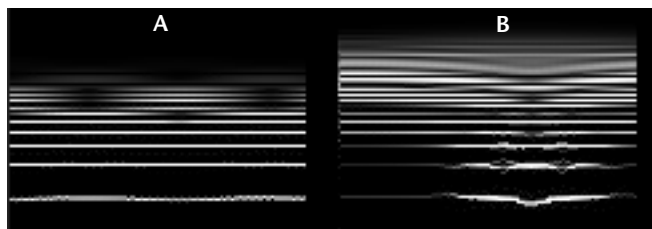
2 Try some other wave tables.

- ❖ Load the file named >2.fm< into the FM Synth.
- ❖ Click the Preview button and then toggle the Evolution check box on and off to compare the sounds.

With Evolution off (unchecked) you're hearing the A (green) FM wave and with Evolution on you're hearing the B (red) FM wave. The only difference is that the carrier and modulators are swapped.

A is a sine wave carrier modulated by a brass like modulator. B is a brass like carrier modulated by a sine wave modulator.

The illustration (saved as preset #6) compares the analyzed spectra of these two FM waves (A on the left and B on the right).





- Complex carriers tend to have greater impact than complex modulators.

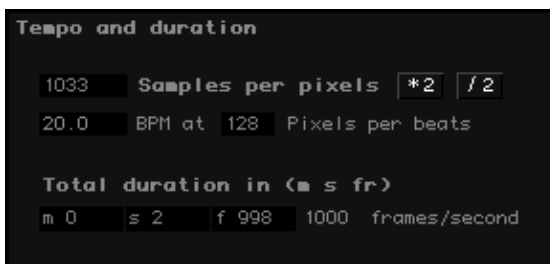
3 Try some complex envelopes.

- ❖ Load the file named ›3.fm‹ into the FM Synth.
- ❖ Click the Preview button then look at the A and B carriers and modulators.

Notice that the B modulator has much less amplitude than the A modulator. This is one way to compensate for the fact that there's only one Modulation Amount setting—vary the amplitude of the modulating waves.

The Mix crossfades the A FM wave into the B FM wave at a rate of 20 BPM. The full crossfade takes three seconds. The A FM wave resembles a bell strike and the B FM wave resembles the decay section of a bell tone—many of the highs are lost.


- ❖ Close the FM Synth and return to the Image Synth.
- ❖ Recall preset #7-1 (fade out filter) and type  to copy it to the clipboard.
- ❖ Recall preset #3.
- ❖ Type  to filter the picture by the clipboard.
This has been saved as preset #7.
- ❖ Open the Duration window (double-click on the Duration button) and change the duration to ›20 BPM at 128 Pixels per beats.‹







Choosing 128 Pixels per beat makes the whole Image Area one beat and setting the BPM to ›20‹ matches the FM Synth's envelope rate.



- ❖ Synthesize the sound.


The sample should be exactly one ring of the bell.

- ❖ Change the Image Area width (x) to 1024.
- ❖ Recall preset #7-2 (stereo panning filter) and type  to copy it to the clipboard.
- ❖ Recall preset #2-1.

This is the same as preset #7 except the Image Area width (x) has been changed to 1024 and the Scale Map has been changed to Quartertones.


- ❖ Set the Grid Size to 128.
- ❖ Type  to select everything.
- ❖ Type   .

This creates a new note 128 pixels to the right. Use the  and  keys together with the Preview button to move this note to a bell sound you like.

- ❖ Repeat the last step six more times to get eight notes total.
- ❖ Type  to deselect everything and synthesize the sound.

This has been saved as preset #2-2.

- ▶ Each note plays a new FM Synth note starting at the beginning of its envelope because they are placed exactly one beat apart. (Remember there are now 128 pixels per beat). Any other placement will cause the FM Synth notes to start somewhere else in their envelope. It's as if the FM Synth envelope is looping throughout the entire picture and the placement of the notes simply make it audible.

- ❖ Click the Mono/Stereo button to change the Image Area to stereo.
- ❖ Type  to apply the pan filter on the clipboard to the picture.

This has been saved as preset #2-3.

- ❖ Synthesize the picture.

- ❖ Open the Duration window and reset the ›Pixels per beats‹ to 32.

4 Lose that fundamental.

- ❖ Open the FM Synth by choosing ›Procedural Synth‹ from the Sounds menu.
- ❖ Use the Load Settings button on the right side of the FM Synth to load the setup named ›4.fm.‹
- ❖ Preview the sound toggling Evolution on and off.

With Evolution off you should hear a steady sine wave and with Evolution on you should hear only a very faint sine wave. Waves A and B are both sine waves but they are 180 degrees out of phase and they are mixed for maximum cancellation (which is not quite 100%).

- There is no button for creating the sine wave used as carrier B, but it has been saved as a wave table in the Tutorial 12 folder under the name ›revsine.wave.‹ ›flatline.wave‹ is another useful wave form in this folder because the Carrier section has no Reduce Amplitude button. (Only the Modulation section has this button—it's not in the Wave Table Editor either.)

Remember you can move wave tables between the Carrier, Modulator and Wave Table Editor.

- ❖ Use any of the wave morphing buttons in Modulator A together with the Frequency and Amount settings to create an FM wave.
- ❖ Use the crossfade mixer's Move button to tune out the fundamental.

If the Move button doesn't have sufficient range, use the Line Up (upper-left corner) and Line Down (lower-right corner) buttons.



- Toggle Evolution off temporarily to hear the difference with and without the fundamental cancellation.

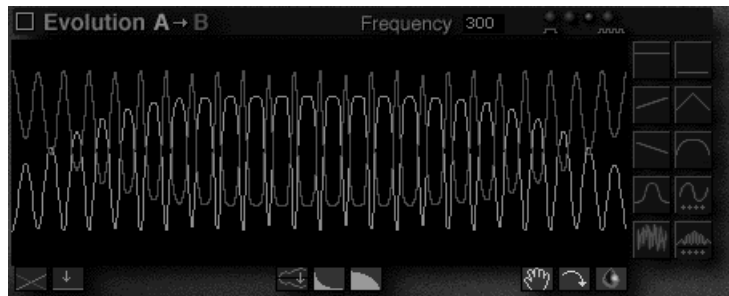
- ❖ Use the Modulator's various wave shaping buttons to further modify the sound.



You will probably need to adjust the carrier cancellation after each change because the amount of carrier present varies with the shape and amount of modulation.

5 Simulate an AM wave form.

- ❖ With FM Synth setup ›4.fm‹ still in place, set the Modulator Amount to 0 (i.e. no modulation).
- ❖ Turn Evolution on (check the box).
- ❖ Set the Evolution Frequency to 300 BPM (max setting).
- ❖ Use the crossfade mixer's envelope shaping buttons to create a rapidly changing envelope. An example is shown in the illustration.



- ❖ Preview the sound and use the crossfade mixer's Move button to fine tune the sound.

- You can simulate some AM and ring modulation like effects by using high frequency envelopes with many cycles in their wave forms.

More Things to Try

- ◆ Use the crossfade mixer as an amplitude envelope.
 - ❑ Select Carrier B and load the file named ›flatline.wave‹ into its wave table. This will silence sound B.
 - ❑ Turn Evolution off and create a sound using Carrier and Modulator A.

- ❑ Turn Evolution on and use the various buttons together with the Frequency setting to envelope sound A.

Although the crossfade mixer always keeps the A and B envelopes inverses of each other, envelope B no longer matters because there is no sound B.

- At low envelope Frequency settings you can use this technique to create rhythm effects. The FM Synth setup file ›5.fm,‹ preset #2-4 and CD audio track 33 illustrate this technique.

Remember that you can draw directly in the envelope window to create multi-stage envelopes.

© 33—FM Rhythms

Summary

In this tutorial you learned how to:

- ◆ Create frequency modulated sounds in the FM Synth (Steps 1 and 2).
- ◆ Use envelopes in the crossfade mixer section to crossfade between FM sounds (Step 3).
- ◆ Cancel the fundamental in FM sounds (Step 4).
- ◆ Simulate AM and ring modulation effects (Step 5).
- ◆ Use the FM Synth's crossfade mixer as an envelope and rhythm generator (More Things to Try).

What's in the ›Tutorial 12‹ Folder

Name of File	Description
12.presets	All presets and filters
1.fm	FM Synth setup for step 1
2.fm	FM Synth setup for step 2
3.fm	FM Synth setup for step 3
4.fm	FM Synth setup for step 4
5.fm	FM Synth rhythm envelope example
flatline.wave	Flat line wave table (no wave)
revsine.wave	Reverse sine wave table (180° out of phase)

Tutorial 13: Instruments

If you've worked with any kind of hardware or software sampler, you already know most of what there is to know about MetaSynth Instruments—you load in samples, set their root and max keys and use them to synthesize pictures in the Image Synth.

The Instrument window maps up to eighteen stereo or mono samples across the pitch range of the Image Synth's Image Area.



Each sample is assigned a root pitch and a ›max‹ key. The root pitch is the pitch in the Image Area that will play the sample at its natural ›pitch‹ (i.e. the way it was sampled). The max key is the note number where the next sample starts. A sample's range is the max key of the sample below it to its max key minus 1.

Once the samples' root pitches have been set, you can have MetaSynth set the ranges automatically by clicking the

›Auto ranges‹ button. MetaSynth then does its best to set the max keys half-way between adjacent samples.

- The root pitch does not need to be within the key range of the sample. You can create interesting timbral effects by assigning the root key several octaves above or below the sample's key range.

Samples can be looped or played straight through. MetaSynth will loop and crossfade the samples for you—click the ›Auto-Crossfade and loop‹ button for this. You can then unloop some samples by unchecking their individual loop check boxes.

If a sample is not looped then lines in a picture that are longer than the sample will not sound for their full duration.

- Keep in mind that a sample's duration is a function of its pitch. For example, if a sample is played an octave above its natural pitch, its duration will be cut in half.



Samples can be stereo or mono and stereo samples can be converted to mono by the Instrument. In this case they will take less memory.

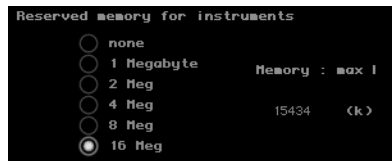
The whole Instrument can also be tuned. The tuning is in cents and is relative to the natural tuning of the samples.


- The difference between standard A440 tuning and MetaSynth's A441 tuning is about four cents. To use an Instrument made of samples tuned relative to A440 together with other sounds synthesized from waves relative to A441, set the Instrument's tuning to four cents. This will raise the sample tunings the appropriate amount. If on the other hand, you want to use sounds synthesized with the samples along with other material tuned to A440, leave the tuning at 0 cents. The thing to remember is that it's the tuning of the samples that counts when using Instruments.

You can have MetaSynth randomly adjust the start-point of sample playback by clicking the ›Randomize sample start‹ check box. This applies to all samples used in the Instrument

and can be useful for creating a natural feeling, especially with percussion sounds (see Tutorial 2).

Instruments are memory intensive. You can reserve memory for Instruments in MetaSynth's Preferences window ( ).

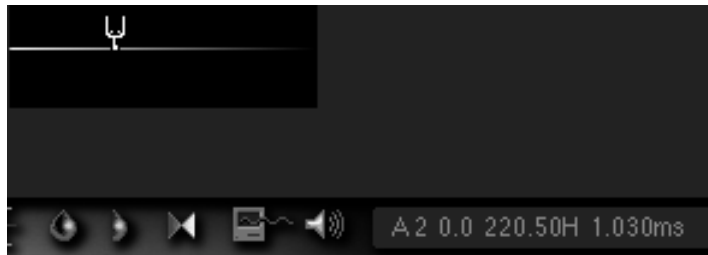



If you are unable to open an Instrument for lack of memory, you can delete already opened Instruments (and retrieve their memory) by selecting them from the Instrument menu while holding .

1 Where's the root?

- ❖ Load the presets file named >13.presets< into the Image Synth.
- ❖ Recall preset #1.

This picture is a single line at the Image Area reference pitch of 220.5 Hz.



You can hear this pitch by holding  and clicking on the line. When the mouse is over the line, MetaSynth's note display will also show you the note name, note

number, frequency and time position (A2 0.0 220.50 Hz 1.030 ms in the illustration).

- ❖ Synthesize the picture.

This sample has been saved as ›sine220‹ in the Tutorial 13 folder.

- ❖ Choose ›Open Instrument...‹ from the Instrument menu and when the open dialog appears, select the file named ›orientation.instrument.‹



This Instrument uses only one sample, the ›sine220‹ sample you just synthesized. It assigns it a root pitch of A2 and a max key of 127. So the whole Image Area uses this sample (the 127 part) and it will sound at its natural pitch at A2 (wherever that is).

- ❖ Click the green check mark to close the Instrument window.
- ❖ Use the Image Synth's Source menu to change the synthesis source to this Instrument.
- ❖ Use the Preview button to hear how the picture will sound when synthesized.
- ❖ Play back the sample in the Sample Editor for comparison.

The sample in the Sample Editor is the same 220.5 Hz sine wave that is used in the Instrument and should sound exactly the same as the previewed picture. What this tells you is:

- The Image Area uses two different note numbering schemes—name and octave (e.g. A2) as well as note number (e.g. 0.0). The Instrument window uses the same name and octave designation but different note numbers—it uses the MIDI note numbers 0 to 127 instead.



Subtract 33 from MIDI note numbers to get Image Synth note numbers.

All you need to remember is that Image Area note number 0.0 is MIDI note number 33. From there it's just a matter of counting on your fingers and elbows and toes and knees.

- ▶ The Image Area's decimal note numbers come into play when microtonal scales are used. Note numbers with a ›0‹ after the decimal point indicate the exact pitch and octave frequencies while values other than 0 after the decimal point indicate the notes ›between the keys.‹ In the Micro8 scale for example, ›A2‹ is used for note numbers 0.25, 0.0, -0.25 and -0.50.

2 Build a simple instrument.

- ❖ Use the Image Synth's Source menu to change the source back to the Wave Table Editor (sine wave icon).
- ❖ Change the Image Synth reference pitch to A5.
- ❖ Synthesize the picture.

This sample has been saved as ›wave A5.‹

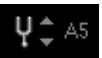
- ❖ Change the Image Synth reference pitch to A4.
- ❖ Click the Wave Table Editor's Square Root button.
- ❖ Synthesize the picture.

This sample has been saved as ›wave A4.‹

- ❖ Repeat the above steps—lower the reference pitch an octave, modify the wave table by clicking the Square Root button and synthesize the picture—four more times.

These samples have been saved as ›wave A3,‹ ›wave A2,‹ ›wave A1‹ and ›wave A0‹ respectively. Note that they get a little brighter harmonically as you go down in pitch.

- ❖ Choose ›Build Instrument...‹ from the Instrument menu.
- ❖ When the Open dialog appears select the sample ›wave A0‹ and click ›Open.‹



- MetaSynth will build instruments automatically for you if the samples follow the standard sample-naming system: the sample name followed by a note name.

In this case, the six ›wave‹ samples were automatically loaded and assigned to the pitches A0 thru A5. The max keys were also set to divide this range over the six samples. You might want to adjust the max key for sample ›wave A5‹ to 127 so the whole Image Area will have a sample assigned to it. (Otherwise the top portion will create no sound when synthesized.)

waves.instrument		looped	max key	pitch	octave
<input checked="" type="checkbox"/>	wave A0	<input type="checkbox"/>	15	A	0
<input checked="" type="checkbox"/>	wave A1	<input type="checkbox"/>	27	A	1
<input checked="" type="checkbox"/>	wave A2	<input type="checkbox"/>	39	A	2
<input checked="" type="checkbox"/>	wave A3	<input type="checkbox"/>	51	A	3
<input checked="" type="checkbox"/>	wave A4	<input type="checkbox"/>	63	A	4
<input checked="" type="checkbox"/>	wave A5	<input type="checkbox"/>	73	A	5
<input type="checkbox"/>	--	<input type="checkbox"/>	127	A	2

This Instrument has been saved as ›waves.instrument.‹

- If you add a pitch-named sample to an Instrument its root pitch will be set accordingly and if the Instrument contains other pitch-named samples, the new sample will be inserted in the proper order and all ›max keys‹ will be adjusted.

❖ Recall preset #2.

- ❖ Select the Instrument as the synthesis source and either preview or synthesize the picture.

© 34—Waves Instrument

This picture is a chromatic scale across the full range of the Image Area. Notice how the sound changes as the samples change.

The instrument in the Tutorial 13 folder named ›waves.instrument‹ has the max key for ›wave A5‹ set to 127 and it also has its ›Fine tuning‹ set to -4 cents to

compensate for the fact that the samples were synthesized from wave tables with A441 tuning.

- Use stereo pictures, additional lines above or below the fundamental (less is more, here) and Filter window filters to create interesting variations on simple wave form instruments like the one created above.

3 Use a more interesting Instrument.

In Tutorial 12 we created a gong like sound in the FM Synth that used the crossfade mixer envelope for a rhythm effect. This has been saved as ›pulse15.fm‹ in this tutorial's folder. If we use the FM Synth as a picture-synthesis source, we must start notes exactly on the grid to get the sound from its beginning. You can use an Instrument to get around this.

- ❖ Choose ›Open Instrument...‹ from the Instrument menu and open the Instrument named ›pulse15.instrument.‹

This Instrument uses nine samples synthesized from this FM sound at consecutive pitches G#2 through E3. Notice that the sounds are not exactly the same because the modulator frequency does not track the Image Area pitch (i.e. only the carrier frequency changes).

- ❖ Recall preset #3.

This is a blue grid showing both the range of Instrument samples (blue dots) and half-note grid (vertical lines) where the FM Synth envelopes start.

- ❖ Create a long note (64 pixels is a good choice) somewhere between the vertical grid lines.
- ❖ Set the synthesis source to the Instrument, ›pulse15.instrument,‹ and preview the sound.

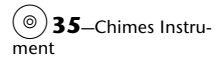
Regardless of where you placed the note you should hear the FM Synth envelope from beginning to end.

- ❖ Open the FM Synth and load the setup named ›pulse15.fm.‹

- ❖ Change the Image Area's source to the FM Synth and preview the sound again.

The FM Synth's envelope should be out of sync—the note attack should start somewhere in the middle of the line.






- ❖ Recall preset #4 and ensure that the synthesis source is set to ›pulse15. Instrument.<
- ❖ Synthesize the picture.
- ❖ Change the sound source to the FM Synth and preview the picture.



- ▶ To preserve the crossfade envelope and/or modulator frequency relationship to the carrier, convert FM Synth sounds to samples and use them as the synthesis source either directly or in Instruments.

4 Use a microtonal Instrument.

- ❖ Open the Instrument named ›fmChime.fm.<

fmChime.instrument			looped	max key	pitch	octave
<input checked="" type="checkbox"/>		fmChime A2	<input type="checkbox"/>	36	A	2
<input checked="" type="checkbox"/>		fmChime D#3	<input type="checkbox"/>	40	D#	3
<input checked="" type="checkbox"/>		fmChime F3	<input type="checkbox"/>	44	F	3
<input checked="" type="checkbox"/>		fmChime A#3	<input type="checkbox"/>	49	A#	3
<input checked="" type="checkbox"/>		fmChime D#4	<input type="checkbox"/>	55	D#	4

This Instrument uses the fm chime sound created in Step 3 of the Tutorial 12. Each sample is mapped across four or five notes including its root pitch.

- ❖ Recall Image Synth preset #5.
This is a blue grid showing the note ranges for each of the Instrument samples. Notice that they are between fifteen and twenty lines apart and that the Scale Map is set to ›Micro8.<
- ❖ Ensure the synthesis source is set to the Instrument ›fmChime.fm.<

- ❖ Move the cursor around within the note ranges and look at the corresponding note numbers.



- ▶ The Image Synth always uses whole numbers for the notes of the twelve-tone equal-tempered scale. When microtonal scales are used, the Image Synth uses decimal note numbers to fill in the gaps. The Micro8 scale divides the semitone by 4 (48 divisions per octave) so decimals .0, .25, .5 and .75 are used. In the illustration, note 1.25 is one Micro8 step above note 1.0 (A#2).
- ▶ The Instrument max key and root pitch settings always refer to whole numbers in the Image Area. When microtonal scales are used, sample gets more lines although its pitch range (maximum and minimum pitch) stay the same.

36—FM Instrument

- ❖ Recall preset #7.
- ❖ Ensure the synthesis source is set to the Instrument ›fmChime.fm‹ and synthesize the picture.
Microtonal scales are very hand for vibrato and glissando-like effects.

5 Use a multi-timbral Instrument.

- ❖ Open the Instrument named ›multi.instrument.‹

multi.instrument		looped	max key	pitch	octave
<input checked="" type="checkbox"/>	fmChime A2	<input type="checkbox"/>	45	A	4
<input checked="" type="checkbox"/>	pulse15 A2	<input type="checkbox"/>	69	A	3
<input checked="" type="checkbox"/>	wave A2	<input type="checkbox"/>	93	A	6

This Instrument uses one sample from each of the Instruments used in the previous steps. Each sample gets a two-octave range. Notice that the octave part of the root pitches are not all set to A2 even though this is

the ›reak‹ root pitch of each sample (see the sample names).

- ▶ Use the root pitch setting in an Instrument to transpose a sample relative to its Image Area range. With this technique you can:
 - ➔ Use the sample's ›natural‹ sound at different sections of the Image Area.
 - ➔ In the illustration the sample, ›wave A2,‹ is assigned an Image Area range four octaves above its natural range. Its root octave has been set to 6 to compensate. Notes in the Image Area at note number 48.0 will play the sample at its natural pitch.
 - ➔ Transpose a sample.
 - ➔ In the illustration the sample, ›fmChime A2,‹ is assigned an Image Area range including its natural pitch but in the Instrument, its octave has been set two octaves higher. This will make it sound two octaves lower.
 - ❖ Recall preset #2-3.
 - ❖ Use the Source menu to set its source to the Instrument named ›multi.instrument.‹
 - ❖ Synthesize the picture.
 - ❖ Change the octave settings for some or all of the samples in the Instrument and synthesize the picture again.
- ▶ You can often get new life out of a picture synthesized with an multi-instrument by changing the samples' root pitches in the Instrument.

© 37—Multi-Instrument

More Things to Try

- ◆ Layer different pictures.
 - ❑ Open or create two pictures both of which use only the bottom half of the Image Area.
 - ❑ Use different samples to synthesize each picture.
 - ❑ Create an Instrument containing the two samples used to synthesize the pictures.
 - ❑ Set the pitch for the first sample to A2 and set its max key to 69.

- ☐ Set the pitch for the second sample to A7 and set its max pitch to 127.
- ☐ Recall the second picture and use **[F]** to raise it five octaves.
- ☐ Type **[C]** to copy it to the clipboard and recall the first picture.
- ☐ Type **[E]** to add the second picture to it.
- ☐ Synthesize the picture.
- ◆ Create a percussion multi-instrument.
 - ☐ Create an Instrument with some (up to ten) percussion samples.
 - ☐ Set the samples' root pitches to consecutive A's (i.e. A0, A1, A2, etc.). Click the ›Auto ranges‹ button to automatically set their max keys an octave apart (i.e. 15, 27, 39, 51, ...).
 - ☐ Recall preset #2-4. This preset uses the custom scale named ›percussion.sck‹ which divides the octaves into twelve notes of nearly equal pitch.
 - ☐ Use the octave zones indicated by the gridlines to create a percussion part—each zone uses one of the percussion samples in the Instrument.

Check the Instrument's ›Randomize sample start‹ check box to add variety to the percussion parts.

Summary

In this tutorial you learned how to:

- ◆ Set up and use Instrument pitch zones (Step 1).
- ◆ Automatically create an Instrument from appropriately named samples (Step 2).
- ◆ Use Instruments to preserve the envelope and modulation of FM Synth sounds (Step 3).
- ◆ Use Instruments with microtonal scales (Step 4).
- ◆ Use and transpose multi-instruments (Step 5).
- ◆ Layer pictures with different sounds (More Things to Try).
- ◆ Use multi-timbral percussion Instruments (More Things to Try).

What's in the ›Tutorial 13‹ Folder

Name of File	Description
13.presets	All presets
sine220	Sine wave sample used in Orientation.instrument
orientation.instrument	Instrument used in Step 1
wave A0, etc.	Samples used in waves.instrument
waves.instrument	Instrument used in Step 2
pulse15 A#2, etc.	Samples used in pulse15.instrument
pulse15.instrument	Instrument used in Step 3
pulse15.fm	FM Synth setup for samples pulse15 A#2, etc
fmChime A#3, etc.	Samples used in the fmChime.instrument
fmChime.instrument	Instrument used in Step 4
multi.instrument	Instrument used in Step 5
percussion.scl	Scale used in second More Things to Try

Tutorial 14: Samples and Spectra

One of the easiest synthesis sources to use is the Sample Editor itself. This makes your entire sample library a source for MetaSynthesis. You can also use all of MetaSynth's sound design tools to create Image Synth sound sources.

1 Load and use a sample.

- ❖ Load the sample named ›chimes‹ from the Tutorial 14 folder into the Sample Editor.
- ❖ Load the presets file named ›14.presets‹ into the Image Synth.
- ❖ Recall preset #1.

Notice that the sample has been chosen as the synthesis source.



- ❖ Play the sample then synthesize the picture for comparison.

The picture is a single line at note 0.0—the Image Area's reference pitch. This line plays the sample at its natural pitch.

- ❖ Choose ›Crossfaded Sample‹ as the synthesis source and synthesize the picture again.

- ▶ You can use the sample as a source in two ways, straight through or as a crossfaded loop. MetaSynth automatically creates the crossfaded loop for you.
- ▶ You can not create your own loops either in the Sample Editor, but you can crop the sample then repeat it and use it straight through as a source to achieve the same result. (Loops in Sound Designer II format

samples *are* preserved when those samples are used in MetaSynth Instruments.)

- ❖ Load the sample named ›sgreat‹ into the Sample Editor.
- ❖ Recall preset #2 and synthesize the picture.

► You can create instant ›phase pieces‹ from small speech clips by synthesizing two closely spaced lines using a microtonal scale. This technique was pioneered by Steve Reich in the 60's using tape loops.

Ⓒ **38**—Insta-Phase

2 Repeat the process.

- ❖ Select ›chimes‹ from the Sounds menu to recall the original sample to the Sample Editor.
- ❖ Recall preset #3.

Ⓒ **39**—Chime After
Chime



This preset is the picture used to create the chime sample in Step 3 of Tutorial 13. It has been scaled to fill the Image Area and its Duration is roughly half of the original.

- ❖ Synthesize the picture three times.
- You can use the same picture over and over again to process a sample. Sometimes each pass produces a different result. Other times an interesting ›steady state‹ is reached (see below).
- ❖ Select ›chimes‹ from the Sounds menu to recall the original sample to the Sample Editor.
 - ❖ Recall preset #4 and change the source to Crossfaded Sample.
 - ❖ Synthesize the picture three or more times.



Try using different pictures on each pass.

After the second pass, each synthesis produces roughly the same rhythmic sound. This is the last clip on CD audio track 39.

- ❖ Load the sample named ›sgreat‹ into the Sample Editor.
- ❖ Recall preset #5 and synthesize the picture.


This preset is modified from one of the presets in the ›Process.preset‹ bank on your MetaSynth CD-ROM.
- ❖ Recall preset #6 and synthesize the picture.



© 40—Sounds Great

This preset is obtained from a straight line at A220 by displacing the red channel then duplicating the red channel with inverted pitch.

3 Create a sample from a wave table.

- ❖ Recall preset #7-1 and type  to copy it to the clipboard.

This is a simple left-to-right pan filter.

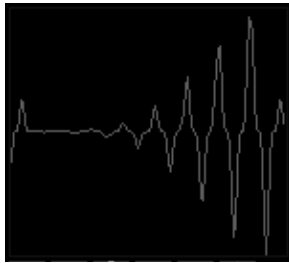
- ❖ Recall preset #2-1.

This is a blue harmonics template setup whose source is a sine wave in the Wave Table Editor.

- ❖ Choose ›Add Fundamental‹ from the Pitch Process menu.

Since the Image Area's tuning is set to ›A2‹ this puts a line at note 0.0 whose pitch is 220.5 H.

- ❖ Type ☐ to pan the line from left (red) to right (green).
 - ❖ Synthesize the picture.
- Use this technique to stereoize wave tables from the Wave Table Editor. Then use the stereo sample to synthesize other stereo pictures.
- ❖ Recall preset #2-2 and synthesize the picture.



This preset uses a hand made wave table with lots of highs as its source. The line has been lowered to the bottom of the picture and the Image Area's tuning has been set as low as possible—A-2. This puts the line's pitch at 3.44 H but the high frequency components of the wave table still produce audible results. The pulsing is from the low frequency components.

- ❖ Recall preset #5 and synthesize the picture using the sample you just created from the wave table.
- Use this technique to create unusual rhythmic effects. Try using different Image Area tunings for the second synthesis. Also try repeating the processing several times with different tunings.

© 41—hmmmm

- ❖ Recall preset #2-3 and synthesize the picture.
This picture contains lines at several of harmonics and uses a sine wave as its source.
- ❖ Recall preset #2-4 and synthesize the picture.
This is another picture with harmonic lines. In this case the source wave table also has some slight octave harmonics.

- Use this technique to get separate ›envelopes‹ for each harmonic. Very interesting synth-like samples can be created this way. Don't forget you can make Instruments out of several of these samples using different Image Area tunings and Filter window filters.

4 Create a sample from the FM Synth.

- ❖ Choose ›Procedural Synth‹ from the Sounds menu to open the FM Synth.
- ❖ Load the FM Setup named ›1.fm.‹
- ❖ Preview the FM sound.



Notice that the Evolution frequency is set to 30. Since this is in BPM and one envelope cycle is one beat, the evolution will take two seconds.

- ❖ Click the FM Synth's ›Apply‹ button and close the window.



The Sample Editor will now contain one cycle of the FM sound lasting two seconds.

- Use the FM Synth's Apply button to replace the current sample or selection in the Sample Editor with the FM Synth sound. (The reason we got exactly one cycle in the step above is that there was already a two second sample in the Sample Editor.)



- ❖ Close the FM Synth and recall Image Synth preset #2-5.
- ❖ Synthesize the picture.

- Just as with wave tables, you can use the Image Synth to create samples from the FM Synth. Use this technique when you want to change the pitch of the carrier (remember the modulator and envelope don't change) or add ›harmonic envelopes‹ as in Step 3.

- ❖ Recall preset #2-6 and type  to copy it to the clipboard.
- ❖ Open the Filter window and type  to paste the clipboard into its Image Area.
- ❖ Apply the filter to the sample.

Cd audio track 42 contains the applied FM sample, the synthesized version and the filtered, synthesized version.





 **42**—Applied FM

5 Create a spectrum and a spectral filter.

- ❖ Load the sample named ›Anna oh‹ into the Sample Editor.
- ❖ Select a short section in the sustain portion of the sample.
- ❖ Choose ›Instant Spectrum...‹ from the Morph menu.

When the Save window opens, save the spectrum as ›Anna oh.spct.‹

- ▶ Use Instant Spectrum to create a multi-cycle wave from a sample. (About 2,000 samples are used and this gives a much more accurate representation than the Wave Table Editor's 200 sample ›From Sample‹ option.)

- ❖ Type   to select the whole sample.
 - ❖ Click the Sample Editor's repeat button twice to create a longer sample.
 - ❖ Choose ›Synthesize Spectrum...‹ from the Morph menu.
- When the Open window appears, choose the spectrum named ›Anna oh.spct.‹


The sample named ›AnnaSynth‹ in the Tutorial 14 folder is an example of this process.

- ▶ Use Synthesize Spectrum to replace the sample or selection in the Sample Editor with the multi-cycle wave form created by the Instant Spectrum command.

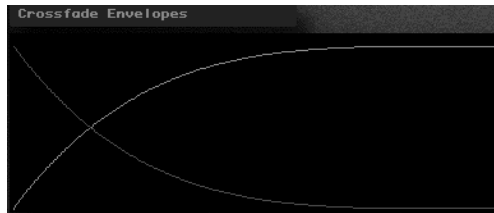


- ▶ You may want to fade-in and fade-out small portions at either end of the sample then normalize it for the most usable results.
 - ❖ Load the sample named ›guitar‹ into the Sample Editor.
 - ❖ Choose ›Spectrum Filter ...‹ from the Morph menu.

When the Open window appears, choose the spectrum named ›Anna oh.spct.‹

This has been saved as the sample ›AnnaTar.‹
 - ❖ Type F to open the Sample Editor's Crossfade window.

When the Open window appears, select the sample named ›guitar.‹
 - ❖ Create the crossfade envelope shown in the illustration and click the green check mark to crossfade the ›AnnaTar‹ and ›guitar.‹

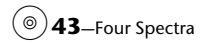


- ▶ Use Spectrum Filter to apply the formants of an instant spectrum to the sample or selection in the Sample Editor.
- ▶ Crossfade a spectrum filtered sample with the original to create morphed samples. This sample has been saved as ›AnnaTarXf.‹

More Things to Try

- ◆ Mix several synthesized spectra to form new composite sounds.
 - ❑ Create Instant Spectra for different samples or significantly different parts of the same sample.

- ❑ Load or create a sample of the length you wish for the end result. The purpose of this step is to create a time base.
- ❑ Synthesize one of the spectra and copy it to the Sample Editor's clipboard.
- ❑ Synthesize the other spectra.
- ❑ Choose ›Merge...‹ from the Edit menu and merge the two synthesized spectra with an appropriate envelope.
- ❑ Synthesize the remaining spectra merging each new sample with the previous composite sample.



Summary

In this tutorial you learned how to:

- ◆ Use samples as the Image Synth's synthesis source (Step 1).
- ◆ Repeatedly process the sample in the Sample Editor (Step 2).
- ◆ Create harmonically complex samples with separate harmonic envelopes (Step 3).
- ◆ Apply FM Synth sounds to create samples (Step 4).
- ◆ Create and use instant spectra from samples in the Sample Editor.

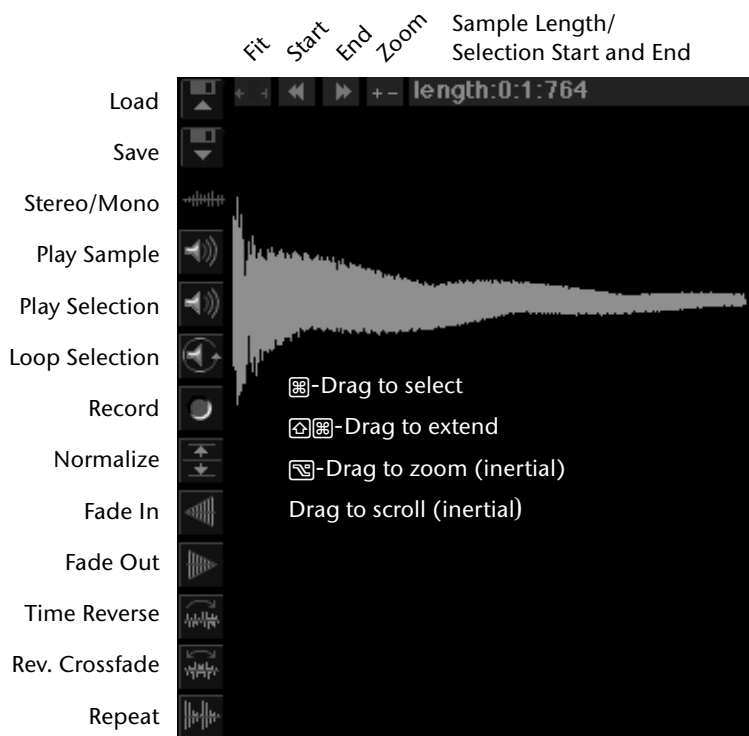
What's in the ›Tutorial 14‹ Folder

Name of File	Description
14.presets	All presets and filters
1.fm	FM Synth setup used in Step 4
Anna oh	Vocal sample used in Step 5
Anna oh.spct	Spectrum from sustain part of Anna oh sample
AnnaSynth	Synthesized spectrum from Anna oh.spct
AnnaTar	Guitar spectrum filtered with Anna oh.spct
chimes	Sample used in Step 2
sgreat	Sample used in Step 1

4 The Sample Editor

MetaSynth contains a powerful sample editor with some very sophisticated built-in Dsp. As with everything else MetaSynthian, both the editor and its Dsp are a little bit different.

Things not to look for in the Sample Editor include sample looping, regions and markers and ultra-precise selecting and editing tools. But, MetaSynth will import and export both Sound Designer II and AIFF format sound files so you can use your favorite sample editor for these processes before or after using MetaSynth's sample editing features.



- If you want to preview samples in MetaSynth's Sample Open window before loading them, save them in Sound Designer II format—this is the only format that supports previewing.

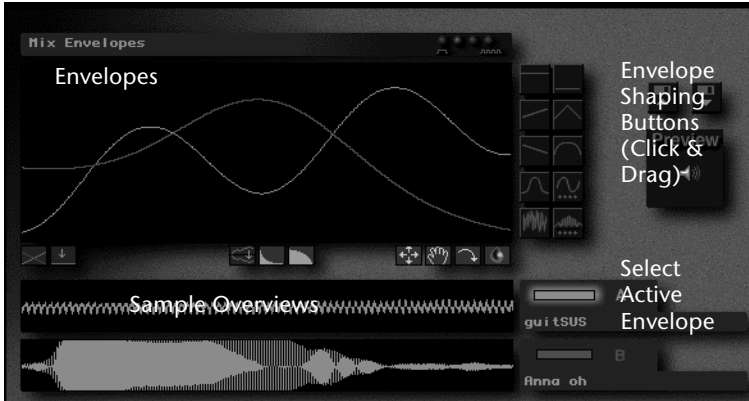
The Sample Editor is a background window—it can't be moved or sized but it can be hidden (and unhidden) by choosing ›Hide Document‹ (⌘W) from the Windows menu. When hidden, the Macintosh desktop provides the background for the rest of the MetaSynth windows.

Like all MetaSynth windows, the Sample Editor has buttons on the borders for the most common tasks. Most of these tasks are selectable from menus and have key command shortcuts. In particular, the Edit menu shortcuts (copy, paste, undo, etc.) use ⌘ like other Macintosh applications. MetaSynth's sample editing functions divide roughly into two categories:

- ◆ Those involving a single sample—the one in the Sample Editor...
- ◆ ...and those involving two samples—the one in the Sample Editor together with one on the clipboard or on your hard drive.

The border buttons as well as most of the selections on the Edit, Sounds and Transform menus affect only the sample in the Sample Editor. ›Merge...‹ on the Edit menu is an exception. Most of the selections on the Morph menu involve two samples. ›Osc Bank PhaseVocoder...‹ and ›Wave Shaping...‹ are exceptions.

Many of these sample editing functions involve time based envelopes for one or both of the samples involved. Although the details of the windows where you create these envelopes vary, the basic design is the same.



If only one sample is involved there is a single red envelope. If two samples are involved there are red and green envelopes. In the case of Cross Convolve, there is also a third, blue envelope. When there are two envelopes, they can be independent as in the ›Cross Mix...‹ window illustrated above or they can be symmetrical—changing one affects the other—as in the ›Crossfade...‹ window. As with the Wave Table Editor and Procedural Synth, the buttons work by dragging—they morph from the current shape to the shape indicated by their icon.

In most of the windows with envelopes, you can load and save envelopes to disk. The envelope format is the same as the wave format for the Wave Table Editor so envelopes and waves can be exchanged.

MetaSynth's Effects window offers fourteen Dsp effects, each with several parameters. These range from standard effects like echo, reverb, chorus, flange and Eq to more unusual effects like inertia, stretch, grain and shuffler.





The tutorials in this section will give you an overview of MetaSynth’s powerful effects processing capabilities, but this is only a beginning. The more you explore, the more you will find.

Tutorial 15: Basic Processes

In this tutorial we'll look at some of the basic DSP functions available from the Transform menu.

1 Load a sample and compress it.

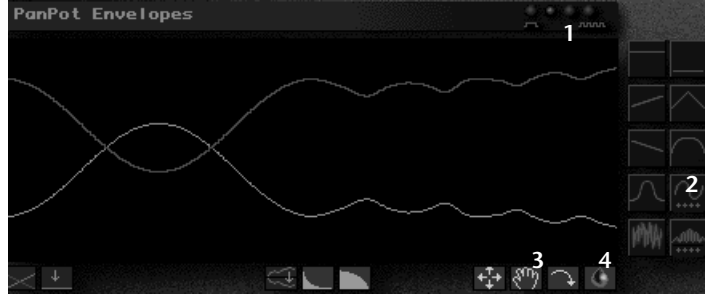
- ❖ Load the sample named ›hmm‹ into the Sample Editor.
This sample is the sound effect constructed in Step 3 of Tutorial 14.
- ❖ Play the sample by clicking the Play button or pressing .
You can stop playback at any time by clicking in an empty portion of the Sample Editor or pressing  again.
- ❖ Select ›Compress‹ from the Transform menu and listen to the sample.

► MetaSynth's Compress function has no user parameters—the results are usually satisfactory. If you need other threshold, amount, attack and release settings, you can always compress the sample in another sample editor or outboard compressor then work on it in MetaSynth.

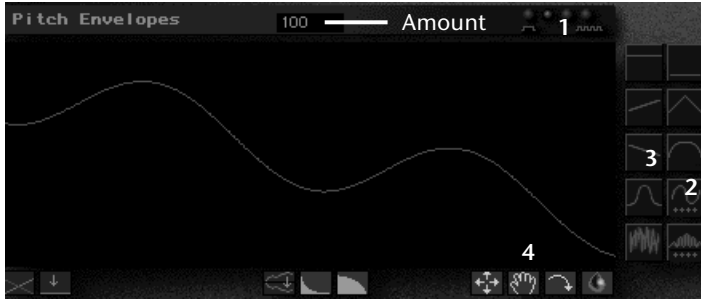
► There is also a Limiter function on the Transform menu. Like Compress, its parameters are fixed but it is handy for knocking down hot spots.

2 Apply a pan envelope to the sample.

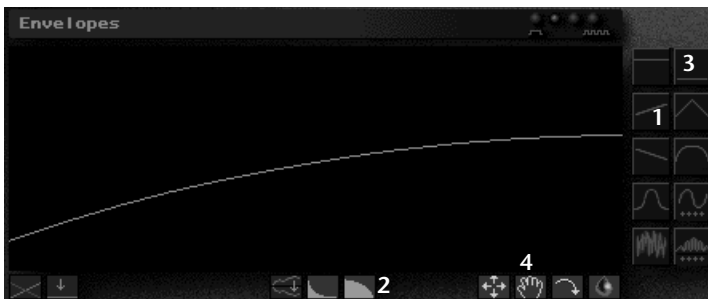
- ❖ Choose ›Pan Envelope...‹ from the Transform menu.



- ❖ Use the buttons as numbered in the illustration—clicking and dragging with the mouse to create the envelope shown.
 - ❖ Click the green check mark to apply the pan envelope to the sample.
- ▶ The Pan Envelope can be applied to mono or stereo samples. The red line (top in the illustration) controls the position of the right input of a stereo sample and of the position of the only input of a mono sample. The green line controls the position of the left input of a stereo sample.
 - ▶ The top of the Pan Envelope window represents the left output and the bottom represents the right output. This means, for example, that if you put the red line on the bottom and the green line on top, the sides of a stereo sample will be reversed.
 - ▶ The Pan Envelope is symmetrical—any change made in either line will be reflected in the other.
- 3** Apply a pitch envelope to the sample.
- ❖ Choose >Pitch Envelope...< from the Transform menu.



- ❖ Use the buttons as numbered in the illustration to create the envelope shown.
 - ❖ Set the amount of the pitch envelope to 100.
- The amount is measured in tenths of a semitone with a range of ± 360 (\pm three octaves). This amount represents the change from the center to the top and bottom of the envelope window. Negative amounts mean the top represents lower pitch and the bottom, higher pitch.
- ❖ Click the green check mark to apply the pitch envelope to the sample.
- 4** Apply a volume envelope to the sample.
- ❖ Choose >Envelope...< from the Transform menu or type $\text{⌘}[\text{E}]$.



- ❖ Use the buttons as numbered in the illustration to create the volume envelope shown.
- ❖ Click the green check mark to apply the volume envelope to the sample.

5 Filter the sample.

- ❖ Open the Filter window.
- ❖ Choose ›Open Pict File...‹ from the Filter window's disk menu and open the file named ›filter.p.‹



This filter broadens to full spectrum emphasizing the graininess as well as the low frequencies at the end of the sample.

- ❖ Apply the filter.

6 Clean up the sample.

- ❖ Choose ›Clean‹ from the Transform menu.

CD audio track 44 contains an example of these six steps applied to the sample from track 41. Compare the two versions.

- The Clean function actually performs three common clean-up operations: first it removes any DC offset from the sample; next it normalizes the sample and finally it fades the ends. Each of these functions is also available separately. Remove DC Offset and Normalize are on the Transform menu—Fade In and Fade Out are on the Edit menu.



© 44—hmmmmm redux

More Things to Try

◆ SuperSymmetry

- ❑ Load a sound effect sample such as the one used in this tutorial into the Sample Editor.
- ❑ Choose ›Pan Envelope...‹ from the Transform menu.
- ❑ Use the Flat Line button to position the red (right source) line at the top of the screen and the green (left source) line at the bottom. Click the green check mark to apply the pan envelope.



This reverses the stereo channels.

- ❑ Click the Repeat button to repeat the sample.
- ❑ Type **⌘C** to save the sample to the clipboard.
- ❑ Reload the original sample.
- ❑ Click the Time Reverse button to reverse the sample in time.
- ❑ Click the Repeat button to repeat the sample.
- ❑ Select ›Merge...‹ from the Edit menu to merge the sample with the clipboard.
- ❑ Click the Cross Lines button to create a crossfade.
- ❑ Click the Square button twice then click the Square Root button three times to create a fast crossfade in the middle.
- ❑ Click the green check mark to merge the sample with the clipboard.



The time-reversed sample is followed by the pan-reversed original.

◆ Create a stereo file from two mono files.

- ❑ Load a mono sample or load a stereo sample and click the Stereo/Mono button to convert it to mono.
- ❑ Open the Pan Envelope window and click the Flat Line button to position the mono file in the right channel of a stereo sample.
- ❑ Type **⌘C** to copy the sample to the clipboard.

If you merge samples of different length, the result will be as long as the longer sample.



Use this technique with the same mono sample processing it the first time with ›Remove Highs‹ from the Transform menu and processing it the second time with ›Remove Lows‹ to create an in-your-face stereo effect. Other processes produce interesting results as well.

- ❑ Load another mono sample of approximately the same length.
- ❑ Open the Pan Envelope window and click the Reverse Envelopes button to position the mono file in the left channel of a stereo sample.
- ❑ Select ›Merge...‹ from the Edit menu to merge the sample with the clipboard.
- ❑ Use the Flat Line and Hand buttons to merge equal amounts of the sample with the clipboard.
The first mono sample will be on the right and the second will be on the left.

Summary

In this tutorial you learned how to:

- ◆ Compress and limit samples (Step 1).
- ◆ Create and apply pan envelopes (Step 2).
- ◆ Create and apply pitch envelopes (Step 3).
- ◆ Create and apply volume envelopes (Step 4).
- ◆ Apply a graphic formant filter (Step 5).
- ◆ Clean up a sample by normalizing, removing Dc offset and fading the ends (Step 6).
- ◆ Create symmetric sound effects (More Things to Try).

What’s in the ›Tutorial 15‹ Folder

Name of File	Description
filter.p	Filter used in Step 5
hmm	Sound effect sample

Tutorial 16: Shape, Pitch and Time Processes

In this tutorial we'll explore two of the more extreme, single-sample processes: wave shaping and phase vocoding. Wave shaping radically changes the harmonic content of a sample. It's a lot like dragging on the wave table in the Wave Table Editor but applied in real time to the sample. Phase vocoding is used to independently time and/or pitch shift the sample.

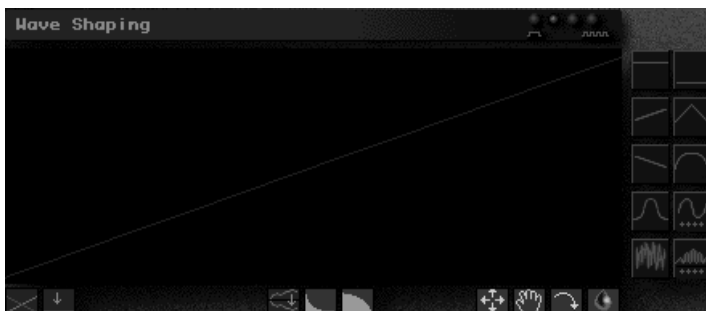
1 Wave shape some wave tables.

► Keep your monitor levels *low* when using the wave shaper.

- ❖ Load the sample named ›sine.<
- ❖ Zoom the sample and click the start button to show the beginning of a cycle at the left edge of the Sample Editor.

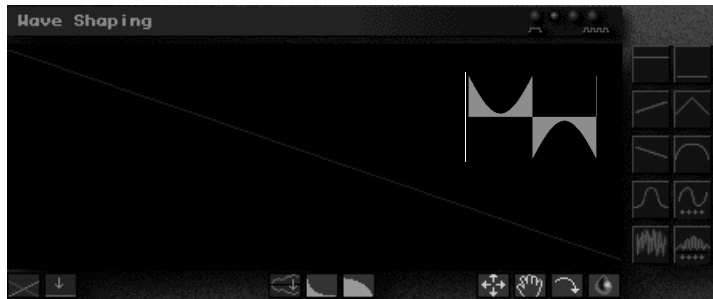


- ❖ Choose ›Wave Shaping...< from the Morph menu.





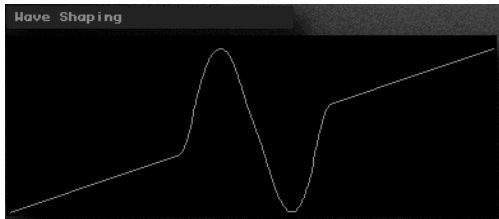
- ❖ Click the Cross Lines button to create an upward sloping diagonal line.
- ❖ Click the green check mark to wave shape the sample.
- The wave shaping ›envelope‹ is actually an amplitude map and the upward sloping diagonal means that the new amplitude value is always the same as the old. There will be no change in the wave form—have a look at the sample. To get an idea of what's what—the horizontal position represents the incoming amplitude and the vertical position indicates the outgoing amplitude.
- ❖ Choose ›Wave Shaping...‹ again from the Morph menu.



- ❖ Click the Reverse Envelope button to create a downward sloping diagonal line.
- ❖ Click the green check mark to wave shape the sample.
The downward sloping diagonal reverses all amplitudes and the wave form that results is shown in the inset to the illustration.
- ❖ Open the Wave Shaping window again and immediately click the green check mark to apply the downward sloping diagonal again.
Since we've just reversed the amplitudes again, we're back to the sine wave.
- ❖ Load the sample named ›revsaw.‹



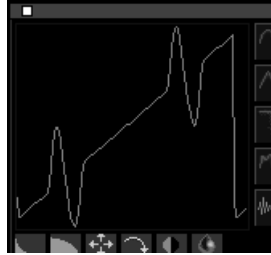
- ❖ Open the Wave Shaping window and drag on the diagonal to create the shape shown in the illustration.



- ❖ Click the green check mark to wave shape to the sample.



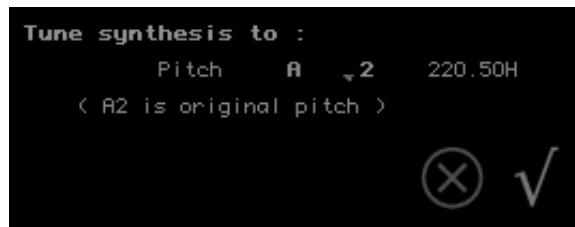
- ❖ Drag right on the Wave Table Editor's From Sample button to capture the wave shape as a wave table.



- ▶ Use the Wave Table Editor's From Sample button to capture any wave shape applied to a single-cycle wave form.
- ▶ To convert a wave shaping envelope into a wave form first use it to shape a reverse sawtooth as above. Next, choose ›Octave down‹ from the Transform menu or type `⌘⇧⌘` to lower it an octave. Finally, drag the Wave Table Editor's From Sample button. (Some of the envelope shaping tools are not available in the Wave Table Editor.)
- ▶ Start with any wave table as a starting point then use the wave shaper to create interesting new wave tables.

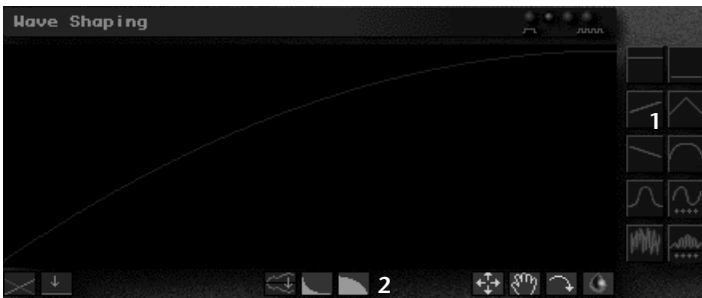
2 Wave shape a guitar spectrum to add some grunge.

- ❖ Choose ›Synthesize Spectrum‹ from the Morph menu and when the Open dialog appears, select the spectrum file named ›guitsUS.spct.‹ When the ›Tune synthesis to:‹ dialog box opens, click the green checkmark to preserve the original tuning.



This is an instant spectrum of the sustain part of the guitar sample from Tutorial 14.

- ▶ Tuning adjustments should always be set relative to A2. If the original sample was tuned to G2 for example, then a setting of ›A2‹ would synthesize the spectrum to G2 and a setting of ›B2‹ would synthesize the spectrum to A2.
- ▶ Retuning the spectrum is done before the resynthesis and is preferable to pitch shifting the resulting sample.
- ❖ Open the Wave Shaping window.

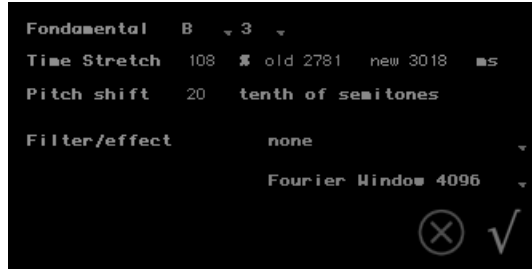


- ❖ Use the buttons as numbered to create the exponential envelope shown in the illustration.
- ❖ Click the green check mark to wave shape the sample.
- ▶ A little wave shaping can beef up a wimpy sound, but remember a little goes a very long way with wave shaping.

© 45—Wave Shaping

3 Tune a sample with the Osc Bank PhaseVocoder.

- ❖ Load the sample named ›xvbendB3C4.‹
This sample is derived from the MetaSynth CD sample ›xvoices B3‹ by adding a pitch envelope to bend the note up a semitone from B3 to C4.
- ❖ Choose ›Osc Bank PhaseVocoder‹ from the Morph menu.



- The PhaseVocoder breaks the sample into small slices then shifts and/or stretches them before pasting them back together. This allows for independent time and pitch changes.

- ❖ Use the settings shown in the illustration then click the green check mark to phase vocode the sample. (This can take a while.)

The pitch has been shifted up two semitones so the chord now bends from C#4 to D4. It has also been lengthened slightly to match the sample we're going to mix it with next. If we tried to use a pitch envelope instead of the phase vocoder, the time would contract as the pitch was raised.

- The ›Fourier Window‹ setting determines the granularity of the FFT analysis used by the PhaseVocoder. Higher values increase time resolution while low numbers increase pitch resolution.
- Use the ›Filter/effect‹ menu to apply different filters or effects during the phase vocoding process. The Harmonic Filter, Odd Harmonics and Octaves selections are relative to the chosen fundamental. The effect named ›FFT Inertia‹ is especially interesting.

4 Cross Mix two vocal samples to form a chord.

- ❖ Load the sample named ›xvblendB3C4+p.‹

This sample has been stereoized from the phase vocoded sample above and has been panned from center to far left.

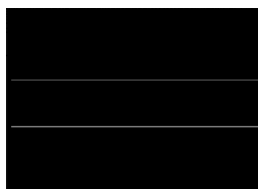
- ❖ Choose ›Cross Mix...‹ from the Morph menu and when the Open dialog appears, select the sample named ›rvbendA2G2.‹

This is another vocal sample. It has been pitch bent from A2 to G2 and panned from center to far right.

- ❖ Create the cross mix curve shown in the illustration (green line on top) and click the green check mark to cross mix the two samples.



46—Bent Vocals



- Morph menu choices ›Mix 50%...‹, ›Cross Mix...‹ and ›Crossfade...‹ offer three ways to combine two samples (stereo or mono). The simplest is ›Mix 50%...‹ which simple mixes the two samples at equal volume. The difference between ›Cross Mix...‹ and ›Crossfade...‹ is that the volume envelopes are completely independent with cross mixing. With cross fading, the envelopes are tied together—changes on one cause inverse changes in the other.

More Things to Try

- ◆ Extreme phase vocoding.
 - ❑ Load the sample named ›fm.‹
 - ❑ Open the PhaseVocoder and set the pitch change to -240 (two octaves down), set the time to 150 % and set the Fundamental to C1.
 - ❑ Click the green check mark to phase vocode the fm sound effect.
- Don't just think of the PhaseVocoder as a pitch and time machine—it's also a great effects processor.

Summary

In this tutorial you learned how to:

- ◆ Apply wave shaping to wave forms (Step 1).
- ◆ Apply wave shaping to samples to add grunge and beef (Steps 2 and 3).
- ◆ Use the Osc Bank PhaseVocoder to pitch shift and time stretch a sample (Step 4).
- ◆ Cross Mix two samples (Step 5).

What's in the ›Tutorial 16‹ Folder

Name of File	Description
fm	Sample used in Step 3
guitsus.spct	Spectrum used in Step 2
revsaw	Wave table sample used in Step 1
rvbendA2G2	Other voice sample used for cross mixing in Step 4
sine	Wave table sample used in Step 1
xvbend B3C4	Voice sample used for phase vocoding in Step 4
xvbendB3C4+p	Vocoded and panned voice sample used for cross mixing in Step 4

Tutorial 17: Formant Filters and Convolution

In this tutorial we'll look at processes that apply some characteristics of one sample (on your hard drive) to another sample (in the Sample Editor). The Morph menu has four processes of this type: Cross Convolve, Fit Amplitude, Formants Filter and Convolve.

1 Gate one sample with another.

- ❖ Load the sample named ›BentVocal.<

This is a normalized, mono version of the vocal sample created in Step 5 of Tutorial 16.

- ❖ Choose ›Fit Amplitude...< from the Morph menu and when the Open window appears, select the sample ›Groove.<

This is the drum groove from Tutorial 3.

- ❖ Normalize and play the sample.

- Use Fit Amplitude to apply the amplitude of one sample to another. This works especially well when percussion loops are applied to sustained sounds.





2 Vocode noise with a voice sample.



- ❖ Load the sample named ›Nsg.<


This is the vocal sample we used in Tutorial 9 to sculpt white noise from the Filter window.

- ❖ Choose ›White Noise< from the Sounds menu.

This creates a white noise sample the same length as the Nsg sample.

- ❖ Type   to copy this noise sample to the clipboard.
- ❖ Choose ›Formant filter...< from the Morph menu.

- ❖ When the Open window appears, select the sample ›Nsg‹ and play the sample.
- ❖ Type V to recall the noise sample from the clipboard.
- ❖ Choose ›Convolve...‹ from the Morph menu (or type K).
- ❖ When the Open window appears, select the sample ›Nsg‹ and play the sample.

 47—Nsg x3

- ▶ Formant filtering and convolving produce similar results but formant filtering uses broader bands and is therefore smoother and often less ›accurate‹ in reproducing speech. Vocoding (not phase vocoding as in Tutorial 16) is one application of formant filtering. CD Audio track 47 compares formant filtering using the Filter window (first clip), formant filtering using the Morph menu (second clip) and convolving.

3 Vocode a pad with a voice sample.

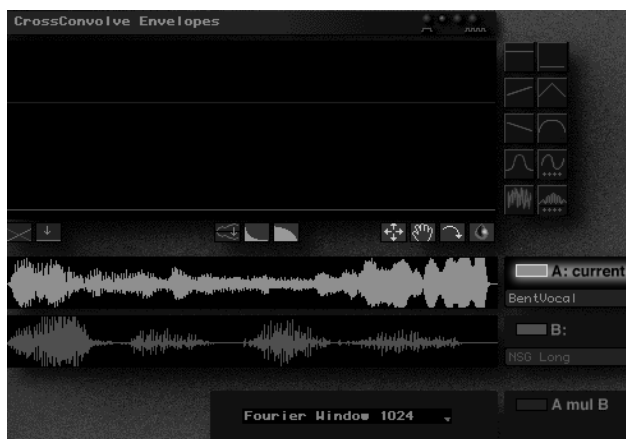
- ❖ Load the sample ›BentVocal.‹
This is the pitch bent, combination vocal chord from Step 5 of Tutorial 16.
- ❖ Choose ›Formant filter...‹ from the Morph menu and when the Open window appears, select the sample named ›Nsg Long.‹
This is a time stretched version of the vocal sample used in Step 2.
- ❖ Re-load the sample ›BentVocal.‹
- ❖ Choose ›Convolve...‹ from the Morph menu and when the Open window appears, select the sample named ›Nsg Long.‹

- ▶ As mentioned above, convolving usually renders the speech better than formant filtering. When the ›carrier‹ is noise, this isn't so obvious but the less highs the carrier has, the more noticeable the difference.

4 Cross Convolve a pad with a vocal sample.

- ❖ Re-load the sample ›BentVocal.‹

- ❖ Choose ›Cross Convolve...‹ from the Morph menu and when the Open window appears, select the sample named ›Nsg Long.‹



- Cross Convolve is the most flexible of the formant filtering and convolution functions. It is a symmetric process—each input sample is convolved with the other—so that the formant characteristics of each sample stand out more. It also allows you to mix each of the originals with the convolved result and you have completely independent envelopes for each: sample in memory (green and top), sample on disk (red and middle) and cross convolve (blue and bottom).

- ❖ Click the ›A:current‹ button then click the Flat Line button to remove any of the current sample from the final mix.
- ❖ Click the ›B:‹ button then click the Flat Line button to remove any of the disk sample from the final mix.
- ❖ Click the ›A mul B‹ button and use the Line button to raise the blue line nearly to the top of the window.
This sets the level of the convolved sample in the final mix.
- ❖ Set the Fourier Window to 4096.



As with the phase vocoder, this sets the resolution of the convolve process. Here, more is usually better (and slower)—4096 is the max.

- ❖ Click the green check mark to cross convolve the samples.

Notice that the speech is rendered better than with either formant filtering or convolving.

- ❖ Re-load the sample ›BentVocal.<
- ❖ Again, choose ›Cross Convolve...< from the Morph menu and when the Open window appears, select the sample named ›Nsg Long.<



The red and green lines are really just a cross mix of the original samples. Adding a little of this to the convolution can both improve the rendering of speech samples and yield interesting morphs.

- ❖ This time, mix a little of both samples in.
The pad (green) is the lowest line and the voice (red) is the middle line in the illustration.
- ❖ Click the green check mark to cross convolve the samples.

© 48—Nsg Chords x4

- CD audio track 48 contains the original, time-stretched voice sample followed by the results of formant filtering, convolving, cross convolving without the originals and cross convolving with the originals.

More Things to Try

- ◆ Use Cross Convolve to create morphed instrument samples.
 - ❑ Load an instrument sample to use for the attack portion of the sound.

© 49—Morphs

- ❑ Choose ›Cross Convolve...‹ from the Morph menu and select the sample to use for the sustain portion.
- ❑ Experiment with different red, green and blue envelopes until you get a satisfactory morphed sample.
- ❑ Create similar morphed samples across the desired pitch range.
- ❑ Choose ›New Instrument‹ from the Instrument menu and create an instrument from the samples.

Summary

In this tutorial you learned how to:

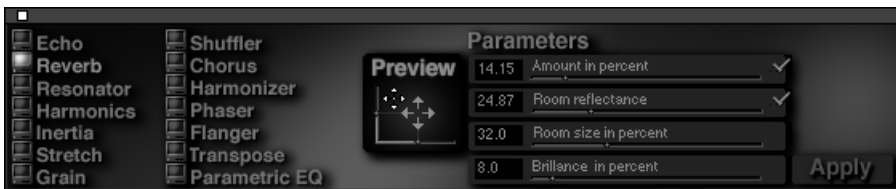
- ◆ Gate one sample with the amplitude envelope of another using ›Fit Amplitude...‹ (Step 1).
- ◆ Use ›Formant filter...‹ and ›Convolve...‹ to vocode noise with a voice sample (Step 2).
- ◆ Use ›Formant filter...‹ and ›Convolve...‹ to vocode a pad sample with a voice sample (Step 3).
- ◆ Use ›Cross Convolve...‹ to vocode a pad with a vocal sample (Step 4).
- ◆ Create morphed samples using ›Cross Convolve...‹ (More Things to Try).

What's in the ›Tutorial 17‹ Folder

Name of File	Description
BentVocal	Vocal chord sample
Groove	Drum groove sample
Nsg	Voice sample
Nsg Long	Time stretched voice sample

Tutorial 18: The Effects Window

MetaSynth's Effects window contains fourteen Dsp effects which can be applied to whole samples or selections within samples. These effects range from the common to the truly bizarre. We'll play with a few of the more bizarre ones in this tutorial to get a feeling for how the Effects window works.



The Effects window is fairly simple to operate—select an effect, set a few parameters and click the ›Apply‹ button. The current sample or selection is then processed with the effect.

You can set the parameters in three ways: scroll the numericals at the left end of each parameter bar; select the numerical and type in a value or use the xy-Control in the Preview button.

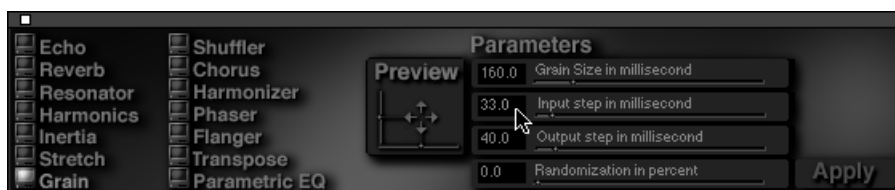
The parameters that are changed by the xy-Control are indicated by the green check marks at the end of the parameter bars. The rules are:

- ◆ Horizontal motion affects the first or third parameter.
- ◆ Vertical motion affects the second or fourth parameter.
- ◆ Only one horizontal and one vertical parameter can be changed at a time. (If you select two, the top-most one will be changed.)
- ◆ Horizontal motion to the right increases a parameter's value.
- ◆ Vertical motion down increases a parameter's value.
- ◆ Most xy-Control changes preview in real time. (Resonator ›Semitones‹ is an exception.)

- ▶ Even though xy-Control changes preview in real time, there is only one set of parameters per application of an effect. Parameter changes are *not* dynamic.

1 Pick out and add harmonics to a chime-like sound.

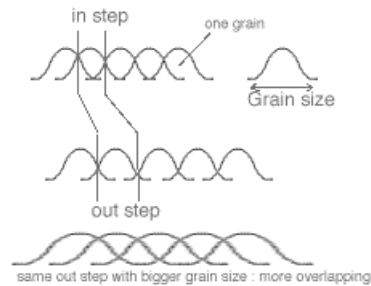
- ❖ Load the sample named ›chimes‹ from the Tutorial 18 folder and play it to hear how it sounds.
- ❖ Open the Effects window by selecting it from the Windows menu or typing **(⌘)3**.
- ❖ Select the Grain effect.



- ❖ Unclick all xy-Control green check marks and set the parameters as in the illustration.
 - ❖ Click the Preview button to preview the effect then click the Apply button to modify the sample.
- This sample has been saved as ›chimes I.‹
- ▶ Previewing an effect provides only a low resolution, mono version. It gives you a rough idea of the results—if it's close to what you want, apply it then undo (**(⌘)Z**) if you're not satisfied.

- ▶ Grain is a real-time granular synthesis algorithm. It breaks the sample up into slices (input step size) then granulates them (grain size) and splices them back together (output step size) for playback. Here are some rules of thumb:
 - ➡ $\text{Input Step} \div \text{Output Step}$ determines time expansion or contraction. (When time is contracted, the output is repeated to fill the original sample time.)
 - ➡ $\text{Grain Size} \div \text{Output Step}$ determines the graininess or smoothness of the result. (Ratios ≥ 4 produce smooth results—smaller ratios produce rhythmic pulses.)

- ➔ Small Input Step and Output Step sizes produce harmonic distortion favoring harmonics related to the Input Step size. (Randomization tends to counteract this.)
- Depending on the relation between these three size parameters the effect can cause anything from smooth timbral changes to radical rhythms. The illustration below, courtesy of Eric Wenger, shows the relation between these three settings.



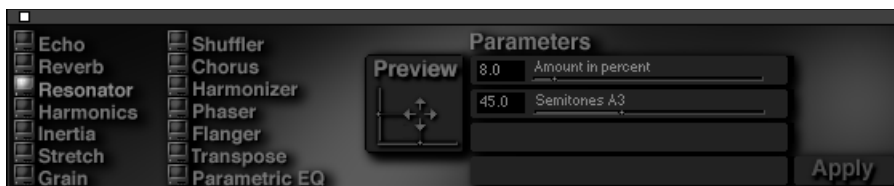
- Grain can radically alter the sample length and can leave the beginning of a ›grain‹ at the end of the sample which typically needs to be cropped (⌘⌘ after selecting the portion to retain).
- ❖ Experiment with other Grain settings then reload ›chimes I.‹
- ❖ Select the Harmonizer effect and set its parameters as shown in the illustration.



- ❖ Apply the effect.
This has been saved as ›chimes II.‹

- The Harmonizer mixes a transposed version with the original sample. The balance parameter controls the relative amounts and the transpose parameter sets the transpose amount. (In this case four semitones—a major third.) Experiment with different grain sizes for the smoothest results.

❖ Select the Resonator and set its parameters as shown.



❖ Apply the effect.

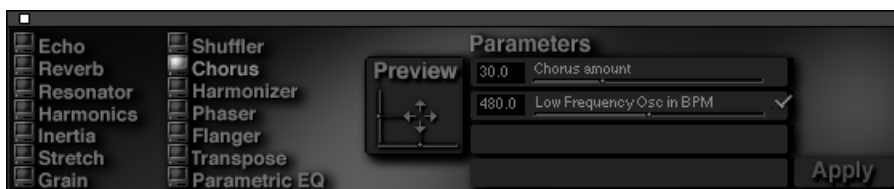
This has been saved as ›chimes III.‹ Cd audio track 50 contains a severely filtered version of this sample.



- The Resonator picks out harmonics embedded in the original sample. In this case we've resonated the fifth of the predominant pitch of the original sample which was D3. The result is a major triad (D3, F#3 and A3) embedded some where in the cacophony.

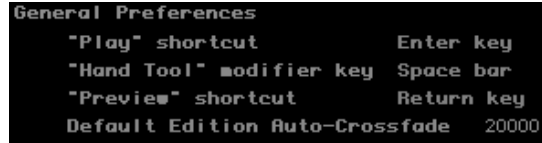
2 Apply effects to different parts of a sample.

- ❖ Load the sample named ›gongs.‹
- ❖ Select the Chorus effect and set its parameters as shown.



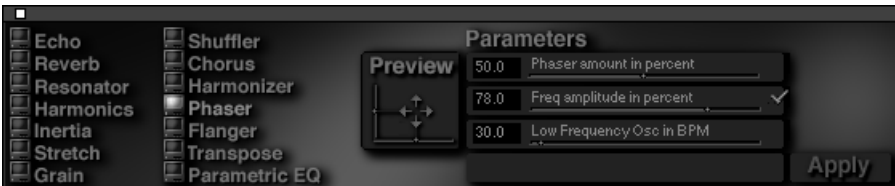
- ❖ Choose ›Preferences...‹ from the File menu or type **⌘P** to open the Preferences window.

- ❖ Set the ›Default Edition Auto-Crossfade‹ parameter to 20,000 samples.



- The Auto-Crossfade setting controls how much crossfade is used when applying any effect to a selection. (This applies to all MetaSynth operations, not just the Effects window.) 20,000 is the maximum setting and yields the smoothest results. (We'll use the minimum setting of 0 with a rhythmic sample in the next step.)

- ❖ Select roughly the first third of the sample.
- ❖ Apply the Chorus effect.
- ❖ Select roughly the next third of the sample.
- ❖ Choose the Phaser effect and set its parameters as shown.



- ❖ Apply the effect.
- ❖ Select the last third of the sample.
- ❖ Choose the Flanger effect and set its parameters as shown.



- ❖ Apply the effect.
- ❖ Type **⌘A** to select the whole sample and listen to the result.

This has been saved as ›gongs 3fx.‹

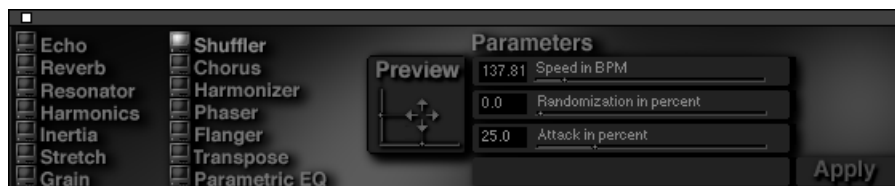
© 51—Gongs 3Fx

3 Create a repeated loop with different effects.

- ❖ Open the Preferences window (**⌘P**) and change the ›Default Edition Auto-Crossfade‹ setting to 0.

In this step, we do not want crossfades between the separately processed parts because each section is an exact four-bar rhythm pattern.

- ❖ Load the sample named ›rhythms.‹
- ❖ Type **⌘C** to copy it to the clipboard.
- ❖ Select the Shuffler effect and set its parameters as shown.



- The Shuffler breaks the sample into sixteen grains and splices them back together in something between their original and completely random order. It is an excellent tool for altering rhythm loops. If you want to keep the original rhythm of the loop, set the Speed parameter to the loop tempo.

- ❖ Apply the Shuffle effect.
- ❖ Type **⌘I** to insert the clipboard at the end of the sample.
- ❖ Change the Shuffle effect's Attack parameter to 12.5.
- ❖ Apply the Shuffle effect.
- ❖ Type **⌘A** to select the whole sample.

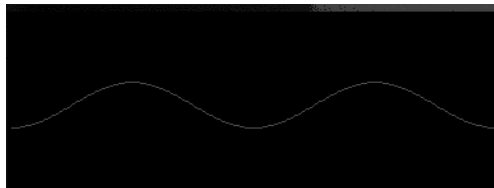
- ❖ Type **⌘I** to insert the clipboard at the end of the sample.
- ❖ Change the Shuffle effect's Attack parameter to 6.25.
- ❖ Apply the Shuffle effect.
- ❖ Type **⌘A** to select the whole sample.
- ❖ Type **⌘I** to insert the clipboard at the end of the sample.

This has been saved as ›shuffle rhythms.‹

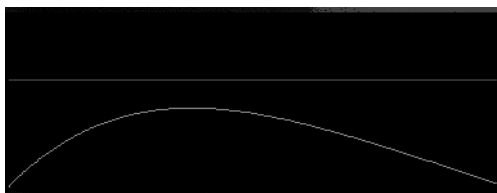
- ▶ You can repeatedly process and stack a rhythm loop by first copying it to the clipboard, then selecting the whole sample and inserting the clipboard at the end after each pass. Be sure to:
 - ➔ Keep the inserted clipboard image selected for the next effect.
 - ➔ Set the Preferences Auto-Crossfade time to 0.

More Things to Try

- ◆ Add overall effects after iterative processing as in Step 3.
 - ❑ Load the sample ›shuffle rhythms.‹
 - ❑ Choose the Transpose effect and set the Transpose to -12. This halves the tempo as well as lowering the pitch an octave.
 - ❑ Open the Wave Shaping window and starting with the upward sloping diagonal (no change) click the square button twice. This adds punch to the individual rhythm hits.
 - ❑ Copy the sample to the clipboard.
 - ❑ Open the Pitch Envelope window and apply small pitch shift to the sample with the contour shown. The amount is set to -12.



- ❑ Choose ›Merge...‹ from the edit menu and merge the sample with the clipboard in equal amounts.
 - ▶ You can create amazingly varied rhythm effects by combining Meta-Synth's various DSP processes.
 - ▶ You can create your own custom phasing effects by merging a sample with a pitch-enveloped version of itself.
 - ◆ Add sympathetic vibrations to a piano sample.
 - ❑ Load the sample ›Bosen F2f.‹
 - ❑ Choose the Inertia effect; set both parameters (Amount and Decay) to 100 then apply the effect.
 - ❑ Choose the Resonator; set the Amount to 20 and the Semitones to 48 (C4) then apply the effect.
 - ❑ Set the Amount to 15 and the Semitones to 53 (F4) and apply the effect again.
 - ❑ Choose Derivate from the Transform menu.
 - ❑ Normalize the sample.
 - ❑ Choose the Reverb effect; set the Amount to 30, Room Reflectance to 35, Room Size to 40 and Brilliance to 20 then apply the effect.
- This has been saved as ›Bosen F2f efx.‹
- ❑ Choose ›Cross Mix...‹ from the Morph menu and when the Open window appears, choose ›Bosen F2f.‹
 - ❑ Set the mix envelopes as shown (green line on bottom) then mix the samples.



This has been saved as ›Bosen F2f+.‹

- The Inertia effect simulates sympathetic vibrations; the Resonator highlights two harmonics and Derivate strips the lows from the sample. Similar iterative processing can often improve both synth and acoustic timbres.

Summary

In this tutorial you learned how to:

- ◆ Apply harmonic effects from the Effects window (Step 1).
- ◆ Apply crossfaded phasing effects to different parts of a sample (Step 2).
- ◆ Apply repeated rhythm effects to a percussion loop (Step 3).
- ◆ Combined DSP effects to create new rhythmic patterns (More Things to Try).
- ◆ Create custom phasing effects using pitch envelopes (More Things to Try).
- ◆ Add new resonances and harmonics to acoustic samples (More Things to Try).

What's in the ›Tutorial 18‹ Folder

Name of File	Description
Bosen F2f	Piano sample used in More Things to Try
Bosen F2f efx	Processed piano sample
Bosen F2f+	Mixed piano and processed piano sample
chimes	Sample used in Step 1
chimes I	First effect in Step 1
chimes II	Second effect in Step 1
chimes III	Third effect in Step 1
gongs	Sample used in Step 2
gongs 3fx	Final result in Step 2
rhythms	Sample used in Step 3
shuffle rhythms	Final result in Step 3
shuffle rhythm+	Processed and phased shuffle rhythms

Reference

MetaSynth on the Web

There are any number of valuable web resources available to the MetaSynth user. Since MetaSynth is both a graphics and a music program, you should explore sites dedicated to both of these areas. In particular, graphics, graphics software and utilities, MIDI files, sound files and sound editing software and utilities can all enhance your use of MetaSynth.

Here are three places to get started:

<http://www.uisoftware.com/> This is U&I Software's home page. It is the best source of MetaSynth news and update information. You will find numerous sound and graphics files here as well as useful tutorials, tips and tricks. This is also one of the best sources of links to other MetaSynth related web sites.


<http://www.wizoo.com/> Wizoo is the publisher of this as well as many other excellent books and CDs relevant to the electronic musician. Among other things, you will find update information on keeping this book current with new releases of MetaSynth—check the book update page ›MetaSynth‹.

<http://www.swiftkick.com/> This is my web site. You will find additional MetaSynth information here as well as links to other topics of interest to electronic musicians.

Glossary

Due to the tutorial nature of this book word-references are highly context sensitive. For this reason, the index has been omitted. Instead, this glossary provides brief definitions of the key terms used in the tutorials.

Term	Description
Brush	Various brushes (pen, spray, paint, note, etc.) are provided for adding and editing pixels in the Image Area.
Brush Grid	The distance in pixels between consecutive dots when in Dot Brush Mode
Brush Menu	A pop-menu for selecting the active Brush
Brush Mode	The type of line created by brush strokes. Three modes are provided: Dot, Line and Repeat.
Brush Size	Sets the width and height of brush strokes.
Color Channel	The part of the picture containing only the specified color. There are three color channels: Red, Green and Blue. The Blue channel is silent but is useful for templates.
Displacement Bank	A storage area for pictures used as Displacement Maps. Displacement Banks, Preset Banks and Filter Banks are all interchangeable.
Displacement Map	A picture used to alter another (target) picture by causing the target's pixels to be displaced by an amount relating to the displacement picture's pixel intensity. Any picture can be a displacement map—the word ›displacement‹ just refers to its intended use or its place of storage—i.e. the Displacement Bank.
Displacement Menu	A pop-up menu which appears in the Displacement window for selecting the active Displacement Map.
Displacement Window	A dialog window which is opened by double-clicking the Displacement button.
Effects Window	The MetaSynth window used for applying various DSP effects to sound files.
Envelope	A line graph used in various MetaSynth windows for setting the contour of a process. Envelopes are used for dynamic pitch change, panning, volume contour, mixing, Procedural Synth morphing, etc.
Filter	A picture used to alter another picture (Image Synth) or a sound file (Filter Window). Any picture can be a filter—the word ›filter‹ just refers to its intended use or its place of storage—i.e. the Filter Bank.







Term	Description
Filter Bank	A storage area for pictures which can be transferred to and from the Image Area for use in filtering other pictures or sound files. Filter Banks, Preset Banks and Displacement Banks are all interchangeable.
Filter Menu	A pop-up menu which appears in both the Image Synth and Filter window for selecting pictures from the Filter Bank.
Filter Window	The MetaSynth window used for creating and applying graphic filters to sound files.
FM Synth	See ›Procedural Synth‹.
Formants Filter	A 128 band, time varying filter derived from the frequency spectrum of one sound file and used to filter another.
Fourier	French mathematician
Grid Size	The distance in pixels used for Hot Filters and  -copying of selections. The Grid Size and the Brush Grid are completely independent.
Hot Filter	A selection of time processes accessible from buttons along the right edge of the Image Synth and which usually adapt in some way to the Grid Size.
Image Area	The portion of the Image Synth window devoted to the picture. The Image Area is surrounded by buttons and menus.
Image Synth	The MetaSynth window used for creating pictures and converting them to sound files.
Instant Spectrum	A frequency spectrum derived from an FFT analysis of the first few (≈45) milliseconds of the sound file in the Sample Editor. Actually the analysis starts with the left-most visible part of the sound file.
Instrument	A pitch-zoned collection of sound files which can be used as a sound source when synthesizing MetaSynth pictures.
Instrument Window	The MetaSynth window used for creating Instruments. Sound files are loaded and mapped in the Instrument window.
Marquee Tool	See ›Selection Tool‹.
Normalize Picture	A graphic process which proportionately increases the intensity of all pixels until the originally brightest pixels are at maximum intensity. This is the graphic equivalent of normalizing a sound file to achieve the maximum level possible without clipping.
Osc Bank Vocoder	An FFT derived process for independently varying the time and pitch of a sound file














Reference

Term	Description
Pitch Process Menu	An Image Synth menu for selecting graphic processes which affect some vertical aspect of the picture. These processes generally influence the pitch and timbral components of the sound when the picture is synthesized.
Preset	An individual picture stored in the active preset bank
Preset Bank	A storage area for pictures which can be transferred to and from the Image Area. Preset Banks, Filter Banks and Displacement Banks are all interchangeable.
Preset Menu	A pop-up menu in the Image Synth used for selecting pictures from the Preset Bank
Procedural Synth	The MetaSynth window used for creating multi-cycle, FM, morphed wave forms used as sound sources when synthesizing pictures in the Image Synth.
Sample Editor	The MetaSynth window used for viewing and editing sound files (samples). This window is not sizeable or moveable.
Scale	The correlation of Image Area pixel rows with pitch
Scale Window	The window used to create, load and save custom scales for use in synthesizing Image Synth pictures. The Scale Window is opened by selecting ›Custom Scale...‹ from the Image Synth's Map menu.
Selection Tool	A tool on the Brush Menu for selecting areas within the Image Area. Selections can be separately moved and otherwise modified by the various Image Synth processes.
Snap Grid	See ›Brush Grid‹.
Synthesize	The process of converting Image Synth pictures to sound files
Time Process Menu	An Image Synth menu for selecting graphic processes which affect some horizontal aspect of the picture. These processes generally influence the time component of the sound when the picture is synthesized.
Transfer Mode	The effect of the source picture's pixels on the target picture when dragging selections and pasting or inserting from the clipboard. Filtering is one example—it is the same as pasting from the clipboard using the ›Multiply‹ Transfer Mode.
Wave Table Editor	The MetaSynth window used for creating single-cycle waveforms used as sound sources when synthesizing pictures in the Image Synth.




Process Sequences




Many handy Image Synth processes involve repeated sequences of keystrokes and menu selections. Here is a list of some useful ones (but first, the abbreviations):



















Abbreviation	Description
 ...  ,  etc.	Type that key.
 ,  ,  , <i>ctrl</i>	Hold this modifier key while acting.
DUR=	Double-click the Duration button and set the duration in units given.
X= (Y=)	Set the Image Area width (x-value) or height (y=value).
R/G/RG/B/RGB	Set the channel to red-only/green-only/red and green/blue-only/all colors.
COLOR=	Brush Color
TXF=	Transfer mode (this replaces the Brush Size menu for the Selection tool)
BTN=	Press button (Normalize, Smooth, Interpolate, etc.).
pic	Load, recall or draw a picture.
>PRESET	Save picture as preset.
PRESET	Recall preset.
>FILTER	Save picture as filter.
FILTER	Recall filter.






























- ◆ Layer several pictures:
pic1, , pic2, , , pic3, , , ...
- ◆ Fade one picture into another:
pic1, , pic2, , TXF=Fade in
OR: pic2, , pic1, , TXF=Fade out
OR: pic1, , pic2, , TXF=Fade in out
(Fades pic1 in and out of pic2)
- ◆ Fade picture in, out or in and out:
pic, ,  (fade in and out)

Reference

OR: pic, , , , TxF=Fade in (fade in)

OR: pic, , , , TxF=Fade out (fade out)

- ◆ Compress picture to half size:
BTN=Scale with  (horizontal)
BTN=Scale with   (vertical)
- ◆ Reverse crossfade (picture width unchanged):
, , 
- ◆ Reverse repeat (doubles width of picture):
 $X=2 \times X$, , , 
Reversing the picture makes the seams match. This is especially good with filters.
- ◆ Change color channels:
 (cycles through RG, R, G, B, RGB)
- ◆ Analyze (create a picture) from the sample:
 (replaces the picture currently in memory)
- ◆ Match the Image Area duration to the sample:
DUR=>Fit duration to current sample<
This is relative to the current Image Area size.
- ◆ Restrict brush or selection to snap grid:
 while brushing, selecting or moving selection
- ◆ Repeat brush stroke at octave intervals:
 while brushing
- ◆ Convert a filter to a picture:
, , FILTER
First select stereo or mono as appropriate.
- ◆ Apply the inverse of a filter:
+FILTER
(Gray areas reverse in intensity, color areas also reverse red and green.)
- ◆ Filter by a solid color or shade of gray:
, COLOR=desired, 

- ◆ Select the brush color from the picture with:
+click in the Image Area
 (This brings up the Eyedropper tool.)
- ◆ Move the Image Area window around the picture:
-drag in the image area
- ◆ Zoom in / Zoom out
 (larger),  (smaller)
- ◆ Transpose and Nudge
    
 ( to nudge right or left by Grid Size)
  for octaves
 for fifths.)
 (Use any of these with  to make copies.)
- ◆ Use clipboard as a filter:
 
  (filters w/ inverse of clipboard)
- ◆ Exchange colors (stereo sides) in a picture:

- ◆ Create blue grid lines at the current Grid Size spacing.
 (Color Mode only)
- ◆ Create blue pixels at octave intervals from all other pixels.
 (Color Mode only)
- ◆ Create blue hash-grid (Color Mode only).
 Set the Snap Grid to the vertical spacing. Choose ›Draw Octaves Grid‹ from the Blue Channel menu. Set the Grid Size to the horizontal spacing. Choose ›Add Blue X Grid‹ from Blue Channel menu.
- ◆ Fade out towards yellow (pan center):
 pic, , , , XFR=Differences
- ◆ Fade in towards yellow (pan center):
 pic, , , , XFR=Differences, , pic, 

Reference

- ◆ Access previous bank of presets/filters:
⌘+select preset/filter
- ◆ Half intensity:
⌘, *
- ◆ Double intensity (up to limit):
⌘, ⌘
- ◆ Remove/replace a rectangular section:
pic, ⌘, select and remove, >PRESET, pic, ⌘
This leaves the selection in the Image Area and the picture with the whole as a preset. To replace the selection into the picture:
⌘, PRESET, ⌘

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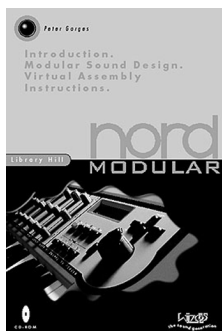
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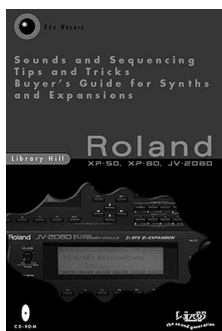
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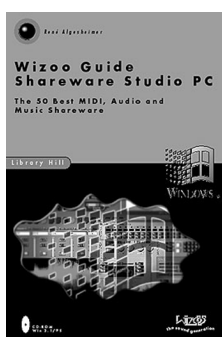
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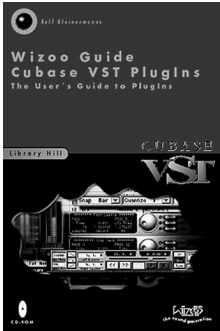
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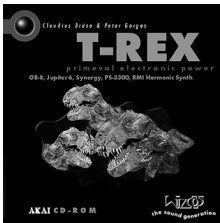
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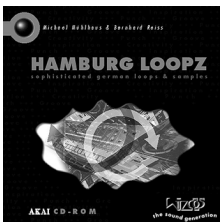


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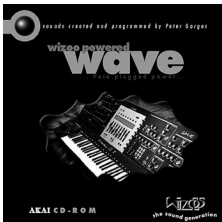


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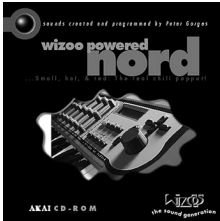
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