

# TRACES

A sample-playback instrument that creates textures based on fragments of your waveform(s). The magic of this particular instrument lies just in-between typical sample-looping and the 'micro' sound of granular synthesis – Traces rests on neither extreme, yet brings a glimpse of both: the vibrating, pulsating rhythm of fragmented audio. With ample ways to manipulate the envelope of each grain, or fragment, as well as its placement. Traces features four independent buffers, each with its own grain envelope and sequencer, and a Sallen & Key analog-modeled filter built by Surreal Machines, and the ability to directly control most parameters via MIDI or Live's remote mapping & automation.

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## System Requirements

Traces was built with Max 8.1.10. and is recommended for Live 11 (though it may as well work for Live 10).

## license information

## Photo credits

FASE: choreography by Anne Teresa De Keersmaeker, danced by Laura Bachman & Soa Ratsifandrihana, Yuika Hashimoto & Laura Maria Poletti, Anne Teresa de Keersmaeker & Tale Dolven.

Photos by Anne Van Aerschot & Jamie Williams/Sydney Festival.



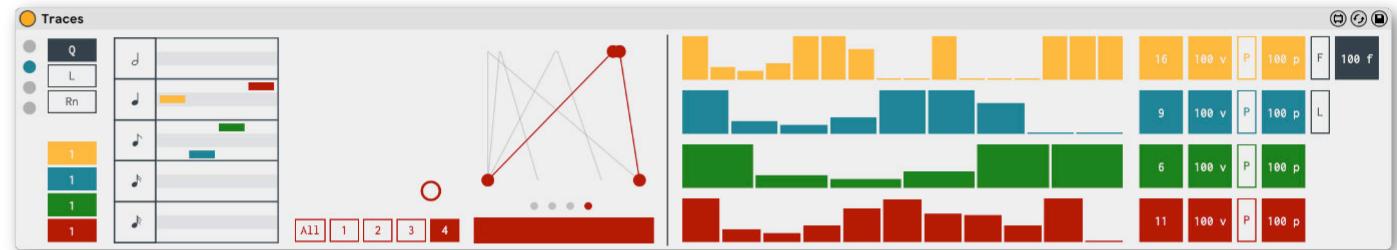
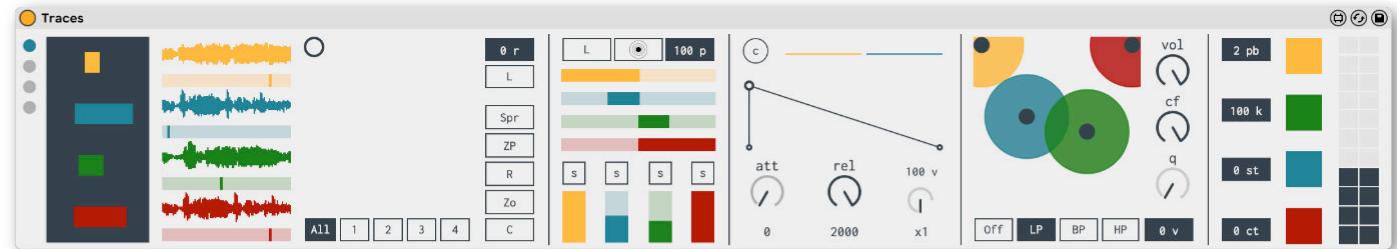
# OVERVIEW

Traces is made up of four panels, the first two providing all the main controls. On the first panel you can load up to four audio files that you can play with. You can scan through the waveforms, pan each voice, adjust the overall AR envelope and filter. You also get many nifty visual aids to show you where your sound is playing.

The second panel gives you all the rhythmic controls for each voice: a grain envelope and a sequencer for each.

The third panel provides all the MIDI CC routing and mapping options.

The fourth panel provides a number of links with additional information related to Traces.

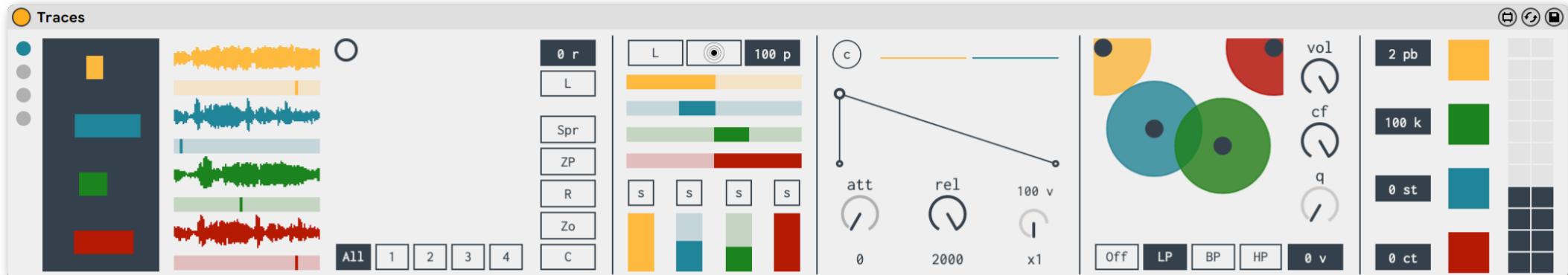


Wave Control				Rhythmic Control				Sequencer				Env, Filter, Pitch				Panning & Vol			
10 cc	11 cc	12 cc	13 cc	18 cc	19 cc	20 cc	21 cc	26 cc	27 cc	28 cc	29 cc	34 cc	35 cc	36 cc	37 cc	40 cc	41 cc	42 cc	43 cc
0 wv	0 wx	0 wy	0 wr	0 gv	0 gx	0 gy	0 gl	0 vs	0 vs	0 vs	0 vs	0 fs	0 at	0 re	0 st	0 v	0 v	0 v	0 mv
14 cc	15 cc	16 cc	17 cc	22 cc	23 cc	24 cc	25 cc	30 cc	31 cc	32 cc	33 cc	1 cc	2 cc	39 cc	38 cc	44 cc	45 cc	46 cc	47 cc
0 wp	0 wp	0 wp	0 wp	0 r1	0 r2	0 r3	0 r4	0 ps	0 ps	0 ps	0 ps	0 cf	0 q	0 kt	0 ct	0 p	0 p	0 p	bypass



# MAIN PANEL

The Main Panel is divided into six sections. We'll cover the details soon, for now here's a brief description...



1. On the left you get a couple of panels for wave control. The 'Mondrian-like' dark box on the left is where you get to drop up to 4 audio files (it's also a zoom map). Next to it are the waveform displays and wave position sliders.
2. To the right of the waveform displays is an XY pad that will let you zoom in on each waveform. You also have a few shortcuts to randomize the zoom settings and wave positions, you can also zoom out or clear the displays.
3. Next up are the panning and volume controls for each voice.
4. Next you get a visual display for a global AR amplitude envelope.
5. The fifth box has two parts: a) A visual monitor that provides feedback of what each voice is doing, and b) filter controls.
6. The last section has global pitch controls and LEDs that quickly tell you which voice is active at any given moment, and you also get a summing stereo level meter.

# RHYTHMIC CONTROLS

The second panel is devoted to all the rhythmic aspects of your sound. It's divided into three general areas...

The screenshot shows the Rhythmic Controls panel with the following components:

- Traces:** A grid where each row represents a voice (labeled Q, L, Rn) and each column represents a rhythmic value (labeled 1, 1, 1, 1). The grid contains various colored bars (yellow, green, red) representing different rhythmic patterns.
- XY Pad:** A central area featuring a red XY pad with a red circle and a red line connecting it to a red dot on a grid. The grid has several red dots connected by lines, forming a path or envelope.
- Sequencers:** On the right side, there are four horizontal sequencer strips, each consisting of a series of colored bars (yellow, green, red) followed by numerical values (e.g., 16, 100 v, P, 100 p, F, 100 f).

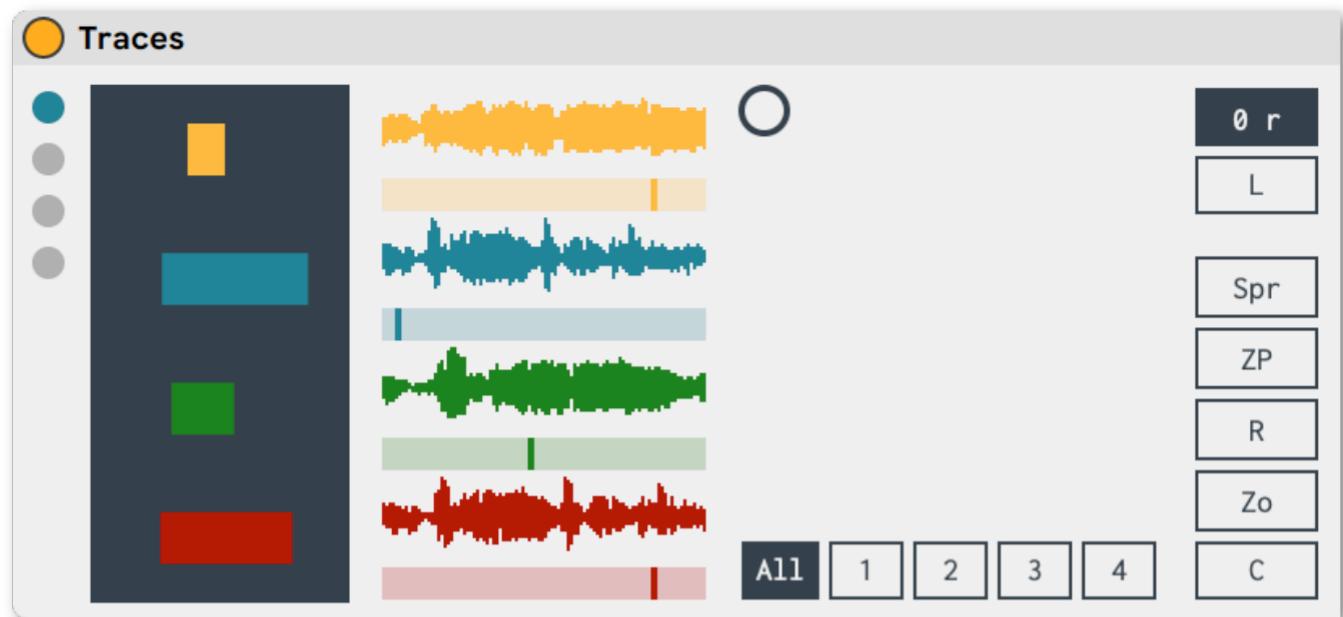
Three numbered arrows point from the text below to specific features:

1. Points to the Traces grid and the XY pad area.
2. Points to the sequencer strips on the right.
3. Points to the sequencer strips on the right, with a note below stating "You can also map these to panning, or the global filter."

# WAVEFORM CONTROLS

In order to play with Traces you have to first load an audio file. Simply drag it to the **File Drop** box on the left side of the panel (it's the only dark panel in Traces and it looks like some really bad imitation of a Mondrian painting!).

**Note:** Traces is a four-voice sample-playback instrument. It was designed so that you can either treat all the voices together as one cohesive sound, or work with each voice independently for more experimental sonic sculptures. In various sections of Traces, you'll find an option to 'lock' the controls (usually a button labeled 'L'): when this button is active, all the voices are relegated to the first voice. When all four voices are independent, each voice will have its own color: **1 is yellow**, **2 is blue**, **3 is green**, **4 is red**. When a particular section is locked, all the controls will turn grey, **except for the first voice, which will stay yellow**.



When you first drop an audio file into Traces, you'll notice that there are four 'hidden' boxes in the File Drop Box, which will highlight as you attempt to drag the file to each respective voice. The first time you drop a file it doesn't matter where you drop it: all four buffers will be filled with the same file. However, once you've dropped one file, you have the option to drag a new file on any of the voices and so be able to play four different samples independently.

The **Waveform Displays** will initially show you each sample in its entirety. You'll see that the File Drop box also serves as a visual aid to show you what portion of the entire sample the Waveform Display is showing. You can navigate around your file using the Waveform Display (the cursor will turn into a hand: as you drag down you'll zoom into the waveform and as you drag horizontally, you'll scroll across its length), or you can use more dedicated controls for live performance. That's what the **XY Pad** to the right is for, but before we talk about it, also notice that each Waveform Display has a **Position Slider** below it, which lets you scan through that portion of the waveform as you play a note.

Below the XY Pad you'll see a tab that will let you choose which waveform to control (you can also control all the voices at once).

To the right of the XY Pad, you'll see a number of vertical controls (7 in total), described below from top to bottom:

1. The first control is a number box that will let you adjust the **Random Amount** for the position of each waveform. If set to 100%, each time you play a note, the Position Slider will move to a new random place. If you want to control these positions manually, then turn this number to zero. When you set the Random Amount to some middle value, the randomness will hover around the wave position that was previously set (e.g. if the wave position is set at 75% and the Random Amount to 10%, then each trigger will randomize the position somewhere between 70 - 80%).

2. The second button, labeled 'L,' locks the Position Sliders to the first voice. If for example you want to play the same sound with a 4-voice polyphony and scan through the waveform as you play a chord, then you can turn the **Lock Button** ON and move Position Slider 1 (all the voices will then move together).

3. Below the Lock Button is a **Spread Button** (labeled 'Spr'). It will toggle between three automatic positions:

- You can reset all the sliders to the beginning of the Waveform Display.
- You can spread them out half-way (that will leave you some headroom to play with)
- You can spread them out across the entire Waveform Display.

**Note:** The lock positions are *relative*. If, for example, you set them all to the beginning of the waveform display before locking them, then they will move exactly together. However, if you first spread them out before you lock them (whether you do that manually or by using the Spread Button), they will then move relative to their initial distances.

4. Next is a **Random Mode** Button, which works in conjunction with the Random Trigger Button right below it. There are three random modes:

- You can randomize the zoom settings for each Waveform Display (in which case this button will be labeled 'Z').
- You can randomize just the Position Sliders (the button will be labeled 'P').
- You can randomize *both* zoom settings *and* the Position Sliders at once (in which case the button will be labeled 'ZP').



5. The **Random Trigger** Button works in parallel to the MIDI random triggering and can be engaged independently, after a note has been started. It can be mapped to incoming MIDI CC data or Live's remote mapping (as we'll see later, when we talk about the 3rd panel in Traces, the MIDI Page).
6. The **Zoom Out Button**, labeled 'Zo,' will reset the zoom positions back to full zoom.
7. The **Clear Button**, labeled 'C' will clear the buffers, in case you'd like to start over with a new audio file.



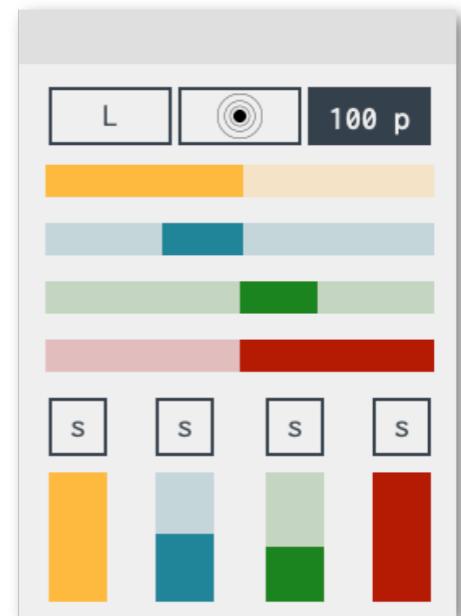
# PANNING & VOLUME CONTROLS

This section is divided in two halves: at the top, you get the **Pan Sliders**, laid out horizontally, and at the bottom you get the **Volume Sliders** (laid out vertically).

The Panning section also has three other buttons:

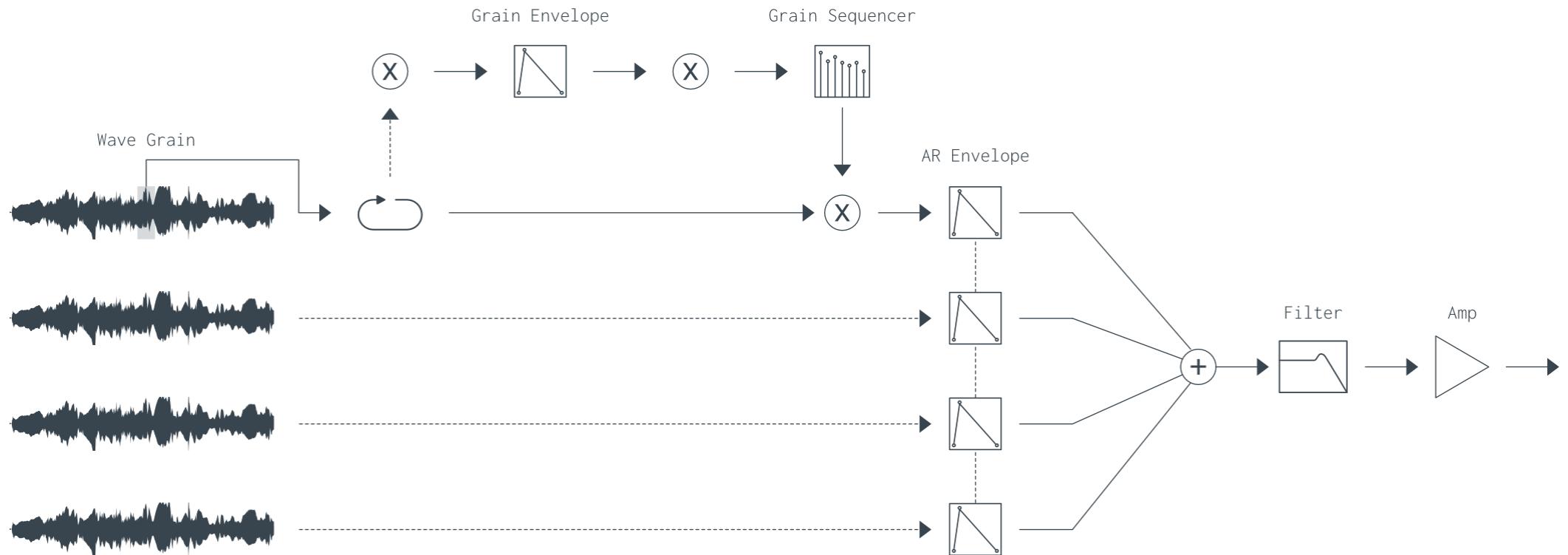
1. The **Pan Lock** Button, labeled 'L.' When it's active, voices 2, 3 & 4 will lock to voice 1.
2. The **Spread/Random Mode** (with either a dice or a concentric-circles icon), switches between two modes, and works in conjunction with the Spread/Random Amount number box to the right. In Spread Mode, the Pan Sliders will spread across the left and rights speakers evenly, in Random Mode, each Pan Slider will be randomized with each incoming MIDI note.
3. The **Spread/Random Amount** number box, to the right, will determine how much spread or randomness to give to the Pan Sliders. In Spread Mode, 100% will give you a full spread, and zero will place all the Pan Sliders at center. In Random Mode, 100% will completely randomize each Pan Slider, and zero will leave each Pan Slider in its current position; a random amount 'half-way' will deviate that much from the current position of each Pan Slider.

The Volume section, in addition to providing a slider for each voice, also feature **Solo Buttons**, which will quickly solo a particular voice. This will be helpful when you're in the midst of creating a complex sound texture with all four voices and would like to focus on what a particular voice is doing.



# POLYPHONIC VS. MONOPHONIC CHARACTERISTICS OF TRACES

Before we move on describing each following component in Traces, we should stop for a moment and take a look at how they're all put together....



In terms of the sound generating engine, Traces may be considered a 4-voice polyphonic sample-playback instrument. Each voice is made up of a stereo sample buffer, processed independently (a section of the waveform is scanned, looped and then each loop – or **grain** – is passed by a Grain Envelope, then by a Grain Sequencer, giving each repetition a potentially different volume).

Each voice passes through an AR Envelope, and then all 4 voices are summed into a stereo bus, which then passes through a filter & amplifier.

Therefore, some of the components will be treated *independently* (e.g. the scanning of each waveform, its pan position, etc.), and some will be treated *together* (e.g. the filter will affect all four voices, as they're summed before the are processed by it).

# AR ENVELOPE

Each voice in Traces, once it's been processed by the grain scanning sequence, passes through an AR envelope (that is, with an Attack and a Release stage).

The **Attack & Release** times have a range each of 0 - 2000 milliseconds, which can be further expanded by the third, **AR Time Scaling** knob on the right, which can multiply those times by up to 4 times.

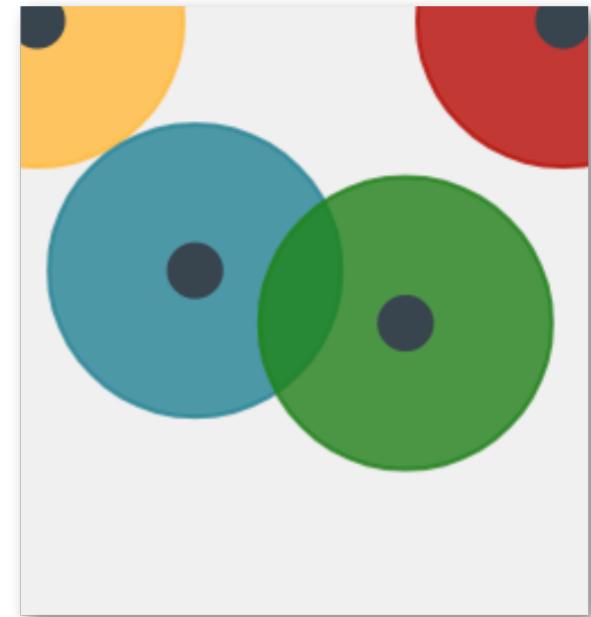
You can also curve each stage with the colored sliders on top. The **Curve Reset** button (labeled 'c'), on the top-left corner, will reset these curves back to zero (giving you a straight diagonal).

Additionally, the **Velocity Scaling** number box above the AR Time Scaling knob (and below the visual display), will adjust how much incoming MIDI Velocity will scale the output of the envelope.



# VISUAL MONITOR

To the right of the AR Envelope is a **Visual Monitor** that will show you ‘where’ each sound in our imaginary sonic space is located. The X axis represents the pan position of each voice and the Y axis represents the volume. The size of each circumference represents the rhythmic value of each grain (the bigger the circle, the longer the grain).



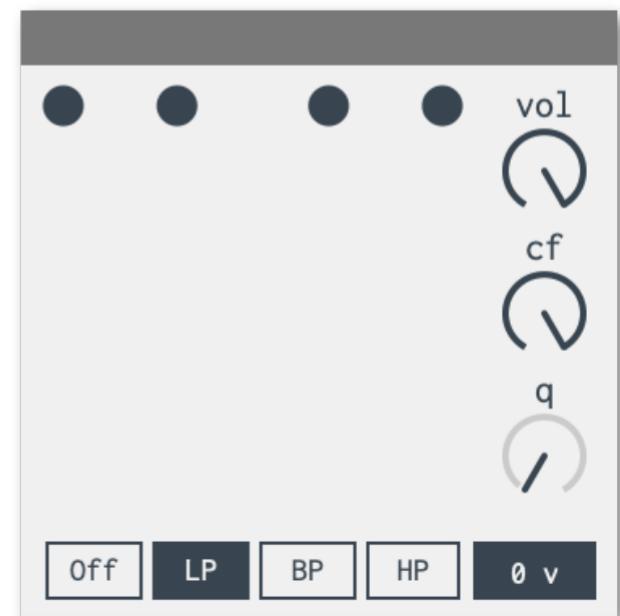
# FILTER & AMPLIFIER

To the right and below the Visual Monitor are controls for the **Filter** and **Main Volume** in Traces.

Included with Traces is a Sallen & Key analog-modelled filter, designed by [Surreal Machines](#). It features a low pass, a band pass and a high pass filter; you also have the option to bypass the filter altogether.

Besides changing the **Filter Type** (the tab at the bottom of this section), you also get the standard parameters for the **Cutoff Frequency** (CF) and **Resonance** (Q). In addition, you can scale the Cutoff Frequency to incoming MIDI Velocity.

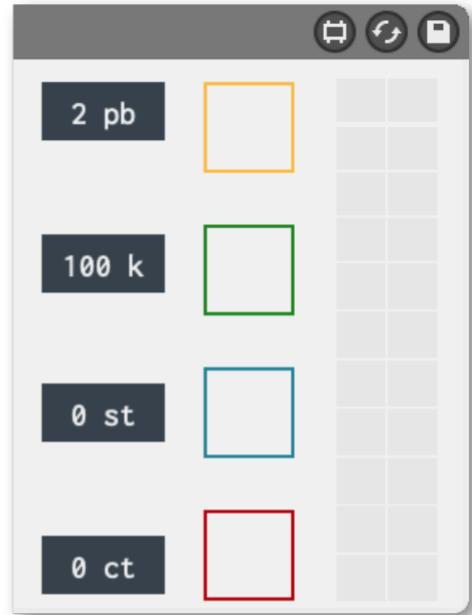
**Note:** the Filter Velocity Scaling is a *positive* kind of modulation, so you will only hear the corresponding changes if you set the Cutoff Frequency (CF) knob to a lower value.



# GLOBAL PITCH CONTROLS

There are four number boxes that affect the pitch of your samples (from top to bottom):

1. The first number box is the **Pitch Bend Range**, from 0 - 48 semitones, which defines the range of either side of the Pitch Bend Wheel. For example, a setting of 12 semitones will give you an octave above *and* an octave below the middle of the wheel.
2. The second number box is the **Key Tracking** control. You have the option to have all the keys play the original pitch of your sample(s), when this value is set to zero, or you can map the keys to an equal temperament, by raising the value to 100%.
3. The third box is the **Global Pitch Transposition**, which lets you transpose the pitch up or down by 48 semitones. C3 will play the original pitch of your sample(s) when this value is at zero.
4. The fourth box provides **Global Pitch Fine Tuning** and lets you further adjust your pitch by cents. You can go up or down by 100 cents, which is equivalent to a semitone each way.



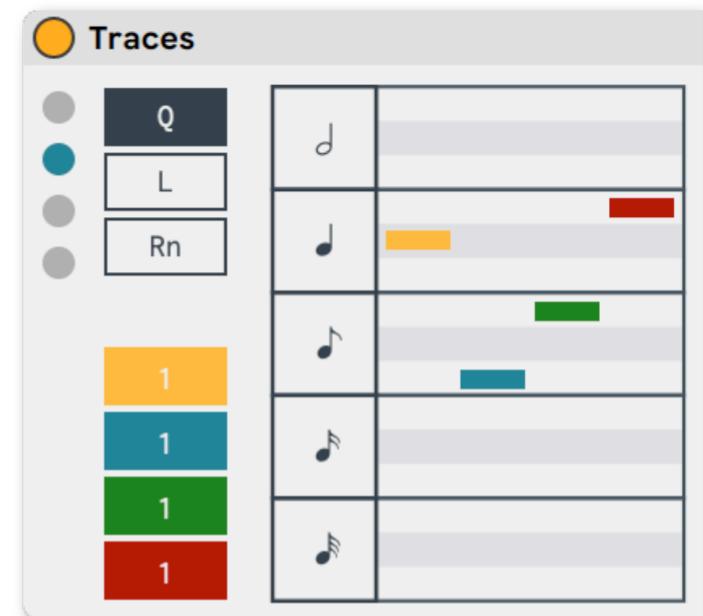
## METERING SECTION

To the right of the pitch controls are two types of audio level meters. First, you get four **LEDs** which will quickly show you which voice is currently active. To the right of the LEDs is a **Stereo Level Meter**, showing you the summing bus coming out of Traces.

# RHYTHM CONTROLS

Moving on to Traces' second panel, the first section you see consists of a number of controls that define the rhythmic values for each grain being played by Traces. Let's start by looking at the various buttons and number boxes on the left, laid out vertically from top to bottom:

1. The **Rhythm Quantize** Button. This button will affect how the Rhythm Sliders on the right will behave. When active, they will be quantized to a round note value. When this button is OFF, you can slide them continuously and you'll get an approximate value in milliseconds.
2. The **Rhythm Lock** Button (like with the other sections in Traces) will lock voices 2, 3 & 4 to voice 1. The Rhythm Sliders will be greyed out, except for the first one, which will carry the value of all four voices together.
3. The **Random Rhythm** Button below will let each incoming MIDI note randomize the rhythmic values for all four voices.
4. Below those, you'll find four **Rhythm Multipliers** (one for each voice). You can expand the rhythmic value of each grain up to 16 times its original value, giving you a wide range of a little over 8 bars for each voice. This allows for working with long loops that may overlap and cross in interesting ways (especially if you have different samples loaded in each voice!).

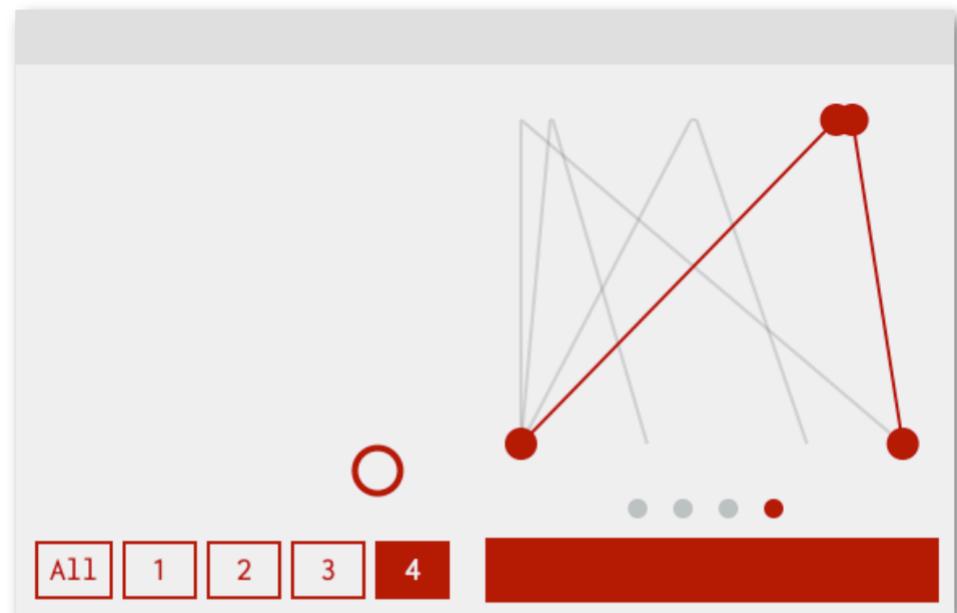


To the right of these, you'll find the **Rhythm Sliders**, where you get to define the length of each grain. You'll notice that it's a table with five basic rhythms. Each box that corresponds to each rhythm is actually split into three stripes, the middle one marked in grey. They represent – respectively, from bottom to top – the triplet, normal and dotted values for each note.

# THE GRAIN ENVELOPE

Each grain that scans through your waveform(s) passes through a **Grain Envelope**. This envelope is also made up of Attack and Release stages. However, these – and the overall length of the grain envelope – are relative to the rhythmic value set for each voice. The Grain Envelope can be manipulated with a dedicated **XY Pad**, which gives you intuitive control of the general arch of the envelope.

- At the bottom you get a tab that lets you choose which voice to control.
- The X axis adjusts the attack and release times relative to each other. As you approach the left side of the XY Pad, the attack time is reduced to a minimum and the release time is that much longer; you get the reverse effect if you move the XY Pad control towards the right.
- The Y axis defines the width of the envelope. The higher the value, the wider the envelope: you'll get a longer sustain time and the attack and release times will be reduced proportionately; the lower the value, the 'pointier' the envelope is: if all the way down, the attack and release times will be at their highest – if the XY Pad is set to the middle-bottom position, they will both be equidistant.
- In addition to the **X/Y Slide Controls**, you also get a **Release Length** Slider (at the bottom of the Grain Envelope Display), which can scale down the envelope's release time, allowing you to create small bursts of sound for each grain, if you set a short value for the attack time, as well as a short release time.

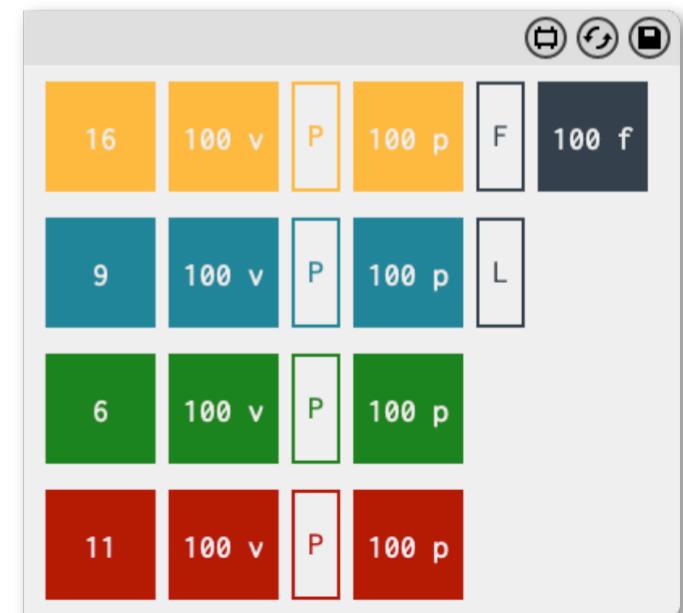
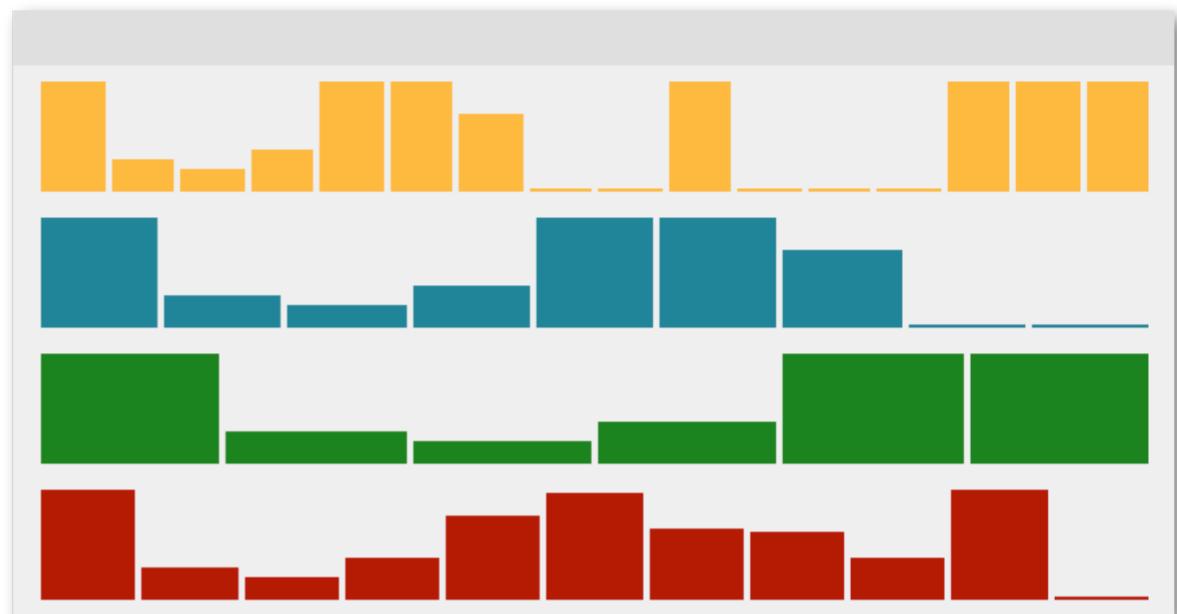


# THE GRAIN SEQUENCERS

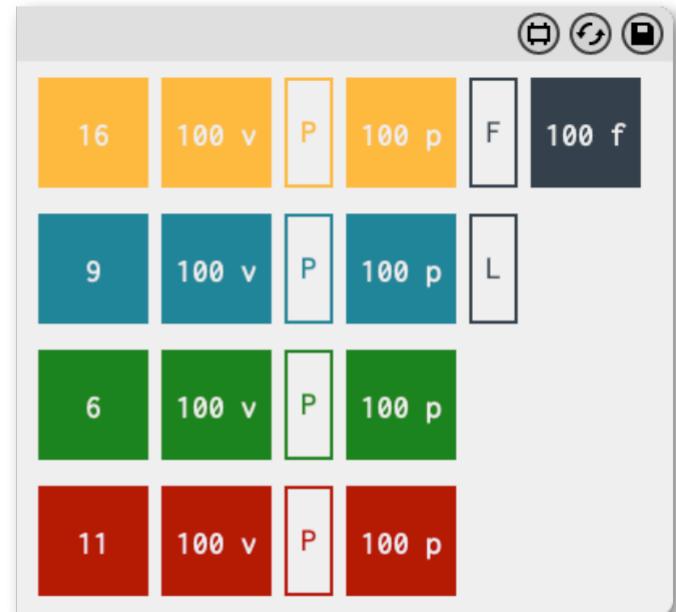
After each grain passes through the Grain Envelope, its volume gets multiplied by a control sequencer – each step in the sequencer will play along with each loop of the grain, and the slider in each of the sequencer's steps will scale the overall volume accordingly.

Each voice is paired with its own sequencer, and all 4 sequencers can play independently of each other. Each grain can have its own rhythmic value and each sequencer its own number of steps, allowing for complex rhythmic groupings. Combined with the Grain Envelope, you can achieve a wide range of sonic textures, from slowly evolving ambiences, to wild polyrhythms, to more cohesive tremolo-infused instruments.

- To the right of the Grain Sequencers, you'll find additional controls. The first column of number boxes are the **Sequencer Steps**. They define the length of each sequence.
- The second column provides **Volume Scaling** for each sequencer. This is a *negative* kind of modulation: when this value is at zero, the sequencers will have no effect on the volume and all the grains will output at full level; when set to 100%, each step will control the volume completely (if the slider is at zero that grain will not output anything, if the slider is at maximum, that grain will output at full volume).
- In addition to controlling the volume of each grain, you have the option of also mapping each sequencer to the Pan Sliders, so the third column provides **Pan Switches** accordingly. **Note:** when a Pan Switch is active, that sequencer will take over the corresponding Pan Slider's control, so you won't be able to adjust it manually.



- The next column of boxes then provides **Pan Scaling** for each sequencer. When set to zero, panning will be at center. At full scale, the sequencer will control the panning completely (when the sliders are at zero, the panning will be set to hard-left, when they are at their maximum, panning will be set to hard-right).
- Because the filter is monophonic (albeit stereo), only one sequencer will be able to control it, but you can map the first sequencer to the Cutoff Frequency as well, using the **Filter Switch** on the right. Only the rhythm of the first voice will be necessarily tied to it, but you can come up with interesting textures by playing other rhythms with the other voices as you change the filter.
- To the right of the Filter Switch, you'll find one last number box to control the **Filter Scaling** (at zero, the filter will be fully open, at 100%, a minimum slider value will close the filter completely and a maximum value will open it).
- Below the Filter Switch, you'll find the **Sequencer Lock** Button, which allows you (like many of the other sections in Traces) to lock all four voices to the first one, so they all play an identical rhythmic texture as you play. This is good for creating more cohesive musical instruments that have some kind of tremolo effect applied to them.



# MIDI ROUTING & REMOTE MAPPING



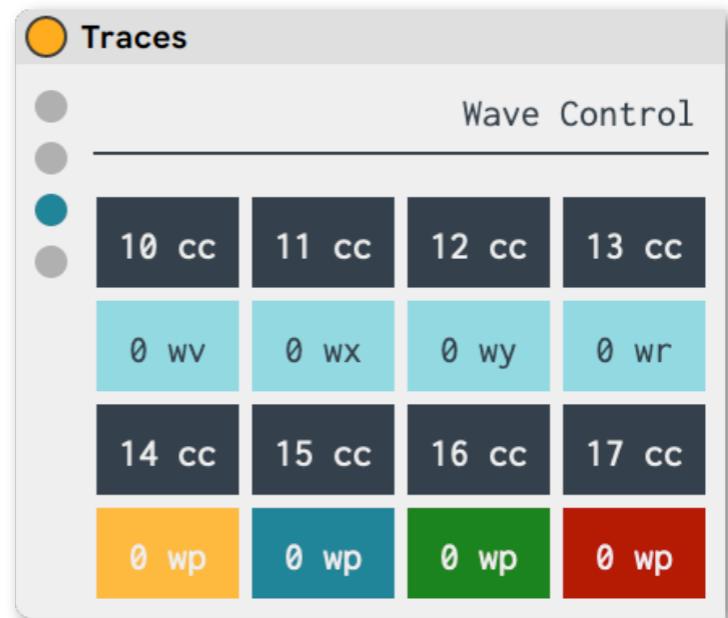
On the third panel of Traces, the **MIDI Page**, you'll find a dedicated area for all of the related MIDI CC routing and remote mapping. This panel is divided into sections that control a particular element of Traces:

- In the **Wave Control** section, you get routing & mapping options for the Wave Controls (the XY Pad on the 1st panel) and the Wave Position Sliders.
- In the **Rhythmic Control** section you can map the Grain Envelope Controls (the XY Pad on the 2nd panel) and the Rhythm Sliders.
- In the **Sequencer** section you can map the various scaling controls they provide (for volume & panning).
- In the **Env, Filter, Pitch** section, you get a mixed batch of controls: first, there is one control that remains for Grain Sequencer 1 – the Filter Scaling – then you get controls for the Attack & Release times of the AR Envelope; circling around this section, you get controls for the Global Pitch Transposition, Fine Tuning and Key Tracking; finally arriving at the Cutoff frequency and Resonance Controls.
- In the **Panning & Vol** section, you get mapping controls for the Pan Sliders, Volume Sliders, and the Main Volume control.
- On the bottom-right corner, you get a **MIDI Bypass** Button, which can stop incoming MIDI flow of CC signals, in case you'd like to only deal with Live's remote mapping (and *not* MIDI control, as the two together might end up confusing you or the system!).

So, how does it work? You'll notice that there are four rows in general. They're really two pairs of rows:

- The top row lets you define a MIDI CC number to control a particular parameter.
- The row below is directly tied to the parameter itself (moving it will automatically change that parameter).

You have two options in general for mapping Traces to an external controller: with the top row, you can apply direct MIDI CC mapping; and you can use the bottom row to either apply Live's Keys & MIDI mapping or map directly from another Max for Live device (e.g. the LFO). The advantage of using MIDI CC mapping is that the routing will be remembered with that instance of your device and you could save it as a preset in your User Library (and so keep the mapping independently of the Live Set you might be working in).



Below is a list of all the controls available for mapping & automation:

#### Wave Control

- Wave Voice.
- Wave Controls X-Slide (horizontal zoom position).
- Wave Controls Y-Slide (zoom amount).
- Wave Position Random Trigger.
- Position Sliders 1 - 4.

#### Rhythmic Control

- Grain Envelope Voice.
- GE Controls X-Slide (attack & release times).
- GE Controls Y-Slide (envelope width).
- GE Release Length.
- Rhythm Sliders 1 - 4.

#### Sequencer

- Volume Scaling 1 - 4.
- Pan Scaling 1 - 4.
- Filter Scaling.
- AR Envelope Attack.
- AR Envelope Release.
- Global Pitch Transposition.
- Global Pitch Fine Tuning.

- Key Tracking.

- Filter Cutoff Frequency.

- Filter Resonance.

#### Panning & Vol

- Volume Sliders 1 - 4.
- Pan Sliders 1 - 4.
- Main Volume.

# CREDITS PAGE



On the fourth panel of Traces, you'll find direct links to related information (including this user guide). These links are also listed below, for convenience:

Traces Wiki

<https://flaviogaete.info/traces>

License Information & System Requirements

<https://flaviogaete.info/license>

Surreal Machines

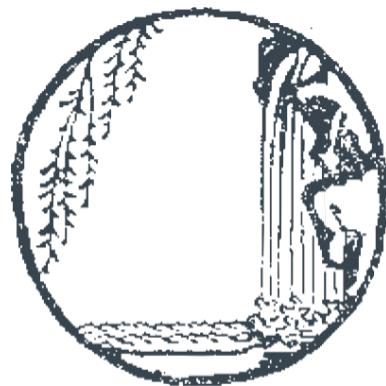
<https://www.surrealmachines.com/>

**Photo Credits...**

One of the initial ideas that inspired Traces was the work of Steve Reich, in the eyes of the great choreographer Anne Teresa De Keersmaeker, who came up with beautiful visual representations of those works that deal with phasing, as part of the compositional structure (*Piano Phase*, *Violin Phase*, *Come Out*, to name a few). Here's a few links in case you'd like to learn more about their work:

<https://www.rosas.be/en/productions/361-fase-four-movements-to-the-music-of-steve-reich>

[https://en.wikipedia.org/wiki/Piano\\_Phase](https://en.wikipedia.org/wiki/Piano_Phase)



[flaviogaete.info](http://flaviogaete.info)