THE BAZILLE

COOKBOOK

280+ DELICIOUS MODULAR RECIPES FOR BAZILLE

DISHED OUT
BY HOWARD SCARR

u-he

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Introduction

Thank you for purchasing The Bazille Cookbook. Some of the patches discussed here were made shortly after Bazille (alpha) appeared in 2009 and the collection was completed in 2019. Together with this book, it is the ultimate compendium of Bazille TIPS & TRICKS.

Important: The Cookbook requires Bazille version 1.1.1 or later.

*the u-he team 2020*

About the Author

In 1973 Howard Scarr co-founded the UK's first all-synth band Zorch.

A synth sound designer since the '90s, Howard created many factory presets in the Access Virus, Roland V-Synth, Waldorf Q and Quantum, Prophet 12 and others. In 2007 he started working with composer Hans Zimmer on synth sounds for Hollywood (*The Dark Knight, Angels & Demons, Inception, Dunkirk, Blade Runner 2049* and others).

Always a fan of modular synths, Howard took to Bazille almost immediately:

"The unique combination of synthesis types presents a fascinating opportunity for sound designers to explore a very different modular synth at a fraction of the cost of hardware. However, Bazille isn't the easiest synth to master… and that's where **The Bazille Cookbook** *comes in.*

I sorted through all my unfinished sketches and experiments that never became factory presets, and refined those I thought had some potential. The plan was to compile a set of 100 patches, with an analysis of only the technically more interesting ones in a short "ReadMe" file, but the project simply refused to stop there! I was still learning new tricks, which led to new patches that also begged to be described. In the end, I surrendered to my fate and discussed them all."
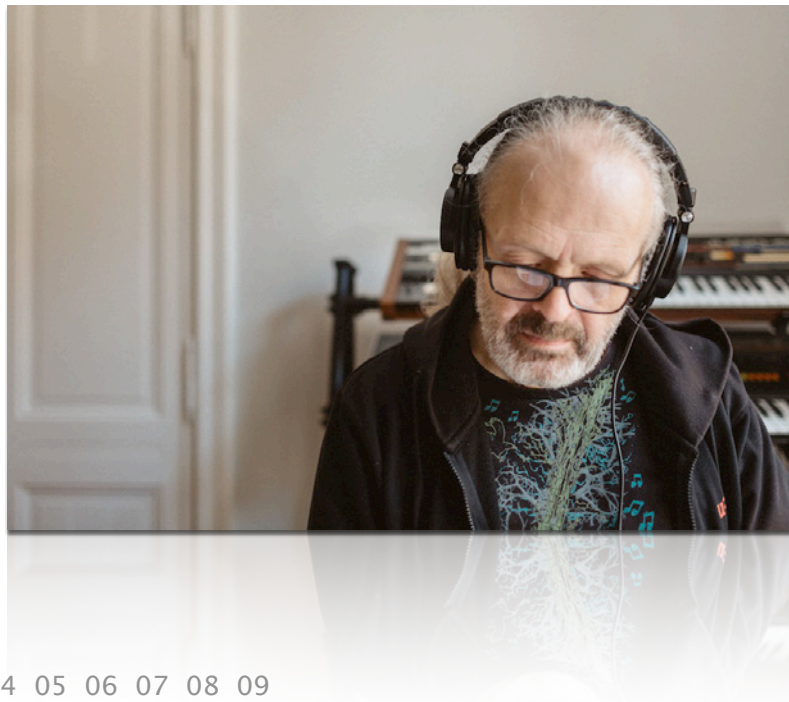
Why Switch to the 'GearPorn' Skin?

The standard GUI was designed to be as clear as possible, with 'major' functions on the main page and all others relegated to a 'Tweaks & FX' page. The 'GearPorn' skin, on the other hand, shows all synthesis parameters on a single page and is therefore is more suitable for experts.

If you haven't done so already, right-click anywhere in the background, select the 'GearPorn' skin, right-click again and select the largest possible zoom factor for your screen. If you want Bazille to open in the this view every time you load a new instance, click on the cogwheel icon, select the 'tools' icon and change the 'Default Size' and 'Default Skin' accordingly.

Everything is much more compact (you could even say 'cramped'), and several modules have been relocated. Best of all, all filter and envelope parameters are immediately available. Both LFOs, the inverters, rectifiers, S&H, quantizer and lag generators appear on the left, while all the global options plus the ramp generators are in the tall column on the right.

FX: Clicking on the [Edit] button in the FX control block (bottom left, between LFO2 and the MIDI & MORE panel) opens this pleasant submarine-style floating window…

How to Read the Patch Notes

All patches in each folder/category appear in alphabetical order, so finding the corresponding text is easy. You can jump between categories via the numbers at the bottom of each page.

The notes are extremely compact. Although some of them cover a lot of ground, they are all short enough to print out if necessary. Many include a practical lesson about one particular feature or technique. Whenever a word or a function isn't 100% clear you could try searching for it in the Bazille user guide.

Some Words

Basic module names are abbreviated without any space before the index: OSC1, Filter2, ENV4 etc.. Instead of the more common "aftertouch", **Pressure** or **Press** (like the label) is used here. The lefthand performance controls are called **mod wheel** and **pitch wheel** as most MIDI keyboards still include a pair of wheels. "ModW" and "PitchW" might have been overly cryptic.

The fixed labels identifying individual knobs and switches are **Capitalised**, while non-numeric values and menu functions appear in single **'quotes'**.

**[Buttons]** appear in brackets. **[UNDO]** and **[REDO]** are the arrows below the data display.

+5V is practically a note-triggered gate with an infinite Release time! Its level is the same as the positive maximum of any other signal generator within Bazille (i.e. 100%).

Audio-rate phase modulation using the 'PM' Phase modes is referred to as "FM" (in quotes), as this is the very same FM that was developed by John M. Chowning and popularised in the '80s by Yamaha with their (in)famous DX range of synthesizers.

For fellow spelling fans: **Quantize** is a module, **Quantise 12** a function – and I tried to spell 'quantisation' with an 's' throughout this book. Embrace the inconsistency!

Module Indices

Large modules are numbered while individual processors aren't. There is no official Rectifier2, for instance. As the unlabelled Multiplex panel could be a source of confusion, remember this:

MULTIPLEX

1	2
3	4
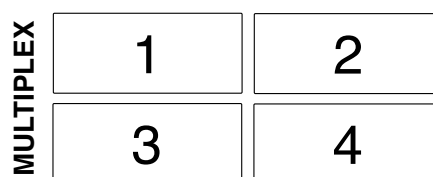
Something else to remember about the Multiplex: A positive "voltage" at the **mod** socket will fade the lefthand signals IN while fading the righthand signals OUT… both percentage-wise according to the left and right knob values. Experiment for a while until this becomes clear.

INIT

The **initialized patch** is used for all experiments in this book. Simply right-click on the name in the data display and select '**init**'. It is written as *INIT* in this document for the sake of clarity!

Patch Notes

The **00 Tutorial** folder contains a bunch of patches demonstrating the individual ingredients used in Cookbook recipes. Despite their simplicity, I hope you find them tasty enough!

00 Tutorial

8-Bit Roller

Take a closer look at Map1 by clicking on its [+] button. Making repetitive maps is easy, although it means right-clicking on the map several times: Load *INIT* and restrict the size of Map1 to only 5 values. Select 'shapes / ramp', then switch back to 128 values. The shape is automatically repeated to fill the entire map. Note: This only works with the ready-made 'shapes', and any edits made before switching back to 128 values will **not** be repeated.

Additive Waves

The map waveforms were created using the 'spectralize' function introduced in v1.1.1.

Spectralize

Load *INIT* and select OSC1 'TapMap1' instead of 'Cosine'. Right-click on Map1 and select 'reset', right-click again and select 7. Drag the third bar from the left and the bar on the far right both up to maximum, then right-click and select 'shapes / spectralize': Map1 becomes a bell-like waveform consisting of the 3rd and 7th harmonics only. You can check these against another OSC in "Overtone" Tune mode.

Here's a table of all intervals up to the 16th harmonic:

harmonic	overtone	interval	semitones	cents
1, 2, 4, 8, 16	0, 1, 3, 7, 15	prime	0	0
9, 18	8, 17	major 2nd	2	+4
5, 10	4, 9	major 3rd	4	-14
11	10	tritone	6	-49
3, 6, 12	2, 5, 11	5th	7	+2
13	12	minor 6th	8	+41
7, 14	6, 13	minor 7th	10	-31
15	14	major 7th	11	-12

Note: **Harmonic = overtone +1**. See "Terminology" on the next page.

For bell-like tones it's often best to start with either 3 or 5 as the lowest harmonic, then add one or two higher ones. Try this: Restrict the map to 16 values, set equal amounts of 5, 6, 10, 12 and 15 and *spectralize* it. As harmonic 5 is your new fundamental, you will need to tune the oscillator down 4 semitones and up 14 cents. Easiest method: Tune it up 8.14 semitones and use Modify mode ''Multiply'' to transpose down an octave or two (try -4.00).

Harmonics 6 and 12 are the new minor 3rd (+14 cents), and harmonic 15 is the new 5th (-12 cents). Result: A slightly detuned minor triad using just one oscillator and no voice stacking! Similarly, harmonics 6+8+10 or 8+10+12 or 6+9+15 will give you the three possible inversions of a major triad. See *05 Basses / HS Slap 90*.

Additive Waves uses the minor triad (OSC1), a fundamental (OSC2), the major triad (OSC3) transposed up a minor 3rd, and another major triad (OSC4) transposed up a 4th.

Note: Whenever you spectralize, each harmonic gets a new random phase.

Terminology

- A **partial** is a sine wave component of a complex tone.

- The **fundamental** is the partial perceived as the basic (usually THE lowest) frequency.

- An **overtone** is any partial except the fundamental.

- A **harmonic** (aka "harmonic partial") is any member of the harmonic series…

- The **harmonic series** is a set of partials whose frequencies are positive integer multiples of the fundamental (which is the lowest harmonic).

- An **undertone** is a member of the undertone series (a.k.a. subharmonic series), a sequence of frequencies defined by inverting the intervals of the harmonic series (division instead of multiplication). It's musical worth is questionable: While overtones occur naturally, undertones can only be produced artificially; they sound distinctly strange. On the other hand, a wind instrument can be made with equally spaced holes so that each successive hole covered will produce the next note in the undertone series.

  Look up Oskar Sala's "Mixtur-Trautonium", a unique undertone-based instrument!

Bit Crusher

OSC1 is severely quantised (the amount is set to only 2.00). The rhythm is LFO1's triangle wave amplitude-modulating OSC1 – disable that by removing the red cable. Play a low note and turn OSC1 Volume very slowly upwards from 0 to 100. Watch the oscilloscope: The sound first appears at 25.00 (the first quantisation level is reached) then becomes brighter above 75.00 (the second quantisation level). Repeat with the Quantiser set to 1.00, 3.00 and 4.00 instead of 2.00, noting the Volume levels at which "bit thresholds" are reached.
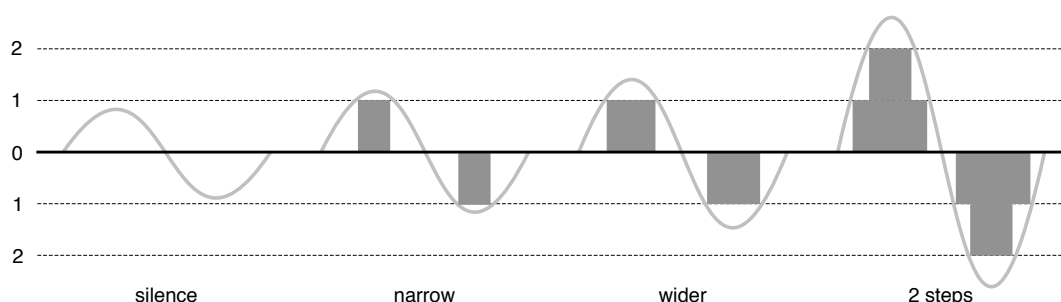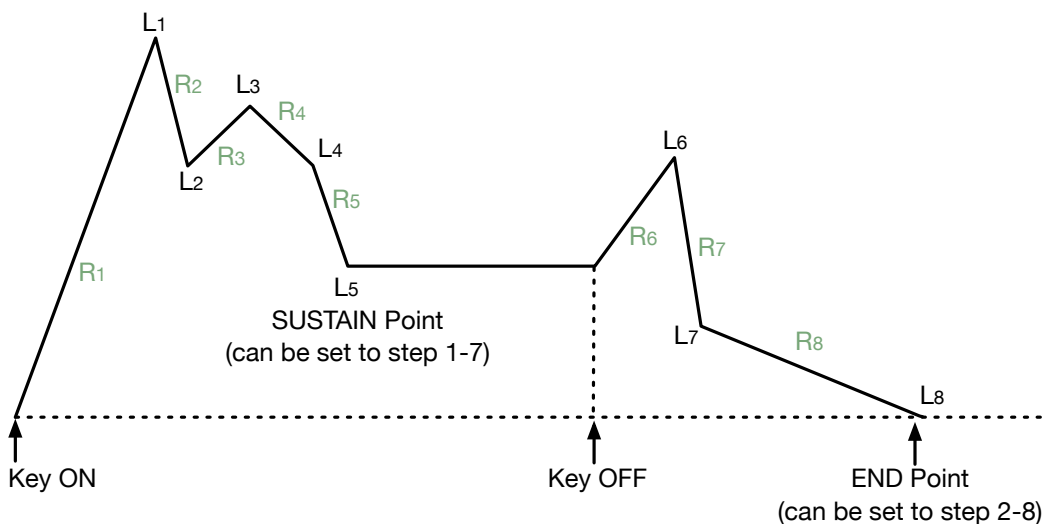
BZ-303

Two filters in series: Filter1 is responsible for the high resonance while Filter2 adds overdrive and removes the top frequencies. The 1-pole 'LP6' suppies a full sound with extra resonance, and the bandpass (BP6) accentuates the resonant frequency further without making everything sound too narrow. Filter2 Gain is at maximum, which seriously distorts the signal. Double-click on Gain, play a few notes… turn up your nose, then turn up the Gain again.

Can you improve this patch? Try replacing the 'Saw' with a 'Square' and add Fractalize (Tri mode) via Ctrl A. Next, control OSC1 Volume from the pitch bender (PitchW), with amount +50. Maybe activate the Distortion effect? Add "PitchW = overtone" to the "preset usage" field and edit the patch name before saving to your User folder.

Complex Envelopes

Casio CZ-101 owners might recognize the image below. Although Bazille is quite capable of emulating most CZ sounds, those 8-stage (rate and level) envelopes aren't easy to copy:

L1 R2 L3 R4 L4 R3 L2 R5 L6 R6 R7 L5 SUSTAIN Point (can be set to step 1-7) R1 L7 R8 L8

Key ON   Key OFF   END Point (can be set to step 2-8)

Watch Map1 while playing. It converts ENV2 into Attack and Release stages using the mirror image of this same shape (scanned in reverse).

The result isn't perfect: CZ experts could rightly complain that the scan isn't linear (as the Bazille envelopes aren't). Also, these envelopes don't jump to the Release stage ("Key OFF" in the above image) if you release a key during the Attack stage. This is particularly noticeable if you slow everything down by pushing the mod wheel a bit (see ENV2 Rate Mod).

Complex LFO

Instead of automatically heading for the sequencer or an LFO whenever you need a rhythm, try a 'Clocked' mode oscillator instead. The rhythm in this patch is caused by OSC2's 'Res1' and 'Saw' phase distortion in combination with 'Max' Fractalize.

Try turning up the OSC2 PD amount (you might be surprised!), then experiment with various OSC2 PD waveform combinations, the Fractalize options (try pushing the mod wheel first), Phase settings and basic waveform (e.g. TapMap1 instead of square).
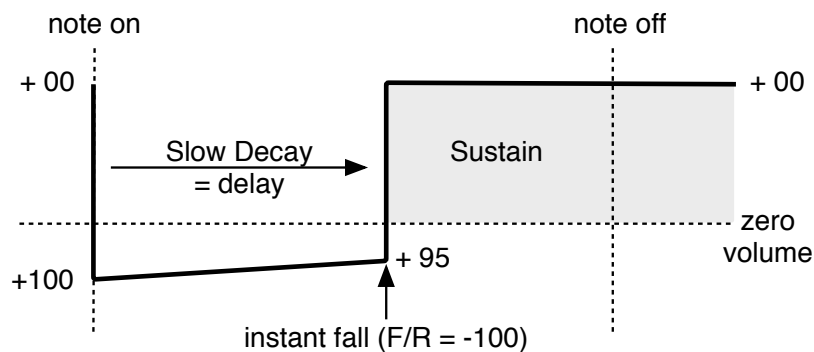
Delayed Envelopes 1

The Bazille envelopes don't include a "Delay" stage, but with a bit of thought you can set up a similar effect. This patch demonstrates two methods: Firstly, OSC2's volume is suppressed (negatively modulated) by Ramp1 – try adjusting the Ramp1 Hold time. Secondly, Map1 driven by ENV2 positively modulates OSC3 volume up from zero. As the upper value in the map is zero, OSC3 starts with silence. Adjust ENV2 Decay.

Delayed Envelopes 2

This patch delays the attack using the fall/rise stage of an inverted envelope:

Two envelopes are needed to delay OSC2 and OSC3 differently. As the 'Decay' is longer in ENV3 than it is in ENV2, the OSC3 "attack" (actually the F/R) happens later.

These delays can be modulated. Here, 'ModWhl' controls both ENV2 and ENV3 Rate, and the positive amounts mean that pushing the mod wheel lengthens both delays.

```
        note on                          note off
+ 00    ┊                                    ┊          + 00
        ┊          ┌──────────────────────────────────┐
        ┊   Slow Decay │                │              │
        ┊     = delay  │    Sustain     │              │
        ┊          │                │              │
zero ···┊··········│················┊··············│··· zero
        ┊          │        + 95    ┊              │    volume
+100    ┊          ▲                ┊              
        └── instant fall (F/R = -100) ────────────
```

Discrete Glissando

Glissando (stepped glide) in one layer (OSC1 to OUT1), normal smooth glide in the other (OSC2 to OUT2). The difference causes an interesting "small room" effect.

Glissando: OSC1 is in Hertz mode, set to 10Hz * 8. The result is actually 160Hz (not 80Hz) because the oscillator uses neither Fractalize nor a second PD waveform. This frequency is modulated by a ramp in Map1, driven by key follow. This isn't the same as setting 'Key' mode for the map because key follow includes glide while 'Key' only sends discrete values.

Filter FM Grunge

Both Filter1 cutoff modulation sources are audio signals here: OSC2 and Filter1's own bandpass output. The former causes a host-synchronised triplet rhythm (OSC2 is detuned by +6.00 'Beats') and LFO2 adds the slower Fractalize modulation.

A modicum of cutoff modulation from Filter1's own bandpass makes the sound much grittier – try using LP6 instead, and test how far you can push it in the negative (!) direction before the sound becomes completely unusable.

Filter FM Vocal

Before formant filters became widespread, the method of choice for vocal-ish timbres was to modulate filter cutoff at high audio rate. The modulator (OSC2) here is set to overtone 9, a major third a few octaves up. You can listen to it by connecting OSC2 directly to OUT1.

FM Bass

3-oscillator FM: OSC3 phase-modulates OSC2, which in turn phase-modulates OSC1. OSC1 and OSC2 are both sine waves, while OSC3 starts as a rounded-off square, adding some grit. If you prefer an even more lo-fi sound (like the original DX7), try quantising the final carrier (OSC1). OSC2 is pitched two octaves higher than OSC1 here – you could try other intervals.

Three envelopes: ENV1 is for the amp (OUT1. ENV2 modulates OSC2 level, OSC3 level and phase distortion. ENV3 creates a plucky attack by modulating OSC3 pitch – try adjusting its Attack and Decay times.
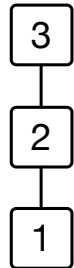
FM Distortion

Simple 2-oscillator FM, with feedback for the modulator and PD for the carrier: OSC2 phase-modulates OSC1. Note that OSC2 is a sine wave unless you add feedback by turning up Ctrl A.

Pushing the modulation wheel gives you a searing phase distortion, and pulling the pitch bender drops the octave as well as shortening the note (via ENV1 Rate Mod).
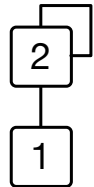
FM Gong

Two pairs of operators slightly detuned against each other. The modulators are pitched 4 semitones above the carriers for just enough metallic flavour to warrant calling this patch a "gong". ENV2 shapes the modulator levels. Tip: While performing, use the slow attack to your advantage by playing mostly short, darker notes interspersed with just a few long, brighter ones.
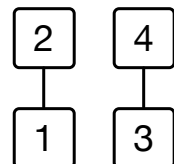
FM Mallet Sustain

2-op "FM" with feedback for the carrier and overtone pitch control (mod wheel) for the modulator. As well as shaping the modulator level in the usual way, ENV2 also negatively modulates the carrier's feedback (Multiplex1) for a "swell" effect shortly after the initial attack (the raw OSC1 output is unaffected).
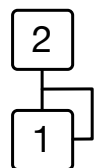
FM Wavefolder

OSC2, set up as a clocked LFO, is used via "FM" as a waveshaper for OSC1. To isolate this aspect of the patch, all sources of movement need to be removed: LFO1 is modulating OSC1 pitch as well as volume… so disconnect those two cables. To lose the straight 1/8 stomp, remove the cable connecting LFO2 to OSC2 PD. The remaining subtle movement is caused by OSC2 itself – check this by adjusting OSC2 Modify. Turn OSC2 Tune down to 0.00. In either 'Hertz' or 'Clocked' mode, it is now **zero Hertz**. Turn OSC2 phase modulation amount up to max, hold a note and watch the waveform fold as you adjust OSC1 Volume.

Full Sequencer

Use this as a template whenever you need a 16-step sequencer. All 4 taps are used:

Tap1: Gate with Velocity (All 4 envelopes use 'ModSeq1' as their trigger)
Tap2: Pitch (Multiplex2 doubles the strength so that integer steps are semitones)
Tap3: Modulation (use it for anything e.g. Fractalize here)
Tap4: Self-rotation!

It's best not to change the Tap4 data unless you don't need Tap3 – in which case you could lengthen the sequence to 32 steps: Remove the Tap3 cable, set the right half of Snapshot [1] to 0.00, 12.50, 25.00, 37.50, 50.00, 67.50, 75.00 and 87.50. Right-click on Snapshot [1], 'copy' then 'paste' to Snapshot [8]. Right-click [8] again and select 'interpolate <-'. finally, set different notes in Tap2 for each snapshot.

Harmonics in Series

Quantisation turns the unipolar LFO1 triangle into steps of equal height, and relative FM can turn these into notes of the harmonic series. With the Quantizer set to 8.00 and the FM amount at 80% it sweeps through the first 9 harmonics (16 steps – count them). To change the number of harmonics, use matching values for quantisation and FM modulation depth. For instance, if you set them to only 5.00 / 50%, you would get 6 harmonics (10 steps).

LFO1 Phase is set to 98. Try setting this to 0 instead to hear why the offset was necessary for a unipolar triangle. Using more steps also affects the speed, so you will have to compensate by adjusting LFO1 Rate and Phase.

Here's something I never had the patience to figure out for myself: Which values for LFO Rate and Phase will bring the 5 steps into perfect sync with the host tempo? If you can work it out, please let me know your method and the results!

Human Touches

Three little tricks that can breathe some subtle life into "instrument" patches;

1) Add a bit of the signal that is controlling vibrato depth (mod wheel in this example) so that the oscillators go slightly sharp whenever vibrato is applied. Setting the LFO to unipolar LFO is too much of a good thing – try that and see for yourself.

2) Modulate the vibrato rate very slightly with its own random wave (select 'LFO1 Rand' as the Rate Mod source). Of course it works!

3) Imperfect intonation often means approaching the correct pitch from the direction of the previous note. This patch applies GLIDE with a low Range (2.00) to simulate that effect.

I Heart Quintuplets

Lowpass-filtered infrasonic oscillator, with some tonal interest added by Distortion effect. The rhythmic division depends on the Fractalize setting. Your mission, should you choose to accept it, is to find the precise Tune value that will convert those tuplets into proper 5/8 time. Then experiment with the OSC1 Fractalize setting to create different rhythms.

Major Stack

How easily can we get a major 3rd and a 5th at the same time using just one oscillator? Stack is set to 2 and OSC1 has 50% 'rel fine' FM from StackV – just the right amount to transpose voice 1 up a major 3rd and voice 2 down a perfect 4th at the same time. The root is provided by the Distortion effect – try switching that off.

The relative modes ('rel fine' and 'rel coarse') are good for setting intervals if you've already used the pitch modulation input. Load *INIT*, connect +5V to OSC1's phase modulation input, select 'rel coarse' there and experiment with multiples of 10 for the amount…

Remember: -20 gives you 0Hz.

Minimal Drum

I don't know how this works! White noise sent through a lag processor with maximum attack and medium decay somehow creates an interesting pitch envelope. I discovered this quite by accident (often a great source of inspiration). See also *09 Percussion / Humming Timp*.

Mod Feedback

Complex effects seldom require a lot of patching. Simple patches with modulation feedback (aka recursive modulation) are often better for those "organic" sounds…

LFO1: The smooth random signal drives Map1, which feeds back into LFO1 as source for Rate Mod as well as Amp Mod. What would otherwise be a simple rising saw is transformed into an "unstable" wave useful for modulating the oscilllator parameters.

Octave Osc

A kind of "stacked voice tuning" for individual oscillators: OSC1 is pitch-modulated by StackV. Stack (in the VOICE panel) is set to 3 and the pitch modulation amount is 12.00, so we get an octave up AND an octave down in addition to the regular pitch.

Once you are stacking voices, you might as well use StackV / 'StackVoice' for other stuff – for instance to spread the LFO rates apart (see LFO1 here) or to balance the volumes of individual voices (OSC1 Volume modulation here). Try adjusting both those amounts.

One-Shot Bouncer

Play a few notes, short ones as well as long ones. Did you notice anything special about the envelope? Whether you hold a note down forever or play staccato makes no difference whasoever. Such behaviour is typical of "one-shot" envelopes. Bazille doesn't offer you a one-shot an envelope mode directly, but you can simulate a simple one:

Load *INIT*, connect +5V via lag processor to the OSC1 pitch modulation input, turn the lag attack time ('A') up to 7 and the pitch modulation amount to 12. Turn ENV1 'Release' up to 60 then test it: A regular envelope would start decaying as soon as you release the keys.

This trick only works because the +5V source is **reset per voice** i.e. it isn't permanently 'on', as you might think. Similarities between Bazille and hardware modular systems can be quite deceptive!

Pseudo Reverb

This trick is CPU hungry due to ENV1's long release time – more voices are likely to be active at the same time. Besides, Stack is set to 2 for an immersive stereo effect. With gate-like settings, ENV2 modulates ENV1 amplitude: The result is a suitable composite envelope.

Look at Multiplex1 and the yellow daisy chain: While a note is being played, ENV2 suppresses random pitch modulation (in opposite directions) from LFO2. Releasing the note allows the modulation, simulating the natural, complex dispersion of a large room. Almost!

The 2 voices in OUT1 are panned apart. Using OSC3 and OSC4 instead of setting Stack to 2 might have saved some CPU, but it wouldn't have been as easy to follow!

PWM (x1, x2, x3x4)

All these patches demonstrate cyclic pulse width modulation using the first method described in the *Tips & Tricks* chapter of the Bazille user guide. They are successively more complex – *PWM x3x4* is the most bombastic version, with a total of 12 PWM oscillators (voice stacking!) contributing to the huge swarm. See also *07 Pads & Poly / HS That PWM*.

Quantizer PWM

How does this work? A rectified LFO is added to a sine wave, moving it up and down before it enters the Quantizer – which then 'squarifies' the constantly shifting waveform: PWM!

Quartet

You can use a map and the sequencer to effectively select "sub-patches". In *Quartet*, Map1 in 'Increment' mode cycles through the first four snapshots (blue cable). Watch the sequencer while repeatedly playing a single note and the principle will become obvious: Each tap activates just one of the oscillators by modulating its Volume upwards from zero.

To edit one of those "sub-patches" without having to cycle through them all, set Rotate to zero (double-click) and select the snapshot you want by double-clicking [1] to [4] in the rim of the dial. Afterwards, take Rotate back to 3.00 and double-click [1].

There's more: You could use the second map to offset LFO or filter parameters, or bit-reduce one of the sub-patches using the Quantizer. Instead of incrementing the map data, select 'Key' mode and define keyboard splits…

S&H Wheel

Move the mod wheel up and down while holding a note. The resonant frequency is constant for each repeat, there is no smooth "sweeping" effect. This is achieved by sampling the wheel is at the rate of LFO2, and having the result modulate OSC1 'Res1' phase distortion.

In case you didn't notice anything special about this behaviour, grab the yellow cable from the SAMPLE & HOLD input and drop it directly onto the PD modulation input, replacing the existing grey cable. Now move the modulation wheel while playing a note again. Compare!

Sampled Sequence

A more interesting job for the Sample & Hold processor than in *S&H Wheel* is to regularly sample a sequence that is running at a faster rate. Thanks to **David Bessell** of NODE for the idea! See *02 Loops - tuned / Sixty Steps* for a more refined use of this trick.

Sequencer Divide is set to 5 so it runs 1.25 times faster than the S&H Trigger source (LFO1), causing the notes to repeat only after 60 steps. As the sequencer Trigger is set to 'gate', any new notes will restart at the first step. Experiment with various Divide settings.

Spectralize Fractalize

Two different 'TapMap' waveforms created with Spectralize (see *Additive Waves* on page 7) in combination with triangular Fractalize, resulting in a robotic vocal sound. Note that VOICE Drift is switched off to accentuate the static character. Try various formant combinations by moving the mod wheel and Ctrl A.

Stack Glider

This patch uses lagged StackV to glide the pitches of 2 of the 3 voices in opposite directions. Voice 1 glides upwards, voice 2 doesn't glide at all, and voice 3 glides downward.

StackV always distributes values evenly between the stacked voices:

Stack = 1   +100%
Stack = 2   +100 and -100
Stack = 3   +100, zero and -100
Stack = 4   +100, +33.3, -33.3 and -100
Stack = 5   +100, +50, zero, -50 and -100 etc..

Those values could be expressed as "voltages" instead: 100% = 5V, so simply divide by 20.

Stack Rotation

Stack (in the VOICE panel) is set to 3 and the voice index rotates the sequencer so that three snapshots are playing in parallel. StackV sends +100%, 0, and -100% to the 3 voices, so voice1 plays snapshot [2], voice2 plays snapshot [1] and voice3 plays snapshot [8]. Check out the values in the other snapshots by clicking around the rim: As snapshots 3 to 7 aren't being used in this patch, they are all empty.

Sequencer Tap3 is connected to an unused multiplex. This is actually required: Tap3 defines 'ModSeq2' so that the sequencer can be used to trigger envelopes. If you're not familiar with this feature, read the section *How to Trigger Envelopes* in the Bazille user guide.

Violin Swell

Notes start quickly then swell up to maximum – a typical "emotional" envelope. The trick is to lag +5V and use that to modulate the envelope level (via Amp Mod). This method makes the swell easier to adjust than using an extra envelope. See *One Shot Bouncer* above.

The LFO1 Delay is just about right for violin-typical vibrato, which is deepened via Pressure.

01 Loops - untuned

Autokratzer

While playing a note you can morph between the first 6 sequencer snapshots by pushing the modulation wheel (the Rotate amount is set to 5).

- Before controlling OSC1 pitch, the sequencer signal is lagged. The lag has a short Attack but a fairly long Decay setting, so upward steps are almost instantaneous while downward steps have a noticeable glide. Listen for a while until the difference becomes obvious. The raw (unlagged) sequencer signal also modulates OSC1 Fractalize and PD.

- The yellow cables: The mod wheel not only rotates the sequence from Snapshot [1] to [6], but also frequency modulates (linear FM mode!) OSC1 negatively. This inverts the "tune": Click on Snapshot [6] and compare it with Snapshot [1]… they are identical.

- Remove the green cable from OUT1 – the sound loses all the grit provided by OSC2. Click on the [UNDO] button then remove the red cable from OUT2 instead. Experiment with the amount of OSC2 phase modulation from OSC1 by adjusting OSC1 Volume. Note that setting it to zero results in silence because OSC2 frequency is extremely low.

Bendy Beets

Push the mod wheel or apply pressure to hear the "coconut percussion".

- Let's work backwards, starting with the outputs: Disconnect the orange cable from OUT1 to check its contribution to the sound… everything, it seems! To hear the percussion you need to push the mod wheel or send it some Pressure. Or both at the same time…

- A trick described in the Bazille manual ("Balancing two modulators") is applied to the mod wheel and Pressure in Multiplex3. The result is sent to Multiplex2, where it controls how much of Map1 (driven by LFO1) is used to control OSC3 volume. Follow the cables!

- So Map1 and OSC3 through Filter3 BP6 does the percussion. Push the mod wheel up to maximum, double-click on OSC3 phase modulation depth (the knob below 'PM coarse') to hear what it sounds like without ENV2 (triggered by LFO1). Then reload *Bendy Beets*.

- The sequencer not only modulates OSC1 pitch, but also triggers ENV1. The 'ModSeq1' option in ENV1 means the **used tap closest to Tap1**, which in this case is Tap4.

- On to the remaining filters: Filter1 bandpass is fed back (the grey cable) so that self-oscillation happens more quickly. Filter1 also amplitude-modulates OSC1 for a gritty effect (try removing the blue cable and compare).

  The role of Filter2? High Gain beefs up the bendy sound, ENV1 adds a bit of contour and the pitch wheel opens it up – so push that wheel!

Big Beaty Boot

An infectious beat, especially at around 140 BPM.

- Hold a note and watch how the left half of the sequencer plays the bass drum while the right half plays the snare. Although the sliders don't move when the sequence is rotated (by LFO1 via Map1 here), you can see the grey bars flipping up and down.

- The values in Map1 are 0, 33.33, 66.67 and 100, but as Bazille only lets you draw integers you can't freely adjust them. However, non-integer values CAN appear: Right-click in Map2, choose 4 steps, select 'shapes / ramp' then apply the 'make unipolar' function.

- Why is Tap2 connected to the Multiplex? Search for "How to Trigger Envelopes" in the user guide. You might be surprised to see that Tap4 doesn't need to be connected to anything although envelopes 3 and 4 use ModSeq2 as trigger.

- Isolate the bass drum by turning OUT2 volume down to zero. Working backwards, OUT1 gets its signal from Filter3 (LP24), which is fed from OSC1. A very snappy ENV2 modulates OSC1 pitch, while the wheels affect pitch ('rel coarse') and tone (PD amount).

- Reload the preset by clicking on the data display and selecting HS Big Beaty Boot again, then isolate the "snare drum" by turning OUT1 volume down to zero. OUT2 gets its first signal from Multiplex1 via Filter1 (LP6), which carries white noise (red cable) multiplied by ENV3 (grey cable). The other signal at OUT2 is a short "zap" from OSC3, the pitch and PD level of which is being modulated by ENV4 (via the green daisy chain), while the level is tamed for higher notes in Multiplex2. Phew!

Bitterlake

Like *Bendy Beets* above, this patch has two layers, in this case a bass drum and a scraper sound. All four envelopes are triggered by the two halves of the sequencer:

- The bass drum is OSC1 with a Tap2-triggered ('ModSeq1') ENV3 modulating linear FM and PD amounts, through Filter1 (LP12) cutoff-modulated by ENV3, to OUT1 via Tap2-triggered ENV1. You might need to read that sentence again while following the cables!

- The scraper is OSC2 with a Tap4-triggered ('ModSeq2') ENV4 modulating linear FM amount, through Filter2 (LP6 and BP6) to OUT2 via Tap4-triggered ENV2. Multiplex1 adds some LFO1 triangle (1 bar triplets) to the mod wheel, which negatively modulates cutoff to isolate the bass drum layer. 100% understood already? If not, rinse and repeat!

That was the hard part. The rest is relatively straightforward:

- Every 2 bars a unipolar LFO2 square wave rotates between snapshots [1] and [2]. The height of each bar determines the ENV1 and ENV2 velocities (both have 'Velocity' set to maximum). See "Gates and Velocities" in the Bazille user guide.

- Stack in the VOICE panel is set to 2, with the second voice tuned to +4.20 semitones in the STACK VOICE TUNING. This thickens the sound, but I'm not sure whether it is worth doubling the CPU hit. Set Stack to 1 and let your ears be the judge!

- All effects are active, and the delay contributes to the rhythm: Click on [Edit] and see those delay times (1, 9 and 3) and levels (the slow Center tap is the loudest). 'Hard Clip' distortion dirties it up, while the spring reverb and the Phaser add some 'space'. Note that the Delay is positioned above (i.e. before) the Distortion – try swapping them.

Chalk It Up

Push the mod wheel: Random filter percussion becomes slowly phasing electronic chaos.

- White noise is fed into an almost self-oscillating Filter1, giving it a chalky character. The LP24 (4-pole) output is low-passed by Filter2 (LP18 i.e. 3-pole) when Ctrl A is turned up (follow the red cables). Ctrl A also increases Filter2's resonance, which makes the transition more dramatic as well as giving the sound a bit more oomph when softened. Disconnect the short red cable and listen to the difference (apply Ctrl A). Then hit [UNDO]… the daisy chain is replaced by individual connections from Ctrl A.

- Filter1 cutoff i.e. its pitch is a random step. Try adjusting LFO1 Wave: The RND signal gets rounded off, which doesn't really suit this preset. Take it back down to 3.00 (not 0, as it would stop triggering ENV1 and ENV2 – see Envelope Tricks in the user guide).

- LFO1 rate modulation is from 'CV1'. The CV1 socket (MIDI & MORE panel) gets a signal from Multiplex1, which balances between the mod wheel and pitch wheel via Map1. What about the curve in Map1? I found that using pitch wheel directly caused the LFO to get too slow at minimum 'wheel', so I made the negative part of the map shallower.

- For a rhythmic 'rain' effect disable the Phaser, hold several notes, push the mod wheel all the way up and take Ctrl A to about 80%. Compare this sound with *03 Effects / HS Rain Manual*, which is much denser.

Clock in Wet Sand

Steady 16th ticking – mostly in groups of 4 – with a squelchy effect added via Pressure.
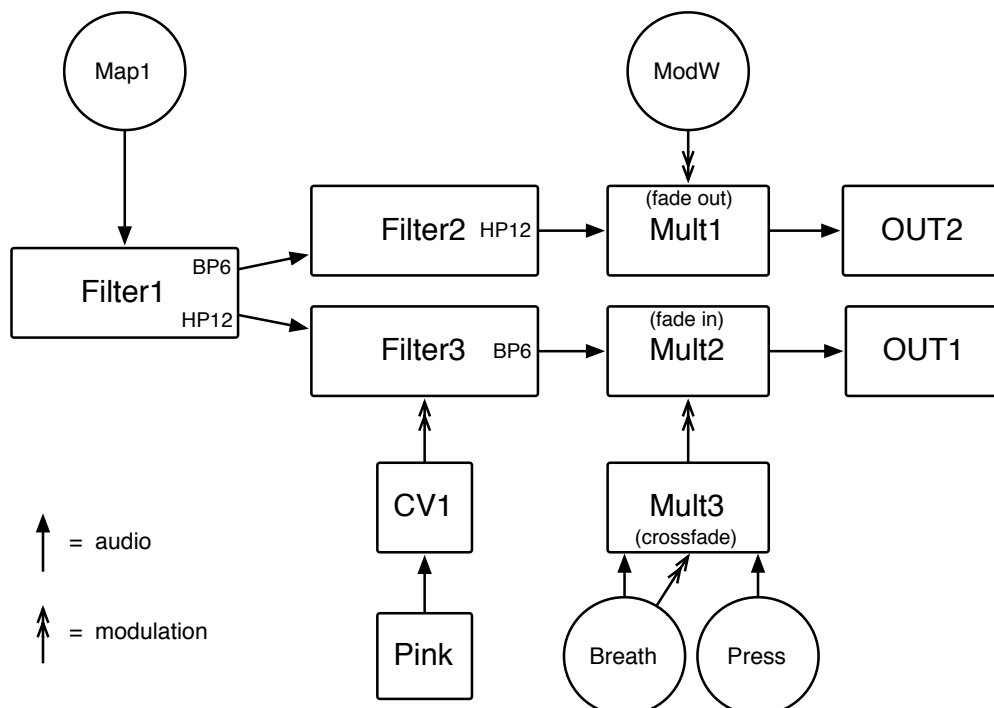
- The ticking is an impulse created by a sawtooth (LFO1) fed into a Map containing a single non-zero value. An earlier attempt using a 'Clocked' oscillator with 'Tap Map' didn't sound clean enough, so I stuck with the clunky but better-sounding method.

- The signal flow is complicated, as you can see in the diagram above. The Filter1 signal is passed on to two other filters: Firstly, Filter1 BP is sent to Filter2, the HP output of which is sent to Multiplex1 where it can be faded out via mod wheel. The result goes to OUT2. Secondly, Filter1 HP is sent to Filter3, the BP of which is sent to Multiplex2 where it can be faded in via Ctrl A or Pressure (via Multiplex3) for the squelchy "wet sand" effect. The result goes to OUT1. The ultimate source of that squelch is Pink noise modulating Filter3 cutoff – try adjusting the modulation knob labelled 'CV1' there.

- Switching [HQ] on reduces the squelch. It's often worth checking whether 'Good' quality sounds better than 'High'. If the difference is negligible, disable [HQ] to save CPU.

- Although pushing the pitch wheel doubles LFO1's rate, pulling it back doesn't seem to slow it down. Not surprising, as those relentless 16ths are caused by the Delay effect!

Down and Up

More of a comedy patch than something musically useful, but the techniques are interesting:

- In Multiplex1, LFO1 triangle crossfades between normal OSC1 and an inverted version using the *bipolar crossfade* method (see *Multiplex* in the user guide). The Multiplex1 signal modulates OSC2 volume and pitch positively, and Filter1 cutoff negatively.

- Multiplex3 balances Pressure and Ctrl A (look for "Balancing two modulators" in the Bazille user guide). The result modulates OSC2 PD, making it honk like a TB-303. The timbre here relies heavily on the Distortion effect, however – look in the FX panel.

Eclectic Fiesta

Two bendy synthetic bells (one low and one high), with a clicky attack.

- To isolate OUT1, remove the cable from OUT2. OUT1 carries a mixture of filtered and unfiltered OSC1. Mod wheel turns up OSC1 PD, making it more square. It also increases Filter1 cutoff and compensates for the extra brightness by reducing OSC1 volume a bit.

- Map2 isn't connected via cable, but 'MMap2' is the rate modulation source for ENV1 and ENV2 (look there): it makes some beats shorter or longer than others. Both envelopes are triggered by the sequencer, which alternates between Snapshot [1] and [2] twice per bar because a unipolar square from LFO2 is modulating Rotate.

- Reload *Eclectic Fiesta* and remove only the lefthand (double) connection to OUT1. Hit the [UNDO] button to see how Bazille reconnects those cables without the daisy chain. Next, reload *Eclectic Fiesta* again and turn down OUT1 Volume. OSC2 sounds very thin due to the 'Res 2' mode phase distortion. The PD amount there is modulated by Map1 for some tonal movement.

- Reload *Eclectic Fiesta* once more. As both maps are already in use, OSC3 and OSC4 (both set up as clocked square LFOs) have been recruited to modulate OSC2 pitch.

- Finally, what is responsible for the soft metallic character? In the VOICE panel, Stack is set to 2 and voice 2 is detuned +10 semitones (STACK VOICE TUNING). Try adjusting the Voice2 tuning, then check what *Eclectic Fiesta* sounds like if you set Stack to only 1.

Eggnog Beat

Another drum machine, but polyphonic – so you can build up complex rhythms or create flams.

- Map1 isn't connected to anything via cable, but modulates ENV1 amplitude (look in the panel). Map1 is being driven by 'LFO2 Tri', a 2-bar ramp (LFO2 Wave is at maximum). OUT1 uses 'Env1', and ENV1 also modulates OSC1 volume (grey cable) for a sharper decay without using the Snappy button. It also modulates OSC1 pitch (blue cable) and Filter2 cutoff. Quite a lot of re-use there!

- The pitch wheel is rectified and sent to CV1, which is then used to rate-modulate ENV1. Rectification makes all negative values positive, so pulling the pitch wheel down also lengthens ENV1.

- About that snare: In Multiplex2, Map2 (also driven by LFO2) is mixed with Pressure and sent via CV2 to modulate ENV2 rate. Adjust ENV2 Decay (D) to taste, then try it without rate modulation by removing the green cable from Multiplex2.

- As the snare body, OSC3 (sine wave) is connected to OUT2. Although in 'Hertz' mode (20Hz x 5 = 100Hz), its pitch tracks the keyboard via linear "FM" (the yellow cable).

Electronium

Based on *Eclectic Fiesta* (see above) but taken to a very different place…

- *Electronium* is basically a distorted sine wave: Disable the 'Dist' effect and listen to the harmless untreated sound, then enable the distortion again.

- Map1 modulates OSC1 pitch via a lag generator, which causes the pitch to glide upwards but jump downwards (D is set to zero). Map2 modulates ENV1 rate: Double-click on Rate Mod and listen to the difference. Then try extreme values, including -100.

- The sequencer triggers ENV1 (Tap4 leads nowhere, but defines 'ModSeq1'). A unipolar square from LFO2 toggles between snapshots [1] and [2] every half a bar – see Rotate.

Entropic Paradise 1

The thin monophonic version of two related patches (see below). Related to *Eclectic Fiesta.* Try playing mostly staccato i.e. as a normal percussion instrument, then add longer notes.

- OUT2 only comes into play if the mod wheel is pushed (see Multiplex2) – turn OUT1 down to minimum to hear the bandpass filtered oscillator in isolation. Push the mod wheel and listen to how the cutoff goes down as the post-filter volume goes up. The mod wheel also reduces OSC1 volume to compensate for the fuller sound.

- Turn OUT1 back up to maximum, then listen to what Ctrl A does. It's like having control over STACK VOICE TUNING (Stack is set to 2). Here's how it works: In Map1, Ctrl A is processed such that low values remain fairly subtle. In Multiplex3 that signal determines how much of the StackV source is sent to frequency-modulate OSC1 ('rel coarse' mode). An interesting detail: Modulation depth at +10.00 sends voice1 up a perfect 5th while voice2 goes down an octave.

  The 'rel' modes are full of surprises – see *00 Tutorial / Major Stack.* Also read what the Bazille user guide has to say about StackV.

Entropic Paradise 2

The fattter, polyphonic version. Although the connections appear to be quite different, this patch is still closely related to version 1. The main differences are:

- Extra one-shot percussion layer. Remove the red cable from OUT1 to isolate it. Both Pink and White noise are connected to Filter2, and the lowpass and bandpass filtered mixture is sent to OUT2, which is gated. The layer is made dynamic by a snappy, velocity-sensitive ENV3 modulating Filter2 cutoff. Click on [UNDO] to reload *Entropic Paradise 2…*

- Pressure and Ctrl A are balanced in Multiplex3 and the result modulates Filter1 cutoff, ENV1 amplitude (via CV1) as well as OSC1 phase distortion… which all adds up to a single tone control, as it should! The OUT2 layer only becomes audible when the mod wheel is pushed (for details, see *Entropic Paradise 1* above).

- The Distortion effect is also being used as an EQ. Most of the grit is 'Saw' Fractalize in OSC1 – try switching that 'off'.

Mad Mix

The rhythm is all LFO, at three different rates…

- Have a look in both LFO panels: The Rate Mod source is 'StackVoice' and Stack (in the VOICE panel) is set to 3. With the modulation amounts at -1.00 and +1.00 respectively, the LFO rates in voices 1 and 3 are doubled/halved, resulting in a usable rhythm.

  Play a note and listen for a while, then try adjusting LFO1 Phase… Why does this parameter affect the sound so drastically? As the three instances of the LFO are running at different speeds, adjusting the phase shifts their relative timing.

- The watery effect from OSC3 is the most unusual element in this patch. Turn OUT1 Volume down and listen. The movement of high frequencies is due to PD modulation of OSC3's secondary waveform 'Res II'. Try 'Same' instead, then reload *Mad Mix.*

- Map1 ensures that stereo panning from OSC4 (via CV1) only happens while the Pressure is very high. Try this in Map2: Click on [+] to expand the map, hold down a SHIFT key and swipe from the centre to the righthand edge – that range is highlighted. Right-click and select 'straighten' from the menu. A linear slope is created in the highlighted area.

  Right-click again, select the drawing mode 'warp' from the alt-draw (Win) / cmd-draw (Mac) submenu. Try to recreate the original curve by holding down alt (Win) or cmd (Mac) and dragging to the right. You can force the slope to start at exactly zero by selecting 'make unipolar' from the Map's context menu.

Phoenix Asteroids

Superficially a simple vintage sci-fi effect, but capable of a wide range of sounds. Try broken clusters, use both wheels as well as pressure… this patch cries out to be performed "live".

- LFO1 sawtooth acts as an envelope for OSC1 (red cable), while the random signal (green cables) modulates pitch and panning (via CV1). Wave set to 1.00 is enough to remove clicks but not enough to cause obvious glide. Try turning it up, find the usable range.

- Pressure and/or Ctrl A add a metallic warble – let's see how: These two are added in Multiplex2, and the result amplitude-modulates OSC2 (orange cable). In Multiplex1, OSC2 (yellow cable) is added to +5V (see what happens if you remove it) and sent via CV2 to amplitude-modulate LFO1. No wonder the result sounds metallic – that warbling LFO modulates 3 targets at the same time: OSC1 pitch, volume and panning.

- Map1 is odd: Driven by the mod wheel, it lowers OSC1 pitch (relative FM) and removes pressure / Ctrl A modulation (Multiplex1). Expand Map1 by clicking on its [+] button. Push the mod wheel up to the last 3rd of its throw, watch and listen. Use those 4 notches in the curve to "glitch" the pitch.

Pink Industry

This one is similar to a VCS3 sound from Pink Floyd's "Welcome to the Machine".

- Follow the cables: A mixture of White noise and highpass filtered Pink noise is bandpass filtered (to OUT1) as well as lowpass filtered (to OUT2), with cutoff modulated by LFO1 sawtooth for the basic rhythm as well as by OSC1 for the faster "warble" (grey cables). Got all that? Moving on…

- While following the cables, you may have noticed that Filter2 isn't being used to process any signal, although one of the cutoff modulation inputs is connected (to mod wheel). In the Bazille user guide, read all about Filter2 'Spread' mode and the tip titled "More cutoff modulation".

- Via CV1, quantised pressure can instantly double LFO1 rate, but this takes a good while to settle back to the normal rate due to the Lag generator's very long release time. Every synth should offer such "aftertouch release lag"!

- Pitch wheel modulates OSC1 pitch ('rel coarse') and therefore the speed of the warble. With it pulled all the way back, OSC1 reaches 0Hz because the modulation amount is +20. See more about 'rel coarse' crossing zero Hz in *09 Percussion / HS Zap Drum 1.*

Porridge

Not a reference to a classic British comedy series, but the sound of rolled oats boiling in milk of course. This patch misuses several modules: OSC1 as a complex LFO, a Lag generator as a pair of lowpass filters, and Filter1 as an oscillator for audio-rate modulation…

- OSC2 is where it all comes together, but let's start with Filter1: A snappy ENV2 kick-starts the self-oscillation (blue cable) and modulates cutoff, which is also modulated by quantised/lagged OSC1 (grey cables). Double-click on the cutoff modulation amount knobs to check the contribution of each source.

  Note: If the lefthand Multiplex knob had been set to 100 instead of 85, there would have been no rhythm from OSC1 until you push the mod wheel. Why?

- Filter1 as sine oscillator modulates OSC2 Fractalize and Phase.

- OUT1 is the same signal as OUT2 but lowpass filtered by a lag generator and with ENV1 instead of Gate as amp envelope. The darker tone and longer release creates a reverb-like effect, especially when playing staccato: Turn OUT2 Volume down to zero and listen.

Qwerk

If you only play single notes and don't perform with the wheels, you're likely to miss what makes this patch interesting. For instance, play the cluster E, F, G and A in rapid succession, hold them and perform with both wheels.

- The hi-hat sound (OUT1) applies the same basic technique as the Synthi-A percussion in Pink Floyd's "On the Run". Isolate that layer by turning OUT2 Volume down to zero. In Multiplex2, the steps from Map1 are ring-modulated with white noise – the greater the jump up, the louder the impulse. The LFO2 triangle sweeps through the 8 values starting in the centre of the map (value 5) because LFO2 Phase is set to exactly 25. Hold a note and watch the map for a while.

  Prove the equivalency of ring modulation inputs by swapping them in Multiplex2: Drag the blue cable from the Mod input and drop it onto the lower left regular input. Then drag & drop the green cable from the upper left input onto the (now free) Mod input… the hi-hat sounds exactly the same as it did before.

- Reload *Qwerk* by clicking on the name, then on the ticked menu entry. Isolate the OUT2 signal by turning OUT1 Volume down to zero. LFO1 (16ths) triggers ENV2 which is modulating OSC1 Volume (red cable), and as the trigger for ENV1. Simple enough so far, but why is the LFO2 triangle wave being rectified (grey cables)? Without altering its shape, Rectification can double the speed of a triangle wave by folding the lower half upwards. In Multiplex1, this double-speed triangle modulates the level of the same LFO's square wave, creating the water-drip effect via OSC1 pitch modulation…

  I often stumble upon such tricks by accident. Although I can usually work out technical details, I am sometimes stumped (e.g. by *00 Tutorial / Minimal Drum*).

Rimbo

Electronic bongos, distantly related to "Sextant Original" (see below). The tangle of cables is due to all 4 oscillators being used for various components of the sound…

- OSC1 is responsible for what you hear when you just play a note – remove the blue cable from OUT1 and the sound disappears (do that). Apply Pressure to hear OSC2, then push the mod wheel for a bouncy OSC3. Finally, turn up Ctrl A to hear OSC4.

- To restore the original patch, click on [UNDO] – the blue cable will reappear. Note: If you click [UNDO] once more, the patch that was loading before you selected *Rimbo* (if there was one) will reappear. Try that, then click [REDO] or reload *Rimbo* if necessary.

- Some of the sequencer values aren't set to either maximum or zero, which suggests that one or more ModSeq1-triggered envelopes will have 'Velocity' turned up… Indeed, both ENV1 and ENV3 use 'Velocity'.

- Driven back and forth by a slow synchronised triangle from LFO2, the maps modulate oscillator pitches: Map1 controls OSC3 pitch while Map2 controls the other oscillators as well as ENV3 rate via CV1 (follow those cables). As Map1 has only 8 values while Map2 has 32, they increment at different rates: Map2 4 times as fast as Map1.

- Multiplex1 adds 50% ENV1 to 100% inverted key follow ('KeyF1'), and sends the sum to control OSC1 volume. The sound gets more snappy, and OSC1's contribution to higher notes is reduced. In Multiplex3, pressure controls how much of the ENV2 signal modulates OSC1 / OSC2 phase distortion, as well as controlling OSC2 Volume. Isolate each oscillator in turn to check that. Multiplex4 multiplies ENV3 with Ctrl A, which adds those "tweets" from OSC4.

Scrub Beat

As the beat is relatively simple (3+3+2), try layering notes at different positions in the bar. For a "Carnival in Rio" effect, hold a low note and throw in a bunch of higher notes every now and then. The routing is quite complicated…

- Remove the hi-hat by turning down OUT2 volume. The OUT1 layer uses three filters in series (F1/LP6 → F3/HP12 → F4/LP24): Filter3 adds overdrive (Gain is at 15.00) while ensuring that high notes remain crisp – try reducing Filter3 KeyFollow to check. Although I like to keep things simple, I think it was worth using Filter4 to warm up the sound.

- The basic 3+3+2 rhythm is sequencer Tap2 triggering ENV1 (Trigger is set to 'ModSeq1'). However, the rhythm can be changed by pulling or pushing the pitch wheel: PitchW is patched to Rotate via the Quantiser and Lag1 (follow the grey cables) so that snapshots are smoothly switched instead of crossfaded. Inspect the contents of the two alternative snapshots by clicking on 8 then 2 In the sequencer dial.

- ENV1 controls Filter1 cutoff and the amount of Pink noise going into the filter (see the green cables and Multiplex1). ENV2 is dedicated to the hi-hat layer, so let's go there…

- Reload *Scrub Beat* and turn down OUT1 volume to isolate the hi-hat. ENV2 controls Filter2 cutoff and the level of White noise entering that filter (yellow cables and Multiplex2). You should recognise this as the same method used for pink noise in the other layer.

- Multiplex3 applies Ctrl A to filter resonance – try it. Multiplex4 mixes both sequencer halves together and sends the sum via Lag2 to CV1, which is used for shortening ENV2. Pressure fades those signals out (as they are connected to the righthand input sockets), restoring ENV2 to its nominal rate.

- Experiment with different sequence rates by changing Divide and the Tap2 and/or Tap4 speed factors to 2, 4 or 8.

- Map1 (driven by Ramp1) is sent to CV2, which pans both OUTs in opposite directions.

Sextant Original

Vintage electronic bongos, the synthetic rhythm in Herbie Hancock's tune "Sextant" (1973). Give the track a listen e.g. on YouTube. Or better, buy the album.

Ironically, this version of the patch is not my original. I had used LFO1 for both the random pitch (RND output) and for triggering an envelope or two. However, recent improvements to the LFOs meant that 'Wave' had to be non-zero, otherwise it wouldn't trigger the envelopes. Unfortunately, doing that also softens the jumps in the random signal. Not good…

Various attempts to fix the patch made it unnecessarily complex and I was getting nowhere. In the end I made a new clone that uses an oscillator instead of pinging a filter. Problem solved!

- LFO1's sawtooth triggers the Sample & Hold, creating a random pitch control signal from white noise. That signal also modulates cutoff as a kind of mild "key follow". The same sawtooth also serves as an envelope for OSC1 Volume and Filter1 cutoff.

- Pitchbend modulates LFO1 rate, although there was no hint of that in the original track.

- I suspect that the reverb unit they used in 1973 was an AKG BX-20 or similar – look it up! Bazille's model is close enough.

How about cloning the other two vintage synth effects at the beginning of that track?

Slapshot

The most unusual feature, visually at least, is the yellow "starfish" around Filter3.

- Try this: Click+drag Filter3's lower input a few pixels down. The short cable bridging the inputs and the longer cable connecting them to CV1 disappear – as does the long noise on the 4th beat. Reload *Slapshot* from the data display.

  Now click+drag the **upper** Filter3 input away. As you have removed the main line from the source (Map2), the entire chain disappears. Restore the preset by clicking on [UNDO].

  [UNDO] restores all connections without using daisy chains. You can use this to your advantage: Whenever you want to remove only part of a chain, right-click+drag on the source, then immediately click on [UNDO] and remove individual connections.

- Reload *Slapshot* from the data display and follow the daisy chain from its source (find the red socket): Driven by a saw from LFO2, the Map2 data is highpass filtered (Filter3) then sent to Multiplex3, where it controls the amount of noise entering Filter2. The reason for highpass filtering will become clear if you lower Filter3 cutoff by applying pressure: the noise envelope created by multiplication with Map2 in Multiplex2 gets longer as more of the low frequencies are allowed to pass, and the result sounds more like firing a cannon.

  The rest of the yellow starfish? Via CV1 it pans the outputs, via lag generator it modulates OSC1 pitch and tone (PD), and modulates Filter2 cutoff.

- Isolate OUT1 by turning OUT2 Volume down to zero. This layer is band-pass flitered noise, with cutoff control from Map1.

- Ctrl A halves the speed, while the pitch wheel can also double it (try maximum Ctrl A and minimum pitch wheel). How it works: In Multiplex3, PitchW is mixed with inverted Ctrl A and sent off to the Quantizer. Quantisation is set to minimum, allowing only 3 discrete values for a bipolar source such as pitch wheel, and only 2 for a unipolar source such as the mod wheel. The Quantizer is patched into CV2 so that it can control the speed of LFO2, which drives both maps. See Rate Mod in the LFO2 panel. Map1 also modulates OSC1 Volume.

  If you can remember all the above and are now a daisy chain master… congratulations!

Sooper16

Sooper16 only comes to life when you use the mod wheel and Ctrl A.

- Despite its complicated appearance, the patch is quite simple: The first layer is OSC1 processed by Filter1 (LP plus BP). Remove the blue cable from OUT1 and listen to the bandpassed signal in isolation. [UNDO], remove the orange cable and listen to the low-pass. Compare the two signals at various mod wheel positions.

- The quasi-random melody is played by Tap3 of the sequencer, using four snapshots selected by Tap4 (see Rotate). You could call this technique "recursive snapshot selection". The Tap4 data is 0%, 25%, 50% and 75% in all the used snapshots (click on snapshots 1 to 4 and check for yourself). These values become 0, 1, 2 and 3 when multiplied by 4 (the Rotate amount) so they step perfectly between the first 4 snapshots.

  What happens if you use "wrong" values? Set Rotate to 3 or 5 and/or mess with the Tap4 data. When you've had enough fun destroying the sequence, reload *Sooper16*…

- The second layer (OUT2) is silent until you send it some Ctrl A: Multiplex2 determines how much of the Filter2 BP signal is sent to OUT2. Turn Ctrl A up to maximum and listen to the noise layer (a mixture of White and Pink) for a while. You don't need to turn down OUT1 as Map1 already does that for you by fading out OSC1. The curve there keeps OSC1 fairly loud for most of the mod wheel range.

- Let's get back to the first layer: Reload *Sooper16* if necessary and have a look at OSC2. Lagged mod wheel controls both the Volume (positive) and the pitch (negative, 'rel coarse' mode). The nominal frequency of OSC2 seems to be 8Hz multiplied by 10.00 = 80Hz, but it is actually 160Hz as only one PD waveform is used and Fractalize is 'off'.

Stolzieren 1

This one started as an experiment about multiplying and dividing rates using a map.

- LFO1, which triggers the envelopes, is rate-modulated by Map1. With the amount set to 2.00, the speed of LFO1 can be divided/multiplied by up to 4 times, so what would normally be 16ths can be shifted to anything between 1/4 and 1/64.

- Map1 is driven by a ramp that repeats every 4 bars. Click on Map1's [+] button and see how the various values affect rhythmic density. Then destroy the rhythm by moving just one of the bars.

- The audio path is OSC1 plus noise through Filter1 (LP12). The second filter is unconnected, but 'Spread' mode means two more cutoff mod inputs for Filter1. See Filter2 'Spread' mode in the Bazille user guide.

- The rest: ENV1 is used for OUT1, ENV2 does cutoff modulation, ENV3 modulates OSC1 (FM in 'Lin 100Hz' mode – also try 'Lin 1kHz' mode). While experimenting, try the 'Res' options in OSC1 instead of 'Square', then try modulating PD with e.g. lagged Map1.

Stolzieren 2

Very bendy '303-ish' version of the above. Perform with the pitch wheel.

- In Multiplex1 the pitch wheel crossfades between Map2 and +5V, and the result modulates OSC1 Fractalize – the effect of Map2 diminishes as Fractalize is increased. The pitch wheel also turns Filter1 cutoff down to compensate for the extra brightness: See Filter2 'Spread' mode in the Bazille user guide.

Sudsophone

Note the CPU-friendly Voices setting for this patch – maximum polyphony is only 3.

- Follow the signal path backwards from OUT2: The orange cable comes from OSC2, which is phase-modulated and fractalized by a resonant Filter1 (the green cables). Filter1 gets a tiny bit of 'Gate' to kickstart the resonance – self-resonating filters can be a bit sluggish if you don't feed them! Try removing the grey cable to check that, then reload *Sudsophone*.

- Filter1 cutoff is being modulated by OSC1, the only source of rhythm in this patch. Its waveform is 'Square' followed by '2Pulse', an interesting combination for oscillators in 'Clocked' mode. As OSC1's Volume modulation input was already taken by LFO1, a Multiplex is used for overall level control via mod wheel.

- In Multiplex3, pressure controls how much of the Filter1 BP signal modulates OSC2 phase. As the lefthand knob in Multiplex3 is set to 94.00, a small amount (6%) of the Filter1 signal is allowed to pass through, even with zero aftertouch. Finally, Ctrl A lowers Filter1 cutoff.

Switching Drums

This preset demonstrates two techniques I don't think I have used anywhere else – yet. Thanks to our very own Rob Clifton-Harvey for the idea.

- Hold down any C for a slowly repeating bass drum - if you get silence, try again. Then add any black note. Try all 12 notes in the octave and watch Map1 and/or the sequencer dial, which moves accordingly. Once you get an interesting rhythm, step on your sustain pedal and check how the sound is affected by the wheels and Ctrl A (see Map2).

  Different keys play different beats because they rotate to different snapshots via the data in Map1 ('Key' mode). As the sequencer is polyphonic, multiple snapshots can run in parallel. The 'sync' Trigger mode here ensures that all notes are synchronised. If you prefer rhythmic chaos, try switching this over to 'gate' and playing out of time!

  All main oscillators used in this patch are set to 'Hertz' mode:

- The bass drum is OSC1, a low thump with a snappy envelope from ENV1 and some extreme pitch modulation from ENV2 (blue cable) as well as the two maps (red cable from Multiplex2). With its Gain set rather high, Filter1 is used mainly for overdrive. ENV1 is triggered by the left half of the sequencer: the 'ModSeq1' Trigger option means the leftmost used tap, which is Tap2 here. Play the note 'G' (Snapshot [8]) to see more than one hit per cycle. All notes between G and B select a mixture of snapshots… see where the Snapshot position indicator lands!

- The snare drum is OSC3 amplitude-modulated by OSC4 plus some White noise and triggered by the right half of the sequencer (Tap4).

- Try performing with Ctrl A - the rather strange data in Map2 (expand it!) gives you a warble effect while sweeping through low values, and a second peak at around 65%.

Tap Happy

Higher notes sound like tap dancing.

- OSC1 is rather gritty because it taps into Map1 for its basic waveform instead of the usual 'Cosine' – try connecting OSC1's upper (raw) output to OUT2, replacing the yellow cable. Give it a good listen, then reconnect Filter1 BP6 by clicking on [UNDO]. The yellow cable might have changed colour…

- Although LFO1 triggers the envelope, the rhythm is created by modulating OSC1 pitch with the result of multiplying LFO2 triangle (double speed due to the rectification!) and square in Multiplex1. Ctrl A modulates LFO2 rate, destroying the strict regularity.

- The mod wheel lengthens low notes much more than high notes. Try it. In Multiplex3, double-strength KeyF1 (key follow) is mixed with PitchW and inverted ModW (both 60%). The result is sent via CV1 to modulate ENV1 rate. The negative amount effectively re-inverts the mod wheel signal so that it lengthens the decay – unless key follow has made it "shorter than zero"…

  Tip: Similar techniques can be used to push lowpass filter cutoff down "below zero" so that any modulation must exceed a certain threshold before it has any effect at all.

- As usual with LFO-based rhythms, the Phase settings are critical – experiment!

Tunnel Chews

FM percussion driven by the LFOs and a ramp generator. All perfectly synchronised until you move the pitch wheel.

- LFO2 sawtooth is sampled at the rate of LFO1. This creates a 4-step waveform, as LFO1 is 4 times as fast as LFO2. The SAMPLE & HOLD output is lagged and sent to control OSC1 pitch. Try adjusting the 'A' and 'D' values.

- The warbling effect is caused by a resonating bandpass filter: In Multiplex1, Ctrl A or Press control the level of Filter3 signal used to modulate OSC1 Phase. Temporarily kill the warble by double-clicking on OSC1's phase modulation depth knob, listen, then turn it back up to 40.00. Note that Filter3 Gain is set to minimum, maximising its resonance. That resonance is kick-started by +5V. Remove that cable, listen to how the initial attack disappears, then click on [UNDO].

- Filter1 is mainly used for adding some grunge to the sound, which is otherwise very pure. The mod wheel lowers cutoff, leaving a soft version with a mild "backwards" effect caused by negative cutoff modulation from ENV1.

- The stereo rotation is OSC2 in 'Hertz' mode modulating 'Pan' via CV1. Both LFOs were already in use and ramps cannot be rate-modulated, so a regular oscillator does the job – we have enough of those to spare.

02 Loops - tuned

This is the largest category in the *Cookbook*. I tried to cut the number down to fewer than 40 patches, but found it so difficult to decide which ones to leave out that I abandoned the idea.

2wei Spiegel 1

Inspired by "Timewhys" from the album "Zero Time" by Tonto's Expanding Head Band. The melody is mirrored – watch those maps.

- Map1 controls the pitch of all 4 oscillators while Map2 modulates two tonal parameters (OSC2 fractal resonance and Filter1 cutoff) via a slight lag. Both maps are driven by LFO2 triangle (Wave = 50.00).

- LFO1 modulates the pitches of oscillators 2, 3 and 4 to various degrees, with the overall depth controlled by Ctrl A. Remember the phase modulation 'rel' modes whenever you need extra pitch modulation inputs.

- Ramp1 slowly modulates OSC1 phase distortion for a shallow rolling effect. Try increasing the speed by lowering both Up and Down to below 20, then reload *2wei Spiegel 1*.

- The orange daisy chain: Pressure turns up OSC3 and OSC4 (both are otherwise almost silent) and turns down OSC1 and OSC2 to compensate for the stronger signal.

- Lagged mod wheel reduces Filter1 cutoff. The lag's long attack and decay settings ensure that the cutoff reacts very smoothly to wheel movement in either direction.

Alien March

Typical octave sequence with 3/8 delay, layered with a retro sci-fi lead. I think there's something creepily regal (in a "Mars Attacks" kind of way) about such layering. Play odd intervals!

- The sequencer is divided into 3 parts. Tap2 triggers ENV1 and ENV2 ('ModSeq1' means the leftmost used sequencer tap) and modulates OSC3 PD. Tap3 causes OSC1 and OSC3 to jump octaves (the orange daisy chain). Tap4 rotates through snapshots 1 to 4.

- OSC2 is responsible for the 'sci-fi lead' part. LFO1 modulates pitch and phase in opposite directions, resulting in a vibrato waveform that somehow isn't the usual triangle. Hmm… next time I need an unusual vibrato shape I think I'll use a spare Map instead, as that would be more controllable.

- Ctrl A adds grit from Filter2. Also check out the OUT2 panning.

Altermotor 1

More than your typical 16th analogue stomp, as a sequence of 64 notes magically appears when you push the mod wheel. Pressure adds a 'ratchet' effect (use this sparingly).

- LFO1 triggers both envelopes, it is the source of all rhythm. The ratcheting? Pressure, quantised to only on or off is sampled and held every 16th (the 'clock' is OSC3), then sent via CV2 to double the LFO1 rate. Without the S&H, this patch would soon get out of sync. Check that: Connect the Quantizer output directly to CV2, and use OSC3 connected to OUT2 as your rhythmic reference (turn it up).

- Map1 modulates oscillator pitches via mod wheel (see Multiplex1). OSC1 pitch modulation is lagged slightly, simulating a 'Glide' offset between the two oscillators.

- Map2 mixed with double-strength Ctrl A in Multiplex3 is sent (via CV1) to modulate ENV2 rate, injecting some life into what would otherwise be a flat rhythm.

Altermotor 2

Similar to the above, but more complex and an octave higher. Step back and forth between the two versions (use the arrows either side of the patch name) and compare the connections.

Animal 1

8th analogue stomp, extra sand via mod wheel. Polyphonic, so try broken clusters / flams.

- All oscillators are Saw/Square, with maximum phase distortion and 'Max' Fractalize. Together with Stack set to 2, this forms a good basis for a massive sound.

- The rhythm is LFO2 triggering ENV1 as well as modulating various other parameters: Via Lag and Inverter it is mixed with white noise – whenever the mod wheel is pushed, this mixture modulates Filter2 cutoff. LFO2 is also connected to Multiplex1…

- Stack is set to 2 mainly so that oscillator phases can be offset between the two voices. For cyclic phasing, those phases need to move differentially – here's how: StackV is routed to both sides of Multiplex1 with slightly different amounts. LFO2 crossfades between them, creating a subtle phasing effect between the two voices.

  If you didn't quite grasp all the above, search for "Stack Voice" in the Bazillle user guide. Voice stacking can do a lot more than make a sound fatter.

- Perform with both wheels. Pull the pitch wheel back for a "cinematic throb".

Animal 2

Similar to Animal 1, except for the following:

- All oscillators are set to Res1 + 2Pulse, a brighter wave than Saw + Square.

- OSC4 pitch is a minor third up (3.00 semitones). Map1 via Ctrl A turns it into a major third, but only for the notes C, F and G - see Map1 and Multiplex4. Turn up Ctrl A and check the triads for each note of a C major scale.

- As Phaser 'Feedback' is set quite high (75%), the sweeping effect is obvious.

Back to Past 3.0

My tweak of Kevin Schroeder's *KS Back to Past* presets ('10 Tune Loops'). Although it looks horrendous at first, the patching is quite easy to follow:

- Four melodies run in parallel. Driven by LFO1, the two maps modulate OSC1 and OSC4 pitches via a Lag processor, while the two halves of the sequencer independently modulate OSC2 and OSC3 pitch.

- Both Ramps add movement: Ramp1 is connected to OSC2's phase modulation input for a mild vibrato. Ramp2's routing isn't quite so direct: To make the normally unipolar ramp bipolar, 2.5V is subtracted in Multiplex2 and the sum is sent via CV1 to pan OUT1.

- In Multiplex1, either Pressure or mod wheel (balanced against each other) cause OSC2 to 'chop' by lowering Filter2 cutoff enough so that the negative cutoff modulation from LFO2 becomes audible.

- Finally, Ctrl A fractalizes oscillators 1 and 4. Isolate those signals and listen…

Bass Cab Stomp

Distorted analogue sequence in a minor key. In a nutshell:

- Each of the 4 sequencer taps has a different job: Tap1 modulates pitch, Tap2 defines gates and velocities (via 'ModSeq2' trigger in ENV1), Tap3 rotates through 4 snapshots ("recursive snapshot selection"), while Tap4 rhythmically fractalizes OSC1 (with offset via mod wheel).

- The sound is distorted at several stages: "FM" from OSC2, two stages of filter saturation, and finally tube distortion with speaker emulation.

- Check for yourself how Pressure and Ctrl A affect the sound.

Binary Fusion

A searing, detuned octave stomp. No filters! Perform with both wheels, pressure and Ctrl A.

- Fixed phase relationships – all Phase modes are set to 'Gate'. Try the other modes to hear why this was the best option.

- OSC2 clocked at 1/8 is the source of the octave jumps (OSC1 and OSC3).

- Pressure or Ctrl A double the speed: The two sources are balanced in Multiplex3, quantised to simple on/off and sent therough the Sample & Hold clocked by LFO2 so that it stays in sync. The result adds just enough 'Max' mode fractalization to OSC2 that 16ths appear in the rhythm.

- The modulation wheel softens the sound by reducing PD: You don't always need filters.

Blockbuster

A little foldback distortion, but lots of 'Guitar Cab' colouration. Use Pressure and mod wheel.

- This patch was programmed to be quite gritty even without Distortion (try disabling all effects): OSC1 and OSC2 use the squelchy Saw+2Pulse combination, with "FM" from white noise and OSC4. OSC3 uses the beefy Impulse+HalfSaw combination.

- OSC4 self-FM is strong enough to turn it into noise. Let's isolate that bit: Remove the cable connected to the Multiplex1 output (right-click and drag away), then connect OSC4 to one of the OUT1 sockets… typical "FM" feedback noise. Try turning down the amount of self-FM, then reload *Blockbuster.*

- Ramp1 is responsible for the double-speed chugging via aftertouch (see Multiplex4). The values add up to exactly 25.00: Up = 2.00, Hold = 10.50, Down = 2.00 and Rest = 10.50. Adjusting any of them will destroy the rhythm… so you should definitely try that!

Bouncing Bass

Duophonic plucky 12-note sequence, with glide range control.

- LFO2 (unipolar) creates the octave jumps. Remove the cable, listen to the difference then [UNDO]. The octave jumps could have been defined directly in the sequencer, but using an LFO instead leaves more room for experimentation.

- Tap1 is dummy-connected (to Rotate) so that 'ModSeq1' uses only the first 4 sequencer values. If this is unclear, search for "How to Trigger Envelopes" in the Bazille user guide.

- The sequence data -24, 0, 14, -10 etc. translates to -12, 0, 7, -5 etc. semitones. Whenever you want the sequencer to send tuned pitches, set '50 Semi' mode in each oscillator, turn the modulation amount up to maximum (50.00) and set each sequencer step to double the offset you need. For a minor 3rd up you would set +6.00, for instance.

- Multiplex1: Modulation wheel crossfades between 100% unlagged and 100% lagged sequencer signal, so it is effectively a glide range control. If you don't have a feel for how the 'A' and 'D' values translate into glide yet, load *INIT,* set LFO2 rate to 0.5 Hz (2 seconds long) and use the square wave via lag processor to modulate OSC1 pitch, with amount = 6 or 12 semitones. Also try modulating OSC1 PD with the same signal.

Brandysnap

Mostly percussion, but pitches appear via pressure or mod wheel.

- Sequencer Tap2 is lagged a bit to soften transitions. In Multiplex1, this signal crossfades between DC (+5V) and the two oscillators. That DC is the source of the 16th "snaps".

- Map1 quadruples LFO1 speed, converting the triangle into a sine that is inverted every 2 cycles (watch that happening!) The map simplifies the rhythm of the white noise layer – try removing the cable connecting it to Filter2, then turn Filter2 cutoff down a bit. Here's how to quickly create such a double sine wave: Right-click in Map2, select '64', right-click again and select 'shapes / sine', then once more and select '128'.

- Pressure and mod wheel are balanced in Multiplex3 and sent (via CV1) to control ENV3 amplitude. As it is triggered by LFO2, ENV2 bends the note once every 4/4 bar (aka 1/1).

- Rotate is set to 0.80 – LFO2 sweeps smoothly around snapshot [1] but doesn't quite reach the empty snapshots [8] or [2] before turning back. Try setting Rotate to 1.00, then to 4.00. You could try using Ctrl B in Multiplex4 to modulate the amount of rotation.

- The OUT1 layer is a high-pass filtered "brush" sound using ENV4. Ctrl A effectively turns the volume up by lowering Filter2 cutoff (high-pass).

Canned Shuffle 1

303-ish sound with 'rectify' type distortion. Play "On the Road Again" or "Spirit in the Sky".

- The alternating octaves are LFO2's square wave modulating pitch. The shuffle rhythm is due to LFO2's pulse width setting (Wave = 67.00). Try adjusting that.

- 3 filters in series: #1 provides most of the resonance, #2 is for extreme saturation (note that the input level is doubled). #3 contributes normal lowpass filtering, with cutoff modulation from the mod wheel as well as from OSC3 (as a clocked LFO) via pitch wheel.

- See those ridiculously smooth exponential curves in the maps? Here's the easiest way to make similar shapes: Right-click and select the preset shape 'Ramp'. Right-click again and select the alt-draw/cmd-draw option 'Warp'. Hold down alt (PC) or cmd (Mac), click in the map and drag to the right. Right-click again and select 'make unipolar'.

Canned Shuffle 2

Simplified version. First I removed OSC2, OSC3 and the guitar cabinet distortion. As I felt it was starting to sound just a bit too "clinical", I couldn't resist adding some different notes: The sequencer's Divide value (12) ensures that the transpositions will follow the shuffle rhythm. Tap4 with a speed factor of 6 switches between snaphots 1 and 2 at the appropriate times.

Copter Bass

Push the mod wheel to maximum for a classic low throbbing sound.

- Filter1 cutoff is modulated by two envelopes, one short and shallow (ENV2) for the rapid attack plus a longer, deep one (ENV1) which is faded out via mod wheel (see Multiplex1).

- OSC1 and OSC2 are slightly detuned, as are the 5 stacked voices. In Multiplex3, Ctrl A is mixed with random fluctuation from LFO2 (important!) and sent to fractalize OSC1.

- Via Map2, lag generator and Multiplex2, Pressure above about 67% instantly activates the 16th note sequence in Map1. Map2 only has 3 steps here – if you want it to switch at 75% instead, set 4 steps. Also try using 'Map Smooth' mode instead of 'Map Quantise'.

Digital Dancer 1

Practical method of doubling a beat…

- Via CV1, Map1 doubles LFO1 rate (and therefore envelope 1 trigger) at the end of 2 bars.

- Map2 does the offbeat, leaving a space for the extra bass drum at the end. Sequencer Tap1 is responsible for ENV2 triggering and dynamics. Try turning up e.g. value #11.

Digital Dancer 2

Based on version 1, but there's a lot happening with OSC3. Push the mod wheel up to maximum and play with the pitch wheel…

- The mod wheel turns up OSC3 volume and drops the pitch.

- The 12-note cycle of squeaks is OSC3 being pitch modulated by Tap4 (via lag).

- In Multiplex3, inverted pitch wheel crossfades between +5V and ENV1. The result is sent via CV2 to modulate ENV1 amplitude (Amp Mod)… so pushing the pitch wheel gives the bass drum a stronger, more spiky attack.

- The red daisy chain: After inversion, the pitch wheel signal is rectified (so pulling has the same effect as pushing) and sent to modulate OSC3 PD as well as Fractalize. CAUTION: Using pitch bend after deactivating [HQ] causes **very loud** distortion. Don't try it, or turn the output way down first. I tracked this down to CV2 modulating ENV1 amplitude.

- OSC4 adds a bright fractalized pulse to the bass drum. Isolate that signal (by removing all cables from the OUTs except the yellow one) and listen. Turn up OSC4 Volume and experiment with the lag and Fractalize parameters.

Double Thumb

Distorted (push the mod wheel) stomp with two beats per note. Repeats after 24 notes.

- Two filters in series: The resonance from Filter1 (LP plus BP) is seriously tamed by Filter2 unless you push the mod wheel.

- Sequencer: The Tap1 and Tap2 signals are multiplied together in Multiplex1, then quantised before modulating OSC1 pitch. As the Tap1's speed factor is 2 and Tap2's is 3, the cycle only repeats every 24 notes. Check that: Temporarily set the host tempo to about 50 BPM and watch how all 3 indicators get back in step at the end.

  Push the modulation wheel a bit to hear the notes better. LFO1 triggers ENV1. Select 1/8 there instead of 1/16, count the 12 notes and listen to the intermediate pitches that occur every 3 notes. Select 1/16 to restore the double plucks.

- Keep the mod wheel pushed up. Try different low QUANTIZER values and listen to the scales: 10.00 gives you root, fifth and major third thanks to the FM mode 'rel coarse'.

- There is strong 'foldback' distortion, so the signal level before the effects is crucial. Key follow and mod wheel both lower OSC1 volume. Push the mod wheel to maximum, remove the volume modulation from OSC1 and listen. The clicks disappear and the patch loses some dynamics (especially high notes), but you may prefer it like that!

- Ctrl A adds dirty pitch modulation from OSC2.

- An opportunity to demonstrate a psychoacoustic phenomenon! Activate the Delay effect: All Delay times are set to precisely 4.00, but why does adjusting 'Right' to only 4.01 shift all delays to the far left? **Can you name the effect?** Now turn up Wow and Feedback, and listen how the delays move across the stereo field.

Electrosmog Alarm

Strong rhythmic Fractalize. Simple but effective.

- Set up as an LFO, OSC2 modulates several of the OSC1 parameters. The Stack count is 2, and StackV spreads OSC2 rate (by a factor of 2) in both directions. The mod wheel controls how much StackV modulates OSC2 volume, so the pitches in the two stacked voices are pulled apart as you push the wheel.

- OSC2 is clocked at 2.87 for a triplet rhythm (connect LFO2 Saw to OUT2 and listen). I have no idea why 2.87 is the right Tune setting – any mathematicians out there?

Forkmented Forth

Although this sounds like random tritones, the sequence does repeat (after 8 x 7 = 56 notes):

- Driven by Ramp1, the 8 values in Map1 send the pitch of OSC2 up and down an octave. They also fractalize OSC1 a bit.

- Similarly, the 7 values in the Map2 switch octaves for OSC1. As Map2 has fewer steps it needs to run faster, so Ramp2's Up knob has to be turned down a bit. The arithmetic is simple enough, even for mathematically-challenged people like me: Map2 loses an eighth, so an Up value of 100-100/8 (= 87.50) keeps both maps in sync.

Fractal Plucks 1

Different overtones per pluck, which repeat every 2 bars.

- It's duophonic. Performance tip: hold a fairly low note then sweep up and down the white keys with your thumbnail. Or a tennis ball.

- Sequencer Tap1 defines 'ModSeq1' which is used to trigger ENV1, and triggers the S&H. Tap3 modulates OSC2 Fractalize. OSC1 Fractalize is random (see LFO2).

- With its speed factor set to 16 (8 times slower than the others), Tap4 does the following:

  1) It steps through 4 snapshots.

  2) It switches the octaves of both oscillators, in opposite directions.

  3) It negatively modulates Filter1 cutoff as well as ENV1 amplitude (via CV1) so that later, notes in the sequence become softer.

- OSC2 is more percussive than OSC1 because its volume is modulated by ENV1, the same envelope that is also used for the output (see OUT2).

- Ctrl A transposes OSC2 down in 5 harmonic steps using 'rel coarse' FM. The Sample & Hold ensures that this doesn't happen between beats, thus preventing glitches.

- The modulation wheel adds more "zing" by lengthening ENV1 (see its Rate Mod).

Fractal Plucks 2

Softer, polyphonic offspring of the above.

- The mod wheel does practically the opposite in this version: It makes the sound more percussive by shortening ENV1 (see Rate Mod).

- The LFO and Sequencer triggers are all set to 'sync' instead of 'gate' here, which ensures tempo synchronisation (test that by playing a broken chord).

- Pressure adds vibrato. OSC3 is used here because the standard LFOs aren't available. OSC4 is also used as an LFO – see the grey cable and the pan modulation in OUT2.

- More delay, with lots of feedback. Almost as peaceful and trippy as the next one…

Hybrid Heaven

The multi-layer sequence looks simple enough, but there's quite a lot going on. Hold a single note in the middle of your keyboard and listen for a while… apply pressure now and then.

- The low notes are OSC1 through Filter1. The sequence is 12 notes long, but as the snapshots are swapped every 8 notes, it only repeats after 48 notes. The melody still flows well because Snapshot [2] is the same as Snapshot [1] but transposed up a 4th.

  As the LFOs have other duties, Ramp1 is used for the rotation. 'Rest' is set to 99.99 so that the ramp cycles i.e. it becomes an LFO. With 'Rest' at 100 the ramp would be a simple envelope – see the Bazille user guide.

- OSC2 is the high melody that follows the 16 steps in Map1. The "backwards effect" is due to LFO1 modulating PD as well as Filter2 cutoff.

- The mod wheel also creates a pleasant warbling effect by increasing OSC3 level and pitch. Set up as an LFO (its Tune mode is 'Hertz'), OSC3 modulates Filter2 cutoff.

- OSC4 is a high sine that moves in the opposite direction relative to OSC1. Remove the two orange cables to isolate it. At such a high pitch there is little or no disharmony; it sounds more like a series of interesting overtones. As OSC4 is connected to Filter2 it has the same "backwards effect" as OSC2.

- Reload *Hybrid Heaven*. Map2 lengthens and shortens ENV2, contributing to the backwards effect. Its appearance is deceptive: Let's find out the true shape of this map…

  Right-click on Map2 and select 'copy'. Load *INIT*, right click on Map1 and select 'paste'. Right-click again and select 4. Change the 'Mode' to 'map smooth' and the Source to 'LFO2 Tri'. Connect Map1 to OSC1's pitch modulation socket and turn it up. Hold a note, listen and watch the map. You might like to turn PD up a bit so you don't get a pure sine.

  The static bit at the end might be an **exploitable quirk** – could this simple patch be turned into an industrial alarm sound?

Just a Second

Two oscillators moving in opposite directions.

- The fluffy little tune is LFO1 square sending OSC1 and OSC2 in opposite directions, while the constant bass notes are OSC3 connected directly to OUT2.

- And the other movement? OSC2 gets its own vibrato from OSC4 in 'Hertz' mode. In OSC1, LFO2 adds random PD and a slight pitch offset to each note. Driven slowly by Ramp1, Map1 via CV2 pans OUT1 with synchronized, moving "random" steps.

- With no oscillators, LFOs, envelopes, ramps or sequencer taps left, Map2 was the only module still available that could be used to add a warble effect via Ctrl A. All LFOs and Ramps are too slow, but that spare map can multiply the Ramp2 rate… here's how:

  Restrict a map to 8 values, right-click again and select 'shapes / sine'. Right-click once more and revert to 128 values – the map is automatically filled with multiple instances of the selected shape. Set the map mode to 'Map Smooth' and ideally a sawtooth or ramp as the Source (if you use a triangle, the phase flips at the ends).

- Filter2 isn't connected, but adds 2 more cutoff modulation controls to Filter1. These work in the opposite direction e.g. the mod wheel **lowers** Filter1 cutoff despite the positive amount – see Filter2 'Spread' mode in the Bazille user guide.

Keep It Going

Steady polyphonic strum, a stack of 3 voices.

- The rhythm is LFO1, with 'StackVoice' (3 values) halving as well as doubling the Rate. OK, LFO2 does also contribute something: it keeps the pulse going by modulating cutoff when the filter is closed via modulation wheel. The mod wheel also compensates for the loss of signal by increasing OSC1 volume.

Magic Roundabout

Cute sequence in a major key. Good for a simple map editing lesson…

- Map1 is responsibe for the pitch, Map2 for the rhythm. Both maps are driven by a rising sawtooth from LFO2 ('Wave' is at maximum). Here's how the data in Map2 was created:

  Expand Map2 by clicking on its '+' button. For EACH of the following functions and options, right-click anywhere in the floating window:

  - Choose 'reset'
  - Choose '4' (the map now has only 4 values)
  - Choose 'shapes/triangle'
  - Choose '32' (the map now has 8 copies of the data)
  - Choose 'selection/select every 4th'
  - Choose the 'shift' drawing mode (via cmd-draw / alt-draw),

  Now hold down cmd (Mac) or alt (PC) and drag any of the highlighted values to slightly above zero. Deselect everything by clicking in a non-highlighted step of the map. Finally, apply 'reverse'… Reload *Magic Roundabout* and compare Map2 using [UNDO] / [REDO].

- To avoid strong bumps when cutoff gets low, the mod wheel reduces Filter1 resonance.

Map Reading

Pluck sound with overtones via pressure. Distortion after the Delay gives it a special character.

- The basic sound source is OSC1. Pressure adds linear FM from OSC2, which is tuned very high for those biting frequencies. Double-click on OSC1's phase modulation amount knob to check the effect, then click on [UNDO].

- Driven by a falling saw from LFO1, Map2 selects overtones by modulating OSC1 Fractalize via Multiplex3 (a bit of LFO2 random is added at this point). Both maps also affect ENV2 speed via Multiplex1 and CV1. ENV2 adds "pluck" by modulating the PD amount.

- The mod wheel adds fast, deep vibrato from OSC3 (both LFOs were already in use). The pitch wheel negatively modulates Filter1 cutoff via Rectifier so that either direction will soften the sound.

- Post-delay distortion sounds a bit different from pre-delay distortion in this patch. Try swapping those effects: In the FX grid, grab the 'Delay' block and drop it onto 'Dist'.

Marble Statue 1

Tuned stomp with analogue drum machine character.

- This one is unusual in that the sequencer uses the same data for defining 'ModSeq1' as it does for pinging Filter1.

- 'ModSeq1' triggers ENV3 and ENV4: Turn OUT1 volume down to zero, listen to the bass drum (OSC3) on its own while watching the sequencer. Kicks happen whenever values go from negative (or 0) to positive! Restore the patch by double-clicking OUT1 Volume.

- To isolate the "wood block", deactivate the Delay effect and remove the following cables:

1) the grey one connected to OUT2
2) the blue one connected to OUT1
3) the yellow one connected to Filter1 input.
4) the blue one modulating Filter1 cutoff.

Hold a note and watch the sequencer for a while. See how the sequence data translates into those different "hits"? The level of each hit is proportional to the absolute difference between successive steps. Transitions in either direction "ping" the filter.

Marble Statue 2

Variation of the above, with extras in OSC2 and Filter2. Spot all the extra connections: Use the arrows either side of the patch name to flip back and forth between the two versions.

Mars Defends

After all that stomping, here's something gentle: a Theremin-like lead atop a tinkling sequence.

- Push the mod wheel to isolate the fast sequence, and listen to the attack for a while… Some of that pluck is due to Volume modulation in OSC1 from LFO1 (which also modulates its own amplitude). Try removing the red cable, then [UNDO].

- The higher notes are extra-plucky because the modulation source for ENV1 Rate Mod is double-strength KeyF1 (key follow). See Multiplex3.

  Sequencer Tap1 makes OSC1 jump an octave (steps 1 and 3) or a fifth (step 4). With the phase modulation set to 'rel coarse' (frequency is **multiplied**!) at a depth of 20.00, setting the intervals is fun: -50 is an octave down, but +50 is a fifth up? Experiment.

- About that other layer: OSC3 is sent through Filter1, with some phase modulation from OSC4 set up as an LFO. Volume modulation is OSC2 via pitch wheel (see Multiplex4). Filter2 is only used for the extra modulation inputs (see 'Spread' mode in the manual). Tap4 plays the slow melody via lag generator, which creates an almost symmetrical glide.

- Now play a Dalek lullaby using the pitch bender…

Minor Offbeat

Binary stomp with a constant minor third. Also try playing staccato.

- Tap1 is the on-beat. It defines 'ModSeq1' which triggers ENV1 (for OSC1 through Filter1 to OUT1). Similarly, the off-beat from Tap2 defines 'ModSeq2' which triggers ENV2 (for OSC2 through Filter2 to OUT2). Follow those cables.

- The minor third is voice 3 of the stack set to +3.00 (see STACK VOICE TUNING). Voices 2 and 3 are brighter as StackV is rectified before modulating cutoff. A reminder…

  "**StackV** (aka StackVoice) is a modulation source derived from the voice number within a stack. If Stack is set to 1 (i.e. normally), StackV sends +5V only. If Stack is set to 2, StackV is +5V and -5V. If Stack is set to 3, StackV sends +5V, 0V and -5V for the 3 voices. The simplicity ends there, but the limits always remain +5V and -5V."

- Zero 'Feedback' in the Delay helps keep the rhythm clear despite the high 'Wow' value.

- Try activating the (pre-distortion!) reverb.

Mirror Principle

Typical 16th analogue sequence in up/down playback mode. Use pressure. Watch Map2…

- Driven by LFO2's triangle, Map2 plays a 64 note symmetrical tune. This was arrived at by the usual process of evolution: Start with random data, adjust individual values to taste and regularly apply "Quantise 12". Of course it's the "to taste" bit that really counts!

- With only 8 steps, Map1 switches values at quarter the speed of Map2. Map1 modulates Filter1 cutoff via Multiplex1 and offsets OSC2 pitch, making the high melody (which appears when you apply pressure) less obviously an inverted version of the main tune. Via Multiplex2, lag and CV1, both maps are used to pan the lower frequencies (see OUT2).

- All envelopes are in use, and all are LFO-triggered. The pitch wheel modulates ENV3 amplitude, which in turn modulates OSC1 pitch ('rel coarse' FM). In the PITCH panel, I set the PB Up amount to +1 and Down to -19 in order to counteract an overall shift in pitch. This compensation is suitable for 120 BPM and needs adjusting for other speeds.

Morse Bass

Primitive dark rhythm (half on-beats, half off-beats). Use pressure or Ctrl A.

- The audio: Overdriven sine plus inverted, extra-overdriven version – see filter Gains.

- The rhythm: ENV2 modulating OSC1 Fractalize and Volume, triggered by LFO1 (1/16) and rate-modulated by LFO2 triangle (1/8). LFO2 itself is being rate modulated by the LFO1 square wave, which adds dynamics (try removing the rate modulation). This particular rhythm wasn't planned; as so often it was a result of trial and error – a valid creative process which should **never** be confused with "random".

- Multiplex1: The amount of ENV2 modulating Filter1 cutoff is doubled if either pressure or Ctrl A are applied. Already at zero, the cutoff is sent further down by subtracting some 'voltage'. Lowering cutoff while strengthening its envelope modulation is often good for such 'flappy' attacks.

Motato

Simple sequence with alternating minor 3rd, mixable higher octave and "metallic" layers.

- Uses all 8 sequencer snapshots, rotated by Tap4 (all values are multiples of 12.50). Tap1 is mostly zero (the root), 6 and -18.00 (the minor third) and -24.00 (1 octave down). Click on the rim of the sequencer to see those values.

  The sequence starts at Snapshot [3] because I simply prefered it that way. Double-click on Snapshot selector [1] and decide for yourself.

- Tap2 provides gates and velocities for ENV1 and ENV3 (the Trigger mode is 'ModSeq2'), which are both used as output envelopes. ENV1 also modulates OSC2 pitch ('rel fine' FM) as well as Filter1 cutoff (try adjusting the lefthand modulation amount).

- Tap1 is responsible for the alternating root and minor 3rd. Turn up Ctrl A to hear OSC3, a higher metallic sound with inverted notes. Tap1 also positively modulates OSC3 volume (see Multiplex3). I use this trick to weaken the **lower** notes of inverted melodies, which tend to clash most with the non-inverted main melody. In this case, however, the trick removes high notes. Check that by turning up OSC3 Volume a bit.

No Stranger

12-note analogue sequence with PWM. Despite the 'ModSeq' triggers, this patch responds to MIDI velocity, as Filter1 cutoff is being modulated by 'Velocity'. Try playing very softly at first.

- OSC1 uses the "PWM 1" pulse width modulation trick described in the user guide.

- OSC2 isn't directly audible: Pitched 7 semitones (a.k.a. "a fifth") up, it modulates OSC1 PD, giving the oscillator a rough edge. Grab OSC2 Tune and try different values.

- Steps 5 to 16 of the sequencer define the melody. All values are double the number of semitones required: -24 means one octave down, +6 means a minor 3rd up etc..

- To balance the levels of two filter outputs, at the same time compensating for general loss of volume when the cutoff is lowered via mod wheel, it was necessary to use two Multiplex units as well as both OUTs. The amount of volume compensation via mod wheel for both signals is 25%, and the LP12 signal is quieter overall because the OUT2 volume is lower. I doubt that it's possible to describe this in a more entertaining fashion!

- The slow phasing is caused by Stack set to 2 in combination with active [Drift] but no further detuning – so try adjusting the STACK VOICE TUNING of voices 1 and 2.

- There's a little trick in ENV1: I modulated its rate by 'Gate' so that the final release when you lift your hand from the keyboard is shorter than the rest.

Nothing Hill

Rising digital sequence. Minor plus the odd "wrong" major 3rd (*House of Cards*, anyone?)

- Sequencer data from Tap2 is doubled in Multiplex1: Values translate to semitones if the frequency modulation amount is at maximum (50.00). This modulates OSC2 pitch…

- OSC2 is phase-modulated ("FM") from the higher-pitched OSC1, for a metallic attack. The OSC1 waveform is 'TapMap1', the curve you can see in Map1. Driven by Ramp1 set up as a very slow LFO, the same map is also used to pan OUT1. "Multipurposing".

  OSC3 is used as a sub-oscillator to fill out the sound, and this is removed alongside OSC4 and other stuff when you push the mod wheel.

- That first section of the sequencer is made "octuple strength" in Multiplex3, enough to drive Map2 (via CV1). Lagged and mixed with LFO2 in Multiplex4, Map2 modulates the amount of phase distortion in OSC4. By the way: OSC4 uses the 'Res1' waveform, with overtones that include a major 3rd… the source of that strangely "wrong" note.

- Tap3 defines the 'ModSeq2' trigger used in ENV1 and ENV2.

O-Minus

Deep PWM drone layered with a primitive stomp. Lots of spring reverb. Ride the mod wheel.

- The stomp is OSC1, which is sent through Filter1 (4-pole) then Filter2 (1-pole) for extra "grunt" (both Gain settings are above zero). The Distortion effect adds the rest.

- The drone is OSC2 through Filter3. OSC2 uses the "PWM 1" trick described in the user guide. To listen to it in isolation, remove the orange cable connected to Filter1 input.

- Reload *O-Minus*. Ctrl A fractalizes both oscillators, while pressure controls the amount that ENV2 modulates Filter1 cutoff – use these two controls for accents.

Octave Aggro

Hybrid digital / analogue cliché, with speaker emulation. Push the mod wheel.

- Again, sequencer Tap4 "self-rotates". Here's a bit of Bazille geekery for those inclined…

  Self-rotation also works perfectly well if each set of values only points to the current and next Snapshot (**0**, **25**, 0, 0 / 0, **25**, **50**, 0 / 0, 0, **50**, **75** / **0**, 0, 0, **75**). However, it's certainly easier to handle if they are all the same (0, 25, 50, 75) – enter rotation values before anything else, then copy/paste/interpolate to all the other snapshots.

  To self-rotate through all 8 snapshots, use multiples of 12.50.

- The brighter part of the sound (OUT1) is panned L/R by 'StackVoice', while the darker part (OUT2) isn't. Higher frequencies are more "directional" than lower frequencies.

- OSC3 gets its own glide, as the Tap3 signal is lagged before modulating OSC3 pitch.

- I don't use it often, but 'Foldback' distortion is well suited to this patch. The speaker emulation "Guitar Cab 4x12" radically colours the sound in a good way, but you should also try "Dual-Band Shelf" for a more full-range sound. Experiment with the Input level!

Quantessence

A very filtery tabla-like sound with lots of 3/16 delay. Try pressure (aftertouch).

- Fractalized OSC1 plus a bit of percussive noise (follow those cables!) is fed into an almost self-resonating Filter1. The bandpassed frequencies are slowly panned to the extremes by LFO1, while the lowpass filtered portion (LP6) remains firmly in the centre.

- Half the Multiplex panel is dedicated to controlling the amount of noise sent to Filter1: Multiplex3 reduces its level and Multiplex2 gives it an envelope (ENV3). The other half? Multiplex1 mixes equal amounts of Pressure and mod wheel with 100% Map1 to modulate OSC1 Fractalize, and Ctrl A via Multiplex4 expands pitch wheel range to an octave.

- The two LFO-driven maps modulate OSC1 Fractalize and the cutoff of both main filters in opposite directions (see 'Spread' mode in the Bazille user guide).

- Finally, the sequencer: Ramp1 switches instantaneously between two snapshots – Hold and Rest are at 50% while Up and Down are zero, resulting in a unipolar square wave. Tap2 is responsible for oscillator pitch (mostly octaves) as well as some negative cutoff modulation while Tap4, although not connected, triggers 3 of the 4 envelopes.

Quantized Oddity

Hold a low note, tap others. Then try again with a different bass note. Notice anything odd?

- This patch actually has several strange properties. Firstly, tapping those high notes out of time doesn't disturb the rhythm. Secondly, some of the notes are charmingly out of tune. Thirdly, you always get a single low 'E' before your first note is played correctly. All these quirks are caused by how (and why) the SAMPLE & HOLD is used…

- Unsatisfied with the precision of my arpeggio playing, I set out to quantise note input in time. To do that, key follow (KeyF1) via Multiplex1 (it needed boosting) is sampled at the rate of sequencer Tap1, which also triggers ENV1. The result controls OSC1 and OSC2 pitch, both in Hertz mode and tuned to a low E (82.4 Hz)…

Try this: Load *INIT*, connect KeyF1 to OSC1's pitch modulation input, hold MIDI note 52 (a low E) and turn the modulation amount up and down. The pitch will not move if you are playing the E in the correct octave – any other notes will move when you turn the knob (try that). That E is the **pivot note for the key follow**. Back to *Quantized Oddity*…
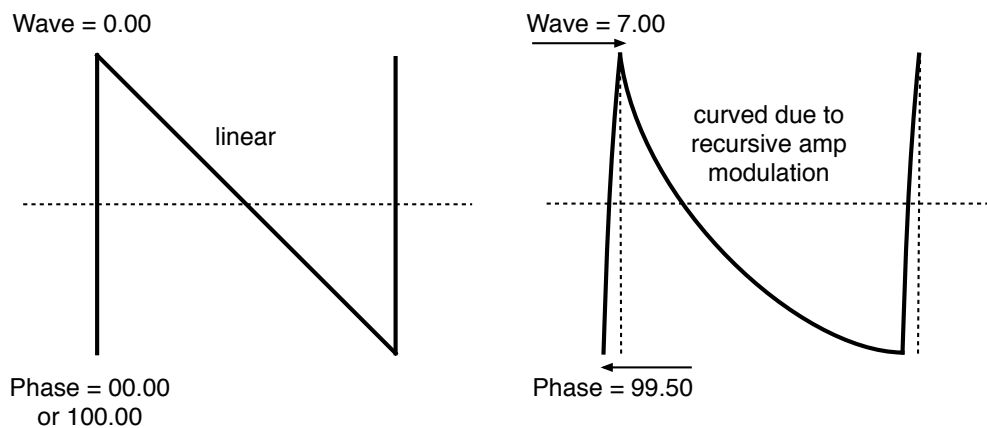
- Those charmingly out-of-tune notes are caused by the glide component of KeyF1. Only noticeable if Bazillle is somewhere in the middle of a glide at the time KeyF1 is sampled.

- The first note is always an E because it takes a few CPU cycles before the sequencer triggers the S&H… too late for the first note. Here's a challenge: can you fix that?

Random Selection

Something is being selected at random…

- Push the modulation wheel to isolate OSC1. Driven by a LFO2's random wave, Map1 modulates OSC1 pitch (mostly octaves). The signal goes straight to OUT1, and what sounds like lowpass filtering is actually phase distortion from LFO1.

- The layer that fades out via mod wheel does most of the high frequencies. Map2 fractalizes OSC2. Its is scanned back and forth by a 1/1 synchronised triangle from Ramp1.

- LFO1 has some interesting settings: Wave at 7.00 slows the rise of the saw a bit, and Phase is almost but not quite 100%. These two factors combine to shift the wave forward in time. Then there's *recursive amplitude modulation*: the Amp Mod source is LFO1 triangle i.e. the LFO itself. The result is a pleasant pluck from OSC1.

  Note that setting LFO1 Wave to zero results in silence as it can no longer trigger ENV1 – 'Wave' is a perfect candidate for automation!

Wave = 0.00

linear

Phase = 00.00
or 100.00

Wave = 7.00

curved due to recursive amp modulation

Phase = 99.50

Ratcheteer

A very retro sequence (run at about 100 BPM) with the occasional double-speed trigger and some detuned notes. Hold a single low note and listen for a while. This patch required an extra portion of spaghetti, as you can see. Let's start with the sequencer…

- Tap3 defines the 'ModSeq2' trigger for the envelopes. Select each snapshot (the numbers in the rim of the dial) in turn: The first 3 values are set to maximum in most snapshots, but 3 and 6 contain the extra spaces required for double-speed triggering (a.k.a. ratcheting). As the sequence is rotated at random, the ratchet also occurs at random.

Divide is 4 so that the triggering can be fast enough for the ratchet effect. To compensate, the speed factors for all other taps are set higher: Tap2 is set to 4x and Tap4 to 16x.

- Tap2 plays the tune (green cables) while Tap4 (red cable) detunes OSC2 whenever the random rotation hits close to Snapshot [3] when the pointer is close to the third beat of the bar. You might have to read that again – watching the sequencer helps.

- Spaghetti: Multiplex1 mixes three oscillators (yellow cables). Multiplex2 reduces Ramp1's effect on Filter1 cutoff when the mod wheel is pushed (ModW also lowers Filter1 cutoff via Filter2 in "Spread" mode). Multiplex3 reduces noise sent to the filter. In Multiplex4, inverted key follow is mixed with some lagged random from LFO2, and that signal is sent to fractalize OSC2 while the other oscillators are fractalized by Ctrl A.

Buon appetito!

Ripping Didge

Fractalized stomp with a strong off-beat.

- Set up as a host-synchronised LFO, OSC2 fractalizes OSC1 via Multiplex1. Also mixed into that signal is the mod wheel and ENV2. Finally, OSC2 add a bit of cutoff modulation.

- A 16th saw from LFO1 modulates OSC1 PD, while the sequencer triggers the envelopes.

- The dynamic movement in the rhythm has two components: Firstly, OSC2 has a complex waveform due to fractalization. Secondly, LFO2 modulates LFO1 amplitude but you can turn that down via Ctrl B: In Multiplex2, Ctrl B crossfades between +5V and 0V and the result is sent via CV1 to modulate LFO2 amplitude… all because LFO Amp Mod knobs aren't bipolar!

- Ctrl A introduces a metallic sound from OSC3, and pressure fractalizes it.

- Try activating the effects, which are all pre-set for maximum character.

Roll Your Own

How does the sequencer bend so few notes while smoothly scanning all the snapshots?

- Watch the red LED. It dodges most of the moving bars because the data was chosen to do just that! The few places where it fails only affect cutoff (via CV1 and ENV1) anyway, as the sequencer output is heavily quantised before it gets to modulate oscillator pitch.

- Both CV inputs are used: CV1 sends the sequence data to modulate ENV1 rate. CV2 uses the quantised sequence (3 steps only) to pan OUT2. LFO1 slowly pans OUT1.

- Most of the other connections are for performance control: Pressure (plus sequence) to OSC1 Fractalize, mod wheel to both cutoffs and Filter2 resonance. Follow the cables.

- Note how well the spring reverb suits the "fractal" frequencies in this patch.

Rotate 1 - simple

A sequence can switch snapshots at any point…

- Tap4 rotates through all 8 snapshots; Tap4 values are multiples of 12.50 (i.e. 100/8).

- Map1 converts regular pressure into a kind of "soft switch" for the vibrato depth.

- The rest of this patch is fairly straightforward. Filter1 cutoff is modulated by 3 signals: Mixed together in Multiplex1, LFO2 does the slow synchronised modulation while ENV1 does the 16ths. OSC3 in Hertz mode adds some unsynchronised "waviness". Remove the cable connecting ENV1 to Multiplex1, turn Filter1 Cutoff up to about 60 and listen to the LFO plus OSC3 modulation: the wave is almost (but not quite!) regular. Now reload *Rotate 1 - simple* and remove the cable connecting LFO2 to Multiplex1 as well as the blue cable from OSC3.

  This patch is quite a pleasant head-nodder at certain speeds, unlike the next one…

Rotate 2 - full

Takes the previous patch and adds a bunch of totally unnecessary flavours:

- The Divide setting and the Tap speed factors have both been adjusted so that Tap2 (and therefore ENV1) can run twice as fast. Try setting the Tap2 speed factor to 2.

- Added OSC2. An octave higher than OSC1 and slightly detuned.

- Stack is set to 2, with voice 2 tuned an octave higher. There are also some Filter1 offsets: Resonance directly and cutoff via pitch wheel – follow the grey cables from StackV. Note that Filter2 is unused, but 'Spread' mode allows it to be used as extra modulation inputs.

- Pressure (via lag) softens the sound by lowering the phase distortion of both oscillators. The mod wheel also softens it by lowering cutoff. Its former job (fractalization) has been taken over by Ctrl A, which also shortens ENV1 a bit.

Rotate 3 - pluck

Try comparing this one with the other two variations. Find all the major differences, write them down *as quickly as possible*. You can also quickly analyse any patches you make from scratch i.e. write down their characteristics (technically as well as musically). **Keep editing** that list: Add and delete details until the whole makes the most sense. Why? Because that's a method very similar to *sculpting* patches… as well as how I've been writing much of this Cookbook!

Run Away

Distant drone plus closer footsteps. Perform with the wheels.

- The 8th clicks are nearly all LFO2 square wave patched directly to OUT1 unless you push Ctrl A: The contribution from OSC1 through Filter1 is kept short by ENV1, but you can make it longer by pushing Ctrl B (see ENV1 Rate Mod) – which also softens the pad.

- OUT2: Apart from the detuned stack, much of the drone's tonal movement is pitch modulation from OSC3 (audio rate). Let's isolate that drone: Remove all blue cables, disable all effects, push the mod wheel up a bit and play a note. To remove the last trace of rhythm, double-click on ENV2 Amp Mod.

  We are left with of OSC1 and OSC2, pitch modulated by OSC3 in opposite directions, through the two main filters. Try adjusting the OSC3 pitch, then change its Tune mode to 'Undertone' and experiment with PD waveform selection (and PD amount).

Salty Dog

Complex ripping rhythm. Mod wheel turns it into a kind of heartbeat.

- Sequencer Tap2 does most of the rhythm. Four snapshots create the syncopation, in this case rotated by Ramp1 driving Map1. Although the steps are set up correctly to switch snapshots (0, 25, 50, 75), Watch the movement in the sequencer dial: Unlike using a normal 128-value unipolar ramp or 'Map Quantize' mode, the rotation lingers at snapshot [4] before flipping back to [1]. Why?

  To see what's causing the low notes at the end, click [4] in the rim of the dial.

- Ctrl A adds a pinch more salt. Turn it all the way up and hold a note. How it works: Ctrl A modulates the amplitude of LFO1, whose square wave is modulating Filter1 resonance. The fizz is due to this resonance being heavily quantised (bitcrushed) before reaching OUT1 via Multiplex3. Pressure accentuates the effect by increasing OSC2 PD. Try adjusting QUANTIZER values between minimum and 20, then set it back to 1.40.

- OSC1 isn't directly audible in this patch; it is the FM source for OSC2. Tweak the Volume and especially the Tune value.

- The LFO2 random wave fractalizes OSC3. Isolate this by turning OUT1 all the way down.

See the Submarine Fly

A resonant drone plus a simple root-3rd-5th melody. It sounds like there are a couple of resonant filters at play here, but most of this effect is phase distortion. The name is a quote from an old song ("Tropical Fish" by Gong).

- Map1 is responsible for the melody while Map2 creates the rhythm by modulating the PD depth of the 'Res III' wave in OSC1. The data in Map2 appears upside-down and the PD modulation is negative to compensate. Doing it this way means that you don't have to invert the KeyF1 signal (see the blue cable also attached to Multiplex1). Saving modules is generally a good thing, and we might even need both Inverters for something else in future edits. Unlikely, but I tend to err on the side of thrift.

- As both LFOs are already in use, OSC3 in 'catch' phase mode (no retrigger) is the best ersatz LFO for fractalizing the drone. Ramps always retrigger, and we don't want that. You will soon hear why: Right-click on OSC3 output and drag+drop the green cable onto Ramp2's output socket (Ramp2 is already set up as a slow LFO). Hear how the Ramp retriggers every time you play a non-legato note? That's why OSC3 with its phase mode set to 'catch' is the better choice here, especially if you play this patch with trills.

Sextant Pitched

Non-random pitches, randomly selected. Derived from *02 Loops – untuned / Sextant Original,* which in turn was based on a classic "sample & hold" recording by Herbie Hancock. None of the main oscillators are used here – this one is all about filters. Try applying pressure or Ctrl A.

- Instead of random pitches, the two elements of the sound (pitched noise and a "pinged" resonant filter) use the pattern in Map2. However, the signal driving that map IS random ('LFO1 Rnd'). While retaining much of the character of Herbie's Odyssey, all pitches are "in tune". Try to create something similar using quantised 'LFO1 Rnd' instead of the map.

- A burst of white noise is used to ping Filter1. As the noise generator only has output sockets, to create a contour we need to use a Multiplex as "VCA" and modulate it with a short envelope. Multiplex1 output is connected to Filter4 together with a synchronised click, a narrow pulse from LFO1 (see that very low Wave setting).

  The highpass filtered mix is used in Filter1 to "ping" the resonance, which is overdriven in Filter2 (high Gain, cutoff near maximum) and sent to OUT2.

- The other layer is pitched noise via Filter3: Follow the green cables. OUT1 uses a snappy ENV2, and those knob settings are critical. Via CV1, either pressure or Ctrl A (balanced in Multiplex3) modulates ENV2 amplitude. High notes are shorter because ENV1 and ENV2 rates are being negatively modulated by 'KeyFollow'.

Shufflebug 1

A 3-octave "sequence" using LFOs. Quickly developed into two more presets (see below).

- One advantage of using pulse wave LFOs instead of the sequencer or map is that achieving a "shuffle" is just a matter of adjusting the pulse width. LFO2 Wave is set to 66.67 here, which gives us triplets. Try all values between 50 (straight) and 75 (dotted).

- All the juicy goodness is due to the choice of PD waveforms: 'Saw' + '2pulse'. Load *INIT*, turn OSC1 PD up and explore all waveform combinations again, noting the character of each one at various amounts of phase distortion (PD knob). Back to *Shufflebug 1*…

- The two LFOs are lagged before modulating OSC1 pitch, but using decay ('D') only. They appear to act in opposite directions, but the 'rel coarse' modulation is so strongly negative (-50) that it crosses 0Hz. The following experiment should make that clear:

  Either double-click on the pitch modulation knob or remove the red cable. Drag another cable from ModW (see MIDI & More) and drop it onto OSC1's Phase modulation input, replacing the blue one. Hold a note while slowly pushing the modulation wheel up… find the point where the pitch reaches zero Hertz. Take a look at the oscilloscope: the waveform is inverted after it crosses zero.

Shufflebug 2

This version uses a bit-crushed sawtooth (see the Quantizer). Some other differences are:

- While lowering cutoff, the mod wheel also fades out the unfiltered portion which is keeping the sound bright (see Multiplex1). It also boosts OSC1 volume to compensate for the loss of signal level – which adds up to a good range of sounds via the mod wheel.

- Instead of the wheel, PD is modulated by LFO1 triangle in this version. Try '1/4 trip' Sync (the selector below LFO1 Rate) instead of 1/2.

- There's no delay effect, as this kind of sound is best served hot!

Shufflebug 3

A more extreme version of Shufflebug 2, with the following extras:

- Vibrato using OSC3 as LFO, via mapped pressure (see Map1).

- Filter wobble from OSC4 via pitch wheel in Multiplex4. But why is +5V connected to one of the inputs? Multiplied with PitchW, this closes the filter when you push and opens it when you pull.

- Resonant phasing is positioned **before** the Distortion for extra "rip". Try swapping them.

Sixty Steps

An interesting technique turns 12 steps into a 60-note sequence. The same method as described in *00 Tutorial / Sampled Sequence.* Use aftertouch (Pressure).

- Disable the delay and watch the sequencer… it is stepping faster than notes are being triggered! The clou is the SAMPLE & HOLD processor, which is sampling the sequence every quarter note as a pulse from LFO1 is connected to its Trigger input. Note that LFO1 is also used to trigger all the envelopes. As Divide is set to 5 instead of 4, one out of every five sequencer values is skipped. Enable the delay and listen for a while. Try holding octaves: As the Trigger mode is 'free', the two notes will usually start at different positions within the sequence. However, extra notes will not destroy the rhythm here.

- Turn OUT1 Volume down to isolate the OUT2 layer, a little "pluck" with pitch modulation from Map1 driven by Ramp1. The attack is a combination of PD modulation and Filter2 cutoff modulation using the same short envelope (ENV3) that is selected for OUT2.

Slipshod

Searing rhythm with a strong offbeat. Use all performance controls (see PATCH INFO panel).

- Multiplex2 is probably the most interesting bit here: The pitch wheel crossfades between LFO2 sawtooth and itself (!), and the result is sent via CV1 to modulate LFO1 amplitude (52%). This means that pushing the pitch wheel reduces LFO2's effect on LFO1 amplitude by 52% while at the same time increasing LFO1 amplitude overall.

- Multiplex1 mixes ENV2 and OSC2 (set up as a synchronised LFO), and the sum modulates OSC1 and OSC3 Fractalize (the former gets pitch wheel added in Multiplex3).

- Most of the rhythm is due to LFO1 modulating the PD of OSC1 and OSC3 – remove the grey daisy chain to check that, then [UNDO].

Spangle

Inspired by my memory of an element that popped right out of a "Shpongle" track. Relatively simple patch with some interesting movement…

- A rolling 4-note pattern from Map1, with Filter1 cutoff jumping up and down at quarter the speed (see Map2). Only Filter1 is being used – the sources attached to Filter2 are modulating Filter1 cutoff thanks to 'Spread' mode (see the Bazille user guide).

- LFO1 via mod wheel creates a fast wobble, and OSC3 (an octave lower) via Pressure injects some audio-rate cutoff modulation. Ctrl A fractalizes the oscillator – so try that too.

- As both LFOs were otherwise engaged, a Ramp pans the output (via CV1). To convert this unipolar signal to bipolar, 2.5V is subtracted in Multiplex1. I could have used OSC4 in Hertz mode more directly, but those oscillators don't have a triangle wave (boo-hoo).

Spring in Step

Plucked sequence with a hop and a skip. Try Ctrl A (hi-hats) and pressure.

- Sequencer Tap2 modulates OSC1 and OSC2 pitch in opposite directions, while Tap4 does a whole heap of stuff: Being the second used tap from the left it triggers both ENV1 and ENV2. Lagged, it modulates ENV2 speed and amplitude via CV2, OSC1 Fractalize and the cutoff of both main filters.

- LFO2 changes the snapshot every 6 beats, as the speed is effectively '1/1 dot'. This value isn't available in the list, but is easy to achieve by selecting '1/2 dot' and lowering the Rate to -1.00. Watch the 9th step in the sequencer flip up and down, creating the "skip".

- Map2 controls ENV1 rate via CV1. It gives Key Follow a shelf from C7 to C8 so that the pluck doesn't get any shorter in that particular octave. Another shelf below A2 ensures that the release time doesn't get ridiculously long for very low notes.

- Turn up the hi-hats (Ctrl A). Half of Map1 converts LFO2's triangle into a mirrored pattern that doubles LFO1 rate. Double-click on LFO1 'Rate Mod' to check that.

- Pressure introduces a high sine wave (OSC2), with half-strength negative pitch modulation. Some of this signal bypasses the filter (see Multiplex4) so you can still hear it when the mod wheel is pushed up to maximum.

Summer Travels

After the Spring…

- Sequencer Tap1 defines 'ModSeq1' for ENV1 and ENV2 (see "How to Trigger Envelopes" in the Bazille user guide). Tap4 is a 12-note pitch sequence.

- OSC1 and OSC2 both use 'Res' type waves, modulated by the maps. One map is the 'Source' for the other: As all Map1 values are positive, only half of Map2 is used.

- The modulation wheel rotates to an empty Snapshot: Use it to bend notes and to pause the sequence at maximum. How/why does that work?

- LFO1 modulates Filter1 cutoff positively and Filter2 cutoff negatively. Filter2 is in 'Offset' mode, so that negative amount is larger to compensate for the modulation already adopted from Filter1. Read all about Filter2 "Offset" mode in the Bazille user guide!

Three Against Four

To hear the rhythm more clearly, turn off the delay.

- 1/8 dot (LFO1) and 1/4 (LFO2) trigger ENV1 and ENV2. Single mode!

- Ramps are used for all other cyclic modulation: Ramp1 fractalizes OSC1. Ramp2 affects Filter1 cutoff and is also the source for Map1, which converts it into a bipolar signal suitable for panning OUT2.

- OSC2 is tuned up 13.6 semitones to compensate for detuning caused by audio-rate pitch modulation from OSC4. Why 13.6, not 13.3? Because the 'Cents' Modify option is actually +/- a semitone, not +/- 50 cents as you might think. Remember that detail.

- As the high notes in this type of patch can get very harsh, the oscillator volumes are negatively modulated by key follow. Distortion 'High' is also turned down to minimum.

- Use Ctrl A to destroy the rhythm (see LFO1). Question: After turning Ctrl A down again, why does the rhythm remain "broken" until you retrigger the note? Is there a "trick" yet to be discovered that fixes the problem, or is that impossible? I believe it's impossible.

Two-Stroke

Classic analogue stomp using a stack of 2 x 4 oscillators. Apply pressure.

- 'ModSeq2' triggers ENV1 and ENV2, with very low "velocity" for the offbeat…

  Although 'Velocity' is turned up in both those envelopes, this patch doesn't respond to keyboard velocity because envelopes triggered by 'ModSeq' use **velocities as defined by the sequence data**. Try this: Double-click on ENV2 Velocity, then select 'Velocity' in ENV2 as Amp Mod source and turn the amount way up. Now play some notes on your keyboard very dynamically and listen to the difference… Then reload *Two-Stroke*.

- Push the mod wheel to hear this. Multiplex2: Via Pressure, Filter1's LP6 modulates Filter2 resonance, resulting in a juicier sound than simply turning up the resonance.

Uneasy Peace

Pushing the wheels breaks the spell.

- Like "Three Against Four", this patch uses a pair of LFOs to create the rhythm.

- However, the ersatz LFOs here aren't ramps: OSC3 and OSC4 set up as LFOs modulate OSC1 and OSC2 Phase In parallel with pitch, but in the opposite direction – a combination that creates a subtly different kind of wobble.

- Multiplex4 ensures that the high notes don't get too loud: KeyFollow crossfades between Filter1 (LP6 output) and silence.

- In Multiplex3, the mod wheel fades in the amount of noise sent to the **input** of Filter3. Bridged to Multiplex1, it also crossfades between the oscillator pair and the **output** of Filter3. Play with both wheels and listen…

- Pitch wheel fractalizes OSC1 and modulates Filter1 cutoff via Filter2 in "Spread' mode.

Vitamin P

Retro, cheesy in a good way. Strictly host-synchronised LFOs – play chords.

- The two layers are OSC1 and OSC2 with LFO2-triggered envelope, plus a pad from OSC4. The rhythm is mostly 'Res III' PD in OSC2 being modulated by Map2.

- Mod wheel closes both filters, phase-modulates OSC4 strongly enough to cause the pitch to waver (the faster you move the wheel, the stronger the effect) and lowers the oscillator Volumes. The latter is via Multiplex3: I would normally use a map to alter the 'law' of the control signal, but as neither of them is available, "ModW times ModW" it is!

- Map1 has two very different duties: It defines a triangle wave (TapMap1) for OSC1, and also converts the slow LFO1 sawtooth into a smooth wave suitable for panning OUT2.

Vocal Roller Lead

A legato-mode CPU-hog. Resonant lead with rhythm via S&H. Pull the pitch bender back…

- Filter1 bandpass modulates its own resonance for that squelchy effect. Stack is set to 8, so you actually get 8 bandpass filters in parallel. StackV modulating cutoff via Filter2 in 'Spread' mode gives the sound most of its vocal quality – try disconnecting that cable.

- The signal processed in the S&H isn't white noise, but a host-synchronised triangle from LFO1. Lagged and mixed with slow cyclic Ramp1 in Multiplex1, it modulates cutoff.

- Things get more interesting when you start using the performance controls: The mod wheel injects a bit of jaw-harp feel by modulating cutoff with a rounded square from OSC2. Double-strength pressure (see Multiplex3) sends the pitch of that oscillator well into audio range for some serious grit if the mod wheel is also up. Last but not least, the pitch wheel either bends OSC1 two octaves down for a very bubbly effect, or fractalizes it two octaves up.

Vocal Roller Poly

A polyphonic (4-voice) version of the above, with just a few changes. While turning down Filter1 cutoff, Ctrl A lowers the volume to prevent chords from getting too muddy. Stack is only 2 and [HQ] is switched off to save CPU.

Zorch 1974

Clone of an EMS Synthi AKS sequence that my all-synth band "Zorch" recorded in 1974.

- This version comprises two sequences: all notes from Map1 (driven by LFO2) plus a more sparse thump from the sequencer, rotated via Ramp1. To isolate the stomp, push the mod wheel. Despite the apparent simplicity, two snapshots are required. We can blame it on the double-hits in the second half of the sequence – look at the second snapshot by clicking [2] in the rim of the dial. The sequence has two jobs: As well as OSC1 pitch, it also defines 'ModSeq1' (see ENV1).

- Here's a trick I don't think I've ever used before: The Sample & Hold keeps the pitch steady until the next positive value so I don't have to set the same value for intermediate steps. Test it: Connect Tap4 directly to OSC1 pitch instead… [UNDO] that!

- Set the mod wheel to minimum so you can hear all notes. OSC3 is sent to Filter2, faded out via mod wheel in Multiplex2 and passed on to OUT2, where ENV3 (triggered every 1/16th by LFO2) serves as the amp envelope. ENV3 is also the contour for Filter2 cutoff.

Zwei Spiegel 2

And finally, an alternative version of the very first patch in the *02 Loops - tuned* folder. Compare this one with *2wei Spiegel* (with a 2). The German name translates to "two mirrors" in English.

03 Effects

Animatronic Farm

Various cartoon animal noises.

- Most of the motion is ENV1 in 'Loop' mode, with the speed modulated by 'CV1', a mixture of LFO1 random wobble and mod wheel. See Multiplex3, follow the cables.

  Via Multiplex1, ENV1 also modulates the amount of phase distortion. KeyFollow and Pressure are both mixed in here, at 50% strength.

- Blue daisy chain: Key follow stretches the pitch and lowers the volume of high notes.

Arakatak

From chiptune-sounds through growl to grungy FM. Percussive enough to be used as a drum throughout the range. Check out the extreme pitch bend.

- OSC1 is frequency modulated ('rel coarse') by a seriously quantised and seriously low pitched saw from OSC2. Note the extra pitch modulation from KeyF1 (orange cable), which increases the range of OSC2 across the keyboard.

- Also rather serious: 'Foldback' distortion gives the sound most of its bite.

- Apply pressure or push the mod wheel… the rising pitch is ENV3, amplitude modulated by whatever is sent to CV1: "Balanced" pressure and mod wheel (see Multiplex1).

Barnacules

Quasi-random tinkles with 5 dimensions of performance control: Velocity, pressure, pitch wheel, mod wheel and Ctrl A. Can you find something useful for Ctrl B to do? There are plenty of unused modules!

- The audio is OSC1 with "FM" from OSC2. Ctrl A increases the modulator's PD amount, and the 'Res 1' waveform gives low notes a characteristic resonance. With Ctrl A at maximum, very low notes remind me of a wooden ruler pressed onto a table and plucked.

- Pitch modulation: The pitch wheel crossfades between a quantised Map1 and a smooth Map 2 containing exactly the same data.

- Both maps are driven by LFO2, the speed of which is controlled by double-strength mod wheel via CV1. See Multiplex3.

Bitfalls

A lesson in extra-strength control. Simple video game sound until you push the mod wheel.

- LFO1 is responsible for the slow pitch drop, while LFO2 does the fast steps: The LFOs are mixed in Multiplex1, quantised and used to modulate OSC1 pitch and the amount of phase distortion (via lag generator).

- Via Multiplex3 and CV2, extra-strength mod wheel (2 * 70 = 130%) plus LFO1 sawtooth controls LFO2 rate (see Rate Mod). Via CV1, Ctrl B speeds up LFO1, the slow fall.

Calculated Play

Icy FM sounds especially for manual performance. Boring until you learn how to play it!

- 5 continuous performance controls: 2 x wheels, Ctrl A, Ctrl B, pressure.

- The steps move in opposite directions - see OSC1 and OSC2 pitch modulation amounts.

- OSC2 is an "FM" source for OSC1, creating the basic bell-like tone.

- HQ removes high frequency grime. Easy on CPU, though, as this preset only has a single voice. The Voice mode is 'duo' so you can get various intermodulation effects by holding one note and moving the other.

Crowbots

This could get ugly…

- An irregular shape in Map1 controls ENV1 loop rate (via Multiplex1 and CV1). The looping ENV1 is used for pitch modulation as well as amplitude (OUT1 is set to 'Env1'). Expand Map1 with its [+] button, hold a note and watch how the different Up and Down stages of Ramp1 affect the scan rate – it moves down slowly, but flips back up very quickly.

- Pushing the mod wheel all the way up sends the ENV1 loop into audio rate.

- Pulling the pitch wheel down lowers Filter1 cutoff, while either direction injects chaos (Pink noise) into the CV1 mixture.

Dusty eBell

Somewhere between an old 'chain store closing time' electronic bell and the real thing.

- 4 sine waves mixed together in Multiplex1 are sent through Filter1, to be softened via mod wheel (which also boosts each oscillator to compensate for the loss of signal).

- Stack is set to 2 so that the pitch of each voice can be individually detuned (in this case by 2.4 semitones) as well as each oscillator via regular pitch modulation. The result is a sound with bell-like overtones.

- Multiplex2 and Multiplex4 are both required for the subtle pitch fall/rise via pitch wheel. The former adds 50% inverted pitch wheel to both sides (!) of Multiplex4 so that the "average" pitch remains fairly constant, whatever the position of the pitch bender.

- See LFO1. Pressure adds vibrato, which is faster for higher notes (Rate Mod).

Electric Cows

Moo. This patch features lots of modulation feedback. You might have to read the following several times and study the flow diagram on the next page.

- In Multiplex1, a positively skewed triangle from LFO1 (blue cable) crossfades between inverted mod wheel and OSC1. The resulting signal frequency-modulates (linear FM) and un-fractalizes that same oscillator (yellow cables). Multiplex1 is also sent to CV1 (orange cable), which modulates LFO1 rate (Rate Mod). LFO1 also modulates its own amplitude, affecting the shape. This eventually feeds back into OSC1, as it is used for the crossfade!
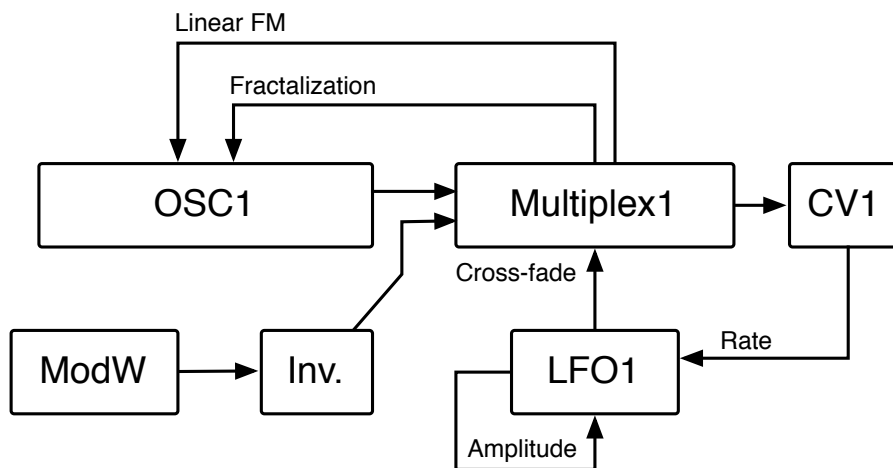
Signal routing in "Electric Cows" – spot the 4 (!) feedback paths

- Despite all the modulation feedback, this patch was quite easy to create. As is so often the case, the complexity **evolved**: I had zero concept before I started patching.

Electron Shower

Clean (HQ mode) electronic waterfall sound that falls much more quickly upon release. Try playing staccato. This patch is polyphonic, but restricted to 3 voices in order to save CPU.

- The audio is Filter1 self-oscillation, and the drop in pitch is ENV2 modulating the cutoff. ENV2 also modulates OSC2 Volume and frequency (boosted 4 x in Multiplex1) so that the "warble" effect becomes both shallower and slower as the cutoff drops.

- Mod wheel sends OSC2 down to 0Hz…

  How to modulate down to zero Hertz

  Load *INIT and* turn OSC1 PD up to 100.00. Connect ModW to OSC1 phase modulation input, change the mode from 'PM coarse' to 'rel coarse', and adjust the amount to precisely -20.00. Play a note and push the modulation wheel up to maximum. The pitch will drop down to zero Hertz. Even if you set the tuning (Tune) extremely high e.g. 'Overtone' 24.00, the mod wheel will always take it down to zero (check that).

- Reload *HS Electron Shower.* Pressure or Ctrl A (balanced in Multiplex3) fractalize OSC2. As you can hear, an OSC in Hertz mode is the better choice of 'LFO' if you need an especially interesting / complex waveform: Load *INIT* and experiment!

Flaming Water

Chaos is easy to achieve in modular synths! To save CPU, this patch is only 3-note polyphonic.

- Gritty quantised pink noise excites AND modulates two resonating filters, one of them indirectly: Filter2 band-pass modulates Filter1 cutoff.

- Mod wheel lowers Filter2 cutoff to slow down the bubbling.

- Resonance is on the edge of self-oscillation in both filters. The pitch wheel pulls Filter2 resonance back, or pushes it over that cliff.

Flux Granules

A bubbling sound like *Flaming Water* but less dense. Otherwise completely different…

- LFO2's random wave drives Map2, which is sent through both (!) lag processors before modulating Filter1 cutoff. See Multiplex1: Ctrl A is a "smoothness" control, crossfading between just one lag processor (blue cable) and both (orange cable).

- The mod wheel adds buzz by introducing cutoff modulation from OSC2. Try playing a high note with the mod wheel at about 60% – R3D3?

Glitch Calculator

The complex "digital" timbre depends largely on stacked oscillators. Ctrl A adds noise.

- Try setting Stack (in the VOICE panel on the right) to only 1, compare the sound then set Stack back to 8. StackV modulates OSC1 PD via Multiplex1 so that each voice in the stack has a different 'Res III' level. Remove that red cable, listen, then click on [UNDO].

- About the rhythm: Watch the motion in Map1. You might like to expand it by clicking on the [+] button. As well as the quasi-random jumps at 48 times the rate of whatever is driving the map back and forth (in this case LFO2 triangle), there's an offbeat 'slosh': One of the Multiplex1 inputs is ENV2, which is triggered by LFO1 running 12 times as fast as LFO2 (1/2 vs 6/1). Try shortening ENV2 Attack (A).

- Performance control: The mod wheel lowers cutoff and how much OSC1 PD is affected by StackV. Pitch wheel modulates LFO2 rate and therefore how fast Map1 is being scanned. Finally, Multiplex2: Ctrl A adds noise by feeding OSC1 back into itself as the source for Fractalize as well as linear FM modulation!

Happy Spacebaby

Guaranteed to trigger your parental instincts.

- Recursive stuff: The Bandpass output of Filter1 frequency-modulates the same oscillator (OSC1) that is being filtered (twice). A lag generator keep it all from getting too wild – turning down the Attack makes this patch sound more like cats vs dogs.

- To inject movement into the feedback path, LFO2 modulates Filter1 cutoff. Remove that connection and there's nothing at all pulling the sound back and forth. It becomes flat and boring… yes, you should try that too!

Highway Hogwash

Inspired by the memory of the phasing sound of passing trucks while hitchhiking many moons ago. Mod wheel adds lots of resonance, which is meant to be carefully performed.

Let's break this one down by checking the sources of rhythm…

- Disable all FX, hold down a note and listen. Speed up LFO1 by slowly increasing Ctrl A. The signal from Multiplex1 phase-modulating OSC1 ('PM coarse') is OSC1 itself, lagged a bit (downward transitions only) and amplitude-modulated by LFO1's triangle wave…

- Disable that feedback by removing the red cable connecting Multiplex1 to OSC1. Might as well clear up the remains: Remove the other cables connected to Multiplex1 and the upper lag generator. Play a low note and listen… In the VOICE panel, set Stack to only 1 instead of 2. We are left with cutoff modulation from lagged sequencer and soft random from LFO2 – the bedrock upon which this patch was built.

  Could you build it up again from memory? What was connected where?

Lobster Love 1

A strangely ear-tickling ambient patch. Hold down a few notes, close your eyes and listen for a while. Try both wheels as well as Ctrl A (careful with that one). Looking at the panel, the first thing you should notice is that **none** of the oscillators are used.

- As so often, it's best to analyse the signal flow of this patch *backwards from the outputs*: OUT2 ← Filter1 BP ← Filter4 HP (x 2) ← Quantizer (x 2) ← Filter3 LP ← Pink noise (x 2). Find out what each stage does, starting with the source…

  Make a note of what you achieve by following each of the following steps:

  Drag a new cable from Pink noise to OUT2, replacing the connection from Filter1. Disable the distortion, delay and phaser to isolate the raw noise. So that's our audio source! Next, connect Filter3 LP24 to OUT2, replacing the cable you just added. As the cutoff has to be set very low (10.00 here) for a slow crackle, the result is almost silent.

  Quantising it adds high frequencies, however: Connect the Quantizer to OUT2, replacing the previous one again. You should hear a deep crackling now. That's more like it, but the low frequencies need to be filtered out…

  Connect Filter4 'HP12' to OUT2, replacing the cable from the Quantizer. Almost silence again, but enough to "ping" Filter1… connect Filter1 'BP6' to OUT2 instead.

- Reload *Lobster Love 1* and disable all effects. The slow sweeping effect is Filter1 cutoff modulation from LFO2 and Filter2 bandpass (fed with white noise). Double-click on both Filter1 cutoff modulation amount knobs, turn Filter1 'Cutoff' up and down, then [UNDO] until either both cutoff modulations reappear or you have to reload *Lobster Love 1.*

Lobster Love 2

Check out *Lobster Love 1* (see above) first. Here are the main differences in this version:

- Filter2 is used as an extra input for Cutoff modulation (see 'Spread' mode in the Bazille user guide).

- Each voice is stereo: Stack is set to 2 and 'StackVoice' modulates OUT2 pan position.

- [HQ] is off to save CPU, and the grittier sound contrasts well with version 1.

- Pink noise is not only the audio source here (Filter3), it also modulates Filter1 cutoff and resonance as well as Filter4 cutoff (via CV1). Follow the red daisy chain.

Meditation Bowls

Bells with slow attack. Doesn't use any filters.

- Pressure via Map2 makes the amplitude modulation from LFO2 deeper (Amp Mod) as well as faster (Rate Mod). After releasing pressure, relaxation is very smooth because the Map2 signal is lagged twice – see the grey cables.

- The basis of the sound is OSC2 "FM" by OSC1. To balance the frequencies of both oscillators so that the bells are usable over several octaves, key follow modulates their pitches in opposite directions: The blue daisy chain sends a positive version directly to OSC1, while an inverted version modulates OSC2 via Multiplex1, where it is mixed with the mod wheel signal. You'd think it could be done more simply, wouldn't you?

- A tip about bell tones, whether based on FM, AM or RM: Keep trying different frequency combinations until you hear something that you particularly like. Trial-and-error rules! Keep saving interesting versions, compare and delete the least interesting ones.

Micro Chimes

Electronic wind chimes.

- ENV2, a very short impulse triggered by LFO2, is highpass filtered (Filter3) and used to "ping" Filter1's resonance. Map1 balances this resonance across the keyboard, reducing the danger of squealing. Try removing the green cable, then reload *Micro Chimes.*

- LFO2 also modulates Filter1 cutoff so that the pitch changes for each impulse. LFO2 speed is also fairly random: the Rate Mod source is 'LFO2 Rnd'… self-modulation!

- Finally, ENV1 triggered by LFO2 modulates OSC2 (linear FM, blue cable), which in turn modulates Filter1 cutoff. This adds a metallic "zing" when the mod wheel is up.

Plastic Shards

Random tinkles that get richer when you push the mod wheel. This patch uses a lag generator as a primitive lowpass filter… even though regular filters are available.

- The signal at OUT1, the more percussive element, is Filter1 self-oscillation. ENV1 in 'Loop' mode (I really should play with that more often!) is the amp and pitch envelope: After quantisation and lag it modulates Filter1 cutoff: Listen to the pitch "popping" upwards at each attack. The other half of that same lag generator softens the audio before it reaches OUT1.

- The OUT2 layer is a sine wave from OSC2. Tap4 of the sequencer modulates OSC2 pitch ('rel coarse' FM) and Volume. OSC1 also modulates OSC2 pitch.

- Adjust Rotate and listen to what happens. Leave it at maximum and attach ENV1 to the Rotate socket. Remove again and double-click the knob to stop the rotation.

  How about making the sequence much longer? It makes sense to copy the Snapshot [1] data to all other snapshots first: In the sequencer dial, right-click on 1 and select 'copy'. Right-click on 8 and select 'paste'. Then right-click on 1 again and select 'interpolate ->'. The data should be the same in all snapshots – select them in turn and see. After hours of fun editing each snapshot, turn Rotate up to maximum again…

Quartz Stairway

Best below 90 BPM. With two very similar layers, it is structurally simpler than it appears.

- Following the audio routing backwards, from the outputs to the ultimate sources…
  OUT1 (using Env1) ← Filter1 ← OSC1 & OSC4 (red cables)
  OUT2 (using Env2) ← Filter2 ← OSC2 & OSC3 (yellow cables)

  So each main filter processes a pair of oscillators, one of which is amplitude modulated: OSC3 from ENV4, and OSC4 from ENV4 (grey cables).

- Although all oscillators have PD turned down to minimum, they are not pure sine waves as they "tap the maps" (see the waveforms in the Mapping generators). OSC2 uses the more complex Map2 shape, while all others use Map1. Both driven by LFO1, the maps also modulate Filter1 and Filter2 cutoff. Map1 does double duty as pan modulation source for the high frequencies (OUT2).

- **Spectralize**

  Those smooth curves were made using the map "Spectralize" function. Load *INIT* and select 'TapMap1' instead of 'Cosine'. Right-click on Map1 and select 'reset', right-click again and select '4'. Drag the leftmost and rightmost values both up to maximum (taking care not to change the other two). Right-click again and select 'Shapes / Spectralize': Map1 now contains an organ-like waveform consisting of the 1st and 4th harmonics. For more details see <u>Additive Waves</u> on page 6.

- Back to "Quartz Stairway". The sequencer modulates all oscillator pitches (the green daisy chain), and can be rotated via pitch wheel to a random-ish (down) or a whole-tone pattern (up). Via Multiplex1, mod wheel introduces a fast warble (relative FM) from ENV2 in 'Loop' mode. The looping speed is controlled by the sequencer data via CV1, for a noticeable "key follow" of the sequencer data when mod wheel is at maximum.

Rain Manual

One of a zillion way to create thoroughly chaotic sounds in Bazille.

- OSC1 is 'TapMap', a smooth shape made using the 'Spectralize' function (see *Additive Waves* on page 7). Try manually drawing different shapes in Map1 after disabling the FX.

- Reload *Rain Manual*. The main spice used here is modulation feedback: OSC1 modulates its own pitch, phase, PD and Fractalize – test them all by adjusting the amounts. At certain settings you will get silence – why?

- Pushing the mod wheel increases the "whistle" from Filter1 resonance by reducing OSC1 Volume. Perform with the rectified and quantised pitch bender!

- Filter4 low-pass filters the signal from Filter1. If you want a "wasteland rumble" sound, close that filter by turning up Ctrl B.

Rattlesnake Thunder

Electric storm. Bring back the rattle effect via aftertouch.

- OSC1 pitch is modulated by two LFO-driven maps, one smooth and the other quantised. Although a random LFO could have been used instead of those maps, it isn't quite as much fun watching an LFO panel.

Let's listen to the raw oscillators: Drag the red cable from the Filter1 input and drop it directly onto OUT1, replacing the existing connection from Filter1. Such a stupid warble is used to excite resonance in Filter1? It sounds primitive, but it works.

- Reload *Rattlesnake Thunder.* Only Filter1 is being used to process a signal – Filter2 in 'Spread' mode offers extra cutoff modulation inputs for Filter1, adding more key follow and pressure control. Remember that Filter2 in 'Spread' mode effectively inverts cutoff modulation of Filter1. If this is still unclear, search for "spread" in the user guide.

- Ctrl A effectively removes OSC1. Ctrll B turns Filter1 Resonance up a bit from the 50.00 added by +5V via Multiplex4. Why does doing that lower the pitch? Ultimately because recursive cutoff modulation from BP6 is not "zero delay feedback".

Replay Bonus

An 8-bit video game sound which is actually more complicated than it appears.

- Map1 is driven by a looping envelope (ENV2). Expand the map by clicking on the [+] and watch the movement for a while. The pitch is consistently steppy, and this is especially noticeable when the scan gets very slow. The loop speed is controlled (Rate Mod) by a lagged square (follow the yellow cables). This can only be done using one of the "CV" routes because the list of modulation sources doesn't include lag generators. Double-strength pitch wheel control is added in at this point – see Multiplex3.

- **Experiments!** The CV sockets are portals to a universe of grungy effects. Load *INIT* and turn OSC1 PD up to 100. Connect OSC2 lower output to CV1, select CV1 as the Amp Mod source in ENV2 and turn the amount up to maximum. Then connect ENV2 to OSC1 pitch modulation and turn it up. Adjust ENV2 Sustain. After exploring the limits of this patch, connect ENV2 directly to OUT1, replacing the other cable. Then try amplitude-modulating an LFO instead of the envelope…

  But wait, there's more where this came from: You can use an OSC via CV to drive a map!

- Reload *03 Effects / HS Replay Bonus:* The mod wheel increases the amount of phase modulation ("FM") from OSC2 tuned a couple of octaves lower than OSC1. Both of the oscillators are square waves, which is typical of old video games. Filter1 bandpass gives the sound some extra colouration: For the unfiltered sound, disconnect OUT2.

Seargulls

Like *Replay Bonus*, this patch also alternates between upward and downward rapidly stepping pitch. The methods used to achieve that effect couldn't be more different, however…

- In Multiplex1, a fairly slow triangle wave from LFO1 crossfades between OSC1 (clocked sawtooth) and an inverted version of the same signal. +5V is added to the righthand side of the multiplex, raising the pitch whenever the LFO moves over to that side.

- See that green daisy chain? The left inputs of Multiplex1 are bridged and the amount is set to 50.00, ensuring complete crossfade. See the image on the next page…
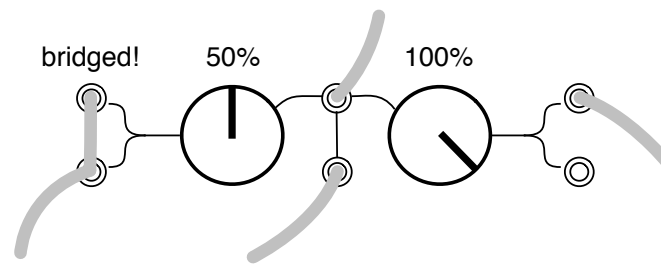
You can apply this trick whenever you want a bipolar modulator (such as an LFO or the pitch wheel) to crossfade perfectly between two signals. For details, including the simple maths, please refer to the Multiplex chapter in the Bazille user guide.

- Via Multiplex1, OSC1 modulates OSC2 Volume. After serious quantisation (only 3.00), that same signal modulates OSC2 frequency: Linear FM, as the regular pitch modulation socket is already being used by LFO2 for the very slow pitch modulation. Turn up the Quantizer and hear how the steps disappear.

Slow Rise to Power

Hold a note or two and watch Map1 (which is just a realtime indicator of LFO2's "voltage").

- All four oscillators are patched to Filter1 and Filter2, and their pitches are modulated by a very slow LFO2 (the blue daisy chain).

- In the VOICE panel Stack, the number of unison voices, is set to 2, and via Multiplex1 the two stack indices (StackV) cause the pitches to be sent in opposite directions whenever the pitch wheel is pulled or pushed…

Quoting the Bazille User Guide:

Stack Voice (StackV)

A modulation source derived from the index of the voice, this signal is +5V when Stack is set to 1, +5V and -5V when Stack is 2, +5V / 0V / -5V when Stack is 3. The simplicity ends with settings of 4 and above, although the limits will always be +5V and -5V.

Those two "voltages" are sent down the same cable: The cable paradigm breaks down when the voice mode is 'poly', as each voice actually gets its own "cable".

- LFO2 is set extremely slow, and Map1 indicates the current position within its cycle (only the most recently played voice is displayed). You can speed up LFO2 by either applying pressure or Ctrl B or both (as they are not balanced with each other, they will add up!)

- See ENV1: Map2 causes the attack and release of black notes to be shorter (Rate Mod). As Map2 is in 'Key' mode, the 12 values are repeated across the MIDI note range.

- The pan positions for the two stacked voices are alternated in Multiplex2, but ultimately controlled by the pitch wheel in Multiplex1. Check for yourself: Disable both effects and turn ENV1 '**A**' (attack) and '**R**' (release) down to minimum. Play a note and listen to how the stereo width changes when you push and pull the pitch wheel.

- Reload *03 Effects / HS Slow Rise to Power* and enjoy the sloth.

Sub Sonix

Before analysing this patch, disable all effects by clicking on them in the FX block.

- 'Ramp1' rotates the sequencer, flipping back very quickly from Snapshot [8]. I suspect I did that mainly for the visual effect, as setting the ramp's Down knob to minimum and Rotate to maximum doesn't make much difference to the sound. It's worth disabling all modulation pathways one by one to find out what's really important in this patch:

- The audio path is OSC1 → Filter1, LP24 (lowpass 24dB/octave) → OUT2. Very simple.

- Remove the blue cable connected to the upper input of the Lag Generator. What happened? The pitch variation was lost because the output of that Lag modulates OSC1 pitch. Restore *Sub Sonix* again by clicking on [UNDO]. That blue cable carries a filtered square from LFO1. The highpass (Filter2) removes DC from the signal.

  A few experiments:

  Load *INIT* and turn OSC1 PD up to maximum. Connect LFO1 square to OSC1's pitch modulation input and turn the amount up to 6.00 (one octave is enough). Change LFO1 mode to 1/4 to slow it down.

  Now insert Filter1 (LP24) into the connection you just made. The modulation range becomes narrower, it is obviously less than an octave now. Adjusting Filter1 Gain isn't any help at all (try that!), so go to OSC1 and turn the pitch modulation depth up to about 8.50 (which restores the octave interval). Play a note and turn 'Cutoff' down below 50… as you can hear, filters can be used as lag processors!

  Finally, right-click on the LP24 socket and reconnect that cable to the HP12 output instead. Turn 'Cutoff' down to minimum, play a note and listen: The highpass filter has removed the upper and lower "shelves" of the square wave, leaving just a short "blip" at each transition. Make the blips stronger by turning OSC1 mod depth up to maximum.

Swirly Thing

Centrifuge / helicopter type sound, with envelope-controlled speed.

- ENV2 has a lot to do here, as you can guess by the number of orange cables sprouting from its output socket. It modulates OSC1 and OSC2 volumes (the latter via mod wheel), OSC1 and OSC2 pitches, as well as Filter1 cutoff.

- The main audio source in this patch is a mixture of white and pink noise, bandpass filtered in Filter2 and sent to OUT2. The Filter2 highpass signal is also bandpass-filtered by Filter1 and sent to OUT1… which hopefully adds up to a more interesting colour! Check that by removing individual cables from the two OUTs. Then reload *Swirly Thing*.

- Using ENV2 in Multiplex1, mod wheel adds a high-pitched whine from OSC2. Although the modulation amount is only 4.00, it is enough to make that signal perfectly audible.

- Why is StackV modulating ENV2 'Rate', although Stack (see the VOICE panel) is set to only 1? Answer: This trick makes envelope times longer than normally possible. The source +5V isn't available in the list of modulation sources for Rate Mod, but as StackV also sends +5V to the first voice, we can use that instead!

- LFO1 pans OUT2. It randomises its own rate ('LFO1 Rand' is the source for Rate Mod).

Twinkle Tree

The Bazille version of a sound I first made with an Access Virus (B, I think) many moons ago. Hold down a random bunch of notes and listen to the twinkly chaos for a while…

- OSC1 uses 'TapMap1' (i.e. the wave in Map1) to create a bell-like tone. Such smooth curves are easily made using the 'Spectralize' function – see *Additive Waves* on page 7.

- The mod wheel fades OSC1 out while fading in the lower-pitched OSC2 (yellow daisy chain). It also pans OUT1 to the far left and OUT2 to the right, turning the normally mono sound into stereo. However, the stereo delay masks much of this effect.

- Blue cables: Random steps from LFO2 are quantised so that the pitches are fixed like real chimes instead of being totally random. LFO2 is also randomly modulating its own rate – a trick worth remembering! Finally, Multiplex1: The stack index (StackV) plus 50% inverted mod wheel detunes the two oscillators, differently per stacked voice. Push the mod wheel a bit and try adjusting the amounts of linear FM in the two oscillators. Then experiment with 'rel coarse' FM mode instead of 'lin 100Hz'.

Zipper Farm

An exercise in multiple use of LFO1. Mono mode saves CPU.

- While the amp envelope ENV1 is almost a simple gate, the LFO1 triangle wave creates the basic contour by modulating OSC1 Volume. LFO1 also affects pitch via relative FM – see 'rel coarse' mode in the Bazille user guide.

- The square wave modulates OSC1 pitch over a 2-octave range. The amount is set to only 12 semitones, but as the LFO is bipolar, the pitch is sent up AND down an octave.

- The 50% smoothed random signal modulates phase distortion. Remove that by double-clicking the PD modulation amount knob – the difference is subtle. Click on [UNDO].

- The two main filters in series colour the sound (via resonance and overdrive) and allow it to be softened via mod wheel: Why is that cutoff modulation amount positive?

- The two halves of the sequencer modulate LFO1 rate and Filter1 cutoff. Ctrl A rotates the sequencer dial to Snapshot [2], which is empty: That is one very annoying Kookaburra!

04 Leads

A Simple Plan

Inspired by a lovely old Korg 800DV ("Maxikorg"), the octave jump alternates between up AND down here. Try the pitch and mod wheels. This one isn't as simple as the name would suggest!

- The oscillators are patched in pairs to the two main filters, which are connected directly to the outputs. Disconnect OUT1 to isolate the pad in the other layer, then click [UNDO] or reload *A Simple Plan*. OUT1 does the octave-jumps…

- The octave jump is Map1 in combination with a Ramp, a lag generator, a Multiplex and the mod source 'Alt'. It works like this: Via Map1, Ramp1's Hold delays the jump for an 8th note. Ramp1 wasn't used directly, as the initial value needs to be zero. The Map1 signal is lagged (try different 'A' values) and sent to Multiplex1, where 'Alt' inverts it for every 2nd note before it pitch-modulates OSC1 and OSC2. Got all that? Next…

- Pitch bend is rectified so that negative values become positive, quantised and sent to all oscillators (grey daisy chain). 100% relative mode FM ('rel coarse') with the quantisation at 10.00 causes pitches to move up the *harmonic series*, ending at the 12th harmonic. Try setting quantisation to 8.00 and all modulation depths to 80%, or quantisation to 5.00 and all modulation depths back to 100%.

  See *00 Tutorial / Harmonics in Series*.

- Isolate the "pad" layer by turning Ctrl B all the way up (see Multiplex2). This layer cleverly lets you use Ctrl A to transpose notes in both directions, with steps that make sense. How it works: The mod wheel drives Map2 containing 5 quantised values created by hand then adjusted using the Quantise 8 function. As the OSC3 and OSC4 pitch modulation amounts are -8 and +16, the result is 2, 5, 7 and 8 semitones down and 4, 10, 14 and 16 semitones up. Each of the pairs creates a more or less sensible chord.

- Bits and bobs: For the jumping layer, Filter1 cutoff is modulated by two envelopes at the same time (ENV1 adds a bit of attack). For the pad layer, LFO2 provides subtle tonal movement by modulating OSC3 Fractalize.

  The mod wheel fades out OSC1, OSC2 and OSC3 while boosting OSC4 (a softer sound). Last but not least, +5V is lagged and sent to modulate Filter2 cutoff: effectively a 1-shot envelope for the tone of the pad so that it continues to rise, however "staccato" you play!

Alternate Vocal

This patch uses ring modulation (see Multiplex1) to add a special colour to a typical bandpass filtered lead sound..

- It sounds significantly more "analogue" than *Fractal Primitive* or *Fractal Vocal* (see below). Try adjusting OSC2 Tune.

- In Filter1, bandpass and lowpass are used in parallel (the latter adds warmth). For a strong vocal effect, the resonance has to be set fairly high. Negative resonance modulation from 'KeyF 1' (key follow 1) ensures that higher notes don't get too shrill. Key follow also modulates OSC1 volume so that high notes aren't too loud.

- Play the same note several times: Do you notice a pattern? The envelope modulating Filter1 cutoff is alternating between two different attack times as 'Alternate' is modulating ENV2 speed (Rate Mod). If you use this trick in your own patches but find that it doesn't add quite enough "interest", try using a map in 'Increment' mode to step through 3 or 4 values instead of just the two.

- As filtering is so important for vocal-type patches, it is no surprise that the cutoff is being modulated by a total of four signals here: ENV2 does the basic contour while Pressure (lagged for super-smooth transitions) opens it up a bit more. Via Filter2 in 'Spread' mode, Ctrl A lowers the cutoff, as does positive pitch bend. Filter2 is otherwise unused.

American Cut

Audio-rate pulse width modulation (PWM)! Highly velocity-sensitive, despite being single-voice.

- Just in case you forgot how to do PWM in Bazille: Load *INIT*. Instead of 'Cosine' select 'TapMap1' as the OSC1 shape. Right-click on Map1, restrict the size to 2 values and set them to maximum and minimum. Play a note – the waveform is a square. Whereas normal PD morphs between a cosine and the selected PD wave, the PD parameter adjusts the pulse width.

  Connect LFO1 triangle wave to the PD socket, turn the modulation amount as well as the PD knob to about 40, then set LFO1 'Rate' to about -2.

- Reload *04 Leads / HS American Cut*. Instead of slow cyclic PWM via LFO, in this patch the pulse width is modulated at audio rate (by OSC2). Ctrl A via Map2 modulates OSC2 pitch: the concave shape in Map2 makes setting low values easier than if Ctrl A were connected directly to OSC2… and low values are particularly interesting here.

- Filter2 (in 'Spread' mode) is used as an extra pair of cutoff modulation inputs for Filter1. See the "Filters" chapter in the Bazille user guide.

Bass Clari 303

Audio rate PD modulation. The acidic resonance is the Phaser with zero modulation.

- OSC2 is tuned to overtone 5 i.e. two octaves and a 5th up. That already gives OSC1 a bright enough edge, but you could try setting OSC2 Tune to a higher integer.

- Push the mod wheel. Negative amplitude modulation in parallel with the normal vibrato makes it sound more natural, more like a real woodwind instrument.

- Quantised to 3 values (Quantisation is set to 2 and the source is unipolar), ENV2 adds a characteristic "reed" attack, which is particularly noticeable on very high notes. Listen to it slowed down by turning up ENV2 Decay, then reload *Bass Clari 303*.

- ENV1 is amplitude modulated by 'Gate', a simple trick you can use to add a mild room effect to an otherwise short sound. How it works: The amount of amp modulation isn't maximum but only 80%, which means that a bit of the Release is still audible. Double-click on the Amp Mod amount knob to hear how long the Release really is, then turn it slowly back up to 80% while checking how it affects the sound.

Bendjo

Plucked string plus bowed string, with 'Eastern Frets' microtuning.

- If you are only familiar with equal temperament or similar, you could use this one as an exercise in "rewiring your brain" to accept new tunings. Just keep improvising, avoid chords. If you play only white notes (e.g. C major scale), the only unusual note is D. Try playing G# and A together.

- Let's sort out the MIDI&MORE / Multiplex spaghetti by removing the pad and any Multiplex connection that doesn't have an immediate, obvious effect:

  Remove the cable connecting OSC3 to OUT2, silencing the pad layer. Remove all cables connected to OSC3, as it is no longer in use. Multiplex2 only does anything when you apply Pressure, so disconnect all cables there… the plucked sound remains unaffected. How about Multiplex3? Check by removing the output cable… Good, the pluck is still intact, so disconnect the rest of Multiplex3. Finally, disable the Distortion and Reverb to leave us with the **essence** of this patch. It's now time to analyse what's left…

- OSC2, a pure sine wave, is being amplitude-modulated by OSC1, a fractalized sine. Adjust OSC1 Fractalize (the unipolar knob) to check why the value 1.10 is a good minimum.

- Multiplex1: Double-strength 'Velocity' is 20% modulated by 'Alt' (so each note will almost certainly sound different from the preceding one). Remember: If anything is connected to the Mod socket, those knobs control **modulation depths**, not the input levels.

- Reload *04 Leads / HS Bendjo*. In Multiplex3, a mixture of mod wheel (100%), key follow (-83%) and 'Random' (17%) is sent via CV1 to modulate the rates of ENV1 and ENV2 (see Rate Mod) for user control and "acoustic instrument behaviour" at the same time.

  Where did that -83% came from? 100% inverted plus 17% non-inverted KeyF1. This demonstrates that it is (kind of) possible to set three different levels in a single Multiplex!

Brash Ripper Solo

What sounds like sync sweep is actually phasing between the 6 stacked voices.

- Set Stack to 1 and listen to the difference, then set it back to 6. Responsible for the sweep is LFO2, which modulates OSC1 phase via Multiplex1 (so that StackV can shift the phases of the 6 voices apart) and OSC2 phase via Multiplex2 (where ENV3 is added). That consistent sweep is destroyed if the VOICE [Drift] button is activated, demonstrating how important such a "minor" parameter can be.

- If necessary, reload *Brash Ripper Solo*. OSC1 and OSC2 are lowpass filtered, with extra Gain to add some overdrive. Simplify the patch by connecting both oscillators directly to OUT1 instead. Save the patch as "Brash Ripper Solo X" and compare the two versions. If you decide that it doesn't need the filters, remove the orphaned cables from Filter1 and reset all its values by double-clicking on the knobs. Tidying up is a good habit.

- As LFO1 is patched to the oscillators (maximum depth 5 semitones), vibrato via mod wheel is very deep. If you prefer shallower vibrato, simplify this patch by disconnecting the yellow daisy chain and turning 'Vibrato' (in the PITCH panel) up.

Chaos Club

Two otherwise very different layers that share the same movement. Try playing staccato first, then hold a chord for at least 10 seconds for the full cascade effect.

- No peeking… just listening to the patch, do you think it uses two LFO-driven maps, or quantised LFOs? It could have been either, but quantising a pair of sawtooth LFOs (see Multiplex1) is probably the easiest. LFO2 is rate-modulated by a long sawtooth from LFO1, repeatedly slowing the cascade down.

- One of the blue cables sends a smoother version of the quantised signal to modulate the OSC1 phase distortion. Mixed with ENV2 in Multiplex2, that same signal also modulates OSC2 phase distortion. Turn OUT1 down to hear the cutoff modulation of the pad layer, and test the effect of adjusting A and D in the lag generator.

- As the LFOs were no longer available, the vibrato for OSC2 is OSC3 in 'Hertz' mode.

- If you own a MIDI expression pedal you could replace the mod wheel (red daisy chain) with Ctrl B (CC11 Xpress by default) to control "wah" while playing with both hands.

Distorto

Heavy distorted ('Rectify') lead with "palm-muting" effect via mod wheel.

- All the power is created in the effects. If you temporarily disable Distortion, you can hear the fundamental (OSC1) and the third harmonic (OSC2)…

  OSC2: 2.00 in 'Overtone' mode is the second overtone a.k.a. third harmonic. The -2.00 'Multiply' value transposes it down an octave. Read all about the "Modify" modes in the Bazille user guide – they are cleverer than you might think!

- The palm-muting effect is simple: Mod wheel adds cutoff modulation from ENV2 (via its Amp Mod), while lowering the cutoff overall. For a more instantaneous transition between open and palm-muted, try this: Right-click on Map1, select 4 then drag all values except the first one up to maximum. Choose 'ModWhl' as 'Source'. Connect Map1 to Filter1 cutoff modulation, replacing the yellow cable. In ENV2, select 'MMap1' as Amp Mod source instead of 'ModWhl'. The mod wheel now switches to palm-mute after only 25% of its throw. If you prefer a less drastic transition, change the Mode to 'Map Smooth'.

Double Whammy

Drops an octave if you hold a note for longer than half a second. Another obvious feature of this patch is the swirly "un-ducked" delay after release. Use the mod wheel sparingly!

- Disable both effects. The raw sound is a pair of oscillators tuned a 5th apart. OSC2 pitch is multiplied by -2.00 so that its octave is the same as OSC1 (which uses Fractalize). The OSC1 waveform (TapMap1) consist of the 1st, 3rd and 4th harmonics, created using the 'spectralize' function (see Additive Waves on page 6).

- The whammy effect is Map2 driven by Ramp1, which rises fairly slowly (drops the pitch), holds for a short while, then falls quite rapidly (brings the pitch back up).

- Reload *04 Leads / HS Double Whammy*. The distortion comes AFTER the delay – if you swap their positions in the effects chain, you lose the ducking effect because the delay is no longer compressed by tube distortion.

Flute Warbler

Mod wheel activates a "yodel". Ctrl A reduces the PD amount instead of lowpass filtering.

- Driven by ENV2, Map1 modulates OSC1 pitch. Expand the map. How much of it is used is ultimately controlled by the mod wheel (see ENV2 'Amp Mod'). Turn ENV2 Decay up to 50 or higher, push the mod wheel and watch Map1 while you play notes.

- The ear-tickling wavering effect is a combination of rapid, shallow vibrato and wide Delay with quite a high "Wow" setting. The little things add up…

Fractal Primitive

A very "digital" resonant sound tamed by two filters in series.

- OSC2 uses Map1 (the shape is 'TapMap1' instead of 'Cosine'). With 'Square' PD and 'Max' fractalization, it is much brighter than the smooth wave in Map1. Set Fractalize 'off' instead of 'Max' and play a low note. Which particular harmonics can you hear?

  There's no fundamental at all (compare with 'Cosine' as basic waveform) but only a 5th and a minor 7th i.e. the 3rd and 7th harmonics. See *Additive Waves* on page 7.

- Reload *Fractal Primitive* and have a look at Multiplex1: Even if you apply Ctrl A and Pressure (a.k.a. aftertouch) at the same time, the sum of the modulation sources will remain 100%. It works by having one of those signals crossfade between itself and the other source: Ctrl A is not only connected to one of the regular inputs, but also to the Mod socket. Swapping them will make no audible difference, but you should try it anyway: drag the (blue) cable from the righthand input onto the node of the green daisy chain (the connection to Mod should remain intact), then connect Ctrl A to a righthand input.

- Filter2 is used for overdrive (the Gain is quite high). In 'Offset' mode, Filter2 cutoff adopts all cutoff modulation from Filter1. Including the KeyFollow, a detail I sometimes forget!

Fuzz Again

No classic soundset would be complete be without a "Hoover" or two…

- The first 3 oscillators are mixed in Multiplex1, sent through two different filters to the two outputs, where they are panned apart. Two kinds of noise, White and OSC4 "self-FM", are used to phase modulate ("FM") OSC1 and OSC2 respectively…

- Self-FM? Listen to the very special noise coming from OSC4: Remove the yellow cable from OUT1, connect OSC4 upper output to OUT2, replacing the grey cable. Play a note and adjust OSC4 'PM coarse'. Remember that PM stands for **phase modulation**, the more precise term for the (in)famous DX7-type **FM** (frequency modulation).

- Load *Fuzz Again* again. Pressure speeds up LFO2, and Ctrl A increases filter resonance.

Harmoclarina

Chromatic harmonica, 2-note polyphonic so that notes can overlap a bit.

- OSC1, a rounded-off sawtooth, is fractalized a bit ('Max' mode). Result: A fundamental, a strong 2nd harmonic (i.e. an octave up) and a clearly audible 3rd harmonic a 5th above that. Hold a note and listen carefully until you can distinguish all three harmonics. On a good day you should also be able to pick out the 5th harmonic, the note 2 octaves and a major 3rd above the fundamental.

- ENV2 opens up the filter while lowering the PD, giving the sound a horn-like contour. Pressure adds tremolo (slow cyclic amplitude modulation) from LFO1. Note that there is already 15% tremolo even you apply pressure, as LFO1 Amp Mod is at 85%. LFO1 randomly modulates its own rate: 0.09 is enough to make the tremolo less robotic.

- The mod wheel adds a "flute". Disconnect the upper cable from the Filter1 inputs to hear OSC2 in isolation. Normally the 3rd harmonic, Ctrl A via Map1 lets you select the 4th, 5th or 6th harmonic instead (watch that map). Multiplex1 prevents the higher harmonics from getting too screechy by reducing the amount of mod wheel sent to OSC2 Volume.

- The pitch bender is rectified, lagged and sent off to modulate Filter1 cutoff (blue cable): The rectifier inverts all negative values so that cutoff is lowered in either direction.

Horn B

Synthetic horn from the first age of affordable digital synths (DX7, CZ101 etc.), but using filters.

- That "growly" attack: Via Multiplex3, ENV2 modulates the cutoff of the main filters, both of which process the same signal. The trick: Filter2's bandpass signal recursively modulates Filter1 cutoff. Recursive? Filter2 is in 'Offset' mode, so it adopts all cutoff modulation from Filter1. Neat side-effect: The mod wheel opens Filter2 cutoff almost enough to make the growl continuous for medium low notes. Try adjusting Filter2 'Offset' just a bit.

- Pressure and mod wheel are balanced in Multiplex1 and sent via CV1 to modulate LFO1 amplitude (Amp Mod). LFO1 modulates OSC1 volume for a subtle tremolo effect. Try -14 instead of +14 Volume modulation depth. What's the difference?

Laser Sync 1

The original was a preset in the Elka Synthex, a big analogue polysynth from 1981.

- Bazille doesn't have oscillator sync, but Fractalize is similar enough, especially if you control the brightness in parallel. ENV2 is doing all the work: it reduces PD and therefore the brightness of all four oscillators, while at the same time increasing Fractalize.

- The rest: Pairs of oscillators are lowpass filtered (LP12) and sent to the two outputs, which are 100% panned apart for maximum stereo width. The mod wheel closes both filters, and Ctrl A increases the resonance. Play with both of those.

Laser Sync 2

The patch looks very different from version 1, although the basic principle is the same. A detail: In Multiplex1, double-strength and inverted key follow is added to ENV2 before it modulates Fractalize, thus preventing high notes from getting too harsh. Polyphonic, but only 3 notes.

Lowly Unstable

A plaintive "cinematic synth" horn. Recursive modulation strikes again!

- The tendency for lower notes to drop an octave (or to another "subharmonic") every so often is due to Filter1 modulating its own cutoff. A lag generator in the modulation path tames the higher frequencies. Hold a low note and experiment with the attack (A) and decay (D) values. Reload *Lowly Unstable*.

- Filter2 is only used as an extra cutoff modulation input for Filter1. See 'Spread' in the Bazille user guide.

- LFO1 provides a shallow vibrato (see the PITCH panel). More interestingly, ENV2 in 'Loop' mode acts as a unipolar LFO for the slow cutoff modulation. I think I used looped envelope instead of LFO2 because I wanted a shape that "breathes" very slowly, not always moving. To hear what I mean by that, test the shape by connecting OSC3 to OUT2 and modulating its pitch with ENV2. Hold until it repeats.

Lylead

Flutey synth solo, Lyle Mays style. Extra dirty (over)tone control via mod wheel and Ctrl A.

- The main feature of this patch is the "small room effect" caused by applying a pitch envelope to one of the oscillators while the other remains flat. OSC2 is pitch-modulated by lagged +5V, effectively a "one-shot" envelope with an adjustable attack, maximum sustain and infinite release. See 00 Tutorial / One-Shot Bouncer.

- Multiplex1 mixes all audio sources: The flute from OSC1 and OSC2, a 4th down from OSC3 via mod wheel, and high-resonance, bandpass-filtered white noise via Ctrl A.

- The use of an inverter here is unusual. The LP12 signal is mixed with about 30% inverted LP18. Common frequencies are subtracted, and the filter sounds quite silky. Experiment with all filter output combinations, including inversion and/or minimal lag.

Presto Swoop

"Press to swoop", alternating between upwards and downwards. How it works is unusual…

- Driven by Pressure, Map1 only triggers the Sample & Hold processor if you press very hard. If triggered, the +5V signal gets maximum lag and is sent to both sides of Multiplex1: One side at only 50% and bridged, the other at maximum but inverted first. The Alt (alternating) signal attached to the mod input toggles between the straight and inverted version, which then modulate OSC1 pitch ('rel coarse' FM). If you turn up Ctrl A, you will also hear a pure but wavering OSC2 moving in the opposite direction.

  Why is the lefthand input only 50% but bridged? Because the modulator "Alt" is a bipolar signal – see the Multiplex chapter in the user guide, look for "Bipolar Crossfade".

- See LFO1 and the PITCH panel. The modulation wheel adds vibrato. Its rate rises and falls with the pitch as Multiplex1 is connected to CV1, the Rate Mod source for LFO1.

Siesta 01

Another synth flute, with a strong 2nd harmonic via mod wheel and vibrato via Pressure.

- Isolate OSC1 by removing the cable connecting OSC2 to Filter1. Also disable the effects and turn Filter1 'Cutoff' up to maximum. The OSC1 waveform, 'TapMap1', looks like a **highpass-filtered triangle** – it resembles a shark's dorsal fin. Let's test that claim…

  Load *INIT*, change OSC1 shape from 'Cosine' to 'TapMap1'. Right-click in Map1 and select 'Shapes / Triangle'. Drag the cable currently connected to OUT1 and drop it onto one of the Filter1 inputs. Next, connect Filter1 'HP12' to OUT2, set the Cutoff to zero and Filter1 key follow to about 60. Play with the 'Freq' and 'Scale' oscilloscope knobs until you can see a nice multiple "shark fin" in the display. QED.

- Reload *04 Leads / Siesta 01*: The mod wheel adds more OSC2 (an octave higher than OSC1), as well as lowering Filter1 cutoff and increasing resonance a bit. It is subtle, but constantly moving the mod wheel while playing helps to make this patch "sing".

- Ctrl A introduces pitch modulation from LFO2. A lag generator rounds off the square wave. The pitch change is positive-only as LFO2 is in 'positive' polarity mode. Apply some Ctrl A, click on that red cross and listen to the difference.

Siesta 02

Brighter than the above. More of a horn than a flute, with appropriate performance controls. There are two features of note in this patch:

- A lag generator is used to slow down the mod wheel and Ctrl A.

- In Multiplex1, Pressure modulates it's own level before being sent to OSC1 PD (phase distortion) and Filter1 cutoff (via Filter2 in 'Spread' mode). This makes subtle modulation easier while retaining the full range. Think of it like this: 0% times 0% is 0%, 50% times 50% is only 25%, 100% times 100% is 100%.

- The Delay's 'HP' and 'LP' settings narrow the frequency range so that the effect doesn't overpower the dry sound. While you're in the FX panel, see what the Distortion is doing.

Snowflakes R Us

Two layers again: A Theremin-like lead plus a rolling arpeggio.

- The arpeggio is LFO2's triangle driving Map1, which contains 24 values tuned to a minor chord when the pitch modulation depth (OSC1) is '24.00'. I tuned each one as close as possible, then applied 'Quantise 24'. The arpeggio doesn't start at maximum… but try this: Expand Map1, right-click and select 'shift' from the alt-draw/cmd-draw submenu. Hold down Alt (Win) or Cmd (Mac) and try to rotate the Map so that the highest bar appears on the far right (tip: move to the left). It's not easy, but "practice makes perfect".

- Reload *04 Leads / HS Snowflakes R Us*. The melody layer includes vibrato patched from LFO1, with its rate following LFO2 (via Map1, 2 x lag and CV1): Disconnect the cable at OUT1 and listen to the "Theremin" layer on its own. Follow the cables connected to CV1, the selected Rate Mod source in LFO1… Yes, it's the Map1 signal, but lagged once more, and much more drastically. Play a long, hight note and listen to that vibrato again while watching the movement in Map1.

- Although ENV1 Decay is set to maximum, its Rate is being modulated (+40%) by 'Gate' so that it becomes longer still. The Attack rate had to be adjusted accordingly, but the Release rate didn't, as the Gate signal drops to zero as soon as you release the key.

  I don't know the range / law of envelope "Rate Mod", but it is very responsive.

Square Duo

Duophony can be used to create a "small room" effect…

- "Duophonic" in Bazille means that the odd-numbered oscillators (1 and 3) play the lowest held note while the even-numbered oscillators (2 and 4) play the highest. Overlapping notes exhibit an interesting effect caused by half the oscillators playing the new note immediately while the other half only jump to the new note when the old one is released. Get to know how *Square Duo* reacts to different playing styles before moving on.

- OSC1 is in 'Hertz' mode. Double-strength key follow (KeyF1) is sent via lag generator to the pitch modulation input so that the depth (nominally 32.00) is actually 64.00 semitones. The Tune settings: As usual, 10Hz is a sensible starting point, and multiplying this by 8.24 gets it in tune with the other oscillator. All for the sake of single-direction glide…

  For OSC1, the lag generator only causes a glide from higher to lower notes. OSC2 has a regular glide (see Offset 2&4 in the GLIDE panel), but the Range of only 20% means that the glide starts much closer to the target note. Tip: Reducing the glide range is good for emulating "sloppy intonation" and similar.

- Ctrl A brings in OSC3 and OSC4, which are tuned to a 5th and minor 3rd respectively. The bell-like quality is preserved because neither oscillator glides… How come? Because OSC3 has no glide anyway, and OSC4 is in 'Hertz' mode like OSC1.

Welcome Machine

A fuzzy 2-octave lead with filter overdrive and lots of effects.

- Mod wheel closes Filter1. Using Multiplex1, it also reduces the depth of cutoff modulation from LFO2, ensuring that the sound never disappears. Push the mod wheel and listen. Let's test what would happen if the modulation depth were not reduced by the mod wheel: Grab the red cable from Multiplex1 and drop it onto Filter1's righthand cutoff modulation socket, replacing the green one. Play a note and push the mod wheel.

05 Basses

Big Wig

Brassy orchestral hit with pseudo-reverb on release. Warning: The following goes into a lot of detail. I failed to trim it down because it all seemed interesting to me!

- Stack is set to 8-voice unison. Actually, voice 1 is tuned down an octave and voice 8 up an octave. And all voices are detuned a bit. Anyway…

  Multiplex1: ENV2 suppresses any pitch modulation while a note is being played, but when released the data in Map1 pulls the pitches of the stacked voices apart, creating a very "diffuse" sound similar to reverb (except that higher notes obviously sweep). Follow the cables connected to Multiplex1. If you connect 'Gate' to the Mod input instead of ENV2, the attack gets very samey. Why? Also try setting ENV2 Release to zero.

  There's no Delay because I wanted to keep this preset free of add-on effects. To make up for the lack of stereo width, StackV pans both OUTs 100%. Which of the 8 voices are panned to the left, which to the right, and by how much?

- OSC1 and OSC2 are filtered twice, with overdrive at both stages. The highpass (Filter3) reduces rumble while giving the modulation wheel something to do!

- Map2 ensures that Pressure doesn't add vibrato too early. I thought about lagging it as well, but decided against that.

- In Multiplex4, Ctrl A reduces cutoff modulation from ENV3. Why not simplify things by using negative Amp Mod in ENV3 instead? Wouldn't help because Amp Mod doesn't work like that. It works like this (all terms are percentages):

  *Amplitude in % = 100 - a + (a * m)*
  a is the Amp Mod depth [-100 to 100] and **m** is the modulation value [-100 to 100].

  If Amp Mod (**a**) is at -100% and Ctrl A (**m**) at zero, we get 100 - (-100) + (-100 * 0) = 200%. So we get twice as much when there's no modulation at all. Here's a simple test:

  Load *INIT* and turn up OSC1 PD. Select 'CV1' (empty = zero) as the Amp Mod source for ENV1, then turn Amp Mod down to -100. It's true, the volume is doubled!

Bunch of Folders

Why did I choose that name? Analysing the patch might shed some light…

- Isolate the first layer by turning OUT2 volume down to minimum. The basic growl-wobble is OSC2 set to only 1Hz. Phase modulation ("FM") from OSC1 via Multiplex1 suggests that OSC2 is being used as a waveshaper. I remember doing something similar on my DX7 many years ago: The carrier could be set to a subsonic frequency if at least one of the modulators is audio. For more lessons, experiment with *00 Tutorial / FM Wavefolder*.

- Mod wheel increases OSC2 PD, adding lots of fuzz.

- Ctrl A modulates LFO1 Rate via 3 intermediate stages:
  Ctrl A → Map1 → Lag → CV1 → LFO1 Rate Mod.

- Reload *05 Basses / HS Bunch of Folders* and turn down OUT1 Volume to isolate OUT2: White noise is lowpass filtered (Filter1 LP18) and mixed with an overdriven (Filter2) version of the OSC2 signal. Detach the yellow cable from OUT2 to hear the noise on its own. Extra-strength ENV3 modulates Filter1 cutoff upwards while +5V pushes it down "below zero" – the attack appears slightly delayed:

normal contour

minimum cutoff

delay

"below zero" contour

minimum cutoff
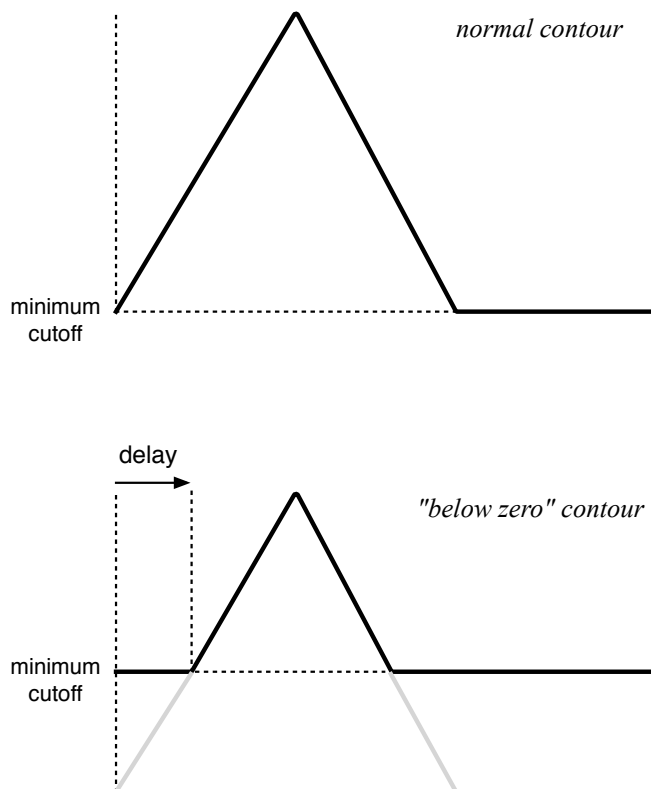
Drone Wars

Play low notes for cinematic drones and high notes for heroic, optimistic major melodies.

- Break it down: Disable all effects then compensate for the loss of volume by double-clicking 'Output' (the knob below the patch name) and turning up OUT1 Volume.

- OSC1 and OSC2 ('TapMap1', a very steppy sawtooth) are mixed together with a rounded off 'HalfSaw' from OSC4, which is an octave lower because Fractalize is being used. The sum is lowpass filtered then quantised to only 4.00 ("bitcrusher"). Hold a low note and watch the oscilloscope for a while… interestingly shifting steps.

- Reload *05 Basses / HS Drone Wars*. There's plenty of performance control here – some subltle, some not so subtle: In Multiplex3, Ctrl A crossfades between the quantised and non-quantised signals from Filter1. Pressure increases OSC4 Volume as well as Fractalize. The pitch wheel adds resonance: try holding the pitch wheel at maximum then playing the mod wheel.

- 'Foldback' distortion beefs up the sound considerably: Negative 'Pre-tilt' warms it up and the post-filter 'High' set to maximum adds extra sizzle.

McBoldface

Similar but not quite so typically "modern-cinematic" as *Drone Wars* (see above). In this patch, the Quantizer is used pre-filter.

- What is responsible for the slow sweep? LFO2 is the most obvious candidate – the triangle has a cable attached, and the speed appears to be about right. Check that by removing the cable connected to OSC1 Fractalize… Yep, that's it. Reload by clicking on the patch name and selecting the ticked entry.

- Filter2 is only used as an extra modulation socket for Filter1, it isn't processing any audio (see 'Spread' mode in the Bazille user guide). As well as bending the pitch down, shifting OSC1 phase and reducing phase distortion in both oscillators, pulling the pitch wheel back lowers Filter1 cutoff ("a minus times a minus is a plus").

- The quantisation value is critical. Try adjusting it, then set it back to 1.20. Tip: Whenever you need precise values, hold a SHIFT key and roll your mouse wheel – you don't need to press the mouse button. If any of the values are skipped, or scrolling through values isn't as smooth as you expected, go into Bazille's Preferences and switch 'Mouse Wheel Raster' on.

- LFO1 is used for vibrato – see the PITCH panel. Via CV1, double-lagged Pressure drives Map1, which is used to control LFO1 amplitude (Amp Mod). Hold a note down and watch Map1: Pressure ramps it up smoothly from the centre, and maximum decay (D) prevents the vibrato from disappearing as soon as you release.

  Why "from the centre"? Not knowing what you are going to feed through them, the maps always interpret CV1 and CV2 as bipolar sources. This means that if you route a unipolar signal such as Pressure via CV to a map, only half the map will be used.

Microlog

Probably as "classic-analogue" a bass sound as Bazille can deliver, but I would be very happy to be proven wrong! The vintage character is due to several factors:

- The OSC1 and OSC2 phase mode is set to 'catch' – each oscillator gets its initial phase from where the most recently released voice left off.

- OSC1 and OSC2 'Saw' are highpass filtered with a medium resonance (this boosts the bass) and sent through a 4-pole lowpass (Filter1) with a little overdrive (Gain is set to 12.00). A square sub-oscillator (OSC3) is added at this stage, and the now complete grimy mess is sent to OUT2.

- ENV2 provides the filter contour, and its rates are randomly modulated by LFO2 (Rate Mod). The LFO2 triangle modulates Filter1 cutoff for a slow rolling effect.

- Multiplex1 adds a bit of mod wheel to LFO1 so that any vibrato is shifted slightly upwards instead of being perfectly bipolar. Follow the orange cables. Note that each oscillator's pitch modulation amount is slightly different (20.95, 21.05 and 21.00 respectively).

- In the effects section, the Distortion is set up to be a fairly mild 'Tube Class A'.

Pedal Bass

Another nod to synth history, with a long release time, delay and spring reverb effects. However, this patch is velocity-sensitive. The structure is appropriately simple:

- OSC1, OSC2 and two kinds of noise (via Ctrl A / Multiplex3) are mixed in Multiplex1, sent through Filter1 highpass (adds overdrive) then through Filter2 lowpass 24 controlled by the mod wheel.

   ENV3 is modulating OSC2 Phase so that it shiftws relative to OSC2. The phasing effect is enhanced by some shallow, slow OSC2 pitch modulation from LFO2. Both oscillators have pre-filter envelope shaping (ENV1 modulates their Volumes), which gives Filter1's otherwise static overdrive (positive Gain) some contour.

- Vibrato: Via CV1, **lagged** Pressure drives Map1, which controls LFO1 amplitude (Amp Mod) and Rate (ever so slightly). Hold a note and watch Map1: applying Pressure ramps it up smoothly, and the high 'D' (decay) value means that the vibrato doesn't suddenly disappear as soon as you release the key (just like in *05 Basses / HS McBoldface*). Remember that maps expect 'CV' sources to be bipolar, so sending e.g. lagged Pressure via CV to a map means that only half of the map will be used – as you can see here.

- Spring reverb and ping-pong delay add to the retro character. The Delay levels are kept low to add an "extra dimension" without overpowering the basic sound.

Pressure Display

Analogue plucked bass with sustain. It looks twice as complicated as it should because Map2 is being used as a display for whatever goes into CV1.

- OSC1 sawtooth with three kinds of movement: 1) Phase-modulation from a detuned OSC2 saw. 2) Low-level Fractalize (saw again) with modulation from LFO2. 3) A tiny bit of vibrato: Vibrato is turned up in the PITCH panel, but LFO1 Amp Mod is not quite 100%.

- Let's listen to that oscillator without any filtering: Drag the grey cable from Filter1 input and drop it onto the used OUT1 input, replacing the blue one, then double-click on the OUT1 'Pan' knob to centre the signal. Experiment with OSC2 Modify, OSC1 PD and especially OSC1 Fractalize for a while, then reload *HS Pressure Display*…

- Half of the cables used in this patch are required to display the lag generator's output. They solve two little problems: Firstly, none of the modules in the PROCESSORS panel appear in the map Source lists – click on either Source selector and see for yourself. However, you can connect those signals via CV1 or CV2, which DO appear in the list. Second problem: The maps expect CV1 and CV2 to be bipolar, so any unipolar signal sent via CV will only use half of the map…

   The solution is to convert the lagged Pressure from unipolar to bipolar. In Multiplex3, the level is doubled by bridging the inputs, and 5V is subtracted. Hey presto, we now have a bipolar version for the CV. Click on Map2's [+] button and watch in glorious detail what happens to Pressure after it is processed by Map1 and Lag Generator. Fun, fun, fun…

Quadragon

Resonant drone with lots of modulation in parallel from a single source.

- OSC2 is set up as a host-synchronised LFO (the Tune mode is 'Clocked'). It modulates four targets at the same time (blue daisy chain): OSC1 phase distortion, OSC1 Fractalize (low level 'Max' mode), Filter1 and Filter2 cutoff. Unless you're aiming for chaotic modulation, reusing a single LFO is often best: Patches with fewer active elements are easier to handle, they are more comfortable to edit when revisited.

  Analyse *Quadragon* by removing elements "top-down" and noting what is **lost** at each step. Start with the effects: In the FX block, disable the Distortion and Delay by clicking on them. Next, the filtering: Grab the cable at the Filter1 input and move it up to OUT1, replacing the red cable. Even without any filtering or effects, the oscillator sounds quite rich, one reason being that Stack is set to 2 ('StackVoice' pan modulation was the clue!) Go to the VOICE panel and set Stack to 1.

  We are left with a "rolling" sound: Remove the part of the daisy chain that connects OSC1 PD to the rest of the chain. Sound simpler now. Next, remove the part of the chain that connects Fractalize. OSC1 still sounds quite rich, partly due to phase distortion: Turn the PD amount knob down to zero and listen. A remaining source of complexity is the choice of waveforms – select 'Saw' and 'Same' instead of 'Res1' and '2Pulse'. Switching Fractalize to 'off' removes the sub-octave. The sound finally becomes pure after changing the basic waveform from 'TapMap1' to 'Cosine'. If you like this simple pad, clean it up *(*remove any unusused cables, pan modulation) and save under a different name.

- Reload *05 Basses / HS Quadragon.* OSC1 goes through a very resonant Filter1 bandpass (BP6) and is then softened by Filter2 lowpass (LP24). Try turning Filter2 cutoff up.

- Mod wheel via Map2 speeds up the rolling effect, eventually reaching chaos, while Pressure adds vibrato. Hardly visible, but the left half of Map2 was straightened so that even low amounts of mod wheel will still affect the FM ('lin 100') in OSC2 – check that out by expanding the map and pushing the wheel just a bit. A small detail, but worth the effort!

Rubber Bass

Almost an acoustic bass. Highly velocity-sensitive, with a strong attack. Map1 looks unusual…

- …so let's start with that. Mod wheel (the Source for Map1) sweeps through only 16 values, with the transitions smoothed by using 'Map Smooth' mode. Map1 is connected (twice) via Multiplex2 to CV1, which appears as the rate modulator in ENV1. If its sustain were not up a bit, the 147% (2 x 73.50) negative Rate Mod would turn ENV1 into a very short "blip". It doesn't actually sustain, as ENV1 fall/rise is set to -10.

  I've been assuming that Rate Mod also affects the F/R time as well as Attack, Decay and Release. Load *INIT* and design a little experiment to test that!

- Reload *05 Basses / HS Rubber Bass.* The data in Map1 lets you smoothly switch between 3 envelope variations using the mod wheel. At minimum (or pushed just a bit by mistake), the envelope is "normal". Positions in the middle cause a short thump, but pushing the wheel way up gives you the longest envelope. All this so you can switch quickly between normal and short envelopes, or instantly dampen long envelopes!

- The strong pluck and the slight pitch modulation at the onset of each note is caused by ENV3 modulating OSC1's Volume and Phase.

- A mixture of ENV2, Velocity and Pressure from Multiplex1 modulates Filter1 cutoff, OSC1 phase distortion and Fractalize – so don't remove those grey cables… I mean do.

Sauna Bass

Miniscule details can make a huge difference to the character of a sound.

- The subtle movement is mostly caused by a 1Hz triangle from LFO2 modulating OSC1 Fractalize a tiny bit. Hold a low note: The low rasp disappears for half of the LFO cycle because the modulation depth (0.20) is twice the Fractalize amount (0.10):

modulation from
LFO2 triangle

0

no Fractalize
in this area
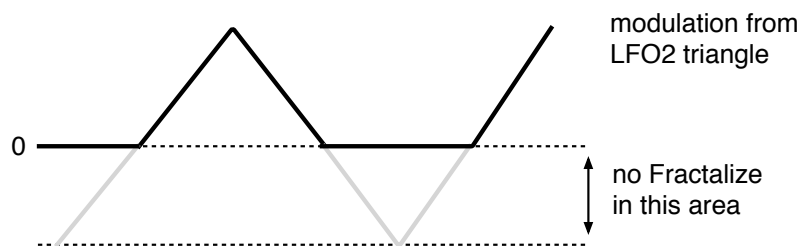
- OSC1 and OSC3 are lowpass filtered (LP18) in Filter1, and the cutoff is modulated by Filter2 carrying the same signals. Filter FM! Some of the slow movement is caused by detuning between the two oscillators here – try adjusting OSC1 Modify ('Cents' detune).

- OSC2 adds a squarish fundamental, and the Distortion effect beefs it all up.

Signal Code Layer 5

Plenty of movement here, and it's not subtle! Low notes include a permanent, raspy D drone.

- First, remove the pad layer by turning up Ctrl A. OSC2 is sent through two filters, one of which provides the resonance while the other does the overdrive. Push the mod wheel for TB303-ish "acid". Use this filter combination or similar to create more realistic clones.

- The rhythm doesn't use the sequencer or an LFO-driven map, but quantised OSC1. Check the OSC1 settings: Adjusting Phase only offsets the start of the rhythm, but setting PD to minimum makes it very choppy. Take it back to 50 by clicking on [UNDO].

- So we have a fractal LFO! Adjust OSC1 Fractalize to check the useful range. All interesting rhythms are between 0.00 and 1.30, while higher values create too many saws unless you adjust the FM. After quantisation, OSC1 modulates OSC2's Phase and PD in opposite directions. Try turning OSC2 'rel coarse' down to 50.00.

- Did you try pitch bender? Multiplex2 feeds the audio (OSC2) into our "LFO" (OSC1).

- Reload *HS Signal Code Layer 5* and isolate the pad by removing the cable from OUT2. A mixture of OSC3 and OSC4 are lowpass filtered (Filter3) and sent to OUT1. OSC3 uses 'TapMap1' and Ramp1 to create cyclic **PWM** (pulse width modulation). See "PWM 1" in the Tips & Tricks section of the Bazille user guide for a full explanation.

Slap 90

Early digital bass. Sounds like good old "FM" but is actually a pair of additive waveforms.

- 'TapMap1' is harmonics 6 + 8 + 10 and 'TapMap2' is 6 + 9 + 15 (see [Additive Waves](#) on page 6). As harmonic 6 is the lowest used, the pitch had to be transposed down a few octaves – see OSC1's Tune mode, OSC2's Modify settings and of course Transpose.

- Note the grungy attack caused by ENV3 modulating PD. Try turning up ENV3 decay!

Storm Base

Massive legato bass with a dramatic glide.

- 4 evenly detuned saw oscillators through a 2-pole filter. All oscillators use 'Max' mode Fractalize: In OSC1 and OSC2 this adds a lower octave, in OSC3 it creates a *sync sweep* effect, and in OSC4 it is used for static colouration. Listen to each oscillator in turn, isolating them by removing three of the cables connected to Multiplex1.

- The gritty effect is caused by overdriving Filter1 at high Resonance. To hear the difference that makes, reset Resonance and 'Output' to their default values and take Filter1 Gain down to -15.00. Why not zero? Because the output of Multiplex1 (all 4 oscillators at 50% Volume) is already strong enough to overdrive Filter1 when Gain is at zero!

Thicket 1

Raw PWM bass, no effects. Press harder and watch the oscilloscope. Then try Ctrl A.

- OSC1 uses Map1 for cyclic PWM (pulse width modulation – see the "PWM 1" trick in the *Tips & Tricks* section of the user guide). Instead of using an LFO, however, OSC1 Phase is modulated by an audio signal: a slightly detuned sawtooth (see OSC2 Modify). 4.00 is 0.8Hz when Modify is set to '5 Hertz', but Pressure speeds this up via linear FM: +0.5 is plenty when the mode is set to 'lin 100'. To understand all the above, you might need to refresh your knowledge of the Bazille oscillators. I have to do that fairly regularly.

- Pushing the mod wheel moves Filter1 cutoff **downwards** because Filter2 is in 'Spread' mode. It is otherwise unused. Read all about the Filter2 options in the Bazille user guide.

  The sound gets more velocity-sensitive as the cutoff is reduced. ENV2 is responsible for the contour without using its own 'Velocity', while 'Velo' to Filter1 does all the dynamics. I think that modulating the cutoff by velocity suits this patch better than using the envelope's own 'Velocity'.

- Ctrl A adds a sub-octave by tuning OSC2 up 7 semitones. As Map2 is a 3-way switch, there's an intermediate pitch, +5 semitones. I think it sounds M***gish.

Thicket 2

Thicker than *Thicket 1*. Use Ctrl A again.

- This version also uses audio-rate PWM, but with two pairs of oscillators instead of just the one. OSC3 is tuned up 7 semitones, and being phase-modulated by OSC4 at the regular pitch, it has a permanent sub-octave. In this version, Ctrl A modulates Fractalize and mod wheel opens the filter instead of closing it. In addition to 'Velo', ENV2's own 'Velocity' also modulates filter cutoff.

Wubber

Push the mod wheel, then apply aftertouch (pressure) to speed it up.

- Overdrive in four stages: Filter3 *highpass* adds Gain and boosts the bass (adjust Cutoff to taste). LFO1 and Filter1 lowpass are responsible for the "wub" via modulation wheel, while Filter2 provides a third saturation stage… and the Distortion effect makes four!

Abominatron

CPU-killer! Bazille doesn't have comb filters, but you can get close using multiple BP filters. Adjusting cutoff frequencies then offsetting each stacked voice may be tedious, but I think it's worth the extra effort – push the mod wheel and listen! Here's the basic audio signal flow:
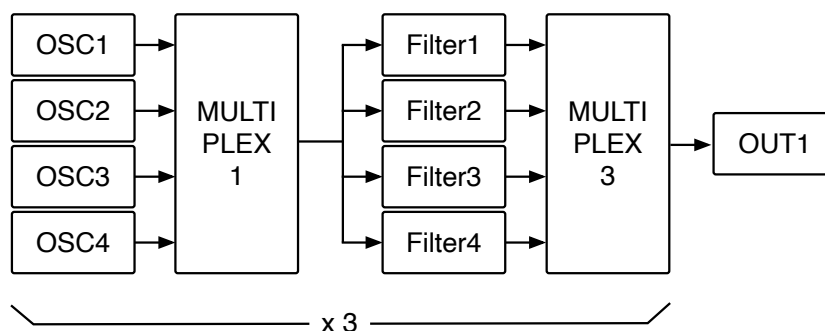
- In the VOICE panel, Voices is set to 12 and Stack is 3. With 4 filters and 3 stacked voices we get a total of 12 resonant peaks per note. As this multiplies CPU usage by 3 we might as well make the most of the stack index (StackV).

- The Multiplex panel looks a mess, as all of them are used. So I colour-coded them:

Mplex1	Blue cables. Mix of all 4 oscillators, sent to all 4 filter inputs.
Mplex2	Red cables. 100% mod wheel, 8% inverted ENV3 and 8% 'Random', sent to control all 4 filter cutoffs, either directly or via CV1.
Mplex3	Orange cables. Mix of all 4 bandpass outputs, sent to OUT1.
Mplex4	Green cables. Stack index plus 50% "random-ish" from Map1, sent via CV2 to pan OUT1. As there are 3 voices per note, there are 3 pan positions at the same time: one positive (50% right), one central and one negative (50% left).

Autowah Clav

Velocity-sensitive vocal "wah".

- Velocity modulates several parameters in this patch, all of which are carefully balanced:

  OSC1 'Res III' phase distortion amount
  Filter2 cutoff
  ENV2 and ENV4 to Filter1 cutoff
  ENV3 to Filter2 cutoff

- Follow the yellow cables: Driven by Pressure, Map1 via lag generator alters how vibrato is introduced. Soft Pressure doesn't add any vibrato at all, as the lower third of the map is set to zero. The vibrato is a bit "more up than down", as pressure adds 16 cents (the pitch modulation amount is set to 8.00).

- Wah-wah type filtering: Although similar to LP6 used on its own, I think that the combination of LP12 and BP6 sounds smoother, and it never gets too thin.

Back Attack Organ

If you play perfect legato, the release noise coincides with the attack of the next note.

- Simple audio routing: OSC1 and OSC3 are sent via Filter1 lowpass to both OUTs. White noise is BP-filtered by Filter2, mixed with OSC2 in Multiplex1 and sent to OUT2. This is only audible when you release a key, as ENV2's sustain suppresses the righthand side of the multiplex. If you have any questions about the above, please refer to the *Multiplex* chapter of the Bazille user guide.

- Movement is caused by vibrato with random self-modulation, by LFO2's triangle modulating OSC1 phase distortion (PD), and by OSC4 in 'Hertz' mode modulating the pitches of all the other oscillators. Mod wheel increases OSC4 depth and rate at the same time.

- Why aren't all yellow cables in a daisy chain? Connecting OSC2 to OSC3 would cross the bottom of data display – see *06 Keys / HS Hells Old Upright*, where I let it do that.

- Easily overlooked in the GLIDE panel: The Glide 'Amount' is high but the Range is very low (4.00). As the pitch only glides 4% of the total distance between consecutive notes (it starts much closer to the target note), this "intonation correction" effect is subtle. To check the speed of that shallow glide, turn the Range up.

BX7 Piano

Typical FM e-piano, but with sustain. Uses all 4 Multiplexes. See also *00 Tutorial / FM Tines*.

- Two oscillator pairs, both with low frequency carriers causing a wavering effect. OSC1 phase-modulates OSC2 via Multiplex1 and OSC3 phase-modulates OSC4 via Multiplex2. The high-pitched element is Filter1 "pinged" by ENV3 (the green daisy chain).

- The Multiplex is entirely devoted to taming levels:

Multiplex1:	Key follow fades out OSC1 so that high notes don't get too bright.
Multiplex2:	Ditto for OSC3.
Multiplex3:	Key Follow reduces OSC1 and OSC3 amplitude modulation from ENV2.
Multiplex4:	Reduces the volume of the "tine" (Filter1) so that it can be fed into OUT1 and OUT2. Turn up the lefthand knob to hear why this was necessary.

- The mod wheel adds pitch modulation from LFO1 and speeds it up. The opposing amounts (-10 and +10 cents) result in a chorus effect. I switched LFO1 Phase mode to 'single' as I think it sounds better than 'random' mode here.

- LFO2 is responsible for cyclic pan. The mod wheel also speeds this up (Rate Mod).

- Map1 offsets the pitch of the "tine" per key so that they sound a bit more Rhodes-like than DX7-like across the keyboard. Ctrl A tunes this down an octave.

Clonewheel

Tonewheel organ with authentic 2⅔' percussion.

- The so-called "percussion" envelopes in traditional electric organs only retrigger after all notes have been released. With a little coaxing, Bazille's LFOs can mimic this behaviour. Configured as a single-triggered DC voltage source, LFO2 Delay serves as the decay of a simple paraphonic envelope. Does that sound odd? Here's a practical demonstration:

Paraphonic envelope

Load *INIT* and turn up OSC1 PD. Connect LFO2 square output to OSC1's Volume mod input and turn the amount down to anything below -50. In LFO2, select the Phase mode 'single' and turn Wave down to minimum i.e. positive DC (see the next paragraph). The result is of course silence. All we need now is to bring that DC in more slowly – turn up LFO2 Delay! Between 15.00 and 25.00 is long enough for typical organ percussion.

Positive DC? Connect LFO1 square to OUT1, replacing the cable from OSC1, then select the Rate mode '0.1s'. Hold a note, adjust LFO1 Wave and watch the oscilloscope: Lower values increase the width of the **positive** part of the wave. QED.

Reload *06 Keys / HS Clonewheel* and play for a while, listening out for when the percussion (OSC2) does and does not get triggered. Note that the "2⅔' drawbar" is audible (10%) as the OSC2 volume modulation amount is only -40.00 while the Volume is 50.00.

- The OSC1 basic waveform is 'TapMap1'. The smooth wave in Map1 (harmonics 1, 3 and 6 only) was created using the spectralize function (see [Additive Waves](#) on page 6). OSC3 is 'TapMap2' i.e. a triangle. Ctrl A makes the patch brighter by phase-distorting OSC1 and OSC3 as well as opening Filter1.

- All stereo panning is due to the Phaser. Unusual: Distortion comes **after** the reverb.

Cracked Bell

Creating bells that sound anything like the real thing isn't easy. You can analyse samples of real bells to determine the overtones and undertones, or you can play it by ear as I did with this one. The black keys in *Cracked Bell* are tuned 6 semitones higher – see the MICROTUNING.

- OSC1 is the FM carrier for a mix of OSC2 (9th harmonic) and the self-oscillating Filter1.

- ENV2 modulates OSC1 PD amount, adding grunge to the attack. ENV2 Decay is quite short, so this effect disappears quickly. Cracked or otherwise, real bells are longer!

- The overall rusty character is a combination of moderate quantisation of OSC1 and white noise modulating Filter1 cutoff – try turning that up, then [UNDO].

- The most important factor is the combination of FM-modulator frequencies: OSC2 Tune and Filter1 'Cutoff'. Adjust those two parameters until you find something different but equally interesting, then save it in your User folder under another name. Then do it again!

Dirt Road

Biting electric piano with tremolo. Let's deconstruct this one…

- First, disable the three effects (you might prefer it without effects anyway). The tremolo is LFO2 ('single' phase) modulating OSC1 volume and Filter2 cutoff. Remove both orange cables at once by clicking and dragging the point where they meet.

- The OSC1 pitch settings seem odd. Without adjusting either Tune or Modify, try fiddling with the PD and the Fractalize settings. Aha! That +10.30 semitone offset compensates for a serious shift caused by OSC1 modulating its own pitch…

An experiment: Load *INIT*, connect OSC1's raw output (the upper socket) to its own pitch modulation input, and turn the amount up to 40.00. Select one of the 'Res' options as the second wave and play with the PD amount. Then connect LFO1's RND output to OSC1's

PD modulation input and turn up the amount. After you've had enough fun making silly noises, change the second wave back to 'Same'. Remove the LFO1 cable again. Connect OSC2 to OUT2 and turn up its PD. Start tuning OSC1… The two oscillators are almost in tune at +18.00. Check out the digital nonsense in the very high notes – not nice.

- Reload *06 Keys / HS Dirt Road* and check out Filter1… There's more self-modulation: The HP12 (2-pole highpass) signal is negatively modulating cutoff. Although it adds a lot of fizz, I'm not sure whether it's really worth doing.

- Isolate OUT2 by removing the OUT1 cable. ENV3 modulates OSC2 Volume, creating a very short high "pluck". Negative 'KeyF' flattens the pitch across the keyboard, while Map2 gives each note an individual pitch offset via 'rel fine' mode FM.

Eastern Motion

This patch uses the 'Res III' waveform for a sitar-like resonance. I tried Microtuning, but decided not to activate it before saving. You should definitely check it out, though, if only to test how long it takes for your ears/brain to adjust to the scale.

- Disable all effects to hear the untreated sound. The OSC1 signal reaches the two outputs via different routes: Firstly, by phase modulating OSC2 which is sent through Filter1 to OUT1, as well as directly via Filter2 to OUT2. The former adds high frequencies and movement while the latter ensures that the overall sound doesn't get too thin.

- Isolate the first layer by turning down OUT2 Volume, then double-click on the OSC2 phase modulation knob… The result is mostly silent because OSC2 is a low frequency carrier for OSC1. Turn the phase modulation amount up to 64 – classic FM with only two operators. By the way, did you know that Bazille is actually capable of 8-operator FM?

- Reload *Eastern Motion* by clicking on the name and selecting the ticked entry. Experiment with OSC2's Tune and Modify, then set them back to 1.00 and -10 respectively. Let's add MIDI control – via Multiplex, as the pitch modulation socket is already in use.

    From the top, drag the red cable away from OSC2 and drop it onto one of the Multiplex2 inputs. Connect Ctrl A to any other of the Multiplex2 inputs, and its output to OSC2's pitch modulation input. Ctrl A now affects the speed, but the range is too low. So treble it using the free input sockets! Connect directly from the Ctrl A output, or "bridge" the unused Multiplex2 inputs to the one already connected to Ctrl A. Play a note and turn up whatever you are using for Control A.

bridged!
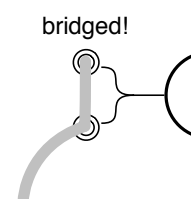
English Theatre

Pipe organ using additive waveforms (spectralized maps) and all 4 filters. Pushing the pitch-bender or Ctrl B adds a detuned pipe (Filter2 resonance). Try all performance controllers.

- OSC1, OSC2 and OSC4 are 'TapMap' waveforms made using 'spectralize' (see *Additive Waves* on page 7). All modulation cables are grey so that you can easily follow the audio routing: Orange (OSC1 through Filter1), green (OSC2 through Filter2), yellow (OSC3 through Filter3) and blue (OSC4 through Filter4). You'd think it would look less messy.

- Ctrl A modulates OSC4 pitch, with the Quantizer forcing it to 3 discrete steps.

Fractal E-Piano

Electric piano with "organ key-click" and fast tremolo.

- The initial click can be individually tuned per note: Isolate OSC2 by turning OUT1 volume down. OUT2 uses ENV3 as amp envelope: Double-click on ENV3 Rate Mod to remove the velocity modulation, then make the click too long by turning ENV3 Decay up to 20 or more. Expand Map1 via its [+] button. Playing the same note repeatedly, edit the high-lighted bar and listen to how the value affects the sound of that particular note. After clicking on a bar, moving left / right is OK as long as you don't release the mouse button.

- Double-click on OUT1 Volume and turn OUT2 down to zero to remove the click. OSC1's deep "electric piano" sound is due to Fractalize in 'Max' mode providing a sub-octave. The velocity-sensitive amp envelope (ENV1), also used as PD modulation source, adds dynamics: Remove that by double-clicking on the OSC1 PD modulation knob.

- The remaining tremolo effect is a lagged square from LFO1 ('single' triggered) modulating Filter1 cutoff, OSC1 volume and OUT1 pan (via CV1). These three combine to create a deep but pleasant tremolo… which loses character if you use a sine wave from LFO1 instead of the lagged square. Test that.

- Reload *06 Keys / HS Fractal E-Piano* and play some funky jazz! For inspiration, listen to George Duke's *"Au Right"*. Note that the maximum polyphony set in the VOICE panel is only 8. If your computer has oodles of CPU power, take it up to 16.

Grain Piano

Wiry FM piano with a Berimbau-like vocal effect (Fractalize) via mod wheel.

- Here's a flow diagram of the audio routing, plus a few relevant modulation paths:
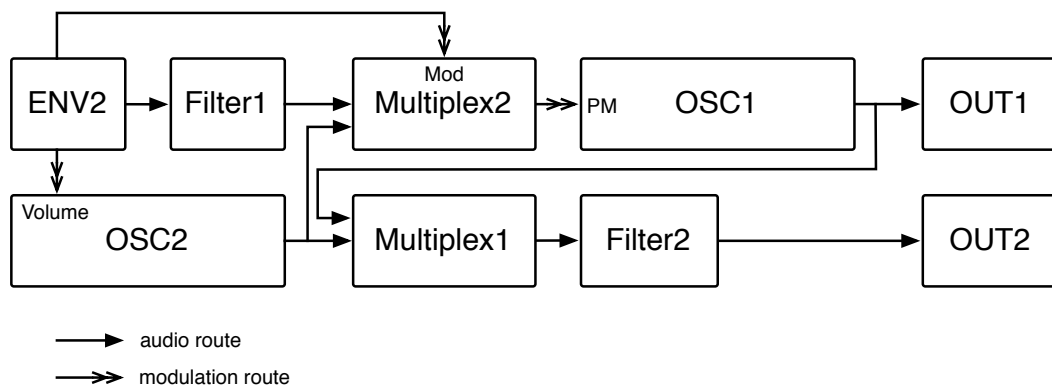
- OUT2 is a lowpass-filtered (well, lagged) mixture of OSC1 and OSC2, a high harmonic. OSC1 is also sent directly to OUT1. In Multiplex2, OSC2 is also mixed/crossfaded with the self-resonating Filter1 signal, and the result phase-modulates OSC1 for classic "FM".

- ENV2 is used a total of 3 times (see the green cables)**:** Firstly to ping Filter1 resonance, secondly to modulate OSC2 volume, and thirdly to crossfade those Multiplex2 signals.

- Key follow negatively modulates OSC2 pitch so that the "ting" doesn't disappear unless you play very high notes.

- The Phaser effect is quite important for the character of this patch – try disabling it.

Hells Old Upright

A rounder version of the *HS Grand Trash Piano* factory preset. Probably the closest I will get to the sound of a trashy real piano in Bazille. Classic "FM" using only sine waves…

- The orange cables, Multiplex2: The modulation wheel adds more detuning from Map1 to all oscillators in both directions. The lefthand knob is set to 90% so that there is still 10% detuning while the modulation wheel is at zero.

- Using two similar layers is CPU-cheaper than setting Stack to 2. The green cables: LFO1 causes a slow wavering in OSC2, which modulates OSC1 phase ("FM"). The same applies to OSC4 and OSC3 (grey cables) except that the source of the wavering is a slowly looping Ramp1. So why not use LFO2 for that instead? Can't remember. My guess is that LFO2 was already doing something else that didn't make it into the final version.

- The blue cables are for the tone envelope: ENV2 modulates Fractalize in OSC2 and OSC4, and arrives less directly at OSC1 and OSC3 via the "FM" route. ENV2 also modulates OSC2 Volume so that OSC1 "FM" get a velocity-sensitive envelope.

- ENV4 modulates Filter1 cutoff, and this is also adopted by Filter2 in 'Offset' mode. Two filters instead of one so that the oscillators could be panned apart (by ENV1 via CV1).

- The red daisychain: Key follow reduces the volume of high notes (OSC3 and OSC4 only).

- Here's something odd: Although Stack (in the VOICE panel) is set to 1, why is 'Stack-Voice' modulating ENV4 rate? Answer: It is extending the length beyond the normal limit:

  Load *INIT* and turn ENV1 'Sustain' down to zero. Connect ENV1 to OSC1's pitch modulation input, and turn it up to about 40. Hold a note… you should hear a falling sine wave. Turn ENV1 'Decay' up to maximum so that it takes longer to fall. Finally, click on ENV1 Rate Mod, select 'StackVoice' and turn the amount up to 100…

  So if you aren't stacking voices, 'StackVoice' can be used as a +5V constant source in any selector (+5V isn't available there). Instead of 'StackVoice', also try +5V via CV, ENV1, Ramp or a 2-value map. Each choice has a disadvantage or two – can you name them?

House Mite

Wiry FM piano with a short envelope, which can be made longer via modulation wheel. Avoid high notes as they sound rather trashy (note: this could be fixed with some effort).

- 2-operator "FM": OSC2 phase-modulates OSC1. ENV3 provides a dynamic contour, also adding Fractalize to OSC2 so the tone of the modulator becomes velocity-sensitive.

- Try connecting Filter1 BP6 (bandpass) to OUT2 for extra colouration. Huh? Doesn't work as expected because the highpass (Filter2) inverts the signal phase. Check this out:

  Load *INIT* and turn up OSC1 PD. Move the cable to one of the Filter2 inputs and connect its HP12 to OUT2. Bridge one of the OUT1 sockets to the used Filter2 input, creating a daisy chain. Set the scope 'Freq' to minimum and the 'Scale' to about 3. Slowly turn OUT1 Volume down and watch the waveform go through zero (between 15 and 14).

  What's happening: The highpass filter **inverts** the signal and reduces the level to just below 50% of the unfiltered level, if Gain is in the centre. As OSC2 Volume is 30%, adding a bit less than 15% of the unfiltered, non-inverted signal causes total cancellation.

Hypervox

Phased synthetic choir. The high resonance of all four filters and the typical slow phasing give this patch a slightly vocal character. *Hypervox* appears more complicated than it really is…

- Follow the cables, which I colour-coded per oscillator/filter pair: The 4 cutoffs are positively modulated by the mod wheel. As it is in 'Offset' mode, Filter2 adopts all cutoff modulation from Filter1 (including that tiny amount of KeyFollow). Via Multiplex1, OUT1 receives a mixture of 4-pole lowpass (LP24) and 2-pole bandpass (BP6) from each of the main filters, while OUT2 gets the BP6 signals from filters 3 and 4.

- Stack (VOICE panel) is set to 2. In STACK VOICE TUNING, Voice2 is tuned an octave higher. The OUTs are panned by StackVoice, which shifts voice1 to the left and voice2 to the right in both cases. With just one cable connected, StackV also manages to offset the cutoff frequencies of all four filters.

- LFO1 modulates OSC1 and OSC2 pitches in opposite directions, while LFO2 does the same for OSC3 and OSC4. As both LFOs are already in use I had to recruit both Ramp generators for any extra cyclic movement (OSC1 and OSC2 Fractalize).

Little Angeltron

Nasal voices, more intimate than *Hypervox*. Find the best tone using mod wheel and Ctrl A.

- Follow the cables backwards from the outputs: OUT1 is connected via Filter4 to Multiplex4, which is the Multiplex2 mixture faded out a bit by mod wheel…
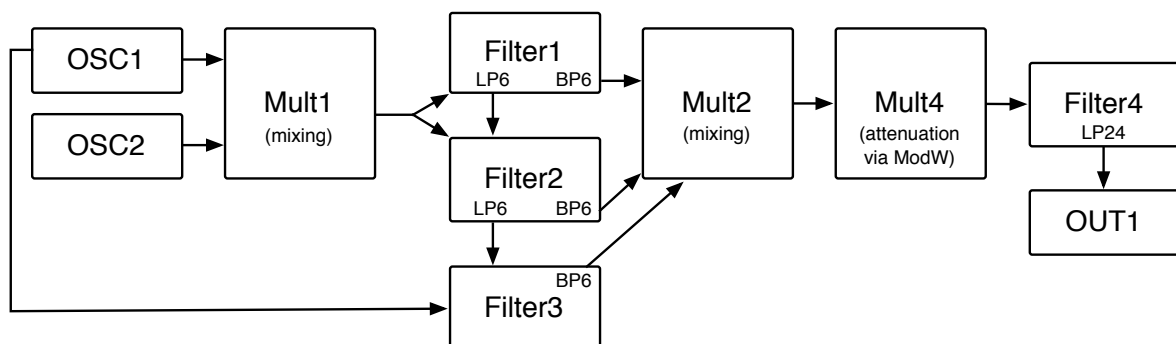
- Note the vertical arrows in this diagram: Using filters in series as well as in parallel makes the most of the few simple formants available. On the other hand, maybe a parallel-only arrangement would have worked just as well – so try removing both LP6 connections. A frequency analyser might be useful at this point!

- Filter4's high Gain adds colour, as does the Phaser with zero Depth. For a fast Mu-Tron Phasor type effect set the Depth to maximum and Wet to 50%, then adjust the other Phaser parameters to taste.

- ENV2 causes the pitch of each note to rise, like a singer approaching each note from slightly below. Pressure adds to the effect (see Rate Mod and Amp Mod).

Little Deviltron

Brighter version of *Little Angeltron*, with Fractalize and per-key modulation from the maps. Map2 also modulates Filter3 and Filter4 cutoff. In this version Ctrl A closes Filter4, which is otherwise fairly bright (note the little bit of Filter4 band-pass in OUT2 – try removing that).

Magic Bell

Delayed envelopes! 6 sine waves (4 oscillators plus 2 self-resonating filters).

- Follow the cables backwards: OUT1 is connected to Multiplex2, whose sole purpose is to make the mixture from Mutiplex1 80% velocity-sensitive.

- Similarly, OUT2 gets the output of Multiplex4, a mixture of the two main filters' bandpass outputs, also times 80% velocity. Multiplex3 reduces the level of noise sent to the filters.

- Let's see how each oscillator/filter is delayed: Turn down OUT2 Volume to silence the filters, and disable all effects. Play a note. You can hear each oscillator played in sequence: Root, octave, octave+5th, 2 octaves. Listen again… OSC2, OSC3 and OSC4 apply the method described on page 9 under 'Delayed Envelopes 2'.

- Reload *Magic Bell*, turn down OUT1 Volume and disable all effects again. Play a note: You can hear an immediate attack (pitched noise) and two delayed attacks caused by full resonance being delayed by the two maps (Delayed Envelopes 1, second method – see page 9). When you're done digesting all that, reload *Magic Bell* and play it.

Silver Toy

Almost chaotic chimes using two different methods of delaying notes. Try pitch-bend…

- First method: ENV2 negatively modulates OSC2 Volume. Isolate OSC2 by turning down OUT2 Volume and removing the red cable from OUT1. Deactivate the Delay effect. Repeat the same note and adjust ENV2 'Decay'. The higher the value of 'Decay', the longer the delay before the note appears. This is because the Decay stage holds the envelope high (and therefore the volume below zero) until it reaches the Sustain level (95.00), at which point it quickly drops to zero (F/R is set to -90), making the oscillator audible.
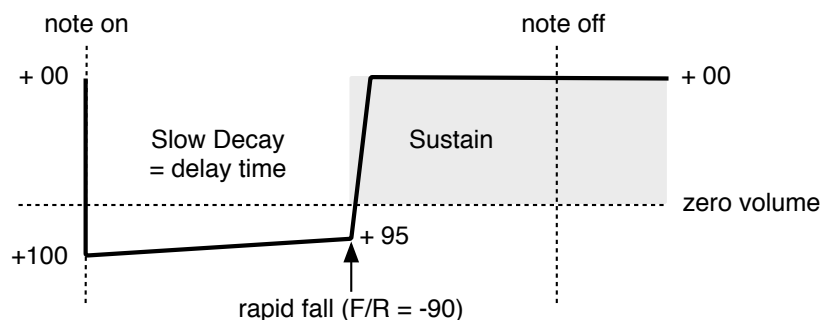
The envelope (the solid line) here is shown upside-down because the volume modulation amount is negative. The grey area is the audible bit, before that is silence.

- Second method: Reload *06 Keys / HS Silver Toy*. Driven by ENV3, the two maps modulate the Volume of OSC3 and OSC4. You can see their shapes more clearly if you expand the maps (click on their [+] buttons). I gave each map a little "whoosh" at the beginning.

- As the Quantizer is already used for OSC3 and OSC4 pitch, Sample & Hold is the best candidate for stepping the pitchbend for OSC1. LFO2 samples the pitchbender in sync (1/32) with the host application for a cool glissando effect without quantised pitch.

Silverfish Organ

This uses either Pressure or mod wheel to speed up the cyclic filtering effect, demonstrating once again the modulation source balancing trick described in the Bazille user guide.

- The first 3 oscillators are mixed in Multiplex2 and the sum is sent to both main filters. Isolate Filter1 by turning OUT2 Volume down to zero. What's left is a muffled sound whose purpose is to preserve the body while all that "bright filtery stuff" is happening in the other layer…

- Restore *Silverfish Organ* by clicking on the display and selecting the ticked entry from the list. Remove the softer layer by disconnecting the yellow cable. What's left is a thin bandpass-filtered sound that gets stronger if you turn up Ctrl A.

- Restore *Silverfish Organ* by clicking on [UNDO] this time. Follow the modulation paths: In Multiplex3, mod wheel crossfades between Pressure and itself (i.e. mod wheel), balancing the amounts so that they don't get in each others way: When the wheel is at zero, the effect of any pressure is at 100%, and when the wheel is at maximum, the effect of any pressure is zero. Of course this trick also works if the sources are swapped. Try it: Swap the cables around so that Pressure crossfades between mod wheel and Pressure.

  Follow the blue cables: As well as increasing Filter1 Resonance, the Multiplex3 signal is seriously lagged (especially downwards) and sent via CV1 to modulate LFO2 rate. Either mod wheel or pressure changes the speed of the rotary effect with lots of "hysteresis". I tried to make it react globally like a real rotary speaker, but couldn't quickly work out how to retain the speed between non-legato notes. Perhaps using Sample & Hold?

Synth Jivari 1

Long string with the shifting harmonics typical of several stringed instruments from the Indian subcontinent (Sitar, Tanpura, Sarod, Veena…). Hold notes forever!

- The OSC1 wave is 'TapMap1': Map1 appears to have been drawn by hand, with no processing (softening, randomisation etc.). It is phase-distorted a bit by 'Saw', with cyclic movement provided by LFO2 modulating the amount…

  Load *INIT*, turn OSC1 PD amount up to 15.00 and replace 'Cosine' with 'TapMap2'. In ENV1, turn 'A' up to about 20 and 'R' to 80. Connect LFO2's triangle to OSC1 PD modulation input and turn the amount up to 15.00. Now listen to as many Tanpura examples as you can stand in YouTube and see how close you can get by editing this new patch. Add slow phasing… and don't forget to save the good versions!

- Reload *06 Keys / Synth Jivari 1*. Turn up Ctrl A – any illusion of an acoustic instrument flies out of the window! Those OSC2 pitches are the same map as used for the OSC1 waveform, scanned by a very slow Ramp1 – the map is being used twice.

Synth Jivari 2

Darker and more synthetic than *Synth Jivari 1*, this version features microtuning and an extra drone. The scale is restricted to C-Db-E-F-G-Ab-B-C, which includes two semitone steps in succession (B-C-Db) – unusual! See the Wikipedia article "Double harmonic scale".

- Remove the drone by turning OUT2 Volume down, leaving OSC1 through Filter1. For its phase distortion, OSC1 uses the highly resonant 'Res III' waveform, swept by LFO2 via Multiplex1 (trsy adjusting LFO2 rate). Multiplex1 also adds KeyF1 (key follow) and the pitch bender signal to that PD modulation. Try flipping the pitch bender up and down.

- Pressure modulates the amplitude (Amp Mod) of ENV2, sending the attack of OSC1 a few semitones up. OSC1 pitch is almost imperceptibly randomised by Map2.

- A fairly slow perfect triangle wave from LFO1 gently modulates Filter1 cutoff.

- Reload *06 Keys / Synthitar 2* and turn down OUT1 Volume. Slowly push the mod wheel to hear all possible drone notes (Map1 steps through one octave of the double harmonic scale). Have a look at the OSC2 tuning. OSC2 is in 'Hertz' mode for the C-drone. 130.9Hz was very easy to set up: Tune is 13.09 and Modify 'Multiply' is 10.00.

- OSC2 also uses swept 'Res' waves – a combination of 'Res I' and 'Res II'. To get a feel for the subtle movement, turn up the LFO1 rate. Finally, Fractalize is also added to the equation, and this reacts strongly to the pitch bender in either direction (it is rectified).

Underwater Mandolin

Inspired by some Lowrey organ samples I heard online. An effect they used to think sounded like that plectrum-destroying mandolin players like to call "tremolo".

- Set up as an LFO, OSC1 is responsible for the tremolo applied to OSC2 (yellow cables). Double-click on OSC1 phase modulation amount knob (the one below 'PM coarse'). The effect becomes lifeless, so turn that knob back up to 44.00.

  The tremolo rate is "smeared": Multiplex1 mixes some StackV with either +5V, 0 or -5V from Map1, depending on the note. The former spreads OSC1 phase for the two voices (Stack is set to 2), while Map1 spreads OSC1 phase between the played notes. You can slow the effect down by pushing the mod wheel.
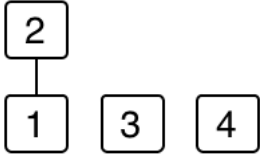
- As OSC2's Volume modulation input is already being used for the tremolo, Multiplex2 balanced OSC2 volume, controlled by a mixture of KeyF1 and Ctrl A from Multiplex3. The result is lowpass and bandpass filtered in Filter1 and sent to the two OUTs. Note: The mid and low frequency body of the sound (OUT1) remains in the centre while all the high frequency stuff (OUT2) is panned around by an extra "LFO": Map2 converts the unipolar Ramp1 into a bipolar signal suitable for panning the signal left and right.

- Filter2 doesn't process any audio in this patch. Set to 'Spread' mode, it is used as an extra cutoff modulation input for Filter1.

Vibey DX

Dynamic piano-type patches rarely feature vibrato via Pressure, as it is too easily activated by heavy playing. However, there's no reason why it shouldn't work just fine if your patch ignores everything below "very strong" Pressure.

- See Map2. As the only non-zero value in the 16-step map is at the very top, Pressure data is effectively ignored until it almost reaches 128 - 128/16 = 120. If the aftertouch in your keyboard makes it tough to reach 120, edit the map accordingly. Why "almost reaches"? Because the mode is 'MapSmooth', not 'Map Quantise'.

  I wanted polyphonic delayed vibrato with random phase, but didn't want the delay to be restarted with each note (which is what using LFO 'Delay' would have done). Lagging Map1 then sending it via CV1 to modulate LFO1 amplitude (Amp Mod) does the trick.

- Isolate the "FM" layer by turning OUT2 Volume all the way down. OSC1 is set to harmonic 4 (overtone 3.00). Remove the green cable and listen to it without any "FM", then click on [UNDO]. OSC2 is harmonic 3 (overtone 2.00). Listen to it in isolation: Move the green cable across to OUT1, replacing the orange cable from OSC1. Did you notice that both oscillators are pitched higher than the result of "FM" between them?

- Click on the name and reload *Vibey DX*. The amount of mod wheel control over OSC2 pitch (-19.80) is interesting here. Had 'rel coarse' modulation depth been -20.00 instead, maximum modulation from the wheel would have sent the pitch all the way down to zero Hz. At -19.80 it remains a pleasant warble in the middle of the keyboard range.

- Isolate OUT2 by turning up Ctrl A. Using ENV3, OSC3 provides the fundamental. OSC4 via ENV4 is a short, high-pitched attack. Remove the grey cable and listen: Map1 in 'Key' mode offsets the pitches so that the attack doesn't sound too samey.

- Reload *Vibey DX* once more. The rates of both ENV1 and ENV3 are negatively modulated by KeyFollow, which shortens the higher notes. Double-click on ENV1 and ENV3 Rate Mod and listen to the difference. By the way ENV3: A little bit of sustain with some negative F/R keeps the sound singing for a while longer.

Waterwheel

Etherial organ with two strong harmonics and filter resonance in parallel. Push the mod wheel.

- Tuned to harmonics 1, 2, 3 and 5 (simply add 1 to each 'Overtone' value), the four sine waves are mixed in Multiplex3 and balanced across the keyboard in Multiplex1: The sum goes to one of the righthand inputs (grey cable) so that the modulation source KeyF1 (key follow) can tame the volume of higher notes.

- Filter1 BP with very high Resonance is used in parallel with the unfiltered signal for some extra colour. Play a low note repeatedly and listen to the attack. It alternates between a rising and a falling effect because lagged 'Alt' (alternate) is modulating Filter1 cutoff.

- Hold a note and slowly push the mod wheel… as well the square pitch modulation from LFO1 sending the 5th (OSC3) up in pitch, you should also notice the very high major 3rd (OSC4) dropping down. With the wheel at maximum they both alternate between their nominal intervals and the prime. You still hear the 3rd and 5th, but only for half the time.

If you don't really notice it, slow down LFO1 until you do. Check the green daisy chain and those different pitch modulation depths / polarities!Multiplex2: Ctrl A adds a metallic edge by turning up "FM" between OSC4 and OSC3. The signal gets much stronger, and this is compensated for by Ctrl A negatively modulating OSC3 Volume. Try swapping them i.e. make OSC3 phase modulate OSC4 instead.

- Click on the FX [Edit] button: The reverb has minimum 'Drive', which removes the low grunge that would have been noticeable on high chords. The Delay is also active, with settings that contribute to the "space" of the reverb without adding too much rhythm.

07 Pads & Poly

This category is arguably the least suited to Bazille, as such sounds are easier to make using simpler, fixed architecture synths. Although a few pad-specific tricks do exist for Bazille, I was surprised at how many of my experiments belonged in this category. I must like polysynths!

Brash Ripper Poly

This looks easy. A polyphonic version of *04 Leads / Hs Brash Ripper Solo*. So there's an over-driven 4-pole lowpass filter. There's 'foldback' Distortion. Anything else?

- Stack is set to 2 and Voice2 is very slightly detuned (STACK VOICE TUNING). With both oscillator's Phase mode set to 'Gate', this creates a consistent "ripping" attack.

- Vibrato via mod wheel is extremely deep, as LFO1 is explicitly patched to both oscillators and set to 5 semitones. If you prefer a shallower vibrato, remove the yellow daisy chain and turn 'Vibrato' (in the PITCH panel) up to maximum.

- Another difference between this patch and *Brash Ripper Solo* is the missing StackV modulation in Multiplex1. With Stack set to only 2, the ripping effect is strongest if the oscillator phases aren't shifted apart per voice. The difference is subtle.

DigiBrass

Very clean, dynamic "synth brass" similar to some factory presets in early digital synths.

- This patch may look busy, but the audio signal flow is simple enough: OSC1 and OSC2 are sent to Filter1, while OSC3 and OSC4 go through Filter2 – in 'Offset' mode so that all cutoff modulation is adopted from Filter1. I thought the stereo might sound more like a natural space if I paired the 4-pole output of Filter1 with the 3-pole output of Filter2 and vice versa. That hunch remains untested – would somebody like to check?

- The control signal flow is a bit more complicated: As well as cutoff for both main filters, ENV2 modulates OSC1 and OSC2 PD, which contributes to the digital character of this patch. Via Map1 and CV1, Pressure controls vibrato depth 100% (LFO1 Amp Mod). For subtle movement at all times, LFO2 modulate OSC1 and OSC3 pitch just 2 cents.

- Ctrl A and mod wheel introduce the otherwise silent OSC3 and OSC4 while balancing the overall level by lowering OSC1 and OSC2 volumes via Multiplex3.

Dream Piece

A mellow sawtooth pad plus rising fifths. "FM" via mod wheel adds more frequencies.

- OSC1 pitch is modulated by Map1, an "escalator" scanned by Ramp1 (no LFOs were available). The map was made by restricting the size to 6, selecting 'shape / ramp' then 'make unipolar'. Easy, no tweaking necessary. On the other hand, I only arrived at the correct pitch modulation amount (35.00) by **trial and error**… so often the best method!

  Set to '1/4 dot', nominally the same rate as the Map1 steps, LFO2 gives each step a soft envelope, which transforms into a fast tremolo if you push Ctrl A (see LFO2 'Rate Mod').

- Mod wheel adds linear FM from OSC2, and Pressure adds vibrato (LFO1 Amp Mod).

- To give the pad layer (OUT2) some extra movement I needed yet another LFO. Ramp2 set up as a triangle wave modulates OSC3 and OSC4 Fractalize in opposite directions. I originally processed Ramp2 via Map2 to make a **bipolar** triangle, but realising that unipolar would do the job just as well if I offset a few parameters… simplifying patches is generally good practise.

Fettschicht

Inspired by a modern digital "string machine" unit made in Germany, hence the name.

- 4 rounded-off sawtooth oscillators are tuned to the following pitches:

- To get a feel for the contribution of noise modulating OSC1 and OSC3 pitch, try this:

  Load *INIT,* connect OSC2's lower output to the unused OUT1 socket and turn both OSC1 and OSC2 phase distortion (PD) up to 100. Connect White noise to OSC1's phase modulation input and change the Phase mode to 'rel fine'. Play a chord and listen while slowly turning the modulation amount up to only 20.00 (the same amount as is used in *Fettschicht*). Listen to the random phasing effect caused by white noise pushing and pulling OSC1 in and out of phase with OSC2. Check the extreme by turning the phase modulation amount up to maximum, then reload *07 Pads / HS Fettschicht.*

- The Distortion effect is mainly used for colouration. It boosts the bass a little via Pre Tilt while reducing the fizzy high frequencies (compare the sound with the Distortion disabled). Set to only -12.00, the Input level is low enough to avoid any obvious distortion.

- The Phaser is an important element of this patch. Try adjusting its Rate and Feedback.

Forest Green

A slowly wavering soft pad plus random bright "electronic chimes".

- Remove the green cable from OUT2 to remove the chimes. As I wanted vibrato on the pad layer but not on the chimes, I couldn't use regular Vibrato in the PITCH panel. Instead, LFO1 is patched directly to OSC1 pitch modulation.

- OSC1 is an octave lower than OSC2 because OSC1 uses Fractalize while OSC2 doesn't and the OSC2 secondary waveform is 'Same'. Most combinations of PD waveforms will cause the octave to drop, as will any use of Fractalize. It's worth loading *INIT* just to check all possible combinations. How many unique ones are there?

- The upper lag generator's attack and decay settings are so long that the effect of Pressure on OSC1 Fractalize and Filter1 cutoff could hardly be smoother… This is especially important for the Release stage. I think the aftertouch (a.k.a. Pressure) control in all performance synths should include such a lag processor!

- Reload *07 Pads / HS Forest Green* and turn up Ctrl A to isolate the chimes layer. Disable the Reverb and Delay effects. Pitched quite high ('Overtone' 4.00), OSC3 is frequency-modulated by OSC4 (which is pitched higher still). To hear it without the quasi-random notes, right-click on Map2 output and drag both cables onto the socket of Map1, a conveniently close source of "zero Volts".

Hold down a note or two. You should hear a whine with a resonant filter sweep caused by LFO2 RND (random) modulating Filter2 cutoff. Via lag generator. Why lag RND if turning up LFO2 Wave would have had the same effect? Answer: Because LFO2's triangle is also panning one of the outputs (OUT2), and is only a pure triangle if Wave is 50.00.

Pushing the mod wheel takes the pitch of OSC4 down, with a "tropical birds" warbling effect at maximum. To hear that effect in context, reload *07 Pads / HS Forest Green*. Play with Ctrl A, mod wheel and aftertouch.

- The effects are important, especially the Delay with plenty of Feedback. Open the effects panel by clicking on the [Edit] button and experiment with all Delay and Reverb parameters. Then activate the Phaser.

Golden 5th

Although this could be dismissed as just another retro cliché, and despite the high notes having noticeable aliasing, *Golden 5th* can sound very expressive. Try enabling the other effects.

- The audio routing here is a classic: OSC1 and OSC2 go through Filter1 to OUT1, OSC3 and OSC4 go through Filter2 to OUT2.

- Velocity is turned up in both envelopes, and ENV2 has several duties: Removing those blue cables results in silence because OSC1 and OSC3 volumes are both zero, and Filter1 Cutoff is set very low. "Velo" (MIDI & MORE) modulates OSC1 and OSC3 Fractalize amounts, making the tone dynamically brighter.

- Vibrato "humanisation": LFO1 speed is modulated by its own random (RND) signal as well as mod wheel: These are mixed in Multiplex1 and sent via CV1 to LFO1 Rate Mod.

Grain Ruler

Wooden rulers pressed onto a table and plucked. I was in two minds about whether to put this one in the *Effects* folder instead, but the long decay clinched its place in the *Pads* category.

- Have a look at Map1: ENV2 scans through a series of teeth which modulate OSC1 Volume, PD and Phase. ENV2 is much faster for higher notes than for lower notes due to the serious negative amount of KeyFollow modulating ENV2 rate (Rate Mod).

  Here's an opportunity to check something else out: Expand the map (click on [+]), play a very low note and watch how the scan slows down as the ENV2 decay approaches zero. Now move the map window out of the way and click on ENV2's 'Snappy' button. Play a note. Initially, the decay falls more quickly now, but it also slows down more towards the end – a very "snappy" envelope.

- Back to analysing Grain Ruler: The little bridge between the PD and the Phase modulation inputs is coloured differently (green) from the rest of the daisy chain (orange), otherwise you would hardly notice that PD was connected. Experiment with the other options by clicking on 'PM coarse', and adjust the amount to suit each mode.

Holy McMoly

Old-fashioned transistor organ type sound, but with a "string machine" envelope (long attack and release). And of course too much reverb and delay!

- Break it down to unfiltered "FM": Disable both effects, move the yellow cable from Filter1 input to OUT1, replacing the orange cable. Play a note or two… OSC1 is being phase-modulated ("FM") by OSC2. Due to low-level Fractalize, neither of the oscillators are pure sine waves – try adjusting the Fractalize amounts.

- Now isolate the other layer: Move the red cable from Filter1 to OUT1, replacing the other one. Play some notes… a pure "FM" sound an octave higher than the other layer. Try adjusting OSC4 Tune, which switches the overtones. 4.00 is nice and silvery?

- Reload *Holy McMoly* and play with the performance controls: Mod wheel closes the low-pass filter, Ctrl A fades out the first layer for a thinner sound.

- Delay with lots of feedback and plenty of 'Wow' gives this patch a suitable space. Try enabling the Phaser (which comes AFTER the Delay for maximum effect).

Icevox

Typical 'tron pad. **Warning:** This patch is extremely loud if you disable the reverb!

- For such "hollow" vocal sounds, square waves are usually best. Although OSC1 and OSC2 are both rounded-off sawtooth, one of them is inverted – to create a square!

  Try this: Load *INIT* and turn OSC1 PD up to 100. Connect OSC2 via Inverter to the other OUT1 socket and slowly turn OSC2 PD up to maximum. The final result is silence, as the two signals cancel each other out 100%. Now turn OSC2 Phase up and down for a PWM-type effect, then leave it at 25.00 (almost a square wave). Patch LFO2 triangle into OSC2's phase modulation input and turn the amount up to only 6.00. Note the squarish pitch jumps when LFO2 Rate is turned up. This effect can be remedied by using a sine (e.g. OSC3 in 'Hertz' mode) instead of the triangle. Try that!

- Reload *07 Pads / HS Icevox*. All 4 oscillators are patched in pairs to the two main filters. Apart from the different Gain levels, all filter settings are basically the same. However, as Filter2 is in 'Spread' mode, Pitchbend sends the cutoff in opposite directions. At various mod wheel positions, check how bending pitch also affects the tone.

- Phaser and Distortion are used for static tonal colouration. Experiment with all settings.

Optimism

Swept resonating lowpass filter layered with a soft pad is a fine thing…

- Set up as a 3-bar trapezoid, Ramp1 sweeps the cutoff off Filter1. The amount of resonance was set high enough to accentuate all the harmonics in OSC1, but not so high that the filter starts to oscillate permanently. The sweep starts at the 2nd harmonic and ends at the 7th (the highest point of the sweep is 3 octaves up), so it travels through the 5th, octave, major 3rd, 5th and minor 7th – if you listen carefully you can hear all those notes. Ramp1's Hold setting keeps the sweep at highest point for a short while, while Rest does the same at the lowest point.

Filter3 is patched in so that the sound could be softened/darkened without affecting those harmonics: Push the mod wheel. Ctrl A thins out the sound by negatively modulating OSC2 Volume, effectively removing the darker second layer…

- Turn OUT1 Volume down to isolate the OUT2 layer. OSC2 uses 'TapMap1' to create a slow PWM pad very much like an old analogue polysynth. You can hear the pulse-width modulation from LFO2 more clearly if you disable the effects. This signal is softened by Filter2, with ENV2 creating a gentle contour.

Palatino

This one relies very heavily on the Delay and Phaser effects, and is otherwise quite plain.

- Two sawtooth oscillators detuned in opposite directions, plus a square wave. Note that the Modify modes differ: OSC1 detuning is in cents while OSC2 is in Hertz. This trick allows higher notes to beat faster, but less than if both oscillators were detuned in cents.

- As well as regular vibrato, the pitches waver a bit due to phase modulation from LFO2. The triangle is softened by a lag generator, as phase modulation ("FM") by a triangle wave sounds like pitch modulation by a square wave. Here's a quick experiment:

  Load *INIT* and turn OSC1 PD up to 75. Connect LFO1 triangle to OSC1's phase modulation input and turn the amount up to 20.00. Play various notes on your keyboard… The interval between the two notes of the trill is shallower for higher notes. Your mission, should you choose to accept it: Compensate for this effect using a Multiplex.

- Reload *07 Pads / Palatino* and take a look at the FX panel: To maximise its stereo effect, the Phaser is positioned after the Delay. Move it up and down to check the difference.

Pinup Butter

Filtery analogue pad with a smooth contour, especially good for low chords.
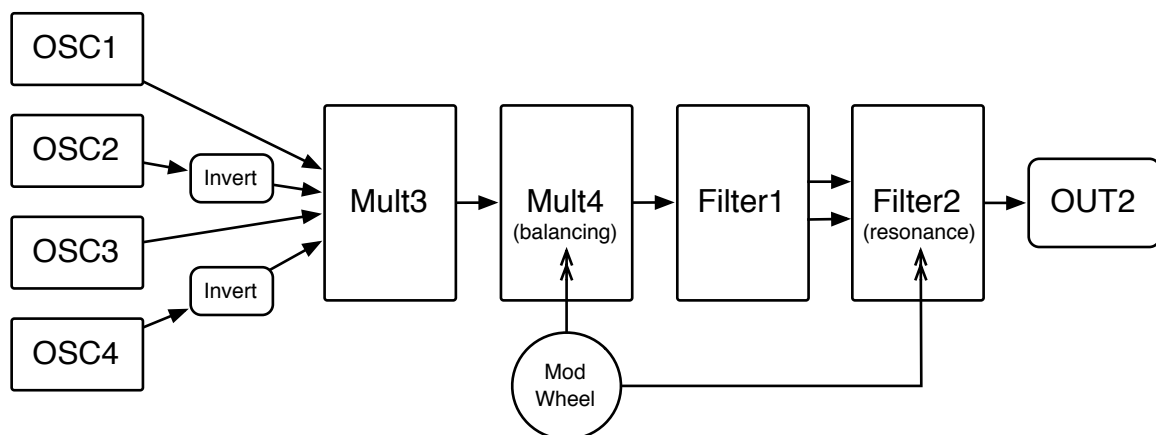
- Two pairs of sawtooth waves, with one of each pair inverted and slightly detuned for a kind of PWM effect (follow all cables connected to Multiplex3). The two LFOs are used to phase modulate OSC2 and OSC4 – a very significant factor for the sound of the low notes. Check that by removing the cables, then click twice on the [UNDO] button.

- As low chords can get overpowering when Resonance is turned down, Multiplex4 is set up to reduce the signal level to 50% when the mod wheel is at maximum.

Poly Hannah

Very "retro" pad with some fast, shallow movement. Let's untangle the spaghetti…

- First, the audio routing: OSC1 and inverted OSC2 are highpass filtered by Filter2. Mainly to glue them together, but you might like to try using it to boost or attenuate bass frequencies! Mixed with OSC3 in Filter1, the result is then lowpass filtered. In OUT1, the LP24 signal is randomly panned, while in OUT2 the LP18 signal remains in the centre. An attempt to add some subtle stereo "interest"…

- Several of the modulation routes in this patch also try to inject some good old analogue chaos! Firstly, the two maps create "round robin" offsets (like in the next patch): Map1 affects OSC1 pitch and ENV2 rate via CV1, Map2 affects Filter1 cutoff and OSC3 pitch.

Round Ribbon

Something for etymology fans: "Round **Robin**" was the English nautical version of the French *ruban rond*, a document in the form of a closed **ribbon** to conceal the identity of the ringleader amongst the signees: there is no first or last signature.

Via computing, the synth world used this term to mean addressing each voice circuit in turn to avoid obvious tonal repetition. Individual voices in hardware polyphonic synths sound slightly different, however carefully they are adjusted. This patch tries to emulate some of the quirks of a classic 6-voice, 2 oscillator synthesizer of yesteryear…

- Round robin: Map1 offsets oscillator pitches and amp envelope (ENV1) rate. Map2 offsets the pan positions and filter envelope (ENV2) rate. Both maps are incremented; the next note applies the next offset values.

- What is LFO2 achieving by modulating OSC1 Volume? A kind of pulse width modulation not mentioned in the Tips & Tricks chapter of the user guide! Try this:

  Load *INIT* and turn OSC1 PD up to maximum. Move the cable (right-click and drag) up to OSC1's raw output and adjust OUT1 Volume to taste. Change OSC1's PD waveform from Saw to Square. Connect OSC1's lower output to its own Phase modulation input and change the mode to 'PM medium'. Move that self-phase-modulation amount back and forth; listen to how the sound breaks up at values beyond 80. Leave the amount at 40, play a low note and look at the waveform in the data display. Now disengage the [HQ] switch and compare. Do you see the differences? Can you hear them?

  Connect LFO1 Triangle to the Volume modulation input and turn it up to 40. Double-click on LFO1 Rate and watch the PWM-like movement in the 'scope. The triangle needs rounding off, so patch in a lag generator and adjust the Attack and Decay until the pitch movement is no longer too "square". Reload *07 Pads & Poly / HS Round Ribbon…*

- High notes sound rather fizzy, but activating the [HQ] switch reduces it: Listen to a high note, deactivate [HQ] and play the same note again. Adjust LFO1 rate.

- Filtered noise (see OUT2) adds "retro" character, especially if you enable the Phaser.

Rowboat Cave Dreams

Resonant pad with added "stalactite" chimes.

- OSC1 is processsed by all four bandpass filters while the other main oscillators are used as LFOs: Using 'TapMap1' (see Map1) as their waveform, OSC3 and OSC4 modulate Filter1 and Filter2 cutoff. Although they appear to be set to the same speed, OSC4 is actually slower than OSC3 – see theie Modify settings.

- Clocked mode values are divisions of whole notes. With Multiply set to 1.00 or -1.00, a Tune value of "1" means 4 beats. As OSC3's Multiply is set to -2.00, it is 8 beats long. OSC4 is 12 beats long (Multiply = -3.00). You can develop a feeling for Multiply by following this little experiment…

  Load *INIT* and turn OSC1 PD up to maximum. Change OSC1 Tune mode to 'Clocked' and set Tune to 4.00. You should now hear a mild thump at the same BPM as your host application. Let's turn that into a click: Connect OSC1's raw output to the PD modulation input and turn the amount up. Finally, change the OSC Modify mode from 'Cents' to 'Multiply', hold a note and adjust the Modify knob. Note that Multiply set to -1.00 is exactly the same as +1.00 (see the Bazille user guide).

- Reload *07 Pads & Poly / Rowboat Cave Dreams*. The resonance of all 4 filters is set to 49.90 – just below self-oscillation at these input and Gain settings. The squinky effect from Filter4 is due to LFO2's random wave being slightly rounded – the Wave setting is not quite zero.

- Pressure: The vibrato of each note has one of 8 fixed speeds because LFO1 is being rate-modulated by Map1. Have a look there while playing individual notes.

- The Distortion adds breathy frequencies to the already delayed signal, and Reverb followed by slow phasing adds a stereo "wash".

Silversteps

Wavering pad with a fairly soft attack and a long release. Two of the oscillators can be tuned in harmonic steps via the mod wheel and Ctrl A: Find interesting static combinations or use them to sweep through the intervals.

- Audio routing: OSC1 and OSC2 are patched into Filter1 and mixed with OSC3 in Filter2.

- The wavering effect is a combination of vibrato (LFO1), pitch modulation from LFO2 (orange daisy chain), and Phasing.

- Map1 converts the mod wheel signal into 8 steps, which are slightly smoothed (equally in both directions) by a lag generator. Modulating 'rel coarse' with the amount set to 70.00 gives you a 26 semitone range i.e. 2 octaves and 2 semitones for a unipolar source.

- Map2 is the same ramp but driven by Ctrl A instead of mod wheel. It is only being used to display the position of Ctrl A as I used the Quantizer for OSC3 instead – for no reason I can remember or discern. Quantisation is set to 7 (for 8 steps). Try 'rel coarse' = 80, Quantizer = 8, number of map steps = 9. Then try 'rel coarse' = 90, Quantizer = 9, number of map steps = 10. There's a pattern emerging here!

  See *00 Tutorial / Harmonics in Series* on page 11.

Sirensister

Shimmering vocal pad / lead, with a "musical saw" effect.

- Disable the FX and listen to the "ringing" when notes are released. Also try shifting chords – the effect becomes more of a background wash. The mod wheel adds noise.

  Let's clear out some spaghetti: Cut the mod wheel noise by removing the orange daisy chain, and cut the tone control by removing the yellow daisy chain. How exactly did you remove those daisychains? The method that always works immediately is to right-click and drag on the sources (in this case Multiplex2 and Ctrl A). However, I find that dragging on the first node of the chain feels more natural / comfortable. Try both methods!

  ENV2 modulates OSC1 and OSC2 pitch in opposite directions. Play and release a note: ENV1 'Attack' is slow enough and ENV2 'Attack' fast enough for the initial pitch sweep to be subtle (try reducing ENV1 Attack). Vibrato appears later, as LFO1 'Delay' is set to 50.

- Reload *07 Pads / HS Sirensister* and disable the effects again. Only remove the blue daisy chain this time. Test the "tone control" by turning up Ctrl A. This works not only by increasing the PD amount of OSC1 and OSC2 (yellow daisy chain), but also by amplitude modulating ENV3, which in turn modulates OSC3 volume and PD. OSC3 plays a high 5th (overtone 5.00 i.e. the 6th harmonic), which gets significantly louder when Ctrl A is turned up. If you can't hear that high 5th, isolate OSC3 by turning OUT1 Volume down to zero.

Soft Ice

Similar to *HS Forest Green*, but softer and with a more regular "icicle" effect. Due to how the two maps are set up, this patch is almost ideal for demonstrating a few of the options and functions in the mapping generator context menu – one easy, one difficult!

- OSC1, OSC2 and OSC3 form the pad layer, and lag generators keep everything smooth. By modulating Filter1 cutoff, Ramp1 keeps the pad moving. Mod wheel closes the filters, and Pressure via Map1 increases the resonance (see yellow cables). Here's how the data in Map1 was made – each step requires right-clicking Map1:

  - Expand the map, right-click and select 'Shapes / Ramp'
  - Select 'Cmd-Draw' (Mac) or 'Alt-Draw' (Win) / '**Warp**' drawing mode
  - Hold cmd (Mac) or alt (Win), click and drag down until only about 20 bars are positive
  - Select 'Make Unipolar'

- OSC4 is responsible for the icicles (see Map2). Ctrl A crossfades between the two layers (orange daisy chain). The OSC4 signal doesn't need to be sent to OUT1, as Stack Voice spreads the panning evenly when Stack is set to anything above 1.

  Here's how the shape in Map2 was created (again, each of the steps requires right-clicking on the map):

  - Restrict the number of values to '24'
  - Select 'Shapes / Triangle'
  - Choose 'Selection / Select every 2nd'
  - Select 'Cmd-Draw' (Mac) or 'Alt-Draw' (Win) / '**Shift**' drawing mode
  - Hold cmd (Mac) or alt (Win) and drag down until the 3rd bar from the left almost flips up
  - Adjust the leftmost bar until it lines up with the 4th bar in
  - Choose 'Selection / Deselect'

Map1 should now look exactly like Map2. Although working with the mapping generator's context menu does get easier with practice, and although Bazille is unapologetically a "geek product", I would welcome a version in which all those functions are immediately accessible via a palette of buttons.

- Reload *07 Pads / Soft Ice* and play. Turn up Ctrl A…

Solar Flare 1

I tend to associate 2-pole filtered sawtooth pads with *bright sunshine*. Use the mod wheel!

- All oscillators are sent pairwise through the main filters to the OUTs, which are panned apart. Stack is set to 2. Modulation: Three unipolar ersatz-LFOs (lagged sequencer and the two ramps) modulate Fractalize for three of the oscillators.

  Listen to OSC1: Drag the orange cable from the upper Filter1 input and drop it onto OUT1, replacing the yellow one. Remove the cable from OUT2. Set Stack to 1. Double-click on OUT1's Pan to put the signal dead centre. Play a low note and listen to the cyclic "sync" effect while watching the sequencer dial. The first 4 values in all odd-numbered snapshots are at maximum. Rotated, this creates a unipolar triangle, an "extra LFO".

- Reload *Solar Flare 1.* StackV (+5V for voice1 and -5V for voice2) via Multiplex1 modulates OSC2 and OSC4 Phase in opposite directions, with the amount modulated 50% by LFO2 triangle. Disconnect LFO2 at source and listen to the difference. Was it worth it?

Solar Flare 2

A more primitive (and perhaps better!) version of the above, with delay instead of phasing.

Squee Organ

Velocity-sensitive, and with a distinctive attack. Play a single note and slowly add pressure…

- OSC3's pitch jumps up in 5ths (7, 14 and 21 semitones). The Quantizer is set to 3.00 and the pitch modulation amount is 21.00… simple arithmetic.

- More easy stuff: The audio routing is common for pads – the oscillators are sent in pairs via the two main filters (lowpass) to the two outputs. Modulation wheel lowers the cutoff.

- Quite unusual, on the other hand, is the use of LFO-modulated envelopes (see the Rate Mod and Amp Mod sources in ENV2 and ENV4). These envelopes modulate OSC1 and OSC3 phase distortion as well as OSC2 and OSC4 pitch via the yellow daisy chains. Double-click on OSC1 and OSC3 PD modulation amount knobs and hear how the squelch disappears, then click twice on [UNDO]. Play a chord with plenty of velocity but zero pressure and turn up Ctrl A. This speeds up LFO2, and therefore the ENV2 and ENV4 modulation.

  To make each attack sound different, LFO2's random wave modulates ENV2 rate. Also, ENV1 and ENV4 rates are modulated by Pressure. Try this: Apply pressure to a bass note while playing staccato chords – the chords appear more distant as the envelope release gets longer. Note that ENV1 uses Map1, which lengthens it at a lower pressure than Map2 does for ENV4… All unnecessarily complicated!

Sweeping Parallels

Revisiting this patch, my first thought was "What is the cause of that silky resonance?"

- Is it the mixture of outputs from Filter1 (LP18, inverted BP6, HP12)? No, as removing the bandpass and highpass demonstrates: Right-click and drag those outputs away… the sound retains much of its original character. Is it the choice of waveforms, then? Nope – setting OSC2 to 'Saw' doesn't make much difference. And there's nothing in the Multiplex panel that would affect the overall timbre.

  Must be the effects, then! In the FX panel, click [Edit] and check the Distortion settings. 'Post Tilt', 'Low' and 'High' are all turned down, so to be on the safe side it is a good idea to turn down either OUT1 Volume or the main 'Output' before disabling the Distortion. Without the Distortion, which is used mainly as an EQ, the "silky" character disappears.

- Reload *Sweeping Parallels.* Pressure has a very long journey from Map1 to Multiplex2 to Inverter2 to Lag2 to Multiplex3 to CV1 (follow those cables!) and finally to LFO2 Rate Mod. Such tortuous routing is usually the result of incremental improvements, it is hardly ever part of the original idea.

- Pressure and Ctrl A are inverted and lagged. The result is mixed at double-strength with ENV2 (also double strength) and sent via CV1 to control LFO speed – negatively, so that the ENV2 modulation is negative while the inverted Pressure and Ctrl A are positive.

  It would have looked simpler if I had inverted ENV2 instead of Pressure and Ctrl A (then set LFO2 Rate Mod to +42 instead of -42). Try that as an exercise, but practice on a copy first, as it's far too easy to lose the plot in the middle of such tricky "rewiring" jobs!

Swellington Boots

Cinematic drone or massive chord maker? Try the #1 cliché, a 10th interval (octave + 3rd).

- All oscillators are mixed in Multiplex1 and sent to all 4 filters. Full sawtooth except OSC2, which also includes a sub ('Max' mode Fractalize). Each Filter's LP24 output is paired with another at the two OUTs. Also, Filter1 LP12 is sent to Filter2, Filter2 LP12 to Filter3 and Filter4 LP24 to Filter1. Note that there is no feedback at all in this arrangement:
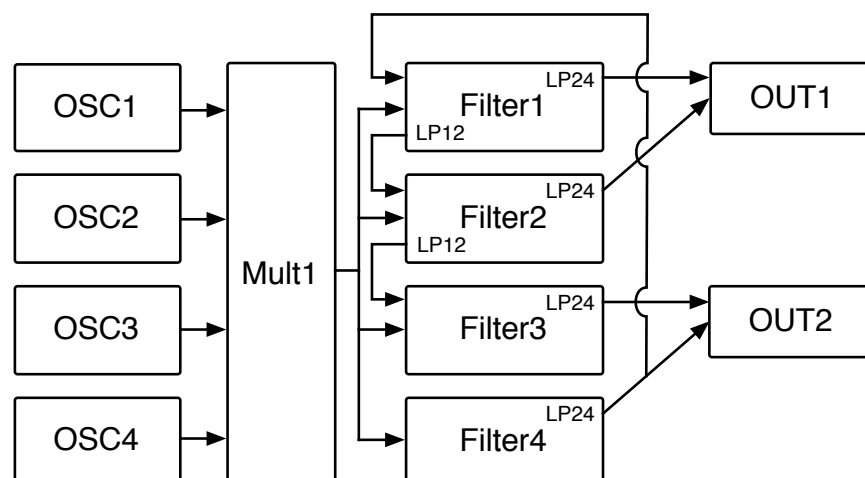
- ENV2, mod wheel and Ctrl A (Filter1 and Filter2 only) modulate all 4 cutoff frequencies. As Filter2 is in 'Offset' mode, it adopts all cutoff modulation from Filter1. Note that mod wheel control is positive for the main filters, but negative for the other two. The result is in an interesting "gear change" when the mod wheel is about a third of the way up.

That Pad

Another "cinematic analogue" pad.

- Here we have (again) OSC1 plus OSC2 into Filter1, and OSC3 plus OSC4 into Filter2.

- LFO2 creates shifing phase offsets between the two stacked voices. Neither of the first two voices is detuned (see STACK VOICE TUNING), but Voice3 is already tuned up an octave just in case you would prefer more of an "Interstellar" sound (try Stack = 3).

  Here's a hopefully enlightening experiment, a testbed for how Multiplex units handle StackV: Load *INIT* and adjust OSC1 PD to taste. In the VOICE panel, change Stack from 1 to 2. Patch StackV (MIDI&MORE) into one of the **righthand** inputs of Multiplex1, and LFO2 square wave to its Mod socket. Now patch Multiplex1 output to OSC1's pitch modulation input and turn the amount up to 2.00. You should be hearing a slow police-siren, alternating between unison and a 8 (!) semitones. Turn LFO2 rate up to taste.

  Now turn the righthand knob in Multiplex1 down to minimum for a steady major 3rd (4 semitones), then back up to maximum for the 8-semitone siren. Here's what's happening: When the Mod socket is used, 100% amplitude modulation causes the LFO to alternate between (100% x 2 for voice1 and -100% x -2 for voice2) and (-100% x 2 for voice1 and 100% x -2 for voice2). The former creates unison between the two voices, the latter spreads the pitches apart by 200% in each direction – for a total of 8 semitones.

- Reload *07 Pads / That Pad*. For extra movement, LFO1 and both ramps modulate Fractalize in all oscillators. Pressure sends cutoff in opposite directions (see 'Spread' mode).

That PWM

Primitive pulse width modulation – best kind! Uses the Minimoog method:

- Multiplex3 mixes regular saws from OSC1 and OSC3 with inverted saws from OSC2 and OSC4. The sum is sent to Filter1 together with a tiny bit of White noise (see Multiplex1). With a slow Attack and some velocity control, ENV2 opens up the filter (blue cable), while the mod wheel closes it down (grey cable).

- The initial phase of all oscillators is set to 'gate', so the 1 cent detuning of OSC3 (see its Modify value) causes a mild but consistent "ripping" effect.

- LFO1 is lagged a bit to reduce the pitch-jumping you get from phase modulating with a slow triangle, without turning it into a sine. I tried regular pitch modulation at first, but I think that the "squareness" (squarity?) of this method sounds more interesting.

Tidal Wave

A gently phasing pad for all your floaty tracks, whether "New Age" (how old is that genre already?) or old age i.e. Pink Floyd.

- OSC1 plus OSC2 through Filter1, OSC3 plus OSC4 through Filter2. The usual pad setup.

- Try Ctrl A: At maximum, it sends OSC2 up 24 semitones (2 octaves), OSC3 up a minor 3rd and OSC4 up a 5th. Of course intermediate amounts of Ctrl A send it out of tune.

- Vibrato isn't used. LFO1 is patched to all 4 pitch modulation inputs instead, with modulation amounts set both positive and negative. The effect is very subtle, it certainly isn't as strong as the Phaser in this patch.

- Closing the filter via modulation wheel also turns up the oscillator volumes (yellow daisy chain) to compensate for the loss of signal level.

- Click on FX [Edit] and turn the Delay 'Feedback' up to maximum. Play (but don't hold) a chord. Listen until the sound disappears… that's Wow: Try turning it up to maximum!

08 Chords

Add Nine

Synclavier-typical bendy attack sounds – use Ctrl A and Ctrl B.

- If you play a C you will also hear a G (5th) and a high D (9th). Although Stack is set to 3, these offsets are not Stack Voice Tuning, which would affect all oscillators equally, but pitch modulation **per oscillator** from StackV. As its pitch is modulated 7 semitones up AND down, OSC1 is set 7 semitones up so that Voice3 is the root of the "power chord":

  Voice 1:   +7 +7 = +14 (9th)
  Voice 2:   +7 +0 = +7   (5th)
  Voice 3:   +7 -7 = 0   (the root)

- OSC2 is also tuned 7 semitones up, emphasising the 5th with all 3 of its voices. Quantised Ctrl A tunes this up in 4ths.

- Filtering the oscillators while allowing them to be panned independently required that they be connected to the two outputs via different filters. This patch is 4-note polyphonic, so you should try various intervals or chords with various amounts of Ctrl A.

Big Five

Use this as a "fanfare" lead, or turn triads into 7th chords.

- Two layers: the fundamental is OSC1 + OSC2 through Filter1 to OUT1. The 5th is OSC3 + OSC4 through Filter2 to OUT2.

  Stack is set to 2. As StackV is modulating OSC1 pitch up and down 6 semitones (for an octave interval), it is tuned up 6 semitones to compensate. Strangely, OSC3 needed to be tuned up 13 semitones: 7 semitones for the fifth transposition plus 6 for the octave interval between voices. The two Lag generators with slightly different settings are used to create a typical bouncy "synth-brass" attack: Try increasing those 'A' values.

- Pressure via Map1 adds vibrato (see LFO1 Amp Mod). Such "highly exponential" curves are easy to make. Each step requires right-clicking on Map1:

  - select either 'Shapes / Ramp' or 'Shapes / Quadric'
  - select 'Cmd-Draw' (Mac) or 'Alt-Draw' (Win) / 'Warp' drawing mode
  - hold cmd or alt, left-click and drag down until about 20% of the map remains positive
  - select 'make unipolar'

- Watch Map2 while repeating a single note. As Stack is set to 2, the map increments 2 steps at a time. Each pair detunes OSC2 and OSC4 differently per voice for a "two layer 6-note polyphonic round robin" or something! See *07 Pads & Poly / HS Round Ribbon*.

- More daisy chains: The mod wheel darkens the sound by reducing the phase distortion (PD) of all 4 oscillators (red cables), as well as the Cutoff of both filters (yellow cables).

Bowed Bowl

Listen to the harmonics. Try playing very lightly.

- Play a long fairly low note. Can you pick out each harmonic, and state its **interval** above the prime? To my ears, the 9th sounds strongest, followed by the minor 3rd, minor 7th and a very weak 5th (I might be imagining that last one). Testing, testing…

  See the Modify values: OSC3 is overtone 6 divided by 4 (that's our minor 7th interval) and OSC4 is overtone 8 divided by 2 (that's the 9th). OSC2 is set to overtone 18 divided by 8, which is the minor 3rd (check that by turning down all other oscillators). There is no 5th – what I thought I could hear might be the 3rd harmonic of OSC1 (a squarish waveform).

- Long daisy chains: Ctrl A fades out the fundamental (OSC1) and compensates for the loss of signal level by turning the other oscillators up a bit. It also slows down ENV2, adds a brighter attack by modulating PD (via mod wheel – see ENV2 Amp Mod), and gives OSC4 a slight bounce by negatively modulating its Phase. Check all that again!

- Playing very lightly causes the sound to swell. Take a look at ENV1: the Amp Mod source is ENV3, which has a slow attack but no velocity control. The ENV1's Amp Mod amount is carefully balanced with its own 'Velocity' – try turning them up and down!

- No filters were harmed during the making of this patch, unlike the next one…

Breath of Life

Although OSC1 is used, this patch is mostly filters fed with a whiff of white noise, all stacked 5 voices deep for a total of 20 tuneable resonant peaks. No wonder it's only 3-note polyphonic.

- Drag the grey cable away from Multiplex1 to remove the white noise. ENV2 is left to "ping" the filters on its own, while OSC1 through Filter2 provides the 2nd harmonic (an octave higher than the fundamental). Hold a note and hum the fundamental to yourself, then remove all cables except the green one from OUT1 and OUT2… There it is. Click on [UNDO] several times while holding that note and listen as the muted elements reappear.

- In Map1, each index of the stack (StackVoice) uses one of the 5 values. Click on the [+] to expand Map1, then retune each voice by adjusting the bars in the map. Remember that each bar in the map tunes **all 4 filters** of that voice at the same time.

  Reload *Breath of Life*. Multiplex3 lets Ctrl A reduce the amount of noise sent via Multiplex1 to all filters. Multiplex2 lets mod wheel control how much of the Map1 signal is sent to CV1, which modulates Filter3 and Filter4 cutoff. This effectively increases the cutoff "spread" between the voices, which is why the filter frequencies simultaneously move up and down when you push the mod wheel.

- By retuning Map1, by adjusting how much it modulates the cutoff of each filter as well as the 4 'Cutoff' frequencies, it might be possible to emulate a crash cymbal or even a gong. Worth a try!

Chordu

One-finger jazz? Major 7/9 chords.

- All oscillators are detuned ('5 Hertz' mode prevents high notes from beating faster), mixed in Multiplex1 and sent to Filter1. Filter2 provides extra Filter1 cutoff modulation sockets: In 'Spread' mode, all user-defined cutoff modulation also affects Filter1 in the opposite direction.

- STACK VOICE TUNING: The voices are set to prime, major 3rd, octave, octave + major 3rd and a pure 5th (4th below). As the oscillators are tuned a 5th apart, pressing the note "C" gives you a C major and a G major triad at the same time.

- Via CV1, ENV1 is amplitude modulated by a seriously lagged '+5V', causing a volume swell. For details, check out One-Shot Bouncer and Violin Swell in the tutorial chapter.

Dingle major / Dingle Minor

Omnichord flavoured cheese alarm! Strummed dominant 7th chord. Use Ctrl A to bend the chord up to a major 7th or diminish the 5th. 2-note polyphonic so you can play octaves.

- ENV2, ENV3 and ENV4 are all used to delay the onset of oscillators. See the image in the tutorial chapter, Delayed Envelopes 2 on page 9. Turn up Ctrl B to slow them all down (Rate Mod).

- No filters here – for tonal interest, the mod wheel increases Fractalize for all 4 oscillators.

Dongle major / Dongle Minor

Strummed dominant 7th chord with a brassy tone. Use Ctrl A to bend the chord up to a major 7th or diminish the 5th.

- Multiplex1: Mod wheel and LFO2 triangle, both via mod wheel, increase Fractalize.

- With polyphony set to only 3 notes, the release can be fairly long without eating up CPU.

Eternal Sheet

Cold swarm. Perform with both wheels.

- 40 detuned sine oscillators per note: 4 oscillators plus 4 resonating filters = 8, with Stack set to 5 makes 40. No wonder this preset is only 3-note polyphonic (16/5).

- Two oscillators and two resonating bandpass filters are mixed in Multiplex1 and sent to OUT1, while the other oscillators and filters are sent via Multiplex2 to OUT2. The 5 stacked voices are heavily detuned and panned apart via StackV.

- Via Map1, mod wheel pushes all pitches down to zero Hertz, using 'rel coarse' FM mode.

- Extra performance control: Ctrl A and pitch wheel offset Filter3 and Filter4 pitches.

EZ-Chords

Different triads in C-major. Try playing a C-major scale first. Listen out for which of the chords are major, and which are minor.

- Map2 is set up as a note viewer. Play a chromatic scale upwards from C and watch Map1 skip up and down, never highlighting any of the "black" notes. That's because the 'No Flats 1' microtuning table is shifting all black notes up a tritone. Play C# then G… they are the same chord. Deactivate the microtuning and try the chromatic scale again: The note viewer shows all keys correctly as you play them, without skipping. Re-enable the microtuning.

- All four oscillators are mixed in Multiplex1 and sent through Filter1 to OUT2. Filter1 Gain is kept low to avoid overdrive, which could mess up the chord. Let's test that claim: Double-click OUT2 Volume and Filter1 Gain. Compare with the original by reloading *EZ-Chords* and clicking on the [UNDO] and [REDO] buttons.

- ENV2 modulates Filter1 cutoff as well as resonance (classic ladder filters lose resonance at lower cutoff). Pressure modulates the cutoff via lag to ensure smooth transitions.

- At what Gain setting do the filters start to overdrive? That depends on the energy of the input signal. The following shows that Gain doesn't always have to be zero or positive:

  Load *INIT*, connect the OSC1 and OSC2 raw (upper) outputs to Filter1 and its LP24 output to OUT1, replacing the existing connection from OSC1. Turn both oscillators PD up to maximum and OSC2 Tune up to 3.00 for a pair of saws a minor 3rd apart. Now adjust the Gain knob and listen: The signal is clean at -20 but starts to get grungy at around -15. At unity (0.00) it clearly warbles, and at around +10 you start to hear a higher note (close to a major 7) that dominates the sound when Gain is set to maximum (+48).

Fifth Avenue

A soft pad with a 5th from OSC2. Whistling overtones via Ctrl A… it's quite complicated:

- Working backwards: OSC2 pitch is modulated by lagged Map1, which is driven by CV1. The CV1 source is Multiplex4, -5V plus double-strength LFO2 square from Multiplex2.

  Ctrl A is unipolar, but the map generators always interpret CV sources as bipolar. This incompatibility is fixed here by subtracting 5 Volts from the CV1 signal before it reaches Map1, and doubling the strength of the modulation source. Remove either cable from the Inverter and see what happens in Map1… it starts in the middle instead of at the far left.

- Restore *Fifth Avenue* and check out the other two Multiplexes (*Multiplices*, *Multiplex units…*). Multiplex1 sends the sum of OSC1, OSC3 and OSC4 to Filter1. In Multiplex3, white noise is attenuated down to 10% and sent to the other Filter1 input.

  Tip: Adding just a dash of white noise to any pad recipe makes the texture more fluffy!

- Filter2 is dedicated to OSC2, the oscillator whose pitch is controlled by Ctrl A. Filter2 is in 'Offset' mode so it adopts all of Filter1's cutoff modulations, including the key follow, but the mod wheel is daisychained to **both** filter cutoff modulation inputs anyway. The modulation amount in Filter2 is +24, which cancels out half of the the negative modulation (-48) adopted from Filter1. The idea was to keep OSC2 audible when the mod wheel is pushed up to maximum… Do that, and listen to what happens if you remove the positive Filter2 cutoff modulation by double-clicking on the knob.

- CV2 takes its signal from the Pressure-driven Map2, and controls the amplitudes of both LFOs: LFO1 for regular vibrato and LFO2 for the unipolar "trill" – turn up Ctrl A and watch Map1.

Jazz Parallels

Although it sounds similar to the chord set up in *Chordu* (a major 7/9), this one is minor.

- Stack is set to 4, with detuning (STACK VOICE DETUNING) set to -12.00, 3.00, 10.00 and 14.00 semitones. This all adds up to a wide minor 9th. OSC2 is also tuned up an octave and a 5th, which doesn't really disturb the chord structure, as it is the same as the 3rd harmonic of OSC1. However, together with low level Fractalize and some Distortion, it gives the chord a breathy character. Try disabling 'Dist' and setting OSC2 Tune to +12 instead.

- Reload *Jazz Parallels* by clicking on Bazille's display and selecting the ticked entry. OSC1 and OSC2 are mixed in Filter1 and the 4-pole lowpass (LP24) resonating signal is sent on to Filter2, where it is given some extra independent lowpass treatment: Pressure sends the cutoff frequencies in opposite directions, while the mod wheel reduces Filter2 cutoff and Filter1 Resonance at the same time. It took a while to balance these amounts so that you don't notice anything "special" while using the mod wheel or Pressure.

- Ctrl A adds a warbling effect by turning up LFO1 (Amp Mod) – LFO1 fractalizes OSC2. Note the rate modulation from 'StackVoice' – 4 differently synchronised LFO speeds.

- Via Map1, the modulation wheel turns up the volumes of both oscillators (green daisy chain). to compensate for the loss of signal when mod wheel closes Filter2. Note that the OSC2 volume already hits 100% when the map value is 50% i.e. at around map index #114. Got that? Can oscillator volumes can be sent beyond 100%?

  Load *INIT* and turn up OSC1 PD. Turn OSC1 Volume up to maximum. Connect +5V to its Volume modulation input and slowly turn the amount up… So the answer is "yes".

Light Magma

Inspired by *Hhai*, a hypnotic piece by French band *Magma* sung in their own *Kobaïan* language. Repeat the same note in 16ths – the ringing effect and the low notes aren't random.

- The secret is in the combination of maps. These are mixed in Multiplex1 and sent off to modulate OSC1 pitch. As Stack is set to 4, the 16 values in Map1 define 4 chords of 4 notes each – play again and watch how the map is incremented in sets of 4.

- Map2 has 11 steps, two of which send the pitch **of only one note in the chord** up or down an octave. Expand Map2 (click on its [+] button). Repeat a note and watch how the highlighted value jumps 4 steps for each note. Although the cycle repeats after 11 notes, those non-zero values are applied to different notes. How long is the complete cycle?

- OSC2 pitch remains constant, but is spread across 4 octaves by StackV. It is perfectly in tune despite the OSC2 Tune setting of 11.00 semitones and the strange pitch modulation depth (18.00)! Try this lot:

  Load *INIT* and turn up OSC1 PD. Connect StackV to OSC1 pitch modulation socket and turn it up to 12.00. The pitch will go up an octave. Now set Stack (in the VOICES panel) to 2. The new note is 2 octaves lower. Set Stack to 3 and the middle octave appears.

Then set Stack to 4…The voices are now spread by only 8 semitones, resulting in a wide augmented chord (e.g. C-G#-E-C). It needs to be retuned to octaves-only: Hold a note and turn the pitch modulation depth up to 18.00. The intervals were 8 semitones but need to be 12, so we add 6. While you're here, disable [Drift] to tighten up the pitches.

Now connect OSC2 to OUT2 and turn up its PD amount. OSC1 needs to be tuned up or down 6 semitones to be in tune with OSC2.

- Reload *08 Chords / HS Light Magma. So* did we find out we know why OSC2 Tune is set to 11? Look in the PITCH panel: Transpose is +7 and OSC1 isn't detuned, so it seems that the Map1 pitch data for OSC1 isn't centred around zero, and the +7 is just compensation to put the sequence back in tune with other patches. This means that OSC2 has to be transposed +5 to turn the +7 global transposition into +12, plus the 6 semitones offset due to modulation from StackV (see the experiment above). 5 plus 6 is 11.

- PHEW!!

Major Stars

Two pulsating sounds smeared by "odd" delay times, with extra oomph via mod wheel. Both maps are unusual, so that might be the best starting point for a teardown… I mean "analysis":

- Deactivate the effects and remove both yellow cables to isolate the OSC1 signal. We are left with a 16-note sequence (Map1) with Map2 (lagged) providing the "envelope". Both maps are driven by a rising saw (a.k.a. ramp) from LFO2.

  Map1: This started as 'shapes / triangle' (right-click on the map to see that function), after which I held a note and tuned each bar individually. I then selected 'Quantise 12' to make sure the values are 100% correct. Now it's your turn: Expand the map [+], reset it via right-click ('reset') and either recreate the original pitches or set up your own. Select 'Quantise 12' often!

  Map2: Expand and reset the lower map. Drag the far left and right bars down to minimum and select 'straighten' from the context menu. Next, choose 'selection / select every 2nd' then 'invert'. Finally, click on any non-highlighted bar to deselect everything. Creating such a map should only take a minute, despite the context menu diving. By the way, there are actually several way to achieve the same result, but this is one of the quickest.

- About OSC2: Reload *08 Chords / HS Major Stars* by clicking on its name in the display and selecting the ticked entry. Switch off the effects and remove the grey cable from Filter1 as well as the yellow cable from OUT2 (this signal isn't audible until you push the mod wheel, but hey). Play a low note and listen to OSC2…

  4 of OSC2's 5 modulation inputs are being used. From top to bottom: Shallow vibrato from LFO1 triangle, shallow PD modulation (lagged Map2 plus OSC3 set up as a 10-second LFO), Fractalize modulation from LFO2 (seriously lagged!) and volume modulation from lagged Map2. The lower lag generator's extremely long decay transforms LFO2's rising ramp waveform into a kind of triangle so that Fractalize doesn't drop suddenly.

- About OSC4: Reload *08 Chords / HS Major Stars* yet again and remove the blue cable from OUT1 this time. Push the mod wheel up to maximum. OSC4 is a sine with zero 'Tri' Fractalize – but even 0.00 is enough to add the "sub"! By the way… that cyclic modulation is caused by the high 'Wow' setting in the Delay effect.

Pressure Chord

Big major chord with smooth pressure-activated vibrato and swell. Heavy phasing.

- Let's look in the Multiplex panel first. In Multiplex3, a mixture of White and Pink noise is attenuated via double-strength *key follow* from Multiplex4. A tiny amount of that mixture goes to Multiplex1, where it is mixed with OSC1 and OSC2 and passed on to Filter1…

- Filter1 cutoff has a total of 4 modulation sources (as Filter2 is in 'Spread' mode), and they are all being used: ENV2 for the main contour, smoothed Pressure (blue cables), pitch bender (negative-only) and mod wheel. Remember that when Filter2 is in 'Spread' mode, both its cutoff modulation amounts are inverted for Filter1.

- The origin of the major 3rd? Not STACK VOICE TUNING (see there). Not directly from either of the two used oscillators (they are both tuned to 0.00). However, OSC2 has 50% 'rel fine' frequency modulation from StackV, exactly enough to send voice 1 (OSC2 only) up a major 3rd and voice 2 down a 4th. So OSC1 provides the prime while OSC2 does the 3rd and 5th. See *Major Stack* in the tutorial chapter.

PWM Chords

The first thing you should notice while playing this one (apart from its CPU-hunger) is that the chords aren't all the same. The C major scale gives you C, Dm, Em, F, G, Am, G/B and C. Playing chromatically down from C gives you a kind of Baroque cadence. Also try any (really any) minor 3rd interval as a 2-note chord – it's magic!

- Before tackling the trick behind that behaviour, we need to untangle a few cables: OSC1 and OSC3 (red cables) are sent directly to Multiplex4 while OSC2 and OSC4 are inverted first. With some detuning, this results in an effect similar to pulse width modulation. See "PWM 2" in the Tips & Tricks section of the Bazille user guide. The mixture in Multiplex4 is sent to Filter1, and from there to both outputs.

- About that microtuning trick…

  Firstly, the Microtuning table 'No Flats 1' transposes all black notes up 6 semitones so that C# is actually a G, D# is an A, F# is a C, G# is a D and A# is an E.

  Secondly, Map1 transforms the stack "voltages" (+5V and -5V when Stack is 2) into 0V and +5V so that only voice 2 will be affected. Voice 2 is normally a **minor** 3rd up (see STACK VOICE TUNING), but using Multiplex1, Map2 adds the +5V to the notes C, F and G. Multiplex1 modulates all oscillator pitches by 1, so only those three notes give you **major** 3rds. Yippee! I didn't visualise this trick in all its magnificent glory before applying my usual trial-and-error method. To be honest I had a hard time analysing it just now!

Swimmer 9

A soft pad comprising prime, 5th (7 semitones up) and a slightly weaker 9th (14 semitones up). Hold a note and try to sing or hum each partial.

- Tuning: OSC1 and OSC4 are set to 0 semitones, OSC2 is overtone 2 (the 5th) and OSC3 is overtone 8 pulled down an octave (Modify in 'Multiply' mode is -2.00). Overtone 8 is 26 semitones above the root. Transposed down an octave, that's our 9th.

Next time I'll set it to 14 semitones with 'Multiply' at 2.00. The tuning would be 4 cents off (see the table at the start of the tutorial chapter), but if necessary you can always fine tune oscillators via SHIFT+Tune when Modify is unavailable, as is the case here.

- Push the mod wheel up to increase Filter1 cutoff and resonance, then apply Pressure. You get a cute synchronised pulsing effect due to Pressure-driven Map1 connected via CV1 to LFO2 Amp Mod. The wave is a skewed falling saw (Wave is set to 17.00), which gives the pulsing a soft "attack". Ctrl A modulates LFO2 speed (Rate Mod) – try it.

  Note that the mod wheel also negatively modulates OSC1 and OSC2 volumes, effectively lowering Filter1 Gain and helping the resonance (as well as the 9th from OSC3) to become more prominent.

- Three LFOs: LFO1 slowly modulates Filter1 and Filter2 cutoff (the blue daisy chain) and causes a subtle slow wavering of the overall pitch (see 'Vibrato' in the PITCH panel). LFO2 only modulates Filter1 cutoff – the pulsing effect. Ramp1 is set up as a 1-second LFO that modulates Filter2 cutoff and OSC3 pitch.

- Ctrl B brings OSC4 via Filter2 into the mix. As a bandpass with high resonance is being used, this adds a special quality.

- As is often the case for washy pads, the Delay effect plays an important role. Click on FX [Edit]: 'Feedback' is set very high, but the two filters keep it in check: Try turning 'HP' down to minimum and 'LP' up to maximum.

Synthitar Light

Using a mirrored sawtooth with 'Res II' PD, this is another attempt to cook up some "Jivari", the slow zing characteristic of several Indian stringed instruments. This one has a strong 5th (also 'Res II'), is suitable for chords and has a weird pitchbend flavour – what more could you want? See also *06 Keys / HS Eastern Motion* as well as the two *Synth Jivari* patches there.

- OSC1's basic waveform is 'TapMap1', what you see in the upper map. It's quite easy to make this shape, although all functions are in the map's context menu. Remember: every step needs a right-click. Follow me…

  Expand Map2 with its [+] button, right-click in the map and select 'reset'. Change the size to 32 then select 'Shapes / Ramp'. Change the size back to 128, which gives you 4 ramps. Now hold down a SHIFT key and swipe from the very centre (the bar at -100) to the right edge, highlighting the entire right half of the map. Select 'Reverse' then click anywhere in the left half of the map to remove the highlight. Compare with Map1.

- Reload *Synthitar Light*. Let's isolate OSC1: Disable all effects and remove the lower cable connected to the Filter1 input. This patch has HD set to 'High', but you might prefer the sound (and the CPU-usage!) of the 'Good' setting, which shimmers a bit more. Play a low note at maximum velocity and listen to the movement. Disable [HQ] and play the same note at maximum velocity. Listen out for artifacts that weren't so obvious before.

- How OSC1 works: The 'TapMap1' wave has more high frequencies upon which 'Res II' can work its phase distorting magic than 'Cosine' does. At 14.50 the amount of PD is quite low, but as it is being modulated (30.00) by a mixture of ENV1 with its own Velocity plus plain Velocity from MIDI & MORE, the maximum is equivalent to setting PD to 74.50. "Surely you mean 44.50", I hear you cry? No, because that 30.00 takes a 200% signal!

The attack also has a velocity and pressure-sensitive pitch envelope: ENV2 modulates the phase and ENV4 (pressure-sensitive via Amp Mod) modulates pitch.

- Reload *09 Chords / Synthitar Light*. OSC2 is tuned up 7 semitones. The phase distortion is being modulated by LFO2 set very slow (10 seconds). Turn Rate up to maximum and listen, then double-click the knob to reset it back to the centre.

- Pitch bend! Map2 translates the pitchbend data into a very strange shape indeed. Learn how to control it. Push and pull, slow and fast… and try different Lag settings.

09 Percussion

Electric Tennis

Couldn't be simpler, mono mode. Trill by holding one note down and tapping another.

- OSC1 pitch, nominally 1Hz, is modulated up by ENV2. The amp envelope (ENV1) cuts the sound off before it reaches 1Hz again because ENV1 decay is shorter than ENV2 decay. Try increasing ENV1 Decay, then [UNDO].

- The choice of secondary PD waveform in this patch doesn't seem to matter all that much, but the primary waveform certainly does. After testing all PD waveforms at various Phase settings, only 'Res I' works as well as 'Res III'.

- Strangely, activating the higher [HQ] option lowers the pitch about a semitone. I left this switch at the lower setting ('Good') because I prefer the brighter sound.

- Find out how far you can warp this sound by editing the ENV2 settings only.

Fluffophone

Typical pitched noise using two bandpass filters in series… plus a lowpass for the dynamics.

- This patch doesn't need reverb as the combination of a "normal" envelope (OUT1 uses ENV1) and a snappy envelope with a longer release (OUT2 uses ENV2) already creates enough "space". Remove the cable connected to OUT1 and have a look at ENV2: The Amp Mod source is 'Gate', and the strong positive modulation causes the release phase to start at a much lower level, resulting in a fairly realistic polyphonic reverb effect.

- Filter1 doesn't contribute to the **pitch**, but restricts the **tone** to a narrow band of frequencies (note that KeyFollow is set to only 10.00). You can check the range by temporarily turning up Filter1 Resonance. Then [UNDO].

- The modulation wheel adds Filter2 Resonance, emphasising the pitch. It also modulates Filter2 Cutoff to compensate for a slight shift in pitch when the resonance changes: With Cutoff set to 13, *Fluffophone* sounds in tune while the resonance is low, and mod wheel effectively takes it down to 12 when the resonance goes up. You can test all that by setting Filter2 Cutoff to 12.00 and removing the green cable.

- Ctrl A modulates ENV1 rate (Rate Mod). Try it with maximum mod wheel.

FM Frame Log

Not entirely happy with the Bazille version of a frame drum I had previously programmed into ZebraHZ, that patch eventually turned into what we have here. Notes played very softly have a log drum character, while notes played staccato at higher velocities give you the ring of a frame drum, but even more so. *FM Frame Log* is only 4-note polyphonic (Voices is 12 and Stack is 3), but it doesn't really need more…

- Basic 2-operator FM plus filters (inbetween as well as on top). The modulator is OSC1 via Filter2 (bandpass) and the carrier is OSC2. Note that OSC2 is filtered twice: Once by Filter1 (4-pole lowpass) where Cutoff is modulated by ENV2 as well as velocity, and once by Filter3 highpass. Let's isolate the Filter1 signal:

  Grab the yellow cable where it connects to Filter3 input and move it up to OUT2, replacing the green cable. Turn OUT2 Volume down to about 40 to compensate for the extra bass. The sound is fuller without the highpass, but it loses character and dynamics.

  Reload *FM Frame Log*. The high Gain in Filter3 (highpass) adds all the grunge, and velocity modulating Cutoff is responsible for most of the dynamics. Filter3 Cutoff is a crucial setting, as it determines the depth of the frame, the lowest frequency. Try adjusting it.

- On to the envelopes: Inverted key follow plus Velocity are sent via CV1 to modulate ENV1 and ENV2 rates. Positive rate modulation means longer attack, decay, rise/fall as well as release.

- Finally, the "FM" bit. Let's listen to the modulator: Grab the green cable from OSC2 phase modulation and drop it onto OUT2, replacing the other green cable. It sounds fairly harmless, but a bandpass filtered square is actually quite rich for an FM modulator… remember that all those in the DX7 were just sine waves. Restore *FM Frame Log* and perform with both wheels.

- Did you notice that Map2 appears to be decrementing instead of incrementing? Why is that? Tip (actually a dead giveaway): Stack is set to 3.

High Tension Cables

Whenever I see a metal cable under tension I have a compulsion to test the "twang". As I don't often have access to a suspension bridge while I happen to be carrying a slegehammer, I thought about creating a similar sound in Bazille. Is it just me, or do the vertical pylons and horizontal daisy chains make this patch resemble a mutant suspension bridge?

- The idea was to have plenty of phases that drift apart after the initial attack, and that became the basis of this patch. Set Stack to 1 instead of 5… It's the same sound but with only 4 oscillators instead of 20. Set it back to 5.

- OK, I only used filters 3 and 4 instead of the main filters to make the patch look more like a suspension bridge. Both are bandpass and highpass in parallel: Remove the two orange cables to isolate the bandpasses and give it a listen. Click on [UNDO] twice and remove the yellow cables to isolate the highpasses instead. Reload *High Tension Cables*.

- The maps convert the mod wheel signal into two differently-shaped ramps which control LFO2 speed (Rate Mod) and amplitude (Amp Mod). Try pushing the mod wheel slowly up… Subtle movement between intermediate values gives you a vinyl-scratch effect.

- Velocity modulates Fractalize (see the grey daisy chain), creating a tonal shift similar enough to my memory of different strength hammer-blows.

Humming Timp

Two layers: If you play legato the rising kettle drum sound (OUT1) morphs into a vocal hum with vibrato, and the noise hit (OUT2) starts to repeat.

- LFO1 is worth inspecting here, as it is not only responsible for the repeating noise hits (see Multiplex1), but also the vibrato of the hum. As I wanted the vibrato to be symmetrical, for the hits I could either use a falling saw from a second LFO, or a triangle+square mixture from just the one LFO. Adding the square splits the triangle at both peaks, so I went with this more interesting solution…
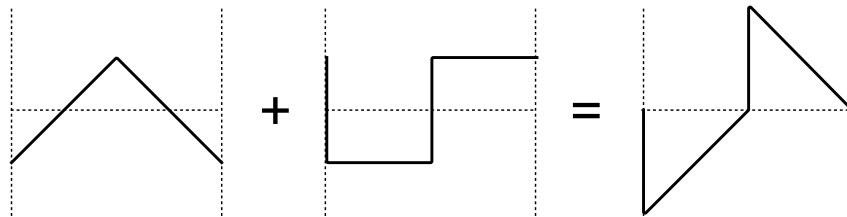
  Remember that shape so you can use it in future.

- Turn down OUT2 to isolate the timp-to-hum layer. White noise sent twice through a lag processor with a long attack creates an interesting pitch envelope for OSC2. Try adjusting lag Decay (D) a.k.a. Release, and see *00 Tutorial / Minimal Drum*.

  OSC2 pitch is also being negatively modulated by key follow (the orange cable). In combination with the 'lin 100Hz' mode frequency modulation, key follow isn't only negated but ever so slightly reversed: The lower the played note, the higher the hum.

- Check out what Ctrl A does… It makes the sound brighter in two ways: By increasing Filter1 Cutoff (via Filter2 in 'Spread' mode) and by turning up OSC2's phase distortion.

Kappa Waves

Bendy percussion with two layers…

- Disable all effects, then remove the noise by detaching the cable from OUT2. After a few seconds, notes start to waver. See those crossed red cables? Each oscillator frequency modulates (relative FM) the other = modulation feedback. OSC2 is detuned +0.14 semitones minus 0.4Hz = careful balancing! This causes beating between OSC1 and OSC2, which is amplified by the feedback. Try speeding up the beating effect by adjusting OSC1 Modify, then double-click on the knob to reset it.

  The green cables also play a role in that "instability": Most of the detuning is initially cancelled out by ENV2 modulating the pitches of OSC1 and OSC2 differently (7.21 for OSC1 and 7.00 for OSC2), and that's why the effect doesn't appear immediately. Check by turning ENV2 'D' down to minimum, then click on the [UNDO] button. ENV2 also adds some phase distortion (square wave), which isn't dramatic as it is mostly filtered out.

- The other layer is simpler. Reload Kappa Waves and disconnect the blue cable at OUT1. Follow the cables connected to Multiplex1 and Filter3. Try various velocities: Although it's only lowpass filtered noise (a mixture of White and Pink), this layer reminds me of something in *Tonto's Expanding Headband*'s synth album *Zero Time* (1971).

Noisefloor Toms

Zappy electronic percussion plus slowly rising phased noise? An unlikely combination, but it's fun to play with the wheels and aftertouch.

- OSC1 is set to 100Hz (10 x 10) and is being frequency modulated (yellow cable) by the signal from Multiplex2. Here's a flow diagram of all modulation handled by the Multiplex units… everything eventually feeds into that yellow cable:
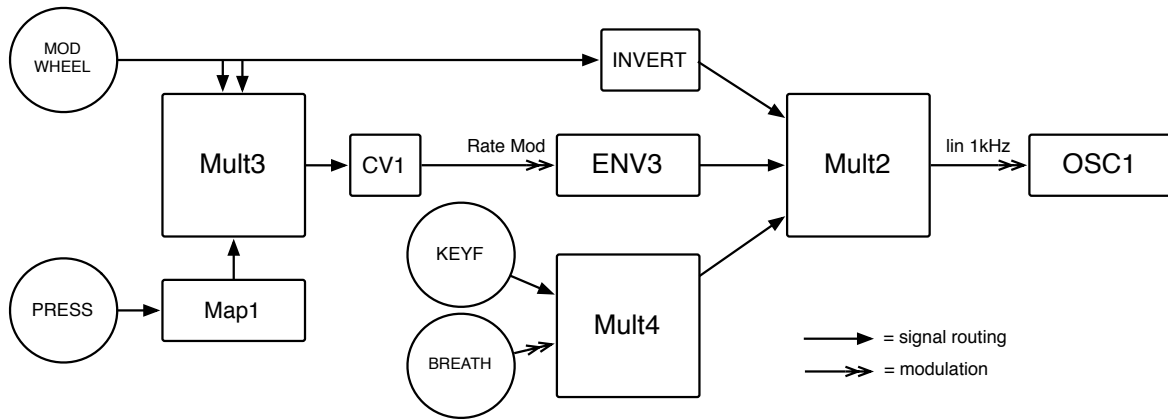
- ENV3 is very short, but the rate is being 100% modulated by double-strength mod wheel plus pressure-driven Map1 – all via Multiplex3 and CV1. Repeat a note and **very** slowly push the mod wheel. First you will hear the pitch dropping and crossing 0Hz (the upper path in the image), then ENV3's decay getting long enough to make itself noticed (middle path). Ctrl A messes with the keyboard range (lower path) – try playing extreme notes.

- White and Pink noise are mixed in Filter1 with a low Gain and a little Resonance. Its LP6 output forms the high-frequency component of the initial hit…

- Reload *Noisefloor Toms* and turn down OUT1 Volume to isolate the darker noise layer and "noise floor", which is highly velocity-sensitive. ENV2, with its 'Velocity' control set to 90%, is not only used as the envelope for OUT2, but it also modulates Filter2 Cutoff over a 150 semitone (!) range. As Filter2 is in 'Offset' mode, it adopts all cutoff modulation from Filter1, including 'Velo'. To compensate for so much positive modulation, Filter2 cutoff has a lot of negative offset (-66.00).

  ENV2 is also quite short and has zero Sustain, but the F/R setting (+10) causes the level to rise slowly up to 30.00, the value of the Range parameter. Try higher F/R.

Punkussion

Digital percussion à la Waldorf Attack (remember that?), with different sounds per note. The plan was to set up a simple FM patch and have both maps ('key' mode) offset the most dramatic parameters, starting with random data which could be optimised later.

One target parameter per map wasn't enough…

- Map1 has 4 duties:

  - it offsets Filter1 Resonance
  - in Multiplex1, it crossfades between the signals modulating OSC1 frequency ('lin 1kHz')
  - via Multiplex3 and CV1, it offsets ENV1 and ENV2 rates (Rate Mod)
  - it pans OUT2

  Map2 has 3 duties:

  - it offsets OSC3 frequency ('lin 1kHz')
  - via Multiplex2 it determines how strongly OSC1 phase-modulates OSC2
  - via Multiplex3 then CV1 it offsets ENV1 and ENV2 rates (Rate Mod)

  None of this was planned in detail. It evolved by trial-and-error.

- OSC1 and OSC2 indirectly modulate each other, and *modulation feedback* is the ultimate cause of the chaos. Follow the cables: OSC1 via Multiplex2 modulates OSC2 Phase (classic "FM"), while OSC2 via Multiplex1 modulates OSC1 frequency (linear FM).

- The audio routing is easy to follow: OSC1 goes to Filter1, which has a high Gain setting and a noticeable amount of Resonance. ENV2 is the "contour" modulating its cutoff (more about ENV2 in the next bullet point). The 3-pole lowpass and bandpass signals are sent on to Filter2, which also has high Gain but less resonance. It is mainly for over-drive… until you push the pitch bender!

- Multiplex3 offsets the length of each note by modulating ENV2 rate. The source signals are the two maps plus double-strength mod wheel, so each note gets a fixed length which increases when you push the wheel.

- Multiplex1: OSC2 and OSC3 are cross-faded by Map1. ENV3 is patched into both sides of Multiplex1 and both knobs are at maximum, so Map1 has zero effect on the amount of ENV3 modulating OSC1 Phase. It is simply a convenient method of injecting a third sig-nal in addition to those being crossfaded. That third signal is amplitude-modulated by Ctrl A, however (see ENV3 Amp Mod) – try it. On second thought, why not try performing with both wheels and Ctrl A, all at the same time!

Silver Tablet

A failed attempt to imitate Tablas, but fun anyway. Play staccato for a ringing effect.

- Try various notes across your keyboard. There is a "C" below which the notes obviously bend and are way out of tune. I like to play this patch around that particular C, plus a few octaves higher. Thanks to microtuning, black notes a tritone higher are the same.

- OSC1 and OSC2 modulate each other's frequency ('lin 100Hz' mode), which causes the lower notes to bend due to the feedback. ENV2 modulates their volumes.

- In an early version I used LFO1 as a sub-oscillator. As OSC3 was available, I used that instead, added OSC4 for the extra metallic "ring" (see OUT2) and appended "Silver" to the name. Map1 modulates OSC4 PD, picking out different harmonics per note.

- Filter1 damps the sound considerably – try turning Cutoff up, but mind your ears. Cutoff is also modulated a bit by Pressure via ultra-smooth lag generator – hardly worth it…

Splash in Time

I made this patch after describing *06 Keys / HS Abominatron***,** which got me thinking more about stacked filters. This is also 3-voice unison, with each voice connected to all 4 filters for a total of 12 bandpass filters per note. *Splash in Time* is rather CPU-hungry! If you are having trouble, try switching off [HQ], activating [MC] and/or reducing the number of Voices to 6.

Back to the analysis…

- OSC1 is set up as a noise generator – it phase-modulates itself. I could have used regular white noise instead, but oscillators don't need a Multiplex for amplitude modulation. OSC1 is amplitude-modulated by ENV2, and the trigger is 'ModSeq2' i.e. Tap4.

- Lots of modulation: StackV (for the all-important offsets) and ModW are mixed in Multiplex1 and sent to CV1, which modulates Filter3 and Filter4 cutoff. Via the blue daisy chain, StackV also modulates Filter1 and Filter2 cutoff – the latter just to make it a bit different from Filter1: In 'Offset' mode, Filter2 adopts all cutoff modulation from Filter1. The effective key follow amount for Filter2 is therefore 97% + 7% = 104%.

- Resonance is balanced across the keyboard, with just enough KeyF1 for the highest notes to "ring". In Multiplex2, the sequencer's pitch data (Tap2) is multiplied with Ctrl A. The result is sent via CV2 to modulate Filter3 and Filter4 cutoff so that they play notes.

- Spring reverb, Delay and Phaser conspire to make this patch even more splashy. Tip: It's usually a good idea to accentuate "to the max" any interesting character you find.

Stanford Marimba

A simpler version of *Wendys Xylophone* (see below) I made after finding some suitable info at the Stanford U website by googling "marimba overtones".

- The description there is simple enough to follow: "The second partial of the marimba is tuned to about a two-octave interval (a ratio of 4.0). The third partial has a frequency around 9.2 times the fundamental (about three octaves plus a minor third above)."

- I took *Wendys Xylophone* down two octaves (global Transpose) then removed OSC4, the 'TapMap' waveform and the individual envelope control. ENV3 was now free to be used for the beater noise (Pink here) instead of Ramp1 and the extra Multiplex.

Timpanum

Synthetic noisy kettle drum.

- Remove the noise component by dragging the blue cables away from OUT1. Filter1 and Filter2 process all 4 oscillators in parallel. OSC1 and OSC3 are both sine waves pitched at 0 semitones, while OSC2 and OSC4 (slightly square) are pitched 10 semitones up. Play a middle C and listen: You should be able to hear a higher Bb…

  Try singing the notes. This should be easy enough despite the various detuning between oscillators (via Modify as well as ENV1) and between voices (see Stack and voice 2 in the STACKED VOICE DETUNING panel, which is set to 0.10).

- Reload *Timpanum* by clicking on the name and selecting the ticked entry. Isolate noise by dragging the green cables away from OUT1 as well as OUT2. White and Pink noise

are mixed in Filter3 and sent to both outputs. ENV3 provides the filter contour, with lots of Velocity, a long 'Decay', long 'Release' and 'Snappy' switched on…

- This little experiment demonstrates what 'Snappy' does: Load *INIT*, connect ENV1 to OSC1's pitch modulation input and turn the amount up to 24. Turn ENV1 'Sustain' down to minimum, play a note and listen to the shape of the envelope. Next, activate ENV1 'Snappy' and notice how it drops more quickly before becoming shallower.

  With 'Snappy' off again, try creating a similar curve using recursive modulation: Select 'Env1' for Rate Mod and set a negative amount.

Wendys Xylophone

I made this patch by following a short YouTube video of Wendy Carlos making a xylophone sound on her Crumar GDS, an additive synthesizer with fairly simple FM capabilites but a price tag approaching $30,000 in 1979. For the geeky details, look up "Bell Labs Digital Synthesizer" and "DK Synergy".

- As the individual partials in the video sounded flute-like, I set all oscillators to a triangle using 'TapMap1' (see Map1) instead of the usual 'Cosine'.

- Each oscillator was then tuned to the pitches in the video: a major 3rd, a major 7th and a well-sharpened 4th above the fundamental, with various octave offsets via 'Multiply'.

- Each oscillator gets its own envelope, and ENV1 also serves as the overall amp envelope (OUT1 and OUT2). For a more percussive decay, all envelopes are set to 'Snappy'.

- Couldn't find any details about the GDS "shake" parameter (my guess is self-FM noise), but in the video it sounded close enough to a burst of white noise, so I just used that.

- The mod wheel should do something interesting in every patch… a warbling vibrato is appropriately cheesy for this one. You can adjust LFO1 Rate to slow it down a bit.

Zap Drum

Does this simple sound really need all those cables?

- Isolate OSC1 by turning OUT2 Volume down to minimum. +5V is lagged and sent to modulate OSC1 pitch in two different ways. Follow this little experiment:

  Load *INIT* and turn OSC1 PD up to 50. Connect +5V to OSC1's phase modulation input and select 'rel coarse' mode. While holding a note, slowly turn OSC1 phase modulation down… at -20.00 it will cross zero Hertz. Leave it at -20.00, insert a lag generator between +5V and OSC1 phase modulation, then repeat a note while turning the lag's Attack ('A') up. Try all values, then leave it at 5.00. For a mellow "heartbeat" sound, turn OSC1 PD back down to zero.

  Now switch OSC1 Tune mode to 'Overtone' and turn the knob way up. However high you set that knob, the frequency of any note always falls down to 0 Hz. Adjust the Attack of the lag generator to taste. So that's your basic "zap".

- Reload *09 Percussion / HS Zap Drum*. Filter1 Gain is set quite high and the input level from OSC1 is 200%, which results in quite a strong overdrive. Turn Gain way down to appreciate the difference, then click on the [UNDO] button.

- The other layer: Turn OUT1 volume down to minimum, then alternate between low and high notes. Expand Map1 by clicking on its [+] button, play some more and locate the split point… it's at C, MIDI note 72. However, if you edit the value for that note (drag it down just a bit) you will see "**#73**=whatever". The discrepancy is due to the fact that MIDI notes are indexed from 0 to 127 while Bazille's map goes from 1 to 128.

Do you have a MIDI monitor?

Let's see how the keyboard split works: Close Map1 and follow the yellow cables – Map1 negatively modulates OSC2 volume (-80.00) so the high bars will silence that part. At the same time in Multiplex1, it increases the level of white noise and OSC3.

Zap to Bass

A rapid-fire zap which gets nasty if you push either the mod wheel or the pitch wheel. Turns into a simple bass note as soon as you release.

- LFO1 triggers ENV2, which modulates Filter1 cutoff. Filter1 is self-resonating, with the highpass signal used as feedback. Note the minimum Gain setting, which preserves the resonance.

- Filter2 adds a lot of grit (see that Gain setting) while at the same time taming the effect of pushing the wheels. Try removing the blue cable, give it a listen, then click on [UNDO].

- Map1 reduces the playable range to 3 octaves by killing Filter1 resonance. I did that because low notes squealed unpleasantly, and the tail of high notes sounded neither useful nor nice. Even turning Filter1 Cutoff down from 5 to 0 introduces the squeal. You can check by double-clicking on the resonance modulation knob. Turn it back up to maximum and adjust the range to suit your own tastes by editing the map.