

Groove Synthesis

3rd Wave

Wavetable Synthesizer

Californian start-up Groove Synthesis haven't just recreated the PPG Wave, they've made it even better.

RORY DOW

If the picture of this synthesizer is causing you *déjà vu*, it's for a good reason.

The 3rd Wave is a spiritual successor to the PPG Wave 2. Even down to the beautiful blue colour, Groove Synthesis have gone to great lengths to emulate the iconic wavetable synthesizer's sound, feel and good looks. But why stop at a straightforward recreation when you could improve on the old one?

Groove Synthesis are a new company of highly experienced synth builders. Bob Coover, a name you may recognise from his work with Dave Smith on everything from the Prophet-12 to the OB-6, founded the company. The PPG Wave is a dream synth for Bob, and with his new company, his assembled team of synthesis experts and his experience doing DSP for

Sequential, he set about making the ultimate reboot.

Give Us A Wave

The PPG Wave was the first commercially successful wavetable synthesizer, released in the early 1980s. It is revered for its harmonically rich, crunchy, 8-bit sound, and it made a refreshing change from traditional analogue synths. In 2023, if you want to pick one up on the second-hand market, it will be costly. As I type this review, there is one on eBay for £15,000. And, in their old age, they are notoriously unreliable.

The PPG Wave 2.3 (its last incarnation before PPG closed shop and Wolfgang Palm, the designer, went to work with Waldorf) featured eight-voice polyphony, two oscillators per voice, 24dB/octave low-pass SSM filters, 30 wavetables, and even eight-part multitimbrality. The 3rd Wave ups the game considerably with 24 voices. It retains the analogue low-pass filters (using the SSI2140, a modern SSM2040 replacement) but adds a digital state-variable filter. On top of that, there's four-part multitimbrality, effects (two per part), 32 8-bit wavetables, 64 96kHz user wavetable locations, four stereo outputs, oscillator sync, linear FM, an arpeggiator, a sequencer and more modulation than you can shake a mod wheel at.

The striking blue design is, of course, an homage to the PPG, but so are the knobs and the lozenge-shaped buttons that cover the front panel. The build quality is superb throughout, with a five-octave, synth-action keyboard that feels lovely to play. It supports aftertouch, but not poly-pressure, which is a shame, although you can hook up an external poly-pressure keyboard and take full advantage that way. Standard pitch and modulation wheels are joined by over 70 knobs (a mixture of potentiometers and encoders), nearly 40 buttons, and a lovely bright monochrome

display. Overall, I cannot overstate the premium feel.

The basic operation of the synth is done using the many dedicated controls. For any parameters that don't have a button or a knob, you use the screen plus four soft encoders and four buttons that appear directly above and below. Bob Coover's time at Sequential is evident in the design, so if you've used a Sequential synth manufactured in the last 10 years, you'll feel right at home.

Wave Mechanics

A 3rd Wave preset is made with up to four parts. Each part is a sound comprising three oscillators, filter settings, modulation, effects, etc. Parts have volume and panning and can be layered or key-split. They can even be assigned separate MIDI channels if you want to sequence them individually. With 24 voices, you can sequence four completely different parts and still have six voices per part (voice allocation is dynamic depending on how many parts are active). And, with four sets of stereo outputs, each part can be processed differently using your outboard equipment, in addition to two onboard effects. It's like having four PPG Waves in one box.

A part is made up of three oscillators. Each one can load a different wavetable, unlike the PPG, which had two oscillators which shared a common wavetable. Wavetables can be one of two types — either classic legacy wavetables or one of 64 'User' wavetables. The 33 legacy wavetables are modelled on the original 8-bit tables from the PPG Wave 2.2 and 2.3. In contrast, the User wavetables are all-new, high-resolution, anti-aliased, and sampled at 96kHz. There are 64 User wavetables, 48 of which come pre-filled, and 16 are empty for your own creations, although all 64 slots can be overwritten if desired.

In addition to the two wavetable types, there are seven virtual-analogue waveforms. They include sine, triangle, square, sawtooth, supersaw and two variable noise options. Each oscillator can frequency modulate or hard sync its neighbouring oscillator, although, for some reason, sync doesn't work when using User wavetables. Most of the waveforms can do some waveshaping via the Pulse Width control. These waveforms sound full and convincingly analogue. Even without wavetables, the 3rd Wave makes a powerful polysynth. I spent a fun afternoon making sounds using only these waveforms, and the results were

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PROS

- It sounds awesome.
- A generous 24 voices.
- Old and new-school wavetable technologies.
- Four-part multitimbral with effects for each part.
- Four stereo outputs.
- Superb build quality.

CONS

- If you plan to add your own wavetables, the 16 empty slots may fill up quickly.

SUMMARY

Groove Synthesis bring some Californian surf mojo to the synth world with the PPG Wave-inspired 3rd Wave. It pays excellent homage to that 8-bit wavetable sound whilst elevating it with 24 voices, enhanced oscillators, alternative modern 96kHz wavetables, extra filters, effects, and a sequencer.





Rejoice, as the power supply is built in and requires nothing but an IEC cable. The USB Type-B socket handles USB MIDI and access to the internal flash memory for wavetable audio transfer, OS updates and patch backup. MIDI in, out and thru are on 5-pin DIN plugs. There are one sustain and two expression pedal inputs, an audio input (unbalanced) for recording wavetables, four pairs of stereo outputs (unbalanced) and a headphone socket, all on quarter-inch jacks.

» as good as from any of my dedicated analogue polysynths.

A standard option on modern wavetable synthesizers is waveform interpolation, which smooths the transition from one wave to another. The PPG had no interpolation, but in the 3rd Wave, it is called 'Wave Flow' and has its own dedicated front-panel button. It works on all three oscillators simultaneously. Wave Flow is the key to smooth evolving sounds, which, as it turns out, is something the 3rd Wave is phenomenally good at.

If accurate PPG emulation is your aim, you will have to disable Wave Flow, but that's not the end. There was a PPG feature called the 'upper wavetable'. The last four waveforms in the original PPG wavetables were always triangle, pulse, square and sawtooth. The 3rd Wave hides these last four waveforms by default since they can sound jarring compared to the first 60 waveform positions. When you turn on the upper wavetable, these last four waveforms are exposed, as well as wavetable 30, which has another 64 waveform positions that can be used if you modulate past wavetable position 64. This was how the PPG dealt with modulating beyond the end of a table. So in the quest for perfection, Groove Synthesis have recreated this idiosyncratic feature.

Another option in pursuing an accurate PPG sound is 'Waveform Smoothing', not to be confused with the wavetable smoothing, or Wave Flow mentioned above. The PPG had minor pitch errors from note to note on the keyboard caused by its lack of interpolation. Enabling Waveform

Smoothing will correct these pitches, but anyone looking for the exact sound, warts and all, will want to keep this option disabled. Finally, there is a function called voice drift. Despite being digital, the PPG suffered from oscillator pitch and other parameters drifting over time, and this is now a parameter you can apply per patch.

It should be evident by now that Groove Synthesis have gone to great lengths to get the PPG sound perfect. Multiple elements must be in place if you want an authentic PPG sound: use an 8-bit wavetable, disable Wave Flow, disable Waveform Smoothing, switch the envelopes to PPG mode, increase voice drift, and enable the upper wavetable. You'll also need to load the same wavetable into two oscillators and disable the third oscillator. Thankfully, plenty of presets in the 500-strong factory library recreate famous PPG sounds. And they sound impressively close to the original.

The fact that you can switch these elements of PPG emulation on or off makes everything more flexible. Do you want a PPG sound with exponential envelope shapes instead of more linear PPG ones? No problem. A PPG sound but with all pitch instabilities fixed? No problem. Or even a modern 96kHz wavetable with all the pitch instabilities of a 40-year-old instrument. I love this approach to emulating old gear because it allows you to cherry-pick the bits you like best.

Modulate Me

Of course, wavetables are nothing without modulation, and the 3rd Wave certainly delivers. The Wave Envelope is a six-stage

loopable envelope generator primarily designed to sweep through the waveforms in a wavetable. There are three per part (one for each oscillator), but you can assign them to other destinations in the 16-slot modulation matrix.

Another source dedicated to traversing wavetables is the Wave Surfer, a solid Californian name if ever I heard one. Wave Surfer is the largest encoder on the front panel. It allows you to sweep through the wavetables of all three oscillators at once. The effect is like a tone control for the preset, simultaneously changing the starting point of all three wavetables. It's a brilliant idea, and I found myself constantly using it to explore alternative timbres of any patch I had loaded.

You can assign plenty of traditional modulation sources to wavetable scanning or anything else via the modulation matrix. These include four DADSR envelopes, switchable between exponential and PPG (more linear) modes. There are also four LFOs with 10 waveforms, delay, reset and optional tempo sync. With four-part layering, that's a potential of 16 LFOs, and 19 envelopes per patch. And there are the usual MIDI sources, velocity, pressure and expression pedals. Mind-blowingly complex patches, anyone?

Two interesting modulation sources are barely mentioned in the manual, 'Audio In' and 'Audio Out'. Audio In allows you to use the audio from the input jack on the rear of the unit. Audio Out, similarly, is the final mixed audio generated by the synthesis engine. You can even use the oscillator signals as a source. Interestingly, all these audio-rate modulation options are really happening at proper audio rates. Many synths downsample their modulation, running it at a slow sample rate in order to save CPU, but the 3rd Wave runs its matrix at audio rates.

I also like the ability to modulate all the Wave Envelope segments' positions and times. Imagine a complex envelope with the height of each point moving with the help of an LFO or two. There are enough modulation options in this synth to keep the most adventurous sound designer busy for a very long time.

Making Waves

Creating your own wavetables has traditionally been a mind-numbing affair capable of reducing any grown adult to tears. To save your mind and your tears, Groove Synthesis have included the Wave Maker, which analyses audio and creates a wavetable. Instead of being a separate piece of software, Wave Maker is built directly into the synth. You can record audio from the rear-panel audio input jack or copy a WAV file to the internal flash memory via USB. Wave Maker will analyse the file and attempt to extract 64 waveforms.

Getting a good wavetable from a piece of audio can be hit-and-miss. Groove Synthesis recommend tuning audio to 93.75Hz (MIDI note F#1). This is equivalent

to a single-cycle wavelength near 1024 samples, the period length that the 3rd Wave uses. If your audio isn't tuned to this frequency, you can have Wave Maker try to pitch-shift it first. Then you adjust the sensitivity level, which will alter the level of timbral changes that Wave Maker looks for in the file. The push of a button is all that's left to create your custom shiny new wavetable.

Although Wave Maker is fun to play with, you may wish to import wavetables you've downloaded from the Internet or made yourself using software like Xfer Records Serum or Kilohearts Phase Plant. The 3rd Wave requires a WAV file at 96kHz, 1024 sample wavelength, with 64 waves per wavetable. Serum wavetables use a 2048-sample waveform, but I converted some that I have created over the years, and I can confirm they sound fantastic played through the 3rd Wave. Groove Synthesis tell me they are working on an update to Wave Maker that will allow direct import of Serum format wavetables without the need to convert. That should be a real timesaver.

My only complaint is that there are only 16 spare wavetable slots. With so many free wavetables available online, it would be easy to add hundreds. You can overwrite the 48 factory-supplied User wavetables, allowing for 64 total writeable locations, but that would change the character of many factory presets, so it's not an ideal solution. One potential workaround is to export the user wavetables and import a different set, which is easy to do via the USB flash drive, but I still wish they'd included more slots.

The Other Stuff

It is proper to get carried away talking about wavetables, but the 3rd Wave has plenty more to offer. The 24 analogue filters (one for each voice) sound superb. The filter saturation sounds excellent, and there is switchable resonance compensation and dedicated envelope and velocity front-panel controls. The analogue filters self-resonate too, which is a nice bonus.

A digital state-variable filter opens the sonic palette further. Mode is variable between low-pass, notch/band-pass and high-pass. There is no way to change the »

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■ The 3rd Wave is a substantial instrument, measuring 976 x 362 x 136mm, and makes a strong case for blue becoming the official colour of wavetable synthesis.

» routing, but I didn't find that a problem. The digital state-variable filter is always first, followed by the analogue low-pass. Unlike the analogue filter, the digital one does not self-resonate.

If, like me, you were raised on '90s dance music, you'll appreciate the Unison mode, which also offers a Chord Memory function for all those Detroit stabs and rave pads. Unison can be enabled per part, allowing you to detune up to 24 voices. I was almost scared to try the full 24, but, in reality, you don't hear much difference after about six voices. Using Chord Memory is simple: hold a chord and press the Unison button. Then any key you press will play the chord transposed. The Chord Memory is saved with the patch, which is a nice touch.

Each part can have two active effects. There are three types of delay (BBD, Tape and Stereo), three reverbs (Room, Hall and Superplate), chorus, phaser, flanger, ring modulator, Leslie speaker and distortion. With four parts and two effects per part, there is potential for eight active effects in any patch. Some effects use more processing power and, as a result, cannot be used in specific configurations. In practice, I found this wasn't an issue. Only the most insane patch designer would want to run eight hall reverbs simultaneously.

There are only two parameters for each effect on the front panel, but some effects

have more options once you open their on-screen editors. An optional limiter can also protect the signal from clipping going into the effects. I didn't notice any of the internal effects clipping during my testing time, so I didn't feel the need to use it. But it's a nice option to have.

The quality of the effects is good. They don't match the main synth engine's quality and obsessiveness, so most patches sounded better when treated by external, high-quality effects. Of course, that is true of almost every synth with onboard effects, but it seems more noticeable here because the dry synth sounds so damn good.

Like the PPG Wave, the 3rd Wave comes with an arpeggiator and sequencer. The arpeggiator is fairly standard with its modes (up, down, random, etc.) and octave range. It can be sync'd to tempo, and there's a hold function if you like to have both hands free for expert knob twiddling. It gets interesting when layering parts. Each part has its own arpeggiator, which means you can layer up to four different sounds, each with different settings, panning, effects... The results can send notes cascading into the darkness for days.

The sequencer is perfect for those who like to get ideas down fast. A sequence comprises 24 patterns with up to 32 measures (or bars) per pattern. You can even record parameter automation.

Patterns can then be chained in a playlist, or 'Song', with repeats.

The sequencer works like a MIDI loop. You set the length of a pattern, then record and overdub (with the aid of a metronome if required) to your heart's content. You can record parts separately in different 'tracks' within the pattern. Any knob twiddling will be recorded into the pattern as well. If you make a mistake, you have to record again, although an erase button will work whilst you hold the button, so if you time it well, you can rub out the occasional duff note.

One nice touch is that the quantise function works 'live' on playback. You can record unquantised and then experiment with quantise values afterwards to see how they sound. If you don't like them, spin the knob back to 'off'. Once you have a good pattern, you can duplicate it to overdub additional notes or automation and chain the results into a song. I like the 3rd Wave sequencer. It's unfussy and very usable, and you'll never lose a killer chord progression waiting for the DAW to boot up.

Conclusion

I'll cut to the chase. The 3rd Wave might be my favourite synth released in the last 10 years. Allow me to explain why.

There are four main areas where a synth can fly or fall. The first, and arguably most important, is the sound. In this regard, the 3rd Wave does not disappoint. The sound is classy, expansive and detailed. At the risk



of sounding like a hi-fi salesperson, the highs are intricate with no harshness, and the low end is well-balanced and capable of shaking the windows if required. The PPG emulation side is impressive too. Groove Synthesis' dedication to nailing the exact sound is remarkable, right down to the tuning peculiarities and low-end imaging problems found in the original.

The PPG obsession is only half of the story. Using the high-resolution 96kHz wavetables, triple oscillators, extra filters, FM, hard sync, modulation capabilities and four-part layering, you can go way beyond anything the PPG could do. Whether complex, ever-evolving textures, expansive pads, classy polysynths, layered arpeggios, simple analogue recreations, digital basses, FM pianos or CS-80 brass emulations — the 3rd Wave does them all and remains elegant and convincing throughout. In the sound department, the 3rd Wave is a resounding success.

The second area that can let a synthesizer down is the user interface. Once again, we're in good hands. The 3rd Wave is so easy to use that you barely have to read the manual. There are controls for nearly everything, and no dual functions, shift-clicking or menu-diving (well, maybe a bit, but only for rarely used settings). The 3rd Wave is a proper synth with proper controls.

The third potential downfall for any synth is power, or lack of it. You'll

ALTERNATIVES

The closest synth to the 3rd Wave currently in production is the **Waldorf M**, which I reviewed in April 2022 (www.soundonsound.com/reviews/waldorf-m). The M is a recreation of the Waldorf Microwave, the synth Wolfgang Palm worked on after the PPG Wave when PPG closed their doors. Like the 3rd Wave, the M offers 8-bit wavetables alongside analogue filters. It is only eight voices, but it's a desktop unit, which might suit anyone who doesn't need another keyboard.

Otherwise, the **UDO Super-6** might be worth a look (www.soundonsound.com/reviews/udo-audio-super-6). It is modelled very loosely on the Jupiter-6. Although it doesn't use traditional wavetables, it does offer digital oscillators with many waveforms, 12 voices, analogue filters, and a similar only-the-best-will-do approach to the design and manufacture.

know the struggle if you have used a four- or six-voice synthesizer. It doesn't matter how great the synth sounds; if it suffers from voice-stealing, it can certainly spoil the mood. With a massive 24 voices, four parts, a stereo output for each part, and dedicated effects per part, the 3rd Wave can effectively work as four 6-voice synthesizers, two 12-voice synths, or a single 24-voice monster. Groove Synthesis could have stopped at eight or 12 voices, but they didn't. Once again, the 3rd Wave knocks it out of the park.

The fourth and final area where a synth can fail is build quality, and, once again, the 3rd Wave lands in the top tier. It looks fantastic, the materials are premium, the aluminium casing curves in all the right places, and everything feels rugged and well-built.

The 3rd Wave scores top marks on every single aspect by which I can judge it. The only elephant in the room is the high price, but considering the no-compromise approach that Groove Synthesis have taken, I can't fault it for being expensive. And it's still considerably cheaper than eBay's £15,000 PPG Wave. I know it's only February, but my money is on the 3rd Wave winning best synth of 2023. **///**

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