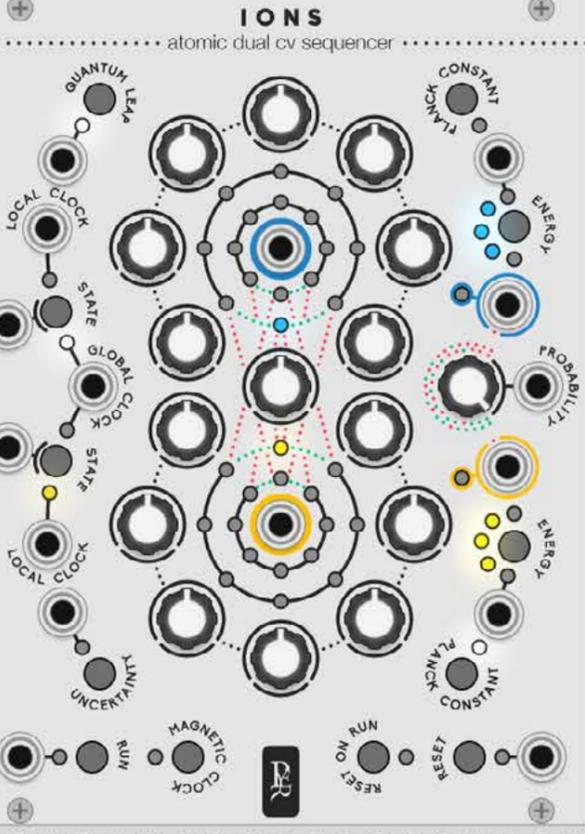
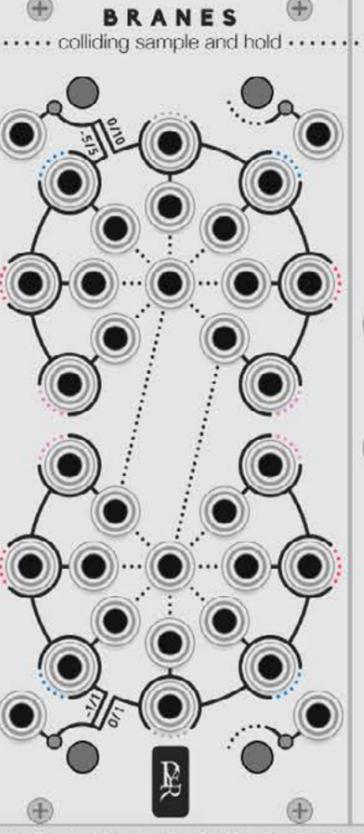
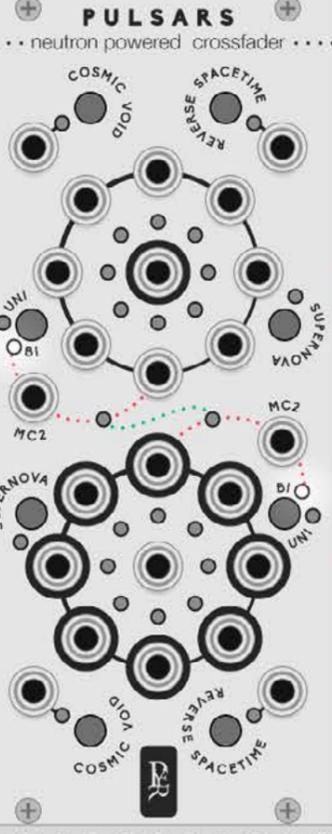
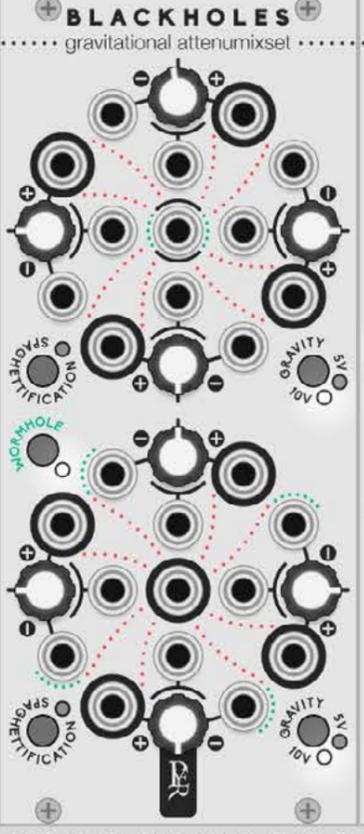
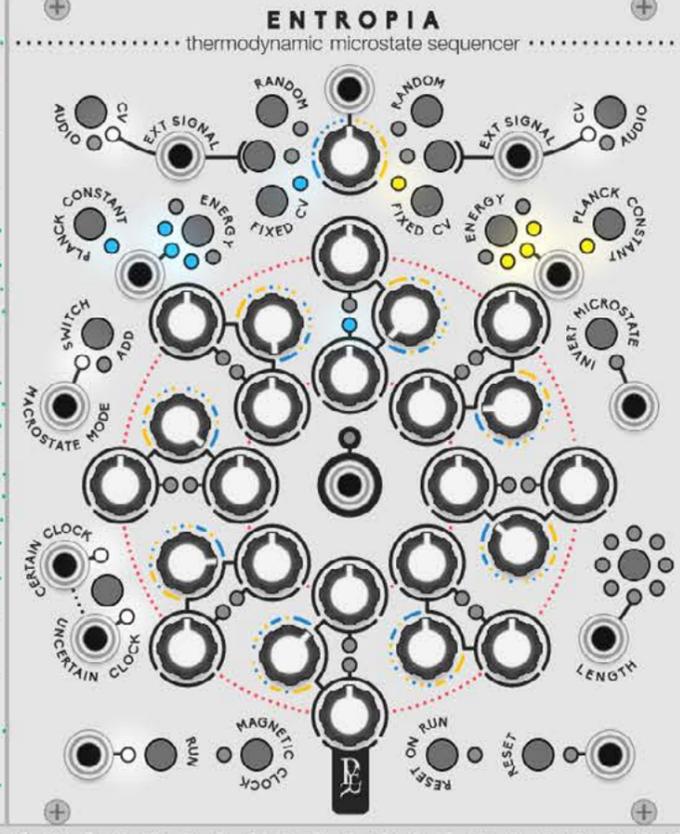
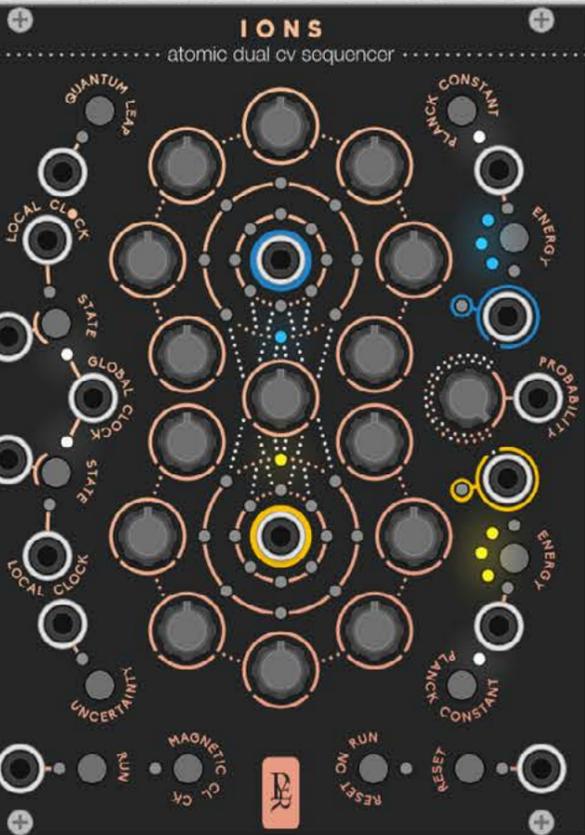
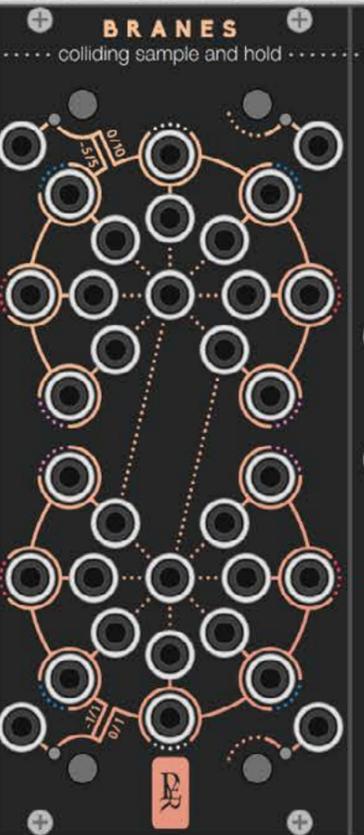
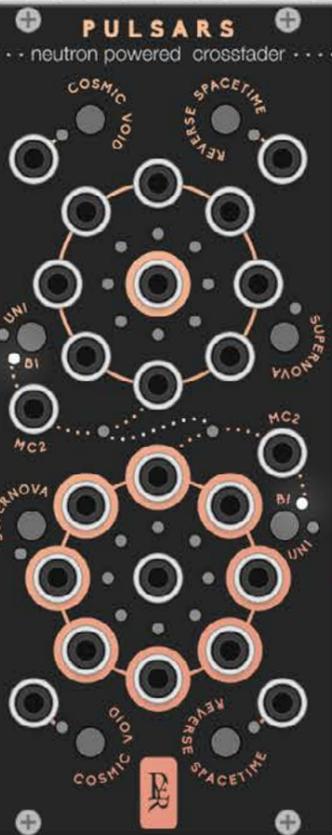
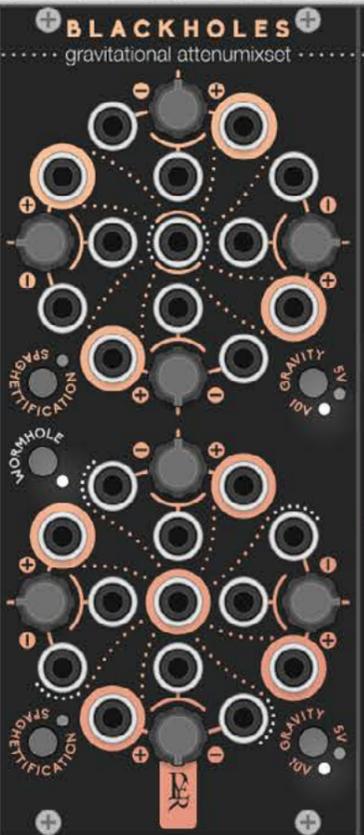
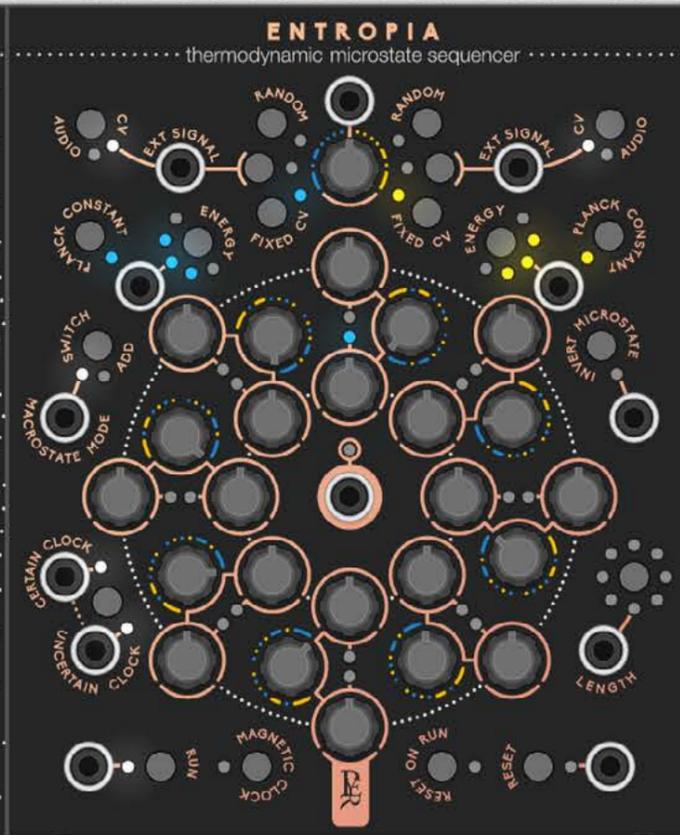
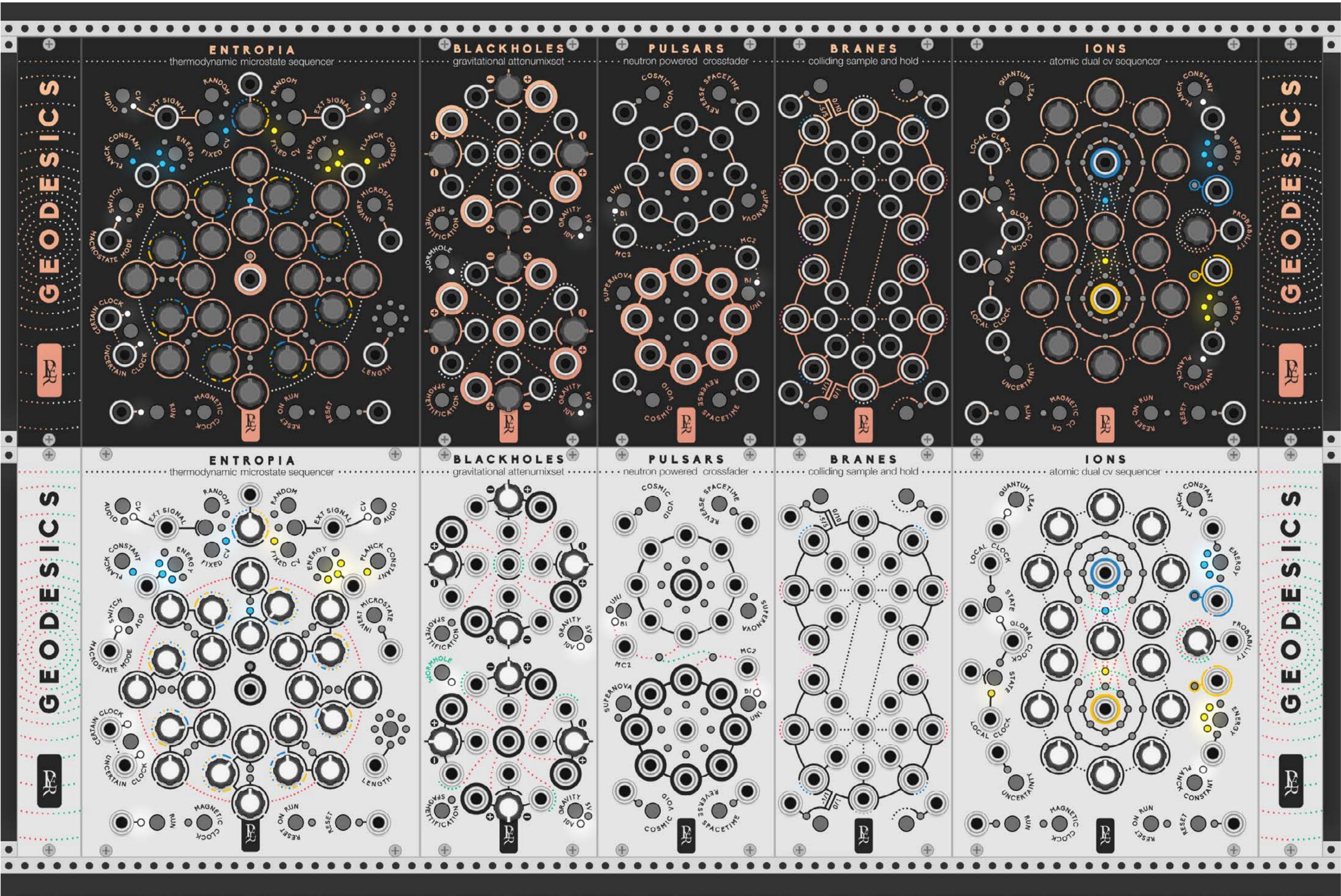


# GEODESICS

A modular collection for VCV Rack by Pyer & Marc Boulé



User Manual - version 0.6.6



# PHILOSOPHY

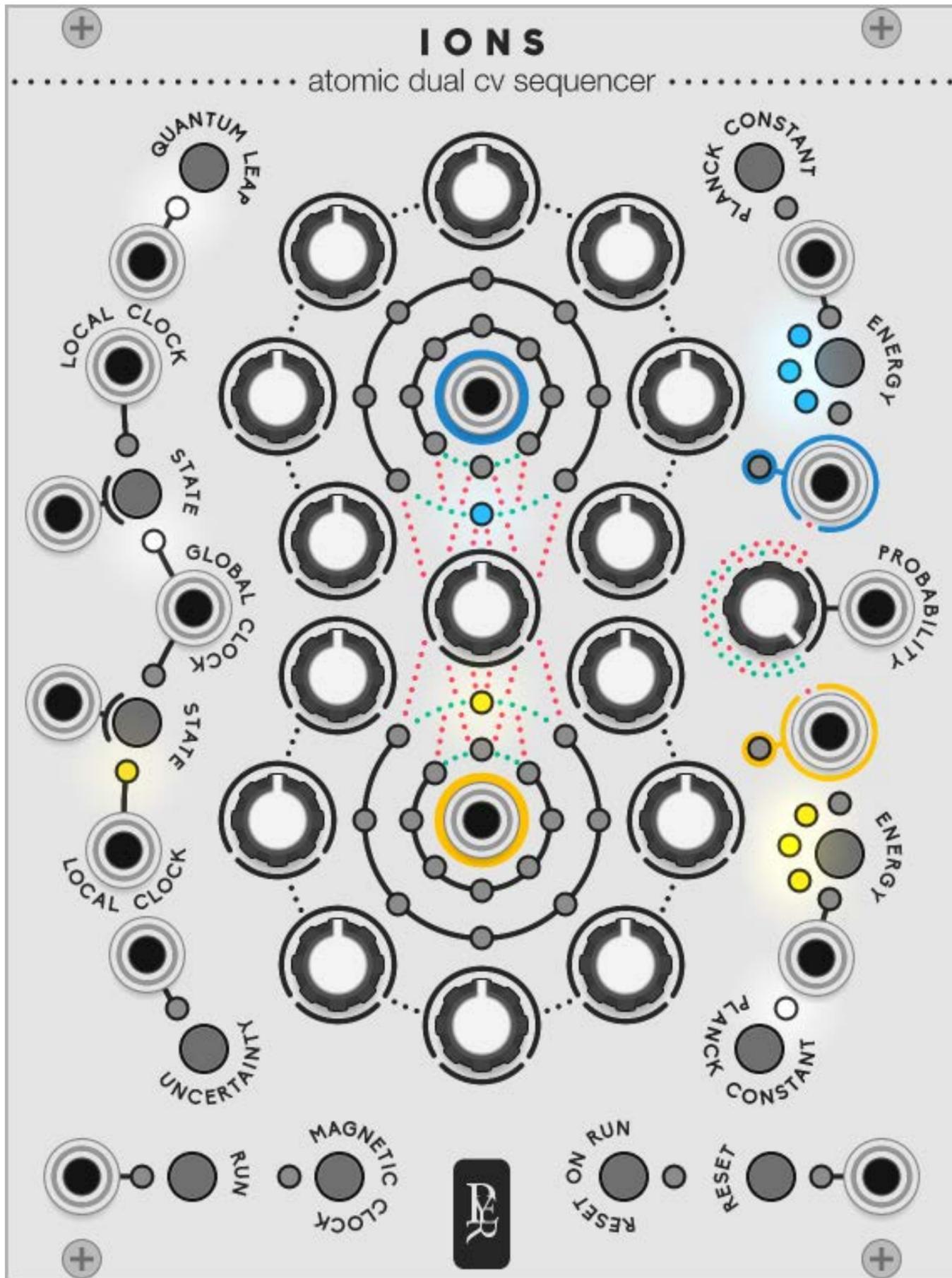
science inspires music

The modules are loosely inspired by astronomic events and physical theories. The goal is just to see how science can inspire us to create new music.

Every module is feasible in the hardware world, interacting elements are only knobs, buttons, LEDs and serigraphy. there is no right click option other than skin change.

For a more immersive concept, every parameter displayed uses terms related to the scientific phenomenon that inspires the module. It might be confusing at first but that's why this manual is here. As every unusual musical instrument, a learning curve is required to make the best of it.

While a lot of advanced science is involved, the final purpose is to create musical and creative instruments, effective and friendly to use.

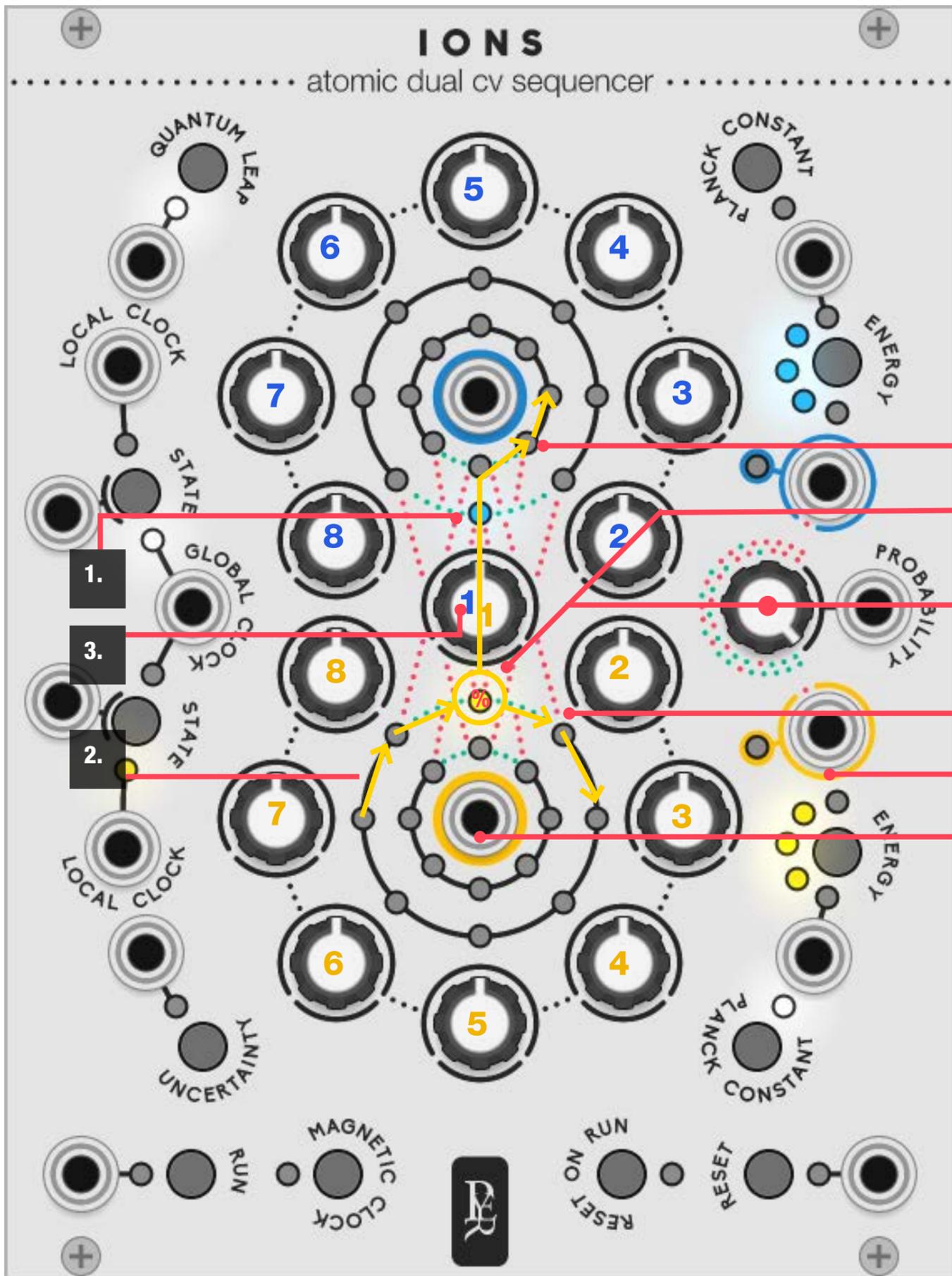


# IONS

atomic duophonic voltage sequencer

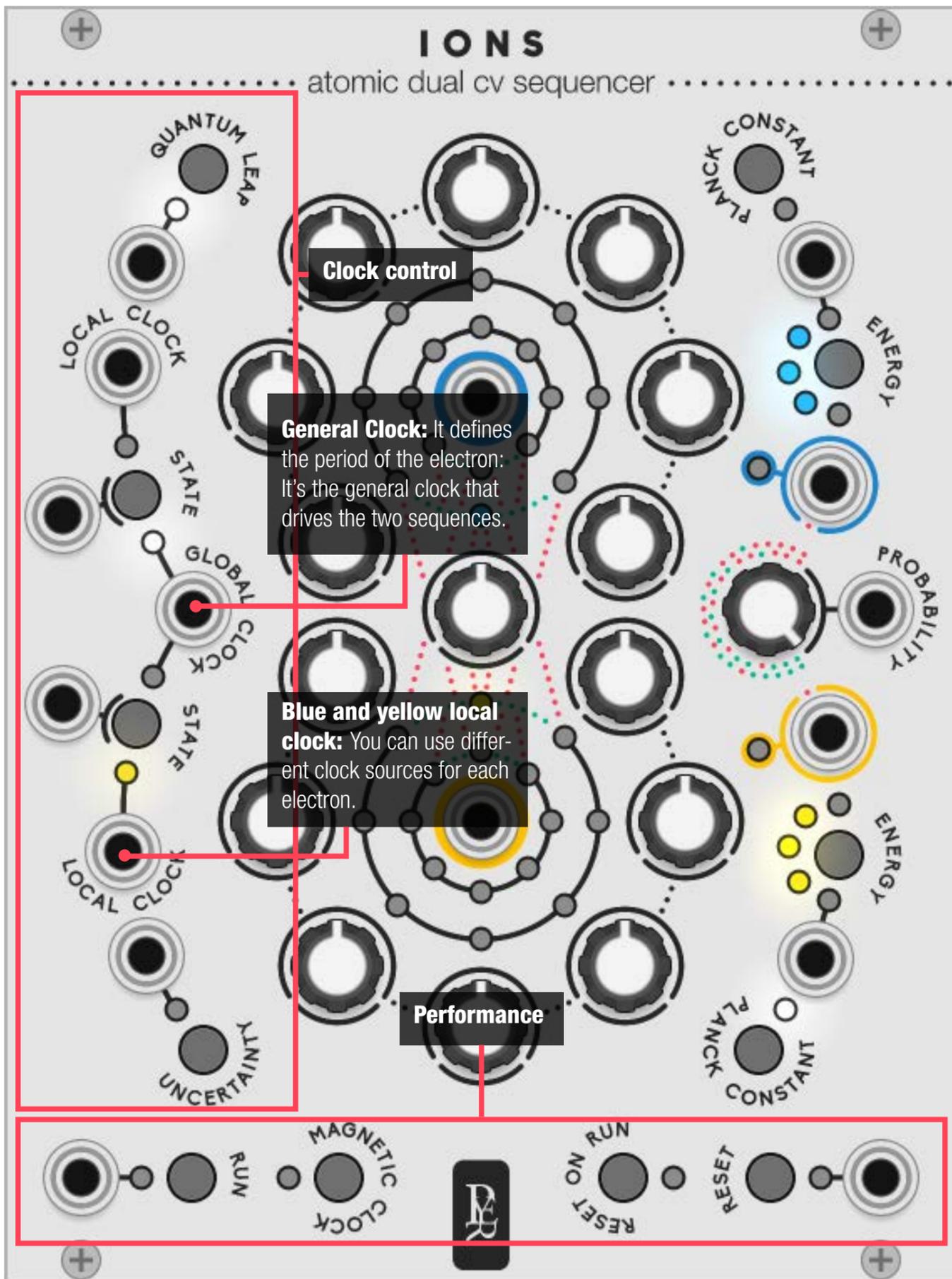
An Ionic bond describes two atoms that exchanges electrons.

**IONS** is a two voices sequencer. While each voice has its own sequence, they can exchange their sequences as easily as an electron can jump from one atom to another.



### How it handles the sequence

1. The two CV voices are the blue electron and the yellow electron, they each gravitate around their blue and yellow core (CV OUT).
2. The electrons are both cycling through their own 8-step sequence.
3. They share the first step of their own sequence.
4. Each time they pass through step 1, they have a **probability to switch to the other core** and run on through the other sequence. The electron still emits from its original output, but it steals the notes from the other sequence.
5. The probability to switch is controlled by the probability knob. And can be automated. While they share the same probability knob, they don't have the same engine, so they might be both together on the same core.
6. With a **probability of zero**, they will never switch and always stay a proper 2 voices **8 steps seq.**
7. With a **probability of 100**, they will always switch and always stay a proper 2 voices **16 steps seq.**
8. A trigger is emitted each time an electron jumps from one atom to another.
9. The Core is always linked to the original electron. The yellow core is always emitting the CV values that the yellow electron is passing through, even when it gravitates around the blue core.



### How it handles the clock:

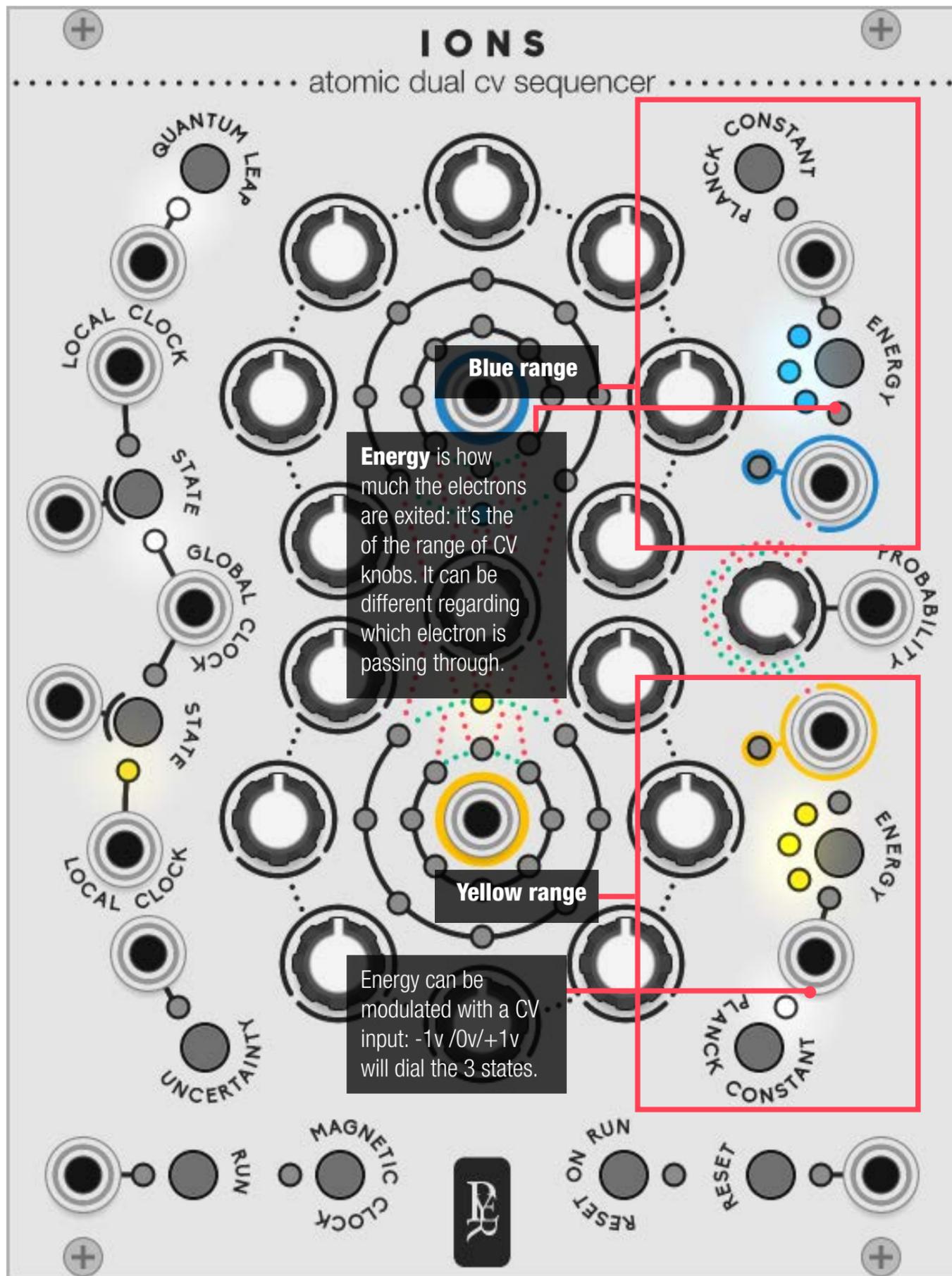
IONS does not have an internal clock. You can use a clock for driving both sequencers at the same time, or a different clock for each sequencer ... or both at the same time.

**The State button:** in our world, nothing can be two opposite things at the same time. But in the quantum world, an electron can have one status, or another ... or both at the same time.

The state button cycles between 3 stages: each electron can be driven by the global clock, or their own clock ... or the addition of both, for polyrhythmic effects.

**State Mod** can be modulated with a CV input: -1v will use the local clock. +1v will use the global clock. Anything in between will use both clocks

**The magnetic clock** will excite the electrons in an alternative way: It's a manual clock. It is active when the experiment is not running, to set the CV value step by step. It is also active when the experiment is running, to interact with the sequence manually, adding a bit of human mess.



## How it handles the CV values:

**Energy** is the range of the CV knobs. Each electron has its own energy setting. When passing through a CV step, the blue electron can interpret the value with a different range than the Yellow one would do if it passes through the same step. The behaviour of energy is depending on the Planck constant.

**The Planck Constant:** In 1900, Max Planck discovered that the electrons were not sharing energy on a smooth and continuous way, but by very small bits: "quanta". The Planck mode will quantise the CV output and modify the energy behaviour.

When the **Planck constant is OFF**, IONS is a smooth CV sequencer with Energy defining the range of CV:



-/+ 1 volt



-/+ 5 volts



-/+ 10 volts

When the **Planck constant is ON**, IONS is a chromatic sequencer with Energy defining the range of CV:



1 octave

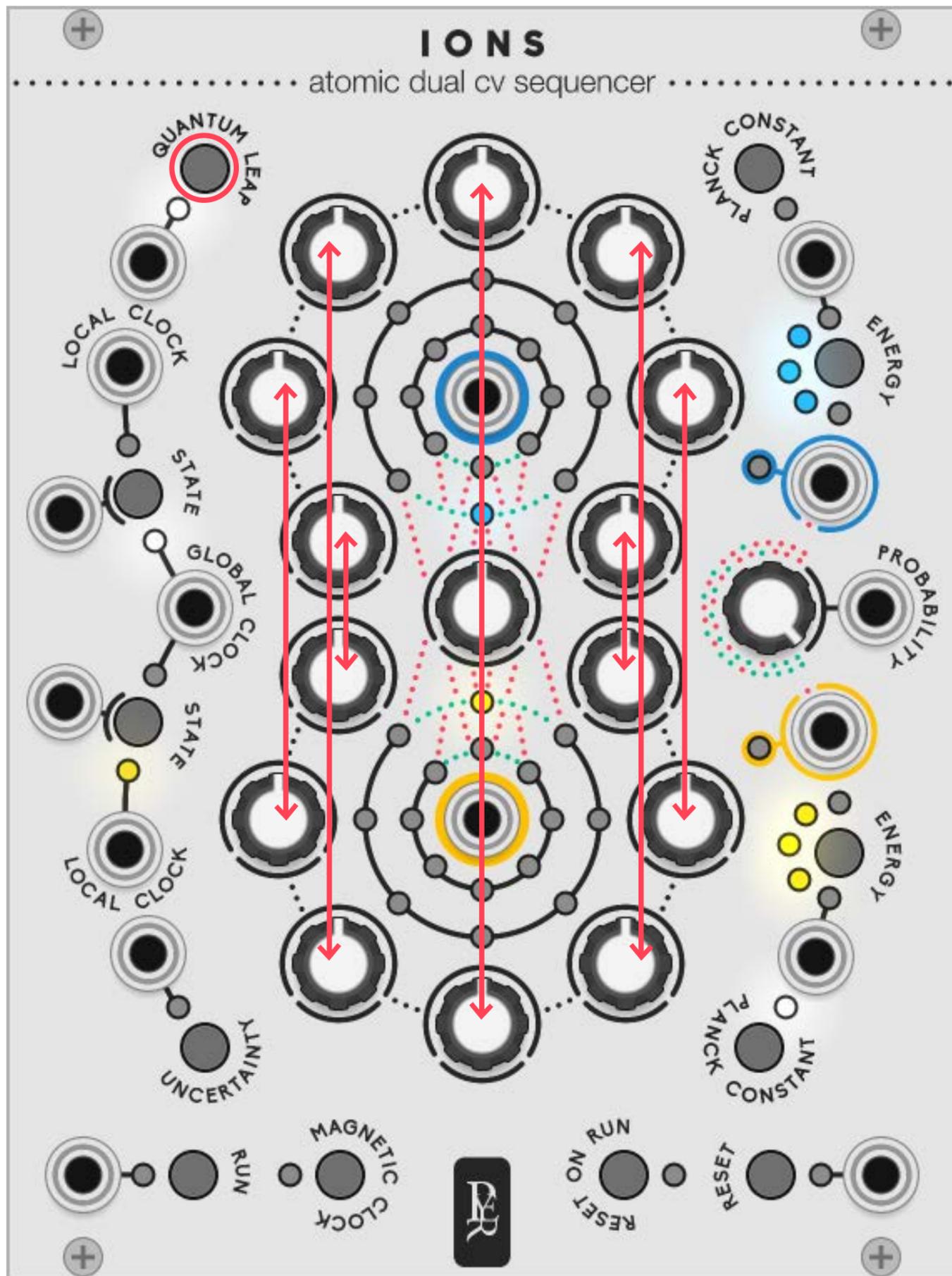


3 octaves



5 octaves

The planck constant can be set for each channel separately to generate both a melody and a free CV sequence at the same time.



## Alternate Modes

**Quantum leap** introduces a strange effect from quantum physic. Every step can be a gate to switch to the other core. By a smart automation of the probability knob, you can run an 8 step seq and decide to steal some notes from the other seq to have some variations.

**Uncertainty principle.** In quantum mechanics, Heisenberg discovered that there is no way to know with certitude both the speed and the position of a particle. Uncertainty will add different flavours of randomness in the position of the electron.

- Every trigger sent by the local clocks will move the electrons forward on a random number of steps (small values are more likely, for musical purposes).
- Every trigger sent by the reset button will place the electrons in a random place in the sequencer.
- Every trigger sent by the global and magnetic clocks will continue to work normally, one step at the time.

With Uncertainty mode ON, 4 levels of randomness can be achieved:

- **Order:** using only the global clock will move the electrons on a regular step by step way.
- **Casual random:** using both global and local clock input, with a regular clock on global and an occasional clock on local (divided, gate sequence or even manual trigger) to have some random jumps in a regular sequence
- **Linear random:** using only the local clock to have a forward random walk.
- **Chaos:** sending a clock into the reset input to have a complete random sequence. In this case, the jump probability becomes useless.

# GEODESICS

A modular collection for VCV Rack by Pyer & Marc Boulé

Geodesics has been created in July 2018 by **Pierre Collard** (industrial and graphic designer based in Brussels) and **Marc Boulé** (developer and creator of Impromptu Modular based in Montréal).

Just like many projects within VCV Rack, Geodesics is also a community effort and it would not have been possible without the help of many users, composers and developers participating one way or another to enhance the quality of the project.

Amongst them we would like to address a special thank to those who helped us in the beta testing phases, who made tutorials, who proposed their help in any way and those who brought the collection to life with some great pieces of music: **Omri Cohen, Georg Carlson, Xavier Belmont, Steve Baker, Marc Demers, Adi Quinn, Ben De Groot, Latif Karoumi, Espen Storo, Synthikat, Dave Phillis, Carbonic Acid, Martin Luders, Ghaleb, Stephen Askew, Lars Bjerregaard, Richard Squires, Lorenzo Fornaciari, Adi Quinn, NO rchestra, Pobox23 and Ananda Bhishma.**

## Geodesics links

[www.pyer.be/geodesics](http://www.pyer.be/geodesics)

[vcvrack.com/plugins.html#Geodesics](http://vcvrack.com/plugins.html#Geodesics)

[github.com/MarcBoule/Geodesics](https://github.com/MarcBoule/Geodesics)

## Creations from composers using Geodesics:

[https://www.youtube.com/playlist?list=PLEh-5QLxa-](https://www.youtube.com/playlist?list=PLEh-5QLxa-BlqLI9rBcncUTFm2Lk-ZMgvZ)

[BlqLI9rBcncUTFm2Lk-ZMgvZ](https://www.youtube.com/playlist?list=PLEh-5QLxa-BlqLI9rBcncUTFm2Lk-ZMgvZ)

## Tutorials on Geodesics by Omri Cohen:

[https://www.youtube.com/playlist?list=PLEh-5QLxa-](https://www.youtube.com/playlist?list=PLEh-5QLxa-Blr4dsurkkwUehFsNI7T_Jv-)

[Blr4dsurkkwUehFsNI7T\\_Jv-](https://www.youtube.com/playlist?list=PLEh-5QLxa-Blr4dsurkkwUehFsNI7T_Jv-)

## Marc's work links

[github.com/MarcBoule/ImpromptuModular](https://github.com/MarcBoule/ImpromptuModular)

## Pierre's work links

[www.pyer.be](http://www.pyer.be)

