

Massachusetts Geophonic

Arvid Tomayko – arvidtp.net

Massachusetts Geophonic is a performative interactive piece that uses data from the USGS Massachusetts geological map as a palette with which the performer can create music – music from geologic data.

The software will be available for download from arvidtp.net soon for both Mac and Windows.

The map of Massachusetts shows various layers of geological data:

- Bedrock Type
- Bedrock Age
- Faults
- Surface Covering
- Surface Covering Depth
- Gravity anomaly (which is a measure of the density of rock beneath the surface)

The check boxes turn on or off the effect of each of these layers of data on the sound produced.

The four colored lines represent transects or paths through the map that you can move – either by dragging the endpoints or the entire line. Musically, they're loops with a playhead that travels along them over and over again. The geologic data under this playhead at any given time determines the sound that's produced. Generally, a playhead will play a note when it crosses a boundary into a new type or age of rock, but a playhead can also be set to sample the data underneath it at specific intervals so that it plays notes in a rhythmic pattern.

The Master Length determines how long the loops are – and hence how quickly the music repeats itself.

Each loop also has its own controls. There are four sets of controls, corresponding to the similarly colored loops. These allow you to

- play or pause the loop
- reset its playhead to the beginning
- change the speed of the loop relative to the Master Length (or even reverse it)
- play notes either at geologic contacts, or in a rhythmic pattern
- setup up to two concurrent rhythmic patterns
- transpose the pitch of the notes

- change the mapping curve of bedrock age to pitch

Below each of the control sections is information showing the bedrock type and some of its geologic attributes, as well as its age in “Millions of Years Ago” and what the surface covering is like in that area. You can click these text fields to google the term.

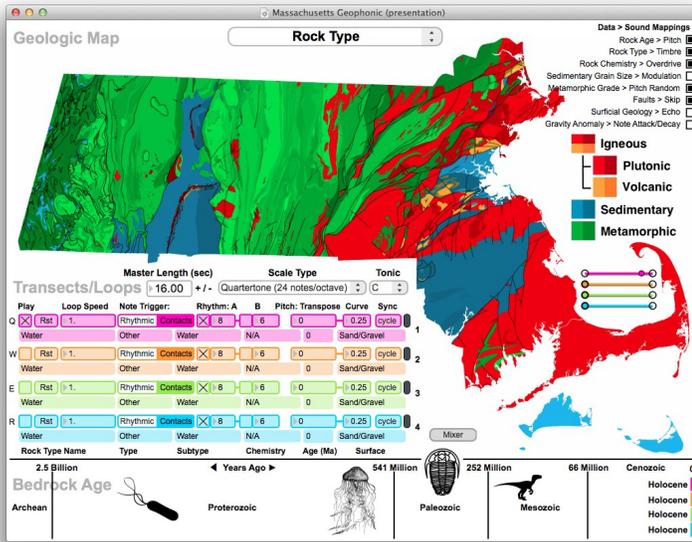
Additionally, the piece displays bedrock age in the timeline at the bottom, with a colored bar corresponding to each loop on the map. Note that the time scale is not linear... some of these rocks are very, very old.

The basic data mappings are as follows:

- Rock Age determines pitch, and also when to play notes in “contacts” mode. You can choose a musical scale and tonic to map the rock age to.
- Rock Type (sedimentary, metamorphic or igneous) determines timbre, or instrument type, for each note:
 - Sedimentary rocks are noisy, percussive sounds
 - Metamorphic rocks are a saw wave
 - Igneous rocks are represented by a resonant filtered oscillator.
- Rock chemistry (mafic to felsic) determines note overdrive
- Grain size determines tremolo or modulation for sedimentary rocks. You can see this represented as different shades of blue on the Rock Type map.
- The metamorphic grade of a rock determines granular pitch randomness. You can see this represented as different shades of green on the Rock Type map.
- Faults produce record skip-like sounds whenever a playhead crosses one.
- Surficial Geology (the surface “stuff” that covers the bedrock) determines the length and feedback of a delay or echo.
- Lastly, isostatic gravity anomaly determines the attack and decay characteristics of the notes.
- Areas outside the state or in the ocean will not produce sound.

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Keyboard Shortcuts

- **Q, W, E, R:** start/stop loops (transects) 1-4 (Q = Pink, W = Orange, E = Green, R = Blue)
- **+ / - :** double or halve the Master Length
- **A, S, D, F:** stop end any notes currently being played by the corresponding loop (A = Pink, S = Orange, D = Green, F = Blue)
- **Number Keys:** click in a number box and type a value for speed, rhythm, etc

Controls

- **Click and Drag Up or Down** to increase or decrease value of number boxes.
- **Map**
 - **Drag the Endpoint** of a loop with the mouse to position it on the map

- **Shift-Drag** a loop to move both endpoints at once
- **Click and Drag** on a loop's middle section to move its playhead
- **Data > Sound Mappings:** choose which data layers are mapped to sound.

- **Transects (four sets of controls)**
 - **Play:** turn on or off a loop/transect
 - **Rst:** Reset the playhead to the loop's beginning
 - **Loop Speed:** speed multiplier for this transect/loop
 - **Note Trigger:** set whether notes are generated by crossing of contacts or by rhythmic patterns
 - **Rhythm A and B:** Two rhythmic divisions of the loop that can be turned on or off. Can be used together to create polyrhythms. Only active in rhythmic trigger mode.
 - **Pitch:**
 - **Transpose:** offset the pitch of notes by this many semitones
 - **Curve:** the exponent of the Rock Age > Pitch mapping curve. 1 is linear mapping.
 - **Sync:** how the loop syncs to the master time.

- **Mixer**

- adjust the volume of the four loops, reverb and the overall volume
- and more

