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Monotype MIDI

Edwin Pickstone, Paul Maguire, Dr Frances Robertson

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typography, punch card, transcoding, music synthesiser software, sequencing, randomisation, improvisation

This interview examines the creative research undertaken by Edwin Pickstone and Paul Maguire, in conversation with Frances Robertson. Edwin and Paul's exploration of how 'text events' can become 'sound events' came from an initial starting point that considered the history of print technology and graphic design within circuits of knowledge and invention. Their collaboration started with the Glasgow School of Art (GSA), School of Design Research Cluster project *The Visible Word*, based in GSA's Caseroom (Letterpress collection), and has run from June 2022.[1]
This interview offers a commentary on work in progress from June 2022 to the present. Since the *Visible Word* group exhibition in September 2023 their work has continued to develop independently, but it remains poised between the materials and processes of typography and sound composition, informed by both and developing new insights through cross-medium transcoding. There is ambition to realise a series of audio recordings made using the software tool created through the research partnership.[2]

Q. Frances Robertson (FR): can you describe what your project is, what it does, and how it relates to the typographic Caseroom?

A. Edwin Pickstone & Paul Maguire (EP & PM): For this project we made a software application which takes text and translates it into musical space by creating a series of what are called 'MIDI events'.[3]

This was inspired by the Monotype system of typesetting and casting, and in particular by the punch tapes that were used in the process. Monotype is a system of casting and composing movable metal type using a keyboard; a punch tape; and a matrix (a mould in which metal type was cast from molten lead alloy), patented in 1887.[4] This revolutionary technology greatly improved the speed and often quality of typesetting for letterpress printing.[5]

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[1] The Caseroom holds the largest collection of letterpress printing equipment in a higher education institution in Scotland. This workshop houses approximately 350 cases of metal type and an extensive collection of wooden type. It is home to multiple printing presses and associated machinery, the oldest of which date from the mid-nineteenth century. The Caseroom is the only Scottish member of the European Association of Printing Museums and is a founding member of the International Association of Printing Museums.
[2] This collection of recordings will feature invited musical artists who use electronic instruments and elements of randomness and repetition within their compositions.
[3] MIDI (Musical Instrument Digital Interface) is a technical standard that describes a communication protocol, digital interface, and electrical connectors that connect a wide variety of electronic musical instruments, computers, and related audio devices for playing, editing, and recording music.
[4] The Lanston Monotype business was established in the UK in 1897; in 1931 this was re-named Monotype Corporation.
[5] In the Monotype system, the compositor who had formerly set individual letters for a text by laboriously by picking them out of the case of type now became a 'typewriter' banging the keys that produced the punch tape. In turn, this

Fig 1. Monotype booklet showing Punch Tape Graphic

Our intended statrting point for the project was to take existing monotype punch tapes and reverse them, from binary punch holes, back into text. We soon found however that due to the complexity of the monotype system, it is near impossible to take a punch tape from an unknown printing house and decode the text which has been encoded onto it. We were interested in the idea that there were all these punch tapes around or had been around, and in the digital nature of the punch tape as an early binary technology. We wanted to spend some time thinking about what we might bring to these extant tapes through transcoding, where you take a system like text, you turn it into binary, in this case punch tape, and then that binary can be taken as code to do something else. This notion of transcoding is really key to the work and connected with this, was the direction that we had to go to bring this work to some sort of conclusion for an early stage exhibition in September 2023. At that stage we felt a kind of defeat, learning that it was near impossible to reverse engineer from just the binary holes, back to what the original text was. To try and work out the rules of the encoding process ends with the realisation there were multiple conventions and multiple standards back at the time the tapes were created. We were confronted with 30,000 possible arrangements. In theory it could be done with a computer system, you could cycle through those 30,000 possible arrangements. But you wouldn't want to.

We're both interested in electronic music equipment such like drum machines and sequencers. And so for both of us, it was quite quick, once we started talking about how we might like to use this idea of transcoding from Monotype, we moved into that [musical coding] space. It made sense because machines such as drum sequencers and electronic music equipment use some similar systems, a fuller idea of what we might produce began to emerge.

Fig 2. Monotype Matrix Case

Yeah, that's true. The solution, the next step, was spawned by a picture. Or rather, we were investigating and were quite taken with images of the patterns, the sequence patterns produced by this system: the holes in pieces of paper which, when photographed or scanned become very graphic. And it was very striking—it became apparent to us that this graphic sequence had great similarities to traditional drum machine sequencer patterns. Both music and text unfold over time, and in a machine like this, where you can literally see the words being assembled, the parts are made in sequence. It is a serial process, a linear transcoding, so the two worlds leaned into each other and blended quite nicely. The first endeavour was something like: ‘let's see what this sounds like, let's map a bass drum to this column, let's map a snare drum to this column…’ That was the first part of this, or rather, the study that brought about this first output did that quite literally, it basically played back these old punch tapes, played them back as drum loops, and so on. So ultimately, transcoding sequences of dots to drum beats.

set in motion the hot metal casting process whereby the letters were cast off into lines of text. After use, the metal was then re-melted for the next print run. In effect, much of the traditional craft skill of the compositor was delegated to the machine.

What we were interested in after that was the idea of using text as our raw material to generate semi-random or, maybe not random but initially unpredictable input events. So how can a word become a note? What note is it? How long is the note? And how long before the next note? If you read a sentence, how can that process be phrased as a musical structure in timbre, pitch, and rhythm?

That set us off on an interesting and much more fruitful journey. We had investigated patterns for drum sequencing and that had run to a logical conclusion. So we returned to looking at text itself, and I think this is where things sort of flipped. We were interested in the idea of making text into sound or audio events, so text events become audio events.

Q. FR: Okay, my next question is how did this come about within the larger exploratory research group centred in the Caseroom?

A. EP & PM: All three of us are part of a 'cluster' *The Visible Word*, set up to consider cross-disciplinary creative work in response to the resources of GSA's Caseroom which holds both a significant collection of letterpress printing equipment and also a sizeable social community of engaged practitioners, past and present. It is an important teaching resource but also exciting as a research resource, a place where possible projects spring from workshop engagements. As a typographer and graphic designer based in the Caseroom I (Edwin) often work collaboratively; Paul does too (in Interaction Design). And apart from a personal inclination to work collaboratively, we also value the ability to bring someone with a different set of skills into a very niche area of work. In the Caseroom, Letterpress is an especially demanding craft, requiring close technical application and years of practice to be any good at it. Developing software requires similar attention to detail in craft. In order to bring in new ways of thinking about applications for the equipment and process, collaboration is key.

One of the great benefits of a room like the Caseroom is that it is a shared physical space devoted to typography. By contrast when we are working digitally we usually have an individual user interface: a computer screen, a keyboard, a mouse. Whereas in the Caseroom it is more like being inside the computer program dealing with text. You are able to run around inside and pick things up to show and discuss. It's possible to bring in another set of skills in a different way from working digitally, I think. And so when we set up the cluster, the premise was that specialists from other disciplines around the School of Design would come in and bring their eyes to the Caseroom, we would also be introduced to new ways of working that exist outside of typography or that are suggested to other specialists by typographic processes and concerns. Those practitioners would then take those insights out back into their specialisms, not necessarily producing work within the Caseroom itself.

Q. FR: What were the key themes and methods you wanted to examine and bring together?

A. EP: For me (Edwin), being embedded in the Caseroom by training and expertise, working with Paul presented a nice opportunity to do something with a specialism that was very digitally focused, and consider the overlaps. People occasionally tell me 'you're not interested in technology', which seems very odd to me. I'm interested in a more inclusive notion of technology, the history of technology and knowledge construction. Digital technology isn't where my specialist skills lie but working with someone like Paul, and looking at all technologies as one long history as opposed to

separate histories, is very engaging. In relation to text, metal type convention is one of the forerunner technologies to our current text in digital interfaces.

A. PM: There is a misunderstanding that technology is only 'digital technology', like you said, I always like to consider that the word 'technology', originates in the 17th Century, deriving its meaning from the ancient Greek word '*tekhnē*' (art/craft), and these misunderstandings are often accompanied by other lazy stereotypes. Recall that the first computer was designed by Charles Babbage, but the first algorithmic programs generated using punch card systems, were generated with a woman – Ada Lovelace.[6] The irony of the first programmer being a woman I like very much. It is one of the things I like to share in the first stages of teaching coding to students here on this program, challenging misconceptions about how this stuff came about.

I'm from a Fine Art Printmaking background as a student, and it occurred to me back then (in the 1990's) that in print you cannot ignore the rules of the process. I have always been a systems-based person: you can't make a print in one go, you have to pre-print ie disassemble the process into sub steps. So something complex is made up of simpler parts that are applied in sequence. This is why I have an affinity to this world of yours, Edwin, the letterpress print and woodblock print and generally the idea of producing editions of things in multiple and accepting the process itself. It's quite interesting talking about being inside the computer reminding me of the classic AI idea known as 'The Chinese Room' [7] In this thought experiment, you put a piece of paper through a hole on one side of a room, and it's in English, and you want it as Chinese coming out of another wall on the other side of the room. So the person puts the input in, and the paper goes in, and then goes around the other side and it comes out. And it's now translated into Chinese. Now, the question is, how did that translation happen? Is there any intelligence in that translation?

Well, inside the Chinese room is there somebody who's doing something like the reverse typesetting or something as we discussed at the start, looking up letters, looking at words, mapping them into space, encoding them and putting them out the other side? The 'computer' itself has no idea what Chinese even is – it just performs an algorithmic function, it just maps things into different spaces and transcodes it from one system to another system. There is no 'intelligence' as we understand. An interesting challenge to the authority of the computer.

So, in short, we were looking for a shared space between history of typography and computer programming. And then as it went on, looking at text being the encoding of speech, which could be mapped from one system to another, by a piece of software.

Ultimately, the software is merely remapping input using a certain rule system that we devise. It is just like the Chinese room: basically translating it and putting it in a musical context as opposed to a text context. It has no autonomy by itself.

A. EP: To continue with the reason we got interested in monotype and punch tapes, I knew a little bit about Monotype as I have spent time around printing machines. I've ordered lots of types that have been cast in Monotype. And I'm interested in the

[6] As one of our colleagues in *Visible Word* is a weave designer working with Jacquard designs, this connection was just one (of many) echoes raised across design specialisms by the history of metal typographic production, connections that are now hidden but still embedded in material processes.
[7] https://en.wikipedia.org/wiki/Chinese_room Accessed 18/07/2024

history of them, but I don't have a day to day working knowledge of how the machines work and the system. So we interviewed Nick Gill, who is a typecasting specialist based in Yorkshire. Nick also works with the Type Archive, London which has latterly been reabsorbed by the Science Museum.[8]

Nick Gill was a good expert to go to for our purposes, in part because like us he's not of an age where he was industrially trained with monotype. He's not from that [trade] world, as it were. And so he's actually very good at explaining monotype in a way, that probably wouldn't be possible if he'd been trained in a more rigorous way [in the apprentice system]; he has had to find his way through the system. And so he has alternative ways of explaining and analogizing how the system works. So we spoke to him initially because we thought we were going to take existing monotype punch tapes, and reverse them back into text, or find out what that text was, and play around between text and music.

But in speaking to him [Nick Gill], he pointed out that the die case, kind of a small metal cassette or cartridge, which holds multiple individual type matrices, maybe it's like 16 x 16, as a grid, and within that die case, the position of those matrices, the moulds for making the letters, you have the whole of a typeface in there, usually including numbers and italics. The positioning of them alone would generate 1000s and 1000s of possibilities in terms of where the punches were in relation to the holes in the binary tape.

In short the punch tapes [being now undecipherable] had to be left as random as it was not possible to reverse engineer these punch codes back into readable text. This left us with an idea of using them or text as a source of random input of indeterminacy within musical scoring. We'd thought about this connection to drum machines already, so once we started thinking about the punch tapes as random sources and converting text into a musical score, we then realised that you could take actual text and convert it with a system that might act like the binary punch tape technology and then apply that within musical space.

Fig 3. Monotype Midi Installation

Q. FR: How did the software evolve?

A. EP & PM: The software was developed in an Open Source application called Processing, designed to allow people like myself from a creative background and with a professional interest in these kinds of workflows to actually engage properly with making art and design using code-based environments. So this work was created not by using production software, but by actually making the computer do things that it doesn't normally do, such as read text and make MIDI events. That's not something you buy, it's not off the shelf, it is a custom tool.

The title of this piece of work is *Monotype, MIDI*. The acronym stands for 'Musical Instrument Digital Interface', a technical standard that describes a communication protocol, that permits digital connections between a wide variety of electronic musical instruments, computers, and audio devices; a standard set in the early 1980s to allow manufacturers to 'sing from the same hymn sheet' and give compatibility across

[8] Gill, Nick, Effra Press, North Yorkshire, https://www.effrapress.co.uk Accessed 18/07/2024
'The Type Archive' http://www.typearchive.org Accessed 18/07/2024

devices from different manufacturers. So when playing, it means that you can play a note on one keyboard and if you want it will trigger another note on another keyboard in the same key, at the same time, and when running in sequence with the same time signature. It's basically a core communication protocol for generating electronic music.

What we essentially did is take the text and convert it to MIDI messages that went out of a MIDI cable, and into a range of synthesizers that triggered the actual sound. To be exact, but without elaborating the software details, no sounds come from the computer itself, just the events to make the sounds play a specific note at a specific time, at a specific pitch and volume.

So, what rules did we adopt for this system of transcoding? The basic rules are: words are notes, and word-spaces are rests (silence). What was interesting for me about this was the disassembly idea: what are the ingredients here that make up a word or how a word is made from the letter. In traditional letterpress of course you can't go to the case and pick up a word – you pick out letters that make up the words that you assemble into the word. In our system of rules, words are notes so that short words are short notes, long words are long notes. So the length of the word determines the length of the note.

Fig 4. Gomringer, Eugen (1961) ‘Snow is’ as printed in *An Anthology of Concrete Poetry* (1967)

Fig 5. Coleridge, Samuel Taylor, The Rime of the Ancient Mariner as Plain Text

This was the start of our transcoding from text to sound. Another rule is that letters are assigned numerical values with word values being an the sum of those letter values. These numbers are not arbitrary – we used letter frequencies found in The Monotype Book of Information. And what's interesting about these frequencies is that they are linked to language use. We use lots of ‘e’s – more ‘e’s than anything else. And so we so took those frequencies, as a numerical way of mapping English language text back into our mapping space in order to help us generate these numerical values for the generation of sounds.

So for example, a case may have 60 ‘E’s, and 20 ‘D’s, or something like that. That means E=60, and D=20 and so on. And then what we did was to add up all the assigned numbers of the letters in a word, to give a total per word. And this total determines its pitch. Now we introduce another rule: the notes are played in sequence as the words of a text are ‘read’; it reads in real time and plays as words are passed, from left to right, along the timeline. The length of the longest line in the text (ie the column width) dictates the length of the musical phrases being used with that text.

The last rule to mention is that spaces are musical rests. Considering how word spaces, line-breaks and justification would translate into musical space made us think about concrete poetry, which often has enormous amounts of white space on the page, and distinct formal/visual structures. From these formal structures of words, spaces and repetitions, musical patterns emerged. Repeat phrases, words, rhythms, and dynamics were particularly interesting. Notes are played in sequence as words are read, with spaces as rests. We also added a little bit of extra control to this so we can to make it more musical such as using *quantising* – essentially making notes play with musical regularity and remain ‘in time’.

Fig 6. Sample text taken from the Pocket Picture-Book of ‘Monotype Machines’ as Plain Text

Fig 7. The Rime of The Ancient Mariner being processed in the Monotype MIDI application.

And we're also quantising scale. So with the two types of quantisation here, I think quantisation is probably easiest to understand as kind of structure in terms of timing – falling on the beat. Quantisation is a standard procedure within musical software. And there are other type of quantisation, such as for musical scale. So again, if we just play the notes, as they exist with their assigned value, they won't fit into any particular scale, but they will bounce around all over the place with no scale, a bit like hitting random keys on the piano. And that can be really useful within certain types of musical systems but be at odds with other more traditional approaches

In terms of generating harmonic, pleasant musical sound, quantising the notes means we can choose which scale we work within. Not all possible notes are included in Western scales. That is what makes it sound like ‘traditional’ music. In its raw form without quantising the music expresses interesting, organic forms, with much less control. In putting the software together, I had to test it and I found myself quite enjoying improvising with it. I might play some sort of pattern drum pattern over the top of it, or I might respond to how the text would flow, with unpredictable peaks and troughs, and the pitch and the timings and so on. And as a performer you respond a bit like a jazz musician would, where you're listening in real time and responding and playing in that feedback loop.

We also put in ‘a looper’ into the software. That idea of looping is very important. We talked about drum machines: older drum machines usually use a sequence of eight or 16 steps, that just loop and loop and loop, you press play, and it loops and loops and loops plus the possibility of a random sequence. Many modern electronic sequencers offer a simple way to generate a random sequences. And that's a really useful, interesting thing for a musician working with electronic music is to be able to have these chance encounters within a pleasing randomly generated rhythm, or with sets of notes.

Like the Turing Machine[9] used in modular synthesis, our looper allows locking and then unlocking loops in randomly generated sequences. And if we think about text we're repeating the words of a phrase. It might be a phrase that we enjoy the words of, it might be a phrase that we enjoy the sound off – hopefully both – where you get this kind of poetic looping of the same thing. And then we can unloop and let the system run free. If our attention is caught by something that we particularly enjoy, we can lock it and loop it again.

Fig 8. Gomringer’s ‘Snow Is’ in the application

A lot of the time when people talk about generative music, it sounds like something that is being created by the computer, or by the system that is doing the generating. If it is not a particularly thoughtful system that's been put together it will make similar sounding music all the time. Interesting up to a point. But I think my point is that with

[9] Music Thing Modular Turing Machine

a generative system, there are actually two jobs for the person, the composer: one is to put together the system, so to decide what rules that system will work with; the other then is to use your ear and to guide the system and to listen out for these chance events and to be made aware to them and then use them. So it's kind of controlled randomness, controlled, indeterminate input which makes improvising over the top of this in real time more of a conversation with the source text.

Another thing that's particularly interesting here is when we talk about it being random. There are lots of random sources for making music, and there are lots of examples of people using indeterminacy within modern classical, but especially using electronic music, there are lots of places where people need random sources to generate variation. Within the system there's necessity for randomness within music that's generally quite repetitive. Randomness brings in something to engage the listener within a repetitive system.

But here, what we have isn't entirely random – it is based on a source text. When we first started this project, I thought what we were doing was automating text into music. To some extent, we were doing that, but actually, the thing that really clicked for me is this idea of interpretation. So like with the looper where we're listening and being alert for something, so it isn't just being generated – we have a responsibility within the making of the music to decide how it sounds, that I think the user's awareness of what text they're using, has to impact what they do with the music, because the MIDI events, a bit like your Chinese box analogy, don't make any decisions, they simply tell the synthesizer to play a note.

But the synthesizer has plenty of other parameters for how that note will sound, whether it will be a quick snap of a note or a long elongated note, a harsh tone or soft. There's a lot of input for the person who's playing the instrument. Often it's quite easy to get lost within that when you're making electronic music, and not necessarily in a bad way – you kind of follow your ear and you hear something you like, and you go with it.

But when you have an external context in the way that someone who was making a film score, you can be driven by the meaning of the text. For example in *Do Androids Dream of Electric Sheep?* there will be certain kinds of ideas and atmosphere that suggest a timbre of the music in a very different way from for example *Harry Potter*.

Fig 9. A reissue of the Buchla Source of Uncertainty module produced by Buchla and Tiptop Audio (2022)

Various ways of generating electronic music were explored over the 20th Century. The two most necessary to mention here would be with notes input/played by using a keyboard much like a piano or working directly with Control Voltage (CV) using modules which can generate patterns of notes by sequencing: randomly, semi-randomly or entirely by the user's design. The keyboard, it could be suggested traps us within the Western 'well-tempered' intonation, scaling, and within Western classical music, and the scales associated with it. Whereas working with Control Voltage systems might offer a much broader palette. Devices such as Don Buchla's *Source of Uncertainty* used white noise to generate random CV. Digital devices, having no true random numbers themselves use special mathematical rules to generate pseudo-random notes in a similar way but our software uses literary sources to generate semi-random musical phrases.

Q. FR: How did using the software and making music with text affect your understanding of the project? (what did you find out).

A. EP & PM: To run our transcoding method in a public exhibition, we more or less randomly picked *The Rime of the Ancient Mariner* as an example test piece of text because poetry has meter and rhythm and musicality in its structure. When we played the text through the software we heard a rhythmical sequence reminiscent of the Rime of the Ancient Mariner read out loud. We then wondered what different sound events might result from other styles of text, for example what happens if we have these concrete poetry texts or even single letters floating in space, one at a time. We worked with Eugen Gomringer's *Snow is…* (1961) which confirmed that concrete poetry could supply a great deal of musical interest in terms of its use of the page and key technique of repetition of words.

Q. FR: Following on from your interest in concrete poetry as a source, I'd like to comment on the connections between your (printed) texts and the resultant sound compositions. In your transcoding, we see a shift in modality from vision to hearing—from the static page to a sequence of sounds in time. Hearing your sound streams in performance was for me an uncanny experience with the vocal qualities, as if I was puzzling to make out an unknown spoken language. In turn this reminded me of the gap between the deliberately meagre quality of printed text and the complex nuanced meanings of spoken language, in Mithen's term, the 'musicality' of prosody. Two connections to books, reading, and literacy came to mind immediately here: first some of the provocations of Walter Ong; second, and more recently, growing sustained interest in the possibilities of 'visual prosody', for example in the research of Ann Besseman in supporting literacy. In particular, Ong's remark about concrete poetry as the 'product not of writing but of typography' resonated with what seemed to me as a kind of playful 'pseudo-prosody' in your musical outcomes. In your process, you worked linearly from typography to sound. I can imagine in the light of interest in visual prosody amongst graphic designers and typographers that this project might generate a research process leading back to type. What do you plan to do next based on your current insights?

A. EP: I'd like to go back to the context aspects of the Caseroom, based in Glasgow, and that specific workshop style of working collaboratively, of being together in the physical space is interesting for the project. Glasgow is a key city for electronic music culture in the UK; we have as many specialist modular synthesizer shops as central London and multiple local companies building really interesting, experimental hardware. There's a lively ecosystem and subculture of electronic music within Glasgow. And that means that there's an engaged audience for a project like this. We have an existing network of people who are interested in electronic music, the history of that music, and also interested in reading and text and authors. That seems like an integral part of where the project goes next.

We are distributing our trial software to invited participants with the aim of gathering feedback on the system and amassing recordings which can be released as an EP or album. Our plan is to put together a launch event here in Glasgow with some live music and talks on the relationship between text and music. In particular we want to explore further the possibilities of using the software in a live setting, chopping and changing between source texts and whist this is displayed to the audience via visual

projections. Once we are happy that the programme is robust enough we will make it available as free and Open Source software.

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Fig. details
Fig. number
Title/Caption (where applicable)
File name

Fig 1.
Punch Tape Graphic, Pocket Picture-Book of 'Monotype Machines', cover, date unkown
F1_MonotypeMachinesBookCover01.jpg

Fig 2.
Monotype Matrix Case
The Matrix Case shown here has space for 272 individual matrices (moulds) arranged in 16 rows of 17 matrices or dies.
F2_TheMatrix01.jpg

Fig 3.
Monotype Midi Installation View, *The Visible Word 2,* New Glasgow Society, 4–5th September 2023
F3_MonotypeMIDIinstallation01.jpg

Fig 4.
Gomringer, Eugen (1961) 'Snow is' as printed in *An Anthology of Concrete Poetry* (1967)
F4_Gomringer01jpg

Fig 5.
Coleridge, Samuel Taylor, The Rime of the Ancient Mariner as Plain Text
Source texts are prepared by taking scans/digital photographs of originals, then using OCR (Optical Character Recognition) and converting to Unicode Plain Text, with minimal post-processing to maintain white space integrity. Through this process the text loses any character styling and is reduced to raw data for use in the application.
F5_RimeAncientMariner.txt

Fig 6.
Sample text taken from the Pocket Picture-Book of 'Monotype Machines' as Plain Text
F6_MonotypeMachines.txt

Fig 7.
The Rime of The Ancient Mariner being processed in the Monotype MIDI application
Note the speed (top left) is shown in reading speed, Words Per Minute (WPM) as opposed to musical software standard of Beats Per Minute (BPM).
F7_Screenshot_Mariner.png

Fig 8.
Gomringer's 'Snow Is' in the application
Here the line 'snow is ignorant' is 'locked' to to repeat or loop until the player allows the application to move on. The timing has been quantised (shown by the thin vertical sticks under the text) to one beat per letter/space and the scale is quantised to F minor.
F8_Screenshot_Snow.png

Fig 9.
A reissue of the Buchla Source of Uncertainty module produced by Buchla and Tiptop Audio (2022)
'Introduced in the mid–late 1970s, Buchla's Source of Uncertainty provided musicians with an unprecedented degree of control of randomness in their music...but it was more than just that: it made it possible to *interact with a musical instrument* in a way that was constantly changing and subject to *any degree* of unpredictability. Moreover, it gave the instrument a way to self-organize and generate highly coherent, yet unpredictable sonic structures.' Gaston, Ryan (2022).
BuchlaSourceOfUncertaintyModule.jpg Tiptop's Reimagined Buchla 266 Source of Uncertainty, Modular Synthesis Legend in Eurorack Format: History + Review
Perfectcircuit.com
F9_SourceOfUncertainty.jpg