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# BEYOND THE PIANO: THE SUPER INSTRUMENT. WIDENING THE INSTRUMENTAL CAPACITIES IN THE CONTEXT OF THE PIANO MUSIC OF THE 21ST CENTURY

Dissertation (University of Oxford, 2014)

## 3.7 Karlheinz Essl: "Sequitur V" for Toy Piano and Electronics

The toy piano has turned out to be a suitable instrument to be used in conjuction with electronic solutions. Its limited characteristics provide the composers a *tabula rasa* to fill with the results of their own musical imagination. It is hardly a coincidence that Karlheinz Essl has written many of his algorithm based works for this particular keyboard instrument (for example, "WebernSpielWek" (2005/2012), "Listen Thing" (2008), "Whatever Shall Be" (2010), "Under Wood" (2012), and "Patchinko" (2013)). His works transform the toy piano into an electro-acoustic "super instrument" by multiplying its instrumental range, bringing in otherwise non-existing dynamics and reverb, as well as electronically doubling the instrument to enable the player to perform a solo duet.

"Sequitur V" is a composition belonging to Karlheinz Essl's long term "Sequitur" project, in the context of which he has written algorithmic pieces for various instruments (for example electric guitar and African Kalimba). The "Sequitur" serie is Essl's response to Luciano Berio's "Sequenze": the composer's aim was "to attempt to write a series of pieces which take advantage of the idiosyncratic instrumental possibilities – and confront them with a realtime sound processing environment that has its own secret life" (Essl, 2008, 1). The live electronic parts of the "Sequiturs" all use the "Sequitur-Generator" program designed by the composer, as each work of the serie uses its own version of it (Essl, 2008-2010, 1).

The acoustic and instrumental qualities of the toy piano have been extended within this composition with the help of real-time sound processing. However, the original timbre of the instrument (and thus the identity of the concert instrument) does not change in this work as radically as in "Sequitur XIII": although the instrument's existing capabilities have been enhanced, the original sonic colour stays recognisable at all times. On the other hand, the compositional identities of "Sequitur V" and "Sequitur XIII" are quite close, as they share the same explorative purpose, that is to extend the harmonic, technical, rhythmical, and structural qualities of the original concert instruments (Essl, 2013). Both works are based on computer-generated micro canons that form a complex and active compositional organism which works in real-time, based on the gathered sonic data.

Composers have developed various ways of controlling their material through MIDI- or other computer-based devices. For example, Nelson refers to a system that "makes no sound by itself but rather reflects the character of the synthesizer that it controls" (G. L. Nelson, 1993, 1). The electronic part of "Sequitur V" is exclusively based on the sounds produced by the performer on the instrument, as the system itself does not make any sounds nor contain any kind of samples or pre-recorded material. The algorithms are used in "Sequitur V" to run the sound modification processes triggered by performer using the space bar of the Macintosh computer or the foot pedal. Moreover, because a toy piano itself does not really have a proper range of dynamics, those qualities are also generated by the electronic system and controlled either by the sound techniciand or the performer.

The sonic material of the electronic part is collected through constant live recording obtained by attaching a contact microphone on top of the instrument. In addition to the artificial dynamics, the selection of electronic functions of "Sequitur V" contains various other effects that help to transcend the natural limitations of the toy piano. Such include, for example, distorting and modifying the instrumental timbre, adding reverb and applying delays, as well as constructing different kind of rhythmical structures and processes. The algorithms are used to generate an extensive amount of electronically processed canons that interact with the recorded sound material produced by the performer.

**FX Parameter Changes in Sequitur V (Karlheinz Essl)**

| | detune (detune) % | flanger (flange) % | ring modulator (rmod) % | comb filter (comb) % | reverb (rev) % | tremolo (trem) % | Relative SPEED of Parameter Change |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 5 | 0 | - |
| 2 | 0 | 0 | 0 | 0 | 5 | 45 | slow |
| 3 | 0 | 85 | 0 | 0 | 30 | 0 | moderately fast |
| 4 | 0 | 0 | 60 | 0 | 5 | 0 | slow |
| 5 | 0 | 0 | 0 | 0 | 5 | 55 | slow |
| 6 | 0 | 0 | 0 | 65 | 50 | 0 | slow |
| 7 | 0 | 50 | 0 | 0 | 5 | 0 | moderately fast |
| 8 | 20 | 0 | 0 | 0 | 5 | 0 | slow |
| 9 | 0 | 0 | 65 | 0 | 5 | 80 | slow |
| 10 | 0 | 0 | 0 | 0 | 5 | 0 | fast |
| 11 | 0 | 50 | 0 | 0 | 5 | 0 | moderately fast |
| 12 | 0 | 35 | 70 | 0 | 5 | 0 | moderately fast |
| 13 | 0 | 20 | 50 | 45 | 5 | 50 | slow |
| 14 | 0 | 0 | 30 | 0 | 5 | 40 | slow |
| 15 | 20 | 0 | 0 | 0 | 5 | 30 | slow |
| 16 | 0 | 20 | 0 | 0 | 5 | 0 | moderately fast |
| 17 | 0 | 0 | 10 | 0 | 0 | 0 | very slow |

Figure 3: The list of parameter changes (estimated values) of each computer-generated passage (1-17).

“Sequitur V” consists of 17 different computer-based processes that have been designed to reflect the corresponding acoustic material throughout the piece. The electronic system is a cumulative process: all the passages are related to each other rather than being separated. The phases overlap and affect one another and the musical material is in constant transition. As shown by the diagram above, the design of each phase is unique: the passages do not necessarily differ from each other radically, but form distinct mixes of their shared functions. Each passage emphasises different effects.

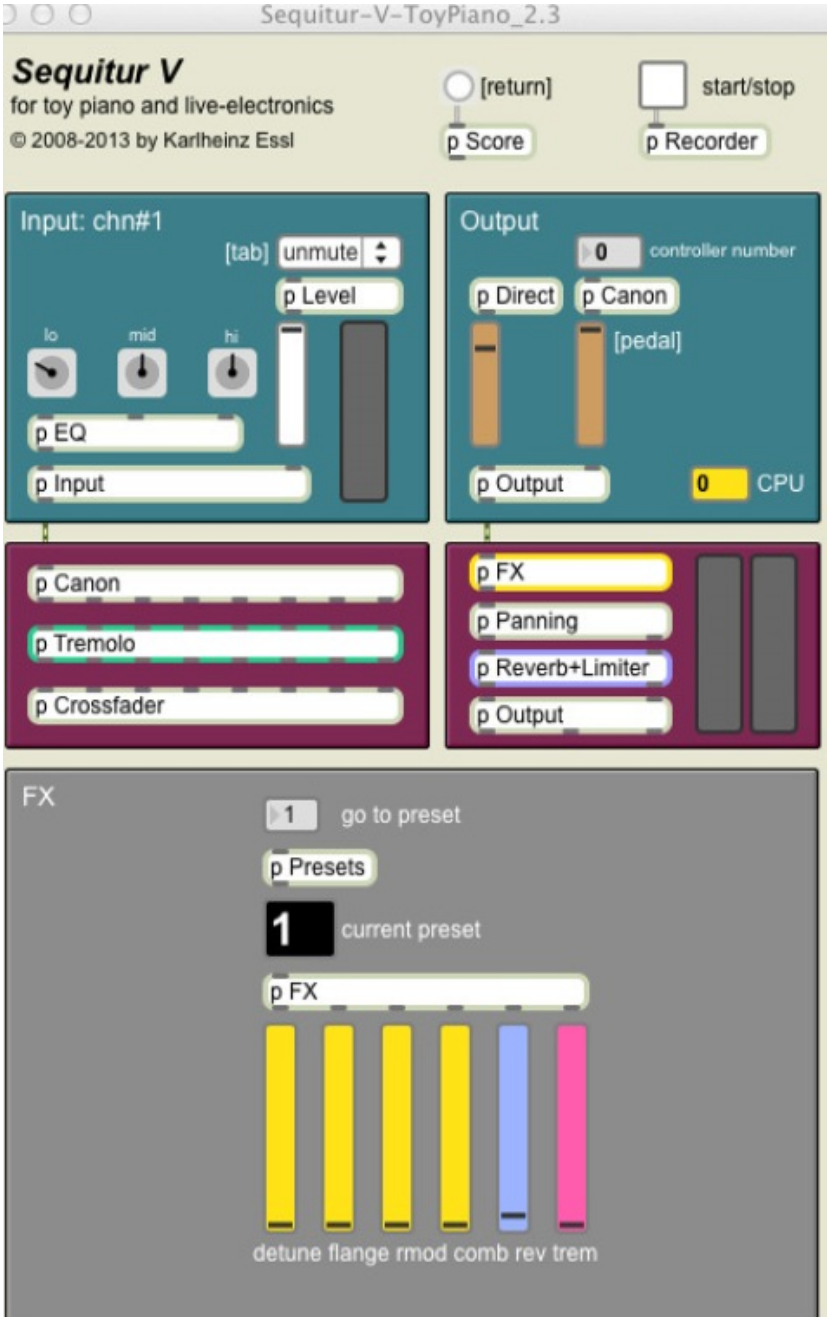


Figure 4: The real-time based player of “Sequitur V”

### 3.7.1 Performing "Sequitur V"

The toy piano is nowadays a secondary instrument for some classically trained pianists specialising in contemporary music. I was not aware of its possibilities (or of the toy piano repertoire in general) until I had a chance to practise and perform Essl's "Sequitur V". The collaboration started during my composition lessons with Essl when I was studying electroacoustic composition at Universität für Musik und darstellende Kunst Wien. To illustrate his composition techniques, Essl gave me the opportunity to rehearse "Sequitur V" at his studio and gave me the score, which I took home to practise the toy piano part. My first impression was that the instrumental part seemed straightforward[1]. However, when I played the piece for the first time, it became obvious that the work would require much practice. I rehearsed "Sequitur V" a number of times, with the first two or three mostly spent on familiarising myself with the interactive computer generated part. I gradually started to understand the reactions of the electronic system and managed to adapt my performance techniques to it. "Sequitur V" has since become a fixed part of my repertoire and I have played it numerous times at different concert venues.

The first version of the piece did not require the performer to observe the dynamics of the electronic part. The composer has since revised his composition: the dynamics of the electronic system are now determined within the current version, which means that the toy pianist needs to use a MIDI pedal for controlling them[2]. Alternatively the work can be performed with an additional musician (sound technician). Most of the functions of the electronic system are not directly shown on the score. Rather than relying on notations, I had to discover a way of playing that combined improvisation with traditional classical music performance. Finding the right balance between playing/performing and waiting/listening is one of the challenges of the work. The electronic "solos" (played by the computer) resemble the orchestral interludes of a concerto. Rather than just waiting for them to pass, the performer has to actively listen to them in order to know how the musical situation is developing. Such passages also bear structural importance. Playing "Sequitur V" could be compared to a situation in which one dances with one's own reflection in the mirror: the electronic background is not an external accompaniment but a real-time system which reacts to the performer's every movement with a short delay.

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[1] The seemingly uncomplicated acoustic solo parts are a trademark of Essl's compositions. However, there seems to be a practical reason for this: because of the complexity of his electronic processes, the composer wants the performer to invest all his or her attention on the interaction with them, rather than focusing on instrumental difficulties.

[2] This of course makes the piece more difficult to play, as the performer has two parallel sets of dynamics to control.

### 3.7.2 The Timing in "Sequitur V"

"Sequitur V" has two contrasting characteristics: while the algorithm controlled electronic part is unpredictable, the instrumental part is thoroughly notated and has to be played precisely. The performer needs to learn how to combine these two aspects of the work. The timing of the piece is left almost entirely up to the performer; no click track or other time controllers are used and, as mentioned, the performer deciding when to proceed to the next passage. Although it is necessary to count the exact durations of some of the breaks, the toy pianist should primarily base the interpretative decisions on each musical situation, i.e. depending on whether the phrase is closing or if, on the contrary, it is emerging from the general sound mass. Sufficient practice with the electronic player gradually makes it easier to approximately estimate the the length suitable for each passage. The lack of time controllers is one of the benefits of this work: rather than having to react to a click track, the performer can focus on playing the instrument, which increases his or her energy and presence. It is easier to concentrate on sound quality and instrumental techniques.

The electronic processes are marked on the score simply with numbers from one to seventeen, which indicate when to move forward to the next passage. Instead of indicating the exact time codes for the key points of the work, the composer has marked their starting points on top of different breaks or fermata symbols. These are not meant to be regular silent breaks but indications for the toy pianist to stop playing and to concentrate on listening to the computer-generated material.

During the rehearsing process of "Sequitur V" I developed the following system of decision making regarding the timing of different passages. The comments are based on my own subjective performing experiences.

1. The electronic system starts: it should be switched on a moment before the performer starts to play (figure 5).

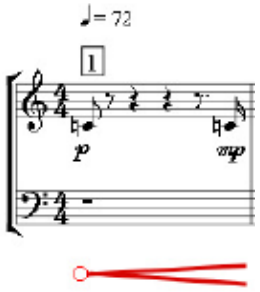


Figure 5: bar 1. The electronic system starts.

2. The beginning of the second passage is placed between two different textures. The performer should make a short break before continuing to the next phase. However, one should not wait until the canons have faded out. Bar 21 emerges from the depths of the electronic system (Figure 6).

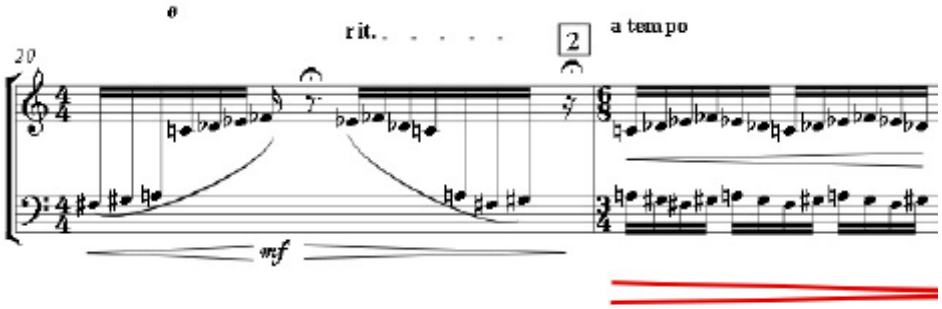


Figure 6: bars 20-21. The beginning of the second passage is placed between two different textures.

3. The transition between passages two and three is longer than the previous ones. Because there has been a long crescendo into ff, the development of the electronic material needs more time. The duration of the break has been notated precisely: the performer does not need to estimate the timing (Figure 7).

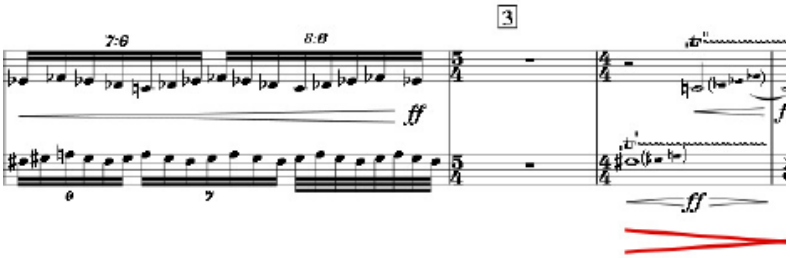


Figure 7: bars 27-29. The transition between passages two and three takes place in bar 28.

4. The fourth passage calms the music down. The break is notated accurately (Figure 8).

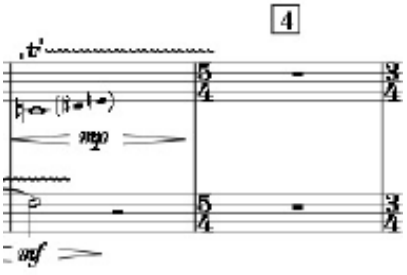


Figure 8: bars 31-32. The fourth passage begins in bar 32.

5. Phase five connects a closing phrase (bars 33-37) and the beginning of a new one. The performer needs wait until the reverb of bar 36 quietens down (Figure 9).

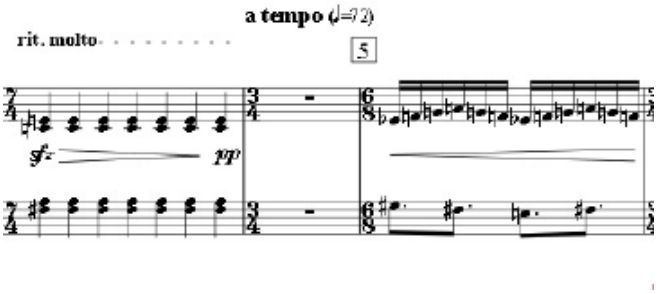


Figure 9: bars 33-37. Connecting a closing phrase and the beginning of a new one.

6. The sixth passage reduces the volume and pitch material of the previous process. A new texture consisting of repetitions emerges. The break should be relatively short, which is why the composer has indicated its exact duration (Figure 10).

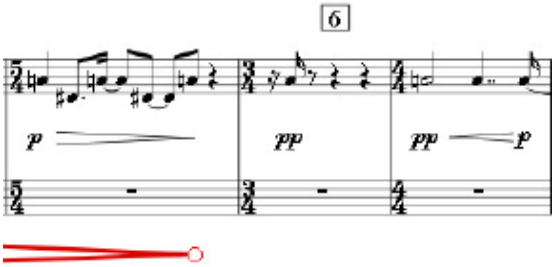


Figure 10: bars 45-47. reduction of the volume and pitch material of the previous process (bar 46).

7. The seventh passage connects the previous rhythmical texture (repetitions on one pitch) and more melodic material. Some time should be allowed for the reverberation in bar 51 (Figure 11).

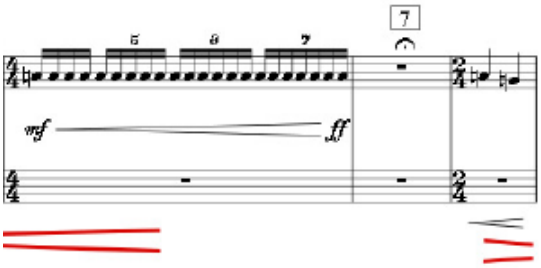


Figure 11: bars 50-52. Connecting the rhythmical, textural, and melodic material.

8. Phase eight serves as a bridge between the relatively fast scale texture and the melodic phrase beginning on bar 67. The echoes of the scales can still be heard in bar 66. The performer should wait until the dynamics go slightly down, after which new musical material should be introduced (Figure 12).

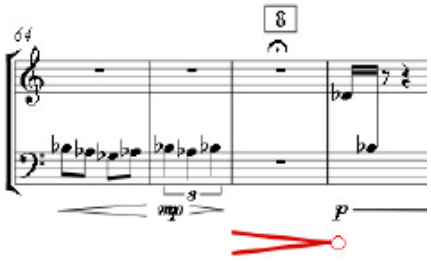


Figure 12: bars 64-67. Phase eight serves as a bridge between the scale texture and the melodic phrase beginning on bar 67.

9. The break between passages eight and nine should be rather short: the process binds together the end of previous phrase and the beginning of the next (Figure 13).

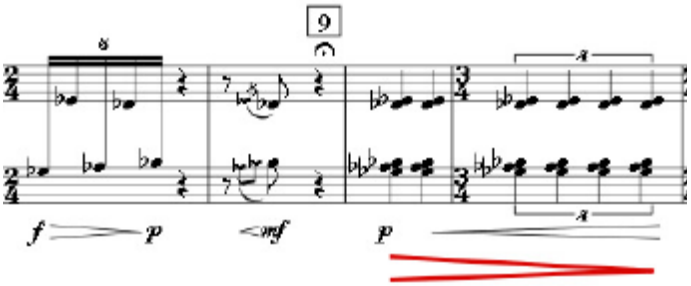


Figure 13: bars 74-77. The break between passages eight and nine should be rather short on bar 75.

10. Phase ten is similar to the third passage: the break between bars 84 and 86 fortifies the preceding crescendo. The performer should allow the electronic system enough time to ring (Figure 14).

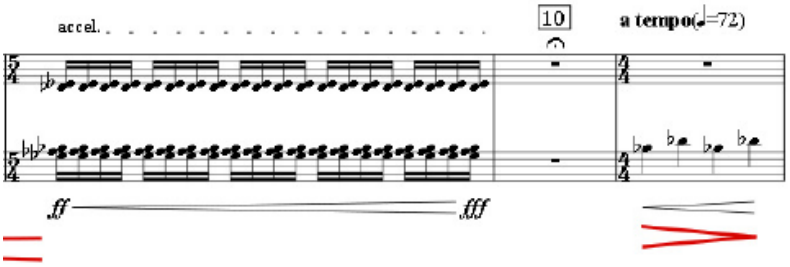


Figure 14: bars 84-86. The performer should allow the electronic system enough time to ring in bar 85.

11. The eleventh phase connects two phrases related to each other; the duration of the break has been notated precisely (Figure 15).

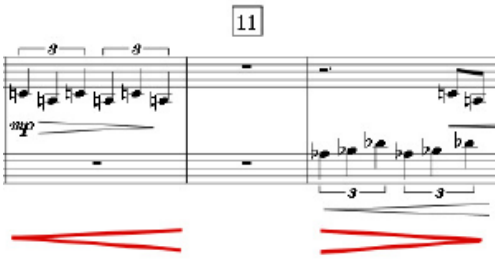


Figure 15: bars 88-90. The eleventh phase connects two related phrases on bar 89.

12. The computer generated process continues the previous phrase and brings the music forward. Similarly to the passage 11, the break should last exactly four beats (Figure 16).

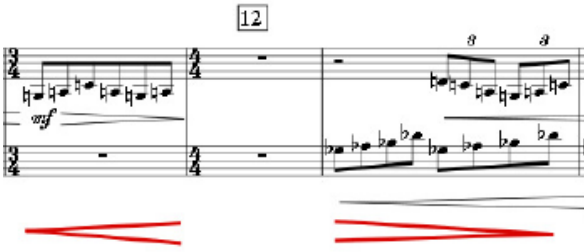


Figure 16: bars 92-94. The break should last exactly four beats (bar 93).

13. The computer generated process helps speed up tempo and volume. The break should have an exact duration of four beats (Figure 17).

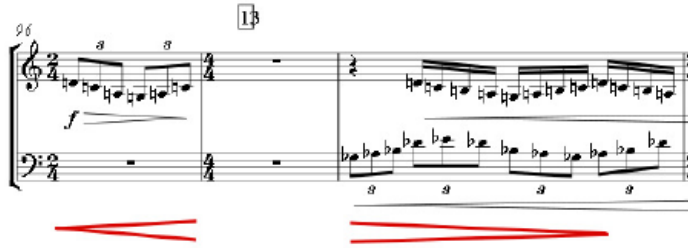


Figure 17: bars 96-98. Speeding up the tempo and volume.

14. Unlike the others, this process does not start during a break. It forms an external dynamic layer that supports the subsequent dramatic passage (Figure 18).

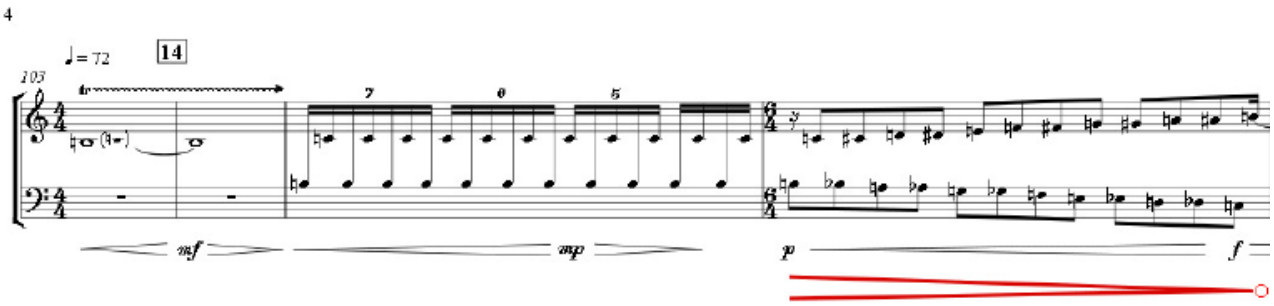


Figure 18: bars 103-106. The electronic part forms an external dynamic layer that supports the subsequent dramatic passage.

15. The performer should clearly communicate an end of a phrase in bar 109, which is why the break can be sustained a bit longer (Figure 19).

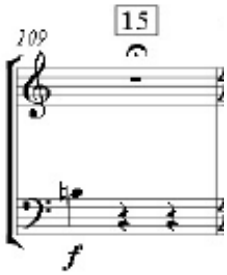


Figure 19: bar 109. The performer should clearly communicate the phrase ending.

16. Passage 16 starts in the middle of the phrase: it helps build the polyphonic situation. The toy pianist should keep on playing and not react to it (Figure 20).

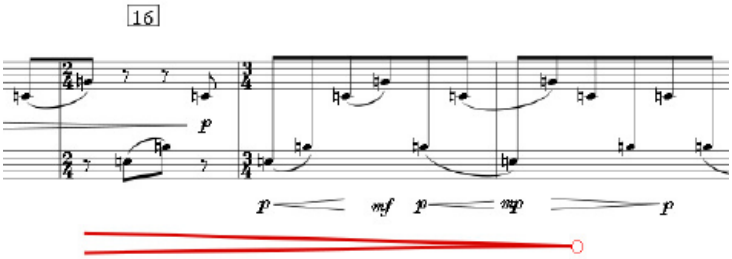


Figure 20: bars 119-121. Passage 16 starts in the middle of the phrase (on bar 119).

17. This process lasts until the very end of the piece: the electronic system constructs rhythmic micro canons around one single pitch and fortifies the dynamic growth. The electronic part should be faded out towards the end of the piece, after which the performer plays the final tone in ffff (Figure 21).

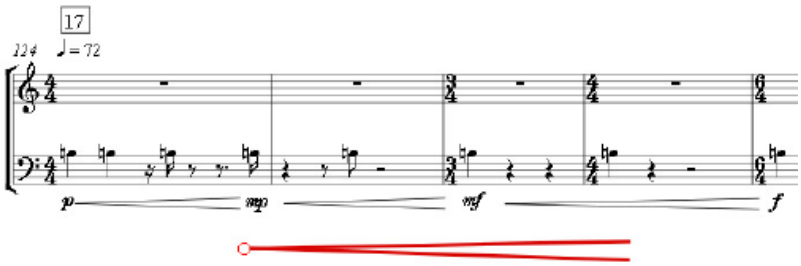


Figure 21: bars 124-128. The beginning of the coda.

### 3.7.3 Notation

Excluding the dynamic markings and the plain numbers indicating the triggering points, the composer has not notated anything related to the electronic part. Although the score does not reflect or communicate the complex overall structure of the piece, this seems to be an efficient solution. The functions of the real-time player would be beyond the grasp of traditional notation because of their high complexity and unpredictable characteristics, as the piece consists of processes rather than independent effects.

### 3.7.4 Toy Piano as a Super Instrument in "Sequitur V"

The specific instrumental characteristics of the toy piano attract some composers eager to re-definine the instrument's identity to accord with their own ideas. It can be a convenient choice within a compositional setting in which the electronics also dictate the functions of the acoustic instrument. A growing number of composers have participated in expanding the repertoire for this miniature instrument[3] and several performers have dedicated themselves to it. One of the first (and most significant) toy piano composers was John Cage who used to collaborate with Margaret Leng Tan (born in 1945), who still frequently performs his toy piano works. Other performers of the next generation include, for example, Phyllis Chen, Isabel Ettenauer, Emil Holmström, Pascal Meyer, Victor Trescolí Sanz, and Xenia Pestova.

Toy piano is a concert instrument on its own right. Despite the visual similarities between a regular piano and a toy piano, they are significantly different. A toy piano is not just a limited version of the normal piano: it has its own characteristics, repertoire, and playing techniques. The smaller size of the keys requires the performer to apply different kind of a hand position and fingering and,

[3] These include, for example, Lou Bunk, Derek Hurst, Jorrit Dijkstra, Yu Oda, Andrián Pertout, Monica Pearce, and Carlos D. Perales, to mention a few.

moreover, the timbre is very different from a regular piano (Pestova, 2014). In addition, instead of sitting on a piano chair, the performer usually sits on the floor next to their instrument (in many cases also controlling an electronic system). The aspects of tuning and resonance are unique. A normal piano is usually carefully tuned, whereas almost nobody tunes their toy pianos (Ibid.), which causes interesting and unpredictable overtone situations. Every toy piano has its own characteristics of sound, which is usually taken into account in the compositions written for this particular instrument.

When the toy piano was invented by Albert Schoenhut, it was originally produced as an instrument for children, an identity which remains in the minds of the concert audience.
Being a miniature keyboard instrument with a range of either two or three octaves (a standard Schoenhut toy grand piano usually has 37 keys), and, metal plates instead of strings, the toy piano is of course limited in its technical and sonic characteristics. Unlike the regular piano, the toy piano does not provide a vast palette of dynamics. Moreover, playing large chords or fast repetitions do not usually fit well to the
natural capabilities of the instrument.

As this work by Essl shows, it is possible to transform the toy piano into a concert instrument by using music electronics. “Sequitur V’s” algorithmic system forms a complex and interactive compositional organism. The end result is a partly independent sonic machinery, and partly controlled by the performer/sound technician. The caleidoscope of sounds, rhythms, reverberations, and delays of this piece has very little to do with the sonic capabilities or limitations of the original instrument. The computer generated part bears an equal importance to the instrumental line by forming a “second instrument” which allows the toy piano performer to play a duet with themselves.