Uranium Tamper

for piano, played into 32 magnetic pickups processed independently by computer in real time

by Clint McCallum

The Title refers to a process in nuclear weapons design. A “tamper” as a layer of material that delays the expansion of the reacting material in the bomb by reflecting neutrons back inward. The result is a more powerful explosion.

The Piano Playing: there are no pedal markings in the score. This does not mean the piano should not be pedaled. Due to the volatility of some of the processing, it is impossible to predict when you might need to let up on the pedal to stop/prevent feedback. There may also be times where you leave the pedal down and let the feedback sing. Also use the pedal expressively. But do remember that the piece is about creating an submersive sea of sound.

The Technology was developed over the course of several years collaborating with computer music scientist Kevin Larke. While experimenting with designs for single magnetic pickups (as opposed to the bunched magnets found in electric guitars), we discovered that they were remarkably good at listening locally. We immediately started putting them inside of a piano and found, to our excitement, that one pickup could listen to the one string it was directly over and not those strings adjacent to it. This discovery opened the door for all sorts of possibilities for computer processing: we send multiple notes into a computer and process each independently!

<u>The Pickups:</u>
Uranium Tamper calls for thirty-two pickups over the following strings:
D#1; F1; B1; C#2; F2; F#2; G#2; C3; D3; F3; G#3; A3; A#3; D#4; F4; A4; A#4; B4; C#5; D5; D#5; F5; G5; C6; C#6; D6; E6; F6; G#6; A6; A#6; F7.
Each pickup is routed through its own preamp, into analog-digital converter, and then into the computers. The pickups themselves are mounted onto a rail, suspended above the piano, so that that may be adjusted by sliding them into place. The pickups never touch the string, and the rail never touches the piano.

<u>Amplification:</u>
The piece should be able to be loud enough that you can feel the sound. Use PA speakers, guitar amps, or a combination of the two. Place one speaker underneath the piano to be used in sections A and F.

<u>The Software:</u>
(The following was written by the composer, who cannot adequately account for the all of the complexities involved in the design of software). All of the processing techniques performed by the computer were developed in order to take full advantage of the opportunity to process multiple piano strings independently. These various techniques can be easily categorized by section as follows:

Section A. Only two processes can be heard in this section, and the four highest F's on the keyboard trigger all of them.

1) F4, F5, F6, and F7 each trigger a noise tail, the duration and loudness of which is determined by how forcefully the pianist plays the note.
2) In the even subsections (A2, A4), each F triggers a step through a pitch sequence with every attack. They each are assigned the same sequence, but, because they are in polyrhythmic relation with one another, their sequences unfold at varying speeds.

These processes slowly and quietly emerge as the section unfolds, first from the speaker underneath the piano and then the other speakers.

Section B. The main process of this section is the “chord tracker.”
The software is designed to recognize chords as opposed to single notes. It is also designed to “hear” which note of a given chord is loudest. Each subsection has its own rules on how to process a) the loudest note/s in a given chord, b) the rest of the notes in the given chord, and c) everything else. The pianist is to play the diamond shaped noteheads louder. As the section continues, the parameters of the effects (digital delay, equalization, distortion, pitch shift, sustain, and feedback) change to create an overall increase in density while also emphasizing the downward chromatic motion that emerges in the piano part.

Section C. Computer sequenza. Through section B, the computer has been recording loops of various strings at random. As soon as the down beat of section B hits, we hear these loops pitch shifted way down and through lots of multi-tap delays. It should rumble. Sub-woofers are preferable.

Section D: While the pianist bangs the octaves, the computer glisses them inward towards the pitch at the beginning of section E.

Section E. Here all of the F's are resonating. The pianist triggers blasts of high piercing squeals, that are processed loops from section D.

Section F. This is the “feedback solo.” One speaker is placed underneath the piano. By lightly depressing a key, without letting the hammer strike, that pitch will feed back.

The Duration is about 40 minutes.

Score

Uranium Tamper

A1

♩=52

Piano

fff

ppp

Ped.

Pno.

8

15

22

29

36

43

50

58

A2

Pno.

66

Pno.

73

Pno.

80

Pno.

87

Pno.

94

Pno.

A3

101

A4

Ped.

Pno.

108

Pno.

114

Pno.

3:2

120

Pno.

3:2

125

Pno.

3:2

A5

131

Pno.

138

Pno.

3:2

B

♩=42

fff

B1

mf

144

Pno.

3:2

149

Pno.

3:2

B2

155

Pno.

3:2

160

Pno.

165

Pno.

B3

170

Pno.

174

Pno.

B4

177

Pno.

181

Pno.

184

Pno.

187

Pno.

B5

190

192

195

199

202

206

210

214

Pno.

3:2

8va

ff

mf

Ped.

217

Pno.

8va

3:2

ff

mf

Ped.

222

Pno.

8va

3:2

ff

228

Pno.

(8va)

232

Pno.

(8va)

235

Pno.

C

ca. 5 minutes

♩=88

3:2

fff

Ped.

D

♩=88

241

Pno.

13x

3:2

E1

f

246

Pno.

253

Pno.

3:2

260

Pno.

266

Pno.

273

Pno.

E2

280

Pno.

286

Pno.

293

Pno.

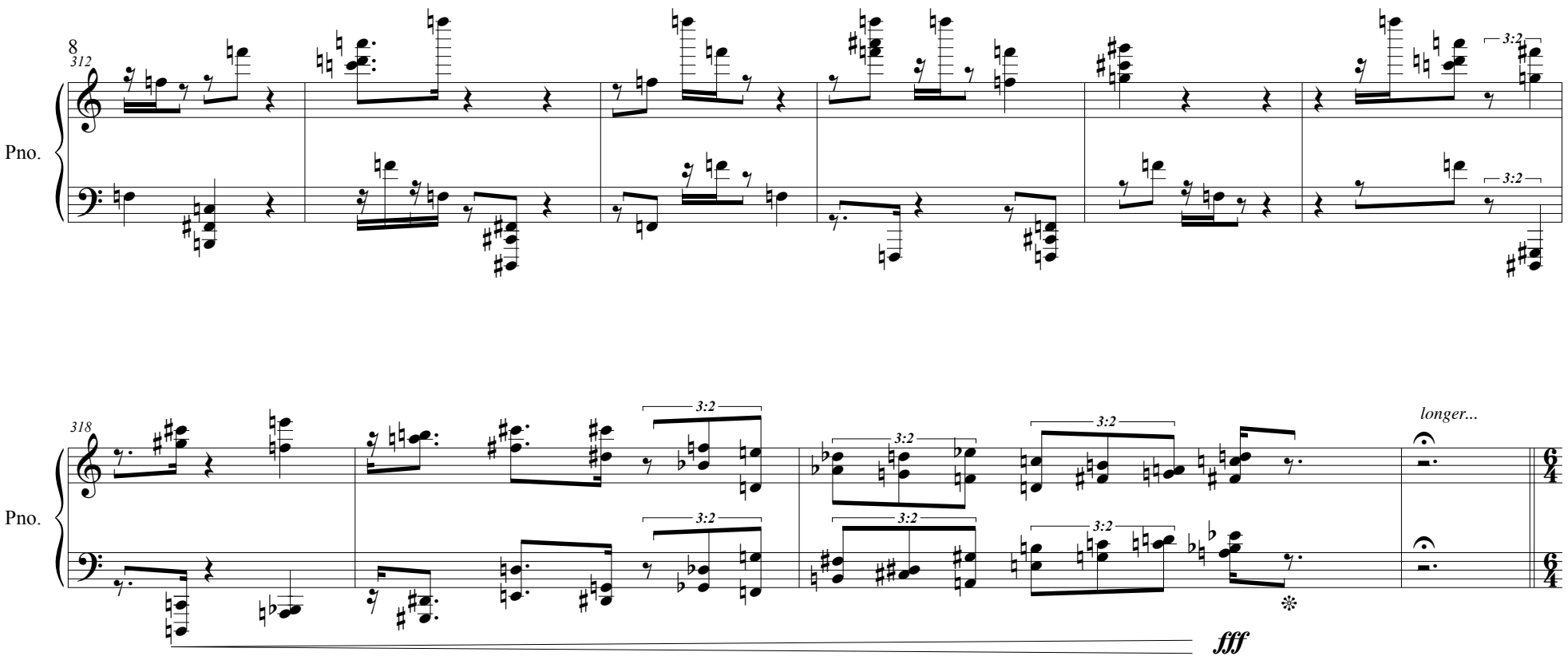
E3

299

Pno.

305

Pno.


8
312
Pno.
3:2
3:2
318
Pno.
3:2
3:2
3:2
3:2
3:2
3:2
longer...
fff
F
ca. 10 minutes
♩=56 but very freely
322
Pno.
(create feedback by depressing keys,
no hammer strikes)