

# Broken Symmetries (and the Masses of Gauge Bosons)

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## Instructions

### Amplification:

Use amplification where necessary. The flute and piano should likely be amplified. The percussion and saxophone should not be. The violin should be amplified and distorted. Use either a guitar overdrive pedal or a computer for distortion. If possible use different distortion settings for each speaker. The speakers for amplification should be in front of the ensemble.

### Feedback setup:

Broken Symmetries uses a custom feedback control setup manipulated by a laptop performer. Two speakers are placed behind the ensemble, each facing a condenser or omnidirectional microphone (depending on the room). The microphone should be approximately 6-10 feet from the speaker. The microphone signal is sent to the laptop performer's setup and processed through the feedback control software. The software monitors the incoming signal, allowing it to feed back for a period of time. When the software detects that a single pitch has fed back for an extended period, it blocks that pitch from feeding back further. When this happens, a new pitch will begin to feed back.

In between the microphone and the feedback software is a bank of resonant filters tuned to the harmonic series of the open strings of the violin. This guarantees that the only pitches that will feed back are harmonics of G, D, A and E.

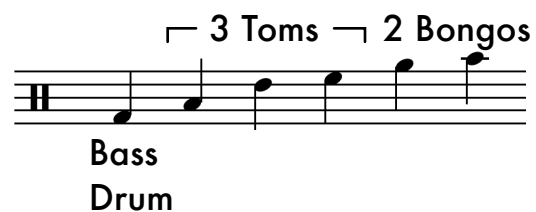
In the signal chain, after the feedback software, there is an overdrive distortion, giving the signal an overdriven guitar-like quality.

### Signal Chain:

Microphone → Filter Bank → Feedback Control Software → Overdrive Distortion → Speaker

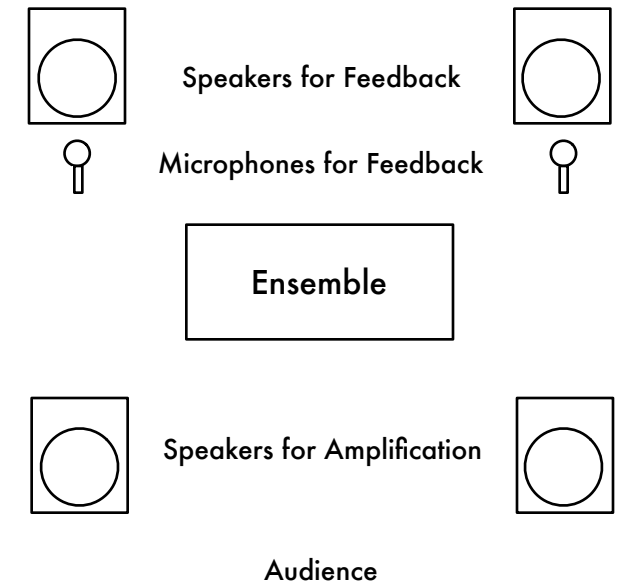


### Percussion Setup:



### Saxophone Multiphonics:

The saxophonist chooses 5 multiphonics of maximal intensity. The score labels the desired multiphonic from 1 - 5 with a number surrounded by a box. The performer plays the multiphonic, in time, corresponding to the numbers in the box.





30

Picc.

Sax.

Perc.

Pno.

Vln.

Elec.

43

Picc.

Sax.

Perc.

Pno.

Vln.

Elec.

54

Picc.

Sax.

Perc.

Pno.

Vln.

Elec.

**B** 67

Picc.

Sax.

Perc.

Pno.

**B** Vln.

Elec.

76

Picc.

Sax.

Perc.

Pno.

Vln.

Elec.

89

Picc.

Sax.

Perc.

Pno.

Vln.

Elec.

C

accel.

101

Picc.

Sax.

Perc.

Pno.

Vln.

Elec.

freely move between multiphonics 1-4

C

accel.

112

Picc.

Sax.

Perc.

Pno.

Elec.

D ♩ = 140

D ♩ = 140

rock between open strings - touching harmonics on adjacent strings

123

Picc.

Sax.

Perc.

Pno.

Elec.

continue to improvise on open strings

132

Picc.

Sax.

Perc.

Pno.

Elec.

continue to improvise on open strings

140

Picc.

Sax.

Perc.

Pno.

Elec.

continue to improvise on open strings

148

Picc.

Sax.

Perc.

Pno.

Elec.

continue to improvise on open strings

156

Picc.

Sax.

Perc.

Pno.

Elec.

continue to improvise on open strings

164

Picc.

Sax.

Perc.

Pno.

Elec.

continue to improvise on open strings

*ff* improvise on multiphonic 5 only - interact with percussion, turning on and off with percussive hits

*fff* improvise sparsely on toms and bongos, similar to the opening section - interact with saxophone, turning it on and off

172

Picc. 

Sax.   
continue to improvise on multiphonic 5 - interact with percussion

Perc.   
continue to improvise on toms and bongos - interact with saxophone

Pno. 

Elec.   
continue to improvise on open strings

181

Picc. 

Sax.   
continue to improvise on multiphonic 5 - interact with percussion

Perc.   
continue to improvise on toms and bongos - interact with saxophone

Pno. 

Elec.   
continue to improvise on open strings

189

Pic.

Sax.   
continue to improvise on multiphonic 5 - interact with percussion

Perc.   
continue to improvise on toms and bongos - interact with saxophone

Pno.

Elec.   
continue to improvise on open strings

197

Pic.

Sax.   
continue to improvise on multiphonic 5 - interact with percussion

Perc.   
continue to improvise on toms and bongos - interact with saxophone

Pno.

Elec.   
continue to improvise on open strings

breath when necessary

205

Picc.

Sax. continue to improvise on multiphonic 5 - interact with percussion

Perc. continue to improvise on toms and bongos - interact with saxophone

Pno.

Elec.

211

Picc.

Sax. continue to improvise on multiphonic 5 - interact with percussion

Perc. continue to improvise on toms and bongos - interact with saxophone

Pno.

Elec.

217

Picc. 


Sax.   
continue to improvise on multiphonic 5 - interact with percussion


Perc.   
continue to improvise on toms and bongos - interact with saxophone

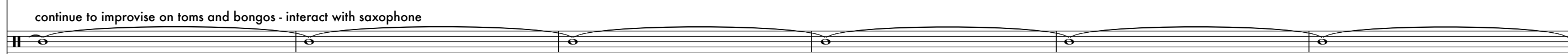
Pno. 


Elec.   
continue to improvise on open strings


223

Picc. 

Sax.   
continue to improvise on multiphonic 5 - interact with percussion

Perc.   
continue to improvise on toms and bongos - interact with saxophone

Pno. 

Elec.   
continue to improvise on open strings

229

Picc. continue to improvise on multiphonic 5 - interact with percussion

Sax. continue to improvise on toms and bongos - interact with saxophone

Perc.

Pno. <sup>f5</sup>

Elec. continue to improvise on open strings

Detailed description: This system of musical notation covers measures 229 to 234. It features five staves: Piccolo (Picc.), Saxophone (Sax.), Percussion (Perc.), Piano (Pno.), and Electric Guitar (Elec.). The Piccolo staff contains a complex melodic line with many accidentals. The Saxophone and Percussion staves are marked with long horizontal lines and curved brackets, indicating improvisation. The Piano staff shows a rhythmic accompaniment with a dynamic marking of <sup>f5</sup>. The Electric Guitar staff is marked with a long horizontal line and an arrow, indicating improvisation on open strings.

235

Picc. continue to improvise on multiphonic 5 - interact with percussion

Sax. continue to improvise on toms and bongos - interact with saxophone

Perc.


Pno. <sup>f5</sup>


Elec. continue to improvise on open strings

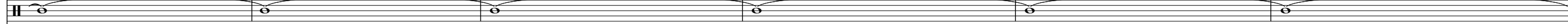
Detailed description: This system of musical notation covers measures 235 to 240. It features the same five staves as the previous system. The Piccolo staff continues with its complex melodic line. The Saxophone and Percussion staves remain marked for improvisation. The Piano staff continues with its rhythmic accompaniment. The Electric Guitar staff remains marked for improvisation on open strings.





254


Picc. 

Sax. 

Perc. 

Pno. 


Vln. 


Elec. 

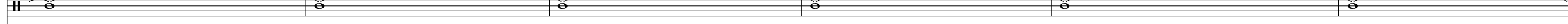
continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion


continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone


260


Picc. 

Sax. 

Perc. 

Pno. 

Vln. 

Elec. 

continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion

continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

\*downward scales/arpeggios over the specified duration.  
each gesture should be comprise of varying types of triplets faster than 16th notes

266

Picc.

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion

Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

Pno.

Vln.

Elec.

272

Picc.

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion


Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

Pno.

Vln.


Elec.

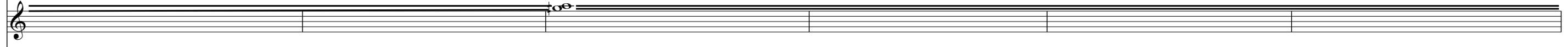
278

Picc. 

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures (now at 50%) - interact with percussion

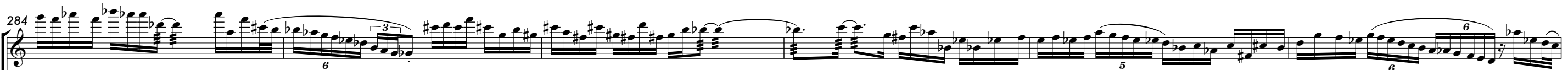
Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures (now at 50%) - interact with saxophone

Pno. 

Vln. 


Elec. 


284

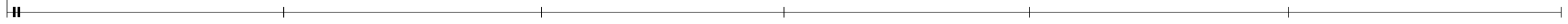
Picc. 

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion

Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

Pno. 

Vln. 

Elec. 

290

Picc.

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion

Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

Pno.

Vln.

Elec.

296

Picc.

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion

Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

Pno.

Vln.

Elec.

Picc. 301

**F** multiple fast downward scales/arpeggios starting and ending on any note.  
 reduce density of gestures from constant to very sparse over the 60 seconds.  
 60 sec

Sax. continue to improvise on all multiphonics, gradually adding more frequent upward trill gestures - interact with percussion

trills, starting in the low register and moving upward across the range of the instrument.  
 0.5-2 seconds per trill. loop the gesture.  
 reduce density of gestures from constant to very sparse over the 60 seconds

Perc. continue to improvise on all percussion, gradually adding more frequent upward roll gestures - interact with saxophone

rolls, starting in the low register and moving upward across the setup. 0.5-2 seconds per roll.  
 loop the gesture.  
 reduce density of gestures from constant to very sparse over the 60 seconds.

Pno. 45

multiple rapid downward scales/arpeggios starting and ending on any note.  
 reduce density of gestures from constant to very sparse over the 60 seconds.  
 60 sec

Vln.

**F**

Elec.

fade out  
before violin