

David Biedenbender

Symmetry
Breaking

for piano four hands

bent space music

Written for and dedicated to Zofo – Eva-Maria Zimmermann and Keisuke Nakagoshi.

Premiered at the Wichita Museum of Art
on the Chamber Music Series of Wichita, Kansas on March 27, 2022.

Performance materials available from Bent Space Music (Publisher):
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PROGRAM NOTE

In 2021 I was appointed guest composer at Fermilab, a United States Department of Energy national laboratory specializing in high-energy particle physics. I was also asked to be composer-in-residence for the Chamber Music Society of Wichita's inaugural season and to write a piece for the incredible piano duo Zofo. As part of the Fermilab residency, my plan had been to write several pieces to be performed in the Fermilab concert hall, but as the COVID-19 pandemic stretched into its second year it became clear that we would not be able to hold any live performances during my tenure. I pivoted and decided that I would write a work inspired by physics for Zofo, and we would capture video of the performance to share virtually with the Fermilab audience.

In physics, symmetry breaking is a phenomenon in which infinitesimally small fluctuations acting on a system crossing a critical point decide the system's fate by determining which branch of a bifurcation is taken. To an outside observer unaware of the fluctuations or "noise", the choice will appear arbitrary. This process is called symmetry "breaking", because such transitions usually bring the system from a symmetric but disorderly state into one or more definite states. *Broken Symmetry* is also the name of the metal sculpture that welcomes visitors to Fermilab's campus, created by Robert Wilson, Fermilab's first director.

This piece explores the idea of symmetry breaking in many ways, including through musical material that is played in literal symmetry across an imaginary center axis of the keyboard, which also causes the pianists' physical motion to be mirror images of each other. This symmetrical material is broken and reassembled many ways, and I imagined a kind of delicate dance created by the pianists coming together and then splitting apart. The subatomic world is very strange compared to our intuitive understanding of the visible, everyday world, so I also tried to capture some of the strangeness of phenomena like quantum entanglement and superposition as well as spin.

While writing the piece though I could not help but see broken symmetry as a larger metaphor reflected in the world around me. In February 2022 Russia invaded Ukraine, starting a war that did not need to be fought and in which many people have died. One morning shortly after the invasion began I received a text from my sister: "I woke up to a panicked message from a mom in our parent Facebook group. She's at the border of Poland and desperate to keep her child safe. She can't get out and is terrified."

Humans are capable of such amazing things as well as such horrific atrocities. In 2021 the Fermilab Muon g-2 experiment revealed the potential existence of a new particle which would challenge our current understanding of the subatomic world, "The Standard Model." 200 scientists from 35 institutions in seven countries worked together on this extraordinary experiment. Meanwhile, a single lost life is worth infinitely more than all the hollow justifications spewed for a meaningless war. I cannot imagine what it's like to be driven from my home by war—to be *that* afraid or to be brave enough to stay and fight—but in some small way this piece is also a meditation more generally on the symmetry we share with other humans, a space to empathize with a woman, a mother—just like my sister—who lives on the other side of the world and who cares deeply for her child but somehow through some unfortunate series of events—some seemingly arbitrary brokenness—is running from her home scared and afraid—a symmetry now broken. My hope and prayer is that we strive to fill this world with more beauty, more empathy, and more curiosity—a curiosity that leads us not only to discover new insights in the infinitely small subatomic world but also to see and value our shared symmetry across humanity.

Total duration: ca. 8:30

PERUSAI SCORE

for Zofu – Eva-Maria Zimmermann and Keisuke Nakagoshi

Symmetry Breaking

for piano four hands

David Biedenbender

Steady, waves ♩ = 84

damp string near peg with finger (all hammer sound),
slowly lift finger with *cresc.*

15^{ma}

I

pp

damp string near peg with finger (mostly hammer sound),
slowly lift finger with *cresc.*

8^{ba}

pp

(*red.*)

II

pp

(*red.*)

(15) open resonance

damp string

I

ff

pp

open resonance

damp string

II

ff

pp

(8)

(*red.*)

Perusal Score only.
Any other use is strictly prohibited.

19 (15) 20

I *ff* *pp* *ff*

II (8) *ff* *pp* *ff*
(*ℳ*.)

22 (15)

I *pp* *ff* *p*

II (8) *pp* *ff* *p*
(*ℳ*.)

24 (15) 25

I *ff* *pp* damp ord. (no damping)

II (8) *ff* (*pp*) *ff*
(*ℳ*.)

27

I *ff* *ppp*

II *pp* *ff*
(8) *p*
(*ℳ*.)

Perusal Score only.
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29

I

II

ff 3 3 5

pp 3 3

(8)
(Red.)

32

I

II

pp (*pp*) *ff*

pp *ff* *pp*

(8)
ff
(Red.)

(♩. = ♩)

35 Faster, flowing ♩ = 112

I

II

p *pp* (*pp*)

pp graceful
(Red.)

mf

38

I *mf*

II *pp*

(*And.*)

41

I *pp* *f*

II *f*

(*And.*)

44

I *pp*

II *pp* *ff*

(*And.*)

47

49 Rising, sparkling

I *ff* *p*

II *p* *pp*

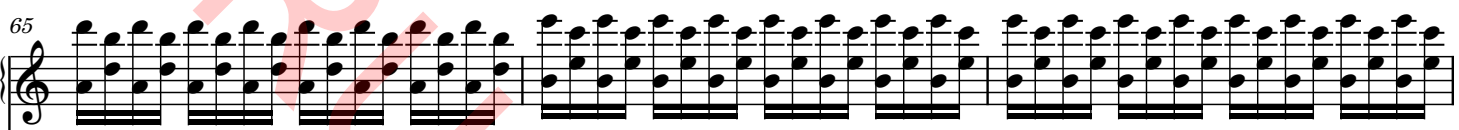
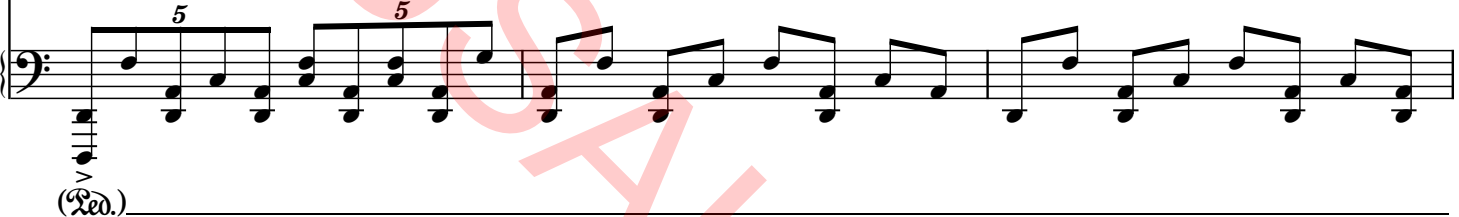
(*And.*)


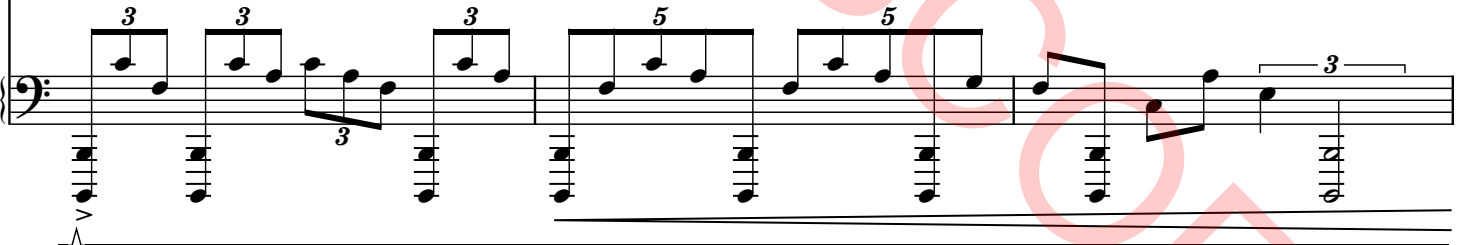
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64


I 
mp suspended singing delicate

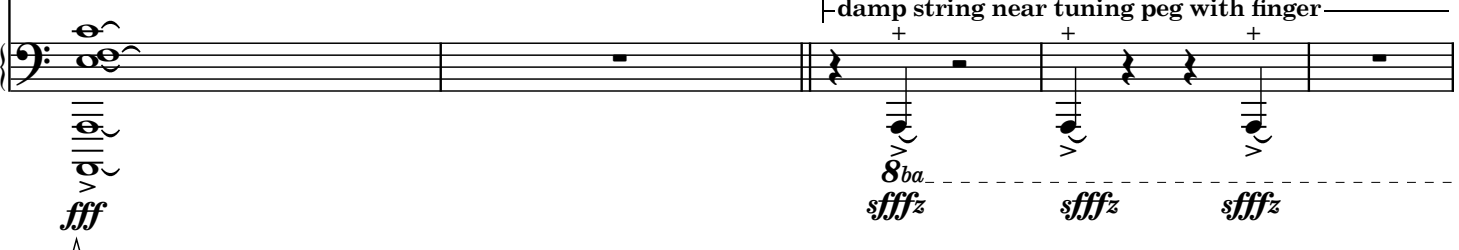
II 
(*ped.*)

I 
II 
(*ped.*)

I 
II 

(♩ = ♩) 73 Slower ♩ = 84

I 
pp

II 
|damp string near tuning peg with finger|
fff *sfffz* *sfffz* *sfffz*

Perusal Score only.
Any other use is strictly prohibited.

76

I

II

sfffz (ped.)

sfffz

sfffz

sfffz

80

I

II

ppp delicate

sfffz (ped.)

(no pedal retake: let m. 83 grow out of resonance)

83 **Aching (a tempo)** ♩ = 112

I

II

p

pp

(ped.)

85

I

II

f

pp

(ped.)

I 87

II

(Ped.)

f

Detailed description: This system contains two staves. Staff I (treble clef) starts at measure 87 with a series of chords, each containing a pair of notes (e.g., G4 and A4, F4 and G4, E4 and F4, D4 and E4, C4 and D4, B3 and C4, A3 and B3, G3 and A3). Staff II (grand staff) begins with a piano introduction marked '(Ped.)' and continues with a melodic line in the right hand and a bass line in the left hand. A dynamic marking of *f* appears in measure 92.

I 89

cresc.

II

(Ped.)

p

Detailed description: This system continues from the previous one. Staff I starts at measure 89 with the same chordal texture, but with a *cresc.* (crescendo) marking. Staff II continues with the piano introduction and melodic lines. A dynamic marking of *p* (piano) appears in measure 92.

93 Blooming

I 91

II

(Ped.)

Detailed description: This system is marked '93 Blooming'. Staff I starts at measure 91 with the chordal texture. Staff II continues with the piano introduction and melodic lines. A '(Ped.)' marking is present at the beginning of the system.

I 94


f *pp* *f*

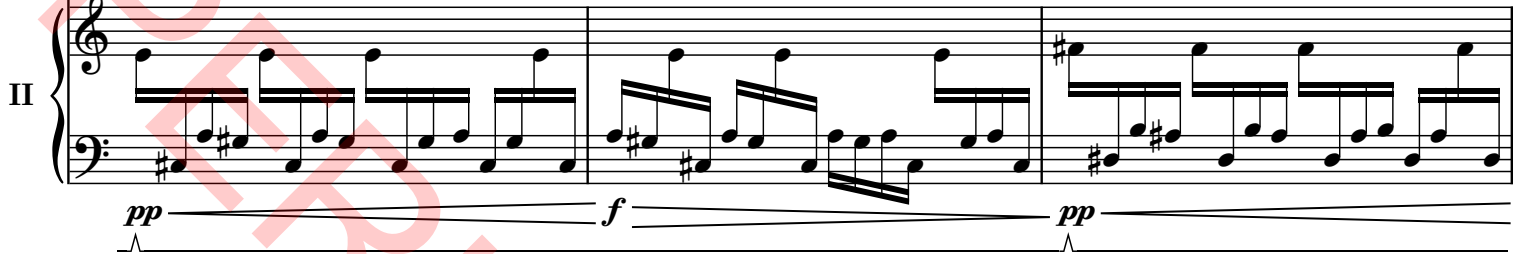
II

(Ped.)


f *pp* *f*

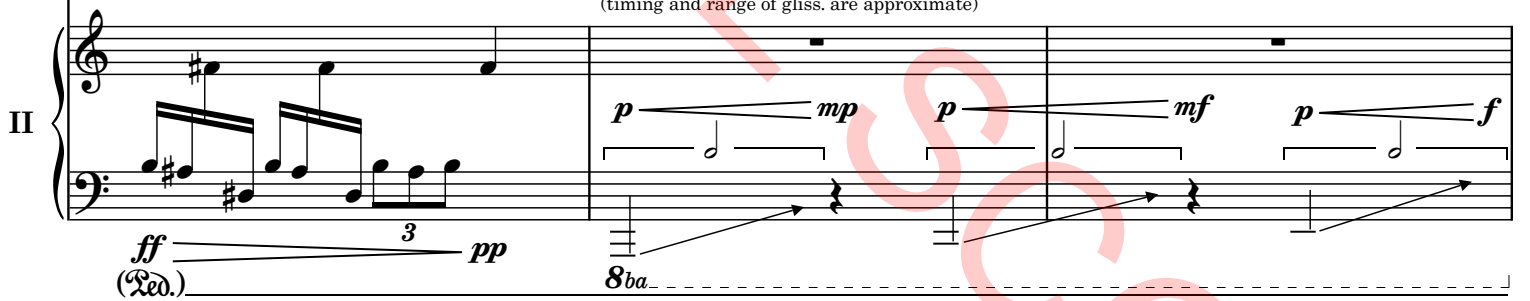
Detailed description: This system starts at measure 94. Staff I features dynamic markings of *f*, *pp*, and *f* across measures 94, 95, and 96 respectively. Staff II also features dynamic markings of *f*, *pp*, and *f* across the same measures. A '(Ped.)' marking is present at the beginning of the system.

I 


II 

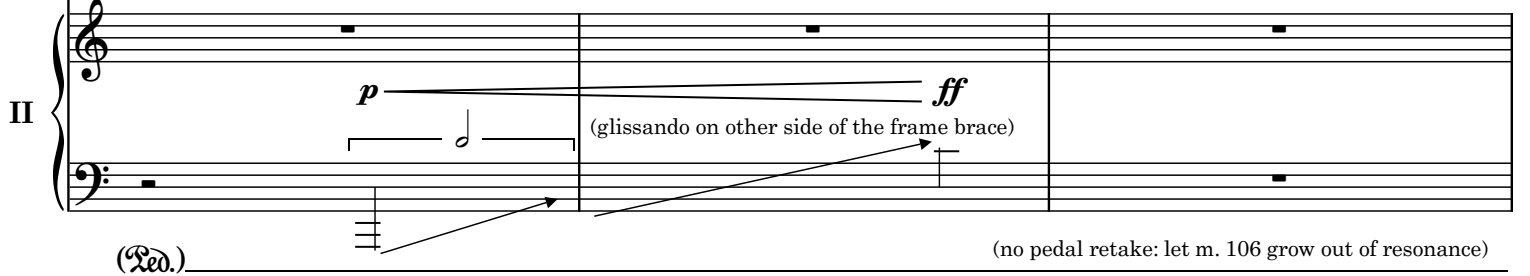
101 Murky

I 

II 

glissando inside the piano/strum across strings with fingertips
(timing and range of gliss. are approximate)

I 

II 

(no pedal retake: let m. 106 grow out of resonance)

Perusal Score only.
Any other use is strictly prohibited.

120 Violent

118

I

II

ff

15^{ma}

8^{ba}

(Ped.)

121

I

II

(15)

(8)

126 Relentless

124

I

II

pp gently

ff

15^{ma}

8^{ba}

(Ped.)

127 (15)

I

II

130 (15)

I

II

133 (15)

134 Floating

pp gently

I

II

Red.

Perusal Score only.
Any other use is strictly prohibited.

136

I

II

(Red.)

139

I

II

(Red.)

142

15^{ma}

I

II

8^{ba}

145 (15)

I

II

glissando inside the piano

(ff)

(8)

(Red.)

148

I *pp* gently

II

(Red.)

152 Clear

151

I *p*

II *mp* lightly, playful *sfz*

(Red.)

154

I

II *echoes* *pp* *mp* *sfz* *echoes* *pp*

157

I

II *f* *sfz*

Perusal Score only.
Any other use is strictly prohibited.

160 *gva*

I *mp*

II *pp*

162 (8)

I *pp*

II *f*

164 (8)

I *pp*

II *f*

166 (8)

I *cresc.*

II *pp*

f

168 (8)

I *f*

II *pp*

ff

pp

170 Brutal

(8)

(chromatic clusters)

fff hammering

p

fff hammering

8va

(8)

172

ff

p

fff

fff

8va

175 (8)

p

ff

p

p

ff

p

178

8va

fff

8va

fff

Symmetry Breaking

180 $\text{♩} = \text{♩}$

185 Still, slowly $\text{♩} = 56$

191

198