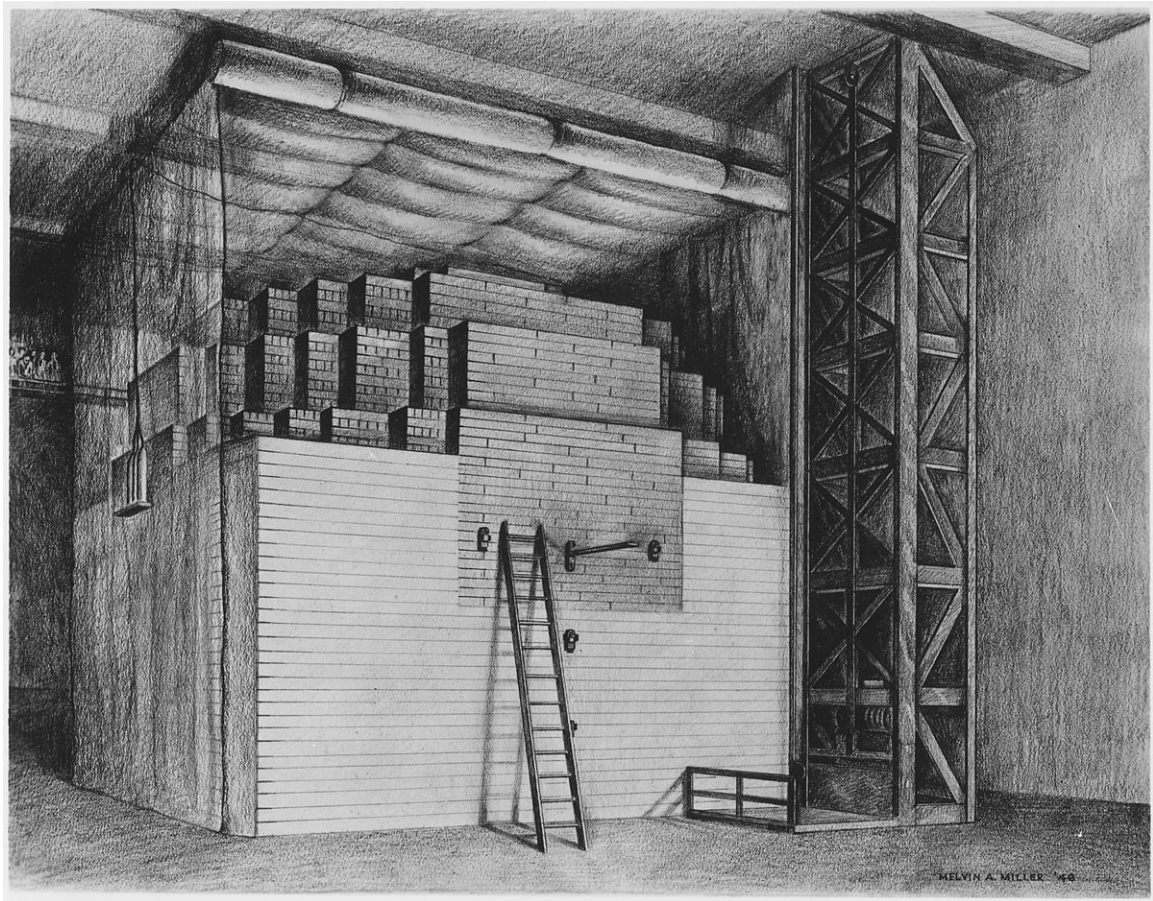


Chain Reactions

2017

for flute/alto flute, vibraphone/crotales, and pian



Commissioned for the 75th commemoration of Chicago Pile-1

Clifton Callender

Chain Reactions was commissioned for the 75th Commemoration of Chicago Pile-1, the first controlled, self-sustaining nuclear chain reaction achieved under the supervision of Enrico Fermi. The first movement, *Subcriticality*, refers to the situation in which neutron losses (due to absorption) exceed neutron production (due to fission) leading to eventual termination of the reaction. Throughout the movement, processes are initiated but inevitably dissipate energy and terminate. The second movement, *Criticality*, is stable without being static. The rhythms of the movement are determined by a guided probabilistic structure in much the same way that the “cross section” of a nucleus characterizes the probability that the nucleus will undergo a nuclear reaction.

Chain Reactions

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Clifton Callender

I. Subcriticality

Allegro ♩ = 132-138

alto flute

tongue ram *

f possibile

vibraphone

piano

mf

p

8vb

Sost. Ped.

senza Ped.

sempre al fine

a fl

vb

pn

mf

f

mp

f

f

(*Sost. Ped.*)

* Finger diamond notehead; lower notehead is the sounding pitch.

11

a fl *mp* *ff*

vb *mp* *ff*

pn *mp* *ff*

(Sost. *Reo*)

16

a fl *p* *ff* *p* *ff*

vb *p* *ff* *p* *ff*

pn *p* *ff* *p* *ff*

(Sost. *Reo*)

22

a fl *p* *f*

vb *p* *f* *Ped.* *Ped.* *Ped.*

pn *p* *f* *Ped.* *Ped.* *** *Ped.*

(Sost. *Reo*)

27

a fl

vb

pn

f possibile

p

f

(Sost. Leo)

* *f*

35

a fl

vb

pn

mf *mp* *f*

mf *mp* *f*

(Sost. Leo)

41

a fl

vb

pn

mp *ff* *mfpp* *mfpp*

mp *ff* *mf*

ff *mp*

p

(Sost. Leo)

Leo *Leo*

47

a fl *mf pp* *mf pp* *mf* 5:3 *f p* *f p* *f p*

vb *mf* 5:3 *mf*

pn *mp* *mf* 5:3 *mf* 5:3 *Reo.* *Reo.* *Reo.*

(Sost. Reo.) * *senza Reo.*

52

a fl *f p* *f p* *f p* *f p* *f p*

vb *mp* *f*

pn *f* *Reo.* *Reo.* *Reo.* *Reo.* *Reo.* * *senza Reo.*

(Sost. Reo.)

57

a fl *p* *ff*

vb *ff*

pn *ff*

(Sost. Reo.)

fl

vb

pn

67

p

f

ff

rubato

crotales

Ped.

8va

(Sost. Leo)

Leo

122 128

73

Tempo primo

152-153

tremolo: slow → fast

a fl

73

vibraphone

mf

pn

(Sost. And.)

79

a fl

f possibile

vb

più f *f*

pn

più f *f*

(Sost. Xco)

83 *to flute*

a fl

vb

f *ff*

pn

f *ff*

(Sost. Xco)

87

a fl

vb

8va *Ped.* *8va*

pn

f

(Sost. Xco)

This musical score is for a piece featuring flute, vibraphone, and piano. The score is divided into three systems, each with measures 92, 97, and 102. The flute part includes a 'flute' marking and a 'ff' dynamic. The vibraphone part includes a 'ff' dynamic. The piano part includes a 'fff' dynamic and a 'Sost. Leo.' marking. The score is written in 2/4 time and features various musical notations, including notes, rests, and dynamic markings.

fl

vb

pn

107

4:3

4:3

(Sost. $\text{F}\flat\text{C}\flat$)

fl

vb

pn

111

(Sost. $\text{F}\flat\text{C}\flat$)

fl

vb

pn

114

5

5:3

5:3

(Sost. $\text{F}\flat\text{C}\flat$)

flute m. 119 – 125 independent of notated tempo and meter

presto possibile poco a poco ritardando e decrescendo

repeat figure through m. 125

119

fl *ff*

119 percussion and piano m. 119 – 125 maintain notated tempo and meter

119 percussion and piano m. 119 – 125 maintain notated tempo and meter

pn (Sost. *Reo.*) *mf* *Reo.* 5:3 5:3

al ♩ = 52 *pizz.* *mp* *fff_p* *fff_p* *fff_p* *fff_p* *8^{va}* *8^{va}* *8^{va}* *8^{va}*

124 *crotales* *ff* *8^{va}* wait for flute to finish figure

pn (Sost. *Reo.*) *8^{vb}* *ff* *Reo.*

----- (Sost. *Reo.*) -----

*

* Dampen immediately.

II. Criticality

$\text{♩} = 176$

flute

vibraphone

piano

fl

vb

pn

ff *p* *ff* *ff mp* *p*

ff *p* *ff* *ff mp* *p*

ff *p* *f* *mf* *ff*

ff *p* *f* *mf* *ff*

mf *f* *ff* *p*

mf *f* *ff* *p*

ff *p*

* Flute and vibraphone equally balanced throughout movement.

** Pedal ad lib. Use sparingly!

System 1 (Measures 20-24):

- fl:** Measures 20-24. Dynamics: *f*, *mf*, *p*.
- vb:** Measures 20-24. Dynamics: *f*, *mf*, *p*.
- pn:** Measures 20-24. Dynamics: *ff*, *p*, *f*, *p*, *f*.

System 2 (Measures 25-29):

- fl:** Measures 25-29. Dynamics: *mf*, *mp*, *f*, *ff*, *f*, *ff*, *mp*.
- vb:** Measures 25-29. Dynamics: *mf*, *mp*, *f*, *ff*, *f*, *ff*, *mp*.
- pn:** Measures 25-29. Dynamics: *ff*, *mf*, *ff*, *p*. Includes a *pizz.* marking above measure 28.

System 3 (Measures 30-34):

- fl:** Measures 30-34. Dynamics: *mf*. Includes a *pizz.* marking above measure 30.
- vb:** Measures 30-34. Dynamics: *mp*. Includes a *dead stroke* marking above measure 30.
- pn:** Measures 30-34. Dynamics: *mp*, *mf*, *p*.

System 1 (Measures 35-38):

- fl:** Measures 35-38. Dynamics: *mf* (measures 36-37), *mf* (measure 38).
- vb:** Measures 35-38. Dynamics: *mf* (measures 36-37), *mp* (measure 38).
- pn:** Measures 35-38. Dynamics: *p* (measure 35), *mf* (measures 36-37), *mp* (measure 37), *mf* (measure 38), *f* (measure 38), *ff* (measure 38).

System 2 (Measures 39-43):

- fl:** Measures 39-43. Dynamics: *f* *ff* (measures 39-40), *p* (measure 41), *ff* (measure 42), *mf* (measure 43).
- vb:** Measures 39-43. Dynamics: *f* *ff* (measures 39-40), *p* (measure 41), *ff* (measure 42), *mf* (measure 43).
- pn:** Measures 39-43. Dynamics: *p* (measure 39), *ff* (measures 42-43).

System 3 (Measures 44-47):

- fl:** Measures 44-47. Dynamics: *ff* *mp* (measures 44-45), *f* *p* (measures 45-46), *mf* (measure 46), *ff* (measure 47), *mf* (measure 47).
- vb:** Measures 44-47. Dynamics: *ff* *mp* (measures 44-45), *f* *p* (measures 45-46), *mf* (measure 46), *ff* (measure 47), *mf* (measure 47).
- pn:** Measures 44-47. Dynamics: *mp* (measure 44), *mf* (measure 44), *mp* (measure 45), *mf* (measure 46), *ff* (measure 46), *p* (measure 47).

fl 48 *f* *ff* pizz. *p* *cresc.*

vb 48 *f* *ff* dead stroke *pp* *cresc.*

pn 48 *f* *pp*

fl 53 *al f*

vb 53 *al f*

pn 53 *f* *ff* *8va* *p* *mf* *f*

fl 57 *ff* *ff* *mf* *f*

vb 57 *ff* *ff* *mf* *f*

pn 57 *mf* *f* *mf* *f* *ff* *f*

Detailed description: This musical score is for a piece titled 'Chain Reactions'. It consists of three systems of staves for flute (fl), vibraphone (vb), and piano (pn). The first system covers measures 48 to 52. The flute and vibraphone parts begin with a forte (*f*) dynamic and a crescendo, then transition to a piano (*p*) dynamic with a 'pizz.' (pizzicato) instruction for the flute and a 'dead stroke' instruction for the vibraphone. The piano part starts with a forte (*f*) dynamic and a piano (*pp*) dynamic. The second system covers measures 53 to 56. The flute and vibraphone parts are marked *al f* (all fortissimo). The piano part features a variety of dynamics including *f*, *ff*, *p*, *mf*, and *f*, with an *8va* (octave up) instruction. The third system covers measures 57 to 60. The flute and vibraphone parts show a dynamic progression from *ff* to *mf* to *f*. The piano part continues with dynamics of *mf*, *f*, *mf*, *f*, *ff*, and *f*.

fl

61

vb

61

pn

61

63

fl

63

vb

63

pn

63

8va

ff fff

sempre fff

sempre fff

sempre fff

fff

fff

fff

fff