

Jeffrey Ryan

Quantum Mechanics

for string quartet

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Quantum Mechanics

String Quartet in Three Movements

Fission	1
Absolute Zero	15
Fusion	19

Performance Notes:

1. Total performance time 15'50". Timings for individual movements are given at the end of each movement in the score.
2. All glissandi begin immediately upon sounding the first pitch. For glissandi of longer duration, the initial pitch is given as an eighth note, with the duration of the glissando given in small notes.
3. At the end of the first movement, the violins and viola must play *col legno* with chopsticks (a classic “Erbism”). This not only saves the bow, it gives a sharper, more pitched sound when played *battuto*, and a more transparent sound when played *tratto*. Wooden chopsticks will work best, and they must be thoroughly rosined (it may be necessary to roughen the wood with sandpaper first).
4. For the second movement, all players play with metal practice mutes. Metal mutes are required to create the more distant yet brighter sound which cannot be achieved with rubber mutes.
5. As an aid to coordination, each player's part for the second movement includes one other player's part.
6. Also in the second movement, there are two accompanied *senza misura* solo sections (measure 10 for the second violin solo, and measure 18 for the viola solo). In these sections, the soloist should move freely within the indicated time span. The accompanying instruments need only be synchronised at the points indicated with an arrow. During the second violin solo, the first violin (whose part includes the second violin part) cues the viola and cello. Similarly, in the viola solo, the second violin (whose part includes the viola part) cues the first violin and cello. The cueing player should coordinate with the solo line, but, except at those specific cues, precise synchronisation is not required.

Programme notes:

The string quartet *Quantum Mechanics* is in three movements inspired by images and ideas found in atomic energy. In particular, the essential image of the elliptical orbits of electrons around the nucleus is represented at many levels of the music. The outer movements are energetic and extroverted, reflecting their titles. Both *fission* (the act of splitting the atom) and *fusion* (the act of recombining the atom) result in a massive release of energy. In the first movement, after a slow introduction during which the instruments converge to an emphatic unison, the musical motives orbit around the central pitch D, while musical threads swirl away from this central pitch in bursts of energy. Elliptical structures are found on the large scale, in the movement's five-part form, and on the small scale, in the irregular 7/8 metre. In the final gesture of the movement, the last remnants swirl upwards into nothingness.

Absolute zero is the temperature at which all atomic motion ceases. The second movement interprets this utter stillness as a pause for meditation. The instruments play with metal practice mutes, creating a distant, ethereal sound. In the course of the movement, the gentle building of dense harmonies through simple step-wise motion in thirds is contrasted with free solo passages in which each instrument, in turn, expends its final vestige of energy and finds its own stillness.

The third movement, as befits its title, is a fusion of musical ideas from the first two movements, including the use of glissandi and the emphasis on thirds and tritones. Though it may appear less stable harmonically than the previous movements, ultimately it resolves the harmonic implications of the whole work. On the structural level, the image of the ellipse again appears, but this time it is represented by the arrangement of phrase lengths into a pattern of 3+4+3+2 measures, which is repeated throughout the entire movement. This use of short phrase units creates more rapid, and often unexpected, changes in the music, though these units are sometimes combined into larger phrases of varying lengths, so that the pattern is sensed but not always apparent to the ear. As in the first movement, the steady pulse of the music is interrupted by sudden bursts of energy, and the work comes to a close with a final unison convergence and a recollection of the opening movement.

Quantum Mechanics is dedicated with appreciation and admiration to my former teacher Donald Erb, whose life and work demonstrate what it means to be a great composer, a great teacher, and a great person.

Quantum Mechanics

Fission

Jeffrey Ryan

= 42 Mysterious

non vib. *sul pont.*

pppp

pp > pppp *pp > pppp* *non vib.*

pp > pppp *pp > pppp* *p sub. > pppp*

sul A *sul D*

pppp *p > pppp*

ord. *pp > pppp* *pp > pppp* *pppp < pp > pppp* *sul pont. ord.* *pp > pppp* *pp > pppp*

pp *pp > pppp* *p sub. > pppp* *pp > pppp* *< p*

pp *pp > pppp* *p sub. > pppp* *pp > pppp* *< p*

(artificial harmonic gliss.)

p *pppp* *p > pppp* *pp > pppp* *pp > pppp* *p > pppp* *ord.* *p > pppp* *p > pppp* *p > pppp* *p > pppp*

pp > pppp *pp > pppp* *pp > pppp* *pp > pppp* *pp > pppp* *pp > pppp* *ord.* *p > pppp* *p > pppp* *p > pppp* *p > pppp*

p *p > pppp* *ord.* *p > pppp* *p > pppp* *p > pppp* *p > pppp*

(II) *+ (non-harm.) arco non vib.*

natural harmonic

p *p > pppp* *p > pppp* *p > pppp*

26 **B** Vibrant and energetic

0 0 0
f > mf
p f > mf
0
mf f > mf
mf f > mf
mf f > mf
ff p f
f

30

ff f > mf
ff p
ff sub. p sub.
f > mf mf
ff p < f p < f
ff p < f p < f p
ff f

C

p
f > mf
mf > ff
(mf) f > f
ff f > p
ff f > p
ff f

48

E

51

54

58

F
62

66

69 *ord.*

gl. *gl.* *gl.* *gl.*

ff *pp*

mf > *pp* *mf* > *pp* *mf* > *pp* *mf* > *pp* *pp*

mf > *pp* *mf* > *pp* *mf* > *pp* *mf* > *pp*

mf > *pp* *mf* > *pp* *mf* > *pp* *mf* >

72

mf

ff *pp* *mf* > *pp* *mf* > *pp* *pp* < *ff* *mf* > *pp* *mf* > *pp* *pp* < *ff* *mf* > *pp* *pp* < *ff*

(III) *pp* < *ff* *pp* < *ff*

pp *mf* > *pp* *pp* < *ff* *mf* > *pp* *mf* > *pp* *pp* < *ff*

75 **G**

gl. *gl.* *gl.* *gl.*

ff *pp sub.* *ff* *pp sub.*

pp *gl.* *ff* *pp* *ff* *pp*

ff *pp* *ff* *pp* *ff* *pp*

ff *pp* *ff* *pp* *ff* *pp*

pp *ff* *pp* *ff* *pp* *ff*

78

ff ff decresc. poco a poco

ff ff decresc. poco a poco (mf)

ff ff decresc. poco a poco (mf)

ff ff decresc. poco a poco

81 H

pp gl. (dotted)

pp n.

pp sim.

ff pizz.

arco sul pont. gl.

mf > pp mf >

arco sul pont. gl.

mf > pp mf > pp

89

pp sempre

pp sempre

pp ff pizz. arco sul pont. gl. mf > pp

pp ff pizz. arco sul pont. gl. mf > pp

pp ff pizz. ord. gl. (dotted)

109

gl.(o) gl.(o) gl.(o)

sul A *gl.*

gl.(o) gl.(o) gl.(o)

sfp > pppp *sfp >*

gl.(o) *sul A* *gl.*

sfp > pppp

114

pppp *sfp > pppp* *sfp > pppp* *sfp > pppp* *sfp >*

sfp > pppp *sfp > pppp* *sfp > pppp* *sfp > pppp* *sfp >*

(o) (o)

gl. (o) *gl. (o)*

K

118

(pppp)

col legno batt. (1/2 hair)

pizz.

(pppp)

123 *arco*

127

L
131

135

139 M

143

147

152 * see note N

156 take rosined chopstick

*Note: attack first note only; as sound rings, finger indicated pitches
(alternating with open strings); sound will rapidly fade but pitches will be audible

160 *chopstick battuto*
p
take rosined chopstick

chopstick battuto
p

chopstick tratto
gl.
chopstick tratto
gl.

chopstick tratto
gl.
chopstick tratto
gl.

pp

165
gl. (o) (▲)
n.
gl. (o) (▲)
n.
gl. (o) (▲)
gl. (o) (▲)
n.
gl. (o) (▲)
n.

(6'00")

Absolute Zero

1 = 36 Very serene
metal practice mute (arco)

metal practice mute (arco) pp

(arco) metal practice mute pp

pp metal practice mute (arco) pp

pp

8 A senza misura (vln I cue) ↓
(pp) solo espr. (accel.) (decel.) <mf>
pp mf pp
gl.
8 (pp) <mf>
gl.
8 (pp) <mf>
gl.
(ca. 30")

8 pp (sim.) pp pp
pp n.
8 pp pp n.
8 pp pp n.

11 **B** *a tempo* ♩ = 36

8
pp

8
pp

8
pp

[19] **D** *a tempo* ♩ = 36

Musical score for section D, measures 19-20. The score consists of four staves. The top two staves are in treble clef, and the bottom two are in bass clef. Measure 19 starts with a sustained note in the treble clef staff at *pp*. The second staff has a note at *pp* with *gl.* (glissando). The third staff has a sustained note at *pp*. The fourth staff has a sustained note at *n.* Measure 20 begins with a note at *pp* with *gl.* followed by a sustained note at *gl.* The second staff has a note at *pp* with *gl.* followed by a sustained note at *gl.* The third staff has a sustained note at *pp*. The fourth staff has a sustained note at *n.* The instruction "(let ring)" is written below the bass clef staff.

senza misura
(violins/viola tacet)

E *solo espr.*
(arco)

Musical score for section E, measure 21. The bass clef staff starts with a note at *f*, followed by a sixteenth-note pattern at *p*. The treble clef staff starts with a note at *f*, followed by a sixteenth-note pattern at *mf*. The instruction "6" is placed above the sixteenth-note pattern.

Musical score for section E, measures 22-23. The bass clef staff starts with a note at *p*, followed by a sixteenth-note pattern at *pp*. The treble clef staff starts with a note at *mf*.

[24] **F** *a tempo* ♩ = 36

solo espr.

Musical score for section F, measures 24-25. The bass clef staff starts with a note at *p*, followed by a sixteenth-note pattern at *pp*. The treble clef staff starts with a note at *pp*. The bass clef staff ends with a note at *pp*.

28

32

G

36

(6'00'')

Fusion

1 ♩ = 152 *In moto perpetuo*

7

12

17

A

22

27

natural harmonic gliss

B

32

ff
ord.
pp ff
ord.
ff
ff

33

34

35

pp sub. f ff
f ff

37

ff>f ff>f ff>f p gl.
ff>f ff>f ff>f p gl.
ff decresc. poco a poco mf
ff>f ff>f ff>f p gl.

43

pizz.
pp gl.
pizz.
pp gl.

C

arco sul pont.
ppp arco sul G
p gl.
pp arco
pp

3 3

49

sul G

13

3 3 3 3

3 3 3 3

54

D

→ ord.

f

ff

f

ff

59

ff

f ff ff

gl.

gl.

E

64

F

69

73

(senza decresc.)

78

G

sul pont.

(spiccato)

83

ord. 3 3

p

pp *p > pp*

sul pont. → ord. *gl.* *p* *pp*

ord. (spiccato)

p

pp

87

H

ord. *pp* *ppp*

gl. (o) *ppp*

(ord.) gl. (o) *ppp*

gl. (o) *p > ppp* *gl.* *gl.* *gl.* *gl.*

(artificial harmonic gliss.)

92

p > ppp *p > ppp* *ppp* *p* *ppp* *p > ppp*

97

J

p > ppp *ppp* *p > ppp* *p < ff* *p < ff* *p <*

102

ff < ffff *ff < ffff* *ff < ffff* *ff* *fff < fffff*

ff < ffff *ff < ffff* *ff < ffff* *ff* *fff < fffff*

ff < ffff *ff < ffff* *ff < ffff* *ff* *fff < fffff*

ff *fff* *ff < ffff* *ff < ffff* *ff* *fff < fffff*

ff *fff* *ff < ffff* *ff < ffff* *ff* *fff < fffff*

K

107

L

112

117

121

125

129

cresc. poco a poco

cresc. poco a poco

cresc. poco a poco

cresc. poco a poco

133

N

ff 3 3 3

ff 3 3 3

ff 3 3 3

ff

136

140

(3'50")