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**Publication Date**

2020

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Emiliano Imondi

# String Qua(antum)rtet

per Quartetto d'Archi

*for String Quartet*

*(Liberamente ispirato al mondo della Fisica Quantistica)*

*Freely inspired to the world of Quantum Physics*

## NOTA DI PROGRAMMA

La composizione è liberamente ispirata al mondo e ai concetti della fisica quantistica in generale e della meccanica quantistica in particolare. Questi principi oltre a ridisegnare la scienza del nostro tempo hanno modellato il pensiero filosofico della società moderna. Il brano è diviso in 9 momenti liberamente correlati alle leggi fondamentali (equazioni matematiche) e al loro contenuto filosofico:

**I. Chi Lancia i Dadi?:** riferito alla natura probabilistica del mondo quantistico in cui non sempre vale la legge di causa-effetto.

**II. Sovrapposizione I:** se un sistema può trovarsi in due stati distinti, può trovarsi anche in una qualsiasi loro combinazione lineare (sovrapposizione).

**III. Il Paradosso del Gatto:** ispirato al paradosso del "Gatto di Schrodinger", un esperimento mentale ideato da Erwin Schrodinger che mette in luce come la natura probabilistica della realtà quantistica e il principio di sovrapposizione portino a manifestazioni bizzarre nella realtà in cui il gatto può essere morto e vivo allo stesso tempo.

**IV. L'entanglement e le sue Inquietanti Azioni a Distanza:** riferito alla famosa frase di Einstein sullo strano fenomeno della correlazione quantistica in cui due sistemi possono essere "intrecciati" e interagire anche a grande distanza in modo istantaneo violando apparentemente il principio per cui la velocità della luce non può essere superata.

**V. Sovrapposizione II:** come Sovrapposizione I.

**VI. Onde Probabilistiche:** ispirato all'equazione di Schrodinger che governa la dinamica (l'evoluzione nel tempo) dei sistemi quantistici definendone le caratteristiche (funzione d'onda) mediante leggi probabilistiche.

**VII. Una Strana Dualità:** basato sullo strano comportamento ondulatorio-corpuscolare delle particelle elementari espresso dalla legge di De Broglie.

**VIII. Figure di Interferenza:** rappresentazione musicale del famoso "esperimento della doppia fenditura" che all'inizio del '900 diede il via alla meccanica quantistica facendo scoprire la doppia natura delle particelle subatomiche che al tempo stesso si comportano come onde e come corpuscoli.

**IX. Relazioni di Indeterminazione:** una mia personale trasposizione musicale del famoso "Principio di Indeterminazione di Heisenberg" che incrinò il sistema scientifico e le sue basi filosofiche mettendo in luce i limiti della fisica dimostrando che è impossibile conoscere contemporaneamente per una particella sia la sua posizione che la sua velocità oppure la sua energia e la sua durata.

## **PROGRAM NOTE**

The piece is freely inspired by the world and concepts of quantum physics in general and quantum mechanic in particular. These concepts, besides redesigning the science of our time, have shaped the philosophical thought of modern society. The piece is divided into 9 moments freely inspired by the fundamental laws (mathematical equations) and their philosophical content:

**I. Who Rolls the Dice?:** referred to the probabilistic nature of the quantum world in which the law of cause and effect is not always valid.

**II. Superimposition I:** if a system can be in two distinct states, it can also be in any linear combination of the two states.

**III. The Cat's Paradox:** inspired by the conceptual experiment of "Schrodinger Cat" which highlights how the probabilistic nature of quantum reality and the principle of superimposition lead to bizarre manifestations in macroscopical world in which the cat can be dead and alive at the same time.

**IV. Entanglement and its Spooky Actions at a Distance:** referring to Einstein's famous phrase about the strange phenomenon of quantum correlation in which two systems can be "intertwined" and interact even at great distance in an instantaneous way apparently violating the principle that the speed of light can not be overcome.

**V. Superimposition II:** same as Superimposition I

**VI. Probabilistic Waves:** inspired by the Schrodinger equation that governs the dynamics (the time evolution) of quantum systems by defining their characteristics (wave function) through probabilistic laws.

**VII. A strange Duality:** based on the strange wave-corpuseular behavior of the elementary particles expressed by De Broglie's law.

**VIII. Interference Figures:** my musical representation of the famous "double-slit experiment" which, at the beginning of '900, has started the quantum mechanics making discover the double nature of subatomic particles that at the same time behave like waves and like corpuscles.

**IX. Uncertainty Relations:** my personal musical transposition of the famous "Heisenberg's Uncertainty Principle" which cracked the scientific system and its philosophical bases highlighting the limits of physics showing that it is impossible to know, at the same time for a particle, both its position and its speed or its energy and its duration.

## Legenda



1/4 bemolle  
1/4 flat



3/4 bemolle  
3/4 flat



1/4 diesis  
1/4 sharp



3/4 diesis  
3/4 sharp

tasto → pont. → ord.

Muovere l'arco gradualmente dalla tastiera al ponticello e verso la posizione ordinaria

*Gradually move the bow from the fingerboard to bridge and to the ordinary position*



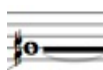
Bartók Pizzicato (Snap)



Accelerando/Ritardando gradualmente e liberamente  
*Freely and Gradually Accelerando/Ritardando*



Tremolo libero non misurato  
*Not measured Tremolo*



Prolungare il suono per tutta la durata del tratto di unione  
*Keep the sound for the entire duration of the line*

# String Qua(antum)rtet

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(Liberamente ispirato al mondo della Fisica Quantistica)  
Freely inspired to the world of Quantum Physics

## I. Chi Lancia i Dadi?

I. Who Rolls the Dice?

Emiliano Imondi 2018

Moderato e Deciso  $\text{♩} = 100 \text{ c.ca}$

Violino I

Violino II

Viola

Violoncello

*fff* pizz. *pp* arco

*fff* pizz.

*fff* *sf* *pp* *p* *ff*

Synchronicity between viola and cello is not required

*fff* *sf* *pp* *p* *ff*

Detailed description: This block contains the first system of the musical score for Violino I, Violino II, Viola, and Violoncello. The time signature is 4/4. Violino I and II start with a rest followed by a sharp sign and a note. Violino I has dynamics *fff* pizz. and *pp* arco. Viola and Violoncello have dynamics *fff*, *sf*, *pp*, *p*, and *ff*. There are fermatas and slurs over the first two measures. A note with a '5' indicates a fifth finger position. A dashed line indicates a slur for the Viola and Cello parts.

Vln. I

Vln. II

Vla.

Vc.

arco

*mf* *espress.* *p* *mf* *3*

*p* arco *gliss.*

Detailed description: This block contains the second system of the musical score for Violino I, Violino II, Viola, and Violoncello. Violino I has dynamics *mf*. Violino II has dynamics *mf* espress., *p*, and *mf*. Viola has dynamics *p*. Violoncello has dynamics *p* and *gliss.*. There are fermatas and slurs over the first two measures. A note with a '3' indicates a triplet. A dashed line indicates a slur for the Viola and Cello parts.

4

Vln. I *pp* *f subito* *f*

Vln. II *fff* *mp*

Vla. *ff* *pp*

Vc. *ff* *ppp*

*pont.*

7

Vln. I *mf* *pp subito* *f* *pp* *ff* *fff*

Vln. II *f* *pp* *f* *pp* *ff* *fff*

Vla. *pp* *f subito* *ff* *sf* *fff*

Vc. *f* *ff* *sf* *fff*

*pizz.* *ord. arco*

*pont.*

9

Vln. I *ppp* *p* *mp*

Vln. II *pp* *mp*

Vla. *ppp* *p* *mp*

Vc. *ppp* *p* *mp*

*sul pont.* *glissando* *(simile)* *gliss.*

14 *accel.*

Vln. I

Vln. II *mf*

Vla.

Vc.

*fff*

*fff*

*fff*

*fff*

## II. Sovrapposizione I

II. Superimposition I

$$\psi = c_1\psi_1 + c_2\psi_2$$

Teso e Misterioso  $\text{♩} = 95$

18

Vln. I

Vln. II

Vla.

Vc.

*pizz.*

*p*

*pizz.*

*p*

*gliss.*

*p*

*pizz.*

*p*

*gliss.*

*gliss.*

*p*

*p*

23

Vln. I

Vln. II

Vla.

Vc.

*gliss.*

*p*

*p*

*arco*

*pp*

*ord.*

*mp*

*pont.*

*p*

*pizz.*

*gliss.*



glissando

27

Vln. I

IV

III 9

*mf*

*pp* subito

arco glissando

*p*

*mf*

*pp*

arco pont.

*mf*

pizz.

Vln. II

Vla.

arco

*ppp*

pizz. bartok

arco

*mf*

*pp*

Vc.

arco

pont.

*pp*

30

Vln. I

pont. arco

*p*

Vln. II

pizz.

*mp*

Vla.

pont.

port.

*mp*

*pp*

*sfp*

*f*

*p*

*mp*

Vc.

pizz.

*mp*

*sfp*

*f*

*sf*

*p*

3

33

Vln. I

pizz.

*ppp*

*mp*

Vln. II

*mf*

*mp*

Vla.

*mf*

*mp*

gliss.

Vc.

gliss.

*mp*

# III. Il Paradosso del Gatto

## III. The Cat's Paradox

$$|Gatto\rangle = \frac{1}{\sqrt{2}}(|Morto\rangle + |Vivo\rangle)$$

$$|Cat\rangle = \frac{1}{\sqrt{2}}(|Dead\rangle + |Live\rangle)$$

Moderato, Molto Ritmico e Ironico

$\text{♩} = 100 \text{ c.ca}$

37

Vln. I *mp*

Vln. II

Vla. *mp*

Vc. *mp*

41

Vln. I

Vln. II

Vla.

Vc.

45

Vln. I

Vln. II

Vla.

Vc.

48

Vln. I

Vln. II

Vla.

Vc.

51

Vln. I

Vln. II

Vla.

Vc.

*sf sf mp*

*sf sf mp f*

*sf sf mp f*

*sf sf mp*

56

Vln. I

Vln. II

Vla.

Vc.

*f*

*ff ff mf*

*ff ff mf*

*f mf*

59

59

Vln. I

Vln. II

Vla.

Vc.

*f* *ff* *gliss.* *ff* *f* *ff*

Detailed description: This system contains measures 59 and 60. Measure 59 is in 6/4 time, and measure 60 is in 5/4 time. The first violin part starts with a forte (*f*) dynamic and a glissando, then moves to fortissimo (*ff*) in measure 60. The second violin part also starts with *f* and glissando, then moves to *ff*. The viola part is marked *ff* throughout. The cello part starts with *ff*, then *f*, and ends with *ff*. A vertical dashed line is placed between measures 59 and 60.

61

Vln. I

Vln. II

Vla.

Vc.

*mp* *gliss.* *mp* *f* *mp* *gliss.*

Detailed description: This system contains measures 61 through 64. Measure 61 is in 4/4 time. The first violin part starts with a mezzo-piano (*mp*) dynamic and a glissando, then continues with eighth notes. The second violin part also starts with *mp* and glissando, then continues with eighth notes. The viola part starts with *mp* and glissando, then continues with eighth notes. The cello part starts with a forte (*f*) dynamic, then moves to *mp*. A vertical dashed line is placed between measures 61 and 62.

65

Vln. I

Vln. II

Vla.

Vc.

Detailed description: This system contains measures 65 through 68. Measure 65 is in 4/4 time. The first violin part continues with eighth notes. The second violin part continues with eighth notes. The viola part continues with eighth notes. The cello part continues with eighth notes.

68

Vln. I

Vln. II

Vla. *arco*  
*mp espress.*

Vc. *p*

Measures 68-71. Vln. I and II play eighth-note patterns. Vla. plays a melodic line with accents and a triplet. Vc. plays a bass line with a dynamic marking of *p*.

72

Vln. I

Vln. II

Vla. *pizz.*

Vc. *p*

Measures 72-75. Vln. I and II play eighth-note patterns. Vla. plays a melodic line with accents and a triplet, then *pizz.* Vc. plays a bass line with a dynamic marking of *p*.

76

Vln. I

Vln. II

Vla.

Vc.

Measures 76-79. Vln. I and II play eighth-note patterns. Vla. plays a melodic line with accents and a triplet. Vc. plays a bass line with a dynamic marking of *p*.

80

Musical score for measures 80-82. The score is for four staves: Vln. I, Vln. II, Vla., and Vc. The time signature is 7/8. The key signature has one flat. Dynamics include *mf* and *f*. There are accents and hairpins throughout.



83

Musical score for measures 83-85. The score is for four staves: Vln. I, Vln. II, Vla., and Vc. The time signature changes from 7/8 to 4/4. The key signature has one flat. Dynamics include *mf* and *f*. A glissando is marked in the Vln. II part.



85

Musical score for measures 85-87. The score is for four staves: Vln. I, Vln. II, Vla., and Vc. The time signature changes from 4/4 to 5/4. The key signature has one flat. Dynamics include *sf* and *p*. Performance instructions include "col legno battuto" and "arco".

88

Vln. I

Vln. II

Vla. arco *p*

Vc. *p*

90

Vln. I arco *mp*

Vln. II

Vla. *mp* *pp* *mp* col legno battuto

Vc. *mp*

92

Vln. I *mp*

Vln. II *f*

Vla. *f* gliss

Vc. *mp*

94

Vln. I  
Vln. II  
Vla.  
Vc.

*mp* *f*

3 gliss. 3 3 3

Detailed description: This system covers measures 94 and 95. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 94 contains triplets in all parts. Measure 95 features a glissando in the Violin II and Viola parts. Dynamics range from mezzo-piano (mp) to forte (f).



96

Vln. I  
Vln. II  
Vla.  
Vc.

arco

3 3 3 3 3 3

Detailed description: This system covers measures 96 through 99. Measures 96-98 contain triplets. Measure 99 is marked 'arco' and contains triplets. The system concludes with a 4/4 time signature.



98

ord. pont. accel..

Vln. I  
Vln. II  
Vla.  
Vc.

*p* *mf* *pp* *p*

ord. pont. gliss. 6 3 3 6 3 3

pizz. arco 3 6 3 3 3 3

ord. pont. gliss. 6 3 3 3 3 3

*p* *mf* *pp* *p*

Detailed description: This system covers measures 98 through 101. It includes dynamic markings (p, mf, pp) and performance instructions like 'ord.', 'pont.', 'gliss.', 'pizz.', and 'arco'. Measure 98 has a 4/4 time signature, while measures 99-101 are in 7/4 time. Measure 101 ends with a 4/4 time signature.



100  $\text{♩} = 90$

Vln. I  
pizz.  $p$   $mp$   $f$

Vln. II  
pizz.  $p$   $mp$   $f$

Vla.  
 $p$   $mp$   $f$

Vc.  
 $p$   $f$

gliss.

## IV. L'Entanglement e le sue Inquietanti azioni a distanza

### IV. Entanglement and its Spooky Actions at a Distance



$$|\Phi^+\rangle = \frac{1}{\sqrt{2}}(|0\rangle_A \otimes |0\rangle_B + |1\rangle_A \otimes |1\rangle_B)$$

$$|\Phi^-\rangle = \frac{1}{\sqrt{2}}(|0\rangle_A \otimes |0\rangle_B - |1\rangle_A \otimes |1\rangle_B)$$

$$|\Psi^+\rangle = \frac{1}{\sqrt{2}}(|0\rangle_A \otimes |1\rangle_B + |1\rangle_A \otimes |0\rangle_B)$$

$$|\Psi^-\rangle = \frac{1}{\sqrt{2}}(|0\rangle_A \otimes |1\rangle_B - |1\rangle_A \otimes |0\rangle_B).$$

Vivace e Deciso  $\text{♩} = 150$  c.ca

103 arco

Vln. I  
 $ff$

Vln. II  
 $ff$   $mp$  subito

Vla.  
 $ff$   $mp$  subito

Vc.  
 $ff$

108

Vln. I  
Vla.

This system contains measures 108 through 112. The Violin I part features a melodic line with eighth-note patterns and some chromaticism. The Viola part provides a steady accompaniment with eighth-note chords. The key signature changes from one sharp to one flat between measures 109 and 110.



113

Vln. I  
Vln. II  
Vla.  
Vc.

mp  
mf  
arco 4  
mp  
mf

This system contains measures 113 through 117. It features a change in time signature to 11/16 (6+5) starting at measure 114. The Violin I part has a melodic line with a *mp* dynamic. The Violin II and Viola parts have a rhythmic accompaniment with a *mf* dynamic. The Violoncello part plays a four-measure rest followed by a melodic line with a *mp* dynamic. The system concludes with a *mf* dynamic marking.



118

Vln. I  
Vln. II  
Vla.  
Vc.

f  
mp  
mp  
f  
mp

This system contains measures 118 through 122. The Violin I part begins with a *f* dynamic and a melodic line. The Violin II part has a *f* dynamic and a melodic line. The Viola part has a *mp* dynamic and a rhythmic accompaniment. The Violoncello part has a *f* dynamic and a melodic line. The system concludes with a *mp* dynamic marking.

123

Vln. I *mf*

Vln. II *p* *mf*

Vla. *mf*

Vc. *mf* *f*

Detailed description: This system covers measures 123 to 127. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 123 has a treble clef and a 6/8 time signature. Violin I plays a melodic line with accents and slurs, marked *mf*. Violin II has rests in measures 123-124, then enters with a melodic line marked *p* in measure 125 and *mf* in measure 126. Viola plays a rhythmic accompaniment of eighth notes, marked *mf*. Violoncello has rests in measures 123-124, then enters with a melodic line marked *mf* in measure 125 and *f* in measure 126. Measure 127 has a 6/8 time signature and a key signature change to one flat. The system ends with a double bar line.

128

Vln. I *f* *mp* *mf*

Vln. II *mf*

Vla. *mp*

Vc. *mp*

Detailed description: This system covers measures 128 to 132. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 128 has a treble clef and a 6/8 time signature. Violin I has rests in measures 128-129, then enters with a melodic line marked *f* in measure 130, *mp* in measure 131, and *mf* in measure 132. Violin II plays a rhythmic accompaniment of eighth notes, marked *mf*. Viola has rests in measures 128-129, then enters with a melodic line marked *mp* in measure 130. Violoncello plays a rhythmic accompaniment of eighth notes, marked *mp*. Measure 132 has a 6/8 time signature and a key signature change to one flat. The system ends with a double bar line.

133

Vln. I

Vln. II *mp*

Vla.

Vc. *mf*

Detailed description: This system covers measures 133 to 137. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 133 has a treble clef and a 6/8 time signature. Violin I has rests in measures 133-136, then enters with a melodic line marked *mp* in measure 137. Violin II plays a rhythmic accompaniment of eighth notes, marked *mp*. Viola has rests in measures 133-136, then enters with a melodic line marked *mf* in measure 137. Violoncello plays a rhythmic accompaniment of eighth notes, marked *mf*. Measure 137 has a 6/8 time signature and a key signature change to one flat. The system ends with a double bar line.

138

Vln. I  
4 *mf* 2 *mp* 2 4 *mf*

Vln. II

Vla.

Vc. *mp* *mf*

Detailed description: This system contains measures 138 through 142. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 138 has a 4-measure rest for Vln. I. Vln. II plays a rhythmic pattern of eighth notes. Viola and Vc. have rests until measure 140. In measure 140, Vln. I and Vc. play quarter notes, while Viola plays eighth notes. Measure 141 continues with similar patterns. Measure 142 features a 4-measure rest for Vln. I and Vln. II, with Viola and Vc. playing quarter notes. Dynamics include *mf* and *mp*.

143

Vln. I

Vln. II

Vla.

Vc. 4 *f* 2 *f* 2

Detailed description: This system contains measures 143 through 147. Vln. I has a 4-measure rest in measure 143. Vln. II plays eighth notes. Viola and Vc. have rests until measure 145. In measure 145, Vln. I and Vc. play quarter notes, while Viola plays eighth notes. Measure 146 continues with similar patterns. Measure 147 features a 4-measure rest for Vln. I and Vln. II, with Viola and Vc. playing quarter notes. Dynamics include *f*.

148

Vln. I

Vln. II *mf*

Vla.

Vc. *f* *ff* *mf* *ff*

Detailed description: This system contains measures 148 through 152. Vln. I has a 4-measure rest in measure 148. Vln. II plays eighth notes. Viola and Vc. have rests until measure 150. In measure 150, Vln. I and Vc. play quarter notes, while Viola plays eighth notes. Measure 151 continues with similar patterns. Measure 152 features a 4-measure rest for Vln. I and Vln. II, with Viola and Vc. playing quarter notes. Dynamics include *mf*, *f*, and *ff*.

153

Vln. I

Vln. II

Vla.

Vc.

8<sup>va</sup> pont.

*pp* quasi un sibilo

8<sup>va</sup> pont.

*pp* quasi un sibilo

pont. quasi glissato

*f* ————— *pp*

158 (8)

Vln. I

Vln. II

163 (8)

Vln. I

Vln. II

168 (8)

Vln. I

Vln. II

Vla.

Vc.

*mp*

*pp*

*mf*

pizz. *mp*

*pp*

*mf*

pizz. *ff*

*ff*

*ff*

173 ord.

Vln. I *pp* ord. *mf*

Vln. II *pp* *mf*

Vla. *ff*

Vc. *ff*

Detailed description: This system covers measures 173 to 177. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measures 173-175 show a melodic line in the violins and a rhythmic accompaniment in the lower strings. Dynamic markings include *pp* (pianissimo) and *mf* (mezzo-forte). Measure 176 has a *ff* (fortissimo) marking for the lower strings. Measure 177 is a whole rest for all instruments.

178

Vln. I *fff* *arco*

Vln. II *mf* *ff* *fff*

Vla. *mf* *ff* *fff*

Vc. *fff* *pizz.* *arco*

Detailed description: This system covers measures 178 to 182. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measures 178-180 show a melodic line in the violins and a rhythmic accompaniment in the lower strings. Dynamic markings include *mf* (mezzo-forte), *ff* (fortissimo), and *fff* (fortississimo). Measure 181 has a *fff* marking for the lower strings. Measure 182 has an *arco* marking for the lower strings. Measure 183 is a whole rest for all instruments.

183

Meno mosso ♩.=140

Vln. I 6/16

Vln. II 6/16

Vla. 6/16

Vc. 6/16 *pp* *arco*

Detailed description: This system covers measures 183 to 187. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measures 183-185 show a melodic line in the violins and a rhythmic accompaniment in the lower strings. Dynamic markings include *pp* (pianissimo). Measure 186 has a *pp* marking for the lower strings. Measure 187 is a whole rest for all instruments.

187

Vln. I

Vln. II

Vla.

Vc.

*ff*

*ff*

191

Vln. I

Vln. II

Vla.

Vc.

*ff sf sf*

*ff sf sf*

*sf sf pp ff sf sf*

*sf sf pp ff sf sf*

195

Vln. I

Vln. II

Vla.

Vc.

*pp*

*pp*

*ff sf sf sf*

*pp ff sf sf sf*

6/16

6/16

6/16

6/16

# V. Sovrapposizione II

V. Superimposition II

$$\psi = c_1\psi_1 + c_2\psi_2$$

Meno mosso  $\text{♩} = 70$

*punta d'arco*

199

Vln. I *pp liberamente tremolato*

Vln. II *pp*

Vla. *ord.* → *pont.* *quasi glissando* *gliss.*

Vc. *pp*



202

Vln. I *ord.*

Vln. II *gliss.* *p*

Vla. *ord.* → *pont.* *quasi glissando* *gliss.*

Vc. *pizz.* *mf*



206

Vln. I *mp* *p* *ord.* *p < f =*

Vln. II *f* *ppp* *p < f = p*

Vla. *mf* *pizz.* *f*

Vc. *mp* *arco*



210

Vln. I *p* *p < f = p* *p < f = p* *p < f = p* *fp* *f* *ord.* *pont.*

Vln. II *p < f = p* *p < f = p* *p < f = p* *f* *ord.* *pont.*

Vla. *ff* *ord.* *pont.*

Vc. *p* *f* *p* *fp* *f*

# VI. Onde Probabilistiche

## VI. Probabilistic Waves

$$i\hbar \frac{\partial}{\partial t} \psi(r, t) = \widehat{H} \psi(r, t)$$

Le linee verticali tratteggiate sono state inserite volutamente per agevolare la lettura e l'esecuzione dei musicisti fornendo un riferimento di durata approssimativo. Tuttavia l'intera sezione è da intendersi in notazione spaziale, quindi libera e senza tempo.

The vertical dotted lines have been inserted intentionally to facilitate the reading and performance of the musicians providing a reference of approximate duration. However, the whole section is to be interpreted as spatial notation, therefore free and timeless.

Calmo ma pian piano sempre più intenso come un'onda che cresce  
Libero, Senza Tempo (Freely, Without Time)

Approx. duration 3" sec. c.ca

215

Vln. I *pp* sempre non vib. glissando a piacere prima del cambio nota

Vln. II *pp* sempre non vib. glissando a piacere prima del cambio nota

Vc. *pp* sempre non vib. glissando a piacere prima del cambio nota (continua simile tranne dove indicato)

225

Vln. I (continua simile tranne dove indicato)

Vln. II (continua simile tranne dove indicato) arco sempre non vib.

Vla. *pp* glissando a piacere prima del cambio nota (continua simile tranne dove indicato)

Vc. *pp* glissando a piacere prima del cambio nota (continua simile tranne dove indicato)

233

Vln. I *p*

Vln. II *mp* ord. pont. *p*

Vla. *p*

Vc. *p*

240

Vln. I

Vln. II

Vla.

Vc.

*molto libero e indefinito*  
ord. ————— <sup>g<sup>ua</sup></sup> pont.

*p* ————— *mp*

248

Vln. I

Vln. II

Vla.

Vc.

*molto libero e indefinito*  
pont. ————— ord. ————— pont.

*mp* ————— *p* < *mf* ————— *p*

252

Vln. I

Vln. II

Vla.

Vc.

ord. ————— pont.

*molto libero e indefinito*

*mp* ————— *p*

ord. ————— pont.

*mp*

256  $\flat$   $\circ$   $\flat$   $\circ$

Vln. I *pp*

Vln. II *mp* *p* *mf*

Vla. *pp*

Vc.

*molto libero e indefinito*

pont.  $\delta^{12}$  ord.

261  $\flat$

Vln. I

Vln. II *mp* *pp*

Vla.

Vc.

pont.

5 6

267

Vln. I

Vln. II *gliss.*

Vla. *mp* *pp*

Vc.

ord. pont.

6 5 5 6

271

(senza glissando) *gliss.* *pp* *ripetere simile*

Vln. I

Vln. II

Vla.

Vc.

(senza glissando)

277

Vln. I

Vln. II

Vla.

Vc.

279

Vln. I

Vln. II

Vla.

Vc.

*pp*

281

Vln. I

Vln. II

Vla.

Vc.

*p*

3 3

5 5



283

Vln. I

Vln. II

Vla.

Vc.

*p subito*

5 5 6

Musical score for measures 285-290. The score includes staves for Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Violoncello (Vc.).

- Measures 285-286:** Vln. I and Vln. II play sustained notes. Vc. plays a low octave chord. Vla. plays a rhythmic pattern of eighth notes with five-fingerings.
- Measure 287:** Vln. I and Vln. II play sustained notes. Vc. continues with a triplet of eighth notes. Vla. continues with eighth notes.
- Measures 288-290:** Vln. I and Vln. II play sustained notes. Vc. continues with a triplet of eighth notes. Vla. continues with eighth notes.

Dynamic marking: *pp* simile



Musical score for measures 287-292. The score includes staves for Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Violoncello (Vc.).

- Measures 287-288:** Vln. I plays sixteenth-note patterns with six-fingerings and five-fingerings. Vc. continues with eighth notes.
- Measures 289-290:** Vln. I plays sixteenth-note patterns with triplet and five-fingerings. Vc. continues with eighth notes.
- Measures 291-292:** Vln. I plays sixteenth-note patterns with six-fingerings. Vc. continues with eighth notes.

Dynamic marking: *pp*

289 *glissando lentamente* *gliss.* *v* *molto cresc.*

Vln. I

Vln. II

Vla.

Vc.

*molto cresc.*



*rallentando* - - - - *e* - - - - *accelerando* - - - - *liberamente* - - -

291 *ff* *ff* *ff* *ff*

Vln. I

Vln. II

Vla.

Vc.

*ff*

*ff*

*ff*

*ff*



## VII. Una Strana Dualità

## VII. A Strange Duality

$$\lambda = \frac{h}{mv}$$

Misterioso  $\text{♩} = 70$ 

293

Vln. I pizz. *mp*

Vln. II pizz. *mp*

Vla. pizz. *mp*

Vc. *mp* *pp* *mp* *p*

*solo*

*sempre molto libero ed espress.*

297

Vln. I pizz.

Vln. II pizz.

Vla. pizz.

Vc. *p* *mp*

302

Vln. I pizz. *mp*

Vln. II pizz. *mp* *f*

Vla. arco *mp* *f*

Vc. *pp* *mp* *f* pizz.

305

arco

Vln. I *f* *f* *ff*

Vln. II *mf* *f* pizz.

Vla. *mf* *f* *ff* arco

Vc. *f* *ff* *mf sf* *p*

307

Vln. I *p* *pp*

Vln. II *p* *pp*

Vla. arco pont. *p* *mf* pizz.

Vc. pont. *p* *mf* pizz.

309

Vln. I *f* *p*

Vln. II *f* *p*

Vla. arco *f* *p* pizz. *mp*

Vc. *f* *p* pizz. *mp*

311

Vln. I *ff* *sf* pont.

Vln. II *ff* arco *sf* pont.

Vla. *ff* arco *sf* pont.

Vc. *ff* *sf* pont.

313

Vln. I *mp* *pp* *mf* 3 *tr.* *ord.* *pont.*

Vln. II *mp* *pp* *mp* *p* *ord.* *pont.*

Vla. *mp* *pp* *pizz.* 3 *ord.*

Vc. *mp* *pp* *mf subito* *fff* *ord.* 3 *pizz.* 3

rall. .. accel. ..

315

Vln. I *pp* *p* *ord.* *pont.* *sempre più indefinito* *fff*

Vln. II *mf* *f* *pizz.* *arco ord.* *pont.* *sempre più indefinito* *fff*

Vla. *f* *arco* *p* *ord.* *pont.* *sempre più indefinito* *fff*

Vc. *p* *ord.* *pont.* *sempre più indefinito* *fff*

# VIII. Figure di Interferenza

## VIII. Interference Figures

$$\sin \theta = m \frac{\lambda}{d}$$

$$\sin \theta = \left(m + \frac{1}{2}\right) \frac{\lambda}{d}$$

Ancestrale e arcaico ♩=70

316 solo

Vc. *mp* molto espress. e cantabile *p*

319

Vln. I *mp* molto espress. e cantabile

Vln. II *p* *p* 7

Vla. *mp* molto espress. e cantabile

Vc. *pp* *p* *p* 7

322

Vln. I *mf* *p*

Vln. II *mf* *mf* *p* 6

Vla. *mf* *p*

Vc. *mf* *p* 7 *f*

324

Vln. I

Vln. II

Vla.

Vc.

*p* *f* *p* *f* *p*

325 A tempo ♩ = 70

Vln. I

Vln. II

Vla.

Vc.

*mp* molto espress. e cantabile

*mp* espress.

pont.

*p*

sul tasto

328 ord.

Vln. I

Vln. II

Vla.

Vc.

*p* *f* *p*

*p* *f* *p*

*mf* *p* *mp* espress.

*p* *f* *p* *mp* espress.

ord.

sul tasto

pont. (quasi glissato)

pont. (quasi glissato)

331

Violin I: *mp* (6), *p* (pont.)  
Violin II: *mp* (6), *p* (pont.)  
Viola: *p*  
Violoncello: *p*

Measures 331-333. Violin I and II play sixteenth-note patterns with sixteenth rests, marked *mp* and *p*. Viola and Cello play eighth-note patterns, marked *p*. Measure 333 includes the instruction "pont." for the strings.

334

Violin I: *pp*, *mp espress.*  
Violin II: *pp*, *ord.*, *pont.*, *p*, *f*, *p*  
Viola: *ord.*, *pont.*, *p*, *f*, *p*  
Violoncello: *mp espress.*, *p*, *f*, *p*

Measures 334-336. Violin I plays a melodic line, marked *pp* and *mp espress.*. Violin II and Viola play sixteenth-note patterns, marked *pp* and *ord.*. Cello plays eighth-note patterns, marked *mp espress.*. Measures 335-336 include dynamic markings *p*, *f*, and *p* for the strings, and the instruction "pont." for the Violin II and Viola parts.

337

Violin I: *pizz.*, *arco*, *rit.*, *Attaca Subito*  
Violin II: *f*, *pizz.*, *arco*, *pont.*, *ord.*, *mf*, *f*  
Viola: *mf*, *pizz.*, *arco*, *pont.*, *ord.*, *mf*, *sff*, *pp*  
Violoncello: *p*

Measures 337-340. Violin I plays a melodic line, marked *pizz.* and *arco*. Violin II plays sixteenth-note patterns, marked *f* and *pizz.*. Viola plays eighth-note patterns, marked *mf* and *pizz.*. Cello plays eighth-note patterns, marked *p*. Measures 338-340 include dynamic markings *p*, *pp*, *mf*, *f*, *sff*, and *pp* for the strings, and the instruction "Attaca Subito" for the Violin I part.

# IX. Relazioni di Indeterminazione

## IX. Uncertainty Relations

$$\Delta x \Delta p \geq \frac{\hbar}{2}$$

Lento e indeterminato (c.ca ♩=80)

340 *Molto Rubato e Libero* ord. → pont.

Vc. *simile ma sempre più indeterminato e impreciso*

*glissando*

*accel. - - - poco - - - a - - - poco*

*f* *pp*



Molto Libero e Senza Tempo

342

Vln. I *punta d'arco* *Free Rythm. Repeat x2* *pont.*

*pp molto liberamente*

Vln. II *punta d'arco* *Free Rythm. Repeat x2* *pont.*

*pp molto liberamente* *Free Rythm. Repeat x2 col legno*

*p molto liberamente*

Vla. *Free Rythm. Repeat x2 pizz.*

*p molto liberamente* *Free Rythm. Repeat x2 col legno*

*p molto liberamente*

Vc. *Free Rythm. Repeat x2 pizz.*

*p molto liberamente*

348

Vln. I ord. → pont. *pp* < *f* > *pp* non vib. *pp* < *f* > *ppp*

Vln. II arco sul tasto ord. → pont. ord. → pont. *pp* < *f* > *pp* *pp* < *f* > *pp* *pp* < *f* > *pp* non vib. *pp* < *f* > *ppp*

Vla. arco ord. → pont. sul tasto *pp* < *f* > *pp* *pp* < *f* > *pp* non vib. *pp* < *f* > *ppp*

Vc. arco ord. → pont. sul tasto ord. → pont. *pp* < *f* > *pp* *pp* < *f* > *pp* non vib. *pp* < *f* > *ppp*



$$\Delta E \Delta t \geq \frac{\hbar}{2}$$

A tempo ♩=60 c.ca

353

Vln. I senza vibrato tasto → pont. → tasto → pont. ord. pizz. *pp* *p* *mp* < *mf* > *f* subito *ff*

Vln. II senza vibrato pont. → tasto → pont. → tasto ord. pizz. *pp* *p* *mp* < *mf* > *f* subito *ff*

Vla. senza vibrato tasto → pont. → tasto → pont. ord. pizz. *pp* *p* *mp* < *mf* > *f* subito *ff*

Vc. senza vibrato pont. → tasto → pont. → tasto ord. pizz. *pp* *p* *mp* < *mf* > *f* subito *ff*