

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-corpiscular 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*



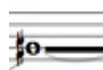
Bartók Pizzicato (Snap)



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*

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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. arco *pp*

*fff* pizz.

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

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

Synchronicity between viola and cello is not required

5

5

Vln. I

Vln. II

Vla.

Vc.

2

arco *mf*

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

*p* arco *gliss.*

*p*

4

Vln. I *pp* *f subito*

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*

pont. pizz. ord. arco

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 ♩=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*

*p*

*pizz.*

*gliss.*

*p*

*pont.*

glissando

27

Vln. I

IV

III 9

*mf*

*pp* subito

arco glissando

arco pont.

*mf*

*pp*

Vln. II

*p*

*mf*

*pp*

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*

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 f*

*sf sf mp f*

*sf sf mp f*



56

Vln. I

Vln. II

Vla.

Vc.

*f mf ff mf*

*f mf ff mf*

*f mf ff mf*

59

59

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

Vln. II *f* *ff* *gliss.*

Vla. *ff* *ff* *gliss.*

Vc. *ff* *f* *ff*

Measures 59-60. Vln. I: 6/4 to 5/4 to 4/4. Vln. II: 6/4 to 5/4 to 4/4. Vla.: 6/4 to 5/4 to 4/4. Vc.: 6/4 to 5/4 to 4/4. Dynamics: *f*, *ff*, *f*, *ff*. Includes glissando markings.



61

61

Vln. I *mp* *gliss.*

Vln. II *mp* *gliss.*

Vla. *mp* *gliss.*

Vc. *f* *mp*

Measures 61-64. Vln. I: 4/4. Vln. II: 4/4. Vla.: 4/4. Vc.: 4/4. Dynamics: *mp*, *f*, *mp*. Includes glissando markings.



65

65

Vln. I

Vln. II

Vla.

Vc.

Measures 65-68. Vln. I: 4/4. Vln. II: 4/4. Vla.: 4/4. Vc.: 4/4.

68

Vln. I

Vln. II

Vla. arco  
*mp* espress.

Vc. *p*

Detailed description: This system contains measures 68 through 71. The Violin I part features a melodic line with accents and slurs. The Violin II part plays a rhythmic accompaniment. The Viola part is marked 'arco' and 'mp espress.', featuring a melodic line with a triplet in measure 71. The Violoncello part provides a steady bass line.



72

Vln. I

Vln. II

Vla. pizz.

Vc. *p*

Detailed description: This system contains measures 72 through 75. The Violin I part continues its melodic line. The Violin II part has a more active role. The Viola part is marked 'pizz.' and features a triplet in measure 73. The Violoncello part continues with a steady bass line.



76

Vln. I

Vln. II

Vla.

Vc.

Detailed description: This system contains measures 76 through 79. Measures 76-78 are in 7/8 time, and measure 79 is in 4/4 time. The Violin I part has a melodic line with a fermata in measure 78. The Violin II part has a rhythmic accompaniment. The Viola part has a melodic line with a fermata in measure 78. The Violoncello part has a steady bass line.

80

Vln. I *mf*

Vln. II *mf*

Vla. *mf*

Vc. *mf*



83

Vln. I

Vln. II *gliss.*

Vla.

Vc.



85

Vln. I *sf* *p* col legno battuto

Vln. II *sf* *p* col legno battuto

Vla. *sf* *p* col legno battuto

Vc. *sf* *p* 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

Detailed description: This system covers measures 96 through 99. Measures 96-98 continue with triplets. Measure 99 is marked 'arco' and features a triplet. 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. Measure 98 includes 'ord.' and 'pont.' markings. Measure 99 features a glissando and a sixteenth-note triplet. Measure 100 includes 'ord.' and 'pont.' markings. Measure 101 includes 'pizz.' markings. Dynamics range from piano (p) to pianissimo (pp). An 'accel..' marking is present above the system.

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.

Detailed description: This system contains measures 108 through 112. The Violin I part (top staff) features a melodic line with eighth-note patterns and some chromaticism. The Viola part (bottom staff) provides a harmonic 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*  
*mf*  
*mp* *mf*

arco 4

Detailed description: This system contains measures 113 through 117. The Violin I part (top staff) has a melodic line with a dynamic marking of *mp*. The Violin II part (second staff) has a melodic line with a dynamic marking of *mf*. The Viola part (third staff) has a melodic line with a dynamic marking of *mf*. The Violoncello part (bottom staff) has a melodic line with a dynamic marking of *mp* and *mf*. The time signature changes to 11/16 (6+5) in measure 114. The word "arco" and the number "4" are written above the Violoncello staff in measure 114.



118

Vln. I  
Vln. II  
Vla.  
Vc.

*f*  
*f*  
*mp*  
*f* *mp*

Detailed description: This system contains measures 118 through 122. The Violin I part (top staff) has a melodic line with a dynamic marking of *f*. The Violin II part (second staff) has a melodic line with a dynamic marking of *f*. The Viola part (third staff) has a melodic line with a dynamic marking of *mp*. The Violoncello part (bottom staff) has a melodic line with a dynamic marking of *f* and *mp*. The time signature is 6/16.

123

Vln. I *mf*

Vln. II *p* *mf*

Vla. *mf*

Vc. *mf* *f*

Detailed description: This system contains measures 123 through 127. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 123 is marked with a dynamic of *mf*. Measure 124 is marked *p*. Measure 125 is marked *mf*. Measure 126 is marked *f*. Measure 127 is marked *f*. The music includes various rhythmic patterns and dynamic markings.

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

Vln. II *mf*

Vla. *mp*

Vc. *mp*

Detailed description: This system contains measures 128 through 132. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 128 is marked *f*. Measure 129 is marked *mp*. Measure 130 is marked *mf*. Measure 131 is marked *mf*. Measure 132 is marked *mf*. The music includes various rhythmic patterns and dynamic markings.

Vln. I

Vln. II *mp*

Vla.

Vc. *mf*

Detailed description: This system contains measures 133 through 137. It features four staves: Violin I, Violin II, Viola, and Violoncello. Measure 133 is marked *mp*. Measure 134 is marked *mf*. Measure 135 is marked *mf*. Measure 136 is marked *mf*. Measure 137 is marked *mf*. The music includes various rhythmic patterns and dynamic markings.

138

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

Vln. II

Vla.

Vc. *mp* *mf*

Detailed description: This system contains measures 138 to 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. Vln. I enters in measure 139 with a 2-measure rest, followed by a 2-measure rest for Vln. II. Vln. I then plays a 4-measure rest. Vln. II continues with eighth notes. Vln. I re-enters in measure 141 with a 4-measure rest. Vln. II plays eighth notes. Vln. I has a 4-measure rest in measure 142. Vln. II plays eighth notes. The Viola and Violoncello parts have rests in measures 138 and 139, then enter in measure 140. The Viola has a 2-measure rest, followed by a 2-measure rest for Vln. II. The Viola then plays a 4-measure rest. The Violoncello has a 4-measure rest. The Viola and Violoncello play eighth notes in measure 142. Dynamics include *mf*, *mp*, and *mf*.

143

Vln. I

Vln. II

Vla.

Vc. 4 *f* 2 *f* 2

Detailed description: This system contains measures 143 to 147. It features four staves: Violin I, Violin II, Viola, and Violoncello. Vln. I has a 4-measure rest in measure 143. Vln. II plays eighth notes. Vln. I enters in measure 144 with a 2-measure rest, followed by a 2-measure rest for Vln. II. Vln. I then plays a 4-measure rest. Vln. II continues with eighth notes. Vln. I re-enters in measure 146 with a 4-measure rest. Vln. II plays eighth notes. The Viola and Violoncello parts have rests in measures 143 and 144, then enter in measure 145. The Viola has a 2-measure rest, followed by a 2-measure rest for Vln. II. The Viola then plays a 4-measure rest. The Violoncello has a 4-measure rest. The Viola and Violoncello play eighth notes in measure 147. Dynamics include *f* and *f*.

148

Vln. I

Vln. II *mf*

Vla.

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

Detailed description: This system contains measures 148 to 152. It features four staves: Violin I, Violin II, Viola, and Violoncello. Vln. I has a 4-measure rest in measure 148. Vln. II plays eighth notes. Vln. I enters in measure 149 with a 2-measure rest, followed by a 2-measure rest for Vln. II. Vln. I then plays a 4-measure rest. Vln. II continues with eighth notes. Vln. I re-enters in measure 151 with a 4-measure rest. Vln. II plays eighth notes. The Viola and Violoncello parts have rests in measures 148 and 149, then enter in measure 150. The Viola has a 2-measure rest, followed by a 2-measure rest for Vln. II. The Viola then plays a 4-measure rest. The Violoncello has a 4-measure rest. The Viola and Violoncello play eighth notes in measure 152. Dynamics include *mf*, *f*, *ff*, *mf*, and *ff*.

153

Vln. I

Vln. II

Vla.

Vc.

8<sup>va</sup> pont.

pp quasi un sibilo

pp quasi un sibilo

pp

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 contains measures 173 through 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). A double bar line is present after measure 175.

Vln. I *fff*

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

Vla. *mf* *ff* *fff*

Vc. *fff*

arco

pizz.

9 16

Detailed description: This system contains measures 178 through 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). Performance instructions include *arco* (arco) and *pizz.* (pizzicato). Measure numbers 9 and 16 are indicated above the staves. A double bar line is present after measure 180.

183

Meno mosso ♩.=140

Vln. I

Vln. II

Vla. *pp* arco

Vc. *pp*

Detailed description: This system contains measures 183 through 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). Performance instructions include *arco* (arco). A double bar line is present after measure 185.

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.

Vc. *pp* quasi glissando gliss.



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. non glissato

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

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

Vla.

Vc.

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.

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

*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. ord.

261

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)

(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.

5 5

6

*p subito*

285

Vln. I

Vln. II

Vla.

Vc.

*pp* simile

Measure 285: Vln. I and II play whole notes. Vla. plays eighth notes with 5-fingerings. Vc. plays a triplet of eighth notes. A dynamic marking of *pp* simile is present.

Measure 286: Vln. I and II play whole notes. Vla. plays eighth notes. Vc. plays a triplet of eighth notes.



287

Vln. I

Vln. II

Vla.

Vc.

*pp*

Measure 287: Vln. I plays sixteenth notes with 6 and 5 fingerings. Vln. II is silent. Vla. has a whole note. Vc. plays eighth notes.

Measure 288: Vln. I plays sixteenth notes with 3, 5, and 6 fingerings. Vln. II is silent. Vla. has a whole note. Vc. plays eighth notes with a *pp* dynamic marking.

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

Vln. II *mf* *p* *mf* *mf* *p* 6 7

Vla.

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 *p*

*mp* espress.

sul tasto

pont.

*p*

328 ord.

Vln. I

Vln. II

Vla.

Vc.

*p* *f* *p*

*p* *f* *p*

*mf* *p*

*p* *f* *p*

ord.

sul tasto

pont. (quasi glissato)

pont. (quasi glissato)

*mp* espress.

*mp* espress.

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 332 includes the instruction "pont." for the Violin parts.

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.*. Measure 335 includes the instruction "pont." for Violin II and Viola. Measure 336 includes the instruction "ord." for Violin II and Viola. Dynamics range from *pp* to *f*.

337

Violin I: *pizz.*, *arco*, *rit.*, *Attaca Subito*  
Violin II: *f*, *pizz.*, *arco*, *pont.*, *pp*, *ord.*, *mf*, *f*  
Viola: *mf*, *pizz.*, *arco*, *pont.*, *ord.*, *6*, *pont.*, *sf*, *pp*  
Violoncello: *p*

Measures 337-340. Violin I plays a melodic line, marked *pizz.* and *arco*. Violin II and Viola play sixteenth-note patterns, marked *f* and *mf*. Measure 338 includes the instruction "pizz." for Violin II and Viola. Measure 339 includes the instruction "arco" for Violin II and Viola. Measure 340 includes the instruction "Attaca Subito" and "rit.". Dynamics range from *p* to *sf*.

## 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.* *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*