

*Marc Sabat*

**Euler Lattice Spirals  
Scenery**

*for string quartet*

**PLAINSOUND MUSIC EDITION**



## Euler Lattice Spirals Scenery (2011/12)

*for string quartet*

*written for and premiered by the Sonar Quartett Berlin*

*(Wojciech Garbowski, Cosima Gerhardt, Nikolaus Schlierf, Suzanne Zapf)*

*composed during a one-year residency in Rome*

*at the Accademia Tedesca Villa Massimo*

This work is the third in an ongoing cycle of string quartets in which musical forms emerge as consequences of explicitly notated intonation. The title refers to Leonhard Euler's discovery of a two-dimensional diagram representing the harmonic space subset based on octave equivalence, pure fifths and thirds: a tonal lattice that models triadic harmony, or in James Tenney's terminology: *(3,5) projection space*.

An extended portion of this lattice, comprising 99 distinct microtonal pitch-classes organised as a progression of major and minor triads tuned in Just Intonation, forms the basis of the fourth movement, *Harmonium for Ben Johnston*. Each triad occurs only once, and for the most part connects to its neighbors by a shared common tone, until reaching the small enharmonic seam in the middle of the movement, from which point a retrograde inversion of the triads begins. The triads are ordered in such a way that all possible common-tone progressions are explored, and also that the progression of triads which opens the piece recurs in the middle of the movement, transposed upward by two commas.

To realize this modulation into distant regions, the open strings of the quartet must be precisely tuned in 3:2 ratio untempered fifths, so that the comma distinctions and partial unisons between open strings may be optimised. Thus, the composition is completed by four additional movements, which explicitly compose the tuning procedure (*Preludio*), investigate the Pythagorean sonorities of the lower natural harmonics (*Pythagoras Drawing I and II*), and present the unisons and commas of higher natural harmonics in the registers they occur (*Harmonium for Claude Vivier*) as an ecstatic singing melody.

Rome, 28 October 2011 / Berlin, 6 March 2012

## **An informal introduction to the Helmholtz-Ellis Accidentals**

by Marc Sabat

Berlin, April 2009

In learning to read HE accidentals, without having to rely on an electronic tuning device, it is important to be familiar with three things:

First, to keep in mind the natural tuning of intervals in a harmonic series, which deviate from the tempered system.

Second, to get to know how the accidentals refer to these overtone relationships.

Third, to observe that each written pitch may be related to many other pitches by natural intervals, and to tune it accordingly.

In most cases, this approach will allow the player to quickly and intuitively play just intonation (JI) pitches quite accurately. Any remaining adjustments can be made by ear, based on the specific sound of JI intervals.

Just intervals are readily learned because they are built up from simple, tuneable harmonic relationships. These are generally based on eliminating beating between common partials, finding common fundamentals and audible combination tones, and establishing a resonant, stable sonority which maximizes clarity: both of consonance and of dissonance.

A well-focussed JI sound is completely distinct from the irregular, fuzzy beating of tempered sounds. Just consonances, when marginally out of tune, beat slowly and sweetly and may be corrected with the most subtle adjustments of bowing or breath. Just dissonances produce a sharply pulsing regular rhythm and have very clear, distinct colors.

To become familiar with the notation and sounds of JI, the fundamental building blocks are prime number overtones 3, 5, 7, 11 and 13, each of which is associated with a specific pair of accidentals and a basic musical interval.

3 is associated with the signs flat, natural, sharp and refers to the series of untempered perfect fifths (Pythagorean intonation). Generally, A is taken as the tuning reference, and the central pitches C-G-D-A-E can be imagined as the normal tuning of the orchestral string instruments. The just C is rather lower than tempered tuning because of the pure fifths. The further this series is extended, the greater the deviation from tempered tuning: the flats are lower, the sharps higher.

5 is associated with arrows attached to the flat, natural, sharp signs and refers to the pure major third. These arrows correct the Pythagorean intervals by a Syntonic Comma, which is approximately  $\frac{1}{9}$  of a whole tone or 22 cents. So, for example, the note E-flat arrow-up is a just major third below G, and the note F-sharp arrow-down is a major third above D. In most music, flats are often raised by a comma and sharps are lowered. Because of the open string tuning, it is common to sometimes raise F and C (to match A and E) and to sometimes lower A and E (to match F and C). Corrections by one Syntonic Comma have been used throughout Western music history and are relatively familiar to the ear. However, traditionally these corrections have been hidden by players, for example in Meantone Temperament where fifths are mistuned narrow by  $\frac{1}{4}$  comma so that the third C-E ends up sounding pure. More recently, the currently prevailing Equal Temperament has made us accustomed to beating thirds, so at first the pure intervals may seem unfamiliar. To play the arrows accurately, one must carefully learn the sound of the consonant major and minor thirds and sixths, and learn to articulate comma differences clearly.

7 is associated with a Tartini sign resembling the numeral. It corrects the Pythagorean intervals by a Septimal Comma, which is approximately  $\frac{1}{7}$  of a whole tone or 27 cents. When the Pythagorean minor third is lowered by this amount, it becomes a noticeably low third often heard in Blues music.

11 is associated with the quartertone signs (cross and backwards flat). The accidental is used to raise the perfect fourth by 53 cents, producing the exact tuning of the 11th partial in a harmonic series. The sound is most easily learned by playing one octave plus one fourth and raising it by a quartertone.

13 is associated with the thirddtone signs (cross and backwards flat, each with 2 verticals). The accidental is used to lower the Pythagorean major sixth by 65 cents, producing the exact tuning of the 13th partial in a harmonic series. The sound is most easily learned as a neutral-sounding sixth, one-third of the way between the just minor and just major sixths (closer to minor than to major).

The following table presents the accidentals together with their associated ratios and cents deviations. To calculate the cents deviation from Equal Temperament of a specific written pitch (if desired) the following shortcut may be used:

- 1.) Find the cents deviation of the Pythagorean pitch, by calculating how many fifths it is away from A, multiplying by 2, and using a plus sign if it is on the sharp side and a minus if it is on the flat side.
- 2.) For each microtonal accidental, add or subtract its approximate cents value (as given above), keeping in mind whether the accidental is raising or lowering the pitch.

The resulting value should be a cents deviation within 1 or 2 cents accuracy, which is an acceptable starting point for fine-tuning by ear.

# ACCIDENTALS

## EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION

*for Just Intonation*

*designed by Marc Sabat and Wolfgang von Schweinitz*

*The exact intonation of each pitch may be written out by means of the following harmonically-defined signs:*

$\flat\flat$   $\flat$   $\natural$   $\sharp$   $\times$      *Pythagorean series of fifths – the open strings*  
(... c g d a e ...)

$\flat\downarrow$   $\natural\downarrow$   $\sharp\downarrow$   $\times\downarrow$       $\flat\uparrow$   $\natural\uparrow$   $\sharp\uparrow$   $\times\uparrow$      *lowers / raises by a syntonic comma*  
 $81 : 80 = \text{circa } 21.5 \text{ cents}$

$\flat\downarrow\downarrow$   $\natural\downarrow\downarrow$   $\sharp\downarrow\downarrow$   $\times\downarrow\downarrow$       $\flat\uparrow\uparrow$   $\natural\uparrow\uparrow$   $\sharp\uparrow\uparrow$   $\times\uparrow\uparrow$      *lowers / raises by two syntonic commas*  
 $\text{circa } 43 \text{ cents}$

$\lrcorner$       $\llcorner$      *lowers / raises by a septimal comma*  
 $64 : 63 = \text{circa } 27.3 \text{ cents}$

$\llcorner$       $\lrcorner$      *lowers / raises by two septimal commas*  
 $\text{circa } 54.5 \text{ cents}$

$\dagger$       $\dagger$      *raises / lowers by an 11-limit undecimal quarter-tone*  
 $33 : 32 = \text{circa } 53.3 \text{ cents}$

$\mathbb{H}$       $\mathbb{H}$      *lowers / raises by a 13-limit tridecimal third-tone*  
 $27 : 26 = \text{circa } 65.3 \text{ cents}$

$\approx$       $\approx$      *lowers / raises by a 17-limit schisma*  
 $256 : 255 = \text{circa } 6.8 \text{ cents}$

$\nearrow$       $\searrow$      *raises / lowers by a 19-limit schisma*  
 $513 : 512 = \text{circa } 3.4 \text{ cents}$

$\uparrow$       $\downarrow$      *raises / lowers by a 23-limit comma*  
 $736 : 729 = \text{circa } 16.5 \text{ cents}$

*In addition to the harmonic definition of a pitch by means of its accidentals, it is also possible to indicate its absolute pitch-height as a cents-deviation from the respectively indicated chromatic pitch in the 12-tone system of Equal Temperament.*

*The attached arrows for alteration by a syntonic comma are transcriptions of the notation that Hermann von Helmholtz used in his book “Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik” (1863). The annotated English translation “On the Sensations of Tone as a Physiological Basis for the Theory of Music” (1875/1885) is by Alexander J. Ellis, who refined the definition of pitch within the 12-tone system of Equal Temperament by introducing a division of the octave into 1200 cents. The sign for a septimal comma was devised by Giuseppe Tartini (1692-1770) – the composer, violinist and researcher who first studied the production of difference tones by means of double stops.*

# VORZEICHEN

## EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION

für die natürliche Stimmung

konzipiert von Marc Sabat und Wolfgang von Schweinitz

Die Stimmung jedes Tons ist mit folgenden harmonisch definierten Vorzeichen ausnotiert:

$\flat\flat$   $\flat$   $\natural$   $\sharp$   $\times$

Pythagoreische Quintenreihe der leeren Streicher-Saiten  
(... c g d a e ...)

$\flat$   $\natural$   $\sharp$   $\times$        $\flat\flat$   $\flat$   $\natural$   $\sharp$

Erniedrigung / Erhöhung um ein Syntonisches Terzkomma  
 $81 : 80 = \text{circa } 21.5 \text{ cents}$

$\flat$   $\natural$   $\sharp$   $\times$        $\flat\flat$   $\flat$   $\natural$   $\sharp$

Erniedrigung / Erhöhung um zwei Syntonische Terzkommas  
 $\text{circa } 43 \text{ cents}$

$\lrcorner$        $\llcorner$

Erniedrigung / Erhöhung um ein Septimenkomma  
 $64 : 63 = \text{circa } 27.3 \text{ cents}$

$\llcorner$        $\lrcorner$

Erniedrigung / Erhöhung um zwei Septimenkommas  
 $\text{circa } 54.5 \text{ cents}$

$\dagger$        $\dagger$

Erhöhung / Erniedrigung um den undezimalen Viertelton der 11er-Relation  
 $33 : 32 = \text{circa } 53.3 \text{ cents}$

$\sharp$        $\sharp$

Erniedrigung / Erhöhung um den tridezimalen Drittelton der 13er-Relation  
 $27 : 26 = \text{circa } 65.3 \text{ cents}$

$\approx$        $\approx$

Erniedrigung / Erhöhung um ein Siebzehner-Schisma  
 $256 : 255 = \text{circa } 6.8 \text{ cents}$

$\nearrow$        $\searrow$

Erhöhung / Erniedrigung um ein Neunzehner-Schisma  
 $513 : 512 = \text{circa } 3.4 \text{ cents}$

$\uparrow$        $\downarrow$

Erhöhung / Erniedrigung um ein Dreiundzwanziger-Komma  
 $736 : 729 = \text{circa } 16.5 \text{ cents}$

Zusätzlich zu der harmonischen Definition der Tonhöhe durch das Vorzeichen für jeden Ton ist auch der Cents-Wert der Abweichung der gewünschten Stimmung von der Tonhöhe des jeweils bezeichneten chromatischen Tons der gleichstufig temperierten Zwölfton-Skala angegeben.

Die attachierten Pfeile für die Alteration um ein Syntonisches Terzkomma sind eine bloße Transkription der Notation, die Hermann von Helmholtz in seinem Buch "Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik" (1863) verwendet hat. Die kommentierte englische Übersetzung "On the Sensations of Tone as a Physiological Basis for the Theory of Music" (1875/1885) stammt von Alexander J. Ellis, der auch eine enorme Verfeinerung der Tonhöhendefinition innerhalb des Zwölftonsystems der gleichstufig temperierten Stimmung durch die Unterteilung der Oktave in 1200 Cents eingeführt hat. – Das Vorzeichen für die Alteration um ein Septimenkomma wurde von Giuseppe Tartini (1692-1770) erfunden, der als Komponist, Geiger und Wissenschaftler die durch Doppelgriffe erzeugten Differenztöne untersucht hat.





8

Musical score for measures 8-9. The score is written for four staves: Violin I, Violin II, Cello, and Double Bass. Measure 8 features a tremolo in the Cello and Double Bass parts. Measure 9 includes dynamic markings *ppp* *molto preciso* and *m.v.* (mezzo-vivace). Fingerings are indicated by Roman numerals (II, III, II) above notes. A bowing instruction "even, clear bowing" is present above the Violin II staff. A breath mark "H" is placed above the Double Bass staff.

10

Musical score for measures 10-11. Measure 10 includes dynamic markings *p* *molto preciso* and *m.v.*. Measure 11 includes dynamic markings *ppp* *molto preciso* and *m.v.*. Fingerings (III, IV) are shown above notes. A bowing instruction "even, clear bowing" is present above the Double Bass staff. A breath mark "H" is placed above the Cello staff.

12

Musical score for measures 12-13. Measure 12 includes dynamic markings *p* *molto preciso* and *m.v.*. Measure 13 includes dynamic markings *ppp* *molto preciso* and *m.v.*. Fingerings (III, IV, IV, III) are shown above notes. A bowing instruction "even, clear bowing" is present above the Double Bass staff. A breath mark "H" is placed above the Violin I staff.

14

Musical score for measures 14-15. The score is written for four staves: Violin I, Violin II, Cello/Double Bass, and Bass. Measure 14 features a violin I part with a grace note and a slur, a violin II part with fingering (III, IV, IV, III) and a slur, a cello part with a slur, and a bass part with a slur. Measure 15 features a violin I part with a slur, a violin II part with a slur, a cello part with a slur and a forte dynamic 'H', and a bass part with a slur and a forte dynamic 'H'. Dynamics include *ppp* and *molto preciso* in the cello part, and *m.v.* in the violin II and bass parts. There are also *s.v.* markings in the violin I and II parts.

16

Musical score for measures 16-17. The score is written for four staves: Violin I, Violin II, Cello/Double Bass, and Bass. Measure 16 features a violin I part with a slur and *s.v.*, a violin II part with a slur and *ppp* *molto preciso*, a cello part with a slur and *ppp* *molto preciso*, and a bass part with a slur and *s.v.*. Measure 17 features a violin I part with a slur and *s.v.*, a violin II part with a slur and *m.v.*, a cello part with a slur and *s.v.*, and a bass part with a slur and *s.v.*. Dynamics include *ppp* and *molto preciso* in the violin II and cello parts, and *m.v.* in the violin I and II parts. There are also *s.v.* markings in the violin I and II parts.

18

Musical score for measures 18-20. The score is written for four staves: Violin I, Violin II, Cello/Double Bass, and Bass. Measure 18 features a violin I part with a slur, a violin II part with a slur, a cello part with a slur and *ppp* *molto preciso*, and a bass part with a slur and *ppp* *molto preciso*. Measure 19 features a violin I part with a slur, a violin II part with a slur and *s.v.*, a cello part with a slur and *IV*, and a bass part with a slur and *m.v.*. Measure 20 features a violin I part with a slur and *s.v.*, a violin II part with a slur and *beating!*, a cello part with a slur and *beating!*, and a bass part with a slur. Dynamics include *ppp* and *molto preciso* in the violin II and cello parts, and *m.v.* in the violin I and II parts. There are also *s.v.* markings in the violin I and II parts.

# Pythagoras Drawing (I)

Tempo ad libitum, vary from bar to bar as desired, swinging

ca. 66-99

The musical score is written for four staves: Violin I, Violin II, Viola, and Cello/Double Bass. It is in 3/4 time and consists of 12 measures. The score includes various performance instructions such as *mezza voce, sostenuto*, *ff*, *sempre simile*, *lead*, *martelé, full bow*, *molto sul tasto*, *ord.*, *come prima*, and *attacca*. Fingerings (I-IV) and bowing techniques are indicated throughout. The score is divided into three systems of four measures each.

\* grace notes placed at beginning and end of bar are not to be deliberately synchronized between the instruments



25

Musical score for measures 25-30. The score is in 12/8 time and consists of four staves. The first two staves are in treble clef, and the last two are in bass clef. The music features dynamic markings of *p* and *f*, and includes fingering numbers III and IV. There are also hairpins and slurs indicating phrasing and dynamics.

31

Musical score for measures 31-39. The score is in 2/4 time and consists of four staves. The first two staves are in treble clef, and the last two are in bass clef. The music features dynamic markings of *p* and *f*, and includes fingering numbers III and IV. There are also hairpins and slurs indicating phrasing and dynamics.

40

Musical score for measures 40-44. The score is in 12/8 time and consists of four staves. The first two staves are in treble clef, and the last two are in bass clef. The music features dynamic markings of *f* and *p*, and includes fingering numbers III and IV. There are also hairpins and slurs indicating phrasing and dynamics.

45

Musical score for measures 45-50. The score is in 3/8 time and consists of four staves. The first two staves are in treble clef, and the last two are in bass clef. The music features dynamic markings of *f* and *p*, and includes fingering numbers III and IV. There are also hairpins and slurs indicating phrasing and dynamics.

54

*f* *(f)* *(f)* *(f) p* *p*

*p* *(p)* *(p)* *f* *p*

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

*(f)* *p* *f p f*

61

*(p)* *f* *(f)* *p* *f*

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

*p* *(p) f* *f p f* *f p f*

*(f)* *p f p f p f p f*

69

*p* *(p)* *f* *(f)* *f*

*(p)* *f* *(f)*

*(f)* *f* *(f)*

*(f)* *f* *(f)*

75

*p* *p* *f* *(f)* *p*

*(f)* *p* *(p)* *p*

*(f)* *p* *f* *(f)*

*(f)* *p* *f* *(f)*

82

Musical score for measures 82-89. The score is in 2/4 time and consists of four staves. Measure numbers 82, 83, 84, 85, 86, 87, 88, and 89 are indicated above the first staff. Fingerings (I-IV) are shown above notes. Dynamics include *f*, *p*, and *(p)*. A *p < >* marking is present in measure 87.

90

Musical score for measures 90-97. The score is in 2/4 time and consists of four staves. Measure numbers 90, 91, 92, 93, 94, 95, 96, and 97 are indicated above the first staff. Fingerings (I-IV) are shown above notes. Dynamics include *f* and *p*. A *p < >* marking is present in measure 91.

98

Musical score for measures 98-103. The score is in 2/4 time and consists of four staves. Measure numbers 98, 99, 100, 101, 102, and 103 are indicated above the first staff. Fingerings (I-IV) are shown above notes. Dynamics include *(p)*, *f*, and *(f)*. An *art. harm.* marking is present in measure 102. A *p < >* marking is present in measure 101.

104

Musical score for measures 104-109. The score is in 2/4 time and consists of four staves. Measure numbers 104, 105, 106, 107, 108, and 109 are indicated above the first staff. Fingerings (I-IV) are shown above notes. Dynamics include *p*.



# Harmonium for Ben Johnston

**Cantabile**  $\text{♩} = 72$

**poco vib. (narrow)**

VI I: *mezza voce*, *poco f*, *sfp*, *f*

VI II: (arco) c.l.b. → ord., *sfz* > *poco f*, *sfz* > *p*, *f sostenuto*

Vla: *mezza voce*, *f*

Vlc: *mezza voce*, *espr.*, *poco f*

VI I: *mezza voce*, *poco f*, *sfp*, *f*

VI II: (arco) c.l.b. → ord., *sfz* > *poco f*, *sfz* > *p*, *f sostenuto*

Vla: *mezza voce*, *f*

Vlc: *mezza voce*, *espr.*, *poco f*

5

VI I: *f*, *sfz*, *p*

VI II: *f*, *sfz*, *p*

Vla: *m.v.*, *poco f*, *p*, *m.v.*

Vlc: *m.v.*, *poco f*, *p*

VI I: *f*, *sfz*, *p*

VI II: *f*, *sfz*, *p*

Vla: *m.v.*, *poco f*, *p*, *m.v.*

Vlc: *m.v.*, *poco f*, *p*

10

VI I: *ppp*, *p*

VI II: *pp*, *mp*

Vla: *p*, *poco*, *ppp*, *p*

Vlc: *pp*, *p*

VI I: *ppp*, *p*

VI II: *pp*, *mp*

Vla: *p*, *poco*, *ppp*, *p*

Vlc: *pp*, *p*

14

*f sfz*

*poco f*

*p*

*m.v. espr.*

*m.v. espr.*

*sfz*

*p*

*pp*

18

*pp*

*m.v.*

*(m.v.)*

*pp*

*poco f*

*espr.*

*ppp*

*poco f*

*m.v.*

*p*

*poco f*

*< espr.*

22

*p*

*l.h. pizz.*

*p*

*sfz*

*p*

*p*

*fast*

*p*

*p*

*sfz*

26

*f*

*p*

*poco*

*espr.*

*slow bow*

*sost.*

*poco f*

*poco f*

*m.v.*

30

34

38

42

46 1. ord. *sfz pp*

*sfz*

*sfz pp*

*pp*

*f sonore*

9/1

49 *f* strike the string!

*f* strike the string!

fast ricochet

*p*

*poco f*

*m.v.*

*m.v.*

*(senza dim.)*

*crescendo*

53 flautando 3 *m.v.*

ord. *poco f*

4-->

*sfz*

fast ricochet

*poco f*

slow bow

*f sonore*

*espr.*

*p*

6.5

*f*

Musical score for measures 57-60. The score consists of four staves. The top two staves are in treble clef, and the bottom two are in bass clef. The music includes various dynamics such as *p* and *pp*, and performance markings like *s* (sostenuto) and *V* (vibrato).

Musical score for measures 61-65. The score consists of four staves. The top staff has a *m.v.* marking. The bottom staff has *pp* and *p crescendo* markings. Performance markings include *s*, *V*, and *1*.

Musical score for measures 66-69. The score consists of four staves. The top staff has *espr.* and *fast ricochet* markings. The bottom staff has *III*, *II*, and *III* markings. Dynamics include *poco f* and *diminuendo .....*. Performance markings include *1*, *3*, and *6.5*.

Musical score for measures 70-73. The score consists of four staves. The top staff has *diminuendo ..... port.* and *2* markings. The bottom staff has *pp sotto voce* marking. Performance markings include *V*, *1*, and *2*.

Un poco largo

♩ = 57.6

75

+4.2 e

libero

change bow as needed

poco f e sempre sostenuto

+4.2 e

+4.2 e

(hairpin applies to F only!)

77

libero

in tempo

p

ppp

ppp

in tempo

p

ppp

rinf.

libero

in tempo

78

libero II

ppp

libero

ppp

rinf.

\* l.h.: establish, maintain, fine tune hand positions — hold fingers as long as possible  
 r.h.: molto flautando, change bows and vary speed often and irregularly — emerging into sharp focus and receding again  
 repeats as many times as needed to set an accurate intonation of the written pattern, sempre un poco ad libitum

simile (tempo libero)

79

*poco f* *rinf.* *m.v.*

*mp* *pp* *poco f* *ppp*

*sfz*

80

*rinf.*

*p*

81

*ppp* *molto tasto* *ord.* *ppp*

*ppp*

82

lower E (5 commas down) is dissonant (27/20) with Vln II A !

*poco f* *sfz* *rinf.*

*rinf.*

83

ppp

ppp

ppp

1

2

3

3

Detailed description: This system contains measures 83 and 84. It features four staves: two treble clefs, an alto clef, and a bass clef. The music is in a key with one sharp (F#) and a 3/4 time signature. Measure 83 starts with a piano (*ppp*) dynamic. Measure 84 continues with *ppp* dynamics. There are various articulations like accents and slurs, and some fingerings are indicated (1, 2, 3). A fermata is present in the alto staff of measure 84.

84

*rinf.*

*poco f*

*rinf.*

3

5

3

3

3

Detailed description: This system contains measures 84 and 85. It features four staves: two treble clefs, an alto clef, and a bass clef. The music is in a key with one sharp (F#) and a 3/4 time signature. Measure 84 starts with a *rinf.* dynamic. Measure 85 continues with *rinf.* and *poco f* dynamics. There are various articulations like accents and slurs, and some fingerings are indicated (3, 5, 3, 3, 3). A fermata is present in the alto staff of measure 85.

85

*rinf.*

*m.v.*

*poco f*

*cantabile, come prima*

45

3

5

3

3

III

*cantabile, come prima*

Detailed description: This system contains measures 85, 86, 87, and 88. It features four staves: two treble clefs, an alto clef, and a bass clef. The music is in a key with one sharp (F#) and a 3/4 time signature. Measure 85 starts with a *rinf.* dynamic. Measure 86 has a *m.v.* dynamic. Measure 87 has a *poco f* dynamic. Measure 88 has a *cantabile, come prima* dynamic. There are various articulations like accents and slurs, and some fingerings are indicated (45, 3, 5, 3, 3, III). A fermata is present in the alto staff of measure 88.

in tempo

88

*rinf.*

65

3

3

3

3

3

Detailed description: This system contains measures 88, 89, 90, and 91. It features four staves: two treble clefs, an alto clef, and a bass clef. The music is in a key with one sharp (F#) and a 3/4 time signature. Measure 88 starts with a *rinf.* dynamic. Measure 89 has a *poco f* dynamic. Measure 90 has a *cantabile, come prima* dynamic. Measure 91 has a *cantabile, come prima* dynamic. There are various articulations like accents and slurs, and some fingerings are indicated (3, 3, 3, 3, 3, 3, 65, 3, 3, 3, 3, 3, 3). A fermata is present in the alto staff of measure 91.

L'istesso tempo ma giusto, scorrevole

91

*poco f*

*f*

*m.v.*

*dolce*

*m.v.*

G# tacet ad lib.

94

*poco*

*m.v.*

98

strike the string!

*sfz*

\* B natural is one schisma (circa 2¢) higher than C flat one comma raised (almost the same pitch)

♩ = 72

101

101-104

*poco f sostenuto*

*f*

*rinf.*

*sfz*

*f*

*rinf.*

*sfz*

1

V

3

^

105

105-108

*sfz*

*f sonore*

*sfz p espr.*

*m.v.*

*sfp espr.*

*poco f*

*sfz*

*f sonore*

*m.v.*

*p*

III

IV *m.v.*

*f sonore*

*m.v.*

109

109-112

*poco f*

*p*

*pp*

*rinf.*

*m.v.*

*p*

*one comma lower!*

*rinf.*

*m.v.*

*p*

2

6

3

2

V

III

2 V

113

Musical score for measures 113-115. The score is written for four staves: two treble clefs and two bass clefs. The key signature is one sharp (F#) and the time signature is 3/4. Measure 113 features a complex rhythmic pattern with triplets and slurs. Measure 114 includes a fermata and a 'V' marking above the staff. Measure 115 shows a dynamic shift from *p* to *poco f*. The bottom two staves have dynamics *p* and *poco f* with slurs and accents.

116

Musical score for measures 116-118. The score is written for four staves. Measure 116 starts with a *pp espr.* dynamic and a 'V' marking above the staff. Measure 117 includes a 'V' marking and a dynamic shift to *p*. Measure 118 features a dynamic shift to *pp* and a 'III' marking above the staff. The bottom two staves have dynamics *p* and *pp* with slurs and accents.

119

Musical score for measures 119-121. The score is written for four staves. Measure 119 includes a 'III' marking above the staff. Measure 120 features a 'II' marking above the staff. Measure 121 includes a 'III' marking above the staff. The bottom two staves have dynamics *pp* and *pp* with slurs and accents.





