A CRITICAL DISCUSSION OF THE TWELVE-TONAL IDIOM OF ANTON WEBERN AND CRITICISM OF ITS ASSESSMENT BY SOME NOTABLE THEORISTS

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University of Cape Town



ANTON WEBERN

PREFACE

Webern took over from Schoenberg, and others, and elevated the art of music to an auditory mathematics.
"It is given only to powerful spirits to travel this razor edge. Lesser ones lack the requisite inner certainty." ✱ 1

Indeed Webern never pandered to popular taste. Every tone he wrote was dictated to by musical necessity and logic. No other composer has shown such iron consistency in the development of his art as Webern has. In him we find an evolutionary growth which consistently advanced the frontiers of music and presented the world with a series of masterpieces which, regrettably, are too seldom performed.

Yet during his life Webern was scandalously neglected and misunderstood. It pains one to think that the Genius who created the Orchestral Variations uttered these heart-rending words:

"Now, my dear chap, say your piece and exert your influence, I beg of you.

If only some notice at all could be taken of my work!" ✱ 2

But History plays amazing quirks!

Within ten years or so after these words were written Webern became the dominating influence in twentieth century music. His ascent was so glittering that Posterity named periods in honour of him, that world-famous composers reconstructed their thinking to write in the Webernite manner. There are few who have attained such a manifestation of power to determine an artistic direction by sheer influence or reaction.
Thus we have approached this study of Webern with awe and the further we have progressed, the greater has our expression of admiration and humility become.

✱ 1: Hans Sedlmayr: Art in Crisis, translated from the German by Brian Battershaw and published by Hollis and Carter Ltd 1957. Part III, Chapter XIV , p.221.

✱ 2: Anton Webern: The Path to the New Music: Letter to Willi Reich. Dated March 3rd, 1941, p.60. English Edition published by Theodore Presser Co. in association with U.E. 1963.

Preface

Our study reflects the sentiments expressed by Nicholas Ruwet in his article: Contradictions within the Serial Language:

"Above all else Webern's ouvre must be studied afresh. Hitherto every study of his work has approached it from a biased point of view..... even those which have undoubtedly contributed a great deal to our understanding of him. ..... Commentators have been inclined to attribute significance only to those parts which seemed to herald serial compositions, treating the rest as "a survival from the past". But this so-called "survival" and forward-looking aspects are two sides of an ordered whole, whose significance will only be made plain when its structure is examined without ideological prejudices". ✱ 1

Consequently it has been our aim in this study to be pertinently objective. Secondly we have abolished the concept of preconceived conclusions - since this has ensnared all too many who strove to give expression to views not properly founded. Alas, Webern seems to be absolutely notorious in baiting authorities and then slipping them up. Thus we have learnt by these mistakes to adopt the dictum: to form conclusions if and only if facts are consolidated by acute analysis from every conceivable angle.

Authoritative opinion is certainly invaluable, but how are we to know whether such opinion is valid unless we subject it to rigorous examination to ascertain its truth value. Many arguments, indeed, are uttered so convincingly that they seem to be absolutely conclusive, yet are later found to be unfounded preconceived notions which are utterly untenable. By virtue of this, it has consequently been found necessary to include herein criticisms of certain evaluations of Webern's ouvre by notable theorists to establish the extent of their contributions.
We give Professor Gunter Pulvermacher the credit for suggesting the inclusion of these criticisms without which this study would have lacked vital information.

✱ 1: Nicholas Ruwet: Contradictions within the Serial Language, p. 74, die Reihe, No 6.

Preface

Though we are sometimes stringent in our criticism, this should not mislead the reader into thinking that a contribution is valueless. Truly, any serious attempt at analysis, prejudiced or otherwise, is certainly not wasted effort as it may lead to a new system of analysis. In this way, for instance, the Direction-variant theory was formulated. Also the insignificant use of statistics by some authorities has led us to an enquiry to see how statistics may be applied usefully. Through it we have discovered the law of "Withholding" which is evident in all music.

Very often we have found that theorists only review a particular section of a work. For instance, Herbert Eimert only examines the first fifteen measures of the first movement of the String Quartet, Op. 28; Stockhausen, in his Experiential Time exposition, considers only the first eighteen measures, and René Leibowitz in his discussion of the Symphony similarly only describes the first few measures and then concludes: "The whole first movement of the Symphony unfolds according to the principles we have just described ". * 1
Now the danger of this procedure is that elements present in certain sections may be absent from successive sections and therefore conclusions based only on a particular section may be invalid. In the sonata-like forms, for instance, Webern employs fixed and constant pitches in the first sections, but later on employs direction-variants. If we base our conclusions on these first sections, and not on the succeeding sections as well, we may gain a totally wrong impression of the use of "fixed pitches".

By virtue of this we have been necessitated to analyse only complete movements and compositions, as far as possible, to be able to deduce more certain and valid conclusions. Such a procedure, however, has entailed a considerable amount of work and strikingly augmented the size of this study. But through this method we were enabled to define Webern's evolutionary development more clearly, and to observe the multi-dimensional serialism existing in the later Webern. Thus we have become convinced of the uselessness of taking examples at random, as parameters in Webern are generally interrelated.

* 1: Rene Leibowitz: Schoenberg and his School: Ch. X, par.5, p.213. Published by Da Capo Press, New York, 1970.

Preface

Very often we were besieged by problems which had to be solved, ere any further progress could be made. It was not until we had classified the tone-rows into classes that we began to see the evolution in Webern and, indeed, in twelve-tone music in general. It will have been noticed that often theorists go into a lengthy description of row-structure. Such a procedure became unnecessary after we had completed this classification.

Afterwards we added a classification of verticalities derived from the various families of rows and also the classification of verticalities derived from multi tone-rows, i.e. rows occurring simultaneously. Such classification has enabled us to describe Webernite procedure precisely.

Throughout this thesis we have employed a new symbology. Such symbology has been invented to describe row-forms, operations on such row-forms, etc. , but chiefly to eliminate unnecessary verbal description. Where such symbology is used, it is defined in the appropriate section.

We also make considerable use of Logic, Set Theory and Venn diagrams to illustrate and elucidate Webern's technical procedure. As far as possible complete musical examples (especially R/R versions and short scores) of the work under discussion are given.

In conclusion the author extends the hope that the readers may become enthusiastic Webern adherents.

Cromwell Everson

September 21, 1973.

ACKNOWLEDGEMENTS

Hereby we convey our appreciation to the Music Faculty in the University of Cape Town for accepting us as a student.
We also cannot refrain from mentioning the courteous service we experienced from the staff of the Music Library in the College of Music.

This study, however, would never have been attempted without the support and encouragement of Prof. Gunter Pulvermacher who has come a long way with the twelve-tone music and who in a subtle way influenced the course of this thesis.

We are truly indebted to several other persons who assisted with the completion of this work:

The typists who typed certain sections: Mrs Ida Roux and Miss Tillie Vermeulen, T.D.M.

The persons who diligently proof-read these manuscripts for errors: Mrs Sandra du Toit, B.A,, Mrs Urma Cooke, B.A., and Mrs Anna van Stuvenberg, B.A.

My wife who painstakingly made drawings and illustrations of some sections, designed the title page, drew the pen picture of Anton Webern and who supported this project in more ways than can be mentioned here.

CONTENTS

Preface		iii
Acknowledgements		vii
Symbols		1
1	A Discussion of Armin Klammer's "Webern's Piano Variations, Op. 27, 3rd Movement"	4
2	A discussion of Peter Westergaard's "Webern and Total Organization"	25
3	Analysis of the Second Movement of the Variations, Op. 27 by Webern	32
4	Order Relations in Tonal Music	47
	Withholding of Notes	50
5	Sound and Silence including John Cage's Theory of Silence	57
6	Silence/Sound Patterns - Variations, Op. 27: II	85
7	Unity - Variations, Op. 27: II	101
8	Relations - Variations, Op. 27: II	121
9	Melodic Structure and Form - Variations, Op. 27: II	131
10	Direction-Variants including Criticism of Klammer, Stockhausen and Eimert	155
11	Klavierstück, Op. Post.	165
12	String Trio, Op. 20: I	173
	II	182

Contents

13	Criticism of Herbert Eimert: Interval Propoertions	194
14	String Quartet, Op. 28: 1st Movement	204
15	Criticism of Karlheinz Stockhausen: Structure and Experiential Time	218
16	String Quartet, Op. 28: 2nd Movement	232
17	Symphony, Op. 21	239
Vol. 2 18	Analysis of Op. 30: Variations - The Row	264
	Classification of different twelve-tone Sets	275
19	Analysis of Op. 30: The Theme	287
20	Chordal Chains	329
21	Variation I from Op. 30	336
22	Variation II from Op. 30	355
23	Variation III from Op. 30	373
24	Variation IV from Op. 30	385
25	Variation V from Op. 30	400
26	Variation VI from Op. 30	411
27	Variations, Op. 30: Conclusion, including Criticism of Eimert's negation of Webern's statements Comparison of parameters	428

Contents

28	Chordal Structures and their Classification	442
	I Chordal Derivation from the Row	
29	II Verticalities brought about by the Simultaneity of Rows	464
30	Cantata, Op. 29: I including a criticism of the translation of the poem	479
31	Cantata, Op. 31: VI including	510
	Criticism of Rudolph Reti on Rhythm	
	Cantata, Op. 31: I	519
	Vocal Works	521
	Serialization of Poetic concepts	533
32	Fifth-Gravitation	542
33	Conclusion	571
Appendix I		586
Appendix II		587
Appendix III		588
Bibliography		589
Index		594

Symbols

The symbols used in this Thesis and which are musically unusual are:

General Symbols

A/R	Attack and release	N-v	Note-values
R/R	Registral reduction	Th	Theme
S	Silence	V I	Variation I
$\sim$ S	Sound	Var. I	Variation I
dB	decibels	$f(x)$	value of f at x
S_n	subscript signifying quantity of silence	2^4	2 to the power of 4
		2^{-3}	2 to the power of -3

Instrumentation (We hereby also indicate where these instruments are to be found in Webern's works)

vl 1	first violin	Op. 17; 20; 21; 22; 24; 26; 28; 29; 30; 31.
vl 2	second violin	Op. 21; 28; 29; 30; 31.
vla	viola	Op. 17; 20; 21; 24; 26; 28; 29; 30; 31.
vlc	violoncello	Op. 20; 21; 26; 28; 29; 30; 31.
cb	double bass	Op. 30; 31.
fl	flute	Op. 24; 26; 29; 30; 31.
pic	piccolo	Op. 31.
ob	oboe	Op. 24; 26; 29; 30; 31.
ang	cor anglais	Op. 31
fg	bassoon	Op. 31
cl	clarinet	Op. 17; 18; 19; 21; 22; 24; 26; 29; 30; 31.
bs cl	bass clarinet	Op. 17; 19; 21; 29; 30; 31.
sax	saxophone alto	Op. 26; 31.
	tenor	Op. 22;
cor	horn	Op. 21; 26; 29; 30; 31.
trp	trumpet	Op. 24; 26; 29; 30; 31.
trb	trombone	Op. 26; 29; 30; 31.
tu	tuba	Op. 30; 31.
guit	guitar	Op. 18; 19
cel	celesta	Op. 19 26; 29; 30; 31.
hrp	harp	Op. 21; 26; 29; 30; 31.
kl	piano	Op. 22; 23; 24; 25; 27;
mdl	mandoline	Op. 26; 29;
gsl	glockenspiel	Op. 26; 29; 31.
xyl	xylophone	Op. 26;
cym	cymbals	Op. 26; 29

Symbols

Instrumentation

Tym	tympani	Op. 26; 29; 30;
B d	Bass Drum	Op. 29
Tam	tamtam	Op. 29
trgl	triangle	Op. 29
bls	bells	Op. 31.

Intervals

A4, A5	Augmented fourth
d5,	diminished fifth
m2, m6	minor intervals
M3, M2	major intervals
P1 or U	Perfect 1st or unison
P4, P5	Perfect intervals
D	dominant
T	tonic
Ø	modified dominant
T	modified tonic

Operations and symbols used in Operations

O →	original operation
I →	inversional operation
R →	Retrograde operation
RI →	retro-inversional operation
b	O statement
p	I statement
d	R statement
q	RI statement
Z	O statement or RI statement
Σ	I or R statement
Σ	Summation
n!	n factorial

O	Original statement of row, etc.
I	Inversional statement
R	retrograde statement
RI	retro-inversional statement.
4	O statement of metrical scheme
∀	I statement of metrical scheme
⊣	R statement of metrical scheme
ϟ	RI statement of metrical scheme
N	O or RI statement of metrical scheme
И	R or I statement of metrical scheme
D	O or I statement of metrical scheme
Ɑ	R or RI statement of metrical scheme

Symbols

Relations

$=$	is equal to
$\neq$	is not equal to
$>$	is greater than
$\geq$	is greater than or equal to
$<$	is less than
$\leq$	is less than or equal to

$0 \rightarrow\!\!-\!\!- 0$	anti-symmetric relation or direction
$0 \rightarrow\!\!\leftarrow 0$	symmetric relation or direction
	reflexive relation or direction
$\wedge$	ascending direction between two tones
$\vee$	descending direction between two tones.

Set and Logic symbols

$\{\ \}$	brackets denote elements contained in a set
$\{\ :\ \}$	set definition
$\{\ /\ \}$	set definition . i.e. such that
$\{a,b,c\}$	set contains the elements: a, b, c.
$\emptyset$	the null set
$\subset$	is a subset of
$\subseteq$	is a subset of and is equal to
$\wedge$	conjunction i.e. "and"
$\rightarrow$	conditional i.e. "if , then"
$\sim$	negation of i.e. "not"

A'	the complement of A
$n(A) = x$	number of set, A
$n(A) = 6$	set, A has 6 elements
$n(o) = 3$	set, o has 3 elements
U	the universal set
$\cup$	a union
$\cap$	an intersection
$\supset$	contains a subset
$\vee$	disjunction i.e. "or"
$\leftrightarrow$	biconditional i.e. equivalent:"if only if"

Verticalities

X-set	verticalities which retain their identities
I, H, O, ϕ, Θ	other X-set families
i-set	verticalities which can be reflected such that O = R or I = RI
A, V, W, M, Y, T, U, Π	other i-set families

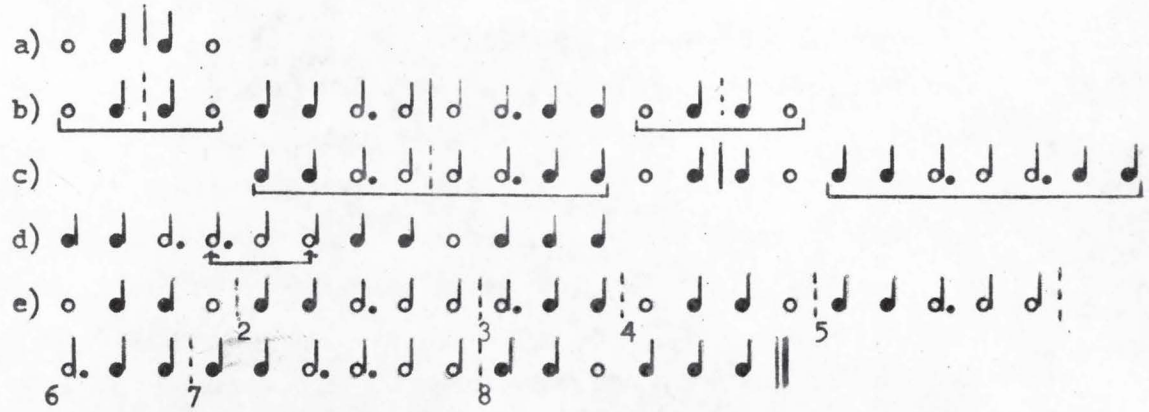
(2, 2b, 9)	a chordal chain
$\begin{pmatrix} a \\ b \\ c \\ f \end{pmatrix}$	designates a verticality.

Errata

Will the reader kindly insert the following instead of the versions given in the text:

p.11, paragraph 3, line 3:"24 effective note-values".

The diagram of note-values should be as follows:



p.23, line 1 should read:

"In the Group-aggregate II (mm. 5-12), we have n(Ab) = 5, n(Bb) = 6 and n(C) = 4."

p.23, line 13 should read:

"The number of repetitions are | 5 | 2 pairs of Ab's
2 pairs of Eb's and 1 of F."

p.27, paragraph 2, line 3: "(p. 81)" should be deleted.

p. 28, paragraph 1, line 18, the words "ordered relations" should read "order relations."

paragraph 3, line 1, the words "ordered relations" should similarly read "order relations".

p.29, paragraph 2, line 4 (last word in line) "critism" should read "criticism".

paragraph 2, line 7 "(P111)" should be"(p. 111)."

p.29, paragraph 3, line 4: "(p. 111 - B.4)" should be changed to "(p.111 - B.3)."

p.29, paragraph 4, line 1: "(p.11 - C.1)" should read (p.111 - C.1).

p.29, paragraph 5, line 4: "A/, B4, and A.1 " should read:
"A1, B4, and A1" .

If the words "ordered relations" occur anywhere within this text, please note that such words should read "order relations."

1

A Discussion of Armin Klammer's "Webern's Piano Variations, Op. 27, 3rd Movement.

Introduction

We commence our studies of Webern by a consideration of the Piano Variations Op. 27, especially the second Movement. There is no particular merit in this procedure, except that originally we thought "these few scrappy notes" ✱ 1 would be easy to analyse and easy to understand by the reader. We were soon to discover how wrong we were and we could also then understand why Peter Stadlen was so amazed at Webern's method of piano instruction. He says:

"For weeks on end he had spent countless hours trying to convey to me every nuance of performance down to the finest detail. As he sang and shouted, waved his arms and stamped his feet in an attempt to bring out what he called the meaning of the music I was amazed to see him treat those few scrappy notes as if they were cascades of sound ". ✱ 1

Our analysis endeavours to show why "those few scrappy notes" are so pregnant with meaning and relation. In the following analysis we probe into the inner recesses of the music to uncover relations and inter-relations. We adopt a statistical inquiry to uncover things which are just not seen or heard. We fully investigate the properties of Silence, a full grasp of which is pertinently essential for a proper understanding of Webern. We also discuss , by the use of mathematical Logic, John Cage's theory of Silence critically.

Now, before proceeding with the music proper, we first of all discuss two articles, one by Armin Klammer and the other by Peter Westergaard. We shall now examine these theoretical evaluations of Webern minutely.

✱ 1: Peter Stadlen: Serialism Reconsidered, par. 2, p. 12, Published in the Score, February, 1958.

A Discussion of Armin Klammer: die Reihe, Number 2. ✱ 1.

On going through this article one gets the impression that the author has given a completely thorough analysis which tends towards a mathematical and scientific approach. The text abounds with terms derived from these sciences, for instance: "ordinal number 4", matrix, field, statistics, and continuum, etc.

At the outset one is struck by the absence of reference to the theme (or group-aggregate) upon which the work must be founded, since this is a work which has been named Variations by the composer. Consequently the aggregates given by the author must be related to some other original aggregate in one of the other movements and the demonstration of such a relationship and derivation of the six aggregates in movement 3 to an original aggregate would have added depth to the author's article.

In Webern's Symphonie, Op. 21, the term "theme" is used and the boundaries of the variations are indicated. In the Variations Op. 30 there are no words to indicate theme and variations, but there are double bar lines and tempo indications. However, in the Variations for piano Op. 27, "Webern gives no hint as to the piece's formal structure. Nowhere does he indicate a theme; nowhere does he mark the boundaries of individual variations ". ✱ 2. Nevertheless with reference to the 1st movement, "Renè Leibowitz.... identifies its three equal parts as theme, variation 1, and variation 2 ". ✱ 3. With reference to the third movement, Robert U. Nelson states: "The rhythmic flow is fairly continuous, yet recurring points of cadential relaxation separate the movement into definable sections. There are six of these in all, each approximately eleven measures long. We may infer from this recurring dimension ..... that Webern thought of the sections as forming his variation cycle. Accordingly, their further designation here will be variations 1 to 6 ". ✱ 4.

✱ 1: Armin Klammer: Webern's Piano Variations, Op. 27, 3rd Movement. published in Die Reihe, No. 2. pp. 81 - 92.

✱ 2: Webern's Path to the Serial Variation, by Robert U. Nelson, P.N.M. p. 82.

✱ 3: Webern's Path to the Serial Variation, p. 82.

✱ 4: Similar, p. 86

It can thus be seen that there is a correspondence between the two authors with regards to the six sections: the one calls it aggregates and the other sections and variations.

The term, variation implies a relationship and derivation to something else. The author, however, states: "Our investigation will not take in the thematic structure of the piece, since that is something quite foreign to serial thought." (p. 81). But even taking this into consideration, it can be argued that the various relations which the author expounds, must have a relationship and derivation to some original constellation.

Group:

The word,"group" is fundamental in Mr Klammer's exposition and around it revolves the whole of his analysis. A set of groups is called a group-aggregate and a subset of a group is termed, sub-group (p. 86). A table is given (p. 85) with the bar number where each group and group,aggregate can be found. This is most helpful as an aid to following the author's argument.

Tables are given which show the various relationships of group to group. There are: modes of attack of notes of the group; the number of notes each group contains; the intervals within a group; dynamics of the group; the rise and fall of intervals within the groups(p. 84); what intervals are linked with particular note-values; the relationship between intervals and mode of attack within a group; field distribution within a group.

Then there is another set of relationships between the six group-aggregates: number of groups, number of series, formal character, expected number of notes (due to the series), actual number of notes (due to overlapping of series), number of attacks, kind of series (whether S,R,RI,I) rising and falling intervals, elimination of notes per series, note-values, note-values and interval links, modes of attack and note-value, magnitudes of alteration which determine the experiental time (p. 91).

These relations are what the author terms "supra-ordered ". The same term also occurs in Stockhausen's article: "Structure and Experiential Time" p. 68 of die Reihe, No. 2. Many of the above relationships are never touched in conventional analysis, but they do show surprising results. For instance the dynamics (p, 81) reveals a retrograde,

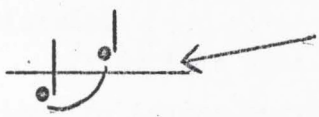
On page 82 the author gives a summary of these results and finds that there are 4 different elements in each of the sets and consequently states,"We hear the different structures in terms of the ordinal number 4."

According to the Reader's Digest Great Encyclopaedic Dictionary, compiled by Oxford University Press, Ordinal means: "(Number) defining things position in a series (first, tenth are ordinal numbers)."

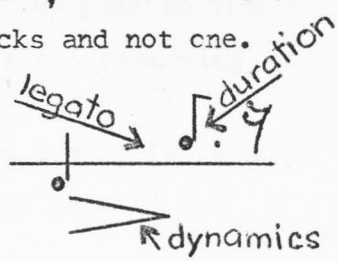
In Modern Grade Mathematics by Gonin, Archer and Slabber, published by Nasou Limited, p. 24 of the First book: "The number of a set is called its cardinal number. n(a) is called the cardinal number of set A ". See also The Language of Mathematics by Frank Land, Chapter 1, p. 14: Cardinal and Ordinal Numbers.

Notwithstanding this error on the author's part or the printer's devil, the author has shown that there are correspondences between those sets he has given. The mathematical term for such sets is equivalent sets. A is equivalent to B if they have the same number of elements. Hence we can state that the six given sets are all equivalent because they all have 4 elements.

However, on closer scrutiny we find that the set of modes of attack is stated to be 4 elements, thus: { ⌒ , — , • , > } but the score also contains 3 notes with, shall we say, natural attack: the Eb (m. 5), F (m. 10) and C-sharp (m. 9). Certainly, too, when two notes are grouped under a slur there are two different attacks and not one.

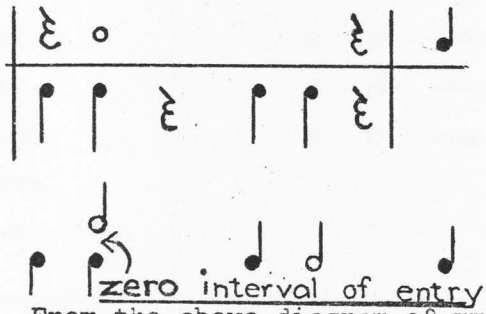


This is performed thus: (Hence the sign gives 3 new relations: legato, duration and dynamics.)



Another discrepancy is encountered in Table1, with regards to the length of rests between the groups. The author states that there are four different lengths of rests between groups, i.e. 0, 1, 2, 3. These are 4 different numbers, but the 0 refers to no rest, the 1 to a crotchet rest, the 2 to a minim rest, and the 3 to a dotted minim rest, which means that there are only 3 rests and not 4!

The intervals of entry in group 8 of group-aggregate 1 are given as: 1 0 2 1 2. Nowhere, however, is it illustrated how the author arrived at these figures.



time scheme in score.

intervals of entry.

From the above diagram of mm. 11 to 12, it appears that when intervals of entry coincide, they are termed "zero intervals of entry ". While discussing the first table, I wish to point out that I cannot agree with assigning numbers to represent the size of intervals, and the duration of note-values, expecially as the author in the consequent pages (pp: 82, 85, 86, 87, 88, 89 and 90) refers to intervals as a major 7th, minor 2nd,etc., and gives the actual note-values - unless the author, during the process of his analysis,employs analytical geometry.

It will also be noted, that the dynamics and the modes of attack are not numbered. The author has assigned the number 4 to represent a semibreve (0), but he has not stated the scale he is employing, which makes it difficult to grasp his immediate intention. On page 82 he employs these figures: 5: 5: 3/5: 5: 3 to represent a ratio. Again no scale is given (This happens to be 1 = a minim). On page 86 the author states a scale, which,of course,makes one grasp his reasoning immediately.

It is felt that when a symbol exists which is clear, it is unnecessary to invent another symbology which in any case refers to the original symbology.

A statement such as: "Note values ..... 4 1 1 4" without a scale of reference is most confusing to a reader and hinders the understanding and following of the argument.A diagram such as the following should have been given at the commencement of the article:

Intervals	Note-values	Interval of entry
1 Min. 2nd	1 	1 
2 Maj. 2nd	2 	2 
3 Min. 3rd	3 	3 
4 Maj. 3rd	4 	4 
5 Perf. 4th		
6 Aug. 4th		

Definition of the term, Group.

The author vaguely defines group as: "note-groups are related to one another through supra-ordered formal criteria which they have in common. Each group .... is itself the summation of a specific number of notes ". This definition of group does not assist in the identification of a group. To determine the supra-ordered formal criteria, it is first necessary to identify each group and if the number of notes could assist in identification, this specific number is not given.

Without such a proper definition of a group, identification of groups is not possible and consequently the reader has either to rely on the bar numbers as given by the author, or through a study of the article formulate his own definition.

Let us proceed to formulate a definition of the term, "group", as used by the author so that we may eventually be able to identify groups in other movements or pieces by Webern.

(1) It is a set of notes derived from the tone-row (series) (p. 82) "The sum of the notes of the first three groups is a twelve-tone row..." (p. 82).

(2) According to the table (p. 85) it could consist of from 3 notes upwards.

(3) There could be any number of attacks (p. 85).

(4) Since it can consist of more than 12 notes, it can thus contain all the intervals which a series may contain.

(5) When looking at the table on page 81 it can be seen that each group has different elements: it has not the same intervals, the same note-values, the same intervals of entry, modes of attack, dynamics, nor are the lengths of rests between groups the same.

A Discussion of Armin Klammer: die Reihe, Number 2.

Definition of the term, Group.

Hence it can be seen that nothing corresponds and therefore no identity can be established. All the elements listed were tried without any success. However, on page 92 an illustration is given with the groups indicated. From this fragment it can be gathered that groups are divided from each other by means of rests and also by means of dynamics. Groups 7 and 8 of aggregate 1 have no rests between them. In addition to this, group 8 contains a rest within itself. Therefore only dynamics, in this particular case, shows where there are different groups. By consulting the article further on page 86, an illustration is given of group 1 of aggregate 1V which contains rests within itself and also different dynamics within itself,i.e. p, f, pp.

Consequently we are forced to conclude that the supra-ordered elements do not define a group. From this it can be seen how necessary it is to give clear-cut and precise definitions of the terms employed in analysis, for,without such a definition,identity cannot be established and what is new and original in an article is rendered valueless. Surely Mr Klammer cannot expect his readers to try and define terms for themselves. If, however,such terms have been previously defined and described,it behoves the author to state sources where the reader can gain the information.

It should be pointed out that the term "group" is not used by all authorities, for instance,in contrast to Armin Klammer's "group" Robert Nelson uses the word "motif" in his analysis of the third movement of the same work. ✱ 1. He also uses the word"phrase"✱ 2. He gives this scheme (with reference to Movement 1):

four phrases arranged 7 + 3+5+3 in part 1 (of the first movement)
six phrases arranged 5 + 3+ 4 + 2 + 2 + 2 in part 2
four phrases arranged 7 + 3 + 5 + 3 in part 3."
(No key is given as to what 7 + 3 + 5 + 3 refers to - only on consulting the score is it seen that these figures refer to the number of bars).

✱ 1: Webern's path to the serial Variation, Robert U. Nelson: P.N.M. p. 86

✱ 2: Ibid P.N.M. p. 83 Volume 7 (b)

✱ See die Reihe No 2: Analysis of a period by Leopold Spinner, p. 47 where the term phrase and motive-elements are employed.

A Discussion of Armin Klammer: die Reihe, Number 2.

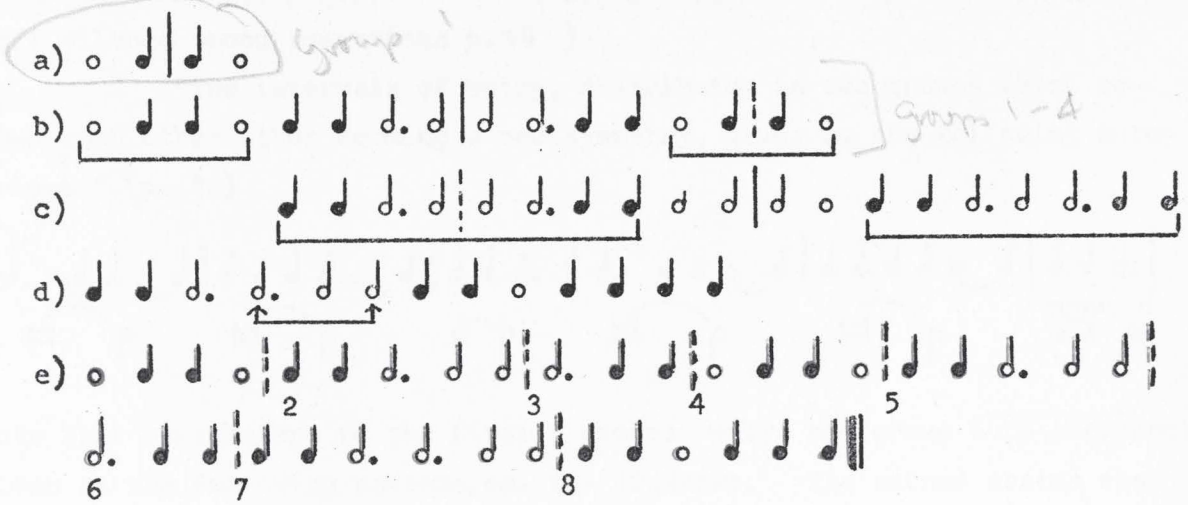
Definition of the term, Group.

By way of digression the divisions given for parts 1 and 2 above correspond to the music, but the 6 phrases of part 2 present considerable difficulty for the reader in establishing where the phrases begin and end. An illustration here would have clarified the matter. The use of the term "phrase" should be redefined for its usage in serial music. A phrase implies a cadence and unless cadences are latently contained in serial music, the word"phrase"gives false expectations.

The use of numbers: 5 + 3 + 4 + 2 + 2 + 2 should be stated carefully and with reference to the score and an exact statement of what they mean. Why should it be left to the reader to determine the interpretation of a symbology?

Cancrizan symmetry. ✱

Leaving the terms: "group" and "aggregate" for the moment, we can turn to an interesting diagram on page 82. The author states: "If the 24 effective notevalues of the six groups (i.e. aggregate 1) are written out, we discover a telescoped cancrizan symmetry ". However, matters are not simplified for the reader in the four rows of notes which one has to decipher or else ignore. Here are the four rows as given:

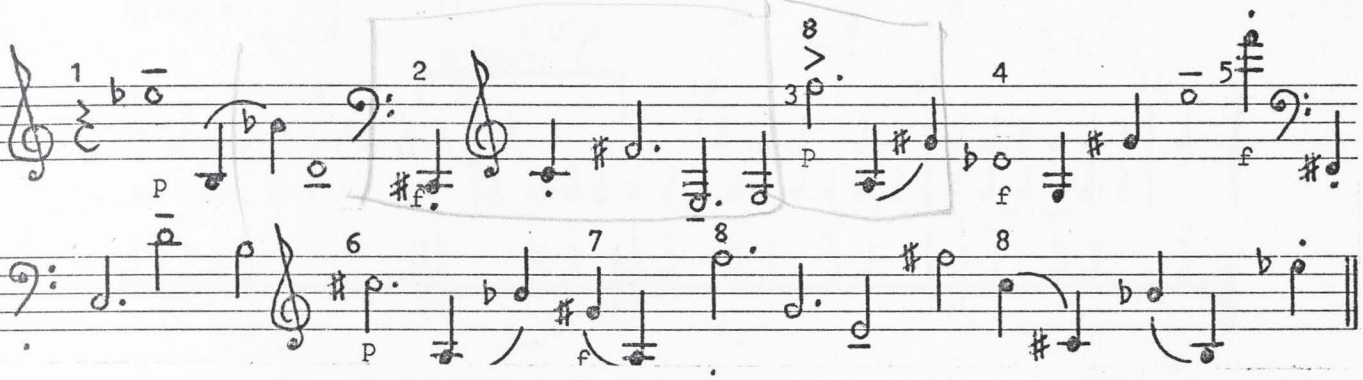


The above diagram is from page 82. (a) shows the note-values of group 1: (b) is the values of groups 1 to 4; (c) gives the values of groups 2 to 6 (Note there is a minim missing - compare to the pattern in red (e) are the note-values with the respective group to which they belong. (d) These are groups 7 and 8.

A Discussion of Armin Klammer: die Reihe, Number 2.

Cancrizan symmetry.

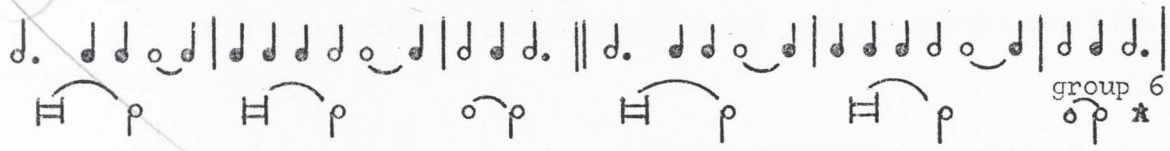
The author states that "an irregularly structured sequence of intervals of entry destroys the symmetry of the cancrizan by counterpointing the sequence of effective note-values". This is criticism of Webern and we shall consequently re-write the first eight groups according to this "cancrizan symmetry".



The above gives a sound-picture of bars 1 to 12 of the third movement of Webern's Variations Op. 27 when the music is arranged in a cancrizan symmetry. The numbers in red are the groups (according to the author).

As can be seen from the musical example this structure, which the author builds, is false: for one, he has ignored rests and it is precisely these which give, in this section (aggregate), the divisions of groups. (cf: silence sound summations p.18)

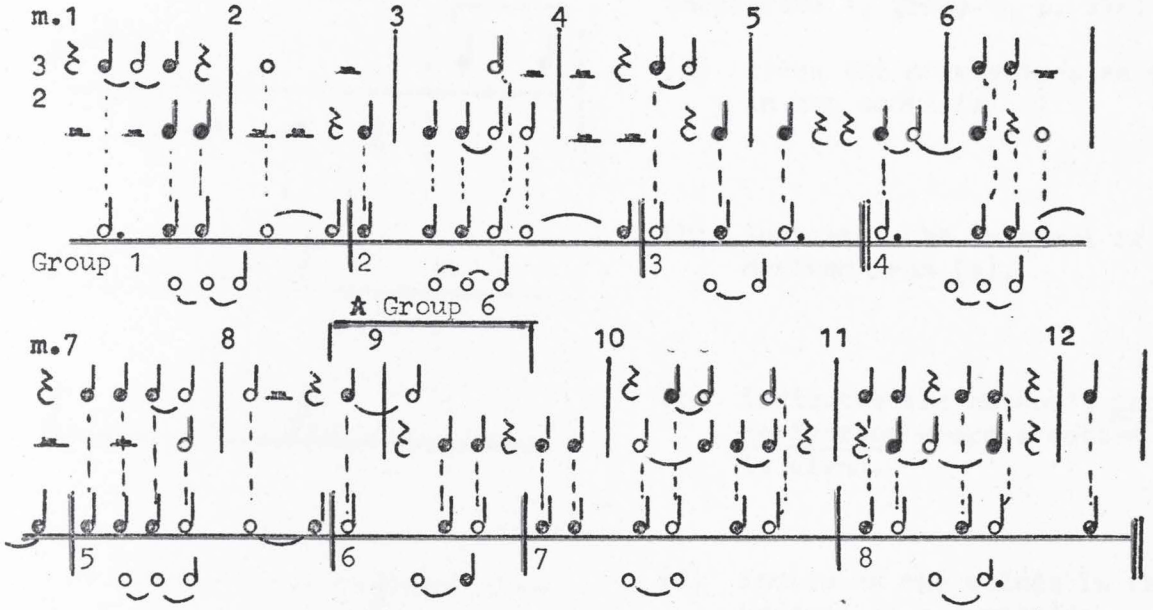
"The intervals of entry, distributed in two groups which repeat each other (thus forming a new symmetry, gives us the following note-values ".(p. 82)



Note that this refers to the first 6 groups only, and group 6 is incorrectly given as the following pattern, mm. 1 - 12, shows. The author states the value as a semibreve plus a minim, whereas it is actually a semibreve plus a crotchet.

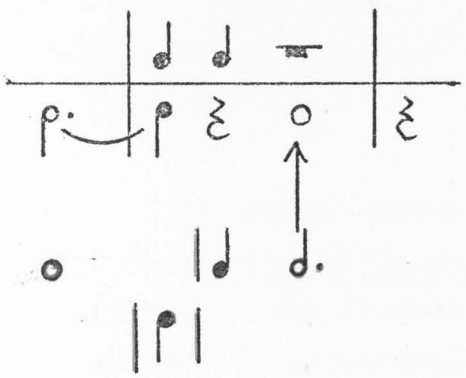
* "Cancrizan Symmetry" is a redundancy. Any symmetry contains elements belonging to set O and elements belonging to set, R, for instance: a,b,c, e, d, d, e, c, b, a, where a,b,c,e,d belongs to the set, O and d,e,c,b,a belong to the set R. The terms Retrograde and Cancrizan are equivalent and identical.

Cancrizan symmetry.



The time pattern is as taken from the score: the notes given on the lines in blue are the note-values and their respective bars. It should be noted, for instance, as in the first bar where the values are a crotchet rest followed by a semibreve, these values have been so distributed that there are three minims per bar. The two bottom lines in red give the interval of entry for each group which is demarcated and numbered. Instead of the breve, semibreves are used so that a better evaluation of group lengths and entries can be formed.

At a later stage we shall again refer to this particular illustration.



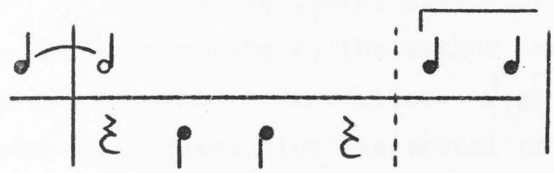
(Group-aggregate 1 - group 4, p. 83:)

(a) gives the note-values as indicated in the score (m. 6)

(b) (indicated in red) shows the author's derivation of intervals of entry. The dotted minim as can be seen by comparison with (a) is incorrect.

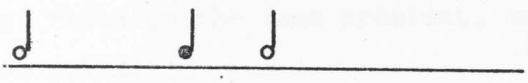
A Discussion of Armin Klammer: die Reihe, Number 2.

Cancrizan symmetry.

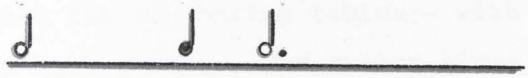


(Aggregate 1, group 6, p. 83:)

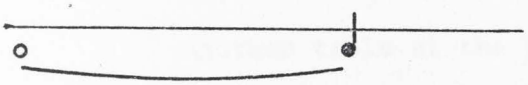
(a) gives the note-values as indicated in the score (m. 9)



(b) indicates the interval of entry derived from (a).



(c) indicates the author's incorrect derivation where a dotted minim is given.



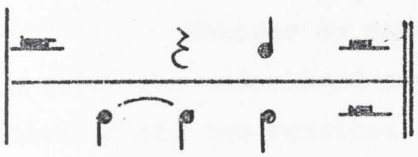
(d) indicates the values in (b) expressed as a summation.



(e) indicates a wrong summation.

(The values in red are the author's.)

(Group-aggregate V1, group 8, p. 86:)



(a) shows the note-values as expressed in the score.



(b) indicates a wrong summation of (a) - the author's.



(c) indicates the correct summation of (a).

The author states, with reference to the note-schemes on pages 83, that ".... asymmetries are combined to give new, supra-ordered symmetries". This thesis fails due to three inaccuracies which occur in this note-scheme, as is indicated in illustrations 1 and 2 above.

A Discussion of Armin Klammer: die Reihe, Number 2.

Cancrizan symmetry.

In the table, given at the top of page 87, with reference to Group-aggregate V, the author inserts the values ♩ and ♩. , and in brackets their derivation:- ♩(♪ 𝄾) ♩.(♩ 𝄾) All the other group-aggregates give the actual note-values as printed in the score. Hence these are not identical cases: aggregate 1 and V, for instance, are not based on the same premises, and, therefore, conclusions so derived are false.

Further inaccuracies occur on pages 83 and 84 in connection with the two bottom tables - with reference to the number of series found in each group. The author gives the following table:

Group-aggregate:	I	II	III	IV	V	VI
number of series	3	7	5	5	7	6

Another table at the bottom of the page repeats the number of series to co-incide with the above table, e.g. 3, 7, 5, 5, 7, 6. See also table 85: No of notes of series eliminated. These figures do not coincide with the facts when the rows are enumerated.

Inaccuracies:

However on page 84, the series is given as: 3, 7, 5, 4, 8, 6 in which the underlined numbers are at variance with the tables on 83. Which of the two versions is correct was established by enumerating all the series of the third movement and it was found that further inaccuracies cropped up. The author gives this:

I	II	III	IV	V	VI
S (x 1)	S (X 2)			S (X 4)	S (X 1)

which should in fact be:

S (X 1)	S (x 2)		S (x 1)	S (x 3)	S (x 1).

I take it that S means the basic set. But besides this, the author gives the order of the series as they appear as: S, I, R, for instance, in group-aggregate I. This, of course, is with reference only to the third movement : R, RI and O. Since a series which first appears at the very first moment of a composition is named "Basic set" and which in this case is movement I, the following series should be named in relation to this

Inaccuracies:

first and foremost basic series. Therefore I am in disagreement that the first of any other section could be named basic or S or O.

Thematic Structure:

I do not think that the author has proved his initial proposition beyond reasonable doubt that "thematic structure of the piece ... is something quite foreign to serial thought".

A group cannot be defined by "supra-ordered formal criteria", but the issue of its definition is clarified when a group is viewed as a "thematic structure". To test this proposition, a score marked according to the group indications given on page 85, can be played through. It will be found that a group has correspondences with the conventional "phrase" and possesses closure - which is effected - not through cadences, but sometimes through harmonic aggregates, sometimes through dynamics, tempo alterations (rit. etc) note- values and silences. Furthermore it can be said, a group can be identical to a motif, if such a group constantly recurs. In addition a group need not necessarily co-incide with the commencement of a new series.

Though the term "group" is evidently derived from the mathematics of groups, it has nothing to do with this. A group is a set of elements G, together with one operation, denoted by O, which satisfies the following conditions:

(1) The set G is closed under the operation O.

(2) The associative law holds in G so that if x, y, z are any elements of G then $x \, O \, (Y \, O \, Z) = (x \, O \, y) \, O \, z$.

(3) The identity element i for the operation O belongs to G such that if x is any element of G the $i \, O \, x = x = x \, O \, i$.

(4) Every element x of G has an inverse x^{-1} with respect to O such that $x \, O \, x^{-1} = i = x^{-1} \, O \, x$ ". ⁂ 1. It is often desirable to add a fifth axiom: commutative ". ⁂ 2.

⁂ 1: The New Mathematics: Groups, p 123. by Patrick Murphy and Albert F. Kempf.

⁂ 2: Principles of Mathematics by Allendoerfer and Oakley: Definition of a group p. 174.

A Discussion of Armin Klammer: die Reihe, Number 2.

Thematic Structure:

In the theory of groups (mathematical) there also occur subgroups. The definition of a subgroup as given by Allendoerfer and Oakley in Principles of Mathematics (third edition), page 198,is: "A subset of group G is a subgroup of G if and only if its elements form a group relative to the operation O of G ".

It is evident that a subgroup S of G must contain the identity e of G and that, if a is in S, its inverse a' in S is the same as its inverse in G".

From these definitions it can be seen that the terms "group" and "subgroup", as used by Mr Klammer in his article have nothing whatsoever to do with the mathematical theory of groups. As a matter of fact,the author's conclusions incline more towards the theory of sets - which however, is not developed in his article. Consequently one feels that the term " set" (without any re-definition) is a better term than"group".

Sets of relations not contained in the Author's Tables.

The author uses the set of rests between the "groups" (p. 81), but he has conspicuously omitted to consider the set of pitch intervals between the groups. A whole set of new relations is shown by the intervals between the groups, and this throws light, especially on the succession of series by another series. For instance,the group-aggregate 1 forms a set of four different intervals:

Group-aggregate I

Group	1	2	3	4	5	6	7	8
Interval	m2	M2	P4	m2	M2	M2	A4	m2

Reference: m = minor; M = major: A = augmented; P = perfect.

In group-aggregate III, the intervals between the groups form this amazing sequence:

Group:	1	2	3	4	5
Interval	M3	M3	M3	M3	M3

A Discussion of Armin Klammer: die Reihe, Number 2.

Sets of relations not contained in the Author's Tables.

In group-aggregate V, we have M3, m2, M2, m2, m2, M3, m2, m2, M3

In group-aggregate II we have the symmetry thus:

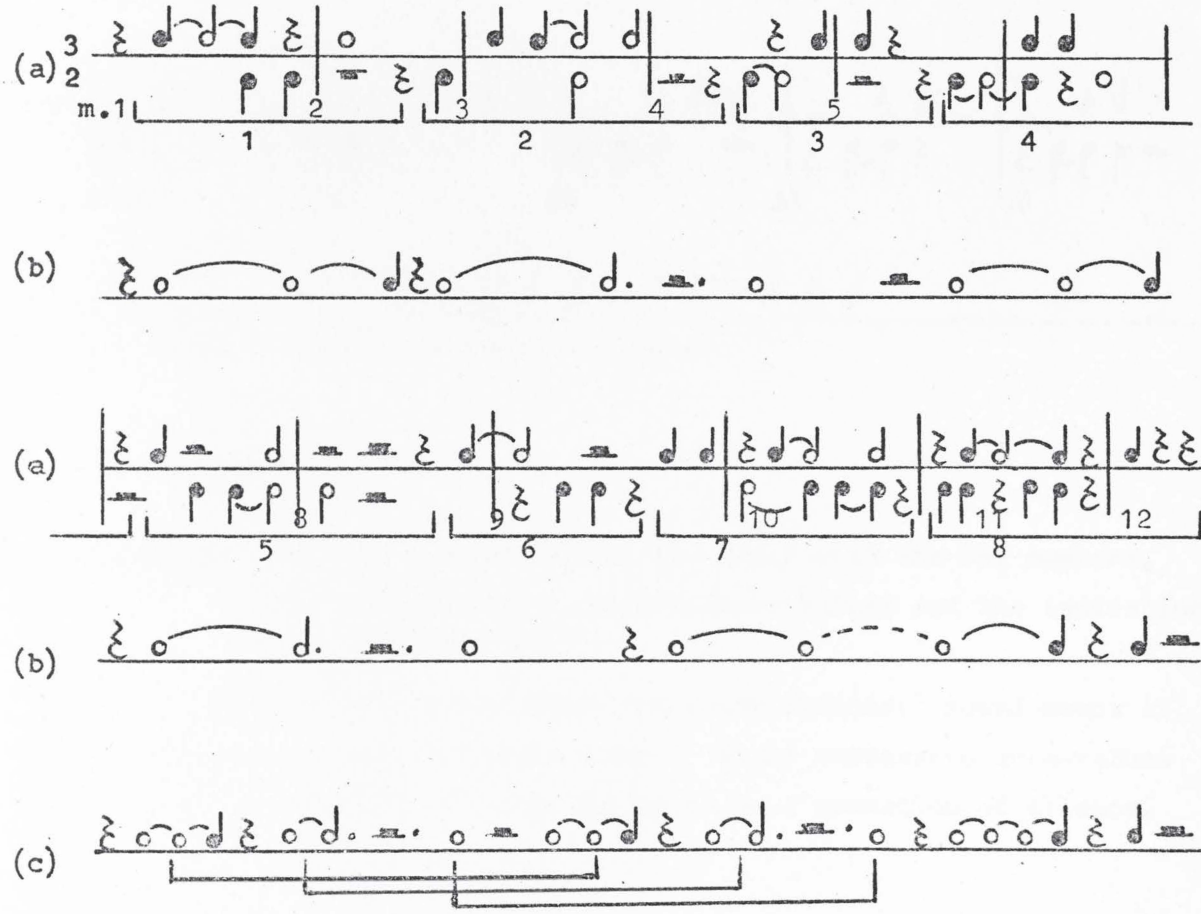
Group	1	2	3	4	5	6	
	m2	A4	M3	m2	M3	A4	m2
Group	7	8	9	10	11	12	
Interval	M2	m2	M2	m2	m2	M3	

Symmetry of intervals

Alternate intervals between groups 6 to 11.

Silence- Sound Summations.

In the article, schemes of intervals of entry, symmetry, etc. have been given to the exclusion of other, even more important, schemes, such as the sets of silence-sound of the different groups in a group-aggregate.



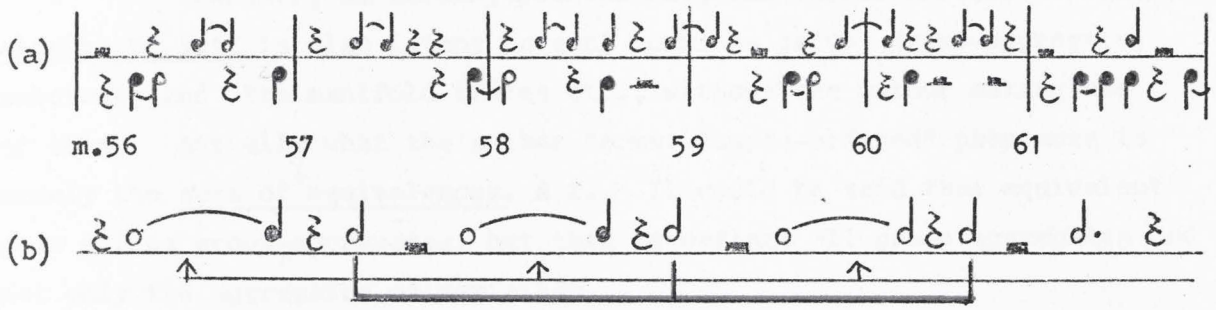
A Discussion of Armin Klammer: die Reihe, Number 2.

Silence- Sound Summations.

Illustration: (a) Indicates the note-values as given in the score, the bar numbers are given in blue,and the red lines with the numbers are given in blue,and the red lines with the numbers show the groups as given by the author.

(b) Indicates the durations of the sound and durations of the silences when there is no sound.

(c) Gives this on one line for a better close-up comparison. Note the symmetrical grouping between the first six groups.



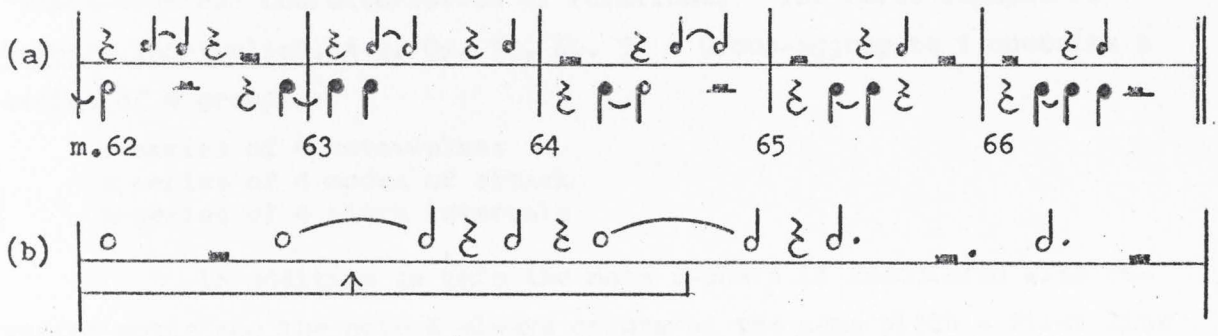


Illustration: (a) the note-values of the score with the bar numbers,

(b) indicates the sound-silence values and the indication of relationship.

The patterns given above are quite obvious: sound means all sound heard until a rest or rests occur. Hence successive note-values are given as a summation of sound and rests as a summation of silence.

A Discussion of Armin Klammer: die Reihe, Number 2.

Silence- Sound Summations.

This is a very important set of relations, especially with reference to Webern, "who attached great value to silence ..... like Mallarmé before a virgin sheet of paper, Webern felt respect, even awe, at the thought of breaking silence". ✱(1.)

All through the article there are elements of analytical geometry, such as: o = 4, ♪ = 2 (p. 81); intervals of entry (p. 81.); intervals of entry that are zero (p. 87). These however remain nebulous without being used in the form of graphs, rays, segments and reflections.

Further, as already pointed out, the characteristics of the algebra of sets is also latent in such terms as group, group-aggregate, subgroups and the manifold tables etc., without the author making use of this. Actually what the author terms: "supra-ordered" phenomena is merely the sets of equivalences. ✱ 2. It could be said that equivalent sets define group-aggregates, but then it defines all group-aggregates and not only the aggregates of serialism.

To prove this 3 examples will be cited to show their so-called "supra-ordered" characteristics or relations. The first example is Grieg's Wächterlied, ✱ 3. Op. 12, No. 3. Group-aggregate 1 contains a series of 4 groups

a series of 4 note-values
a series of 4 modes of attack
a series of 4 pitch intervals

In addition to this the note f-sharp is associated with repeated notes and the note E always occurs at the same pitch - first line of the stave with treble clef.

✱ 1: The Outline of Music Edited by Sir Malcolm Sargent, published by George Newnes Ltd. 1962 - Chapter XXIII. The Twentieth-century Revolution, Webern, page 405.

✱ 2: Equivalent sets are meant to mean those sets which contain the same number of elements though the elements themselves need not necessarily be the same.

✱ 3: As can be seen by not giving illustrations of the above, the reader cannot immediately verify these statements even though the Chopin and Grieg are so well known.

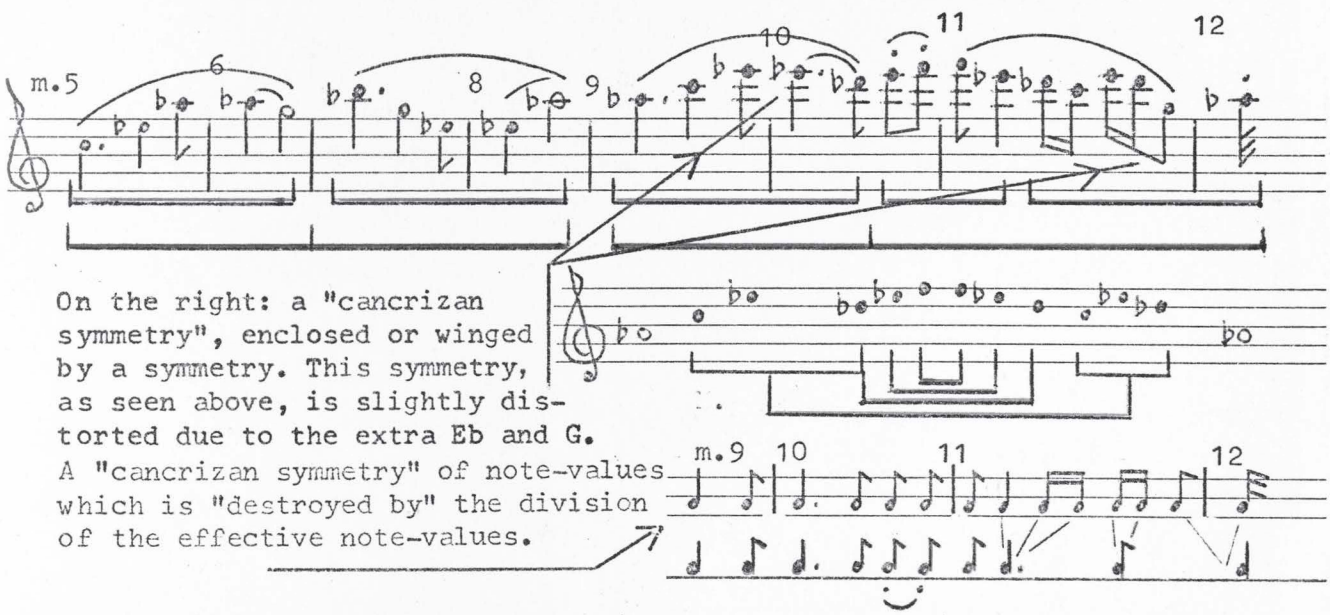
A Discussion of Armin Klammer: die Reihe, Number 2

Equivalences

In Chopin's Prelude in A, Op. 28, No. 7

Aggregate I contains: 4 (X 2) bars
4 sections
The note, D, occurs 4 times
The note, B, occurs 4 times
The note, A, occurs 4 times
There are 4 repetitions of the note-patterns.
Each group in aggregate I is a series of
4 different pitches and has
a series of 4 different note-values.
The note, E, occurs in
4 different registers and
there are 4 rests.
The note-value,  is linked with the interval of a minor 2nd.
The note-value,  is linked with the intervals, m3/M6 and unisons.
All these are merely equivalent sets containing the same number of elements, and as such are helpful in determining a group-aggregate (or period).

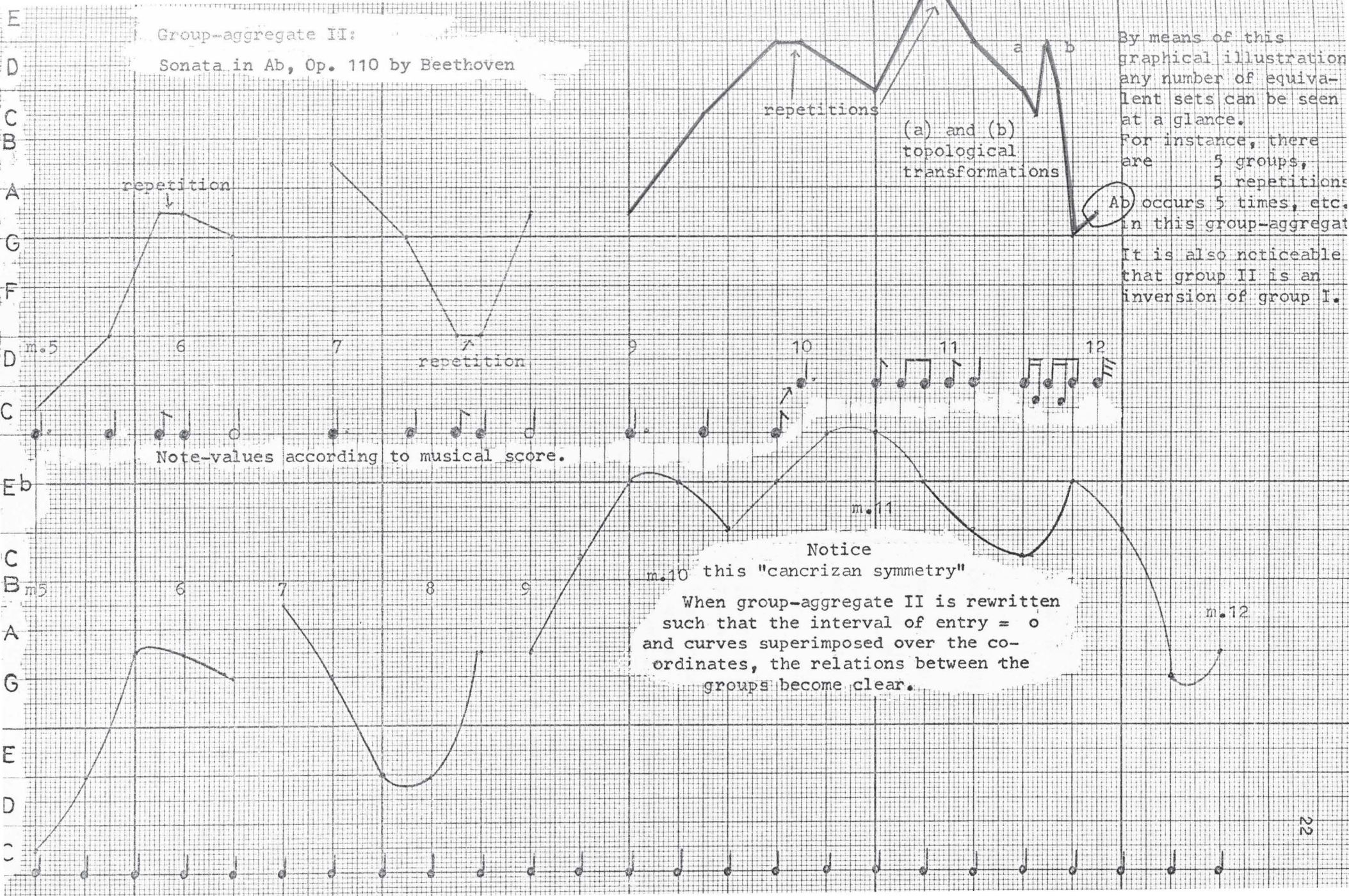
Group-aggregate II: Sonata in Ab, Op. 110 by Beethoven



On the right: a "cancrizan symmetry", enclosed or winged by a symmetry. This symmetry, as seen above, is slightly distorted due to the extra Eb and G.
A "cancrizan symmetry" of note-values which is "destroyed by" the division of the effective note-values.

Group-aggregate II:

Sonata in Ab, Op. 110 by Beethoven



Note-values according to musical score.

By means of this graphical illustration any number of equivalent sets can be seen at a glance.
For instance, there are 5 groups, 5 repetitions Ab occurs 5 times, etc. in this group-aggregat

It is also noticeable that group II is an inversion of group I.

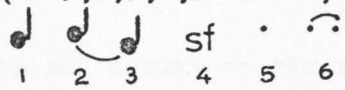
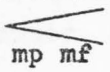
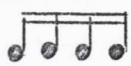
Notice this "cancrizan symmetry"

When group-aggregate II is rewritten such that the interval of entry = o and curves superimposed over the co-ordinates, the relations between the groups become clear.

A Discussion of Armin Klammer's die Reihe, Number 2.

Sonata op. 110. 1st Movement - Beethoven.

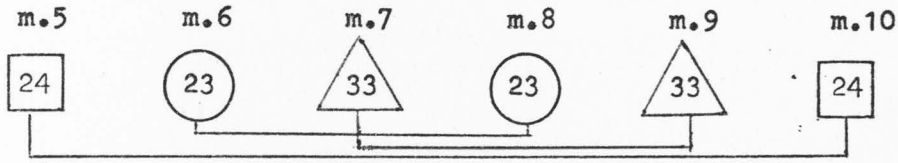
In the Group-aggregate 11 (mm. 5 - 12), we have h (A) = 5 n (B) = 6 n (C) = 4. Let us consider the number of elements = 6 first.

The number of note-values are (melody and accompaniment)	6	(𝅗𝅥. 𝅗𝅥 ♪ ♩ 𝅘𝅥𝅯 𝅘𝅥𝅰)
The number of pitch intervals are	6	(m2 M2 m3 M3 P4 A4)
The number of crotchets (♩) are	6	(m: 5,6,7,8,9 and 11)
The number of modes of attack are	6	
The number of maj. 2nds are	6	(m: 10, 11)
The number of groups are	5	
The number of repetitions are	5	2 pairs of Ab's 2 pairs of Eb's and 1 of F.
The number of dynamics are	5	p (and accomp. pp) mp mf sf the crescendo interpreted as from p  sf.
The note Ab occurs	5	times.
There is a series of	4	sections.
	4	major 3rds
	4	(x 2) bars
	4	divisions per beat  in accompaniment.

A Discussion of Armin Klammer: die Reihe, Number 2

Equivalences

There is an interesting pattern of the number of notes which each bar contains:



Other interesting facets of this group-aggregate are:

The note-value, is linked to a m3 or M3 and is always linked to the first beat;

the note-value,  is linked to a unison and occurs on the second half of a third beat;

the note, Eb always occurs on the fourth space in first three groups;

the note, Ab always occurs at the same pitch.

If we wish to carry on with the scheme, as shown in Grieg and Chopin, we can show equivalences which contain 4, 5 and 6 elements. Hence the author has not conclusively proved serialization as the same parameters occur in conventional music. He has, however, demonstrated relations and the value of the mathematics of sets.

All through the article it has not been our main objective to enumerate a catalogue of faults, but it has been our honest endeavour to try and find what is new and significant. But it shall readily be admitted that new things cannot be established amongst a host of faults and lack of proper and precise definitions. ✱ 1 The fact of the matter, however, is that Mr Klammer's article is a thought-provoking one.

✱ 1 John Backus: Die Reihe - a Scientific Evaluation, published in Perspectives of New Music, Vol 1. On p. 170, this author states:

"It is to be emphasized that the fundamental purpose of technical language is clarity and precision." He also says, p. 170:

".... technical terms used must be defined as exactly as possible, and subsequently used with this meaning and no other, and terms borrowed from another field must be redefined in their new usage."

2

A Discussion of Peter Westergaard's Webern and Total Organization:

As pointed out in the article on Armin Klammer's analysis (in die Reihe, No. 2) ✱ 2, it is absolutely essential that the analyst demonstrate what connection and derivation the variations have to the theme - since the composer himself named this work: "Variations" Mr Westergaard, just as Mr Klammer, nowhere in his analysis touches upon this relationship of theme to variations. However, to show various other relations in some variations (the second movement), is useful in itself, but of necessity incomplete. When the question of theme/variation kinship is ignored, the implication rises that this movement is independent (and therefore probably only related to the other movements by the employment of the same tone-row). However, Rudolph Reti demonstrates how the various themes of a Beethoven work are related. ✱ 3. It is a well-known fact that the last five String Quartets of Beethoven form a cycle of works which are thematically related. Therefore it is highly questionable that Webern could name this work "Variations" without there being a definite relationship between theme and variations.

Merely by glancing through the article one gains the impression that the author has given much thought to his views. Right at the start of his analysis he gives a complete quotation with measures and row position of each note to which the reader may refer. This is an exemplary procedure as so often authorities give tables and refrain from stating how these are derived.

Tone-rows and their succession:

All the author has to say about this is: "Pitch class: Inversionally related row forms are canonically disposed. The last note of each row form is also the first note of the next row form". ✱ (p. 107) Except for this quoted description, Mr Westergaard does not point out the relation between the heard sound and the rows, and why such particular rows are used.

✱ 1: A Discussion of "Webern and "Total Organization": An Analysis of the second Movement of Piano Variations, Op. 27. (Published in Perspectives of New Music, Spring 1963, Page 107.) by Peter Westergaard.

✱ 2. Webern's piano variations, Op. 27. 3rd movement by Armin Klammer, p. 81 die Reihe No 2, 2nd revised Edition 1959 by Theodore Presser Co.

✱ 3. The Thematic Process in Music by Rudolph Reti, Chapter 7, Beethoven: Quartet opus 135 Ex. 317 onwards. See also 5th symphony p. 165, etc.

A Discussion of Peter Westergaard's Webern and Total Organization:

"One ought to be able to establish some valid connexion between the 'serial thread', and the musical correspondences and structures ... as they are made to sound' ... ✱ 1. A relevant discussion of a serial composition would require an analysis of the relation between the effective (i.e. audible) compositional elements and the set, not a mere tabulation ....." ✱ 2.

A question of importance is why the composer has chosen a certain transposition and why he has chosen sets and their inversions to be heard simultaneously (canonically). What determines particular successions of rows, and what determines particular combinations such, as in this case, O and I row-forms?

We could reason that either the succession of rows happen accidentally and therefore unintentionally, or else they happen in accordance with some pre-compositional intention and therefore not accidentally. Similarly the use of one or more row-forms simultaneously are either intentional or unintentional. If they happen unintentionally, then there must be some other principle to cause such a succession or combination. If they happen intentionally then, too, there must be a reason for such an intentional use of succession of rows and particular row-forms.

Numbers

Mr Westergaard says "the distances between the beginnings of consecutive figures (measured in eighth notes) produce the following patterns: /3//: 3343 .." . One immediately gathers what the author's intentions are, because he clearly indicates a scale: 1 unit = a quaver. However, while Mr Westergaard terms it "the distances between ..... consecutive figures", Mr Klammer, in his analysis, adopts the term "interval of entry". ✱ 3

✱ 1: Theory and Practice in Twelve-tone Music (Stadlen Reconsidered) by George Perle, The Score, June 1959, p. 59

✱ 2: Ibid., p. 59

✱ 3: Webern's piano variations, Op 27, 3rd movement by Armin Klammer, die Reihe, No. 2.

Both authors use numbers to represent this occurence. Such a use of numbers (as pointed out previously) in no way assists analysis or its understanding, except if a valid reason for its use exists, such as when analytical geometry, or statistical analysis is made use of to clarify relationships. ✱ 1.

The author is at pains to enumerate the various elements of articulation and then forms a "pattern of succession of these types" (p. 81) i.e. 1//: 2 3 4 5 1.." (p. 109). We are therefore surprised that, since there are only "three discrete dynamic levels" (p. 109), the author has not given a set of numbers here, but instead uses the conventional symbols: p, f, and ff? (The omission of the silence/sound relationship is a pity. Why is this so when especially Webern's music makes such great use of silence?)

Statistics.

Strangely the author gives these patterns of numbers, without showing us the statistics and the implication of such statistics.

For instance the pattern given on page 108:
3//: 3 3 4 3 3 2 ..... etc. gives the data:

2	3	4	6	Elements
6	22	1	1	Frequency

The pattern of succession of types of articulation is:
1//: 2 3 4 5 1 1 ..... etc. which gives:

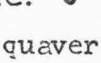
1	2	3	4	5	
9	9	3	6	4	Frequency distribution.

✱ 1: A Discussion of Armin Klammers article in die Reihe No 2 by the present author.

✱ See also Herbert Eimert's use of numbers in die Reihe No 2 pp. 93 - 99.

A Discussion of Peter Westergaard's Webern and Total Organization:

The dynamic pattern on page 109 gives: p f ff Dynamic elements
13 12 6 Frequency distribution.

Altogether there are 90 notes and there are 8 rows so that the expected number of notes should have been 96. But due to 6 rows ending and starting on the same note, 6 notes have been eliminated. However, the statistical patterns given above reveal that there is no equality, because if there were, these numbers should have been more or less the same. Since they are not the same in number, it shows that there is a predilection 1) for the intervals of entry of the two quavers to appear after a quaver rest (i.e. ) 2) that the two quavers are mostly heard thus:  or  3) that the loudest moments are in the minority.

This statistical analysis merely shows beyond doubt that there exists order relations in this movement.

The author states: "None of the patterns within separate nonpitch characteristics makes audible (or even numerical) sense in itself." This is wrong, it does make numerieal sense: in that it reveals ordered relations and consequently it must make audible sense: we shall hear that the groups appear mostly after a quaver rest, we shall hear that there are fewer ff pairs. The author, however, is quite correct in asserting that the patterns don't make sense.

"The point is that these characteristics are still playing their traditional role of differentiation. They interact with one another and with pitch to clarify pitch relationships, sorting out for the ear those pitch relationships which are to shape the movement ".(p. 109). This is exactly what the figures signify: the number of times a characteristic occurs is what is significant, not the sequence of these numbers. Because the number of times a characteristic occurs signifies the relation greater or less than i.e. an Order relation.

The author mentions ordered relations unwittingly in such sentences as: "All such figures begin on the second quarter of a measure ". (p. 110. 3): and paragraph 6: "In all ff figures the lower group of notes is on the quarter note beat, the upper half off ".

It is evident, however, that nothing is made of this fact. Yet the fact that the author has stated this much indicates that such order relations do exist.

A wealth of information is given concerning the dyads regarding their position, register, dynamics and articulation. All this is very accurately described, but the system of tabulation or classification into sections, A, B, C, D, ... etc. (p. 110) is open to critism. For instance, where the author states: "Where not already covered by statements under A or B", or "The Bb/G 's in mm. 8-9 and m.15 are covered by A4." (P111) causes confusion and where the reader has constantly to page to and fro to refer back to other sections does not facilitate analysis nor understanding. Besides, such classification implies that the sections are not complete in themselves or it means that the new sections are redundant.

Altogether there is too much description and lack of proper tabulation. For instance, illustrating the exact dyad would have eased the path for the reader, instead of describing it: "The ninth dyad in a row pair" (p. 111 - B.4); "The tenth and eleventh dyads" (p. 111 - C.2)

System of Classification:

The author, by such statements as: "The dyad D/E (p.11 - C.1) "in m.15 is covered by A.4..... in m.4..... in m.15.... are covered by B.3", proves that his system of classification has far too many exceptions.

In the following statement the exceptions are even justified by the classification: "Consecutive figures have contrasting dynamics" (p.111 - C.5) except (my word) "The f-f-p-p· in mm. 11-13 is because of A/, B4, and A.1" On page 112, D.4 a similar procedure is adopted: "Consecutive figures begin a dotted quarter note apart" except (my word) "because of A.4 ....., because of C.2, ...because of B.4 ..... "etc.

This is open to criticism because the author has classified certain information under the headings: A.3, B.4, A.1, etc, and later on tells the reader that the exceptions occur because of his classification, on which is implied self-criticism in addition to elevating a classification to a priciple and a reason.

A Discussion of Peter Westergaard's Webern and Total Organization:

Intervallic detail.

The author makes an interesting observation on page 114: "Almost every available factor serves to emphasize the connections between canonically corresponding notes in the two "voices" (the dyads) at the expense of the connections between consecutive notes within the "voices".

In support of this the author states 5 reasons: register, correlation between pitch class and interval class; dynamics, articulation and rhythm.

The reasons given seem to be valid enough. His harmonic approach seems feasible although one can question this assertion that harmonic movement resides in the four hexachords as illustrated on page 116. The author states: "hence the harmonic shape is concentrated in the successive appearances of this figure: Ex. 5". The author probably regards these hexachords as harmonic movement because these are various reflectional transpositions but an equally effective argument could be that these are merely rhythmical tonal clusters accentuating the double quaver motive. The author admits this much, stating: "Nevertheless, the type of harmonic motion presented by these figures is a limited one." Further he also states: "There is no linear motion of the kind which produces the strongest effect of motion in tonal music: motion by step from one element of the extablished vertical sonority to another." (p. 117). The last sentence is open to considerable criticism, because the author has not disproved that there might be such a linear motion, he has merely asserted that there is no such motion. (This point will be further developed in my analysis).

The author points out that the dyad: Bb/G♯ can be thought of as beginning and ending each section (of the movement), he, however, fails to see it as not only a connective of the various sections but also as an harmonic connective. It is a pivot to both the dyads: A/A and B/G as well as a connective to the third movement. Hence this dyad causes harmonic movement.

On page 118 the author gives a musical example of the last five bars of which he states: "The interrelation between the various characteristics of sound would have been a simpler one (and simpler to

describe ..... had the last five measures read" ..... as the given illustration. Though he gives some minor reasons why this is less good, he fails to see that such a structure would destroy the melodic line and the particular order relations given to specific notes through dynamics and beat-position.

The author does not mention the element of silence, when considering the "Structure of the movement"as a whole (form) on page118 as an element which is one of the most important form determinants (both in conventional and twelve-tonal music.

The article has a lot of detail and quite a number of illustrations (musical quotations). The author's descriptions are accurate and he does not avoid details which cannot fit into his scheme. He carefully shows and mentions all exceptions. Further he acknowledges the opinions of other authorities, states the sources in copious and detailed foot-notes.

One could call this article an analytical description, but no reasons are advanced why things happen and above all why this movement is considered by the composer to be variations.

In conclusion it should be pointed out that the author has omitted several important elements: Why this is called variations is one. The pivotal dyad, Bb/g-sharp is another omission, so is the amazing vertical 'cancrizan symmetry' of the disposition of the pitches, the silence-sound relations,the construction of the dyads as a permutation of the chromatic scale of Eb in contrary motion and also as determined thereby.

Let us look at these mentioned above:

The dyad Bb/G-sharp is a pivotal dyad, (cf; Analysis of 2nd movement, p. 37)

The dyads occuring in the movement are the same as in the contrary chromatic scale of Eb. The particular row successions and combinations could be considered to be permutations of the combinations as found herein. (cf; Analyses, p.37)

The 19 different pitches appearing in the movement are disposed of registrally such that for each section (mm. 1 - 11) and (12 - 22) a vertical 'cancrizan symmetry' results. (cf. Analysis, P. 119)

Furthermore, in this movement there are flashes of tonality which are uncovered by analytical statistics and by other analyses. These exciting features are not touched by Peter Westergaard in his descriptions.

3

Analysis of the Second Movement of the Variations Op. 27 by Webern

The repetitions in this movement should be strictly observed in both analysis and performance. Statistics reveal that when the repetitions are disregarded, the number of notes in the composition are different to the number of notes when the sections are repeated. Without repetitions there are 90 notes and doubling this to account for the repetition, should be 180 notes, but with the repetitions there are actually 178 notes: thus 2 less, than the expected number.

The movement is constructed out of 8 rows so that the expected number of notes should be 96, but actually it is 90 (8 x 12 = 96).
With repetitions there are 16 rows where the expected number of notes should be 192 (16 x 12 = 192), but it happens to be only 178 notes.
This is 14 notes less than the expected amount, and 2 notes less than when doubling the 90.

Eliminations

These 14 missing notes are due to the fact that "the last note of each row-form is also the first note of the next row-form." ✱ 1 This is a procedure which will be found in many of Webern's compositions.
However, let us tabulate these omissions.

Disregarding the repetitions we have:

	Eb	Bb	F
	Eb	Ab	Db
mm.	6	11	17

and if we double this:

Eb	Bb	F
Eb	Ab	Db

Observing the repetitions we have the following omissions:

	Eb	Bb	Eb	Bb	F	Bb	F
	Eb	Ab	Eb	Ab	Db	Ab	Db
mm	6	11	6	11	17	22	17

✱ 1 Webern and "Total Organization": An analysis of the second movement of Piano Variations Op 27. by Peter Westergaard - Perspectives of new Music, Spring 1963 page 107.

Hence it can be seen that an extra Bb/Ab has been omitted. This comes about because of the particular placement of the repetition signs.

Summarising this in a table we have:

Eb	Bb	Ab	F	Db	Notes
4	3	3	2	2	Number of omissions

These omissions are of great importance and the table contradicts those authorities who assert that in twelve tonal music "all the twelve notes are equal in importance ". ✱ 2 or "a veritable note-communism ". ✱ 3 for this table of omissions implies that there is an Order Relation in twelve-tone music and it suggests that Webern wished to minimise the effect (or strength) of these particular notes. ✱ 4

Grace Notes

The fact as stated above that Webern wished to lessen the value of these particular notes is strengthened by their use as grace notes and it will be observed that the note Eb is used 8 times as a grace note:

Table of notes used as grace notes:

Eb	Bb	Ab	F	Db	B	G	E	D	A	Gb	C	Note
8	2	2	2	2	2	2	2	2	0	0	0	frequency grace note

✱ 2. A study of Twentieth-Century Harmony by Mosco Carner, Volume Two Contemporary Harmony, Part 111, Chapter 1V. The Twelve-note System - page 70.

✱ 3 Modern Harmony by A. Eaglefield Hull, Tenth Impression, Chapter 1V, page 35. Published by Augener Ltd. London.

✱ 4 Order Relations are discussed elsewhere in this thesis.

Analysis of the Second Movement Op. 27

If we add to this the number of omissions then we have:

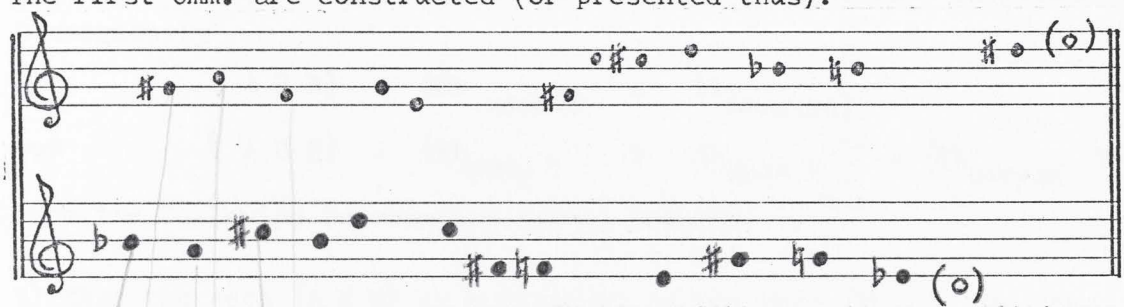
12	5	5	4	4	2	2	2	2	0	0	0
Eb	Bb	Ab	F	Db	B	G	E	D	A	Gb	C

number of omissions and appearances as grace notes.

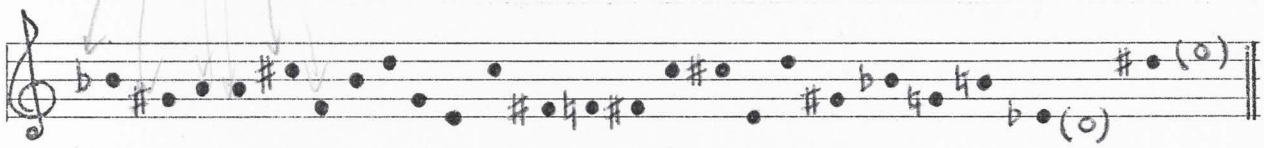
The astounding fact, revealed by these tables, is that Eb is only heard 4 times as an ordinary note in the chordal aggregates in m.15. The Bb is heard 11 times and the Ab also 11 times (as ordinary notes). All the other notes are heard more than this as will be seen in the following table. The question arises why the composer had wished to minimise the Eb, Bb and Ab to the extent he did. Did the dyads Eb/Eb and Bb/Ab too strongly suggest an Eb tonality which he wished to avoid? If this is the case, then it suggests that some form of tonality is immanent in a twelve-tone row (or just this particular row on which the movement is based).

Row Construction

The first 6mm. are constructed (or presented thus):



These two rows are reflectionally related (the O-form and I-form) but they are heard as follows:



Hence the original row is obliterated, because we actually hear another succession of intervals which do not correspond to the original row. In the composition these notes are paired off in dyads of which there are seven. ✱ 1 The various transpositions of the rows and their inversions present the dyads in a different order each time.

✱ 1: Webern and total organization by Peter Westergaard P.N.M. page 109.

Analysis of the Second Movement pp. 27

The 7 dyads are formed by means of the particular grouping of the combination of O and I row-form and the very special way the notes are paired off in two's. This grouping into two's defines the dyads so that identification is easy. But these 7 dyads are also members of the chromatic scales of Eb (in O and I row-forms). ✱ 1. The importance of this information, however, can be overlooked, so we wish to prove its significance.

The original row (mm. 1 - 6) is a permutation of Eb chromatic. Similarly the I form (mm 1-6) is also a permutation of Eb chromatic. When these two permutations which we shall name A and B, are combined, the result is the 7 different dyads.

Hence we can state this in set notation:

$A \cup B = C \ldots \{$ the 7 different dyads $\}$

Similarly $Eb_{ascend} \cup Eb_{descend} = C \ldots \{$ the same 7 different dyads $\}$

Consequently

$$(A \cup B) = (Eb_{ascend} \cup Eb_{descend})$$

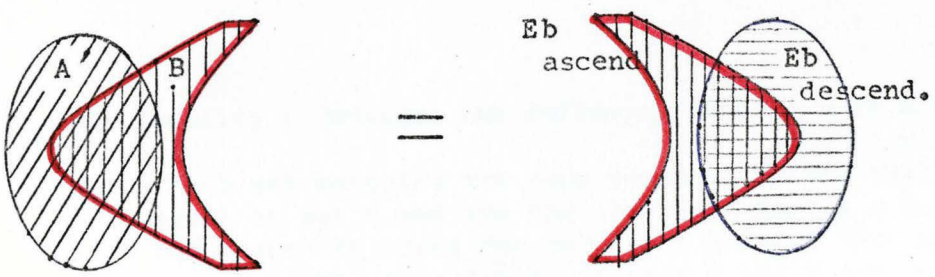
and

$$(A \cup B) = (Eb_{perm\ 1} \cup Eb_{perm\ 2}) = (Eb_{ascend} \cup Eb_{descend})$$

From the following information can be deduced:

1) that the sets $(A \cup B)$ is equivalent to the sets $(Eb_{as} \cup Eb_{desc})$.....

because they both have the same number of elements e.g. the 7 dyads.



✱ 1: See Chordal Structures and their classification II, pp.464-478.

Analysis of the Second Movement Op. 27

2) That the above-mentioned sets are also equal ..... because both contain the same elements: the 7 dyads. ✱ 2

Hence it can be stated that the contrary chromatic scale of Eb provides the material for, and thus forms the basis of, this movement and that the 7 different dyads formed by this combination, which occur elsewhere in the movement as transpositions of row forms, are in actual fact permutations of these original 7 dyads. The number of permutations of the 7 dyads is 5 040, of which Webern chose only those which suited his compositional purpose. It appears that the particular row forms used, could be said to regulate the succession of the different dyads, the material of which is provided by the chromatic scale of Eb in contrary motion.

From the definition given of a chromatic scale, it is seen that the one thing which differentiates it from the twelve-tone row (consisting of twelve different notes) is the fact that it possesses the octave i.e. Eb and Eb an octave registrally removed. Webern has made no move to remove this interval of the octave as is seen in mm. 6 and also m. 21 ✱ 1 Note, too, that a chromatic scale has 13 notes and that a contrary chromatic scale has 7 dyads of which 1 dyad is a unison.

✱ 2: "Set Equality : Consider the following sets: A = (r,s,t,u)
B = (t,r,u,s)
Since each set contains the same members, we say that set A is equal to set B and use the shorthand form A = B.
If A and B are the names for sets, A = B means that set A has the same members as set B, or that A and B are two names for the same set.
Note that the order in which the members are listed does not matter. for example (a,b,c) = (c,a,b,) = (b,a,c,)
Whenever the equal sign (=) is used, as in A = B, it means that the symbols on either side of it name precisely the same thing. The new mathematics by Patrick K. Murphy and Albert F. Kemp. Chapter 1 page 3 - 1968

Analysis of the Second Movement, Op. 27

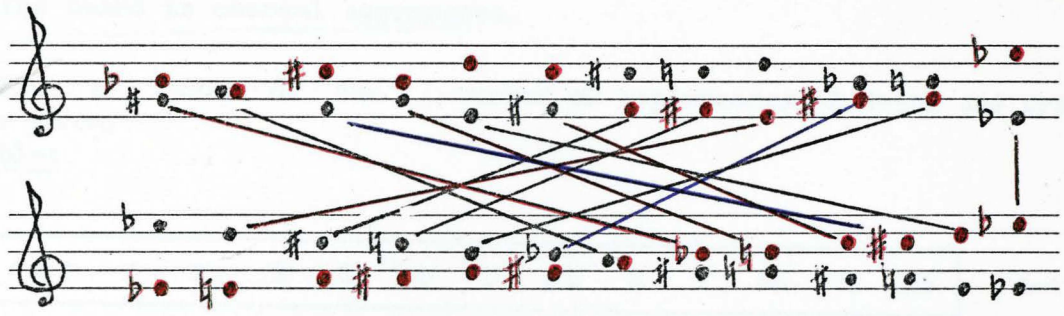


Fig: 1: The derivation of the dyads from the chromatic scale of Eb in contrary motion. The top illustration shows the appearance of the dyads as they occur from mm. 1-6. The bottom figure shows the dyads of the chromatic scale, of which the top examples are merely a permutation. (cf. Row construction, mm.1-6, p. 34)

The Dyad Bb/Ab

The dyad Bb/Ab plays a particularly important role in this movement as a pivotal dyad. It is heard at the start and end of the movement and also connects the sections.

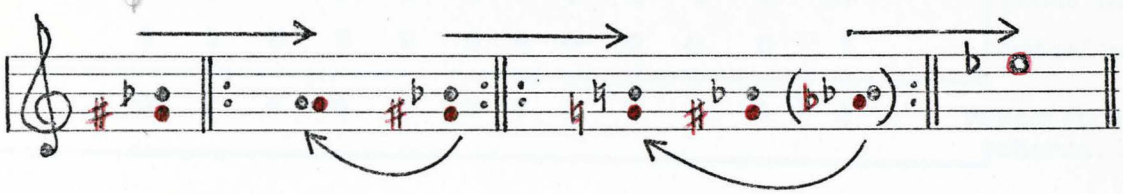


Fig.2: Illustration of the pivotal dyad, Bb/Ab which resolves on the dyads A/A or B/G or on the note, Eb.

★ 2 contin. "Two sets are said to be identical if and only if every element of each is an element of the other. When A and B are identical, we write A = B.
Illustration 3. The sets (1,2,3), (3, 2, 1,) and (2,3,1) are identical since they consist of the same elements. The order in which we write these elements is unimportant.
"Principles of mathematics by Allendoerfer and Oakley, One, Logic and Sets, Page 11 third Edition.

★ 1. See the thesis p.574 for a fuller discussion of the chro-

It is thus firmly established that Eb is a predominant tonal centre in this movement. Yet as shown elsewhere its significance is minimised by eliminations, by being presented as ornamental notes and by only being heard in chordal aggregates.

Below a table of the number of appearances of Notes and grace notes is given.

Table:

mm 1-11	A	Bb	B	C	Db	D	Eb	E	F	Gb	G	Ab	letter-names
	4	3	4	4	4	3	0	3	4	4	3	4	notes
	0	0	1	0	0	1	2	1	0	0	1	0	grace notes
mm 1-11 Repeated	4	3	3	4	4	3	0	3	4	4	3	3	notes
	0	0	1	0	0	1	2	1	0	0	1	0	grace notes
mm 12-22	4	2	4	4	2	4	2	4	2	4	4	2	notes
	0	1	0	0	1	0	2	0	1	0	0	1	grace notes
mm 12-22 repeated	4	2	4	4	2	4	2	4	2	4	4	2	notes
	0	1	0	0	1	0	2	0	1	0	0	1	grace notes

Total number of notes, grace notes and omissions mm 1-22 (with repetitions)

A	Bb	B	C	Db	D	Eb	E	F	Gb	G	Ab	
16	11	14	16	12	14	4	14	12	16	14	11	notes
0	2	2	0	2	2	8	2	2	0	2	11	grace notes
0	3	0	0	2	0	4	0	2	0	0	3	omissions
0	4	4	6	6	2	4	2	6	6	4	4	Appearance in chords.

Explanation of table: the first row gives the letter-names of the notes as used in the composition; the second row states the number of times each of these notes appears; the third row: the number of times these notes appear as grace notes; the fourth row states the number of times the notes appear when the section is repeated - notice that there are some omissions here. The tenth row merely states the number of times the notes appear in the complete movement (with the repetitions). Similarly it states the number of grace notes and omissions in row eleven and twelve. The last row states the number of times the notes appear in the chordal structures.

Sorting these different notes into equivalent sets we have:

n (A) = 16 n(B) = 14 n(D) = 14 n(E) = 14 n(G) = 14 *
n (C) = 16 n(Db) = 12 n(F) = 12 n(Bb) = 11 n(Ab) = 11
n(Gb) = 16 n(Eb) = 4

Equivalent sets of grace notes are:

Eb occurs 8 times
Bb, B, Db, D, E, F, G, Ab occur 2 times each
A, C, Gb occur 0 times each

Equivalent sets of notes omitted are:

Eb	omitted 4 times
Bb, Ab	omitted 3 times each
Db, F	omitted 2 times each
A, B, C, D, E, Gb, G	omitted 0 times each

It is interesting to observe that when the notes appearing in the chordal aggregates are subtracted from the number of notes in row ten, we have the following: (according to their frequency distribution):

16 - A (16)
12 - D (14)
12 - E (14)
10 - B (14)
10 - C (16)
10 - Gb (16)
10 - G (14)
7 - Bb (11)
7 - Ab (11)
6 - Db (12)
6 - F (12)
0 - Eb (4)

This statistical data reveals, beyond any doubt, that Webern employed Order Relations, in that certain notes have been eliminated, used as grace notes, and in chordal structures where their definition is vague, because of adjacencies which make the chordal aggregates to become rhythmic densities.

* n(A) = 16 is defined to mean the number of the set A, where A is the set of pitches of the note A in the composition. Similarly n(♩) = 4, for instance, is defined to mean the number of the set of crotchets in the composition, or section under review, such that the crotchets are termed: a, b, c, d elements.

Analysis of the Second Movement, Op 27.

These methods of Webern are important technical additions to twelve tonal composition: Elimination of notes by means of overlapping of rows; employing certain notes as grace notes; and further using notes together with adjacencies to cloud their definition. In this way the Eb harmonic field ✱ has been rendered inefficient, but it should be carefully noted that what remains is strongly an harmonic field of G major. This is clear from the figures given above, also the figures in row ten, where the numbers which are given include also those notes appearing in the chords (these figures are given above in brackets).

Our analysis thus suggests a tonality of G, because the notes appearing most belong to the set of G. major. This, however, is based on our statistical findings as indicated above, and does not imply necessarily that the movement is in the key of G. major. The number of times certain notes (those belonging to the set of G major) appear, by no means defines a tonality. A tonality is defined by the association of relative notes, and especially by the relationship of dominant tonic. Without this relationship there can be no question of any tonality. However, this fact, the suspicion that there is some sort of tonality lurking in the background (and indeed mm 6-8 proves this contention), makes this analysis highly absorbing and may throw new light on the use of the chromatic scale as a medium of atonal music.

Dynamics

"There are three discrete dynamic levels: p, f and ff. These levels are canonic, i.e. the level is constant within any two- eighth-note figure. The pattern made by successive figures is:

F//: p f p f p f p ff f p ff p f p f:// : f pp f ff p f p ff f p ff p ff f:
// " ✱ 1

✱ Harmonic Field: By this term is meant those notes which are associated with a particular harmony. For instance Eb, Bb/Ab or G. major: G, A, B, C, D, E, F-sharp. Field : those notes which are in the vicinity or neighbourhood of G. major.

✱ 1: Webern and "Total Organization by Peter Westergaard, Perspectives of new Music Spring 1963, p. 109.

Analysis of the Second Movement, Op. 27

However, "the point is that these characteristics are still playing their traditional role of differentiation. They interact with one another and with pitch to clarify pitch relationships, sorting out for the ear those pitch relationships which are to shape the movement ". * 1

How this differentiation is effected, however, is not shown, or developed by Mr Westergaard in his analysis of this movement. The above-mentioned pattern of dynamic levels does not give much information because it is divorced of the elements of pitch and time. When, however, proper tables are tabulated, it can be seen that a further minimising of the strength of certain notes is effected by absorbing such notes into chordal structures and, therefore, lessening their dynamic efficiency. For instance, the number of occurences of f and ff notes in this movement (with these notes occuring in chords and singly) is:

Letter-names	A	Bb	B	C	Db	D	Eb	E	F	Gb	G	Ab
f	0	7	2	12	6	0	0	0	6	12	2	7
ff	0	4	4	2	4	8	4	8	4	2	4	4

Here we can see that the dyad D/E occurs most in the ff range, and the C/Gb dyad at the f-level. When the appearances of notes in the chords are deducted (row 2 and 3 below), we find that D/E is the only dyad which is heard in non-chordal form at the ff-level and the dyad C/gb is heard 8 times at the f-level (B/G is heard 8 times at the p-level). From this it is evident that the dyads D/E and C/Gb are aurally more prominent than the rest of the dyads (and these dyads belong to the set of G major and the subset of D9th).

* 1 : Webern and "Total Organization by Peter Westergaard, Perspectives of New Music Spring 1063, p. 109.

Analysis of the Second Movement, Op. 27

Letter names	A	Bb	B	C	Db	D	Eb	E	F	Gb	G	Ab
p	16	0	8	2	2	6	0	6	2	2	8	0
f	0	7	2	8	4	0	0	0	4	8	2	7
ff	0	0	0	0	0	6	0	6	0	0	0	0
in chords	0	4	4	6	6	2	4	2	6	6	4	4
grace notes	0	2	2	0	2	2	8	2	2	0	2	2
eliminations	0	3	0	0	2	0	4	0	2	0	0	3
TOTAL	16	16	16	16	16	16	16	16	16	16	16	16

This comparitive table shows how each note is disposed, how many times it is heard at p, f, or ff levels, how many times it occurs in chords, or as grace notes and how many times it has been eliminated.

Beat Position

From the above tables, however, it can also be seen that the dyad Bb/Ab occurs 7 times non-chordally, and the dyad F/Db occurs 4 times non-chordally which makes these dyads fairly important since they are heard these number of times at the forte-level. These facts apparently contradict the strong tonal flavour uncovered by statistics, and we, therefore, need to look into these facts . Let us therefore draw up a table so that a beat-position is given for each note. There are four quavers per measure and we shall call each quaver a beat. Hence there will be 4 beat-positions for each note.

Analysis of the Second Movement, Op 27.

	1st beat-position			2nd beat-position			3rd beat-position			4th beat-position		
A	0	0	2	0	0	4	0	0	6	0	0	4
Bb	0	0	0	2	2	0	0	0	7	2	0	0
B	0	0	4	0	0	4	0	0	2	4	2	0
C	4	0	0	0	0	4	0	0	4	2	0	2
Db	6	0	2	0	0	2	0	2	0	0	0	2
D	2	0	2	0	2	0	0	0	4	0	0	6
Eb	2	2	0	2	2	0	0	2	0	0	2	0
E	2	0	2	2	0	2	0	0	4	0	0	4
F	0	0	2	0	0	2	0	0	2	6	2	0
Gb	2	0	2	0	0	4	0	0	4	4	0	0
G	4	2	2	0	0	2	0	0	2	0	0	4
Ab	4	0	0	0	0	2	0	2	0	0	0	5

The table gives the number of times each note occurs on the 1st, 2nd, 3rd and 4th beat-positions. The first column of the beat-positions gives the number of occurences chordally, non-chordally, column 3; column 2 gives the grace notes.

Now, considering the Bb/Ab dyad, we see that it only occurs as follows: Bb, non-chordally, only occurs on the 3rd beat-position and the Ab occurs non-chordally on the 4th beat-position and the 2nd beat-position. None of them ever occurs as a non-chordal note on the strong beat. Hence the prominence of this dyad is softened by being relegated to the weaker beats. This beat-position of the dyad is also ideal for its pivotal and resolutional characteristics.

Regarding the F/Db dyad, we find that Db which occured 4 times at the f-level, now only occurs twice non-chordally on the 1st beat-position, (cf m.2 of the score). However, this is still significant, especially as this is forte. The note, F, however, also occurs twice, but at the piano-level with a consequent lessening of prominence.

Analysis of the Second Movement, Op. 27.

As it can be seen from the table we have the following set of notes occuring non-chordally on the 1st beat-position: G, B, D, E, Gb, Db, F.

There are 3 irregularities with reference to a G tonality here: Db, F which are chromatic notes, are included, and these are certainly prominent, the Db more so than the F, on account of dynamics. Furthermore the note, C, does not occur on the 1st beat as a non-chordal note. If this be an irregularity, then we certainly cannot help wondering why the Db and F is given this prominence and why the C has been avoiding the strong beat?

With this in mind, it should be pointed out that the note, D, is the only one occuring twice on the 1st beat at the ff-level and 4 times at the ff--level on the 3rd beat-position. Hence this is, without question, an important note.

Summation of Durations.

When all the C's, all the A's etc., occuring in this movement, are added so that the total number of times a particular note occurs, is given as a summation of this total appearance, we have the graphical diagrams to show us the relative importance of the various notes. In graph 1 all notes are given chordally and non-chordally and in graph 2, only the non-chordal notes are given. These two graphs coincide remarkably except that the note, A, which is 3rd in graph 1, becomes 1st in graph 2 and the note, Eb, disappears completely in graph 2 as non-chordal note. This compares with the tables on pp. 38 and 39. Let us, for convenience, restate this here:

A	C	Gb	D	E	B	G	Db	F	Bb	Ab	Eb
16	16	16	14	14	14	14	12	12	11	11	4

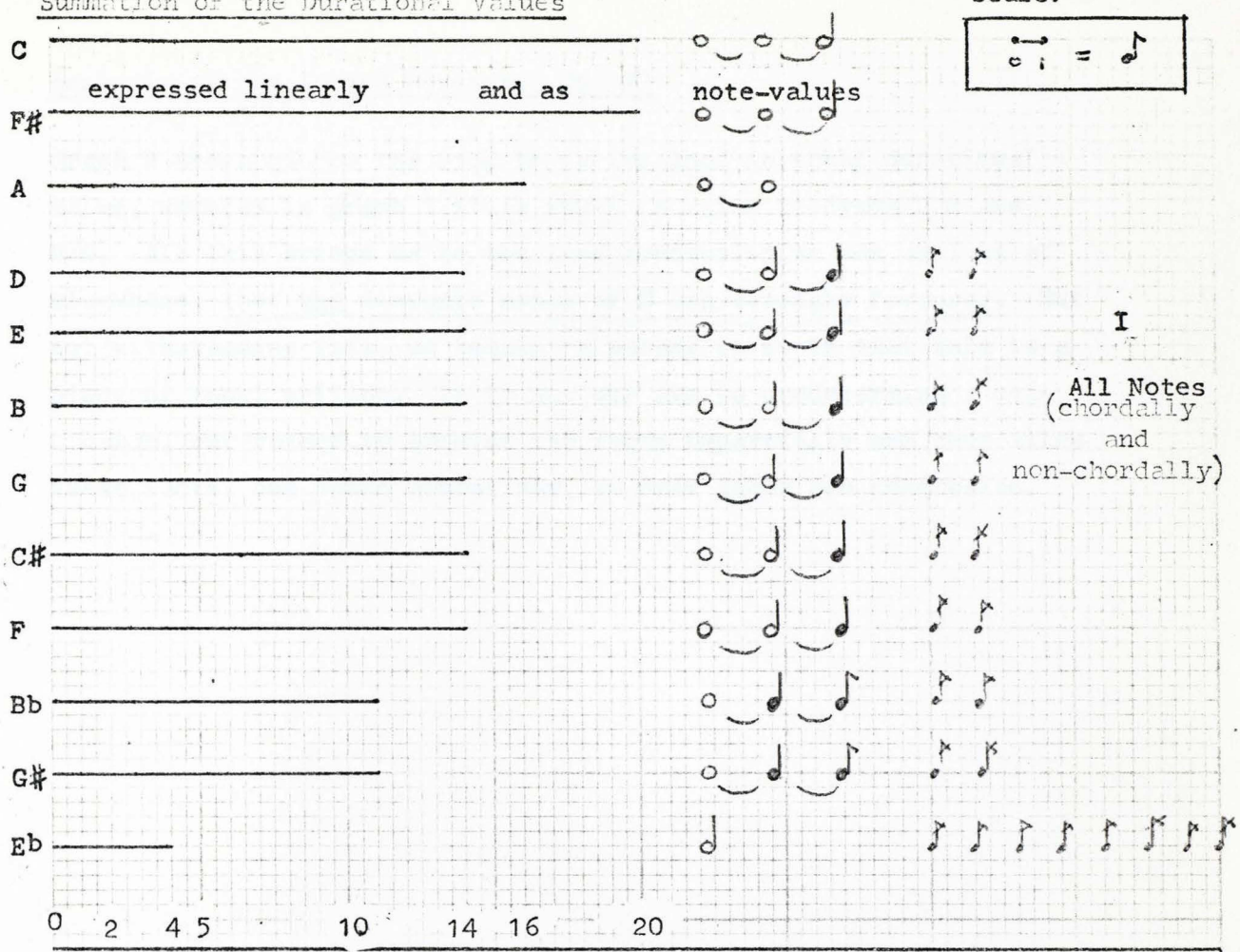
A	D	E	C	Gb	B	G	Bb	Ab	Db	F	Eb
16	12	12	10	10	10	10	7	7	6	6	0

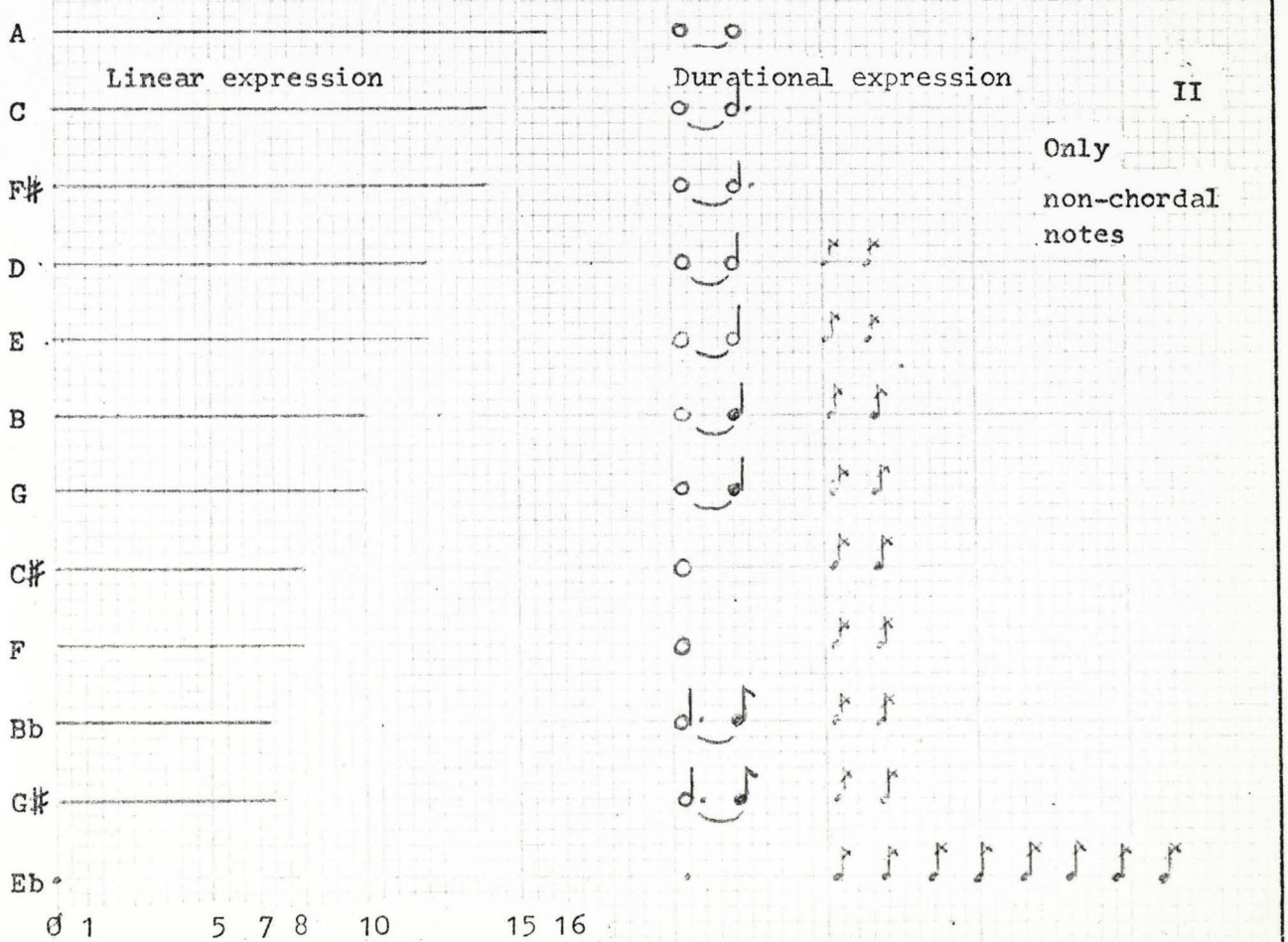
(The top row is with chords and as non-chordal notes: the bottom is non-chordal notes.)

Analysis of the Second Movement, Op.27.

Summation of the Durational Values

Scale: = ♪





Analysis of the Second Movement, Op. 27

Graph 2 shows us how the dyad Db is lessened in total durational value, whereas in graph 1 it is equal in value to dyads D/E and B/G. All this brings us to the same conclusion,as was arrived at elsewhere, that the diatonic notes of G are strongly favoured. But not withstanding this, we remain reluctant to state that this is a piece of tonal writing. It is not our aim to predetermine a conclusion, but rather to examine the facts impartially and then allow these facts, one could almost say, to draw their own conclusion.

4

Analysis of Second Movement, Op. 27

Order Relations in Tonal Music

By way of digression and to see how the order relations, with reference to the frequency distribution of notes ✱ 1 of tonal music, compare with the Webern example under analysis, we hereby give the statistical findings. All the pieces have been transposed to G major so that a direct comparison can be made with the Variations Op. 27.

Grieg: Wächterlied, Op. 12 No. 3:											
d	g	c	E	A	F♯	B	G♯	Bb	Eb	C♯	F
111	108	63	56	46	41	40	26	22	22	6	4 Frequency
Dvorák: Humoresque Op. 101. No. 7:											
G	D	B	E	C	A	F♯	Bb	C♯	G♯	Eb	F
101	74	54	53	39	37	23	3	3	2	2	0 Frequency
Chopin: Prelude, Op. 28 No. 7:											
D	G	B	C	A	E	F♯	G♯	Bb	C♯	Eb	F
42	29	26	22	16	12	11	5	2	2	0	0 Frequency
Sonata No. 10: Finale (mm.1-16,) Haydn											
G	B	D	F♯	A	C	E	C♯	Bb	G♯	F	Eb
16	12	12	12	11	10	6	1	0	0	0	0 Frequency
Beethoven: Sonata Op. 111, 2nd Movement: Variation 1											
D	B	A	G	C	E	F♯	G♯	C♯	F	Bb	Eb
31	19	18	17	13	11	9	4	4	4	2	1 Frequency
Ibid: Variation 2:											
A	D	B	G	C	F♯	E	G♯	C♯	F	Bb	Eb
32	32	27	20	18	13	12	7	5	4	3	1 Frequency
Ibid: Variation 3:											
D	B	G	A	C	F♯	E	F	G♯	Bb	Eb	C♯
82	52	48	48	41	36	14	9	8	6	5	2 Frequency
Beethoven: Sonata Op. 110. 1st Movement (Complete):											
D	G	B	A	F♯	E	C	Bb	Eb	F	G♯	C♯
513	462	336	270	246	213	210	113	79	69	67	67 Frequency
Webern: Variations, Op. 27, 2nd Movement. (See p.44											
A	D	E	G	B	C	F♯	Bb	G♯	C♯	F	Eb
16	12	12	10	10	10	10	7	7	6	6	0 Frequency

✱ 1: "Frequency is a statistic that tells us how many times a given score occurs in a collection of data". Quotation from: Basic Statistical Concepts by Jack I. Bradley and James N. McClelland: Chapter 2, Frequency Distributions and Graphs, p.24. Published by Scott, Foresman and Co. Glenview, Illinois.

Analysis of the Second Movement Op. 27

Order Relations in Tonal Music

For the sake of completeness we add the following examples. Here we give only the frequency of the chromatic notes, (the tonal notes are not counted)

Beethoven: Sonata Op. 101. 1st Movement.

$C^{\#}$	Bb	Eb	$G^{\#}$	F	
68	25	23	20	15	Frequency

Beethoven: Sonata Op. 101, Finale mm. 1 - 85:

$C^{\#}$	Eb	$G^{\#}$	Bb	F	
45	7	1	0	0	Frequency

Ravel: Bolero (Transcription for piano by Roger Branga, Published by Durand & Co. 1929)

F	$G^{\#}$	Eb	$C^{\#}$	Bb	
57	44	42	27	9	Frequency

As could be expected in tonal compositions, the diatonic notes occur more frequently than the chromatic notes. This is here shown to be statistically true that the members of a particular tonality occur more often. In all the sets above the first 7 notes are members of G major and the last 5 are members which are chromatic i.e. $G^{\#}$, Bb, F, $C^{\#}$ and Eb.

A number of important deductions can be made regarding the data presented above.

Analysis of the Second Movement Op. 27

1. The notes { D, G, B } occur within the first 4 of all the sets except the Grieg.
2. The set of: { C, E, $F^{\#}$ } occurs within the 1st 4 notes of the diatonic group. (Sometimes the note A is added to this set.
3. In the sets above the dominant note, D occurs most frequently, except Humoresque and the Haydn sonata.

This order relation comes as a surprise. In most of the examples, too, the Eb occurs low down the scale. Mostly it occurs least of all, but this is not always true as the examples on this page testify. (See also Chopin's Etude in Ab, Op. 25 no. 1). A remarkable coincidence is between the Beethoven variation No. 2 of Op. 111 and the Webern with reference to the order relations (not the number of notes). Summarising all this, we can state:

1. { Diatonic elements } > { Chromatic elements }
2. { Tonic elements } > { Dominant elements }
3. { Dominant elements } > { Any other elements }
4. { The set of the raised dominant (Eb) } < { than any other element }
   (The above is not true for all examples.)
5. The set of chromatic notes function ornamentally or to effect a modulation.
6. The individual order of the elements is not fixed i.e. Eb does not always occur the least number of times.

When we compare the Webern variations with these findings, we note that this example intersects with most of these sets. However, we cannot state with certainty whether all tonal music follows these patterns. To discover this would entail counting several hundred examples which is outside the realm of this work. We can, however, be quite sure that most of tonal music will have some or other of the 6 points given above.

Withholding of Notes.

While working on this data another important point arose: the preparation for a new tonality by withholding of certain notes. We herewith give two examples to illustrate this occurence.

Ravel: Bolero (Piano transcription by Roger Branga): ✱ 1

Notes	mm.1-22	mm.23-40	mm.41-58	mm.59-76	mm.77-94	mm.95-108	mm.109-124	
Bb	0	0	20	18	0	18	1	57
C♯	0	0	15	15	0	11	3	44
Ab	0	0	8	8	0	4	22	42
F♯	0	0	0	0	0	0	27	27
Eb	0	0	4	4	0	0	1	9
	A	A	B	B	A	B	coda	

(The number of notes given here are for all the chromatic notes - every-one of which has been counted. The diatonic notes have not been counted - there being so many,but,besides this,they do not concern the present statistics.)

Statistics such as are shown on these pages, give us some important information and insight into the process of composition which no other method could reveal as clearly and unambiguously. New patterns come to the fore,which patterns could be termed "supra-ordered" because they determine the choice and disposition of the notes. ✱ 2

From the table it is clear that mm.1-40 is completely diatonic as none of the chromatic notes appear. Only from mm. 41-76 do the chromatic notes occur. Mainly these are : Bb and Db(C♯)on a C pedal point. The Ab(G♯)occurs 16 times (mm.41-76) and then again 4 times, but in the coda it suddenly becomes an important note appearing 22 times. An interesting fact is that the F♯does not occur once in mm. 1-108, but in the coda it assumes great importance. The sudden introduction of such notes into the context creates a tremendous dramatic upsurge and climax.

✱ 1. Ravel: Bolero, Transcription for piano for 2 hands by Roger Branga, published by Durandt & Co. 1929, Paris, 4, Place de la Madeleine.

✱ 2. This word has been used by Armin Klammer in his analysis: Webern's piano vaeiations, op. 27, 3rd Movement, p.86, die Reihe No. 2. We use it here to mean an order beyond the normal i.e. that which is seen.

Analysis of the Second Movement, Op. 27

Withholding of Notes.

The Eb only occurs 9 times in the complete composition. We know that chromatic notes function either as ornaments or else as a means of achieving a modulation (See p. 50), and it would therefore appear to be likely that as Ravel did not wish to distract from this element of surprise and climax by anticipating the new tonality of E, he consequently avoided using the Eb(D♯) which could be interpreted as a leading-note (or part of the dominant of E).

A dominant pedal point, such as is found in sonatas, would have prepared the listener for (and also have made him expect) E major tonality. However, in Bolero there is no pedal point on B, but, on the contrary, Bb is an important melodic note in the section preceding the coda. So there is no preparation in the usual sense. Since the note, E, is common to all sections, it has the function of linking the various sections together.

Thus we can conclude that the preparation for a new tonality does not exist in the mere fact of pounding at the dominant pedal, but rather in the withholding of important members of such a new tonality until the new tonality has arrived.

Beethoven: Sonata Op. 110

Let us examine a classical example, to see whether such a withholding of notes also occurs there.

Beethoven: Sonata in Ab, Op. 110, 1st Movement (complete)

	A	B	C	D	E	A		B	C	D	F	
mm.	1-12	12-19	20-28	28-39	40-55	56-62	63-70	70-75	76-87	87-105	105-116	total
Ab	51	38	18	23	45	73	51	26	21	79	47	462
Bb	21	46	26	34	41	10	0	6	25	37	24	270
C	39	22	12	20	46	27	11	10	32	77	40	336
Db	34	14	0	6	25	10	30	7	25	26	33	210
Eb	76	83	15	72	21	45	16	12	31	59	83	513
F	7	6	20	27	64	13	13	0	16	36	11	213
G	15	24	23	57	40	22	0	0	13	27	25	246
A	0	6	7	5	9	0	5	22	7	4	2	67
B	0	7	0	2	4	3	26	61	6	4	0	113
D	1	8	7	20	3	4	0	0	8	16	0	67
E	0	0	0	1	18	0	4	43	3	4	6	79
Gb	3	0	1	1	13	3	30	12	4	2	0	69

Analysis of the Second Movement, Op. 27.

Withholding of Notes.

The letters A, B and C,etc.,indicate the various sections of the sonata:

A is the 1st subject, D second subject, E is the development section and F is the coda. The first column gives the diatonic notes of Ab major (the first seven) followed by the chromatic notes. Total gives the total number of notes occuring; for instance Ab - total 462, means that Ab appears 462 times in the movement. ✱ 1

As we know that the second movement is in F minor, mm.1-4 and in C major, mm. 5-8, let us consider mm 105-116, the coda first. In the table the note F appears only 11 times; the notes which figure prominently in the 2nd movement (B, D and E) seldom occur in the coda, as can be seen from the table in the second last column. Note, too, that the Gb does not occur in the coda, but becomes an important note in the middle section of the 2nd movement.

Contrary to expectation, mm 40-55, the section preceding the recapitulation, has no massive barrage of Eb's, but the Eb actually occurs least of the diatonic notes.

It should be noticed that the note E, which has only occured once (m.33) and then as an ornamental note and demisemiquaver, occurs 18 times in mm. 40-55. In mm. 56-70 it only occurs 4 times, but in mm. 70-75 it is made to appear 43 times. All this proves that Beethoven, like Ravel, applied this method of withholding notes (consciously or unconsciously).

✱ 1. In this example every note has been counted. The error factor, if it should be present, would be minimal and even considering such a possibility, such errors will not effect these conclusions generally. However we have tried to be as accurate as is possible.

Analysis of the Second Movement. Op. 27

Withholding of Notes.

Ravel: Bolero

Let us refer once more to the Ravel example: Bolero in which we shall give the frequency with which each note occurs in sections, named A, B and C.

Ravel : Bolero (Piano transcription by Roger Branga):

A (mm.1-22)

G	C	D	B	F	(E)	A	: names of notes
396	265	49	23	20	(16)	13	: number of times notes occur

B (mm.95-108)

G	C	D	(Bb)	(E)	Db	F	A	(Ab)	[B]	F#	Eb
272	164	25	(18)	(17)	11	6	5	(4)	[2]	0	0

C (mm. 109-124)

(E)	G	[B]	C	D	F#	(Ab)	A	F	C#	(Bb)	Eb
114	77	[64]	60	50	27	(22)	13	12	3	(1)	1

Comparing these tables: A, B and C, we can clearly see the interchanging of the order relation of the various notes. For instance,B and C are consecutive sections and it can be seen how the notes which become prominent in C are withheld in B : E, Ab, B, F-sharp. We can summarise this by stating: that the order relation of a note relative of its present context is least when such a note is predetermined to become more important (to have a greater order relation) in the ensuing section (or movement).

In Bolero we have this relation:

B (mm. 95-108): $Bb > Db > F > A > Ab > F^{\#}$

C (109-124): $Bb < Db < F < A < Ab < F^{\#}$

Analysis of the Second Movement. Op. 27

Withholding of Notes.

This remarkably is a retrograde relation with reference to B and shows clearly how the values interchange in importance: what was least in B becomes greater in C.

Another interesting order relation is given below, where, as can be seen, the order relation remains (practically) constant.

Relations:

A(mm. 1-22)

G > C > D > F > E > A > Eb

B(mm. 95-108)

G > C > D > E > F > A > Eb

C(mm. 109-124)

E > G > C > D > A > F > Eb

The order relation of the note, E, changes - growing greater:

i.e. $E_1 < E_2 < E_3$ As can be noticed, F and A interchange in their order relation. In the tables for B and C we notice that the note, F occurs 6 times and A 5 times in table B: whereas in table C the note F occurs 12 times and the note A 13 times. Hence the difference is such that these two notes could almost be considered to be equal and that therefore no change in value has occured.

For completeness we can point out that

$A \cap B \cap C = \{A, B, C, D, E, F, G\} = \{\text{the diatonic scale of C.}\}$

This means that the whole fabric of the composition has in each section the diatonic scale of C, which thus lends unity to the work as a whole.

Analysis of the Second Movement, Op. 27

Withholding of Notes

Ravel Bolero

Further where

$A = \{A, B, C, D, E, F, G\}$

$B = \{A, B, C, D, E, F, G, Ab, Bb, Db\}$

$C = \{A, B, C, D, E, F, G, Ab, Bb, Db, Eb, F\text{-sharp}\}$

then $n(A) < n(B) < n(C)$ /A = 7: B = 10; C = 12.

This increase in the number of chromatic notes employed in the last two sections, is one of the reasons for the climatic crescendo occuring in the coda. It is such supra-ordered phenomena which are responsible for effect.

Hence as shown by these two examples, the Beethoven and the Ravel, the preparation for a particular key actually means minimising the effect of the main members of that key in a previous (but neighbouring) context so that when these members are heard in the new key, they are fresh and create the element of surprise and climax.

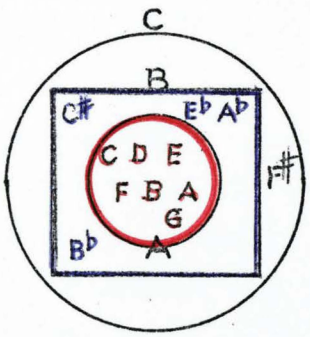
Webern: Variations.

If this may seem to be irrelevant with regards to Webern's variations, it can be stated that Webern, on the contrary, adopts precisely these same methods. Previously it has been shown that the effect of the note Eb, in the second movement of the variations, Op. 27, has been minimised, but in the third movement (mm.1-12), this very note becomes the most important: it is the first note of the movement and also the concluding note: also its total duration (the summation of its appearances from mm. 1 - 12) is greater than the other notes.

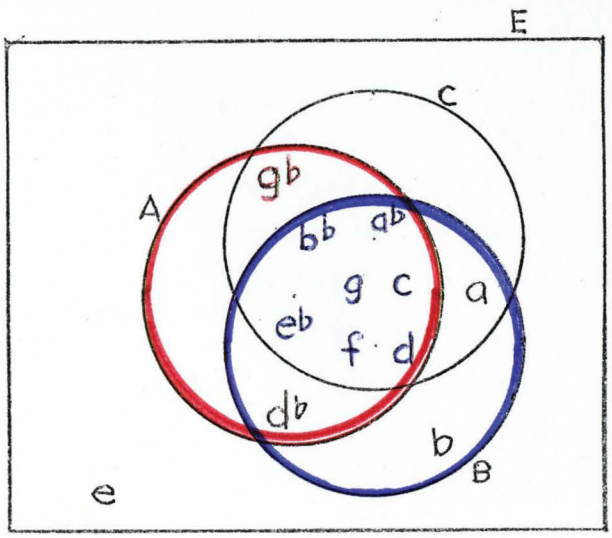
Hence, since Webern adopts the same procedure as the traditionalists and the tonalists, and because the statistics reveal the same tendencies, we must conclude that these variations are not so different to tonal music as is generally thought to be the case.

Analysis of the Second Movement. Op. 27

We cannot, at this stage, conclude that the variations are tonal (because of our statistical findings thus far), but we feel at liberty to state that analysis has shown a strong tonal flavour to exist in these variations. The possibility that here we have to do with a new kind of tonality - perhaps a tonality with a tonal centre, which does not necessarily function as the conventional tonality does, is worth examining thoroughly.



Venn diagram of Ravel's Bolero. It shows what has been discussed above and how only the final section (coda) contains all the chromatic notes.



Venn diagram of Beethoven: Sonata, Op. 110, mm. 1-55 illustrates the intersection of Sections A, B, C and E.

(Section D is equal to E in chromatic content of notes)

Notice that the notes common to all the sections are the notes of diatonic scale of Eb major, the dominant key of Ab. It further shows that only in section E do all the notes occur - this is similar to the Ravel example.

5

Sound and Silence

John Cage: 4'33''

Attention has been previously drawn, in the criticism of Armin Klammer and Peter Westergaard, to the absence in their articles of the sound and silence relationship, which in Weberns Oeuvre - and especially the variations, Op. 27 - are of fundamental importance. Before proceeding with such an analysis, however, it is first necessary to examine the phenomenon of silence in its various aspects so as to be able to better understand it in the specific context of Webern's music.
A composition of total musical silence, called, 4'33''has been written by the American composer, John Cage in 1952. In this composition which is an example of "Chance Music", silence and aspects of silence - which perhaps otherwise would have been merely glossed over - can be studied.

" The clearest possible expression of this idea may very well be the famous 'silent' piece in three movements that Cage composed at Black Mountain that summer and called 4'33". The title refers to the number of minutes and seconds the piece takes to perform, but Cage liked the thought that it could also refer to feet and inches - a sort of personal spacetime continuum. Cage had come to realize that there was really no such thing as silence. This was brought home to him with great force when he was taken into a soundproof room, called an anechoic chamber, in the physics laboratory at Harvard; instead of the total silence he had expected, he heard two sounds in the chamber, one high and one low, and was told when he came out that the high sound was his nervous system in operation and the low one was his blood circulating. If true silence did not exist in nature, then the silences in a piece of music, Cage decided, could be defined simply as 'sounds not intended', and Cage made up his mind to write a piece composed entirely of just such sounds. Seeing Rauschenberg's all-white paintings at Black Mountain-canvases painted flat white, on which the only images to be seen were the shadows and reflections of the painting's environment- gave him the encouragement he needed.*1

*1: Calvin Tomkins: Ahead of the Game, pp. 114-115. Published by Penquin Books.

Sound and Silence

John Cage: 4'33"

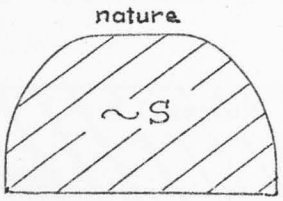
Cage's 4'33" received its first performance in August of 1952, at the Maverick Concert Hall in Woodstock, New York. David Tudor, who performed it, solved the problem of the piece's division into three parts by closing the cover of the piano keyboard at the start of each movement and opening it at the end of the specified time. Aside from these actions he did nothing but sit on his bench, immobile but intent. The Woodstock audience considered the piece either a joke or an affront, and this has been the general reaction of most people who have heard it, or heard of it, ever since. Some listeners have been unaware they were hearing it at all. Just before its New York première, Cage's mother, a loyal and fervent partisan, whispered to her neighbour in the audience that 4'33" could be thought of as being 'like a prayer'. As it happened, 4'33" was followed on the programme by Cage's Music of Changes, which took forty-three minutes, and when that was over Mrs. Cage's neighbour leaned across and said, 'Good heavens, what a long and intense prayer! ' From Cage's point of view, however, both performances were miraculously successful. In the Woodstock hall, which was wide open to the woods at the back, attentive listeners could hear during the first movement the sound of wind in the trees; during the second, there was a patter of raindrops on the roof; during the third, the audience took over and added its own perplexed mutterings to the other 'sounds not intended' by the composer. Whether this was a case of art imitating nature or nature imitating art is perhaps an open question".

Sound and Silence

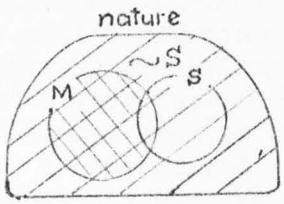
John Cage: 4'33"

Cage's interpretation of "Silence" is founded on the argument based on the premises of the philosophy of "Chance Music". The conditional, "if true silence did not exist in nature, then the silences in a piece of music could be defined as 'sounds not intended'" gives us Cage's interpretation of silence concisely.

Let us now proceed to analyse this logically. We have the statement: "true silence does not exist in nature". There is also the statement: "cage came to realize that there was really no such thing as silence". Hence non-silence is therefore a subset of Nature, thus $\sim S \subseteq N$, which we can illustrate as follows: ✱ 1



Since this Universe (termed, Nature, by Cage) only consists of "Non-silence", anything else immersed herein (or contained herein), must of necessity consist of the property of "non-silence.". Let us herein insert music, the proper subset of organised non-silence and the proper subset of so-called silence. Then we have (according to Cage):



Hence, from the diagram, it can be seen that "silence in music" (denoted by S) must form some part of the incidental sound of which Nature consists, whether such silence occurs in music (denoted by M) or outside the realm of music. The ~S (in red) has been inserted in all the subsets merely to illustrate that it is an all-pervading property.

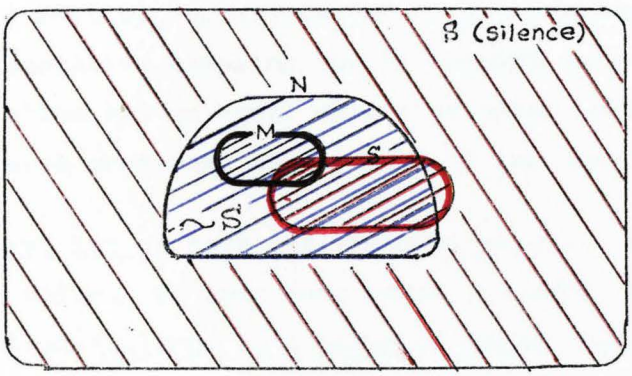
✱ 1: The sign $\sim$ is given to mean "the negation of" by Willard van Orman Quine in "Mathematical Logic; by Seymour Lipschutz in Finite Mathematics; by Allendoerfer and Oakley in Principles of Mathematics.

Sound and Silence

John Cage: 4'33"

It is evident, from the text and the diagram that $\sim S$ refers to audio frequency, for instance, reference to "a sound-proof room" and the words: "instead of the total silence he had expected, he heard two sounds ....." Hence from this we may conclude (according to Cage) that only a.f. exists in nature. ✱ 2. This is not true, What about r.f, m.f, v.h.f and supersonics?

Now if silence does not exist in nature, then it exists out of nature as the complement of "non-silence." And if it exists out of nature then Cage's term, nature, is not the whole of nature, but is actually contained in a greater whole. The following diagram illustrates this fact.



The red area indicates the silence region, the blacked stroked area shows the "sound" region.

The red oval shaped area is that of musical silence, which shows us that silence can occur in one part (or voice) of music while another part is sounding. Furthermore that during silence in a piece of music, accidental non-musical sounds may be heard. The third part of the red ring shows us that during silence in music, there may exist complete silence where no accidental and no other voices are heard. Besides this "silence in music", there exists a large area of other sets of silences such as r.f., v.h.f and supersonic sounds; and, with reference to humans and animals, death is certainly completely silent. Silence exists when we cannot hear sound.

All nature therefore consists of the union of silence and non-silence thus: $\forall N = S \cup \sim S$.

✱ 2: a.f is an abbreviation for audio frequency.

Sound and Silence

John Cage: 4'33"

The conditional, referred to earlier: "if true silence did not exist in nature, then the silences in a piece of music could be defined as "sound not intended", as shown above is only partly true in a narrow sense but false in the universal sense. Also it must be clear that the definition of silence as "sounds not intended, implies that the definition of sound is "sounds intended" which means that we have contradictory definitions of sound. All this merely goes to show that truths cannot be based on isolated cases - such as Cage's presence in an anechoic chamber. Statistical sampling must be based on varied and many samples. "Samples that do not accurately represent the population from which they are drawn are called biased samples. The sample must be representative if generalizations are to be justified. Representative sampling can be assured only if every case in the population has an equal chance of being selected. ✱ 1. According to the above-mentioned text (Ahead of the Game) no such sampling was done.

However, let us test the veracity of the diagram to assess its truth value. We once more refer to Cage. In the conditional it is said that "silence in a piece of music could be defined". (par. 1, p. 115). Hence Cage (or Calvin Tomkins) admits the existence of silence. Let us call silence "x". Also implied in this same conditional is the fact that music is some part of nature. Hence x is contained in music (which we shall refer to as "P") and which is contained in nature (which we shall refer to as "Q"). Now according to Allendoerfer and Oakley in priciples of mathematics ✱ 2, we have:

✱ 1. Jack 1. Bradley and James N. McClelland: Basic Statistical Concepts, Chapter 8, Experimental Applications, p. 106. Published by Scott, Foresman and Company, Glenview, Illinois.

✱ 2: Allendoerfer and Oakley, Principles of mathematics, chapter 1, Logic and sets, p. 44, Third edition.

Sound and Silence:

John Cage: 4'33"

"For x to be in Q, it is sufficient that it be in P.
For x to be in P, it is necessary that it be in Q.
If x is in P, then x is in Q.
Only if x is in Q is it in P."

Hence, as can be seen according to the laws of mathematical logic then "if x is in P, then x is in Q" which when translated reads; if silence is in music, then silence is in nature. According to logic then, silence is in nature which statement contradicts the first part of the conditional, "If true silence did not exist in nature ".

Let us demonstrate this truth diagramatically:

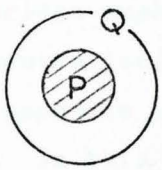


Diagram illustrating that "if x is in P, then it is in Q ".cf. to other diagrams given elsewhere, especially to diagram p.59.

Now since P is a proposition it is thus a variable. So if we narrow it down in meaning, to mean a single note of one frequency and one colour, then since x is in P, it means that in any colour, dynamic or frequency,there is also silence. This is perhaps difficult to grasp since silence has no colour or loudness, yet silence can be expressed as colour or a dynamic by means of the identity element of silence which is zero (0). Since silence is measurable ✱ 1, we have

$S + 0 = S$ (or $x + 0 = x$)

consequently $S = S + (Q + (-Q)$ law of additive inverse
$= S$ (Q represents quantity)

✱ 1: This will be discussed further on.

Sound and Silence

John Cage: 4'33"

In the same way, by making use of this law, silence can be expressed as a colour, which is a particular range and combination of harmonics. "The investigations of Helmholtz proved that the timbre of a sound is determined by the proportions in which the various natural harmonics are heard in it ". * 1.

Silence is all pervading

In electronics,when two sounds are partially out of phase, colour and quantity change. When two such sounds are completely out of phase, or completely filtered the resultant is silence. "If the two sounds are completely "out of phase", so that a moment of compression in one coincides exactly with a moment of rarefaction in the other, they tend to neutralize, or cancel, one another. (Two sounds of equal intensity and opposite phase will actually be heard by the ear as total silence.)" * 2. In this way, it could be stated that silence is related to colour and dynamics, and actually regulates the colour and loudness of the sound. Hence, contrary to Cage, we could claim that silence is all-pervading, even existing in the very make-up of sound (as the absence of certain dynamics and harmonics).

Silence always tends to absorb sound so that sound is forever diminishing to silence. For instance,in oscillators we know that sound cannot continue indefinitely, unless the initial force which set it in vibration is maintained. If this is not done, then the vibration will cease and silence ensue. "All oscillators have this in common, that they generate a cycle of variation in an electrical quantity which is repeated indefinitely, as long as electrical power is supplied to the oscillator." * 3

* 1. Sir James Jeans: Science and Music, chapter 3, p. 84. Cambridge University Press, 1947.

* 2: S.S. Stevens and Fred Warshofsky: Sound and Hearing, Chapter 1, p. 14 Time-Life Books, July 1970.

* 3. James Franklin: Electronic Building Bricks, No. 10: The oscillator, p. 126. Wireless World, March, 1971.

Sound and Silence.

Silence is all pervading.

Another authority states: "For sustained oscillation in a transistor oscillator, the power gain of the amplifier network must be equal to or greater than unity. When the amplifier power gain becomes less than unity, oscillations become smaller with time (are damped) until they cease to exist. In practical oscillator circuits, power gains greater than unity are required because the power output is divided between the load and the feedback network.... The feedback power must be equal to the input power plus the losses in the feedback network to sustain oscillation ". ✱ 1

Hence we may conclude that sound has constantly to be maintained, or else it will relapse into silence (rest). Silence therefore concludes sound. Let us underline these words: Sound is an activity which always tends to come to a rest position (silence).

Measurement of Silence

In the given extract out of "Ahead of the Game" we learn that Cage was inspired to compose 4'33" by "seeing Rauschenberg's all-white paintings at Black Mountain - canvases painted flat white, on which the only images to be seen were shadows and reflections of the painting's environment ", par 1, p. 115. These shadows and reflections, in terms of Cage, are then what can be called chance (or accidental) painting. The important thing about these all-white paintings are that they are painted on canvasses. Hence these paintings have their own existence and are identifiable. Otherwise we could rightly assert that no such paintings exist at all.

The analogy with music would be: an all-silent canvas on which is projected chance (or accidental) sounds, but whereas we can see these all-white paintings because they have boundaries, the only indication of the Cage composition's all-silent canvas is that "the title refers to the number of minutes and seconds the piece takes to perform ".

✱ 1: RCA Transistor Manual, p. 68 : Oscillation. Published 1966.

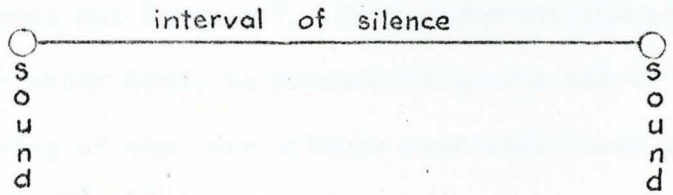
Sound and Silence

Measurement of Silence

The fact that such a title was given shows us that Cage was aware of the idea that silence is quantitative - (that it is measurable). But in this piece the audience actually does not know when the piece commences. Does it commence when the pianist depresses a stop watch, or does it commence when the piano lid is closed? If this is the case, are we not justified in asserting that all such action and sound (if any) could be considered merely to be part of the composition and regarded as "sound not intended"? Hence Cage has not defined the entry or termination of this "silence" beyond dispute. He has given us no boundaries.

Since silence is quantitative durationally, it can be expressed by numbers or variables. Hence it can be accurately plotted on the X-coordinate as: $x_1, x_2, x_3, \ldots\ldots x_n$. But to do this we must know where silence starts and ends. Silence can only be gauged quantitatively by means of sound. By this we mean that in music we can define the duration of silence as the time interval (the distance) between the end of one sound and the beginning of the next sound.

From this definition then, silence is the open interval such that end-points are sound-points.



Sound and Silence

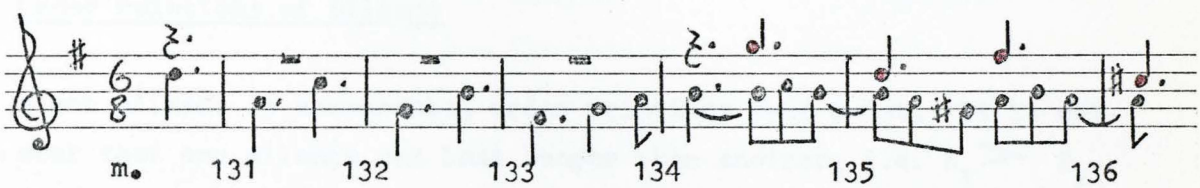
Measurement of Silence

Silence still exists, even though another voice or instrument is heard during part or the whole of its duration. (cf the various Venn diagrams given earlier). In this case we have:

voice 1: _____
sound

voice 2: _____ _____
sound silence sound ★ 0

This class of silence is characteristic of most music, but especially of fugues and music with melody and accompaniment.



Now, according to Cage's dictum, "silence in music could be defined as sounds not intended", which means with reference to the example above that the music heard while voice 1 is silent consists of sounds not intended (i.e mm. 130 - 134). As a matter of fact the third voice (not indicated in the illustration) is still silent, hence everything, above is "sounds not intended". This statement proves to be false.

Sound, on the other hand, is measured from the end of one silence to the beginning of the next silence such that these two silences are separated by sound, thus:

★ 0: With reference to this diagram, the piano David Tudor was sitting at was silent, regardless of the wind amongst the trees and the patter of rain. The expectancy of the audience was that they were about to hear piano music.

★ 1: Beethoven: Sonata Op. 110, Fuga, mm. 130 - 136.

Measurement of Silence

silence | sound | silence

$P_1 (x_1, a)$ $P_2 (x_2, a)$

The length (duration) of this sound segment is given by $P_1 P_2 = / x_2 - x_1 /$. ✱ 1.

Consequently to define the measurement of silence, we need sound at the beginning and end of the silence, and to define duration of sound, we need silence at the beginning and end of the sound. Though this seems obvious, enough, it is exactly here where Cage became unstuck in his composition, 4'33".

Order relations of Silence

Since silence is measurable, order relations must exist, It is evident that one silence can last longer than another, i.e. $S_1 > S_2$. The one question, in terms of music,we should like to answer is whether a greater silence is more significent than a smaller silence. This is difficult whereas any sound's importance can be gauged by a number of characteristics, such as beat-position, dynamics, pitch, belonging to a key or harmony, colour, and attack and decay. These characteristics can determine the order relation of a particular sound, but what characteristics of silence can determine its importance?

Thus far in our analysis we have ascertained that the subset of silence (with ref. to the whole of nature) contains, the elements: x, y, z.

Hence $S = \{x: x \text{ commences} \sim S;\ y: y \text{ concludes} \sim S;\ z: z \text{ is duration and } z = x - y \text{ when x succeeds y and z isolates} \sim S_1 \text{ from} \sim S_2\}$

Sound and Silence

Order relations of Silence

Silence has these two properties, v, w: v in that it tends always to terminate sound (diminish it to silence : i.e. oscillators) and silence has the property of w, that is it changes sound i.e. by adding silence to colour it changes the colour.

So we can state : S = $\{x, y, z, v, w\}$ Having now listed the elements of silence, we can see whether any of these elements throw light on the order relation of different silences.

MEANING

Of these we shall consider the element, z (the isolation characteristic of silence first. Silence has the important characteristic of giving meaning to a series of words or sounds by means of grouping these words or sounds through isolating one group from the next. It is illustrative to consider the following words to see how silence can change meaning (element, w):

"John said Father Jack is talking." These words are ambiguous, because we cannot state with certainty how many persons there are and, secondly, who is talking. But when we rearrange this statement to include silences, meaning without ambiguity is also added, thus:

John said: "Father Jack is talking."
When we insert silences at other points in the sentence, meaning is changed, thus:
"John", said Father Jack, "is talking." Changing the position of a gives us still another meaning thus:

"John", said Father, "Jack is talking." Interchanging the silences yet another way, and we have:

Sound and Silence

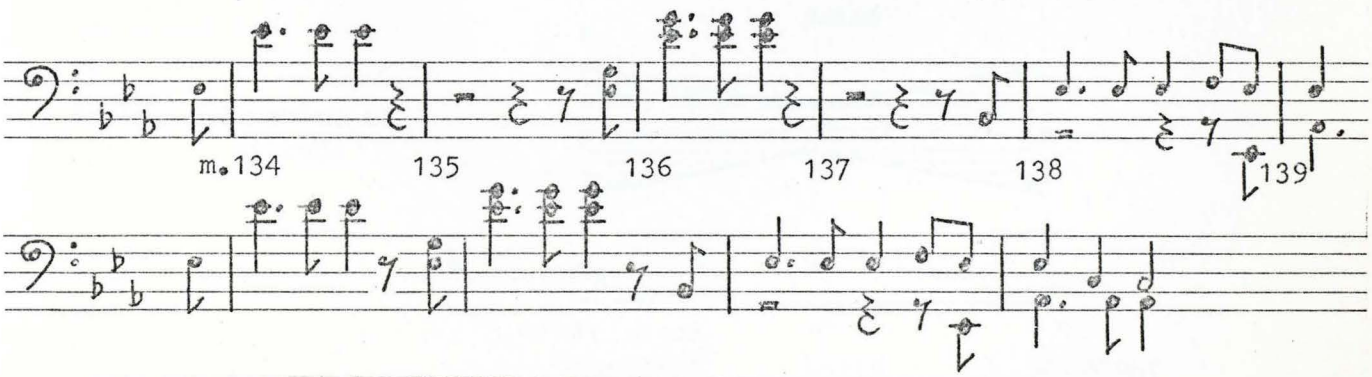
Meaning

John said: "Father, Jack is Talking" or we could organise this sentence to indicate the way it was said:

John said: "Father! .... Jack is talking."

From this it can be seen that a specific meaning depends on silences, and where the silences are placed in any particular context. Simply by changing the silences to other points in a sentence, new and different meanings are achieved, and this is of extreme importance in both language and music. We could summarise this by stating that adding silence to any context (a word-series, or a sound series), or even a colour or dynamic) such a context is altered. It is also clear, in the sentences given above, that silence acts in a twofold manner: it draws attention, and it creates expectancy.

Similar to this, in music,silence gives meaning to a musical context by means of its isolating characteristics: separating motives from motives, phrases from phrases, and movements from movements. Even the shortest silence has significance in that it clarifies ideas in a context. Hence phrasing is important in that it can either distort or enhance musical meaning.
Let us study an example: Beethoven - Sonata, Op. 106, 1st movement, mm 134-148 to study this isolation characteristic and its twofold action.



Sound and Silence

Meaning

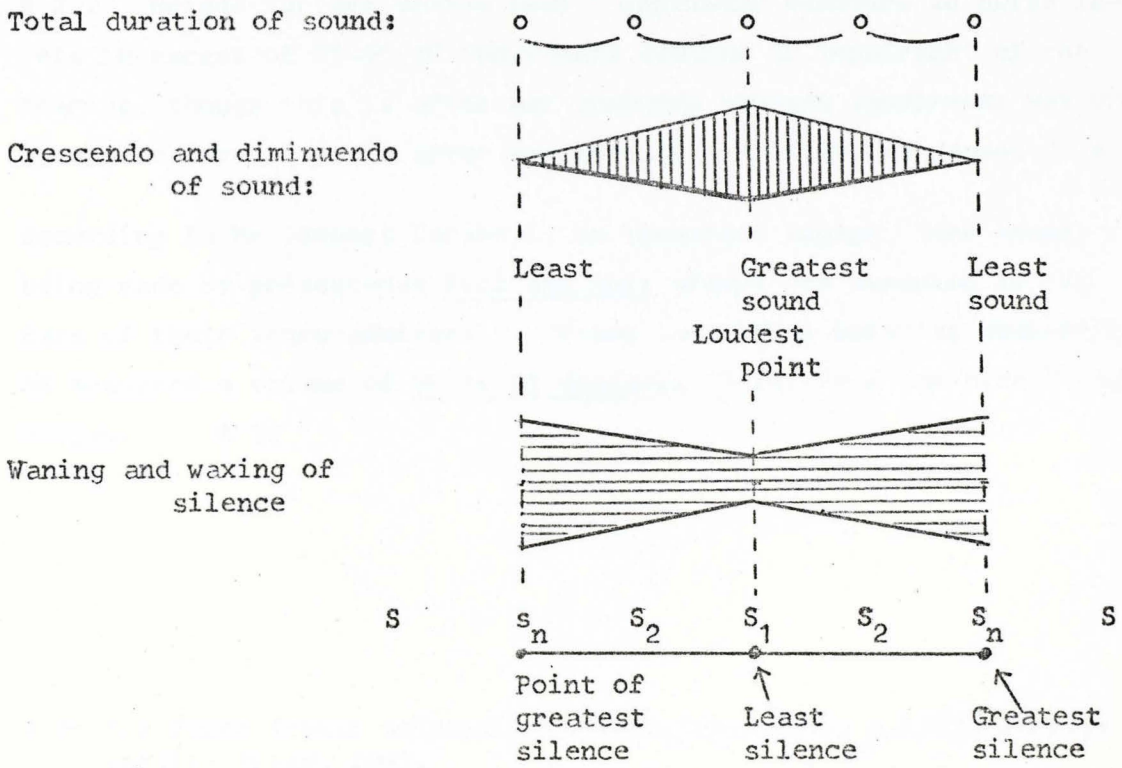
In the first example, above, we see the twofold action in that attention is drawn to the motive and that expectancy is created by the silences. Also by drawing attention to the motif, the development is effectively introduced.

In the bottom example we have maintained the motif intact, but reduced the duration of the silences. From this it can be seen that the durations as given by Beethoven are essential to the meaning and dramatic impact. Hence the duration of silences is important to achieve proper expression of the music.

These durations cannot be altered without destroying the quality of the music and its particular meaning. A similar example is mm. 1-15 of Op. 57, 1st movement by Beethoven. In these specific cases, it would seem that a greater silence is more significant and effective than a lesser silence.

Silence in Sound

It would seem that the order relations of silence are welded to context, especially when quantity (loudness-value) and timbre are considered. An illustrative example of this is the following: ✱ 1



✱ 1: cf. p.68.

Sound and Silence

Silence in Sound

From this we see that when a sound increases in quantity, it decreases correspondingly in silence. We have the following relations: $S > S_n > S_2 > S_1$ / such that $S_1 \neq 0$ and S_1 will correspond to the loudest point in any particular series. S_n represents the softest point.

The point, S_0, which will hardly ever occur in music, corresponds to the largest amount of sound which we can possibly hear. This is called the threshold of pain.

"If we continually supply more and more energy to a source of sound as,for instance,by beating a gong harder and harder - the sound will get louder and louder and, in time, we shall find it becoming too loud for pleasure. At first it is merely disagreeable, but from being disagreeable it soon passes to being uncomfortable. Finally the vibrations set up in our ear drums and inner ear may become so violent as to give us acute pain, and possibly injure our ears ".* 1

G.A. Briggs says: "continued exposure to noise having a level greater than 85dB is likely to lead to a loss of hearing. Noise at 130dB upwards causes severe pain in the ear and, if prolonged, certain damage." * 2 . Briggs further states that " prolonged exposure to noise levels in excess of 85-95 dB inevitably results in impairment of the hearing, though this is often not realised because impairment may only appear several years after exposure to the noise has ceased ". * 3

According to Mr Robert Larabell, an acoustics expert, "the sounds being made by present-day Rock and Roll groups are damaging to the ears of their young admirers ". "Using industrial metering equipment, he measured a volume of 90 to 95 decibels 20 ft. from one band," states Briggs. * 5.

* 1: Sir James Jeans: Science and Music, Chapter 7, p.226;Cambridge University Press, 1947.

* 2: G.A. Briggs: About your Hearing, Chapter 7 - Noise, p. 81

* 3: Ibid, p. 83

* 4: Ibid, p. 83

Sound and Silence

Silence in Sound.

It is important to realise that "noise levels much above 130 dB become a danger to the body even if the ears are adequately protected and at levels in the region of 150 dB can cause disintegration of the body tissue ". As a matter of fact "noise levels above 150dB produce fatique failure in highly stressed metal sheet ".* 1.

Hence we define S_o to mean the threshold of pain with reference to any specific pitch. ("The intensity of sound at the threshold of hearing, and also the range above the threshold which we can endure without due discomfort, both vary greatly with the pitch of the sound, but their sum, which fixes a sort of threshold of pain, varies much less. Throughout the greater part of the range used in music, the intensity at this threshold is given by a pressure of about 600 bars, except that it falls to about 200 bars in the region of maximum sensitivity".) * 2.

Consequently at this point of S_0, silence is completely absent(silence is zero) and sound is at its maximum . Hence we may conclude that extreme loudness is most unpleasant and so is complete absence of silence (with reference to quantity of sound).

It is, however, obvious that the question of least or greater silence largely depends on context: it depends on what we wish to express. If we are trying to give the audience actual physical discomfort, then S_0 is more significant than S_n . If we do not intend this, then silences between S_n and S_1, would be more significant than S_0.

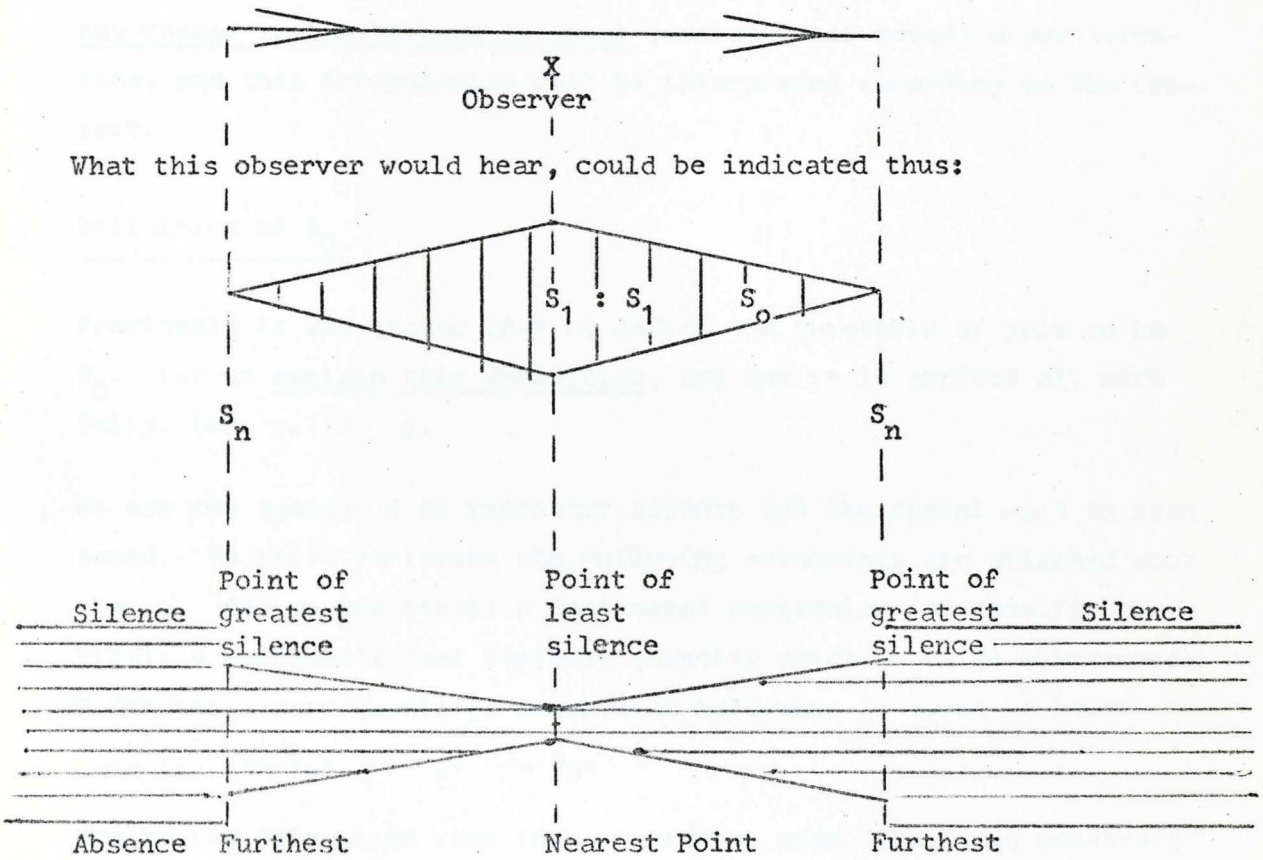
* 1: Ibid, p. 87 - Published by Rank Wharfedale Limited, First edition, May 1967.

* 2: Science and Music, Jeans, p. 226-227.

Sound and Silence

Silence in Sound

Let us take another example. Let us assume that an object which emits a sound, appears, moves past a stationary observer and then disappears again such that its approach and its disappearance are marked by silence. We can illustrate this as follows:



This diagram indicates that the greater the silence the further away is the object, and the lesser the silence the nearer is such an object. Diminishing of silence indicates approach, and the increase of silence indicates removal. Complete silence would coincide with absence of the object.

Sound and Silence

Silence in Sound

If we assume this moving object to be some form of satellite in a constant orbit, then the interval of silence (absence of the satellite) until the point when sound reappears, would indicate the extent of its orbit. Any change in this silence pattern would be noted at once, and such an irregularity would be interpreted, for instance, as a change in direction, or an increase in the circumference of its orbit, or even as a slackening of the speed of the satellite.

Any change in the silence interval (inclusive of sound) draws attention, and this irregularity will be interpreted according to its context.

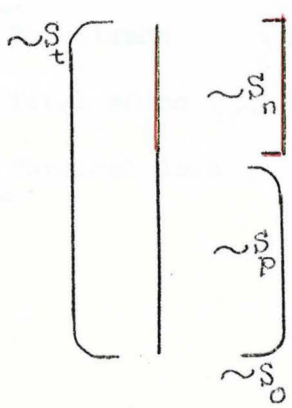
Definition of S_0

Previously it was stated that we define the threshold of pain to be S_0. Let us explain this definition, and how it is arrived at, more fully. (cf. p. 72).

We use the symbol S to represent silence and the symbol $\sim$ S to mean sound. To these variables the following subscripts are attached such that t designates total: p designates particular (or spesific quantity): n represents that variable quantity which is to be subtracted: 0 denotes a zero quantity. Hence with reference to sound we have:

$\sim S_t$, $\sim S_n$, $\sim S_p$, $\sim S_0$.

Now having determined what these variables mean herein, we construct the following diagram:



The symbol, $\sim S_t$, is the whole of any quantity of sound such that it is meant to signify the threshold of pain. The actual (or particular sound heard is represented by $\sim S_p$. This means that $\sim S_p = \sim S_t + (- \sim S_n)$, i.e. the additive inverse.

Hence any particular quantity of sound heard ($\sim S_p$) means that some other quantity has been subtracted from the total sound ($\sim S_t$).

Sound and Silence

Definition of S_0

These symbols enable us to make a few deductions.

Since $\sim S_t$ means total sound, then S_0 denotes no silence.

Hence $\sim S_t = S_0$

Now we can reason : $S_0 + (- \sim S_n) = S_0 + S_n$

$= \sim S_p$ /i.e. $\sim S_n$ amount of sound is absent. Hence $\sim S_n$ is silent.

We can also state: $S_0 + S_p = \sim S_n$ / $\sim S_p$ is absent - not heard.

Further we can deduce that when

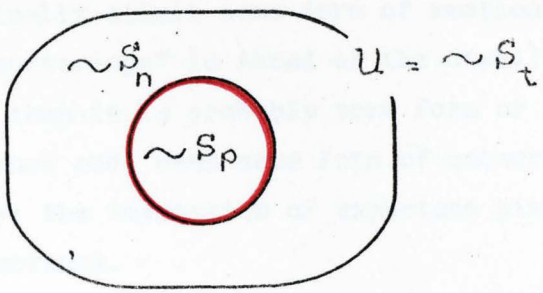
$\sim S_t = \emptyset$

(i.e. this is when $\sim S_t = -(\sim S_t)$

$= S_0$

Hence when $\sim S_t = \emptyset$, then $S = U$, because $\sim S_t$ is absent.

The Venn diagram below gives the above facts pictorially.



Now we wish to summarise what we have found as follows:

No silence	S_0	Total silence	S_t
Total sound	$\sim S_t$	No sound	$\sim S_0$
Physical pain	⟷	Emotional pain (absence/removal/desertion)	

Sound and Silence

Definition of S_0

The whole gamut of emotions employed in music lies between these two poles: between anti-silence and silence.

Any specific colour or timbre in music may be considered similarly. This may be done by substituting the harmonics to be subtracted as $\sim S_n$ and the sound achieved (or heard) as $\sim S_p$. This shows that colour (any colour) has silence in it. As seen from all the above, music consists of a judicious mixture of sound and silence such that this can be expressed in set notation as: $M = \{S, \sim S\}$, i.e. silence and sound is a subset of the set of music where music is the universe of ordered musical sound (composition). Hence silence as such is only one proper subset of music. ✱ 1.

Emotion and Silence

Referring once more to the Cage composition, it is stated that "the Woodstock audience considered the piece either as a joke or an affront, and this has been the general reaction of most people who have heard it, or heard of it, ever since". ✱ 2. These words imply that silence, by itself, does actually elicit some form of emotion. (Notice, too, the words: "perplexed mutterings" in Ahead of the Game.) ✱ 3. If there are emotions in 4'33", then it is probably some form of jovial lightheartedness, slight annoyance and, even some form of embarrassment due to the inverted expectancy: the impression of expectant piano music and the denial of this expectancy.

✱ 1: This is where Cage has also erred, since he has elevated this single set to represent music. Also $M = \{S, \sim S\}$ and N (nature) $= \{\sim S\}$, then $N \subset M$, but Cage assumes : $M \subset N$, which is false according to his own premises : "there is no silence in nature" and "silence in music are sounds not intended."

✱2: One of my students performed this piece at the Worcester Eisteddfod in May, 1972, and the audience reaction was as described above.

✱ 3: Calvin Tomkins: Ahead of the Game, p. 115. Ibid p. 115.

Sound and Silence

Emotion and Silence

Let us therefore investigate the question of emotion and silence. This can best be studied by observing infants before they have become conditioned. In this connection we will particularly examine the effects of S_0 (as far as this is possible) and S_t, i.e. Loud sounds and silence. It has already been found that loud sounds (S_0) cause physical pain.(Cf Silence in Sound, p.71). Now according to John B. Watson, leader of the psychological Behaviorist School, "the fear reaction marked by giving a start, catching the breath, crying, and clutching with the hands was provoked by loud noises or loss of support".* 1.

William Sargant says: "It should be more widely known that electrical recording of the human brain show that it is particularly sensitive to rhythmic stimulation by percussion and bright lights among other things and certain rates of rhythm can build up recordable abnormalities of brain function and explosive states of tension sufficient even to produce convulsive fits in predisposed subjects". * 2

We also quote the following from Sargant: "Rhythmic drumming is found in the ceremonies of many primitive religions all over the world. The accompanying excitement and dancing is also maintained until the same point of physical and emotional collapse has been reached". * 3

The Voodoo cult in Haiti shows with what ease suggestibility can be increased by subjecting the brain to severe physiological stresses". * 4

* 1: S. Stanfiel Sargent: The Basic Teachings of the Great Psychologists, Chapter 6, p. 84.

* 2: William Sargant: Battle for the Mind, Chapter 5, p. 92; Pan Books 7th printing, 1970.

* 3: Ibid, p. 92.

* 4: Ibid, p. 93.

Emotion and Silence

In these above instances it is shown how loud drumming can induce suggestibility and a state of physical collapse,after which new behaviour patterns can be implanted in the subject. Hence loudness can be employed as a means of brain washing.

How a Child interprets Silence

There are two things which are parallel to a child's interpretation of silence: silence in a quantity (or a colour) indicates an absence of some quantity (or colour) and total loudness indicates an absence of silence, Secondly we found that when considering a movable sounding object various points of removal are located and that complete removal (or absence) - hence silence - arouses emotional pain. Now, silence to the child creates anxiety, uncertainty and the fear of desertion and loneliness. Consequently it cries. This cry, however, is immediately rewarded by attention to its needs. *1.If, however, the mother remains silent longer than expected, this becomes all-important to the infant. Grown-ups are not better: couples in love,for instance, where letters do not arrive regularly, will interpret such silence as diminishing love or desertion.

So it appears from these observations that any irregularity of a conditioned pattern - such as a greater silence than that which is normally expected, arouses uncertainty and anxiety. (cf Silence in sound p.74). Hence silence underlines some event or gives importance to the event.

* 1: "Crying as such very shortly becomes conditioned. The child quickly learns that it can control the responses of nurse, parents and attendants, by the cry and uses it as a weapon ever thereafter". John B. Watson:
Behaviorism, p. 91 Published by Kegan Paul, Trench, Trubner, 1925.

Sound and Silence

Emotion and Silence

This irregularity of the silence pattern has been investigated by Pavlov. "A hungry dog might be conditioned to receive food, say, five seconds after the warning signal. Pavlov would then greatly prolong the period between a signal and the giving of food. Signs of unrest and abnormal behaviour might become immediately evident in the less stable of his dogs. He found, in fact, that the dogs' brains revolted against any abnormal prolongation of waiting under stress; breakdown occurred when a dog had to exert very strong or very protracted inhibition. (Human beings, too, often find prolonged periods of anxious waiting for an event more trying than when it finally comes.)" * 1.

The interpretation of Silence of an Infant

"A major infant activity is vocalization. From the "birth cry", when breathing begins, a baby cries when he is hungry, or otherwise uncomfortable ".* 2. Hence silence to the mother indicates that her child is satisfied and in a state of physical well-being. The child's silence therefore, means fulfilment of its needs. Elsewhere we have stated that silence concludes sound. (cf. Silence in sound, p. 67) With reference to an infant we can state the chain of events thus:

Need ——————> Crying ——> Fulfilment ——> Silence.
Physical or emotional — of need

In this case silence draws attention to itself. Similar to this is the case of a couple who are in love and who would for long moments rapturously gaze into each others eyes without as much as a word. This, too, indicates fulfilment.

* 1: William Sargant: Battle for the Mind: p. 27

* 2: S. Stansfield Sargant: Principles of the Great Psychologists; p. 85.

Sound and Silence

Emotion and Silence

Hence silence in the case of the mother/infant relationship means either fulfilment/happiness or else emotional pain. This same state of affairs is true of the youth/maiden relationship. This shows that silence must be interpreted according to its particular context. We also found that order relations are to be similarly considered. (cf. Silence in sound, p. 73) Above all, silence indicates two important things: meaning and emotion. It is a form of communication.

Notation

Silence is such an important element of music that a whole array of symbolical signs has been invented to express its various durations. There are the set of staccato signs, the set of phrasing signs and the set of the various rests. Music is the only art which tries to express silence durationally exact. Poetry and drama use various forms of punctuation to indicate silences. Some modern poets even use blank spaces between words, or groups of words to indicate greater or lesser silences. However, in these arts these durations are finally determined by the interpreter and not the author. An example of silent spacing in poetry is the following:

"val

val

val

die$_{blom}$

die byl

die$_{kind}$ ✱ 1.

Herfsblare eet ek in herfskleure blind

✱ 1: Cromwell Everson: Ontbrandingspunt - derde hanekraai.

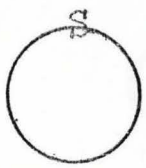
Sound and Silence

Definitions

The preceding investigations have equipped us with the necessary facts to formulate definitions. To attempt any definition of something it is first of all necessary to list all the elements of the set under consideration. Statistically stated, we must first assemble all data ere drawing conclusions. Hence definition must always be the result of investigation and not vice versa. If this is not the case, then our preconceived definition (or notion) is bound to influence investigation,so that such investigation will be severely, or even possibly,be invalidated.

"In forming definitions, we must be careful about a few matters, if we are to do anything useful. In the first place, we must make sure that our definition is meaningful and consistent." ✱ 1.

"Further, when we formulate a definition, we always have something in mind which we are trying to describe, and we must make certain that our definition includes all cases which we have in mind and excludes all others". ✱ 2. For instance,if we take the definition: silence is "absence of sound or speech". at face value, then we have excluded the cases of: in some silence there is sound - and, in some sound there is silence. ✱ 3



Absence of sound

$\sim S = \emptyset$



In some silence there is sound

$\sim S \subset S$



In some sound there is silence

$S \subset \sim S$

✱ 1: Allendoerfer and Oakley: Principles of mathematics, 3rd ed. p. 5.

✱ 2: Ibid p. 5.

✱ 3: Chamber's Twentieth Century Dictionary.

Sound and Silence

Definitions

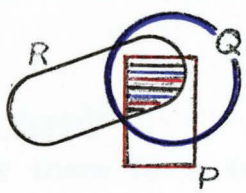
The dictionary definition above seems to mean the absence of all sound (fig 1.), but we have found in our analysis that there can be silence while there is sound - for instance a fugal exposition, or an instrumental colour, etc. Further, in this def., the term "sound" is assumed to be known. But what is sound? We cannot merely accept this intuitively, as we have already seen that to measure the duration of silence, sound is a very necessary prerequisite. (cf. p. 6 al 3)

Percy A. Scholes says: "sound is due to the vibrations of a source, such as a musical instrument, which are transmitted through the air and which set the ear-drums in vibration at the same rate". ✱ 1.

We can set the above out as follows:

Oscillator (application of force)	Air transmission of oscillation	Ear-drums reception of oscillation
⇓	⇓	⇓
oscillation	oscillation	oscillation

To clarify this, we give the following Venn diagram.



Symbology:
P = oscillator
Q = air
R = ear-drums.

The area of intersection is coloured in all three colours.

✱ 1. Percy A. Scholes: The Concise Oxford Dictionary of Music, 2nd ed., 1964.

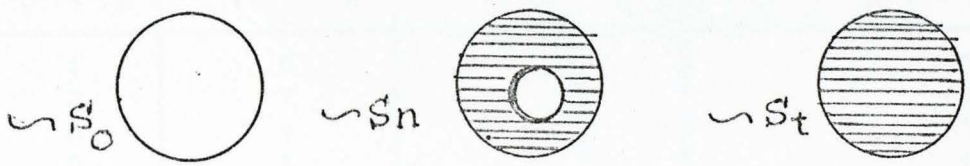
Sound and Silence

Definitions

This shows us that sound is : $P \cap Q \cap R$ = oscillation. Hence there is sound, if and only if there is oscillation of all three subsets. And there will be silence if anyone of the subsets, P,Q,R, are absent.

Let us state $P \cap Q \cap R$ to be simply pqr, then we give sound this meaning: $pqr \longleftrightarrow \sim S$ of which the negation is:
$pqr \longleftrightarrow S$ or $\sim pqr \longleftrightarrow \sim S$. ✱1

However, we should not be too hasty to drive a conclusion that either of these two negations mean silence in all respects. Scholes's definition refers to a single sound source, and there are cases where more than one oscillator is employed - for instance 1st and 2nd violins, etc. Such oscillators can give us: $\sim S_0$ or $\sim S_n$ or $\sim S_t$ (cf. p. 63) due to such things as being in-phase or out of phase and the various other variables. There are actually only these three cases of sound or silence.



So bearing this in mind, let us attempt a definition with reference to a.f.

Definition of Sound:

If and only if there is an intersection between some or all oscillators of the same or different wave-form, and air and ear-drums, such that intersection is some or all oscillation and its amplitude is not zero, then there is sound of the same or different wave-form.
We can simplify this proposition by simply stating that sound is the presence of all sound or some sound which proposition is equivalent to: sound is the negation of all silence and some silence bearing in mind what sound is defined to be in the full definition.

✱1: Allendoerfer and Oakley:
Principles of mathematics, p 37, 3rd ed.

Sound and Silence

Definition of Silence

With reference to the full definition of sound, we can state silence to be the negation of some sound and all sound which is equivalent to the proposition: silence is the presence of some silence or all silence. Logically we can express this:

$$\sim(\sim S_n \wedge \sim S_t) \longleftrightarrow S_n \vee S_t$$

This proposition is a tautology so that it is completely valid as the following truth table proves. ✱ 1

S_t	S_n	$\sim S_t$	$\sim S_n$	$(\sim S_t \wedge \sim S_n)$	$\sim(\sim S_t \wedge \sim S_n)$	$S_t \vee S_n$	$\sim(\sim S_t \wedge \sim S_n) \longleftrightarrow S_t \vee S_n$
1	1	0	0	0	1	1	1
1	0	0	1	0	1	1	1
0	1	1	0	0	1	1	1
0	0	1	1	1	0	0	1 ✱ 2

Making use of this table let us construct the tables for sound.

$S_t \wedge S_n$	$\sim(S_t \wedge S_n)$	$\sim S_t \vee \sim S_n$	$\sim(S_t \wedge S_n) \longleftrightarrow \sim(S_t \vee \sim S_n$
1	0	0	1
0	1	1	1
0	1	1	1
0	1	1	1

This similarly is a tautology so that this is valid for sound.
When these two tables are compared it can be seen that (columns 6 and 7 in the first table and columns 2 and 3 in the second table) silence is not, as is generally supposed to be the case, a negation of sound.✱ 3

✱ 1: To state all the variables in a proposition would entail a complicated and very lengthy definition which would defeat the object of simplicity and the understanding of such a definition. Note we have chosen $\sim S$ to represent sound and S to mean silence. Logically p and q are usually used.

✱ 2: In logic the letters T and F are used to mean true or false. The 1 and 0 employed here mean the same thing: 1 is true and 0 false. These are Boolean Symbols.

✱ 3: "Set A and set B are disjoint sets if $A \cap B = \emptyset$." (Patrick Murphy and Albert F. Kempf: The New Mathematics - Made Simple Books, W.H. Allen, 1st ed., reprint, 1970). Hence since silence and sound have both of them duration, $S \cap \sim S = \emptyset$. Therefore the one is not a negation of the other. P.11 in the above book.

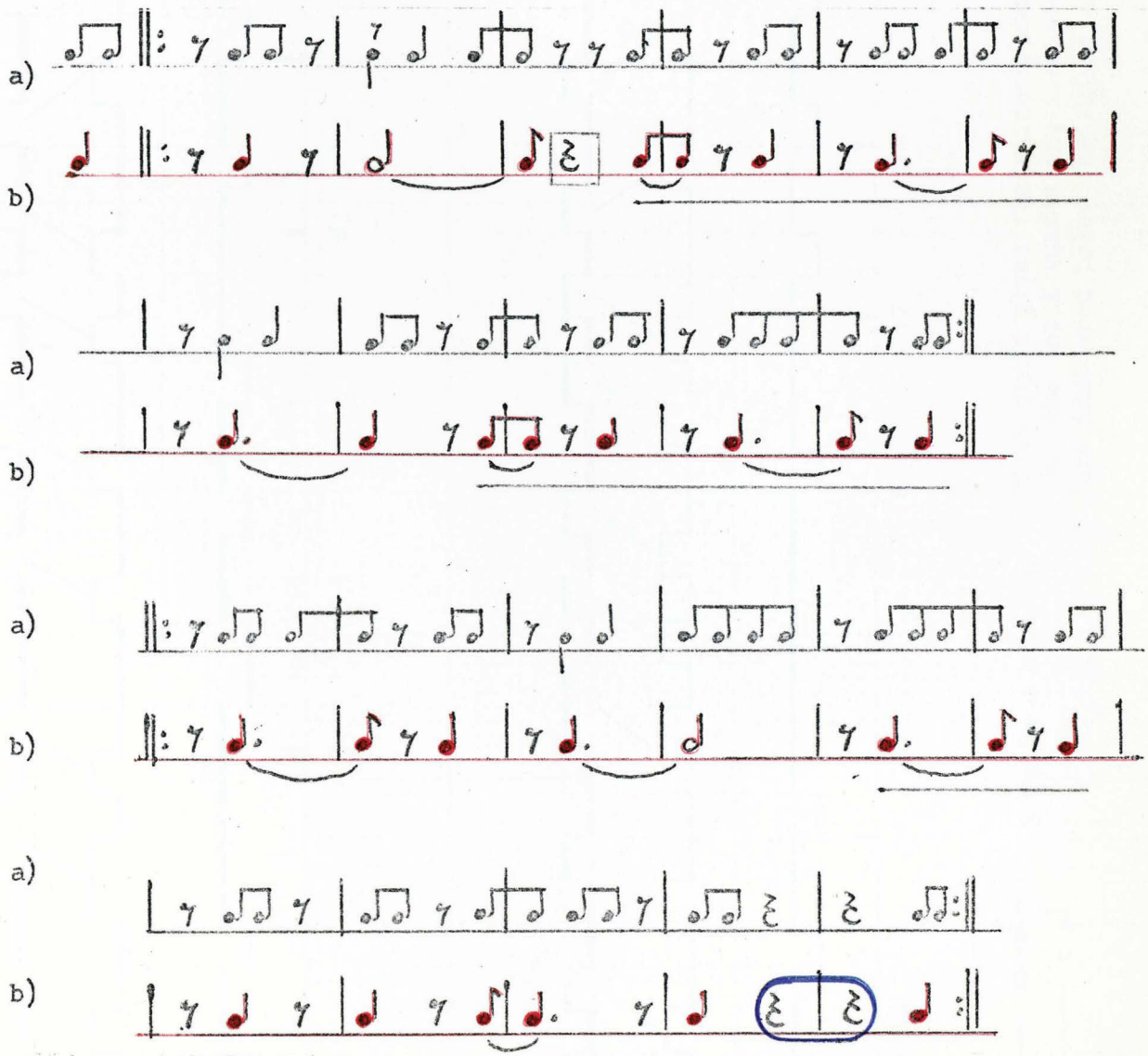
9

Analysis of Op. 27

Silence / Sound Patterns

As the graphs given in this section indicate, the relationship, silence/sound, is important in these variations. By the term, silence/sound, is meant the summations of sound durations and the summation of silence durations. For instance,two crotchets followed by two crotchet rests and another two crotchet notes, would have the following sound/silence values: a summation of a minim sound, a summation of a minim silence and a summation of a minim sound, i.e. the summation of note-values until a point of silence and silence summation are all rests until sound is resumed.

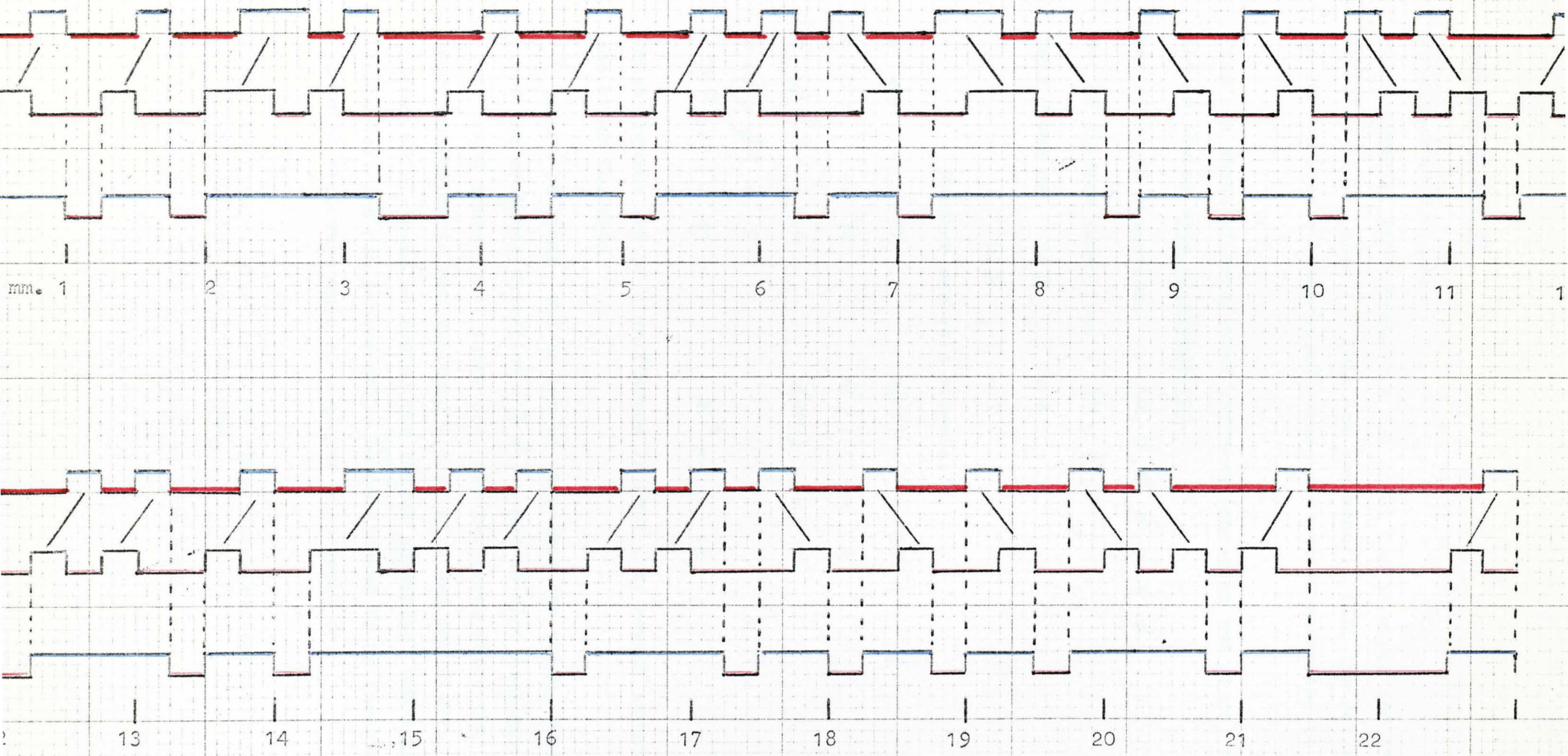
Let us examine the note-values and rests, ignoring for the moment pitch and dynamics in this second movement of Op. 27.



a) indicates the note patterns as they occur in the score.
b) is the summation Σ of the sound durations and the Σ of the silence durations as explained above. By means of the blue lines attention is drawn to certain structural similarities.

SILENCE/SOUND SUMMATIONS

GRAPH 1



ele: —— = ♪

—— = ♩

3 Units = a quaver

This graph gives the silence/sound summations of each of the two parts (a and b) and the total summation, i.e. when the parts are heard together (c). The measures are indicated below the summations.

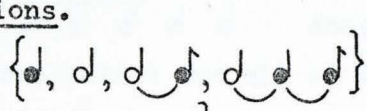
98

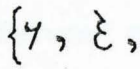
Analysis of Op. 27

Silence /sound patterns

These sound/silence summations (as at b) can be expressed graphically as in Graph 1. This has the benefit that the relations of the various silence/sound values are stated according to a scale.

From the above silence/sound patterns (notation and graph) we derive the following sets of summations.

Set of sound summations = $\{$  $\}$

Set of silence summations = $\{$  $\}$

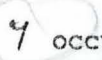
This gives us $n(\Sigma_{\sim s}) = 4$

$n(\Sigma_{s}) = 3$

Further analysis reveals:

n ()	= 27	n()	= 38	✱
n ()	= 10	n()	= 2	
n ()	= 4	n()	= 2	
n ()	= 2			✱ 1
$\Sigma_{1}^{4}\sim s$	= 43	$\Sigma_{1}^{3} s$	= 42	

These figures are of significance in that they reveal structural and other features.

 occurs 38 times, and as can be seen from the graph, mostly isolates the crotchet summation (Σ), but it also isolates most of the other sound summations: there are only two cases where the  silence summation is not employed - e.g. m. 3 and mm. 21-22. It is, however mainly used to define the lesser segments: the 2-note,4-note and 6-note sets and can consequently be considered to be integrated into the sound structure much as a quaver note would be.

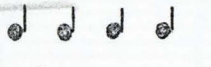
✱ 1: The figures given here are those when the repetitions of the two sections are considered.

✱ This expression is defined on page 39n.

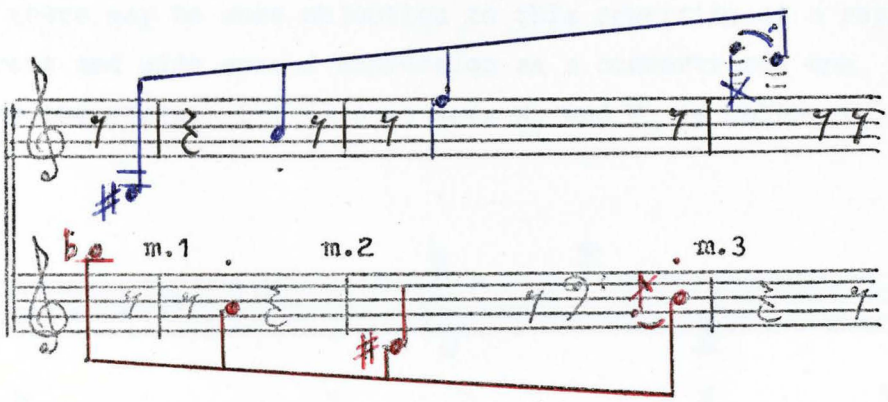
Analysis of Op. 27

Silence/sound patterns

It does not assist us in defining form or the larger segments (phrases and sentences, etc.) Hence other silence values are necessary to define these.

In this connection we could state that dissimilarity is essential for definition of different entities. For instance, in general, a series of pulses such as :  does not name any particular time period, if these pulses are all of similar strength. If however, we differentiate between these pulses, thus:  2-time is defined, and if we sound them thus:  3-time is defined.

The  -silence summation in m.3 draws attention, because it is irregular in a field of -silences. This crotchet silence divides the first three measures from what follows. Previously it was stated that a specific meaning depends on silences and where the silence is placed (cf. Sound and Silence: Meaning, p. 69). Let us therefore, investigate the first three measures to ascertain why they have been divided from the rest of the context, and if this can give us a clue to the structure of the movement.

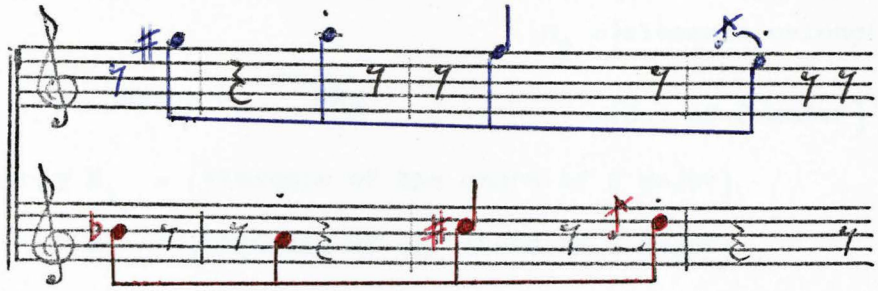


(As can be seen the two canonic parts are maintained separately in blue and red. These are the first five notes of the row and its inversion.)

When, however, this is rewritten so as to dispense with the wide intervals and each of these two parts are within an octave, we have:

Analysis of Op. 27

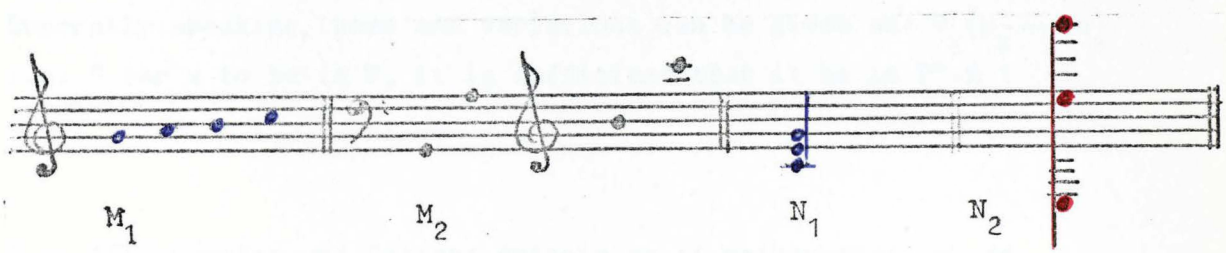
Silence/sound patterns



This gives us a 4-note segment which clearly has diatonic and harmonic implications. As a matter of fact the top part could be stated to be in C major and the bottom part (in red) may be said to be in D major. The two parts considered together are an example of bitonality.

Comparing the two versions, it can be seen that when intervals are reduced (as in the 2nd example), relationships between notes are more easily ascertained. Wide spaced intervals, on the other hand, considerably reduce tonal recognition of a theme as the top example shows. On account of this, wide registral placing of notes must play an important part in the technique of twelve-tone music.

Since there may be some objection to this rewriting of a registrally different and wide spaced expression as a concertrated one, let us examine the facts. Let us have sets M_1 and M_2 as follows:



Analysis of Op. 27

Silence/sound patterns

Now, according to the language of sets, M_1 = {elements belonging to C major}

M_2 = {elements belonging to C major}

Hence $M_1 \frown M_2$ = {Set of C major}

Similarly N_1 = {elements of the chord of C major}

and N_2 = {elements of the chord of C major}.

Hence no matter what the registral differences are between two sets, if Set M_1 is tonal, then Set M_2 will be tonal as well, although, as pointed out, set M_2 is more difficult to recognise with reference to its tonality and relationships. Registral differences do not change a tonality to an atonality, but do minimise recognition of tonality.

In the Webern example under analysis, the 4-note segment above contains the following diatonic elements: a chromatic note, an ornamental note belonging to the row and which cancels the chromatic note, and secondly by being ornamental, does not make the theme lose its identity or tonality. With reference to the part in red, the C-sharp is the most important note due to beat-position, length and dynamics. It has a feminine-like resolution on to the D, and the silence isolates these four notes from the following measures.

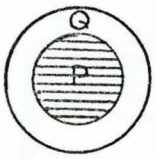
However, since this work is named "Variations" this particular segment should have some similarity elsewhere in the other movements. Generally speaking, theme and variations can be given as: $\forall_x (p_x \longrightarrow q)_x$ i.e. " for x to be in Q, it is sufficient that it be in P". ✱ 1

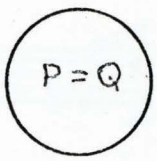
✱ 1: Allendoerfer and Oakley: Principles of mathematics, p. 44, 3rd ed.

Analysis of Op. 27

Silence/sound patterns.

This can be given by the Venn diagrams.





Venn diagram for $P \subseteq Q$

A theme and variations can, too, be considered as a topological transformation. This is actually but another way of stating $P \subseteq Q$.

In a topological transformation, we observe the following facts:

"(a) continuity is preserved;

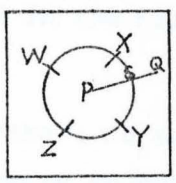
(b) inner regions remain inner regions (the point P confirms this):

(c) outer regions remain outer regions (the point Q confirms this);

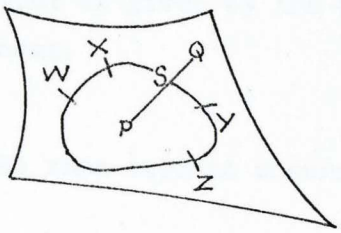
(d) intersection points are preserved (the point S confirms this);

(e) the order of points on a curve is preserved (W,X,Y and Z in that order).

Notice also that S remains between X and Y as well as P and Q. All these are invariants and a transformation which has these invariant properties is called a topological transformation." ✱ 1



given figure.



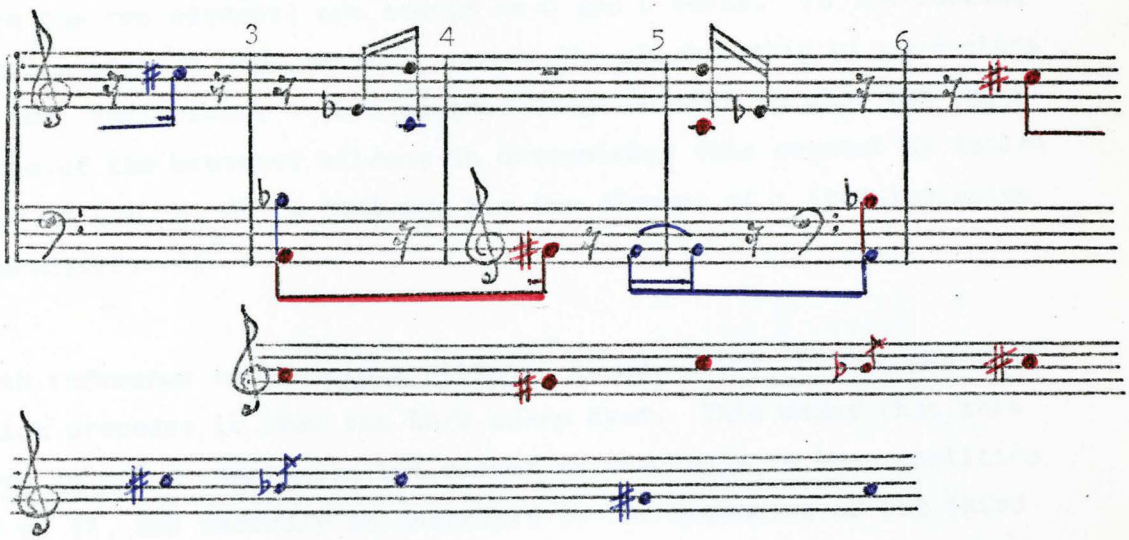
A topological transformation

In the Webern variations, first movement we note that the four segment appears thus(mm. 3-6):

✱ 1: Patrick Murphy and Albert F. Kemph: The new Mathematics, chap. 13, p. 288 1st ed, reprinted 1970. Made simple books published W.H. Allen, London.

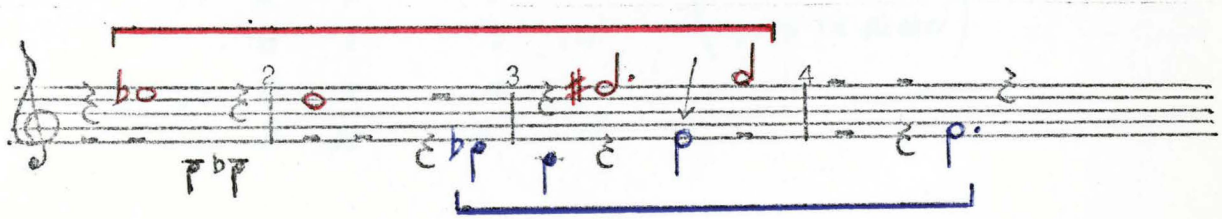
Analysis of Op. 27

Silence/sound patterns



Above we can see that the notes (in red) are similar, bar the transposition, to that on p.89 . This segment is given simultaneously with its reverse (in blue). This fact rules out the possibility of mere coincidence, and also thereby underlines this particular segment. Also note that in the 2nd movement the segment is given by the O and I forms, and in the first movement by O and R forms.

Further, to support the above view, the same segment occurs at the beginning of the third movement.



Analysis of Op. 27

Silence/sound patterns.

Here the two segments are stated as O and O forms. In the ensuing section of this work, we shall review the relationship of parameters in the variations, but at this stage we wish to show the importance of the crotchet silence in determining this segment by isolating it (cf. p. 68 - "Silence has the element of z (the isolation characteristic)".

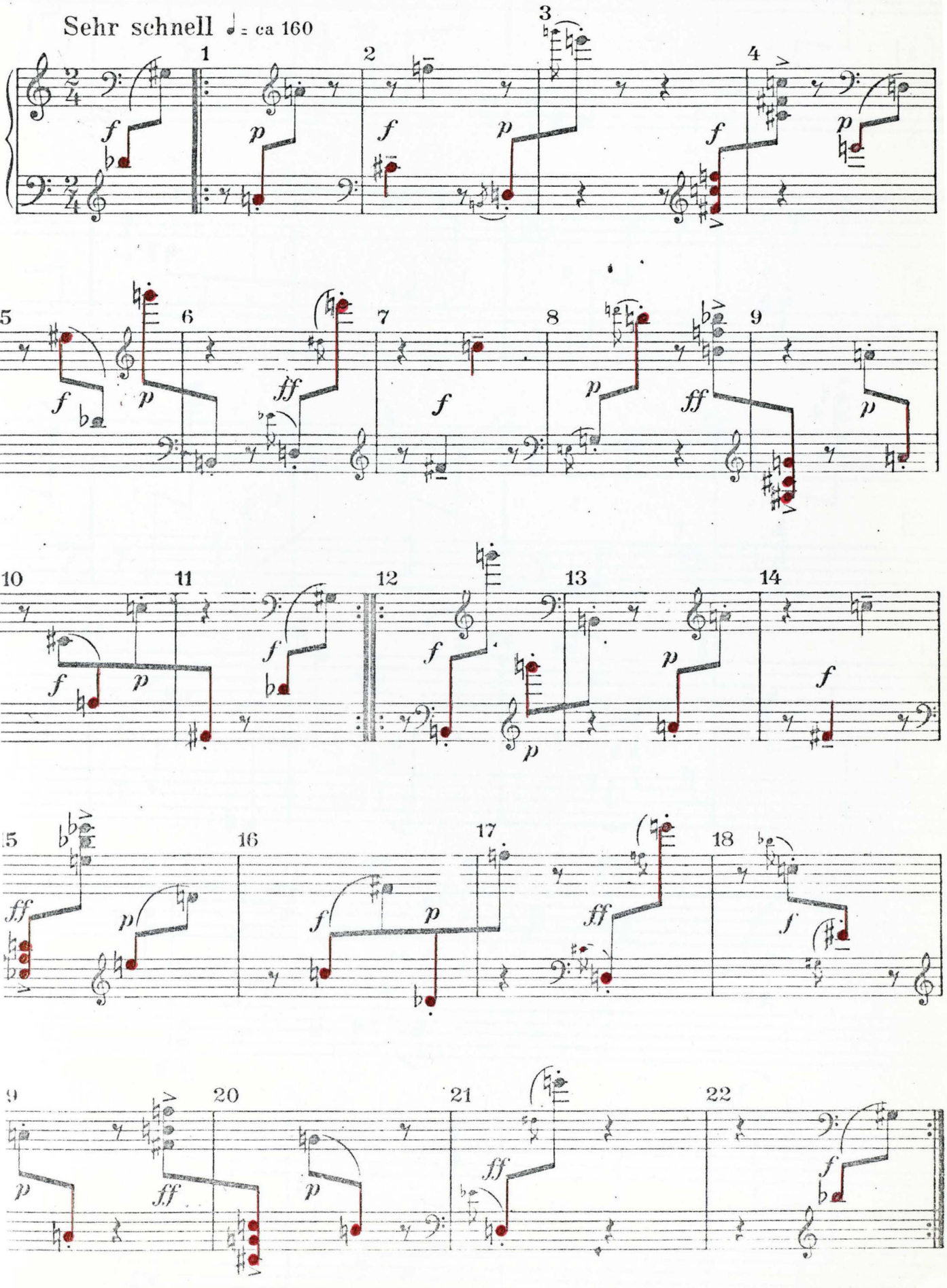
With reference to the minim silence in mm. 21-22, it divides that which precedes it from the Bb/G-sharp dyad. This means that this dyad is not a conclusion but rather an anacrusis to the repetition of m. 12, and secondly an anacrusis to the beginning of the third movement. But because it possesses symmetric properties it also connects the beginning to the end of sections 1 and 2 (of the second movement). Where the segment which precedes the minim silence commences, cannot be defined by means of silences as all the other silences are quavers.

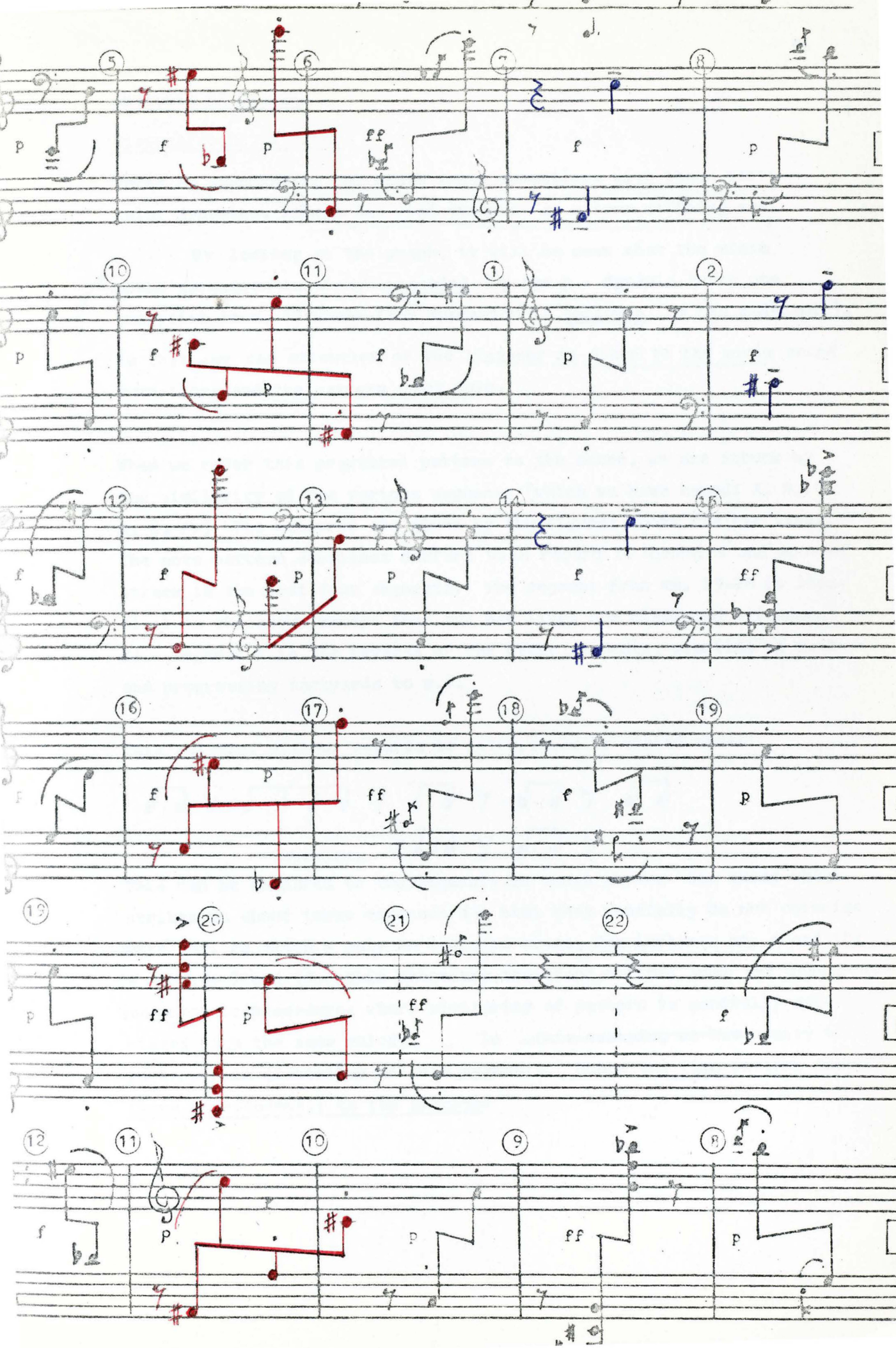
When we examine the sound/silence pattern (cf. 85) and the graph 1 and try to assess whether there are symmetries and similarities, we note that there are a few similarities (cf. p. 86 underlined in blue) and we also note that n (𝅗𝅥) = 10 which gives us some form of pattern. In graph 2, with ref. to this, we find that the 10 minim sound summations are arranged thus:

/:	𝅗𝅥	f	p	
	𝅗𝅥	f	p	:/
/:	𝅗𝅥	f	p	
	𝅗𝅥	ff	p	:/

(f: f is forte
p: p is piano)

II





Analysis of Op. 27

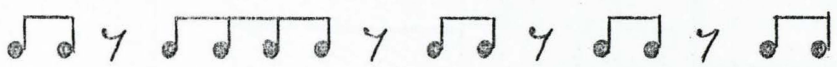
Silence/sound patterns

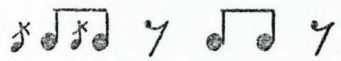
Hence by associating the minim sound summations with these particular dynamics, Webern has used dynamics as a form defining set.

By looking at the graph, it will be seen that the minim sound summation is always preceded by the p - dynamic (with one exception in m. 12 where this summation is followed by the p-dynamic). In this way the attention of the listener is drawn to the minim sound summations and the pattern they form.

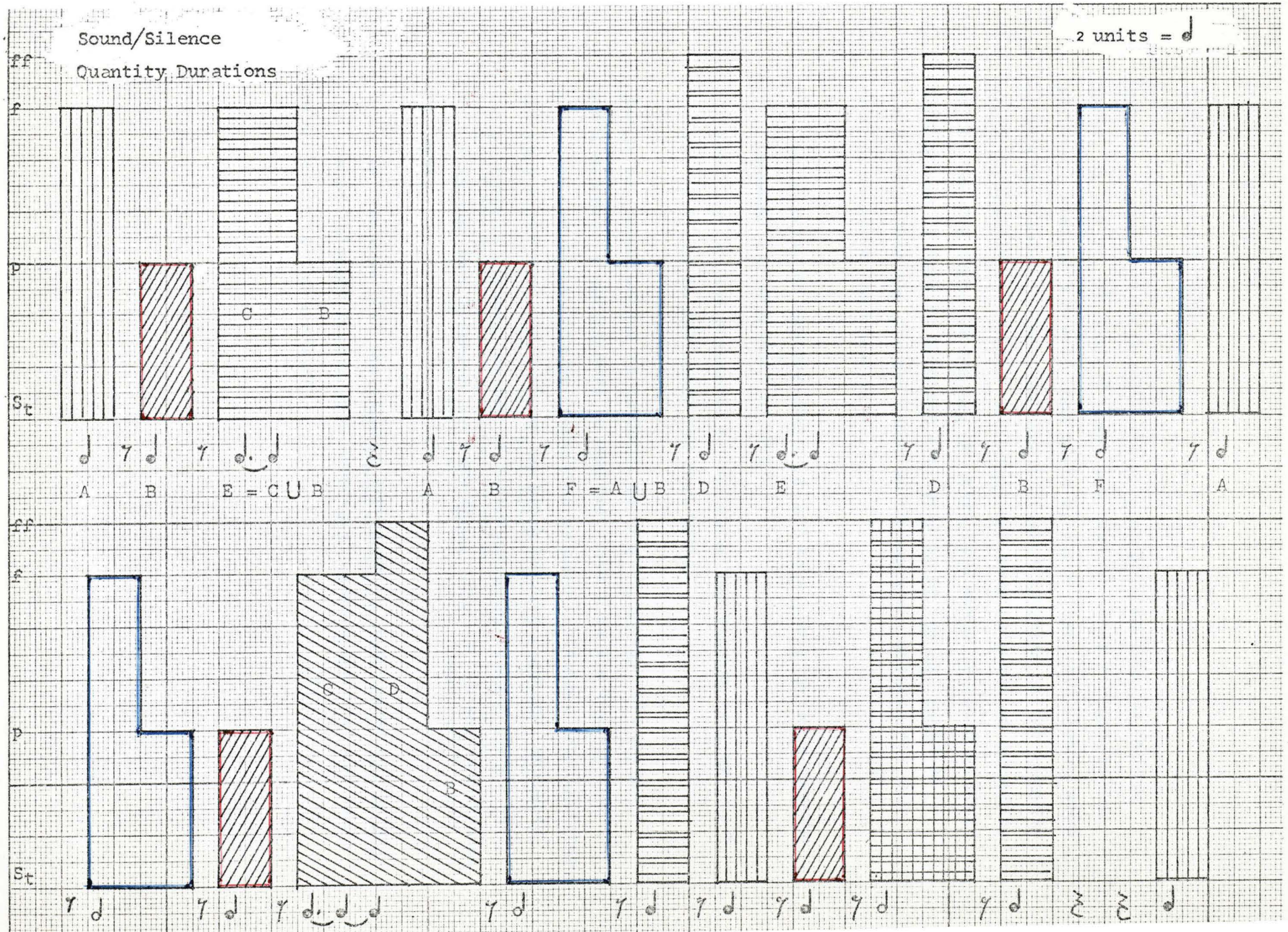
When we refer this graphical pattern to the score, we are struck by the similarity of the various segments (which we have named: A, B, C, D, E, F.) The measures are given by the figures above the bar lines. The note pattern sometimes differs with regard to dynamics and mode of attack in the first four segments. The segment from mm. 19-22 is identical to the above except that the bar lines are displaced - (segment E). Segment F is the reverse of the other segments, starting at m.12 and progressing backwards to m.8.

This pattern, without regards to pitch, could be stated thus:



sometimes 

This can be compared to the segments as shown above. One thing which strikes us about these segments is that they generally do not coincide with ref. to pitch - only in isolated cases, for instance mm. 4 and 15; 9 and 19; 7 and 14. This procedure therefore differs with the classical and romantic procedures where similarity of pattern is generally associated with the same melody. In this example, we have unity of pattern with dissimilar melodic segments. Hence the time pattern functions independently to the pitches.


Sound/Silence
Quantity Durations
2 units = ♩
ff
f
P
St
C
B
A B E = C ∪ B A B F = A ∪ B D E D B F A
C D
B

Analysis of Op. 27.

Silence/Sound patterns

Referring once more to graph 1, it will be noticed that in the two parts, a) and b), b) leads 8 times and then a) leads 7 times, followed by b) leading 9 times, then again a) for 5 times and closing with b) leading twice. This has been indicated by means of the diagonal black strokes on the graph. The graph has been constructed according to the two row forms (O and I), but when this music is heard no such distinction is made to maintain the identity of the two parts as can be seen from the printed score which has been coloured red and blue to preserve the row-forms.

1) The identity of the row-forms is not maintained by their canonic placement (as indicated in graph 1).

2) Identity is not preserved by registral positioning (cf. mm. 4, 8, 11, 15,17,18,20,22) where the rows cross.

Though the construction is canonic, as graph 1 shows, this structural element is not allowed to manifest itself to the listener as each part cannot clearly be identified by mere listening. For instance, the very first dyad, Bb/G-sharp, by being slurred together, connects the two canonic strands instead of differentiating between them. Also by having the same dynamics for each dyad, identity of the two strands is lost.

Hence we conclude that the canonic structure is independent of content. The canonic element exists as a structural element and does not manifest itself to the listener.

Analysis of Op. 27

Summary.

In the foregoing analysis we have shown that the sound/silence relationship is important, because it helps to determine the length of segments.

1.) Dissimilarity is essential for definition of different entities (cf. p. 88).

2.) The crotchet silence defined an important motivic segment which has been shown to also appear in the other movements.

3.) We have shown that registral differences do not alter a tonality (cf. 90)

4.) The minim sound summation is an element to create unity (cf.p. 93)

5.) The note-patterns give similar structural identities and different content.

6.) The canonic structure of the row-forms is independent of content.

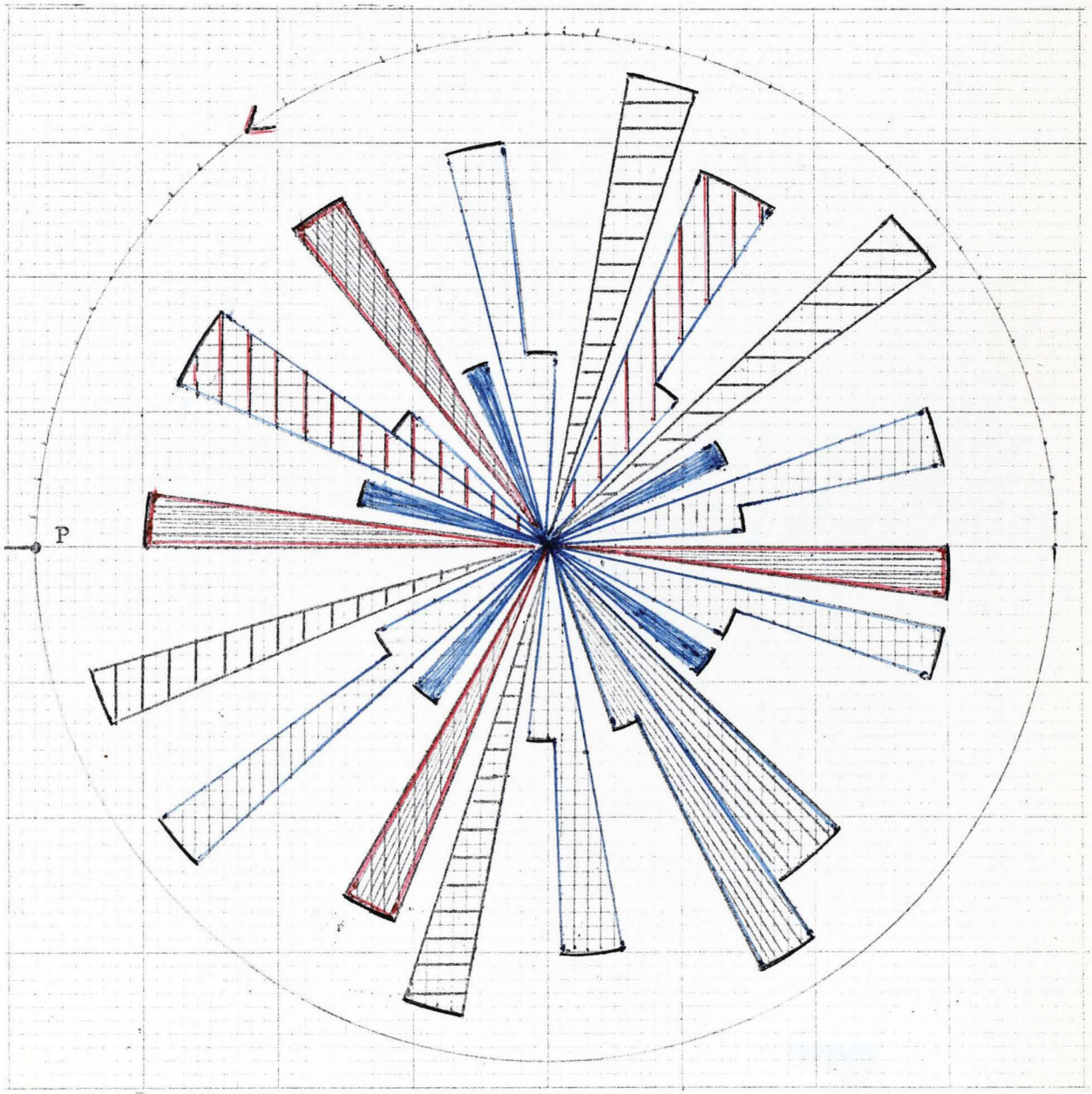
To determine structural features further we need other elements in addition to the sound/silence patterns.

Appended herewith is a circular graph, similar to graph 2. If the sound-hearing region is at point P on the outer circumference, and this graph is made to rotate in an anti-clockwise direction, the loudness-level can be judged by the distance from point, P. This also shows the sound/silence structure as a continuity.

Analysis of Op. 27

Silence/Sound patterns

Graph 3.



7

Analysis of Op. 27

Unity.

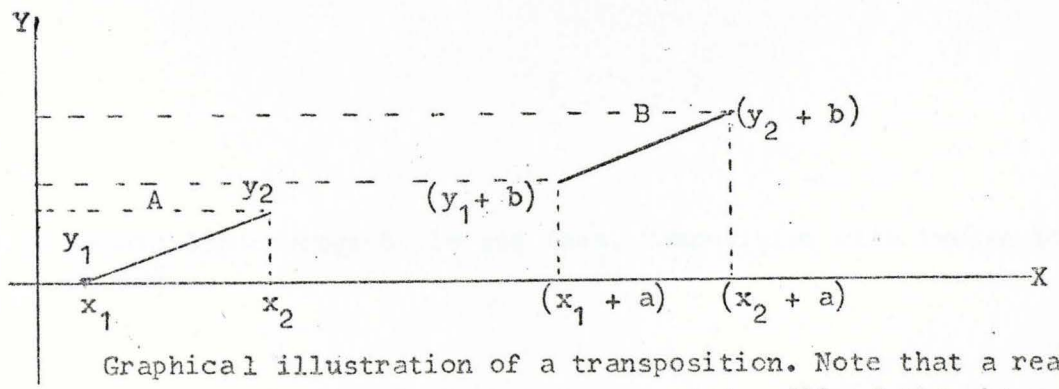
In the previous section, Silence/Sound patterns, we have shown the existence of similarities of patterns (cf. p.85) and similarities of motives (cf. pp. 88-92). We now wish to pursue this study of unity further with reference to twelve-tone music.

Generally (in classical and Romantic music, etc.) well-defined themes, or segments of themes are used to achieve unity by the devices of repetition or transposition. The fugal subject is a case in point, and so is the motive (e.g. in the 5th Symphony of Beethoven). In addition to this, a well-defined key is used. This key is dominant in a system of related keys. Hence repetition of theme and key is a prerequisite of unity. We may enlarge this concept to include any repetition or similarity in the set of Unity.

Let us define the terms: repetition, transposition and identity.
A repetition is a particular form of translation in which

$x' = x + a \qquad y' = y + b : b = 0$

A transposition is a translation in which $x' = x + a \quad y' = y + b$
An identity is a translation in which $A = \mathbb{I}$. Thus $x' = x + 0 \quad y' = y + 0$
All three of these are in the form, $x' = x + a \quad y' = y + b$ where a and b are variables having either a value of 0 or anything else.
It should be observed that a real sequence has the same equation as a transposition and a canon is a special case of repetition where another repetition begins ere the commencing identity has terminated. (cf. String Quartet, Op. 28: 1st Movement, p. 212)



Graphical illustration of a transposition. Note that a real sequence is identical to a transposition. All of the above-mentioned belong to the family: Repetitions.

Analysis of Op. 27

Unity

In dispensing with the tonal system of key, the 12-tonal row is used which, Schoenberg states: " the basic set functions in the manner of a motive." * 1 . If the row functions in this manner, then unity is guaranteed. Let us investigate this claim. We have a basic set to start with : O, and three other permutation relations: I, R and RI. These four permutations are mathematically related. For instance, I can be stated by the matrix:

$$I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \quad \begin{pmatrix} x_o \\ y_o \end{pmatrix} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$$

Now each of these 4 forms can be transposed to the other 11 different pitch levels which gives 44 transpositions of the original O, I, R, RI row - forms. Now according to definition a transposition is merely a repetition at a different pitch level. In actual fact, however, a twelve-tone transposition is quite distinctly another permutation, unless the original row is fashioned as a well-defined theme so that it is recognisable at once when heard (for instance like a fugal subject).

Excluding these cases, where the row is a well-defined theme, then the basic permutation, the O row-form, on which a composition is founded, can be named P_o and any other transposition of P_o can be named P_1, P_2, etc. Now since P_1, P_2 are different permutations of P_o, then P_1, P_2 are not transpositions of P_o. This sounds contradictory so let us clarify this concept. Let us take the following 12-tone row:

* 1: Arnold Schoenberg: Style and Idea, Composition with twelve tones, p. 108.

Analysis of Op. 27

Unity

P_o =	A	Bb	Db	C	B	D	Eb	Gb	F	E	G	Ab
	1	2	3	4	5	6	7	8	9	10	11	12

When this is transposed we have:

P_1 =	C	Db	E	Eb	D	F	Gb	A	Ab	G	Bb	B
	4	3	10	7	6	9	8	1	12	11	2	5

Let us have another transposition following the above, for instance:

P_2 =	Eb	E	G	Gb	F	Ab	A	C	B	Bb	Db	D
	7	10	11	8	9	12	1	4	5	2	3	6

As can be seen from this the original order is different in each of the two cases: It is a new arrangement in each case. Hence it is a permutation and not a transposition actually. However, P_1 , P_2 are transpositions if and only if P_o is a well defined thematic structure.

Let us examine this further by taking the set of C major scale thus:

P_o = C D E F G A B C′ the

P_1 = F B A D C′ E G C Hence P_1 is a permutation because we have the same notes as P_o but in quite a different order.

Now a transposition of the C major scale would be:

T_1 = G A B C D E $F^{\#}$ G′ This is not a permutation, because it is not a re-arrangement of P_o - though some elements of P_o have been re-arranged. Let us take another example:

T_2 = Ab Bb C Db Eb F G Ab. Clearly this is a transposition and not a permutation.

Hence from this, we see that every new transposition of the O row-form dissipates unity instead of strengthening it.

Analysis of Op. 27.

Simultaneities

There are two forms of simultaneities available to the twelve-tone composer: a) Simultaneities which are formed out of a single row such as chordal structures: b) Simultaneities which are formed by the use of simultaneous rows. (cf. Chordal structures and their classification p. 442)

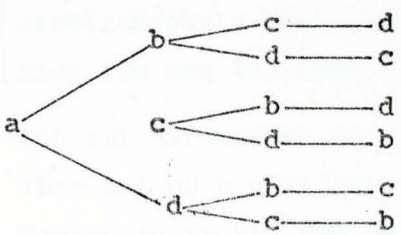
a) Simultaneities based on a single row

Any simultaneity tends to erase or confuse the identity of O. For instance a chordal structure consisting of 4 notes thus:



does not define any particular row, even if the row also consisted of just these four notes, as such a chord may belong to any one of 24 different arrangements.

Let us presume that the note "a" is also the first note of the row then:



Hence any particular row-structure of a basic set is lost in a chordal structure.

Analysis of Op. 27

Unity

b) Simultaneities based on simultaneous rows

Webern is the exponent par excellence of this technique. Simultaneous rows occur in the Cantata Op. 29 and in these present piano variations, where in the second movement, O and I row-forms are employed simultaneously. It suffices to look at the examples on p.34 to ascertain that the basic set has been obliterated. None of the new rows formed by this combination of O and I are identical. They even have different intervallic structures and introduce new intervals which are not present in the Original row.

Hence, although all the rows in the O and I row-forms and singly are meticulously true, their combination causes a loss of identity and consequently the unifying characteristics of the original row are absent. Paradoxically, however, this second movement is well-balanced and its unity is well in evidence.

Webern's technique in this respect is original. When rows are used simultaneously their function is the forming of a unique new set such that the new set forms well-defined elements (the 7 dyads).

Chordal structures are derived from the new set of elements such that they are of a particular structure and hence they are defined. Consequently the row no longer functions as a "motif" but its new function is to order the new set of elements - the dyads - and therefore only such transpositions and such row-froms (here O and I) are used so that only these particular dyads are contained in the combination of simultaneous rows.

Thus: $O \cup I = \{7 \text{ dyads}\}$ ✱ 1

$P_{o1} \cup P_{I1} = \{7 \text{ dyads/permutation}\}$ ✱ 2

✱ 1 : The O and I forms result in the 7 dyads (cf. pp.35-37 of analysis of 2nd movement).

✱ 2 : The permutation of the O-form combine with a particular permutation of I results in a different ordering of the 7 dyads.

Analysis of Op. 27

Unity

Webern's great achievement is his stern and economical use of the musical material. The twelve-tone material is so organised that only a subset (in the form of particular row combinations which result in constant simultaneities - the 7 dyads and - 2 chord-forms) is used.

Dyads and their successions

The dyads, then, are of primary importance, whereas the row in these variations is given a secondary function.

These 7 dyads, which are numbered, are given below

Name of dyad	A/A	Bb/Ab	B/G	Gb/C	Db/F	D/E	Eb/Eb
Number of dyad	1	2	3	4	5	6	7

To establish whether there is any pattern in the succession of dyads, the following table is constructed. The number of the particular dyad as it occurs in the music is entered in the rows successively. For instance, Bb/Ab occurs first so a 2 is entered. This is followed by the dyad, A/A, for which a 1 is entered, etc. Then the succession of all the dyads are:

			(2)		1	5	3	6	H	dyad "6" in alternate columns
6	2	3	7		6	4	6	3	H	
1	5	4	(2)		1	5	3	6	H	
6	2	3	7		6	4	6	3	H	
1	5	5	(2)		3	3	1	4	H	dyad "4" in alternate columns.
6	4	5	5		6	2	4	1	H	
3	7	6	(2)		3	3	1	4	H	N.B. 3 - 6 is inverted in following row.
6	4	5	5		6	2	4	1	H	similarly "4 - 1".
3	7	6	(2)							

dyad "6" in alternate columns
dyad "2" in alternate columns

The symbol H represents: Hexachord.
This occurs regularly after 8 dyads.

Analysis of Op. 27

Unity

Dyads and their succession

Since repetitions are a constructive feature herein, it was stressed on page 1 of this analysis that repetitions should be strictly kept. The particular pattern above clearly shows how important the repetitions are, and how precisely Webern has chosen his combination-rows and transpositions to achieve such balance and unity as the table shows. Hence the principle of repetition as a prerequisite of unity is maintained.

Hexachords

The remarkable feature about the hexachords ✱ 1 are that they are always preceded by 8 dyads, except the first and the last row as is indicated in the table.

Thus we have:

	5 dyads	preceding	the	Hexachord
8	"	"	"	H
8	"	"	"	H
8	"	"	"	H
8	"	"	"	H
8	"	"	"	H
8	"	"	"	H
8	"	"	"	H
	4	-	-	-

The pattern above is monotonous in its regularity, but this repetitive scheme, of course, promotes unity - but unity, though important, is not the primary object of music: unity should be balanced by artistic sense and expression.

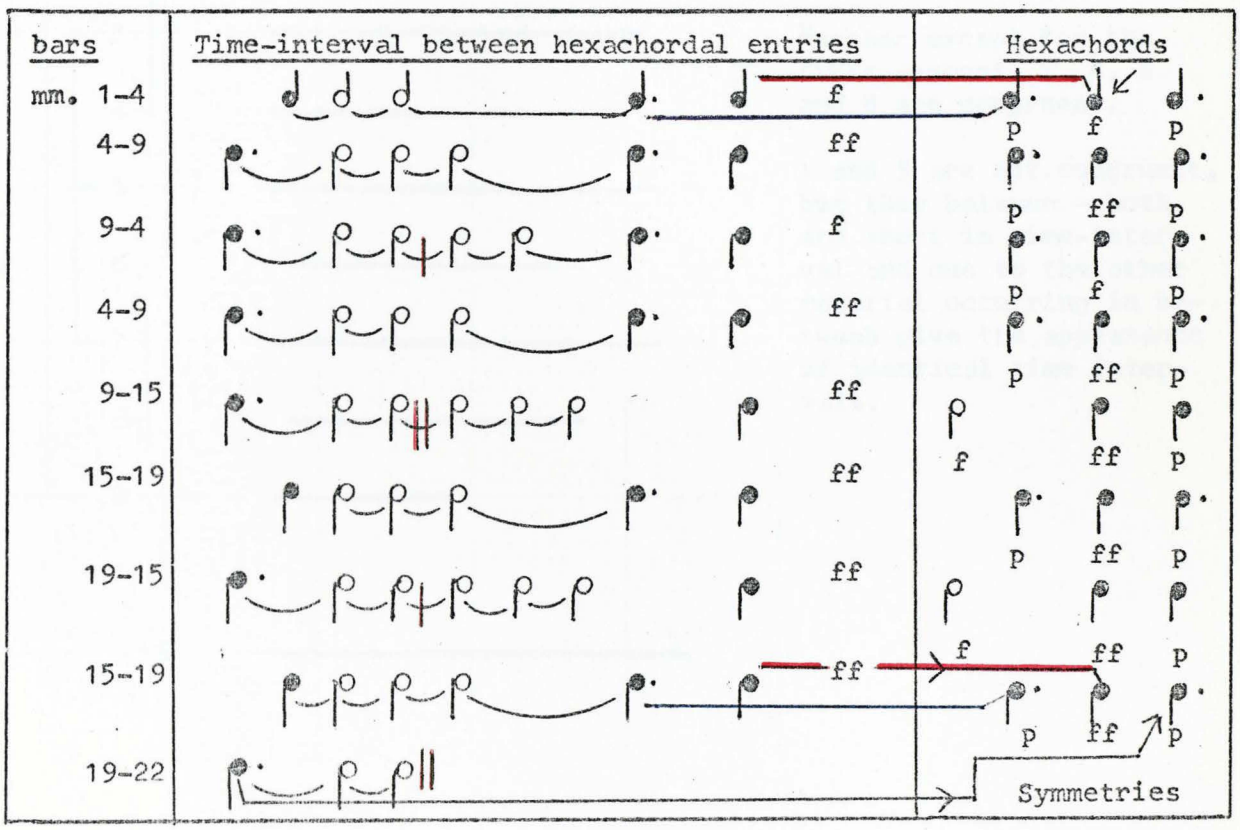
✱ 1: Authorities such as Peter Westergaard in his analysis: Webern and "Total Organization" in Perspectives of New Music, Spring 1963, p. 107. terms pairs of unison notes when each element is derived form a different row, dyads: Hence when 3 such notes are paired with 3 corresponding notes of another row, we may call these hexachords.

Analysis of Op. 27

Unity

Dyads and their succession

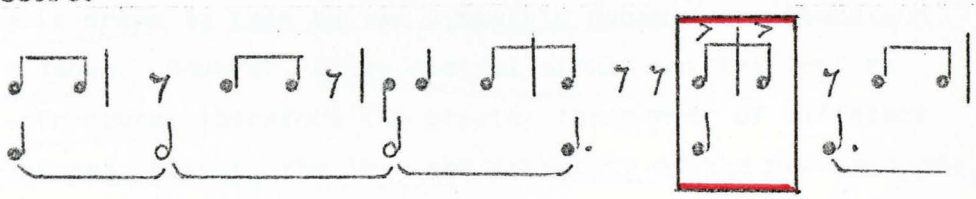
Webern solves this particular problem by having a variable time-interval between each hexachordal entry, but in such a manner that there are intersecting subsets and sub-sets of symmetries.



The pattern above is derived in the following way:

Pattern in score:

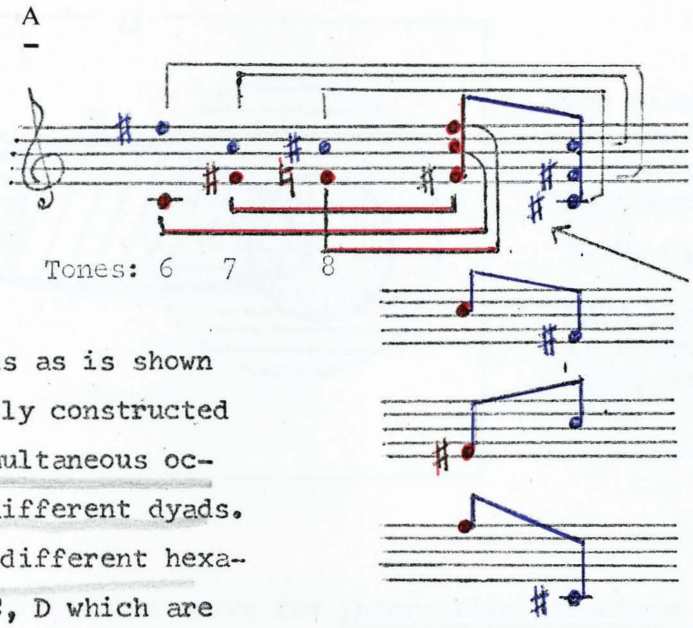
mm. 1 -4



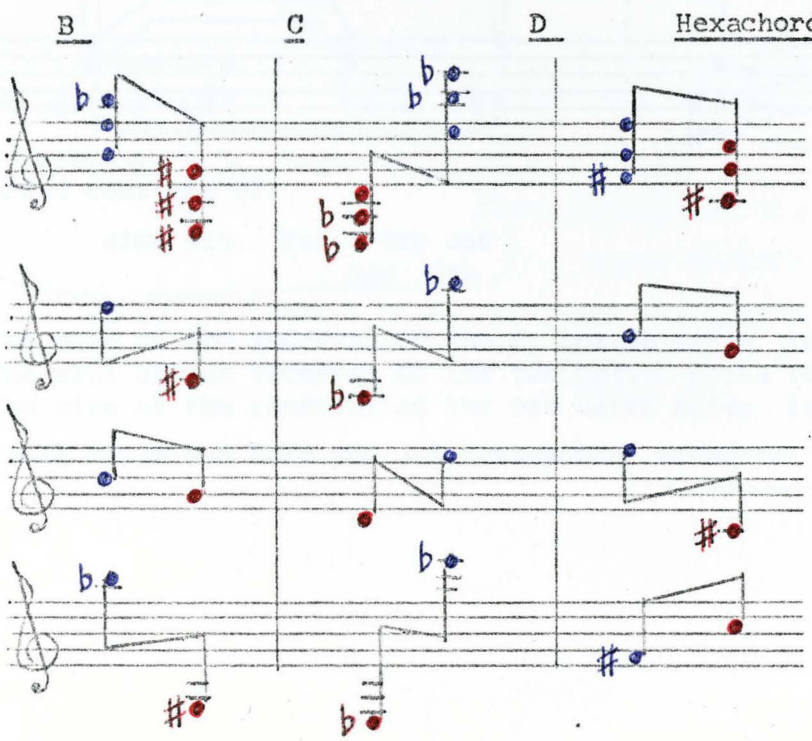
Analysis of Op. 27

Unity:

Hexachords



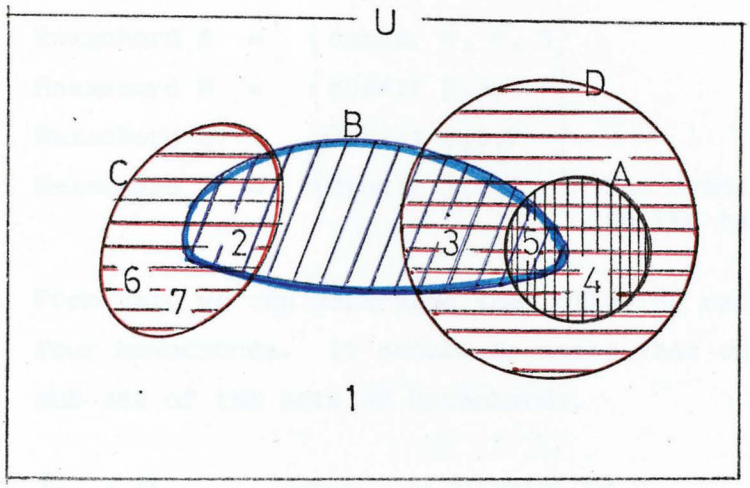
These hexachords as is shown here are actually constructed through the simultaneous occurrence of 3 different dyads. There are four different hexachords, A, B, C, D which are built from the dyads as follows:



Analysis of Op. 27

Unity:

Hexachords

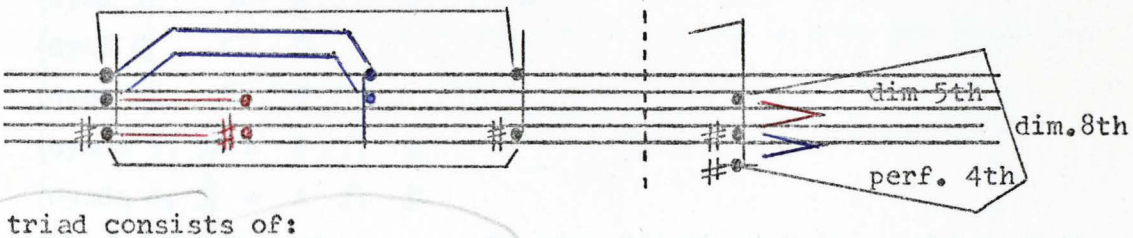


Venn diagram illustrating the inter-relation of the hexachords:

A, B, C, D.

Note that dyad 1, is a non-chordal dyad, but is a member of U.

Besides the interrelation above the intervallic structure of the hexachords is as is given below.



triad consists of:

dim. 5th Perf. 4th and dim 8th

The size of the interval of the 2 bottom notes is a dim 5th
The size of the interval of the two upper notes is a perf. 4th
The size of the interval of the two outer notes is a dim 8th

These relations hold for all hexachordal elements: A, B, C, D.

Analysis of Op. 27

Unity:

Hexachords.

Thus we have the following sets of Hexachords:

Hexachord A = {dyads: 4, 4, 5}
Hexachord B = {dyads: 2,3,5 }
Hexachord C = {dyads: 2,6,7 }
Hexachord D = {dyads: 3,4,5 } The dyads are numbered according to the table given on page 106.

From this we can determine the following relationships between the four hexachords. It should be noted that only dyad 1 (A/A) is not a sub-set of the sets of hexachords.

{Dyad 1} = $A' \cap B' \cap C' \cap D'$
{dyad 2} = $B \cap C$
{dyad 3} = $B \cap D \cap A'$
{dyad 4} = $A \cap D \cap B'$
{dyad 5} = $A \cap B \cap D$
{dyad 6} $\subset$ C
{dyad 7} $\subset$ C
{dyads 3, 5} = $B \cap D$
{dyads 4, 5} = $A \cap D$

Hexachord A $\subset$ D. Further Hexachord B is a subset of the union of C and D: $B \subset (C \cup D)$. Hence Hexachord B is pivotal in that it links C to D and C to A. The diagram below illustrates this clearly.

Analysis of Op. 27

Unity:

Hexachords

Thus we can list the hexachords as follows:

X will indicate lower interval to be dim 5th and upper to be perf. 4th.

Y will indicate lower to be perf. 4th and upper dim. 5th, then:

lower interval:	dim. 5th		p. 4th		d.5		p4		p.4		d.5		p.4.		d.5
upper interval:	perf.	4th	d. 5		p.4		d.5		d.5		p.4		d.5		p.4
outer interval	d	8th	d.8		d.8		d.8		d.8		d.8		d.8		d.8
	A:	X		Y	B:	X		Y	C:	Y		X	D:	Y	X

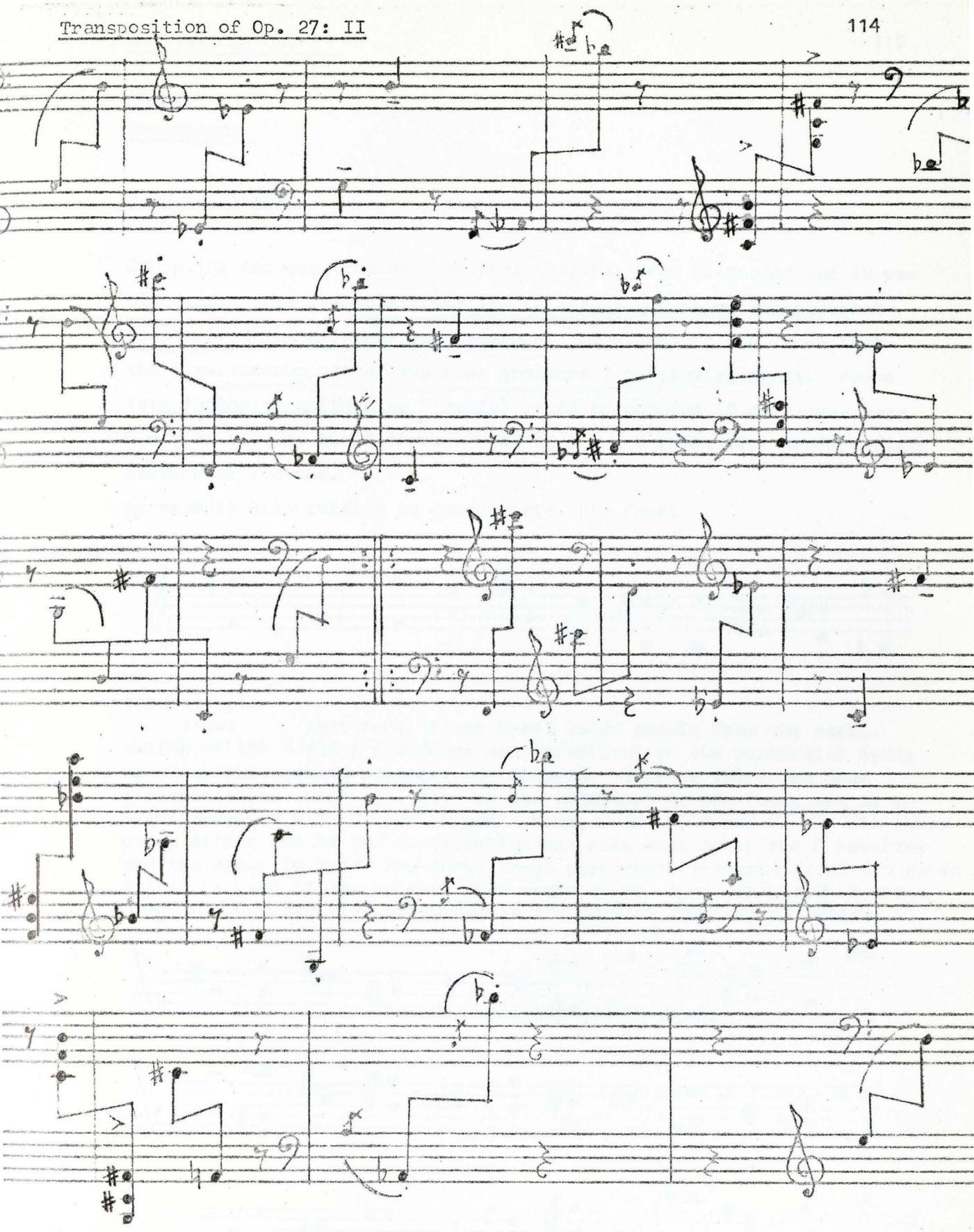
Hence structurally there are only 2 chords which are more-over related in that they are inversions (reflections) of each other. Consequently the hexachords give us the following intersection: $A \cap B \cap C \cap D$.

Registral Relationships of the Hexachords

We have already differentiated between the two chords by naming the one: d.5, p4, X and the other : p. 4 d.5, Y; then the registral relationship will be as follows:

Hexachord A:	X	Y	High	Low
Hexachord B:	X	Y	H	L
Hexachord C:	Y	X	L	H
Hexachord D:	Y	X	H	L

Thus it can be seen that triad X of the hexachordal structure is always high except in the last instance, and triad Y is always L except in the last instance. All these similarities, as pointed out, promote unity.



Transposition - a dim. 5th lower, but such that the same dyads are retained. (Fortunately twelve-tonal transpositions do not simplify compositions - nor is any simplified version possible as in traditional music.)

Unity:

Hexachords

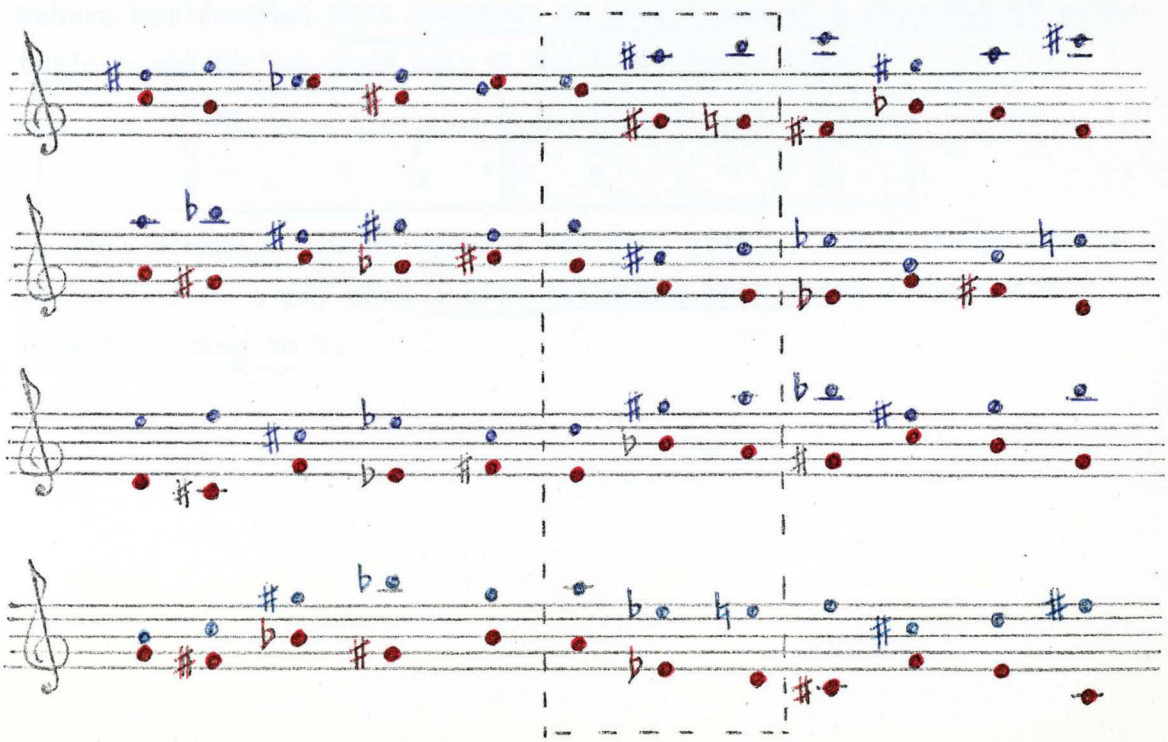
Transpositions

On p.102 the question of transpositions has been discussed and it was discovered that transpositions are in effect new permutations which obliterated the original row sequence. On p.105 it was shown that the simultaneous use of two rows produced 7 particular dyads. Hence this factor of unity (the 7 dyads) would be negated if more rows were used, as not any two different rows in O and I forms will produce these particular 7 dyads.

An example will suffice to demonstrate this fact:



This example shows that none of the dyads which result from the combination of the O and I row-forms are indentical to the particular dyads on which this second movement is founded. However there are four transpositions which will give us the identical dyads: these are on Gb simultaneously with C rows, A and A rows, E and D, B and G. In all these cases either one of the two simultaneous rows must be in the O row-form and the other in the I row-form. These particular transpositions are given below, and it can be seen that every single dyad contained in these transpositions are also contained in the rows as employed by Webern.



Analysis of Op. 27

Unity.

Transpositions

Had Webern used these transpositions above instead of those he had used, a different ordering of the dyads would have resulted, and important, those particular dyads which he wished to eliminate, could not be so easily eliminated in the above transpositions as they are not end-points herein. Consequently a new treatment would have resulted and the course of the composition would have been completely different.

If this movement is transposed a diminished fifth lower, such that O begins on the note D, and I begins on the note E, then such a transposition will contain the same seven dyads, though in a different order, and all other relations will have changed. For instance Eb/Eb will become the axis of symmetry and the dyad E/D becomes the pivotal dyad instead of Bb/Ab. Hence, all statistics will be vitally affected and the equilibrium between the three movements will become distorted. Such a Transposition is given on page 114. This is the only transposition possible which also retains the 7 dyads of the second movement.

Registral Construction

Webern has founded this movement on only 8 out of a possible 48 permutations and he has used only O and I row-forms thus:

Part 1			Part 2		
O	I			I	O
I	O			O	I

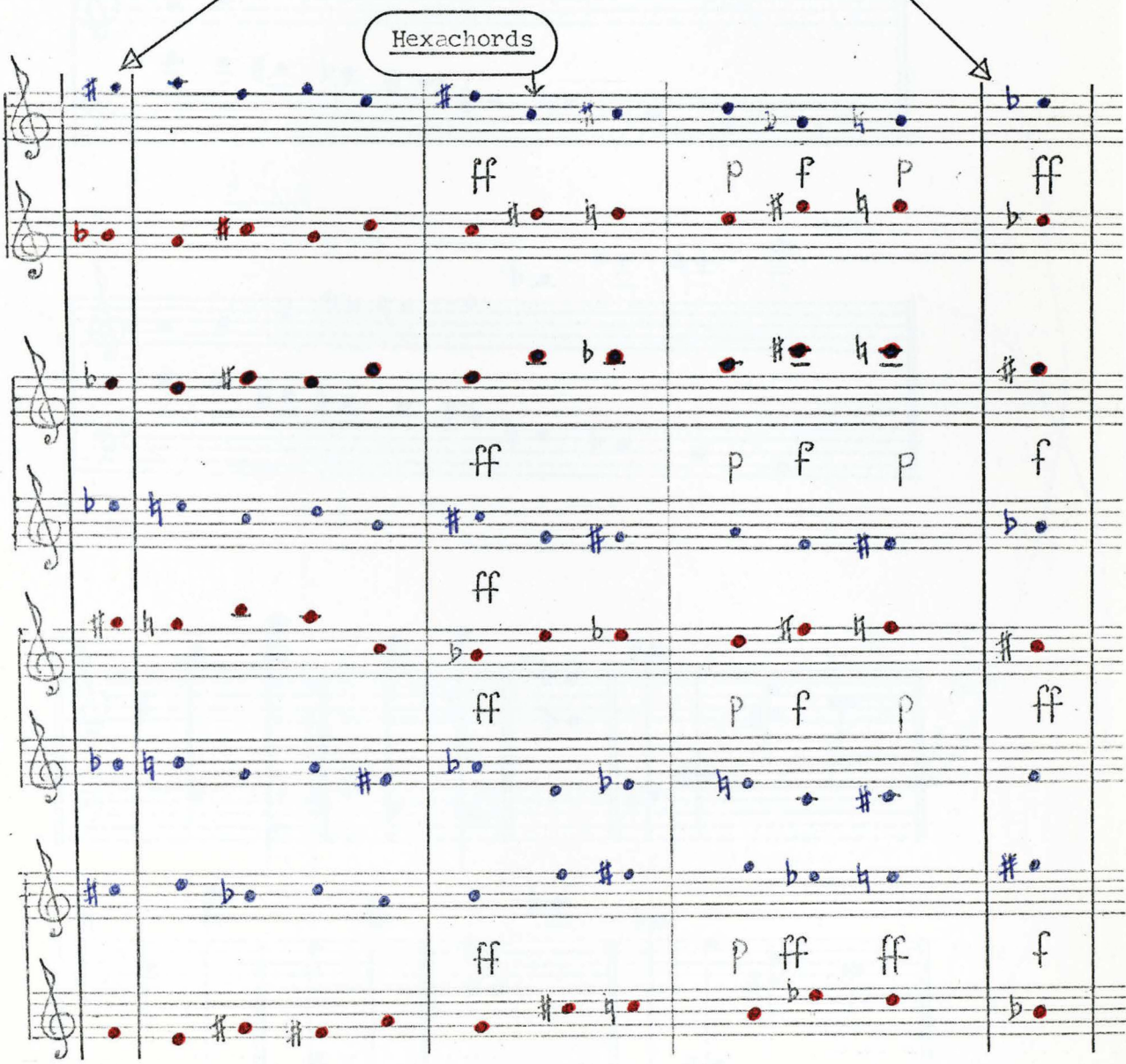
In this scheme O always appears together with I, and I always occurs with O in such a way that a note belonging to O forms a dyad with a note belonging to I.

Unity:

Registral Construction

The rows form a continuous link by means of the construction in which the last note of the row becomes the first note of the new row in this scheme:

G-sharp/Bb are the first notes and Eb/Eb the last notes of the rows
Eb/Eb " " " " " G♯/Bb " " " " " "
G♯ /Bb " " " " " F/C♯ " " " " " "
C♯ /F " " " " " G♯ /Bb " " " " " "



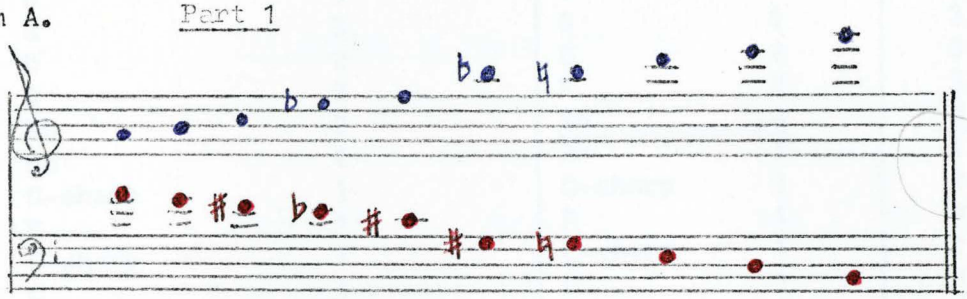
Analysis of Op. 27

Unity:

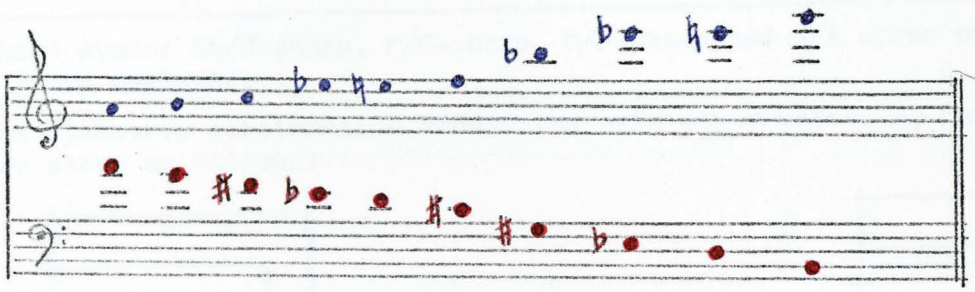
Registral Construction

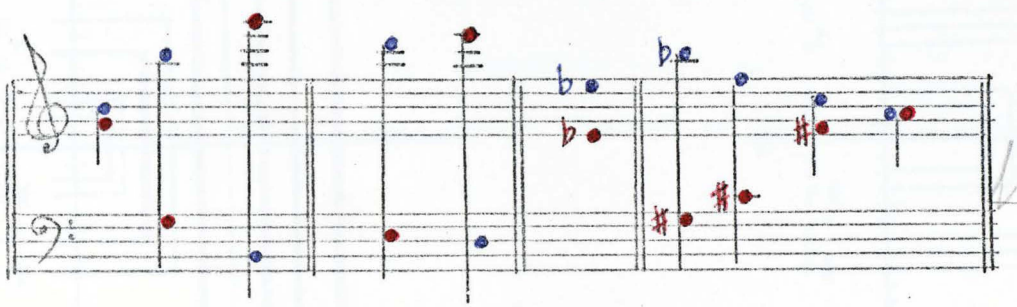
In part 1 of the movement there are 19 different pitches and, in part 2, there are also 19 different pitches. Each part, consisting of these pitches, is constructed in a constellation around an axis of symmetry which in both cases is the pitch A. ✱ 1 As can be seen by the following, absolute reflections are formed: each note being reflected equidistantly from A.

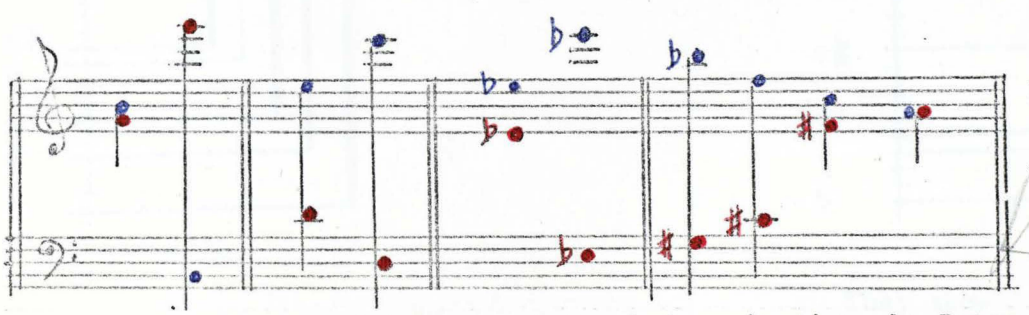
Part 1



Part 2







✱ 1: See a Discussion of Webern and Total Organization, by Peter Westergaard, published in Perspectives of New Music, Spring 1963, page 6 of the present thesis.

Analysis of Op. 27

Unity:

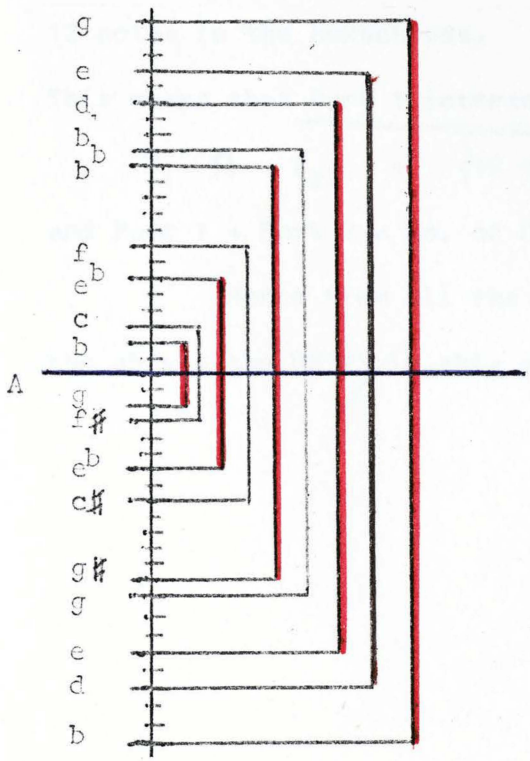
Registral Construction

The following table gives us the pitches and the number of different registers these pitches occur in.

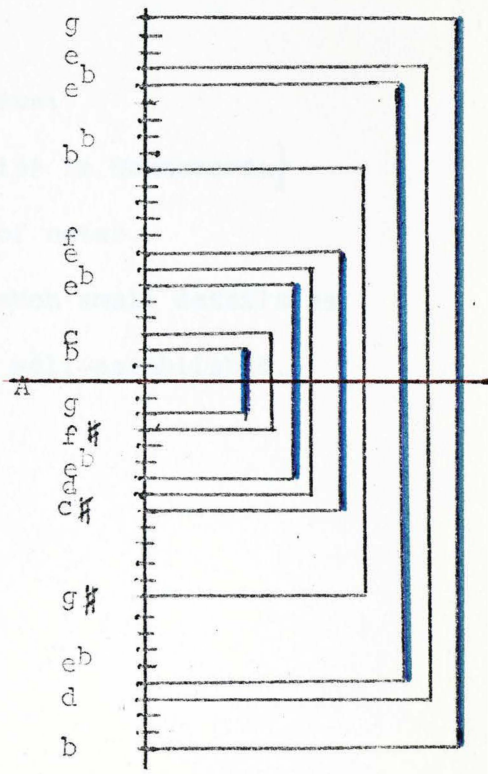
Part 1		Part 2		Part 1 and 2
pitch	number of registers	pitch	registers	registers
B	3	B	2	3
G	3	G	2	3
D	2	D	2	3
E	2	E	2	3
Eb	2	Eb	4	4
Bb	1	Bb	1	1
G-sharp	1	G-sharp	1	1
F	1	F	1	1
C-sharp	1	C-sharp	1	1
C	1	C	1	1
F-sharp	1	F-sharp	1	1
A	1	A	1	1

The 4 dyads: Bb/G-sharp, F/C-sharp, C/F-sharp and A/A occur only in a fixed register.

The symmetric construction around the axis of symmetry, A, can be better shown as follows:



Part 1



Part 2

These diagrams show the exact reflections. They show how the 7 different dyads are disposed of.

Analysis of Op. 27

Unity:

Registral Construction

This symmetric construction is not merely due to the use of O and I row-forms, but is the basic plan of the movement and particularly of the dyads. Only the use of these specific 8 permutations enabled the composer to achieve this balance, unity and symmetry.

Relations between the number of beats and Notes

To end this discussion of unity, there are some interesting statistics which have a bearing on this, and which are worth mentioning.

Part 1 has $22\frac{1}{2}$ bars and part 2 has 22 bars.

Part 1 has 90 quaver beats and part 2 has 88 quaver beats

and actually the number of notes occurring in each part is:

90 notes and 88 notes.

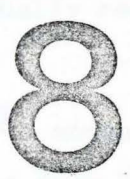
These 90 notes of part 1 contain 12 grace notes and 12 notes in the hexachords. Similarly the 88 notes contain 12 grace notes and 12 notes in the hexachords.

This means that Part 1 intersects with Part 2 thus:

$$P_1 \cap P_2 = \{12 \text{ grace notes, } 12 \text{ notes in Hexachords}\}$$

and Part 1 + Part 2 = No. of Quaver beats = No of notes.

Hence from all the foregoing and in such small details as the above, the UNITY in this second movement is well-established.



Analysis of op. 27

Relations

When we construct a matrix of the dyad progressions, we have all the information possible and it is then easy to arrive at certain conclusions regarding the relations between dyad and dyad. In this way we can discover whether there are any predominant centres.

The matrix below gives us this information. The dyads on the left column are always read first, for instance dyad A/A moves to dyad B/G indicated by the figure 1, but dyad A/A does not move to dyad D/E - this is shown by an 0.

	A/A	Bb/Ab	B/G	C/Gb	F/Db	D/E	Eb/Eb
A/A	0	0	1	1	1	0	0
Bb/Ab	1	0	1	1	0	1	0
B/G	1	1	1	0	1	1	1
C/Gb	1	1	1	1	0	1	1
F/Db	1	0	1	1	1	1	0
D/E	0	1	1	1	1	1	0
Eb/Eb	0	0	0	0	0	1	0

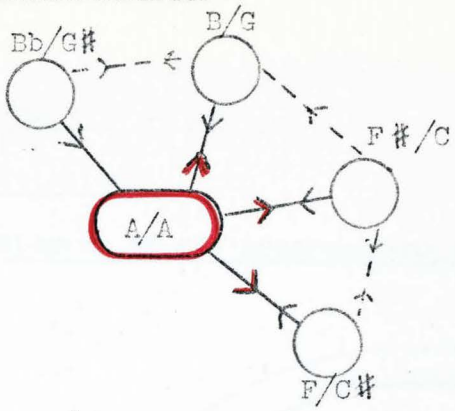
From this matrix we gather that certain relations are reflexive, and others symmetric. A symmetric relation is important as it means a return to a specific dyad and such a return implies accentuation of that particular dyad. The dyad Eb/Eb, which was under discussion earlier on, moves, for instance, to the dyad D/E, but D/E does not move to Eb/Eb. Hence this is not a symmetrical relation and consequently its importance is considerably minimised. Reflexive relations are more static, but nevertheless important. The reflexive relations are dyads: B/G, D/E, and F/Db.

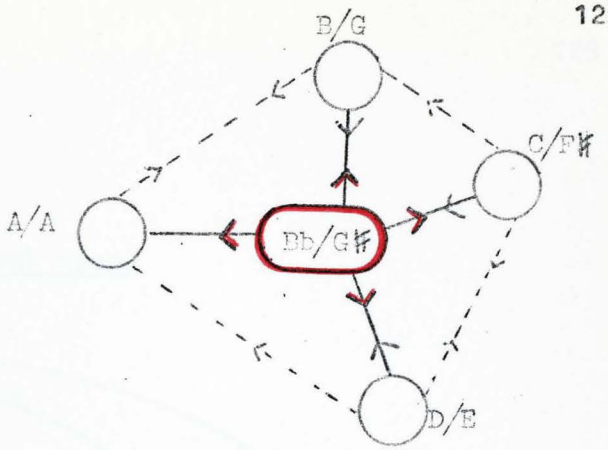
Below is given a complete diagram of the matrix above and shows the relations of movement towards and from dyads. From this it can be clearly seen that the dyads: B/G and C/Gb are centres of most activity.

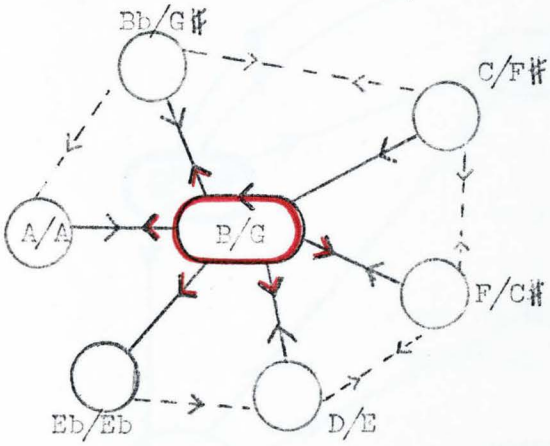
On the following page each dyad is considered individually regarding movement towards and movement from.

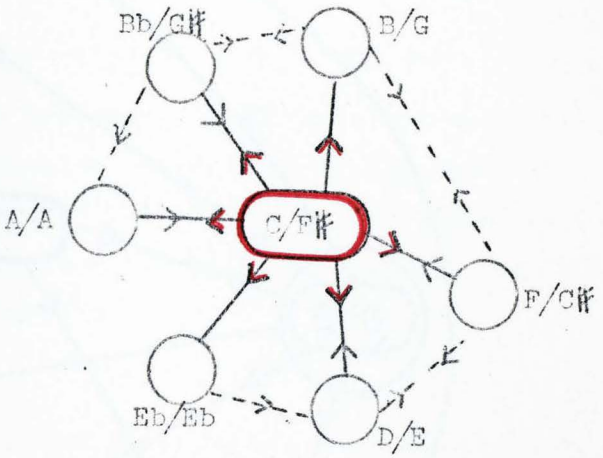
Tonality could be argued to exist herein as dyad C/F♯ moves to dyad B/G. Notice that Bb/Ab does not progress to Eb/Eb, nor does D/E move to A/A which would have expressed the tonalities of A or Eb. ✱ 1

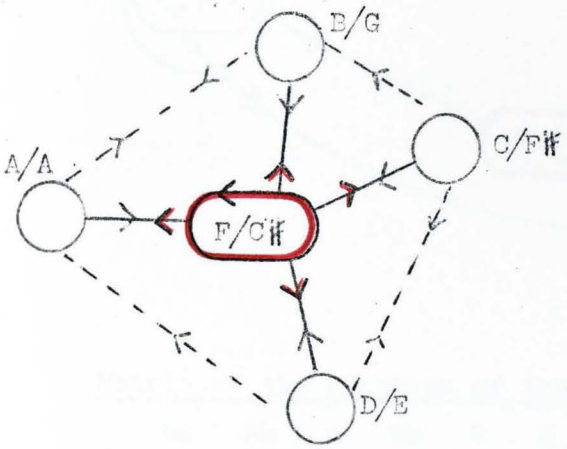
✱ 1: See Analysis of the Second Movement, p. 126 3rd paragraph of this thesis.

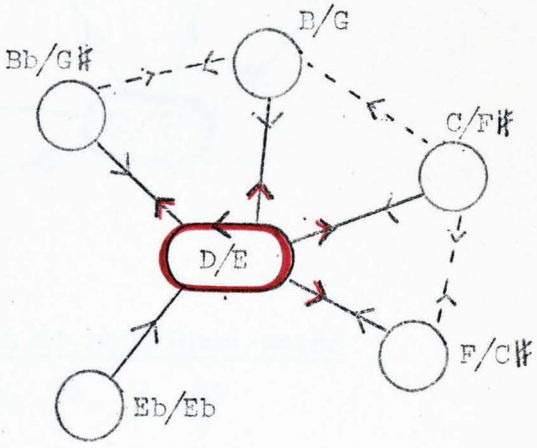


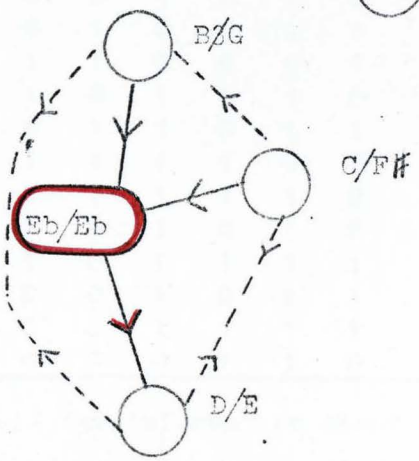










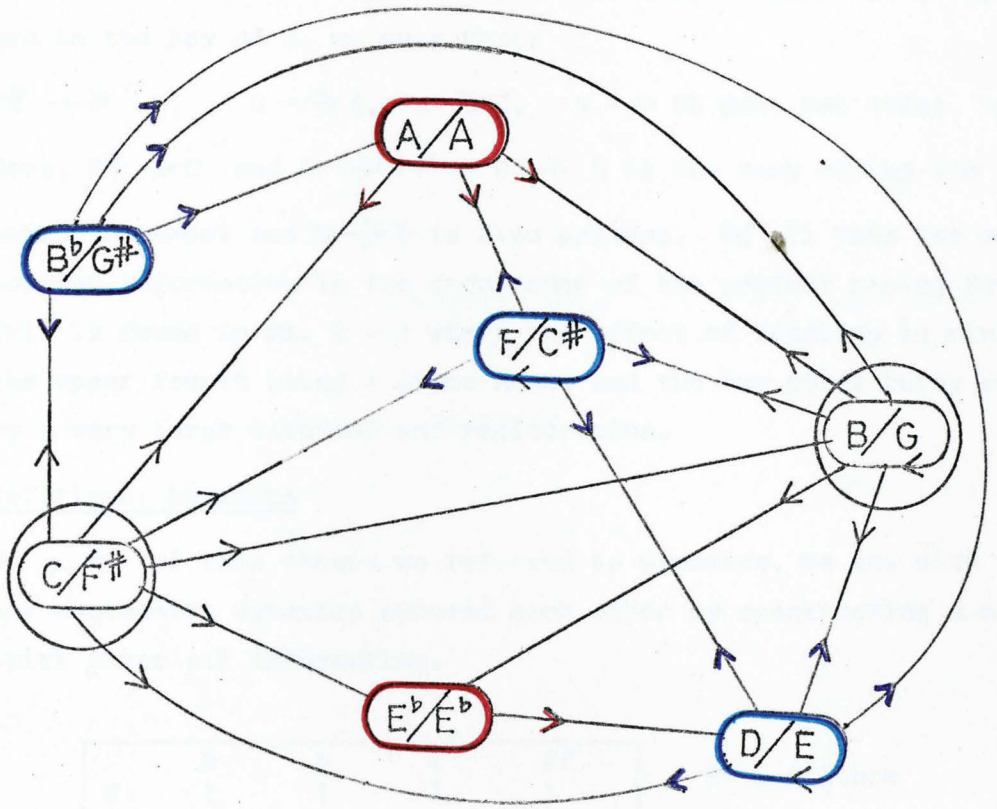


Diagrams of the progression of each dyad. The red centre is the particular dyad, for instance , D/E ; the red arrows indicate movement from this dyad and the blue arrows indicate movement towards the dyad. If there a red arrow on the red centre this shows a reflexive relation, i.e. movement towards itself.

Analysis of Op. 27

Relations

Diagram of the progressions of each dyad.



Matrix of the relation of the progression of individual notes

	Bb	Ab	A	Db	F	B	G	D	E	Gb	C	Eb
Bb	0	1	0	1	0	0	1	0	1	0	1	0
Ab	1	0	1	0	0	1	0	0	1	1	0	1
A	0	0	1	1	1	1	0	0	0	1	0	0
Db	0	0	1	0	1	0	1	1	1	0	0	0
F	0	1	0	1	0	1	1	0	1	1	1	0
B	1	0	1	1	1	1	1	1	0	0	1	1
G	0	0	1	0	0	1	1	1	1	0	0	0
D	1	1	0	0	1	1	1	0	1	0	1	1
E	1	0	0	1	1	0	1	1	1	1	1	0
Gb	1	0	1	1	0	0	1	0	1	1	1	0
C	0	1	0	1	0	0	1	1	1	1	1	1
Eb	1	0	0	0	0	0	0	1	1	0	0	1

This matrix contains all the information about the movement of any note in the movement. To read this is quite a simple matter. The note on the left column is the first of any two notes. For instance, Bb does not move to another Bb anywhere in the movement and this is indicated by an 0. If a 1 is shown, then there is movement towards that note: for instance, Bb

Analysis of the Second Movement Op. 27

Relations

moves to G, which is indicated by the 1.

This table is of particular use to determine quickly what relationship there exists between any two notes. To examine what relations there are in the key of G, we note that:

F♯ → G, G → A, A → B, G → B♭ does not exist, but G → B does, F♯ → C and C → F♯ ; D → G is the only rising 4th in the entire movement and G → D is also present. Of all this the most important information is the occurrence of the perfect rising fourth. This is found in mm. 2 - 3 where the effect of tonality is minimised by the upper fourth being a grace note, and the two notes being separated by a very large interval and registration.

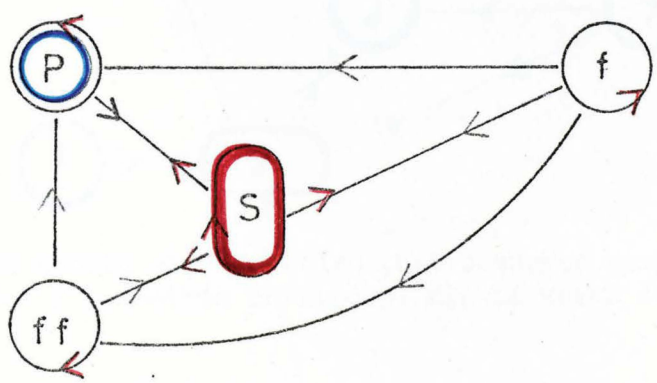
Relations: Dynamics

On p.40 of this thesis we referred to dynamics, we now wish to study how successive dynamics succeed each other by constructing a matrix which gives all information.

	S	p	f	ff
S	1	1	1	1
p	1	1	0	0
f	1	1	1	1
ff	1	1	0	1

S = Silence
p = piano
f = forte

From this matrix we can construct a diagram to illustrate the succession of dynamics, and it seems strange that one had never noticed that the p level does not move to either forte or fortissimo. Silence always intervenes. However, as can be seen, forte moves directly towards piano (m. 12), and fortissimo moves towards piano (mm. 15 and 20), etc.



Analysis of Op. 27

Relations: Dynamics

From this we have the following relations:

F $\rightarrow$ p	Anti-symmetric
ff $\rightarrow$ p	Anti-symmetric
f $\rightarrow$ ff	Anti-symmetric
p, f, ff, S	All Reflexive
p $\leftrightarrow$ S	Symmetric
F $\leftrightarrow$ S	Symmetric
ff $\leftrightarrow$ S	Symmetric

Hence silence plays an important role in this movement as already stated elsewhere.

Relations: Succession of Durations

To complete this picture we give a matrix of note-values and rests and then construct the appropriate diagram.

	1	0	1	1	1
	1	1	1	0	0
	1	0	0	0	0
	1	1	1	1	0
	1	0	0	0	1

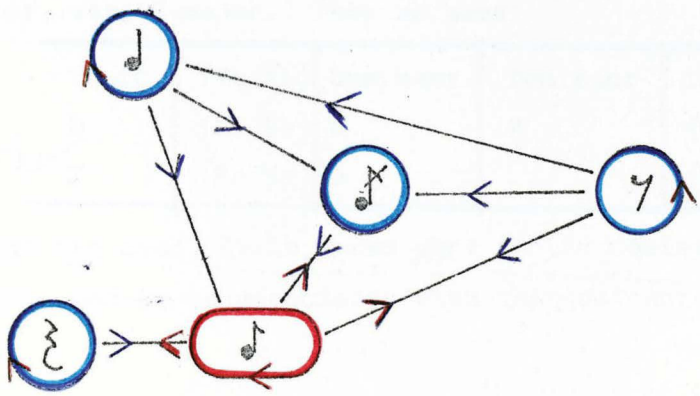


Diagram of succession of Durations.

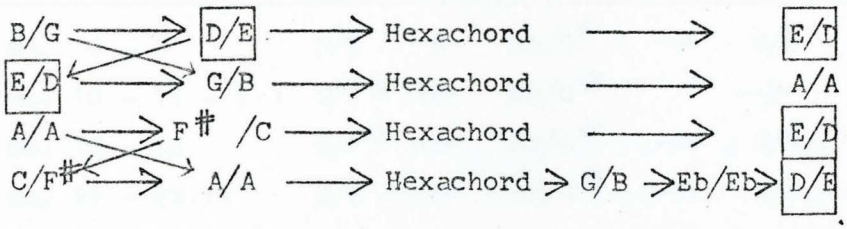
It is interesting to observe that a crotchet value is never followed by a quaver rest and that a grace note never precedes a crotchet value.

It should also be noted that a quaver never precedes a crotchet. There are 3 symmetric relations, all of which involve the quaver note-value.

Analysis of Op. 27

Relations: Involving the Hexachords

We can tabulate these relationships as follows:



This gives us the remarkable feature that the hexachords are either preceded by the dyad, D/E or else followed by this dyad. Furthermore the first two dyads preceding the hexachords are inverted in the second case. Similarly are the dyads preceding the last two hexachords.

Harmonic Progressions

From the diagram above of the progressions of each dyad, we notice that the relation to and from the dyad Eb/Eb is anti-symmetric. It is only approached by the dyads B/G or C/F♯ and that in all cases, movement from Eb/Eb is towards dyad, D/E.

Reference to the score shows the following line of progressions:

mm. 5 - 8	G/B → Eb/Eb → D/E → C/F♯ → D/E → G/B
mm. 14 - 17	C/F♯ → Eb/Eb → D/E → C/F♯ → F/C♯ → D/E
mm. 20 - 22 - 12	G/B → Eb/Eb → D/E → Bb/G♯ → G/B

Since the dyad Eb/Eb only contains grace notes, or is itself contained in ambiguous chords, we may interpret the progressions above to be in a key, say, G major. Then we have:

Tonic	(Eb/Eb)	Dominant	Dominant	Dominant	Tonic
D	(Eb/Eb)	D	D	(F/C♯)	D
T	(Eb/Eb)	D		(Bb/G♯)	T

Hence the dyad, Eb/Eb, forms part of the dominant/Tonic relation of G major, and it is associated with the dominant 7th/9th of G major.

Analysis of Op. 27

Relations: Involving the Hexachords

The dyad Bb/G$^{\#}$ is similarly associated with this tonic - dominant harmonic field. We have:

mm. 4 - 6	D/E	→	Bb/G$^{\#}$	→	G/B	
mm. 10 - 11 - 1	C/F$^{\#}$	→	Bb/G$^{\#}$		→	A/A
mm. 10 - 12	C/F$^{\#}$	→	Bb/G$^{\#}$	→	G/B	
mm. 21 - 22 12	D/E	→	Bb/G$^{\#}$	→	G/B.	

Relations: Harmonic progressions

In those cases where the dyad, Bb/G$^{\#}$ occurs in the hexachords and as grace notes, we have:

mm. 8 - 9	G/B	→	Bb/G$^{\#}$	→				A/A
mm. 14 - 15	C/F$^{\#}$	→	Bb/G$^{\#}$	→	D/E	→	C/F$^{\#}$	
mm. 17 - 18	D/E	→	Bb/G$^{\#}$	→			C/F$^{\#}$ →	A/A

From this it can be seen that by the association with the set of D 7ths/9ths, the dyad, Bb/G$^{\#}$, is absorbed into the G major field as an interpolation.

Since the dominant - tonic relationship establishes tonality, we are bound to consider the above cases as tonality. There are 8 possibilities in which the dominant - tonic relationship can occur to determine a tonality.

These are:

D		T	:	D = Dominant
Ø		T		T = Tonic
D		Ť		Ø = Dominant modified
Ø		Ť		Ť = Tonic modified
D	+	T		+ = An interpolation between Dom. and Tonic
Ø	+	T		
D	+	Ť		
Ø	+	Ť		

Analysis of Op. 27

Relations: Harmonic progressions

By the term , dominant modified, is meant a dominant chord to which notes are added, or from which notes are subtracted provided that it is recognised as a dominant constellation.

The term "interpolation"is approached more circumspectly, as our definition of tonality means the succession of dominant by tonic. Thus if we have the dominant chord moving to some strange chromatic chord, we do not satisfy this definition. Hence, so that tonality can exist, an interpolation can be inserted between the dominant and the tonic, if and only if such an interpolation forms:

(a) an ornamental resolution which has
   i) passing notes
   ii) chromatic passing notes
   iii) grace notes
   iv) suspensions

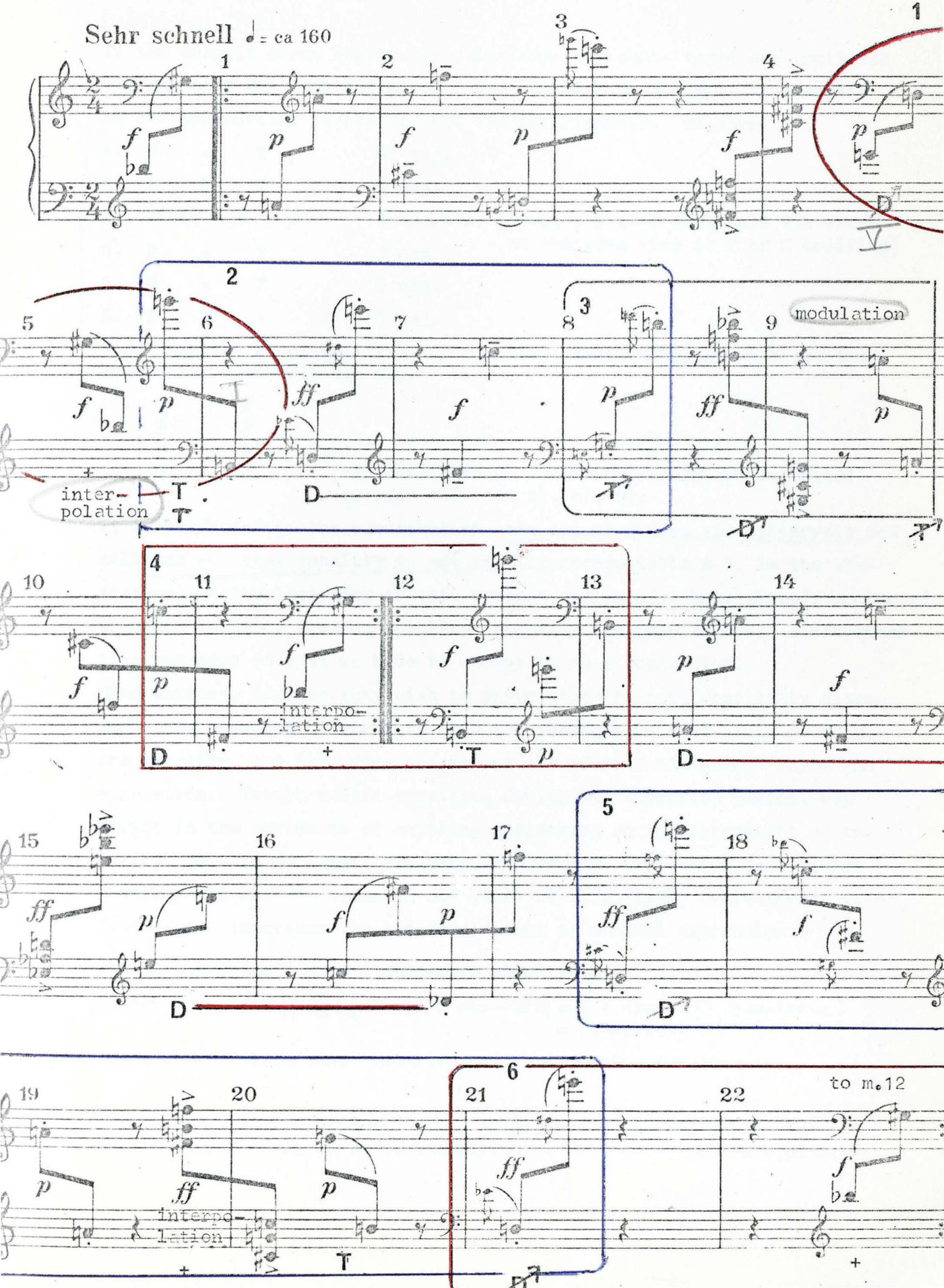
(b) such an interpolation normally resolves on the Tonic by pre-establishment

(c) such an interpolation is constantly associated with the dominant or tonic.

Since these conditions are satisfied in this movement, we consequently can state that the tonality of G does exist, whether such an occurrence was incidental or not. However, since only 6 out of the 22 bars are vague as to exact tonality, Webern must have been aware of the tonal tendency in this movement.

D = Dominant ↗ Modified (cf.p.128)

II



Analysis of Op. 27

Relations: Tonality

In the example given above, the relations: dominant- tonic are encircled and numbered for easy reference. The symbols: D, T + Ø,T are inserted at the appropriate places to show the relationship. We have:

1. Ø + T G maj.
2. T D Ø G maj.
3. Pivot Ø Ø A maj/min (Pivot : E with flattened 7th which at the same time is T of G modified)
4. D + T G maj.
5. Ø + T G maj.
6. T Ø + T G maj.

Hence out the 8 possibilities of tonality-relationship given elsewhere, Webern has used only 4, e.g. :

D Ø
Ø Ø
D + T
D + T

The modifications occurring herein are as stated on page 127 at a), b), c).

It is evident from the construction- the use of dyads, wide intervals and silences - that tonality is not readily recognizable ✱ 1. In the statistics, at the beginning of this present analysis,we have already uncovered a strong tendency towards tonality, and this harmonic analysis strengthens this argument so that we have to accept it as a conclusion.
Some authors, because they wish to prove other things, completely disregard this question of tonality with the consequence that their results are negative, and this does not assist the advance of musical idiom and expression. Though twelve-tonalism, during its inception period, was strict in the avoidence of anything reflecting an interpretation of tonality, this is no longer the case with Webern. This fact that twelve-tonalism can include tonality and still be effectively twelve-tonal is of fundamental importance in the development of musical expression.

We can summarise Webern's procedure as follows:

$$\{\text{Atonal O row-form}\} \cup \{\text{atonal I row-form}\} = \{7 \text{ dyads} \cap \text{dom-tonic}\} = \text{tonality.}$$

Hence we can state that Tonality $\subseteq$ twelve-tonalism.

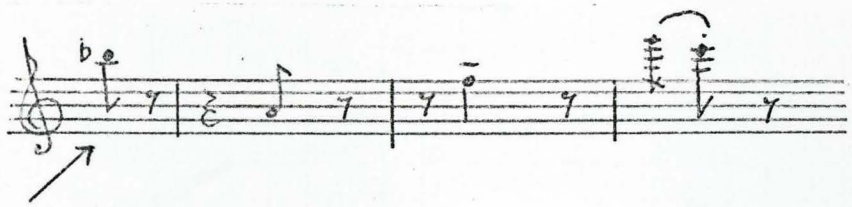
✱ 1: Silence/sound patterns, p.90: "Registral differences do not change a tonality to an atonality: it only minimises recognition of tonality".

9

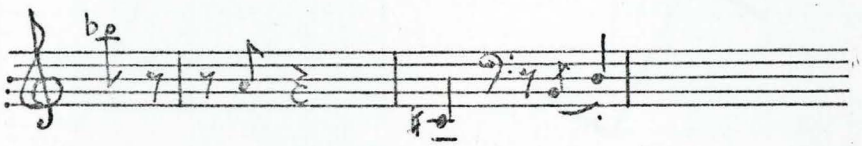
Analysis of Op. 27

Melodic Structure and Form

Though this movement had its inception in O and I row-forms, the listener is hardly aware of this, due to the overlapping and crossing of the rows. For instance, the ear might group notes differently to what the composer intended as in the following (where the first note does not belong to the row):



instead of



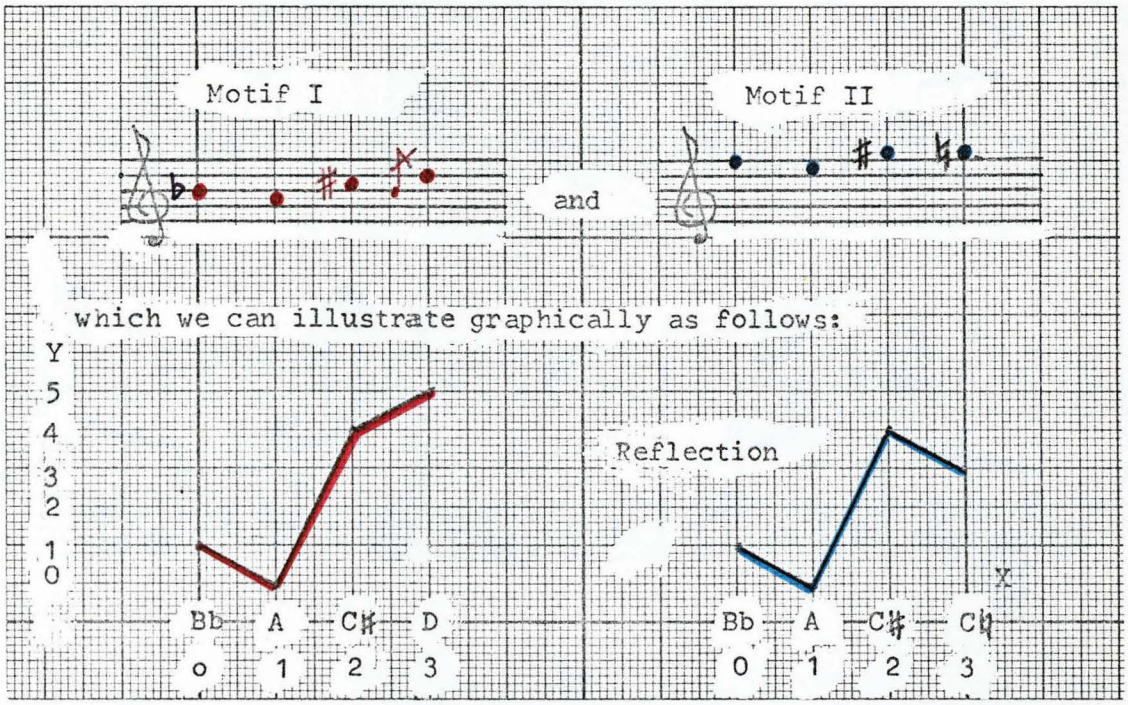
In this last instance all the notes belong to the same row.
A logical argument could be advanced for the first interpretation due to registral placement and beat-positioning of the notes. However, such an interpretation would destroy the canonical expression of the movement and possibly wreck the motivic connections existing between the different movements. The identity of these motives is of prime importance and should be strongly felt, if an interpretation is to achieve unity. The possibility is ever-existent here to present a lifeless form of exercise of twelve tone rows - " a high note, a low note, a note in the middle - like the music of a madman! " - instead of an exciting artistic presentation perfectly integrated into the scheme of the three movements.[1]
Hence the aspects of melodic structure and form is of significance. Webern, himself, mentioned the importance of melody to Peter Stadlen, in the statement: "He kept on referring to the melody which, he said, must be as telling as a spoken sentence. This melody would sometimes reside in the top notes of the right hand and then for some bars be divided between both left and right ".[2]

[1] 1. Peter Stadlen: Serialism Reconsidered, p. 12, The Score, February, 1958.
[2] 2. ibid, p. 12.

Analysis of Op. 27

Melodic Structure and Form

The structure of the tone-row is such that it allowed Webern to fashion two melodic motives from it. We have:

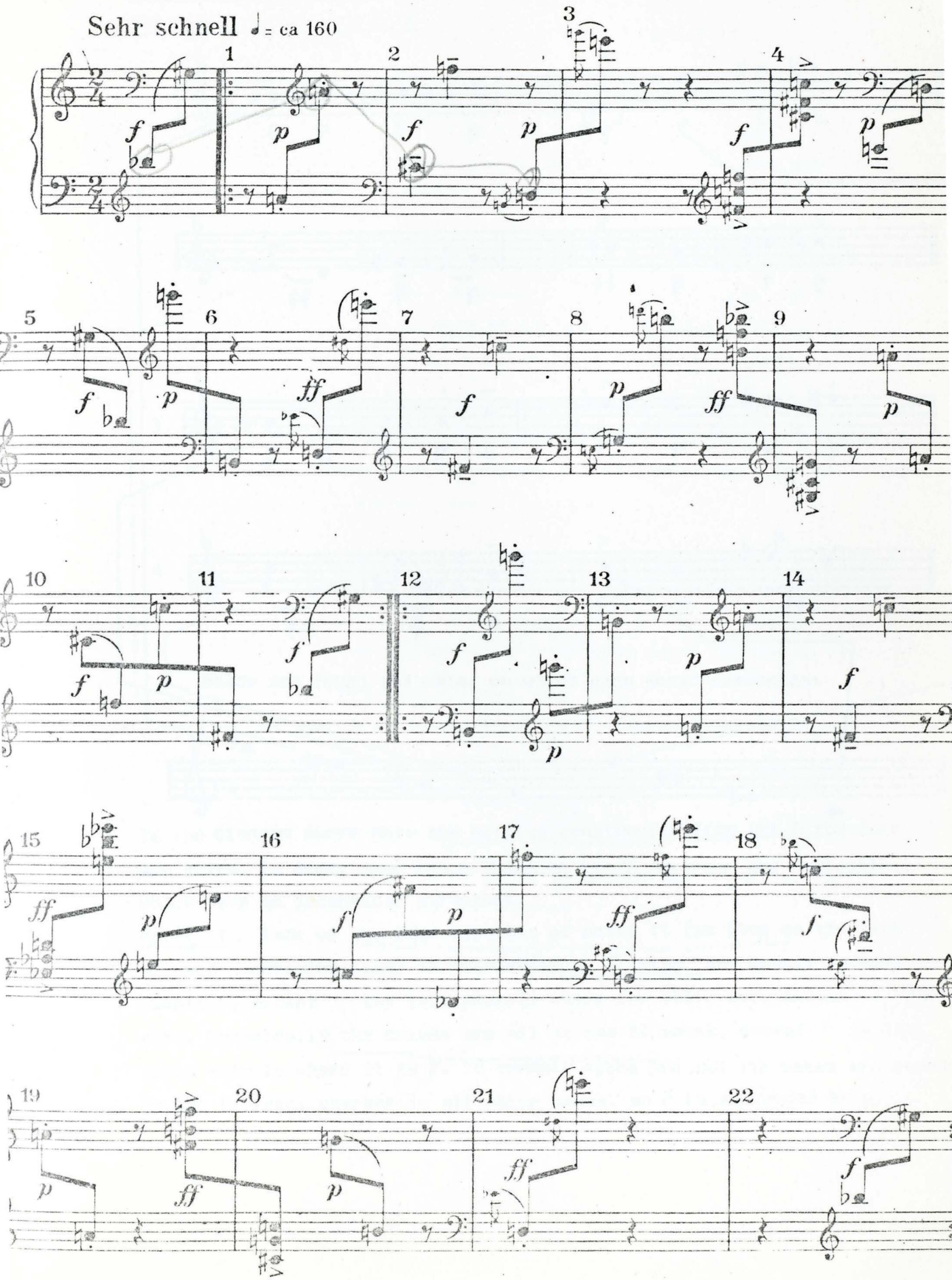


The last note of motif 11 is a reflection of the last note of motif I This is the only difference between these two motives. The similarity is further established by the treatment of the 4th note of the row as a grace note. We can describe the last two notes of each motif in matrix form as:

$$MI = \left[\begin{pmatrix} 2 & 0 \\ 0 & 4 \end{pmatrix} + \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\right]\begin{pmatrix} x \\ y \end{pmatrix} \quad MII = \left[\begin{pmatrix} 2 & 0 \\ 0 & 4 \end{pmatrix} + \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\right]\begin{pmatrix} x \\ y \end{pmatrix}$$

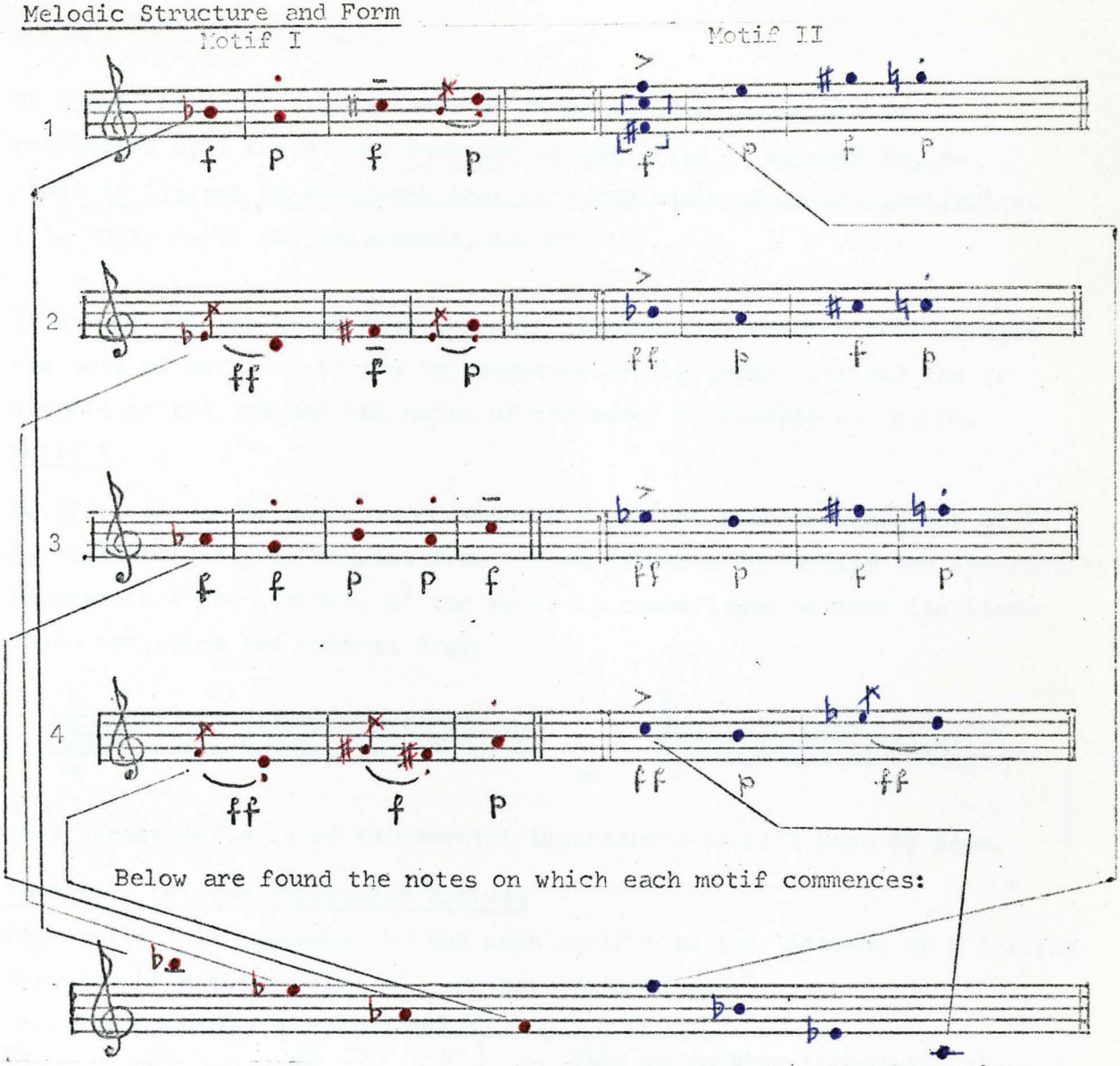
These two motives are not always heard in this direct form: such a procedure would have been tedious. Instead, they are modified and continuously varied, but such that each motif is contained in a phrase-segment. (We use this term to give the idea of a longer melodic segment which presents a sense of partial completeness to the ear. A phrase-segment is similar to the conventional term "phrase" but differs from this term in that it lacks the conventional and direct cadence.

II



Analysis of Op. 27

Melodic Structure and Form



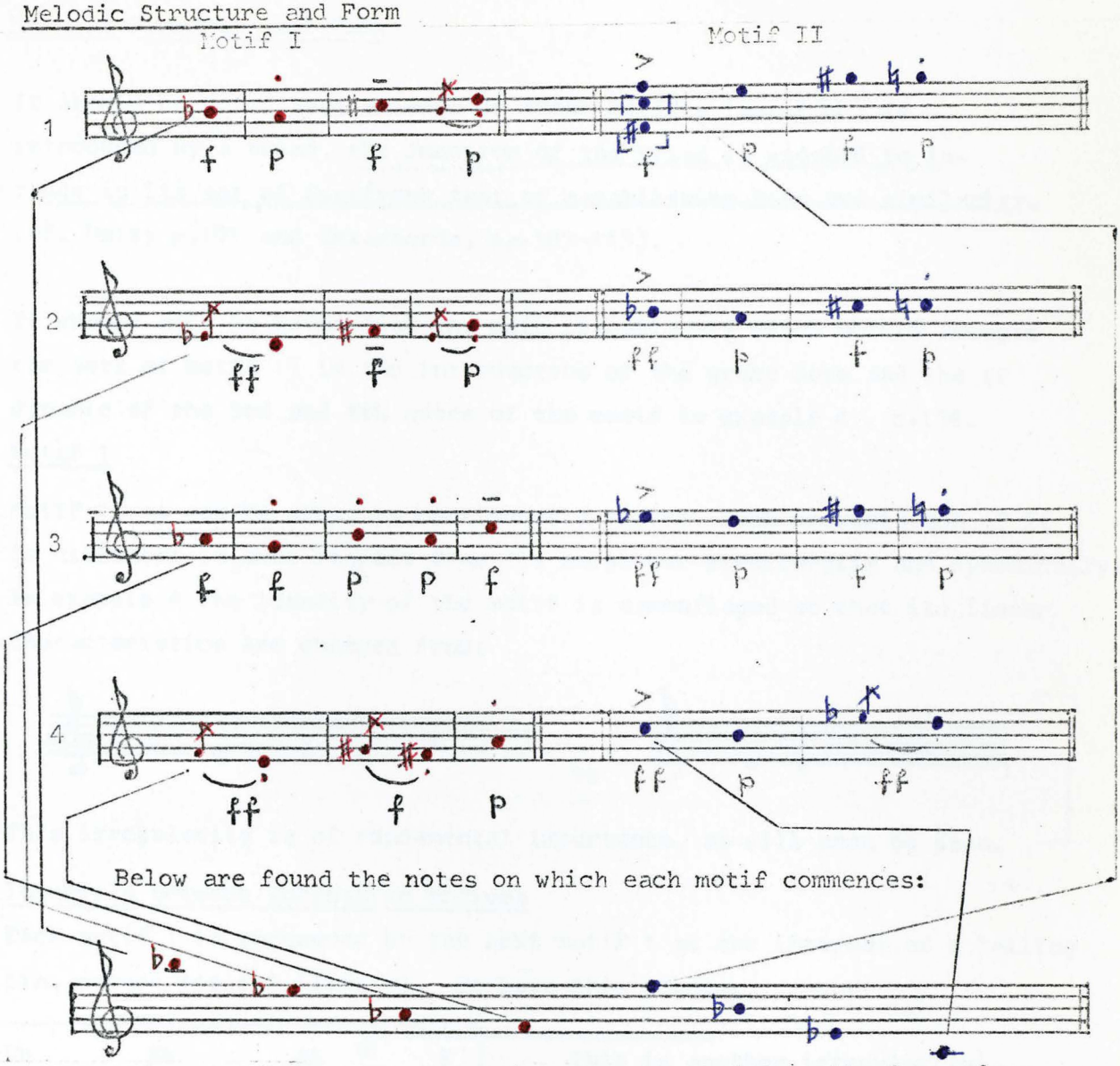
Below are found the notes on which each motif commences:

In the diagram above only the motives constructed from the O row-form are given. In every case those based on the I row-form are reflections which have an indentical structure.

Motif 11 Each of the four versions of motif 11 (in blue on the right of each successive line) is introduced by a triad and mostly retains its identity, except the last example where the third note becomes a grace note. Dynamically the triads are all at the ff level, except in the first example where it is f. In example 4,the 3rd and 4th notes are heard at the ff level whereas in all other cases, an f is succeeded by p.

Analysis of Op. 27

Melodic Structure and Form



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Analysis of Op. 27

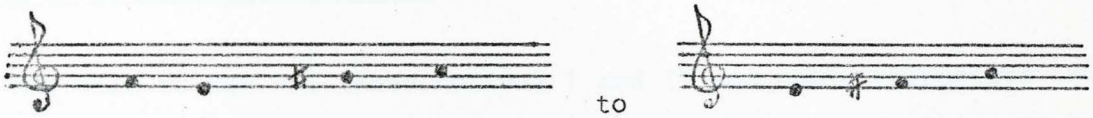
Melodic Structure and Form

It should be noted that as each of these motives (motif II) is introduced by a triad, the function of the triad is widened to include in its set of functions that of establishing form and similarity. (cf. Unity p.101 and Hexachords, pp.107-115).

It should also be noted that the main irregularity which occurs amongst the sets of motif 11 is the introduction of the grace note and the ff dynamic of the 3rd and 4th notes of the motif in example 4 , p.134.

Motif 1

Motif 1, as can be seen, is continuously varied. Each presentation of it is different in some respect from its neighbour structurally and dynamically. In example 4 the identity of the motif is camouflaged so that its linear characteristics are changed from:



to

This irregularity is of fundamental importance, as will soon be seen.

Intervals between successive motives

Each motif 1 is succeeded by the next motif 1 at the interval of a falling 5th, except motif 1 (line 4). We have this scheme:

Bb Eb Ab ↓ F (This is another irregularity).

Each motif 11 is similarly followed by another motif 11 at the interval of the falling 5th, also except the motif of line 4.

F Bb Eb ↓ C which also is an irregularity).

Each motif 1 is followed by a motif II at the interval of a rising 5th.

Analysis of Op. 27

Melodic Structure and Form

Intervals between successive motives

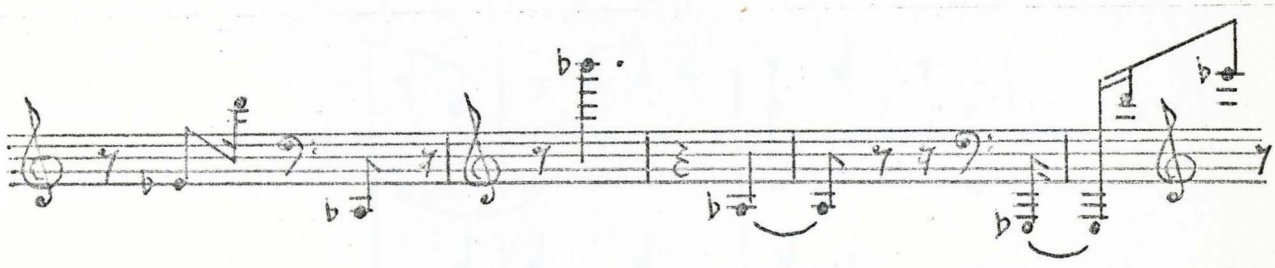
The motives in the inverted form succeed each other as follows:

motif 1_m	✱ 1	Ab	Eb	Bb	Db
motif II_m		Db	Ab	Eb	Gb

Here, too, we have the irregularity of an ascending minor 3rd between the 3rd and 4th successions of the motives, The reason for these irregularities will be determined later. (cf. p. 148)

Method of Registral reduction

We now wish to see how these motives 1 and II and their respective inversions ✱ 1 are put together in this movement. The best way this can be accomplished is by the method of registral reduction. When a piece of twelve-tone music is rewritten so that the intervals lie within the octave, such a procedure facilitates recognition of the various relations and is an aid to finer analysis. (cf. Silence/sound patterns, p. 89). It should also be observed that when such a method of reduction is employed the names of the notes, the relations, form and structure remain invariant and consequently these parameters are more easily recognisable. We give another example here.

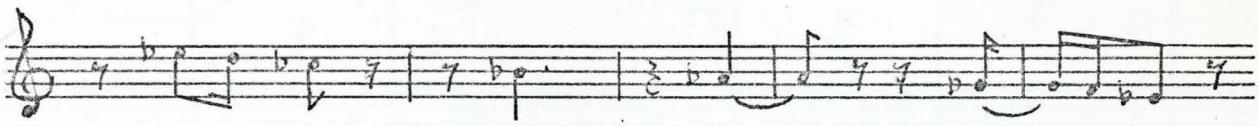


Analysis of Op. 27

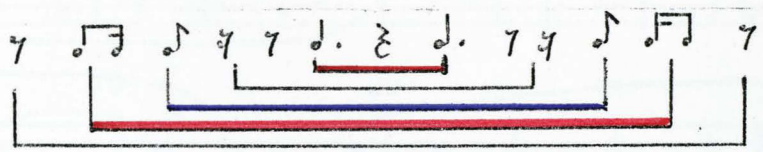
Melodic Structure and Form

Method of Registral reduction

This, which is rather difficult to assess visually and aurally, becomes more easily recognisable when rewritten with the intervals registrally reduced to only one register. Thus:



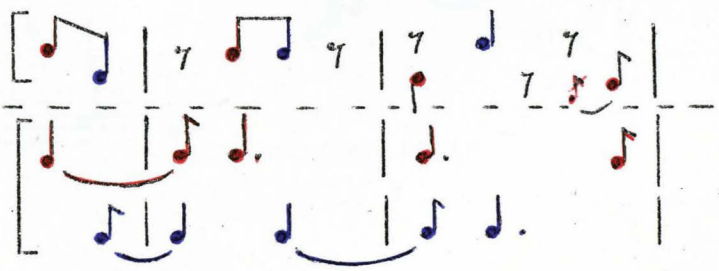
where without difficulty the theme becomes readily recognisable as merely the descending scale of Eb harmonic minor. Even the structure, that of a symmetrical time pattern - is more easily assessed.

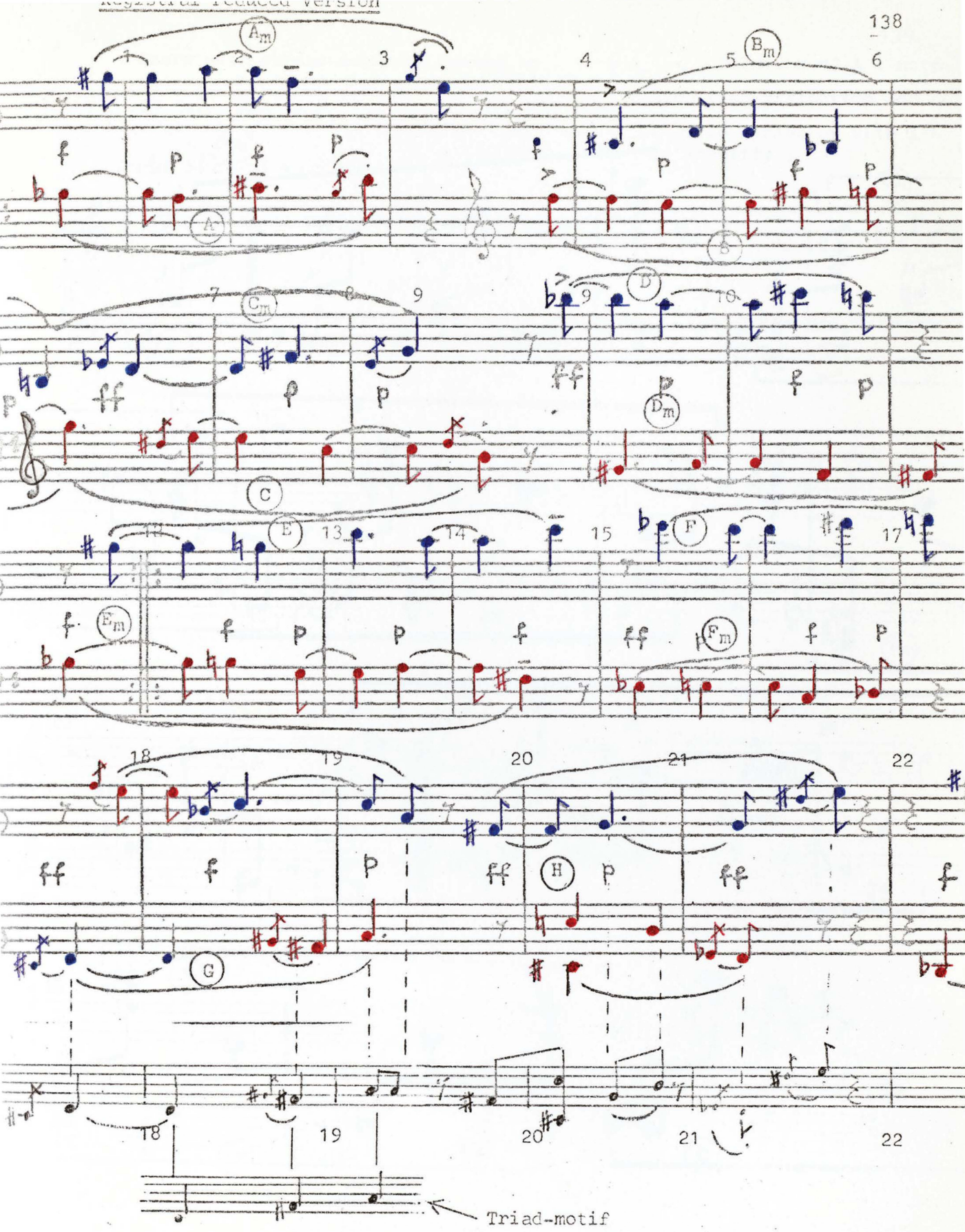


Hence, due to these reasons, justification of this method, as a means to facilitate analysis, is conclusive. Thus we take the liberty to present the movement as follows. (It should be noted that the values given for each note are from one interval of entry until the interval of entry of the following note. In this way a mere continuous thread is formed)

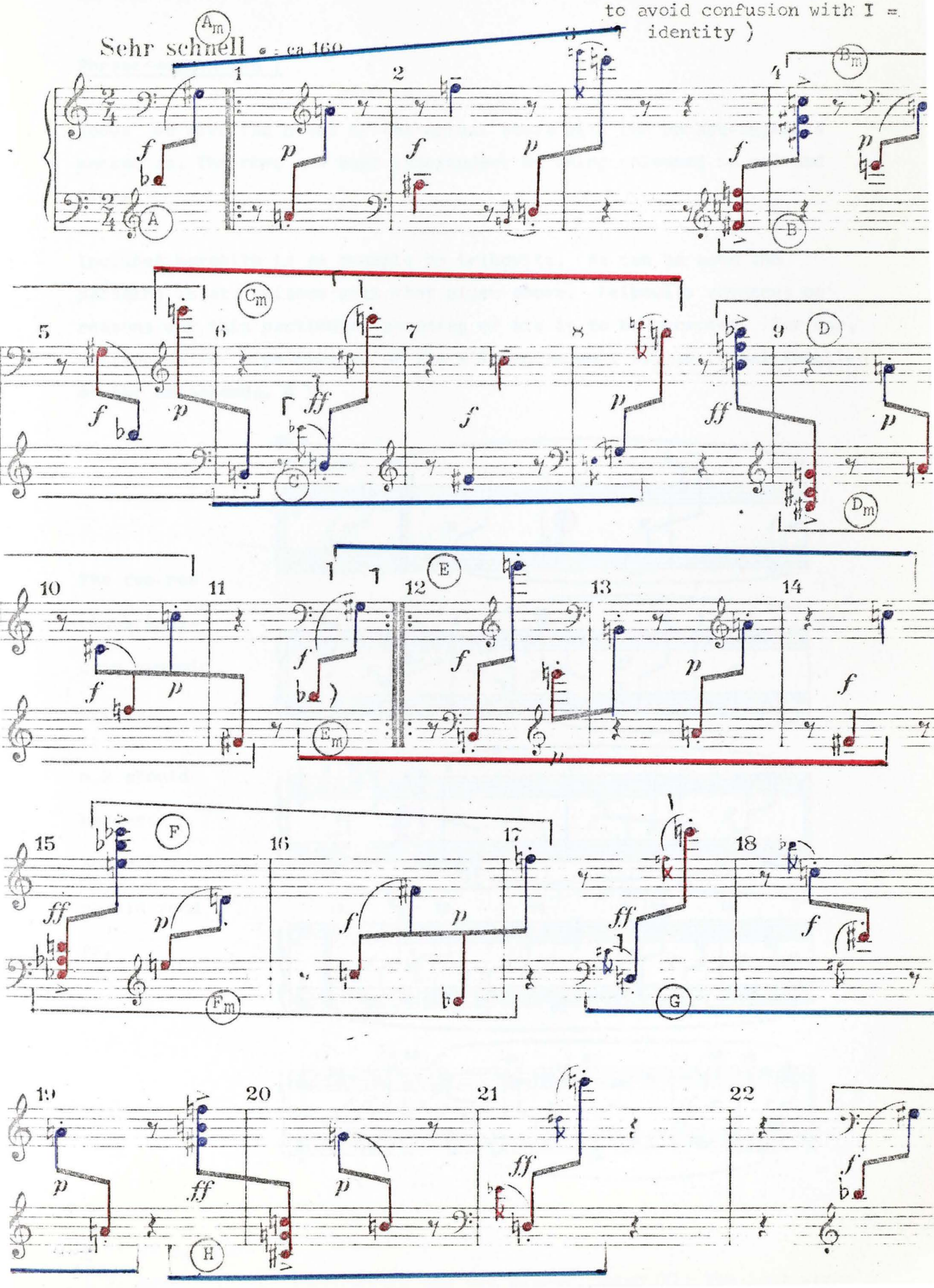
Score :

interval of entry:




Triad-motif

Score with phrase-segments marked in (A_m = reflection of A : note m signifies reflection and not I = identity to avoid confusion with identity)



Analysis of Op. 27 Melodic Structure

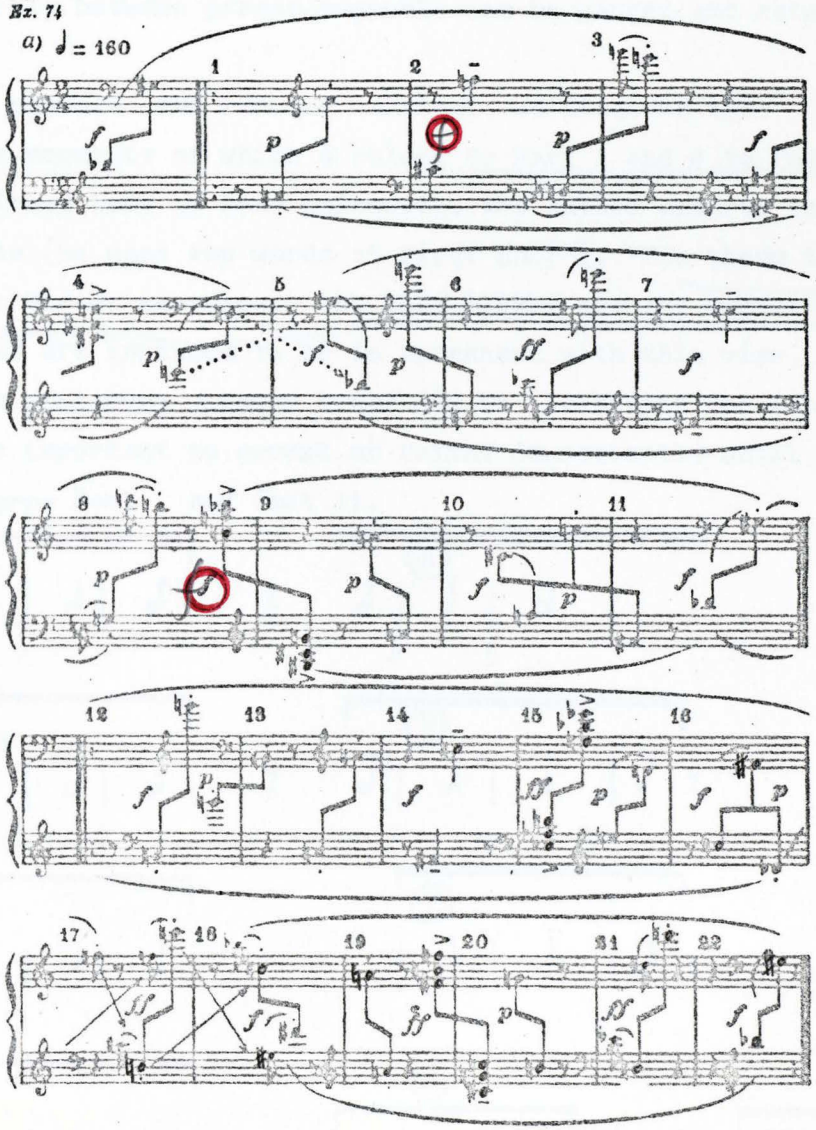
Phrase-segments ✱ 1

Above we give the notes of the actual score with the phrase-segments marked in. The rows are kept independent by being coloured in red and blue.

Included herewith is an example by Leibowitz. As can be seen the phrasing is at variance with that given above. Leibowitz advances no reasons why this particular phrasing of his is to be accepted, For one, he ignores the significance of the silence as well as the formal function of the hexachords. ✱ 2.

Bsp. 74

a) ♩ = 160



The two red rings indicate dynamic errors:

m.2 should be forte and m.8 should read ff.

✱ 1: Cf p. 132.

✱ 2: René Leibowitz:Schoenberg and his School, Caput XI: the last works of Webern, p.236 Da Capo Press New York 1970

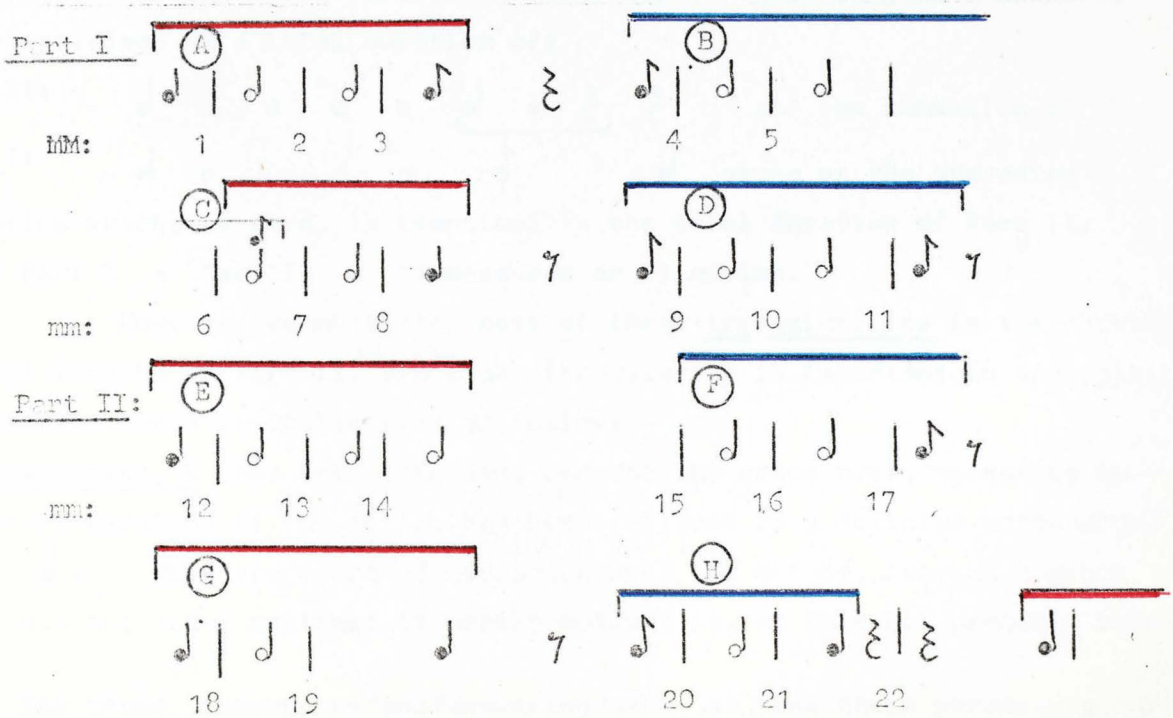
Analysis of Op. 27 Melodic Structure

Phrase-segments

However, by this method of registral reduction we observe that:

1) motives are shaped into phrase-segments and contained by them: (mostly the phrase-segment and motif are identical, except phrase-segment C, which overlaps with phrase-segment B, and which absorbs the note B, into its orbit. Phrase-segments G and H tend to form a single strand out of O and I row-forms, and due to the crossing of these rows, are highly irregular. We shall discuss this later.)
2) the different phrase-segments are easily recognised and their lengths can therefore be more accurately established;
3) formal similarity between phrase-segments can be gauged and established.

Examining the example (the reduced version), we discover that there are 8 phrase-segments of which 4 belong to Part 1 and 4 to Part 11. In the above-mentioned book by René Leibowitz, the author asserts that there are two parts (he uses the words :" first half"). "The theme is exposed in the first eleven measures; the last eleven are the variation." (p. 235) Though we are inclined to be in agreement with this view, we cannot accept this statement without proof and Mr Leibowitz furnishes none. This is too important to accept on faith. Consequently until proved we shall use the terms Part 1 and Part 11.



Phrase-segments

The succession of the phrase-segments of Part I are:

A (announcing phrase-segment) B (answering phrase-segment)

C (2nd announcing segment) D (concluding segment)

E The succession of phrase-segments of Part II are:

E (announcing phrase-segment) F (answering phrase-segment)

G (2nd announcing segment) H (concluding segment). ✱1

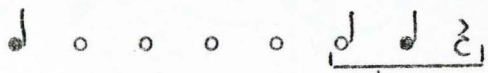
This scheme of phrase-segment division is supported by the following table of phrase-segment lengths (durations) and the number of notes per phrase-segment:

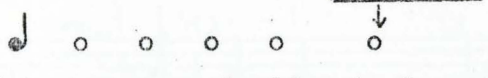
(In the table below each chord is considered as a single entity and therefore represented by a single note. Though grace notes are thematically unimportant, they have herein been counted as ordinary notes).

Segment	length	no of notes	Segment	length	no of notes
A	o 	10	E	o 	10
B	o	8	F	o 	8
C	o	12-2	G	o	10
D	o	8	H	o 	8

(It should be noted that if every note is counted in B, D, F, and H, segments of which contain the hexachords, then in every case there are 12 notes. This still gives us the balance and proof of the identity of the phrase-segments.)

Concerning the above-mentioned, we note that in Part I the phrase-segments are mostly of the same lengths, but in Part II the segments differ in length. Though there is this difference, the summation of these lengths (including the rests) gives us a total duration of:

Part II:  and the summation of

Part I:  gives us the preceding

summation which, as seen, is identical to the total duration of Part II.

Hence Part I = Part II = 11 measures or 11 minims.

However, we must take note of these irregularities in the phrase-segment lengths of Part II, since any irregularity is important in analysis. We describe these irregularities as follows:

Phrase-segment, E has been extended, because the grace note, appearing in the other versions of the motif, has been replaced by a definite note-value, i.e.  . This procedure, of course, changes the melody, whereas a grace note does not alter outline: it merely colours it, so this has probably been

✱1: The terms "announcing" and "answering" show us that these phrase-segments are related to the phrase. The terms "antecedent" and "consequent" could well be used, but Schönberg uses these terms to describe the first

done to achieve variation (cf. p. 134).

Phrase-segment, F has been diminished by the tri-chord falling on the accented beat instead of before it, as in segments B and D.

Segment G is diminished by the discarding of the overlapping of segments as between segments B and C.

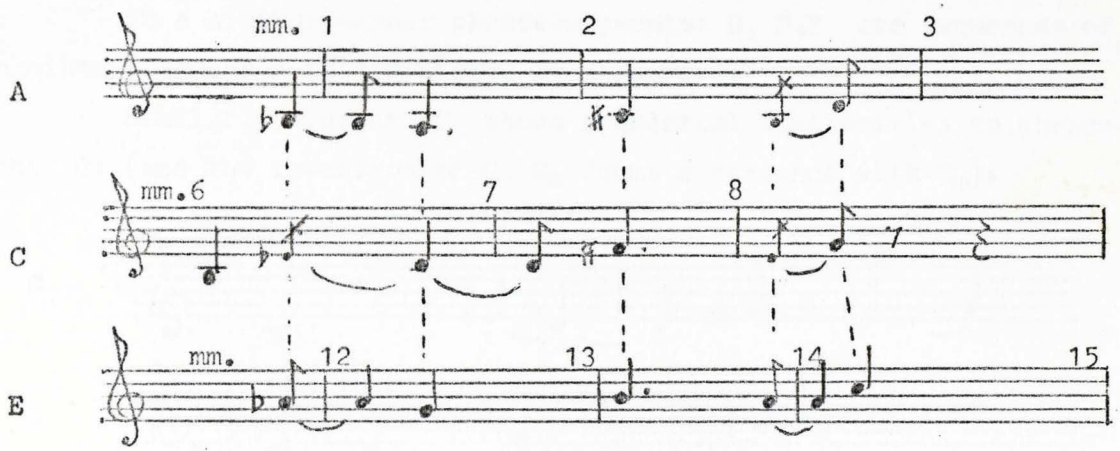
Segment H is also diminished so that it can terminate on a strong beat, and to be conclusive as an ending.

Following segment H are two crotchet rests. These rests have been inserted so that Part II balances Part I in length of duration. These rests also draw attention to the close of Part II and the repetition of Part II , but besides this, they also draw attention to the close of the entire movement and the beginning of the next movement (3rd movement).

However, we shall soon see that these augmentations and diminutions point to other significant facts.

Similarities of Phrase-segments

Comparing the phrase-segments to see if there are similarities of structure, we observe that segments C and E are merely sequences of A (C having an extra note). Similarly, the inversions of these: A_m , C_m, E_m have the same sequential relations.

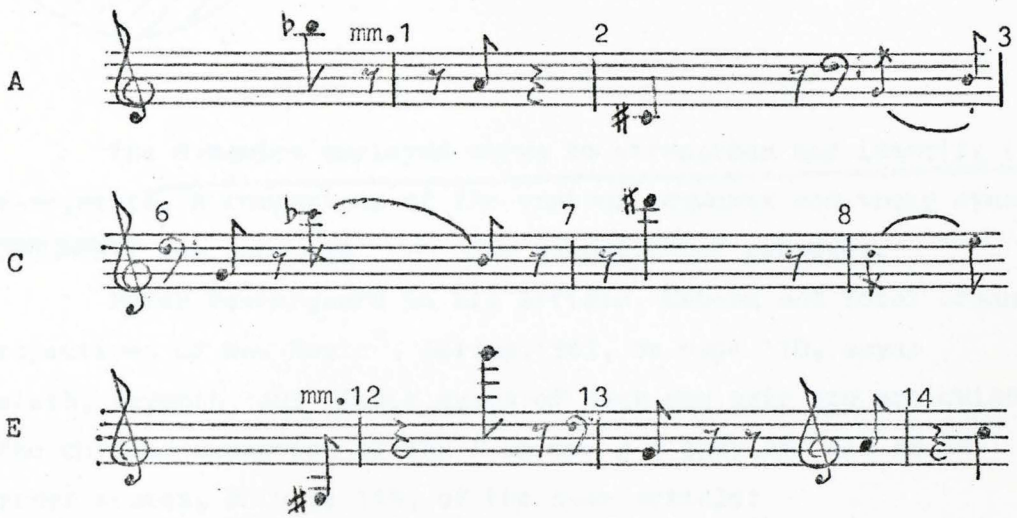


The term "sequence" should herein be qualified. These sequences are contained in the registral reduced version, but not neccessarily in the actual score. (cf. p. 138) Overleaf we give the score versions of the above-mentioned. We see that some intervals are invariant (the first two in A and C and the interval between the last two notes in each case) but that the other intervals, due to registral disposition, distort the sequences.

Phrase-segments

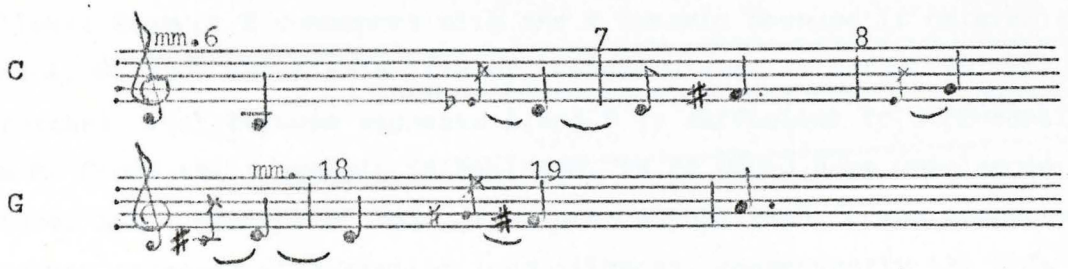
We thus encounter the paradox that the sequence both exists and does n exist. In such cases we term these sequences supra-ordered because they are present in the internal structure of the music but are hidden by means of registral placement. Registration in this case then becomes a tool to create differentiation, for even one note placed in another registral orbit effectively destroys a sequence.

Score versions of segments A, C and E:



In á similar manner phrase-segments: B, D,F are sequences of one another (segment F is diminished by a quaver).

Similarly segment C shows sequential similarities to phrase-segment C: (and the inversion of G, G_m forms a sequence with C_m):

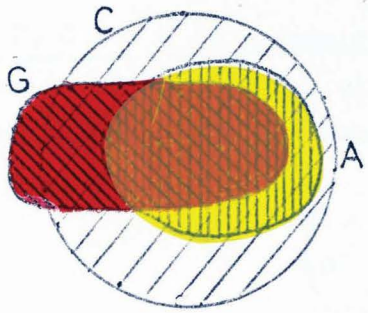


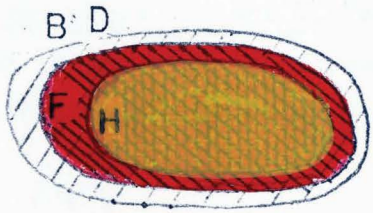
Phrase-segment, H forms a sequence with segments B, D and F, the last two notes of H being diminished. In connection with segments C and G, we observe that even though the rows cross, similarity still exists.

The variable parameters herein encountered are dynamics, accentuation (and different beat-positions) especially with regards to the elements of phrase-segments A, C, E and G. Segments B, D, F, and H are mostly constant except as indicated.

Phrase-segments

We can show the above sequential or other relations as follows by the use of Venn diagrams





The dynamics employed serve to strengthen and identify the various phrase-segments. A comparison of the various segments and their dynamics supports this argument: see page 139 for comparisonal purposes.

Peter Westergaard in his article, Webern and Total organization, in"Perspectives of New Music", Spring,1963, on page 110, says:
"The sixth, seventh and eighth dyads of each row pair are articulated (With the curious exception of the f in mm. 3-4 they are all ff.)"
He further states, on page 116, of the same article:
"The figure at mm. 3-4 creates the first deviation from the norm of dotted quarter between beginnings of figures (See ID4). (I am unsure why this figure is not ff. Perhaps the combination of the first rhythmic and the first dynamic would be too much.)"

We herein advance the reason for the employment of the f dynamic as follows: Segment B commences with the f dynamic because it originates from segment A. We have shown this already. Webern wished to establish this connection. The crotchet rest between segments A and B is sufficient to differentiate A from B. Hence the f dynamic is employed. An ff would have unbalanced the structure. Since segment B has thus been established it was unneccessary to separate segments with similar long silences, consequently the ff's are there to show the similarity of the various even segments: D, F and H and to accentuate these.

Above we have shown the obvious similarities existing between the various phrase-segments and we have seen that matrix X corresponds to matrix Y thus:

$$X = \begin{pmatrix} A & B \\ C & D \end{pmatrix} \qquad Y = \begin{pmatrix} E & F \\ G & H \end{pmatrix}$$

i.e. A corresponds to E
C " " G
etc.

Reflection /

When comparing Part I and Part II we notice a most remarkable fact, which has only been determined by means of the aid of the registral reduced version, namely that the whole of Part II consisting of phrase-segments, E, F, G and H is a complete reflection of the whole of Part I. This important fact is of fundamental significance because it proves, without question, that an operation has been performed on Part I. Mathematically stated if Part I is:

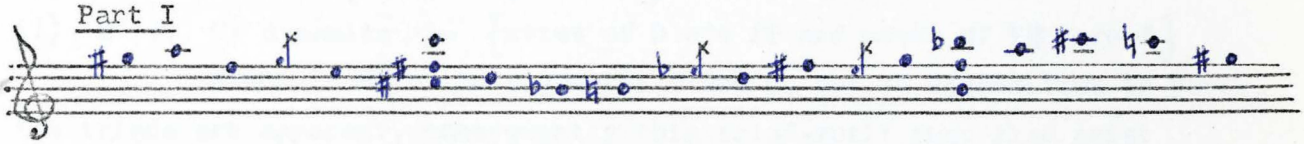
$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x_0 \\ y_0 \end{pmatrix}$$

then Part II is:

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$$

Hence Part II mirrors Part I, therefore Part II is a variation , in the strictest sense of Part I, and consequently the use of the title "Variation" by Webern is logical , legitimate and correct.

Part I



Part II ℙ reflection of I



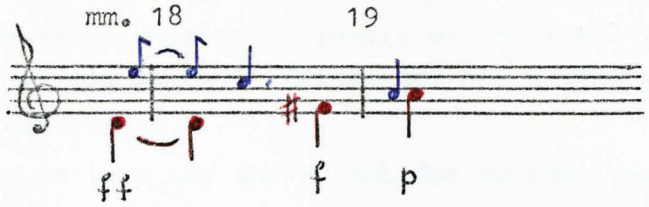
We can further establish this view: that Part II is a variation of Part I, because - if Part II is a variation of Part I, then the theme must contain the variation, or the variation must contain the theme topologically (i.e the thematic notes are indeterminate).

First of all we shall examine the irregularities in connection with with phrase-segment G. This segment is irregular in a number of respects. For instance,it accentuates notes which in the other segments are of secondary importance. Also, due to the crossing of the rows, the two strands form a new melodic segment and the D major triad comes into prominence because of the dynamics associated with the notes of this triad and the appearance of these notes on accented beats. Due to this, the major and the ornamental minor secondary part, this segment acquires a quaint colouring which is fitting for this scherzo-like movement.

Referring to the reduced version, we see that we have (mm. 17-19):

Triad-motif

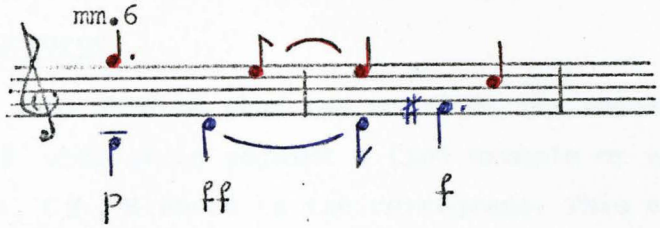
Segment G



A minor and
D major triads

We can argue that if these are variations, then we can expect this idea to also appear in the corresponding phrase segment of C (mm. 6-8)

Segment C



C major and
B minor triads

Thus segment, C, also contains similar triads as in the example above. There are two further relations between segments C and G:

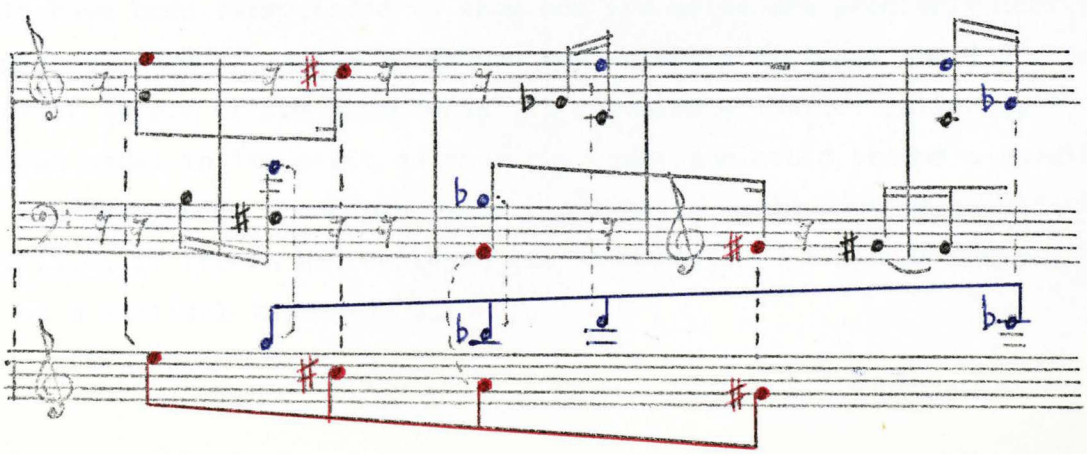
i) G ∩ C = { D/E, C/F♯ dyads }

ii) G ∩ C: dynamics = { notes of D are ff and notes of F♯ are f }

Since in both the segments: G and C, due to disposition of parts, the triads are apparent, consequently this triad-motif must also exist in other segments if the triads are an integral motif of the variations. We see that in segment A, due to beat-position (the strong beats) we have:



The A major triad (and D minor triad) does indeed exist here, but does not in itself, as in C and G, form a melodic segment. However, it is latent, and this is precisely the function of variations to uncover all aspects of a theme. But is this idea also included in the other movements? Indeed it is! In movement I (mm. 1 - 4) we have:



Triad-motif

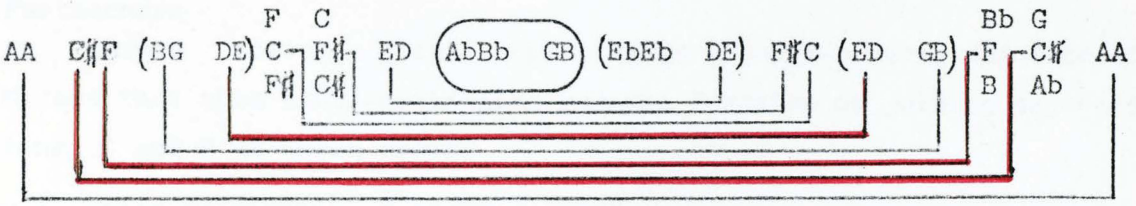
As, can be seen, the triads are apparent, and the relationship between the above-mentioned and phrase-segment A,is clearly established. This fact shows that Part I (of movement II) itself is a variation, and not a theme,as Leibowitz states, of an earlier stated theme.

Hence we have now shown that due to the irregularity of segment G, we have discovered important relations between the segments of Part I and Part II of movement II, and between movements I and II.

Symmetrical structures

We also observe that the notes of the segment above are: E, C♯, A and G♯ whereas in segment A (3rd example on previous page) the notes are G♯, A, C♯, E which is the retrograde. This establishes this as a retrograde of movement I. Hence a variation.

This retrogradal characteristic is more prominent than one would expect. Webern had constructed this movement out of the combination of O and I row-forms, and since R and RI row-forms are not employed we are led to believe that symmetries cannot exist here as they do in the 1st movement. Nevertheless, on closer inspection, we discover that Vr.1 is almost a complete symmetry. From mm. 1-9 we have:

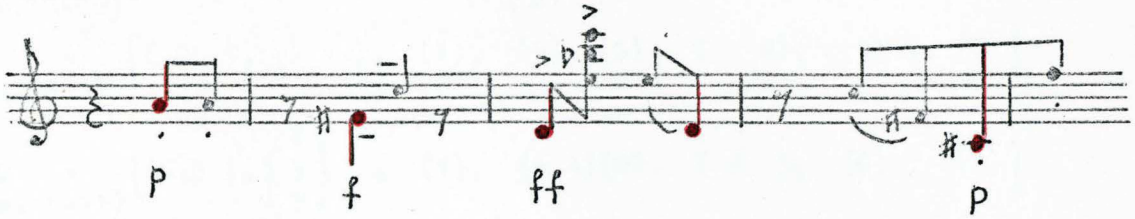


Even the order of the notes is symmetrically maintained, for instance,if the notes are first given: B, G, D, E then they are given retrogradally: E, D, G, B.

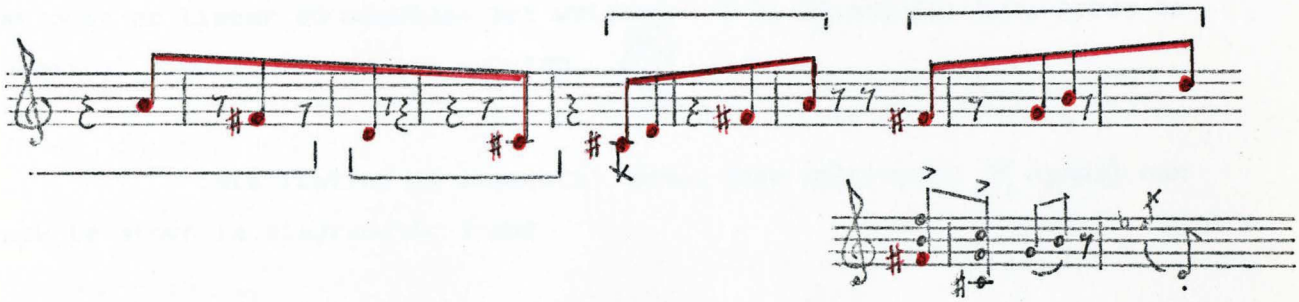
In Vr. 2 we have a similar striking symmetry (from mm. 12-21. See diagram, p.153 where the symmetrical relations have been marked. On p.151, mm. 11-16 have been retrograded to show how the notes are precisely derived. This symmetry is very close,as if Webern had actually employed the R row-form. Here another aspect of the hexachords is revealed - that of gathering the non-symmetrical notes in its orbit so that the cancrizan could become a possibility. Without the hexachords these non-symmetrical notes would have destroyed the symmetry (i.e. if Webern had employed the hexachords as a linear succession and not as a vertical aggregate).

Symmetrical structures

Since the existence of an inherent symmetry has been established, we may now determine whether the D major triad, mm. 17-19 also appears in the reverse. With reference to the score we note that it does in fact appear:



Earlier, on page 142 , we drew attention to the fact that the 4th note of motif 1 had been replaced by a note-value (cf. segment E). We now understand the reason for this to be to maintain the symmetry and the identity of the triad-motif. Let us examine Vr. 2 (mm. 14-21) with these triads in mind.



Furthermore we should notice that segment H is a supra-ordered sequence of segment G, and that this triad-motif also has the function of joining segments: it links E and F as shown above.

Comparison of Segments G and H to other segments

We are further interested to see how segments G and H, mm. 17-22, are related to other segments - whether there is any similar order of succession of dyads, and to what extent topological relations exist. (cf. p. 91 Sound/silence patterns)

We find that G and H contain A, and also that there are similarities between G/H and D. This is shown clearly on page 151 where the correspondences have been marked by dotted lines. On the next page, 153, mm.15-19, segments F and part of G are compared with segments B and C to show corresponding similarities.

We show these similarities diagrammatically by the use of sets where successive dyads are considered as different elements and their order of appearance maintained. We number the dyads as previously i.e.

A/A = 1 Bb/Ab = 2 B/G = 3 C/F♯ = 4 F/C♯ = 5 D/E = 6 Eb/Eb = 7

Then we have:/

Comparison of segments G and H

Then we have:

G/H (mm.17-22) = {(5, 6), (2, 4), (1), $\begin{pmatrix}5\\3\\4\end{pmatrix}$ (3), (7, 6), (0), (2)}

A (mm. 1-3) = {(0), (2), (1), (5) (3), (6), (0), (0)}

C/D (mm. 8-11) = {(6,3), $\begin{pmatrix}2\\3\\5\end{pmatrix}$, (1), (5,4)(0), (0), (0), (2)}

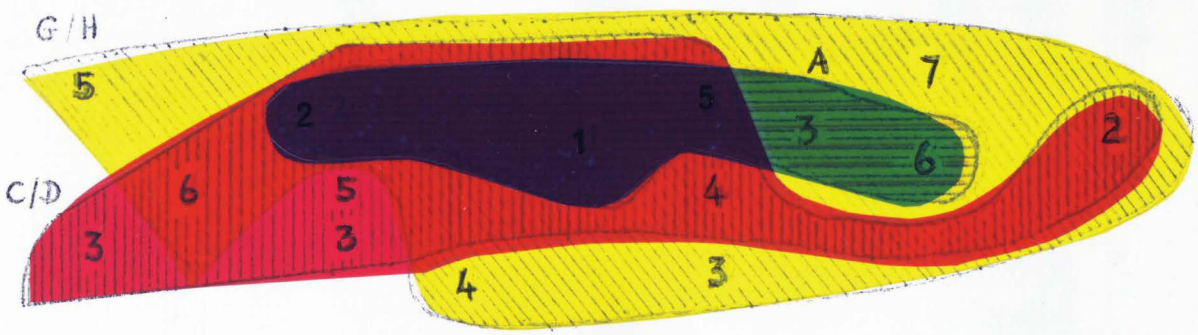
To explain this more explicitly we have, see G/H above:

Segments G and H = {dyads (E/C♯, D/E), (Bb/Ab, C/F♯) ..... }

which are numbered: { (5 , 6), (2 , 4) ..... }

melodic or linear successions are written: (5, 6) and the hexachords or vertical simultaneities are written $\begin{pmatrix}5\\3\\4\end{pmatrix}$.

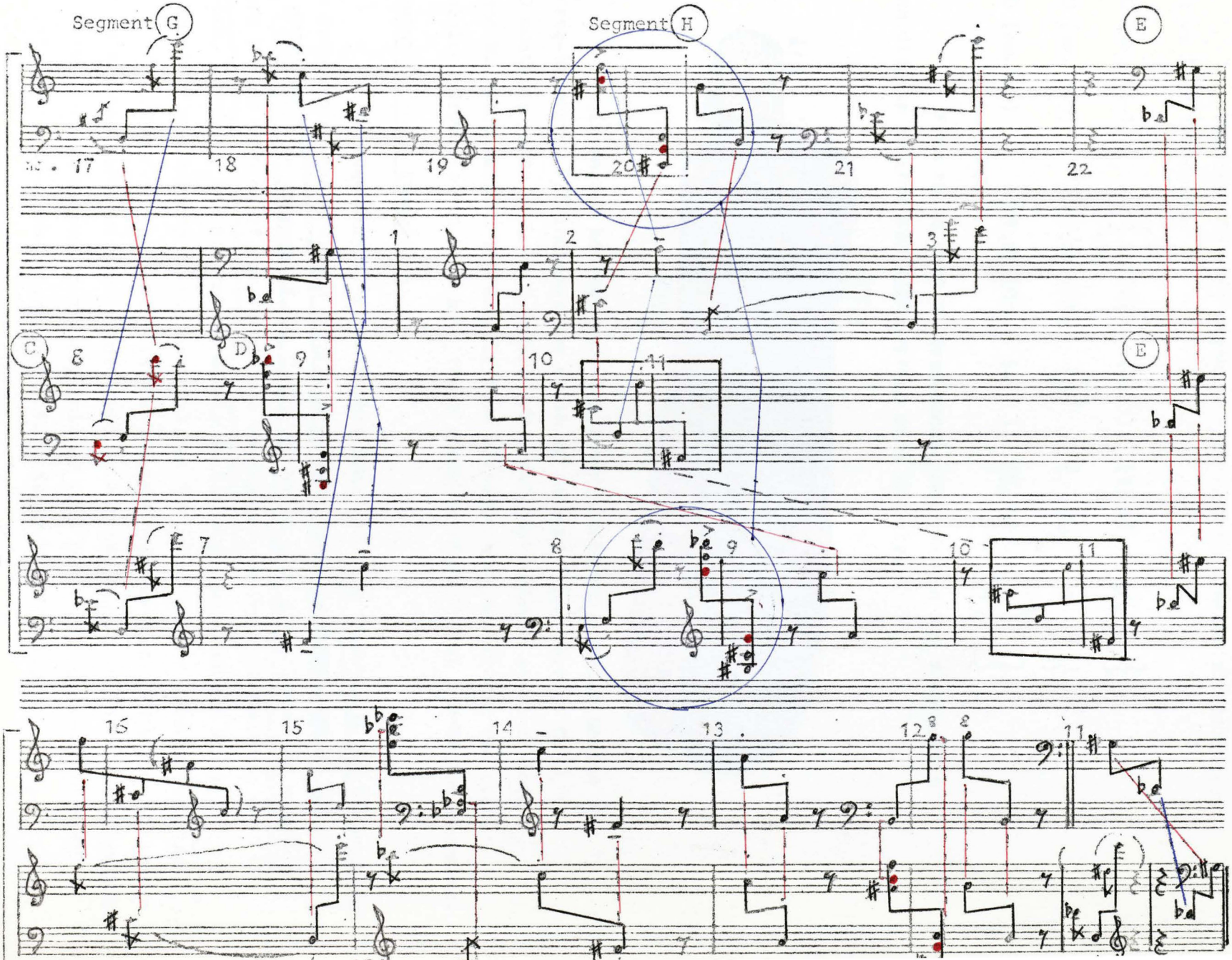
This"listing of elements" above (the succession of dyads) can now be shown in diagramatic form:



The diagram shows that segment G/H mostly contains the other segments. The elements which are not contained within G/H are some members of the hexachords such as, for instance, $\begin{pmatrix}5\\3\end{pmatrix}$ of the hexachord $\begin{pmatrix}2\\5\\3\end{pmatrix}$.

The function of the hexachords herein is to create similarity between the segments as a connective. Elsewhere we have shown how the hexachords are used to achieve symmetry and how they are used to divide the segments from each other, i.e. A from B, C from D, etc.

Comparison of Segments G and H to other segments



Comparison of segments F/G to other segments

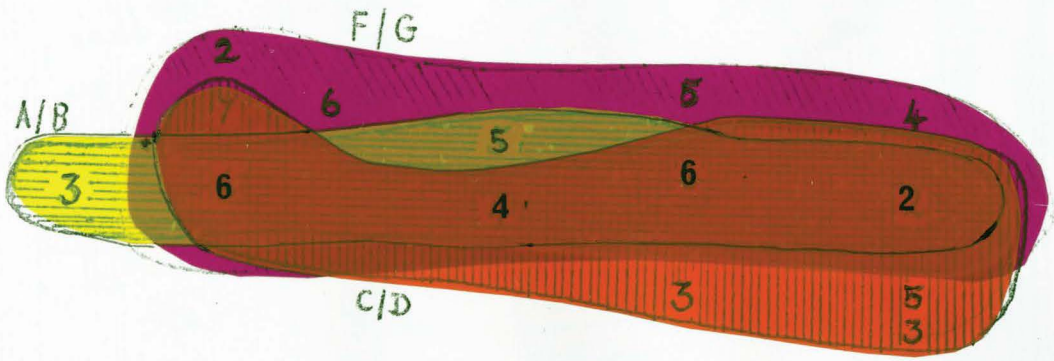
Measures 15- 18, segments F/G gives us similar similarities. Let us list the dyads:

F/G (mm. 15-18) $= \left\{ \begin{pmatrix} 7 \\ 2 \\ 6 \end{pmatrix} (6), \quad (4, 5), \quad (5, 6), \quad (2, 4) \right\}$

A/B (mm. 3-5) $= \left\{ (3,6)\ (0), \quad \begin{pmatrix} 4 \\ 5 \end{pmatrix}, \quad (\ \ 6), \quad (2\ \ ) \right\}$

C/D (mm.6-9) $= \left\{ (7,6)\ (0), \quad (4\ \ ), \quad (6, 3) \quad \begin{pmatrix} 2 \\ 5 \\ 3 \end{pmatrix} \right\}$

From these sets of dyad-successions we can now construct a Venn diagram to show the similarities more clearly.



It should be observed that these similarities exist across the phrase-segments. F/G includes the whole of segment F and part of G. C/D contains parts of both C and D. A/B similarly includes parts of both A and B. Thus, besides the similarities already existing between the self-contained segments, we also have these striking similarities across the segments.

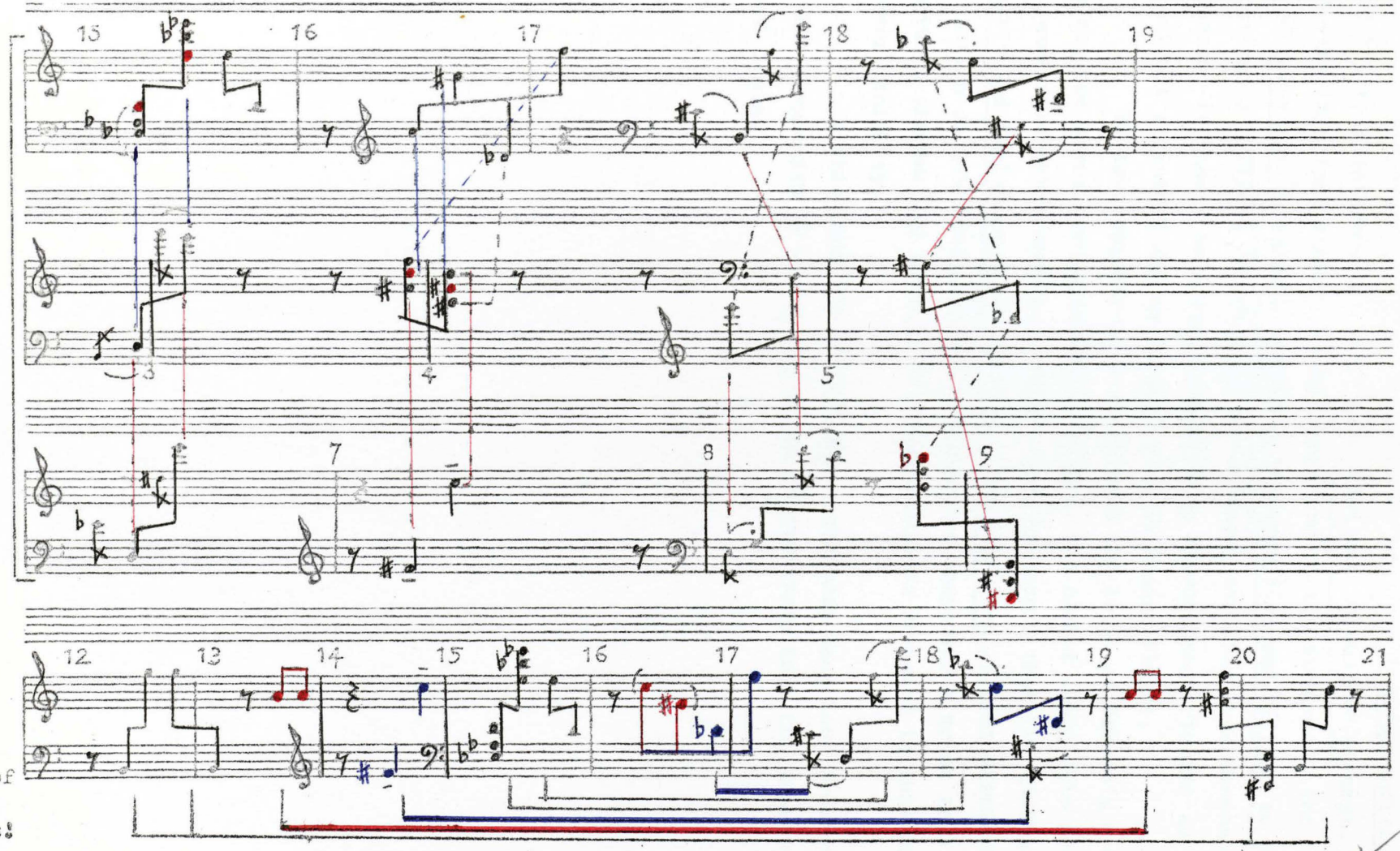
Segments G and H summarises

Consequently we find in this analysis that segments G and H summarise the complete movement with a technical mastery which is unbelievable. Not only is G/H similar to segments A, B, C, D, but it is also a retrograde of segments E and F (and no R or RI row-forms were employed!) Unity is astounding and Webern, as shown, has not relied merely on the rows to guarantee unity, but on the thorough mastery of his material and the logic of his creative ability.

Hence in this analysis we have conclusively shown that the two parts of the movement are two variations based on a theme stated in the first movement. These two variations are so closely related in a unified structure that they can exist as an independent movement which is in binary form.

New light/

Comparison of Segment F/G to other segments



Symmetry without the use of R or RI Row-forms!

Conclusion

New light has been shed on the function of simultaneities as chordal constellations, not only as a rhythmic percussive element, but also as a very important element in the unfolding of the structure. The careful use of accentuation through dynamics, beat-position and silence to draw attention to motives or melodies and endings, etc., has been demonstrated. In Webern, it should be noted, irregularity assumes significance as a technique of indirect accentuation: no irregularity is insignificant.

We have noticed with wonderment the logic of Webern's creative thought, the almost computerised structure, the almost impossible retrogrades and symmetries which emerge . Webern, too, has shown that the diffusion of tonality and twelve-tonalism can have a co-existence without distortion or distraction as Schoenberg thought. Webern even employed a triad as a particular structural element and motif. The resourcefulness revealed in this movement is sheer geniality.

In this analysis several new techniques have been developed to cope with the complexity of the material and to penetrate into the essence of the musical ideas.

10

Direction-Variants

Statistics and Descriptions of a Phenomenon

Some authorities, in their analyses of compositions by Webern, treat intervals statistically and also include in such analyses data about the direction of intervals (whether intervals ascend or descend). Since the direction of tones is important in Webern, let us investigate what these authorities can tell us about this phenomenon.

Armin Klammer in his analysis of Webern's Piano Variations, Op. 27: third movement ✱ 1, states:
"Further differentiation of the group-aggregates results from their characterisation by the interval direction which tends to occur most often. In the first aggregate, seven groups commence with descending, one with ascending intervals; their second intervals all rise; the third go by successive pairs, descending, ascending, descending; of the final intervals the first and the last are both ascending while those in between are descending;....."

After further description along these lines, the author gives a table of the "directions of intervals", from which we select a few samples.
DAD; AADA; DA; DAA; DAAD; DA; DADDA; DAD; ...DADDADAD... where A represents ascending direction and D a descending direction.

Though Klammer does not say what he means by the term, "interval direction", he makes the observation that an interval direction has the property of differentiation and his table is given to support this claim.

Karlheinz Stockhausen, analysing the 2nd movement of the String Quartet, Op. 28, says:
"The groups differ in the type and direction of intervals used within the groups - minor ninths, major sevenths, major sixths, minor sixths, and minor tenths.....". ✱ 2

✱ 1: Armin Klammer: Webern's Variations, Op. 27. 3rd Movement, p.84, published in Die Reihe, Number 2.

✱ 2: Karlheinz Stockhausen: Structure and Experiential Time, pp.73-74, published in Die Reihe, Number 2.

Statistics and Descriptions of a Phenomenon

Diagrams, showing the "interval directions" by means of arrows, are also given. These diagrams are ingenious in that they reveal how the succession of "interval directions" results in symmetric relations. Later we shall investigate this. We, however, observe that Stockhausen likewise mentions this differentiation property of "interval directions".

Herbert Eimert, in his analysis of the First movement of the String Quartet, Op. 28, uses the term "interval-shapes". He says: "Each of the fifty-one descending sevenths has a different shape!" * 3

He further states: "A statistical survey of the intervals gives us the following picture of the movement:

	Asc.	Desc.
Min. 2nd	3	10
Min. 3rd	20	8
Maj. 3rd	11	4
.....		
Maj. 7th	44	51
Min. 9th	29	37 ....."

The inference Eimert draws from this, in his own words, is: "The statistical table shows a definite preponderance of major sevenths and minor ninths. Of a total of 306 intervals, 161 are either major sevenths or minor ninths, as opposed to 145 other intervals ". * 4 This "statistical survey" does not give us any significant information as these statistics have to do with the order relations of the various intervals. The question of ascending and descending intervals have been ignored by grouping maj. 7ths and min. 9ths together and adding these as is encircled above.

* 3: Herbert Eimert: Interval Proportions, p. 94. Article, published in Die Reihe, Number 2.

* 4: ibid.

Direction-Variants

Statistics and Descriptions of a Phenomenon

In the next paragraph Eimert states: "In the first 16 bars of the movement..... Webern presents a perfect example of his interval-technique....." He continues, further on in the same paragraph: "Twenty-one two- and three-note interval-motives are used, each differing from all others." To demonstrate this, an example is given, but the fundamental aspect - that the pitches are invariant for the first sixteen bars only - is not mentioned.

We observe that Eimert has introduced another term: "interval-motives".

Thus all three of these authorities have observed the phenomenon and described it as a means of differentiation. Unfortunately they were not successful in isolating this phenomenon to study its properties and consequently they lack a precise definition. Hence the lengthy verbal descriptions of their observations.

Term and Symbols

Let us decide to drop the old terms: "interval directions", "interval spaces", interval shapes", "interval-motives", etc. and name the event of ascending and descending tones, Direction-Variants. The reason for this is that the old terms are confusing and do not describe this phenomenon accurately.

An element of a direction-variant is the direction between any two tones. To express such an element we shall use the symbol, $\wedge$ to denote an ascending element, and we shall use the symbol, $\vee$ to describe a descending element. Thus the direction of the v-shaped symbol describes the particular direction of the element. We also introduce a dot symbol . to represent a repeated element.

Our v-shaped symbol is derived from Stockhausen's arrow symbol, but as we already use arrow symbols, we prefer an algebraic letter so as to better express different operations, thus:

Direction-Variants

Term and Symbols

$(\wedge\ \vee) \xrightarrow{R} (\vee\ \wedge)$

$(\wedge\ \vee) \xrightarrow{I} (\vee\ \wedge)$

Hence R = I.

Application

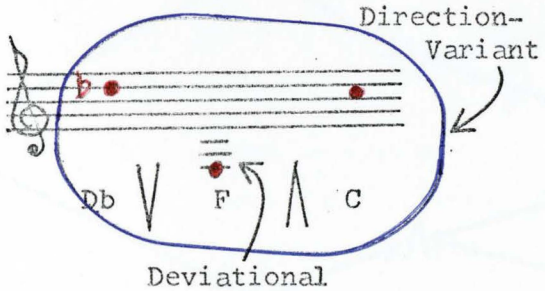
In the meantime let us be satisfied with a definition of a direction-variant as an operation which differentiates any group of tones from the same group of tones.

Now let us investigate the application of direction-variants with reference to any set of tones in the prime form. Let us select the set: {Db, F, C} and state this set in the prime form.



$\wedge\ \vee$

Now when any one of these tones is removed in the opposite direction from its prime and natural pitch orbit, the motif assumes one of the forms of a direction-variant. Such a tone, which changes direction and deviates from the prime pitch, we term a deviational.

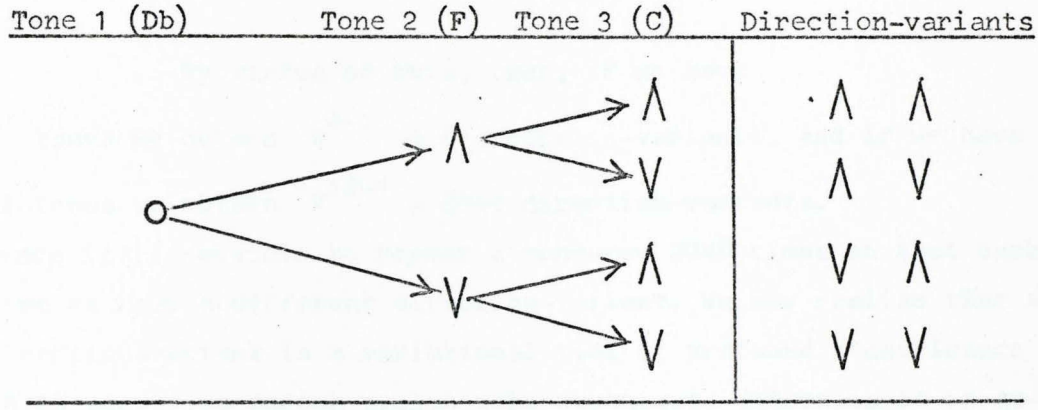


In the example, the three tones, containing the two direction elements is termed a direction-variant.

Direction-Variants

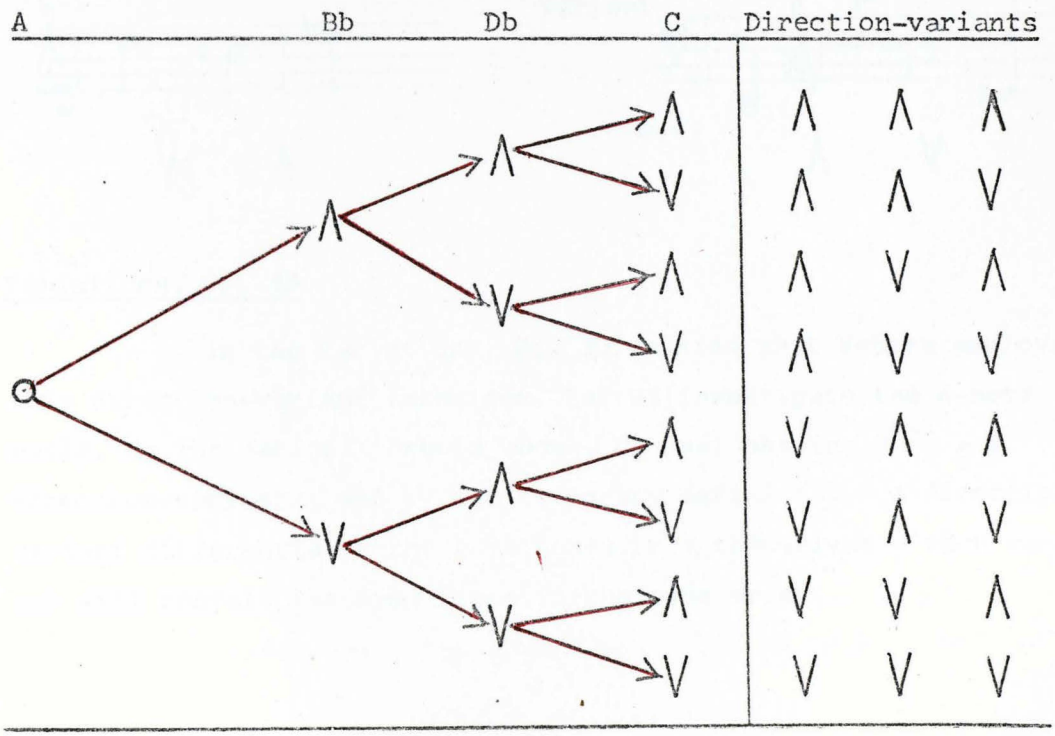
Tree Diagrams

Let us now list all the possible direction-variants of these 3 tones. This can be obtained by constructing a tree diagram where the arrows indicate the various paths the tones might take.



From the diagram we see that 3 tones contain 2 direction-variant elements and from any 3 tones we may obtain 4 direction-variants.

Let us construct another tree diagram using the tones: A, Bb, Db, C, to determine the number of direction-variants and to establish their various forms.

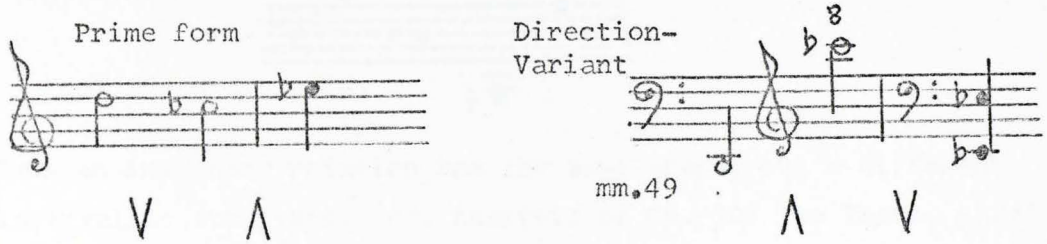


Direction-Variants

Variant Formula

We note that when we have 4 tones and 3 direction-elements, we obtain 8 different direction-variants.
Thus for any number of tones, we shall have
2^{n-1} direction-variants, where the index, n, is the number of tones.

By virtue of this, then, if we have
4 tones we obtain $2^{4-1} = 8$ direction-variants, and if we have
12 tones we obtain $2^{12-1} = 2048$ direction-variants.
Hence it is possible to repeat a tone-row 2048 times so that each time we have a different direction-variant. We now realise that a direction-variant is a variational tool of profound significance which serves to enrich twelve-tone technique. Webern is to be accredited with the discovery and application of this operational technique. Before his time, if some form of direction-variant occurred, it was probably accidental and its application sporadic. We quote an example from the Sonata in C minor, Op. 111, first movement, mm.49-50.



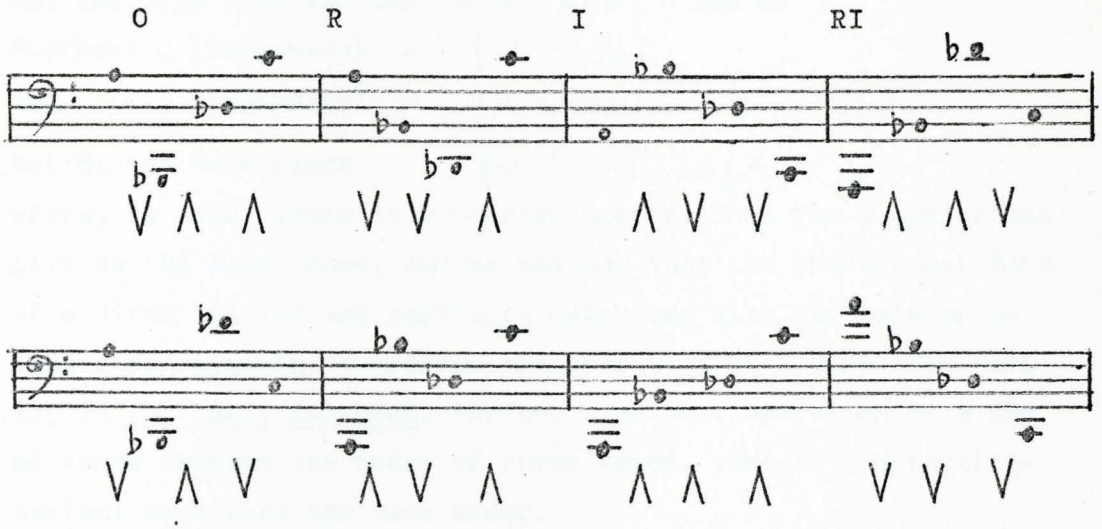
Variations, Op. 30

In the variations, Op. 30,we find that Webern employs this direction-variant technique. Let us investigate the 4-note motif. By the variant formula above, we must obtain: $2^{4-1} = 8$ direction-variants, and by our temporary definition - a direction-variant differentiates the same tones from themselves - each variant will contain the same tones in the same order.

Direction-Variants

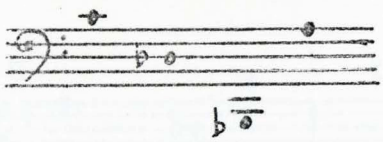
Variations, Op. 30

Relation:



From the example above we observe that the tone-elements A, Bb, Db, C are invariant: A, as first element, remains A, but the pitch of A may change to a different register.

The relations: O, R, I, RI, are imaginary, because they are not real: for instance the real R of O would be:



Thus an imaginary relation has the same shape, but a different intervallic structure. (cf. Analysis of Op. 30: The Theme, p.289)

Comparison of Operations

By means of the symbols given, let us perform operations to discover whether the shapes of the motivic operations of the imaginary relations and the operations of the direction-variants correlate.

O (imaginary) = direction-variant $(\vee \wedge \wedge)$

R (imaginary) = direction-variant $(\vee \vee \wedge)$

but direction-variant $(\vee \wedge \wedge) \xrightarrow{R} (\wedge \wedge \vee)$

where $(\wedge \wedge \vee)$ = RI (imaginary).

Direction-Variants

Comparison of Operations

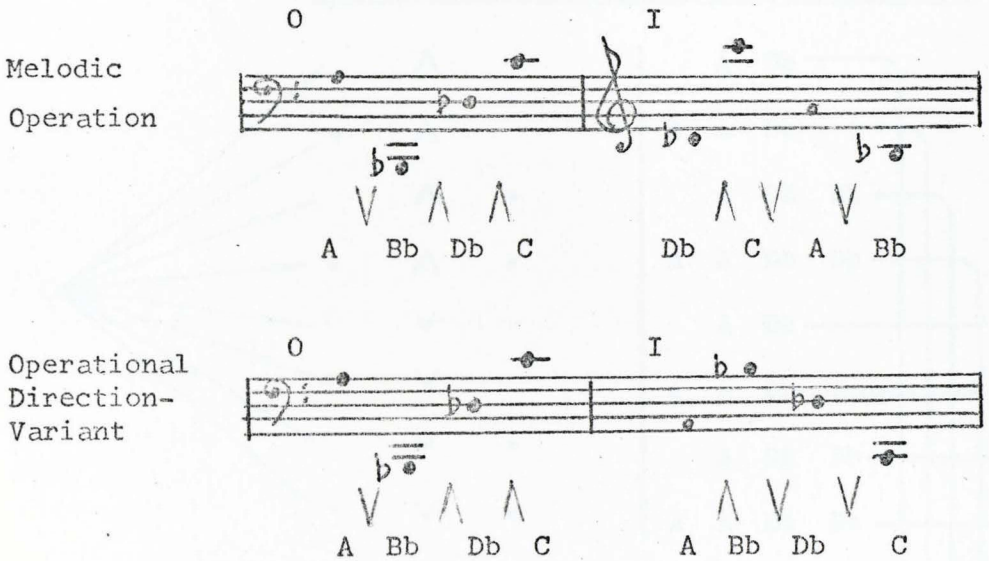
Thus there is no coincidence between O and R imaginary operations and the direction-variant operations of O and R.

Further: O (imaginary) = $(\vee \wedge \wedge)$

and I (imaginary) = $(\wedge \vee \vee)$

but direction-variant $(\vee \wedge \wedge) \xrightarrow{I} (\wedge \vee \vee)$

where, as seen, there is a correspondence. Thus the I operations give us the same shape, and we may say that the operational form of a direction-variant partially coincides with the form of an imaginary relation. Therefore the operation of a direction-variant is partially faithful. Further a melodic operation of a set of tones changes the order of these tones, whereas a direction-variant maintains the same order.



Thus, as the example shows, direction-variants are a set of operations which is independent of melodic operations.

Repeated-note Direction-Variants

To complete the picture and to cover all cases, we shall now consider repeated-note direction-variants. Such variants occur in Webern. Notable examples are:

String Trio, Op. 20, 1st Movement: mm. 10-20; 37-40; 45-62.

2nd Movement: mm. 1-9.

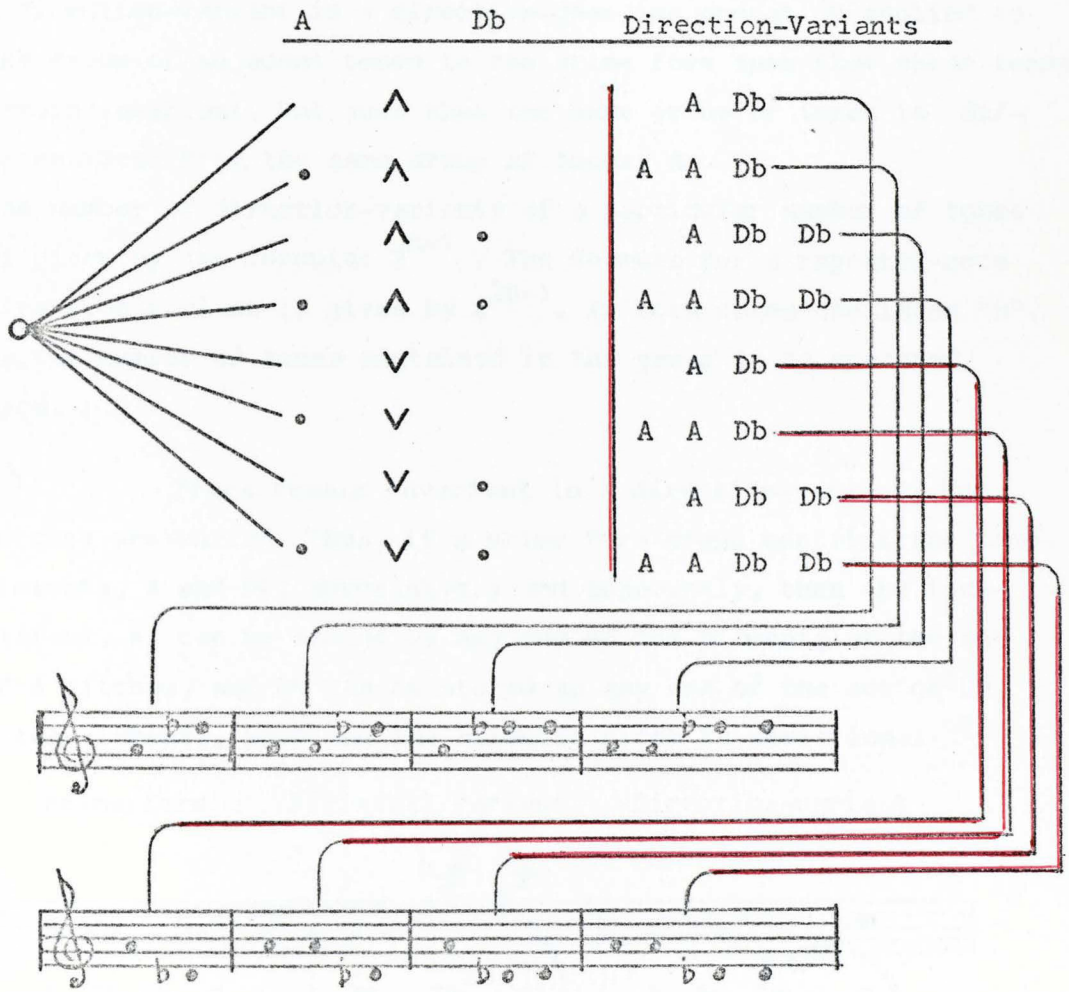
String Quartet, Op. 28, 3rd Movement: mm. 17; 20-25.

Direction-Variants

Repeated-note Direction-Variants

Some authorities may disagree that repeated notes indicate a direction. Strictly, however, it is not stationary: it is a forward direction - a direction in the same plane and it is movement in time. Thus there are three ways a tone may move to another tone: 1) It may ascend ^ ;
2) It may descend v ;
3) It may repeat o .

Now let us investigate the possibilities of repeated-note direction-variants by the application of a tree diagram to a set of 2 tones: A, Db .



The formula for a repeated-note direction-variant is 2^{2n-1}, where the index "n"is the number of tones. In such a variant some tones may be repeated while others are not; all may be repeated or none may be repeated. Since, in the example above

Direction-Variants

Repeated-note Direction-Variants

there are 2 tones, then by the formula we have: $2^{2.2-1} = 2^3 = 8$ direction-variants. The consequences of this are not so transparent, but when we calculate what the possibilities are of a repeated-note tone-row, we realise the significance. Such a tone-row gives us $2^{23} = 8\ 388\ 608$ direction-variants. This means that we may repeat the same row 8 388 608 times such that no repetition will be exactly similar!

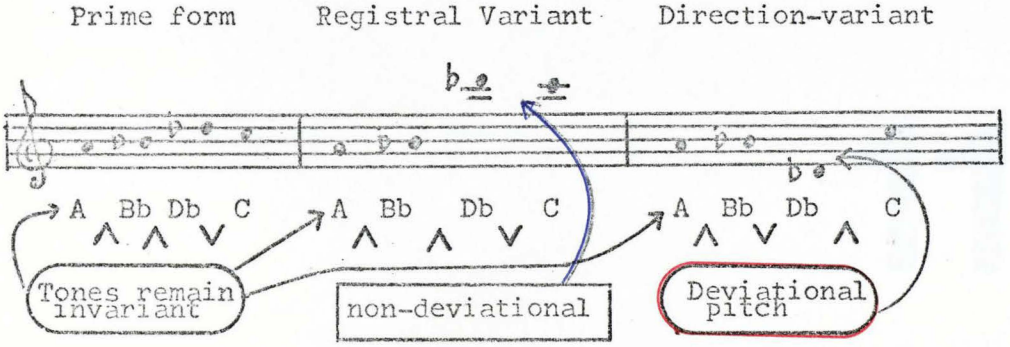
Definition

Having now considered this phenomenon in isolation, we now venture to present a definition.

A direction-variant is a direction-changing operation applied to any group of adjacent tones in the prime form such that these tones remain invariant, but such that the same group of tones is differentiated from the same group of tones. ✱

The number of direction-variants of a particular number of tones is given by the formula: 2^{n-1} . The formula for a repeated-note direction-variant is given by 2^{2n-1}. In both cases the index "n", is the number of tones contained in the group to be operated upon.

✱ Tones remain invariant in a direction-variant, but pitches are varied. Thus, if a prime form group contains the tone-elements, A and Db, successively and adjacently, then the tone-element, A, can be stated as any one of the elements of the set of A pitches, and Db can be stated as any one of the set of Db pitch-elements, provided the selected pitch is deviational



11

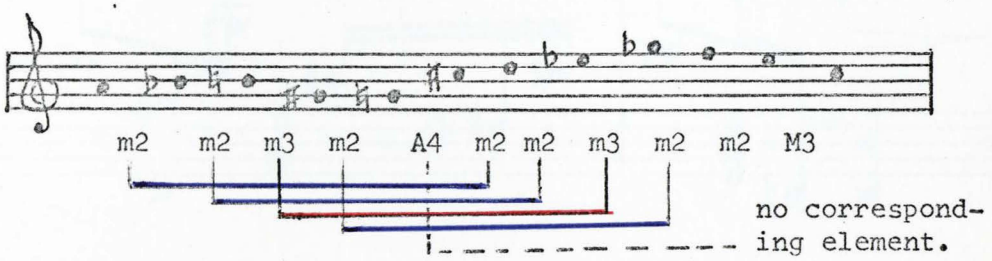
Klavierstück, Op. Post.

The Klavierstück, Op. Post.,"which Webern noted in his sketchbook in 1925", ✱ 1 is a minuet-like piece constructed solely from one row, stated in O and repeated 19 times in O.
The row is a mixed or hybrid anti-symmetric set with equivalent properties. (cf. Chordal Derivation from the row: Mixed or hybrid Anti-symmetric rows, pp.458-460).

Minor seconds are already featuring predominantly in the row-structure thus:

m2 m2 - m2 - m2 m2 - m2 m2 - . (cf. Minor Seconds, 1.3.A, p. 458)

The row in its prime form statement and intervallic structure is as follows:



Direction-Variants

There are many pieces constructed from a single row-form with transpositions like this. ✱ 2 The klavierstück could be called in study in one row. Overleaf we give the complete picture of the succession of rows where it will be seen that the row-distribution is mostly regular. There are 4 instances where tones have been omitted and/or the order disturbed.
At m.5 the C has been omitted and at m. 15, last chrotchet division, the F has been omitted. The row-order has been disturbed at m. 15 where the F-sharp occurs before the D, and also at m. 15 the Eb occurs before C-sharp. The same is true of m.20 where C and E occurs before F. However, though these deviations are insignificant, they are important in establishing the period of composition as such irregularities never occur in the later Webern.

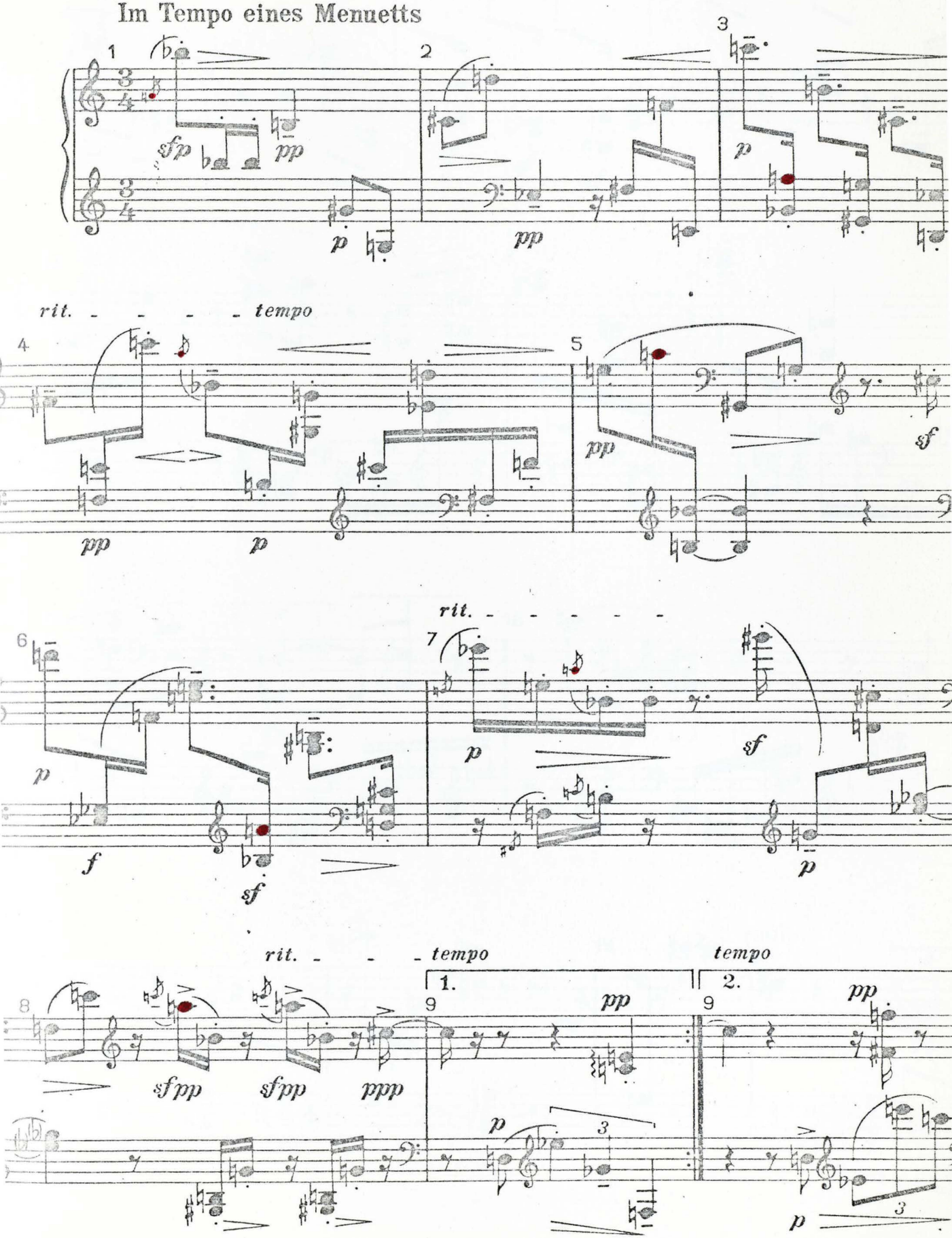
✱ 1: This piece has been published in UE - Buch der klaviermusik des Jahrhunderts 20. Copyright 1966 by Universal Edition, Wien, U E No. 13490. The information of composition is from the notes given in Buch der klaviermusik.

✱ 2: Krenek wrote a piece, Op. 83, No. 1 on a single repeated row.

KLAVIERSTÜCK

Anton Webern, op. po

Im Tempo eines Menuetts



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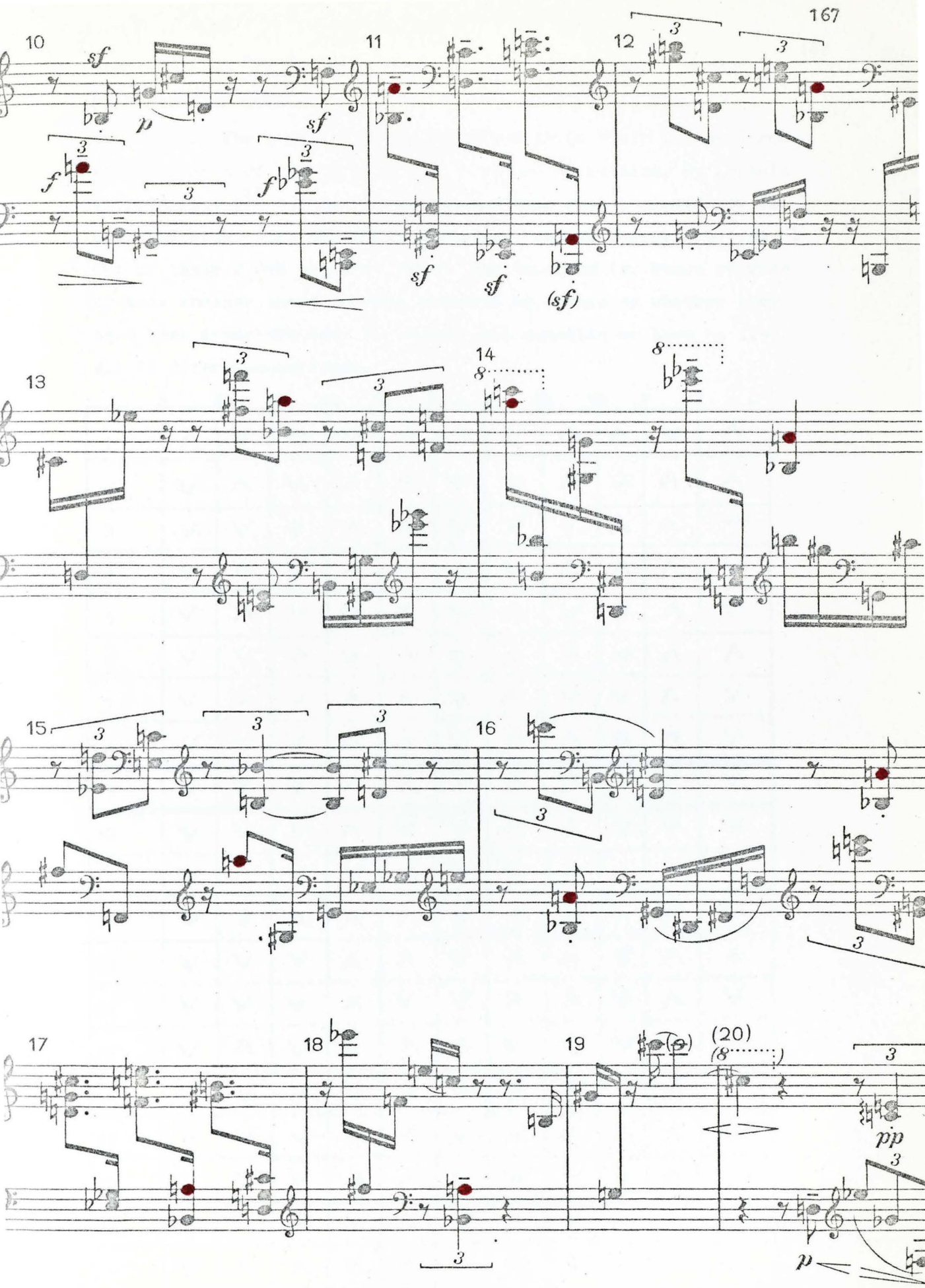

10
11
12
13
14
15
16
17
18
19
(20)
sf
p
f
(sf)
pp

Klavierstück, Op. Post.

Direction-Variants

The aspect we particularly wish to study is the direction-variants of the repetitive O row-form succession. By formula there exists 2^{11} = 2 048 direction-variants when a single row is operated upon. (cf. Direction-variants: Variant formula, p. 160) Out of these 2 048 variants Webern has selected 19. Hence we wish to know whether these 19 have occurred by chance or whether they have been predetermined? To answer this question we have to list all 19 direction-variants.

	A	Bb	B	Ab	G	Db	D	Eb	Gb	F	E	C
1	^	v	^	v	^	^	v	^	^	v	^	
2	v	^	v	^	^	v	^	^	v	^	^	
3	v	v	v	^	^	v	v	v	^	^	—	
4	v	v	v	^	^	^	v	^	^	^	v	
5	v	^	v	v	^	v	^	v	^	^	v	
6	v	v	^	v	^	v	^	^	v	^	^	
7	v	v	v	^	^	v	^	v	v	^	v	
8	v	v	v	^	^	v	^	^	^	^	v	
9	v	v	v	^	^	v	^	^	v	v	v	
10	v	v	v	^	v	v	^	^	v	v	v	
11	v	^	v	v	^	v	v	^	^	^	v	
12	v	v	^	^	^	v	^	^	^	v	v	
13	v	v	v	^	^	v	^	^	v	^	^	
14	v	v	v	^	v	v	^	^	v	^	v	
15	v	^	v	v	^	^	v	v	v	^	^	
16	v	v	v	v	^	^	v	v	—	^	^	
17	v	v	v	^	^	v	v	^	^	^	v	
18	v	v	v	^	^	v	v	^	^	^	v	
19	v	^	v	v	^	v	^	v	v	^	v	
20	v	^	^	v	^	v	^	v	v	v	v	

Klavierstück, Op. Post.

Direction-Variants

From the table we see that the directional element between A and Bb is V , excepting in Row 1.
The direction between G and Db is ^ excepting in 2 cases.
" " " B " Ab " V " " 4 " .
" " " Db " D " V " " 4 " .
" " " F " E " ^ " " 5 " .
This does indicate some form of determination, as the same directional element occurs between particular tones.

A comparison of the rows and their directional content gives us the following information:
Row 17 and Row 18 are identical;
there are strong correspondences between Rows: 7, 8, 9, 10.
Hence this again points to the presence of some determination, though this determination probably arose out of the event of composition, texture, climax and balance. We find support for this view by a study of the direction of F ⟶E, which, even as a row order-succession,is sometimes stated E⟶F . This occurs at mm.9, 12, 20, and at m.15 the F is omitted. Thus compositional requirements overruled row-procedure. At this stage, therefore, Webern had not yet attained that mastery to achieve perfect balance between compositional inspiration and absolute row-predetermination.

In the table we have 218 elements (2 have been omitted) of which 118 are descending and 100 are ascending elements.
Now the probability of random choice between ascending and descending elements is 0,5.
Thus $P = \frac{218}{2} = 109.$ Hence theoretically we should obtain 109 ascending and 109 descending elements solely by chance. In the composition we have an actual probability ratio of 0,5412 : 0, 4588 which we can confidently attribute to chance occurrence.

In a piece like this, constructed from only one row-form, it is to be expected that variants will arise to prevent monotonous repetition. On the other hand we do not want such diversity that all unity is destroyed. There has to be that poised subtlety of balance between diversity and unity. This can be achieved by a random selection of ascending and descending elements, because such a chance selection procures a probability balance of ± 0,5.

Klavierstück, Op. Post.

Direction-Variants

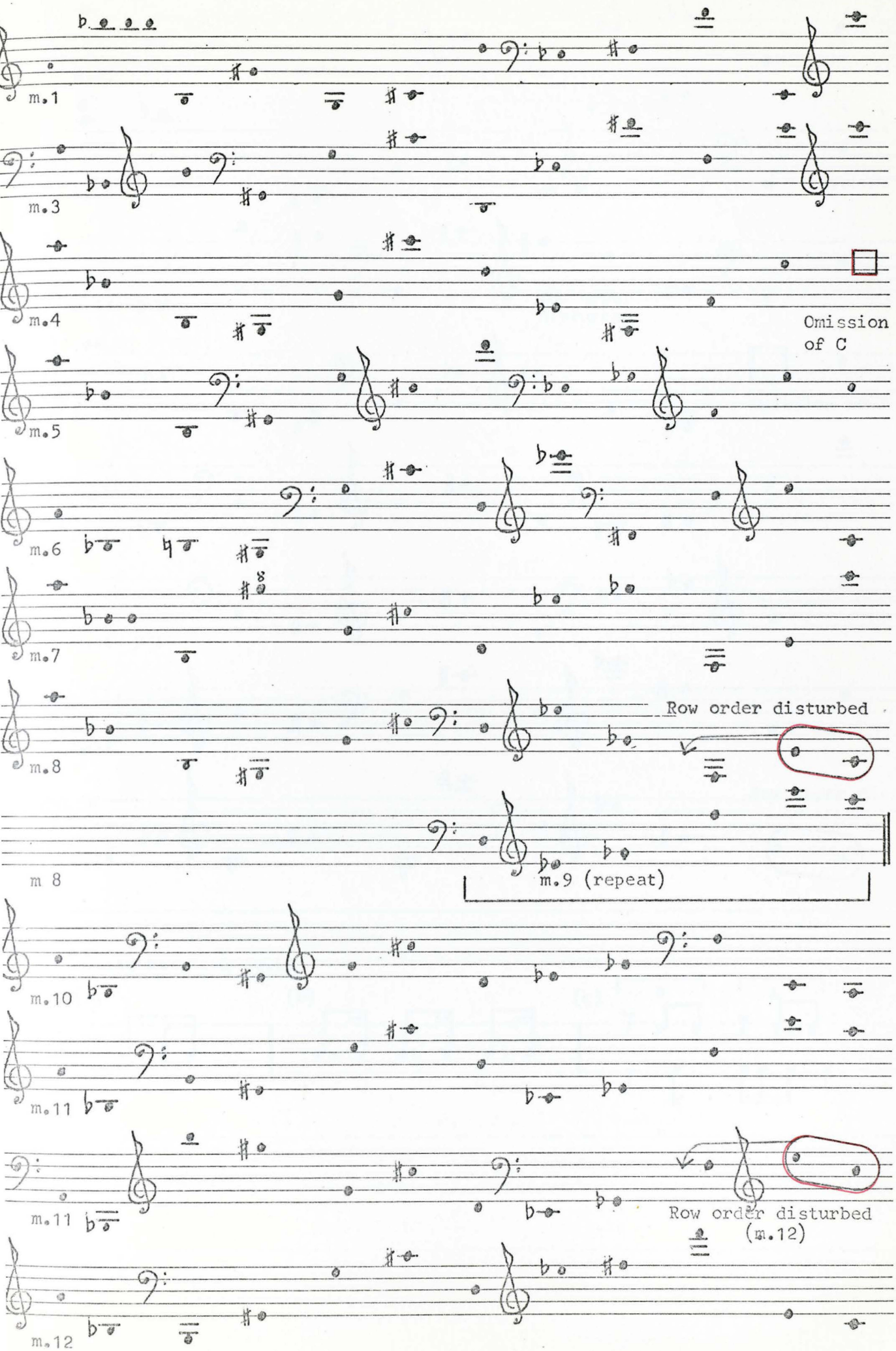
Thus, we see that Webern's subconscious selection and determination of these elements seems to be the same as a random choice of these elements. We say"seems to be the same" because Webern's choice and a statistical choice would not give us the same music. However, we are satisfied that at this stage (1925) Webern had not yet conceived of direction-variants as a set of operations as, for instance, in the Variations, Op. 30 or the String Quartet, Op. 28. Hence these were not predetermined elements.

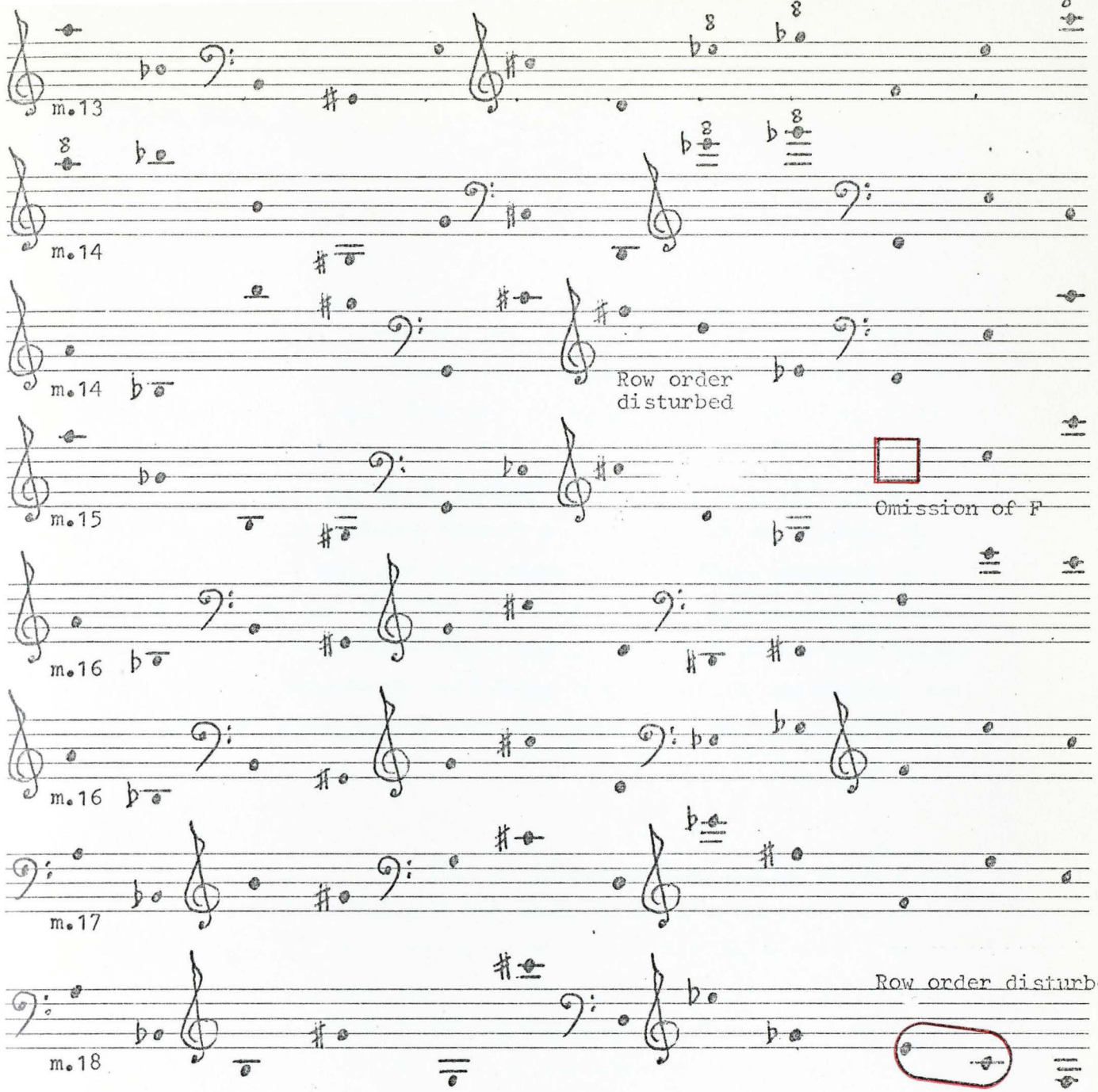
Metrical Patterns

There are no predetermined metrical motives and operations of these present in this piece. There are, shall we say, metrical cells such as (a), (b), (c) which give unity.
(a) only occurs in Part 1 (mm.1-9); (b) occurs in both Parts either completely or partially; (c) probably originated in m.9 and becomes a predominant figure in Part II where,in the form given or as variants of this form, it produces rhythmical tension and develops to a magnificent climax at m.14, thereafter subsiding to end pp at m.20.

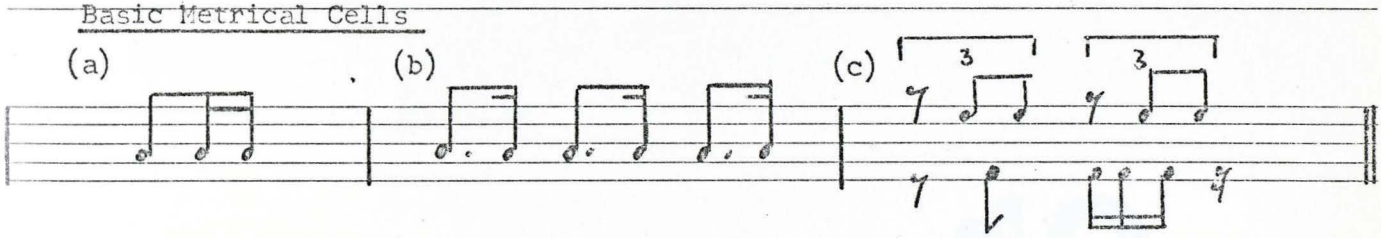
Looking at the patterns as a whole we note certain correspondences which are general and not exact:
mm. 1-3 corresponds to mm. 3-6 and mm. 10-12 corresponds to mm.16-18. Other correspondences are given overleaf.
These correspondences give the structure unity and coherence. The form is distinctly binary with intersecting metrical patterns as stated. Segments are separated by silences. This is thus a property which is characteristic in all Webern's output.

In this klavierstück, then ,the only serial feature is the tone row, but our main interest of analysis here is the direction-variants. The lack of technical constructional features does not make this composition less Webernian. As a matter of fact it is an exciting piece for pianists to study, but there are difficulties,mainly metrical.


m.1
m.3
m.4
Omission of C
m.5
m.6
m.7
m.8
Row order disturbed
m 8
m.9 (repeat)
m.10
m.11
m.11
Row order disturbed (m.12)
m.12



Basic Metrical Cells



12

String Trio, Op. 20

There are a number of reasons why we wish to examine the String Trio, Op. 20. This work is historically important in the evolution of twelve-tone music. Statements by authorities support this view. Leibowitz says: "The String Trio, Op. 20 (1927), marks an important turning-point. Here we have the return to large form, made possible by the use of the twelve-tone system." ✱ 1 Further on, in the same chapter, he says: "The Trio is only a preparatory step to new problems." ✱ 2

An examination,thus,of this work will assist us in determining the scope of Webern's evolution of the twelve-tone idiom. By consultation of authorities we learn that the first movement is in Rondo form and that the second movement is in typical sonata form. ✱ 3 In our examination therefore,we should like to discover what sequence of rows was employed to make these forms possible and whether there are any common properties which characterize other works of Webern in this genre.

The Row

The row is a Partial Anti-symmetric set of which a complete discussion will be found in the chapter: Chordal Structures and their classification: Minor seconds,p. 458 ; Partial Sets, p. 460 . Because we maintained that the row-construction making use of minor seconds led directly to the construction of other row classes,such as symmetric, we are eager to investigate the row sequence to see whether there is further evidence of symmetry present.

We note that the strict order of the tones is not always maintained unblemished. At m.15 the grace note, Bb, occurs as the 8th tone whereas its correct order is 9th. Also at m.58 we have an E occurring as the 4th tone instead of the 6th. Then, in the 2nd movement, at m.105 the tone C occurs 3rd whereas its strict order should be 7th. The deviations mentioned are slight, but nevertheless present.

✱ 1: Leibowitz: Schoenberg and his School, Ch.IX, p. 206
✱ 2: ibid, p. 209
✱ 3: Leibowitz: Schoenberg and his School, p.206
Walter Kolneder: Anton Webern, p.109, trans. Humphrey Searle. Published Faber and Faber, 1968.
Erwin Stein: Trio, Op. 20, Philharmonia No. 175, U.E. 8998, Foreword.

String Trio, Op. 20

Sequence of Rows

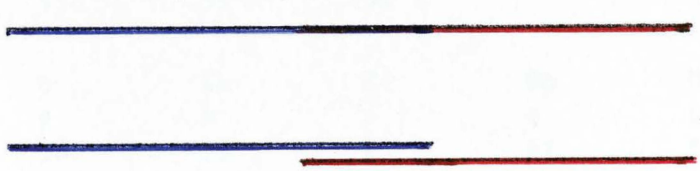
The succession of rows in the 1st movement occurs singly such that the only intersections amongst the 54 successive rows are at mm. 30,40 (there are two intersections at m.40). Leibowitz contends that "the twelve-tone technique, which is used somewhat chaotically in the Trio, is placed in the service of classical forms...." ✱ 1
At first it appears that the formidable array of rows was practically selected at random. However, a tabulation of these successions and their row-forms indicates the existence of a precise and regular pattern which we can abbreviate as follows:

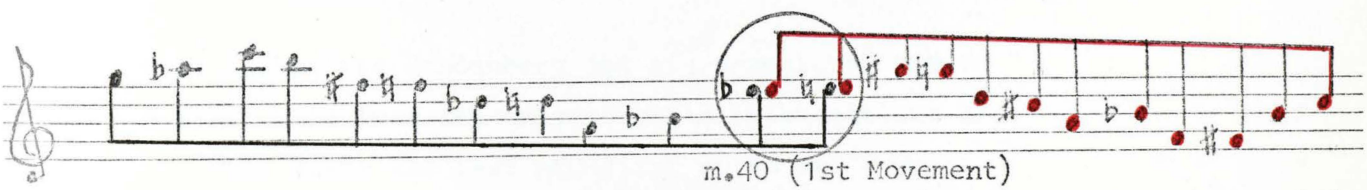
In A B A C In A B A

We thus have 2 order successions:
The order succession of the tones within the row.
The order of succession of the rows themselves one after another.
(On the next page we give the complete sequence of the rows of the first movement.)

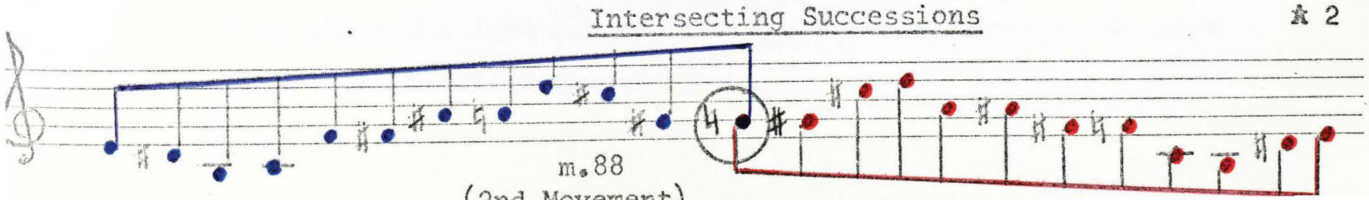
Intersecting and Overlapping Rows

The term "intersection"is used frequently in the description of row-successions. We define an"Intersecting Succession"to mean "a row-succession in which there are common elements to both successions". An overlapping succession is one in which the one succession commences before its predecessor has terminated such that there are no common tones. We define these by diagram as follows:





m.40 (1st Movement)
Intersecting Successions ✱ 2



m.88
(2nd Movement)

String Trio, Op. 20

Sequence of Rows: First Movement

In	Eb b 1	C d 2	Commencing note of row Row-form : b = O; p = I; d = R; q = RI Measure in which row occurs				
A	C q 4	D p 5	Eb b 6	E p 8	Bb q 9	Db p 10	D b 10
B	Gb b 11	E q 12	Ab d 13	Eb d 14			
A	C q 15	D p 17	Eb b 18	E p 19	Bb q 19	Db p 20	D b 21
D	Gb q 21	Db d 24	B p 26	Bb q 27	D d 28	E d 29	G b 30
	Gb q 31	Db d 33	B p 34	Bb q 36	D d 37	E d 39	G b 40
In	Eb b 40	C d 43					
A	C q 44	D p 45	Eb b 47	E p 48	Bb q 49	Db p 50	D b 51
B	Gb b 52	E q 53	Ab d 55	Eb d 56			
A	C q 57	D p 58	Eb b 59	E p 61	Bb q 61	Db p 62	C d 64

* 1: Leibowitz: Schoenberg and his School, p. 209.

* 2: In this Trio the only possible intersections are

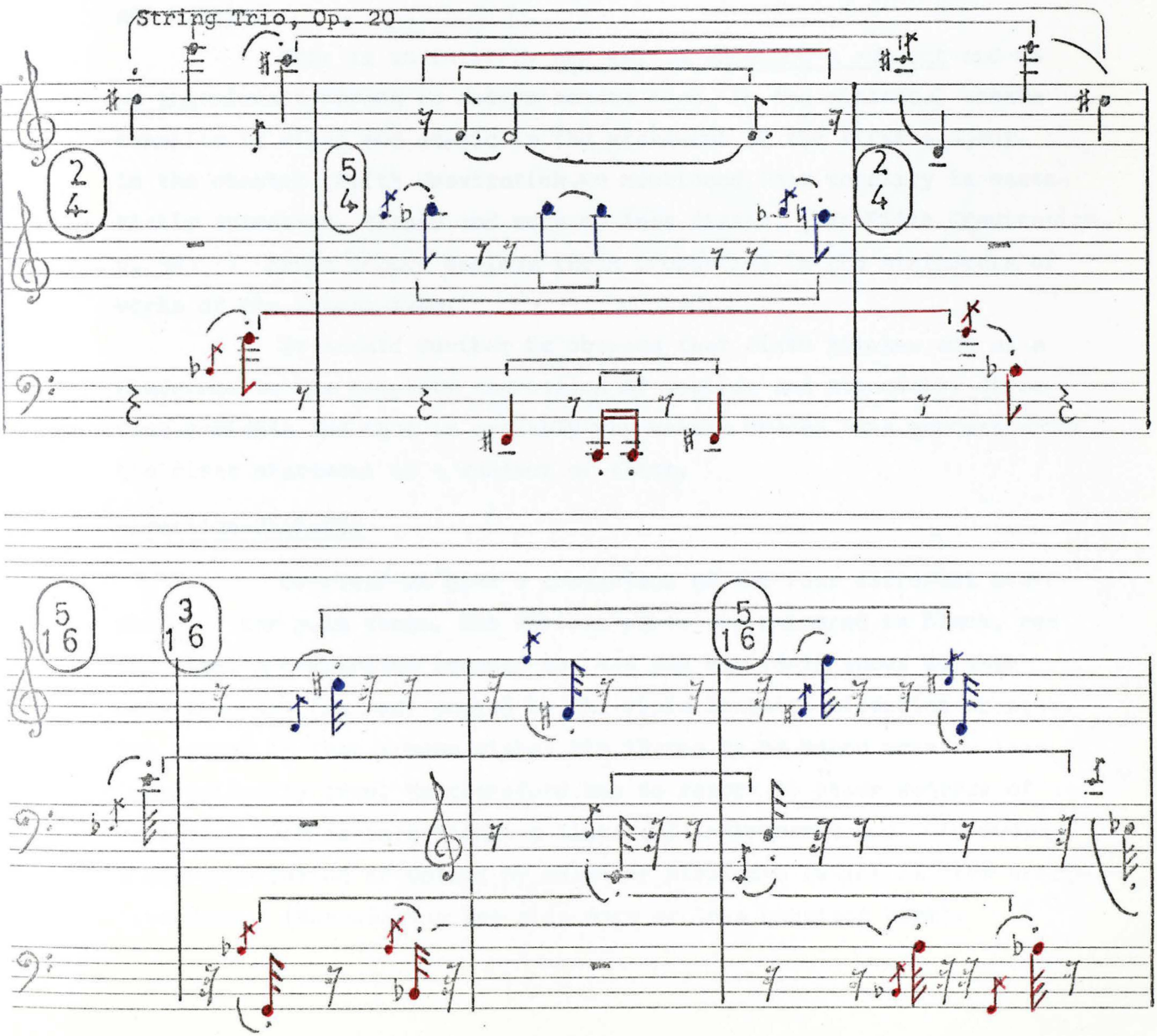
(i) where the last and first notes are common;

(ii) where the last two and the first two are common. We have given both these examples.

String Trio, Op. 20

Symmetry

The first statement of the first two rows, b and d, is an exact symmetric expression. Symmetry was to be developed by Webern in his next work, the Symphony, Op. 21, to be a property of the row itself and thenceforth symmetry became an extremely important parameter in this composer's works. In the examples given we observe that a number of sets are involved in this symmetry: there are pitch, note-values, dynamics and even Time Signatures!
This occasional more-dimensional aspect was to be developed until it attained the status of the multi-dimensional serialism encountered in the Variations for Orchestra, Op. 30.



String Trio, Op. 20

Fixed Pitches

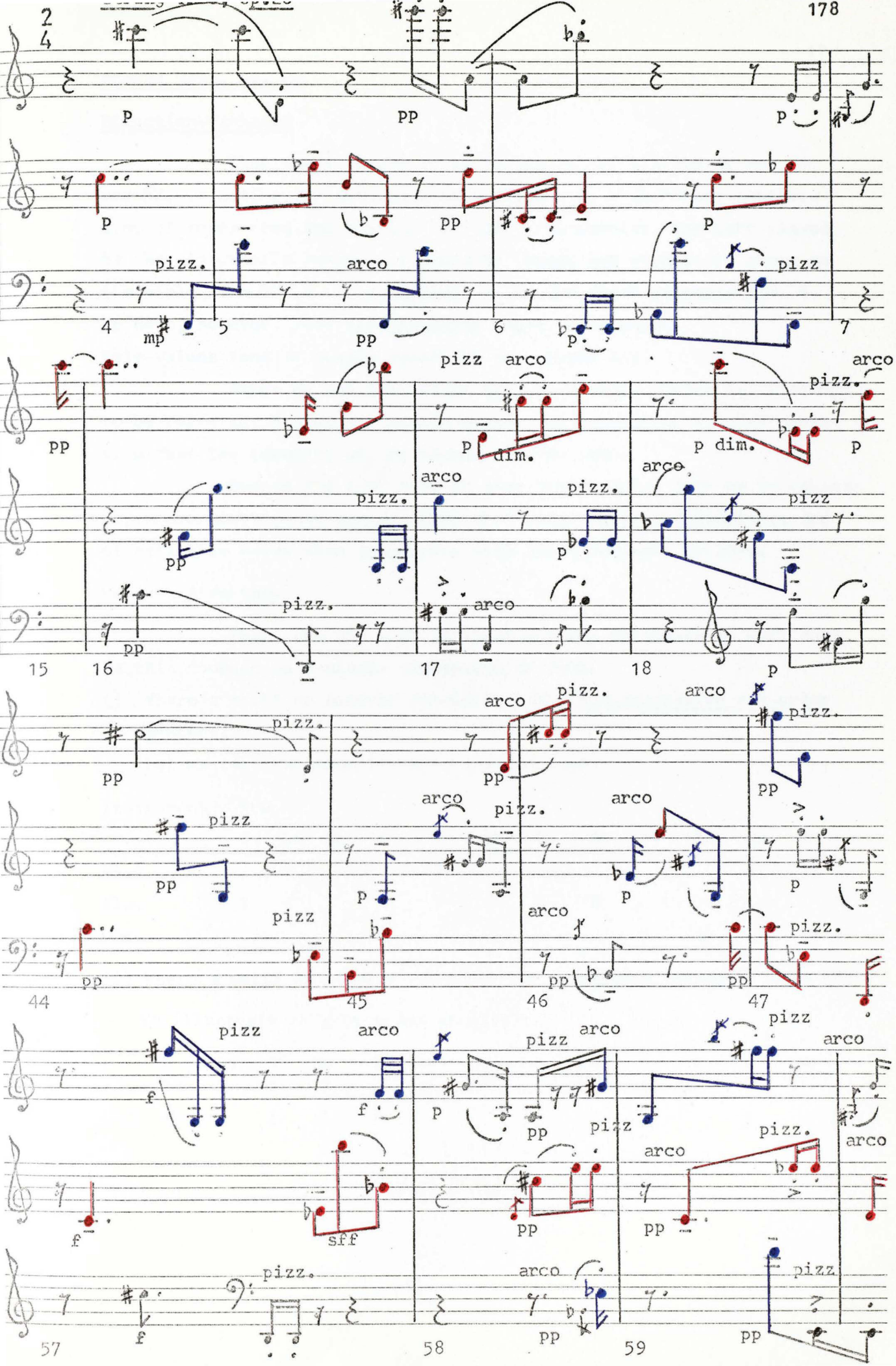
The statement above, mm.1-3, and also mm.40-43, employs a constant register for each different row-element. There are also other instances in this movement where the same property is in evidence: mm.12-15 (violin part) and mm. 12-14 (violoncello part). It will appear that Webern's works in this genre make use of fixed pitches in their first statements. We have the following:
String Quartet, Op. 28, mm.1-15
Konzert, Op. 24, mm.1-6 (The Konzert has an almost identical first statement and so has the first movement of the Variations, op. 27).
Symphony, Op. 21,mm 1-25 and also mm. 42-66.
We also notice that such a statement utilising fixed pitches occurs in all the cases above, except the Symphony, where row successions are single.

This is an entirely new way to announce a subject and is an ingenious approach to modern sonata form. In the classical sonata tonality is fixed and static in the statement of the first subject. In the chapter, Fifth Gravitation,we mentioned that tonality is essentially symmetric, closed and more or less static. (cf: Fifth Gravitation, p. 543) Hence Webern employs these properties in the statements of works of the sonata-type.

It should further be obvious that fixed pitches act as a hindrance to the complete expression of motives and especially direction-variants and that is probably why Webern ceases this process after the first statement of a subject or theme.

Direction-Variants

Overleaf we give a comparison of the four different statements of the main theme. The various parts are coloured in black, red and blue. A comparison between mm. 4-6 and mm. 16-18 shows us that only the part (in red) stated by the viola contains direction changes. The reason is that Webern wishes his themes to be heard more or less intervalically true. He therefore has to resort to other methods of variation such as interchanging lines and instruments and introducing a differentiation of colour by means of pizzicato (which is very effective here. (Note-values are also more or less constant here).


2
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p
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arco
arco
f
sff
pp
pp
pizz.
arco
pizz
f
pp
pp
57
58
59

String Trio, Op. 20

Direction-Variants

When these themes occur in the recapitulation at mm. 44 and 57, we notice the emergence of new lines by a different subdivision of tones from the row for the three instruments. The part played by the violoncello remains practically intact and when it is given to the viola at m.57 it is as complete as in the first statement, m. 4. We note, however, that directionally there are changes. Note-values tend to remain invariant (or almost so).

Hence we see that since this is a rondo, themes are required to be repeated, but Webern avoids mechanical repetition by such variation that the identity of the themes is not lost.

Due to the fact that we have themes which must be recognizable, direction-variants cannot enjoy full scope. Direction-variants are of estimable value when associated with short pregnant motives.

Motivic Structure

There are two ways in which motives originate in work such as this founded on a single succession of rows:

i) Where a motif or segment consists of non-successive row-order members.

Let us take the example, m.4, then we have:

Instrument	Row											
	C	Db	Gb	G	D	Eb	B	Bb	F	E	Ab	A
Vl.1		2			5						11	12
Vla.	1					6	7	8				1 (D)
vlc.			3	4					9	10		

ii) Where a motif or segment contains the successive row-order elements.

We illustrate this by means of m. 52:

	B	Gb	G	B	Bb	F	E	C	Db	Ab	A	D	Eb
	12	1	2	3	4	5	6	7	8	9	10	11	12
Vl.1	12	1	2	3	4							11	12
Vla					5		6	7	8	9			
Vlc.										10			

String Trio, Op. 20

Motivic Structure

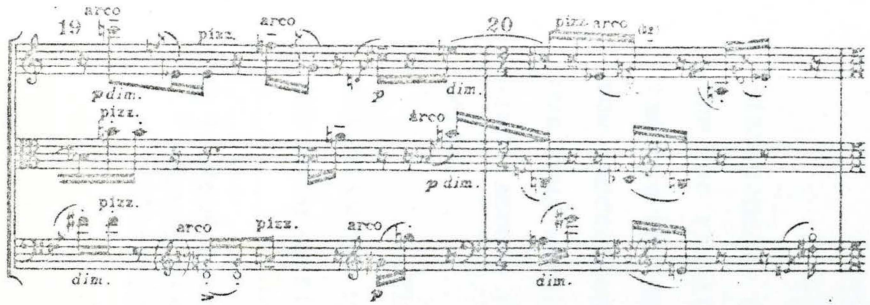
Considering these two conditions, we contend that if proposition (i) is used, then the technical and compositional variational properties are considerably curtailed and the natural expansion of operations becomes unnecessarily complicated.

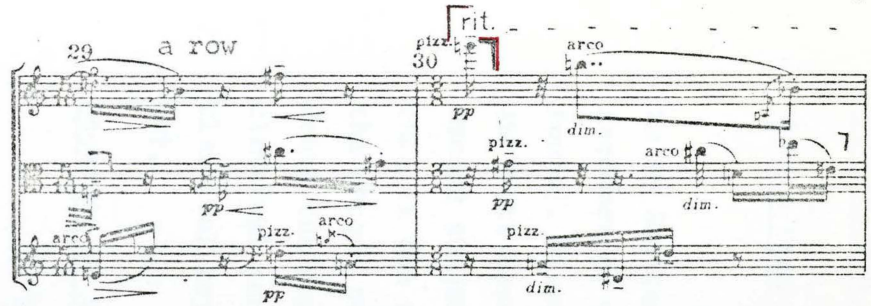
For instance when a theme and subsidiary themes are constructed, as in this Trio, several row-successions are needed. With ref. to theme A (the main rondo theme) six successive rows are used for its construction. Hence any operation, R, I, RI, etc. onto the theme needs the same six successive rows which moreover must maintain the same interval of entries to enable the tones to be in the true row-order.

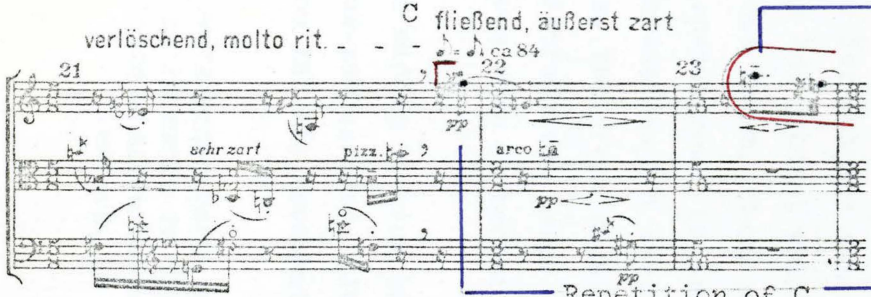
With reference to proposition (ii) there exists a greater latitude in the use of interval of entries, but nevertheless when we have a lengthy theme, unless the thematic content is motivic, we are likewise restricted. Thus we can see that thematic expression in a twelve-tone work leads directly to limitation of operational expression. Hence thematic expression means that the sequence of rows is determined by exterior formal implications, instead of the other way around.

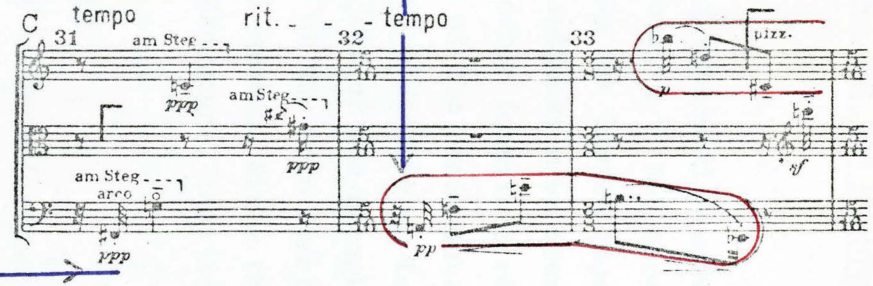
However, in the Trio we observe the emergence of motives most of which are based on condition (i). We quote the following example: the middle section of the Rondo indicated by the symbol, C in the table. Corresponding segments or motives are shown by the arrows, and motives are encircled.

Afterwards, in his later works, Webern based his melodic structures and motives on condition (ii) and such that the row itself contained the motives. In such works as the String Quartet, Op. 28 and the Orchestral Variations, Op. 30 Webern discovered the row as a germinating force from which everything is derived. (cf. p. 193 in this chapter).

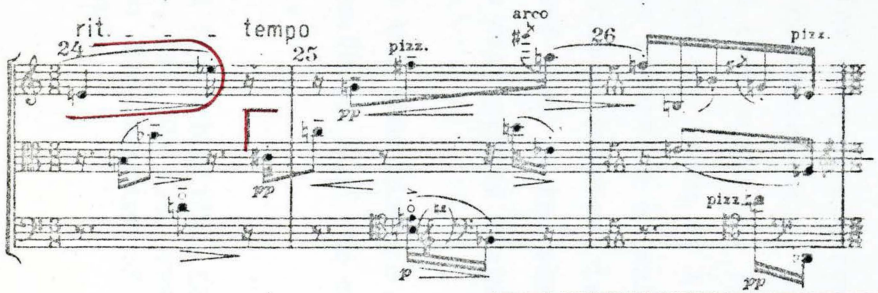


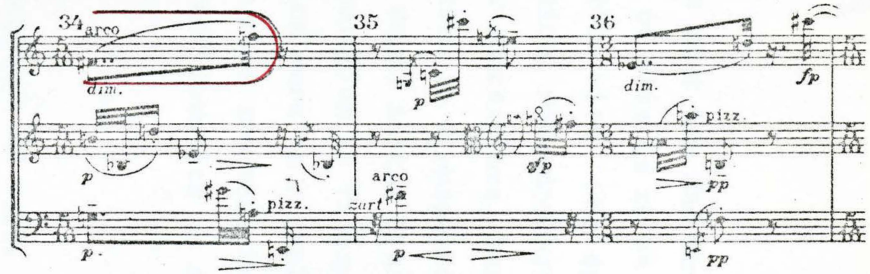


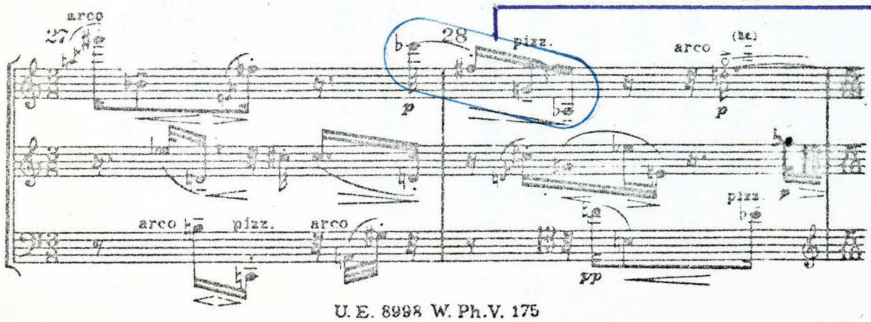


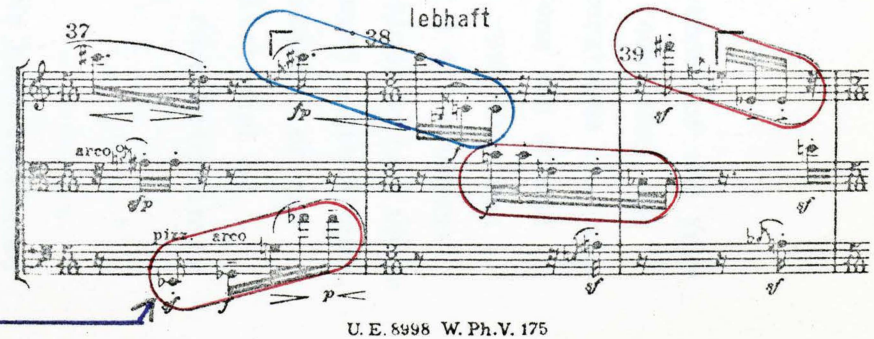


Repetition of C









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String Trio, Op. 20: 2nd Movement

Sonata Form

All authorities agree that the 2nd movement of the Trio is in Sonata Form. ✱ 1 Evidence of this is to be found when the sequence of rows is listed together with its operations (or row-forms). First subjects have identical row-successions and second subjects have other identical row-successions, but such that the second subject of the recapitulation is transposed a 4th upwards. This is the same procedure as is found in the classical sonata where the second subject of the recapitulation is transposed a 4th higher. Hence the rows of the Trio function here as a replacement of the classical tonal system. Since the rows are thus imitational of classical key procedure, they do not function as a form-determining set.

Sequence of Rows

Let us consider the sequence of rows. We have tabulated every row and named it by its first row-element. Below the name of the row we give the particular operation and the measure where it occurs.

By this tabulation we observe the following:

The 1st subject contains only single row-successions.

The 2nd subject which commences at m. 30, introduces simultaneous rows in mm. 33-36 and then again mm. 39-56. The use of the two simultaneous rows is irregular: there is a mixture of simultaneous row-successions (at various intervals of entry) and single row-successions. The great significance, however, is that simultaneous rows were introduced. Later (and even in the very next work) simultaneous rows were to become a disciplined feature in Webern's idiom.

The middle section has the same mixture of single and simultaneous row-successions. (At m.88 we find the only instance of row intersection in this movement).

✱ 1: René Leibowitz:Schoenberg and his School:Ch. IX, par. 2, p.206.
Erwin Stein: Foreword to Trio, Op. 20: U.E. 8998 W. Ph. V. 175.
Walter Kolneder: Anton Webern: The Adoption of Schoenberg's method, p. 109.

String Trio, Op. 20: 2nd Movement

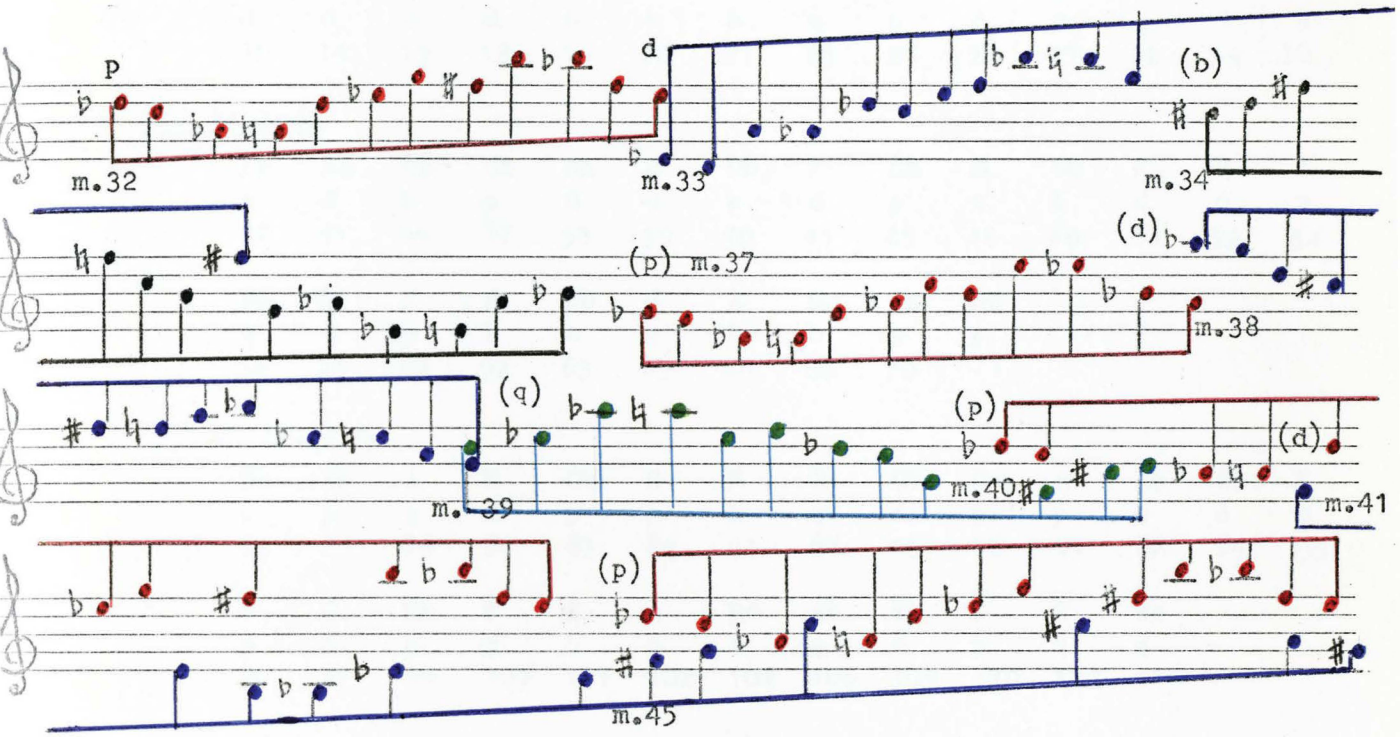
Sequence of Rows

In the recapitulation we encounter the same as above.

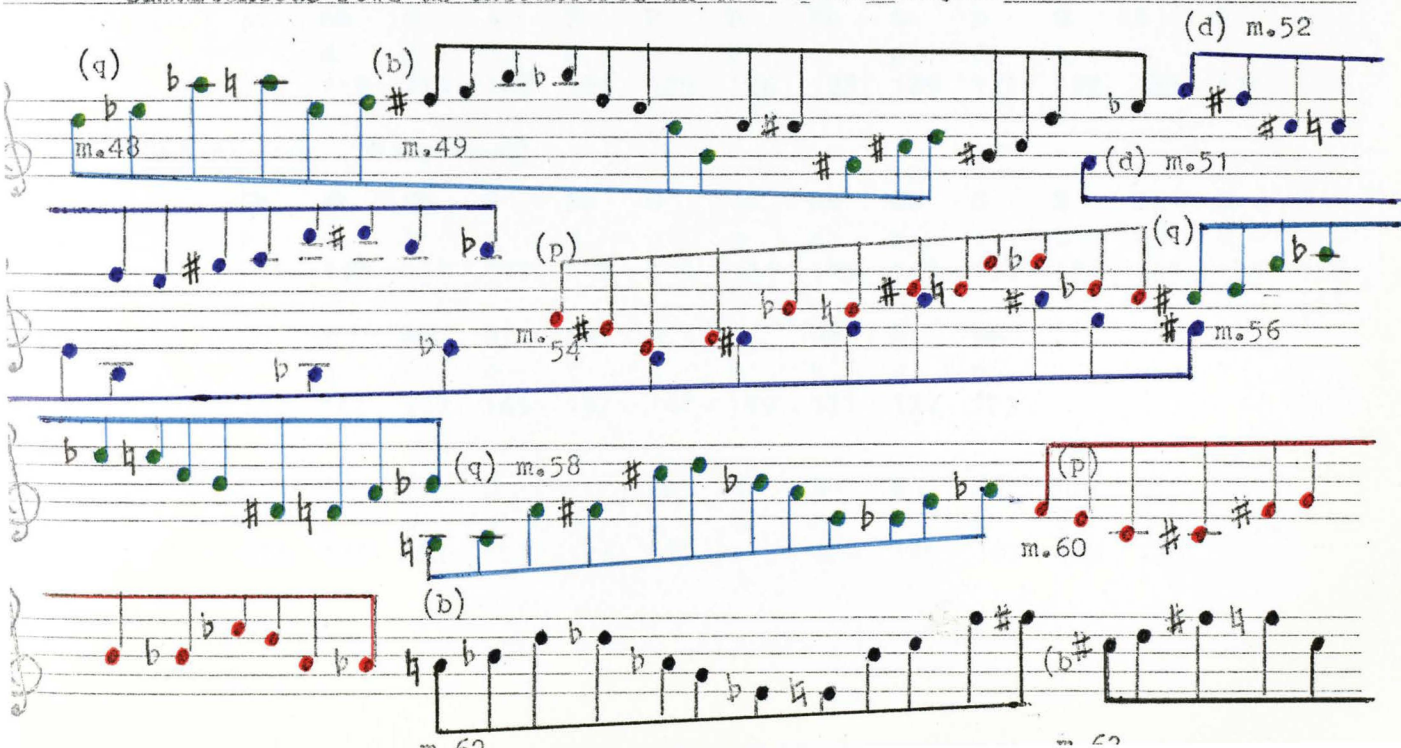
The 1st subject contains only single row-successions.

The 2nd subject is a duplication of the mixture between simultaneous and single row-successions, but transposed a 4th up.

The coda is a similar mixture of simultaneous and single rows.



Simultaneous rows as encountered in the Second Subject



String Trio, Op. 20: 2nd Movement

Sequence of Rows

Introduction

Ab	F	E	D	Ab	G	A
d	q	b	q	p	d	d
1	4	6	7	8	9	9

1st Subject

Ab	Db	G	A	F	F	B	Eb	G	D	G	D	A	B
d	d	p	d	b	b	b	q	p	d	q	q	d	d
10	14	15	18	19	20	21	23	24	26	27	28	29	30

2nd Subject

Db	Eb	Db	Gb	Ab	D	Db	F	Db	D	Gb	F	G	A
p	d	b	p	d	q	p	d	p	q	b	d	d	p
32	33	34	37	38	39	40	41	45	48	49	51	52	54

Db	B	F	A	Db	A	A	Db	Gb	Db
q	q	p	b	b	q	b	b	q	p
56	58	60	62	63	65	66	68	70	71

Middle Section

Db	Gb	A	E	Gb	E	F	G	Gb	G	A	Ab	Gb	E
p	p	q	d	p	p	b	q	d	p	p	b	d	b
71	73	74	81	83	84	84	88	88	90	91	92	94	95

B	C	Bb	F	B	A	B♮	Ab	Eb	D	C	Bb
p	d	p	p	b	b	d	q	d	p	q	q
97	97	99	101	101	102	104	106	109	110	112	114

Recapitulation

1st Subject

Ab	Db	G	A	F	F	B	Eb	G	D	G	D	A	B
d	d	p	d	b	b	b	q	p	d	q	q	d	p
115	119	120	122	124	125	126	128	129	131	132	133	134	134

2nd Subject (transposed)

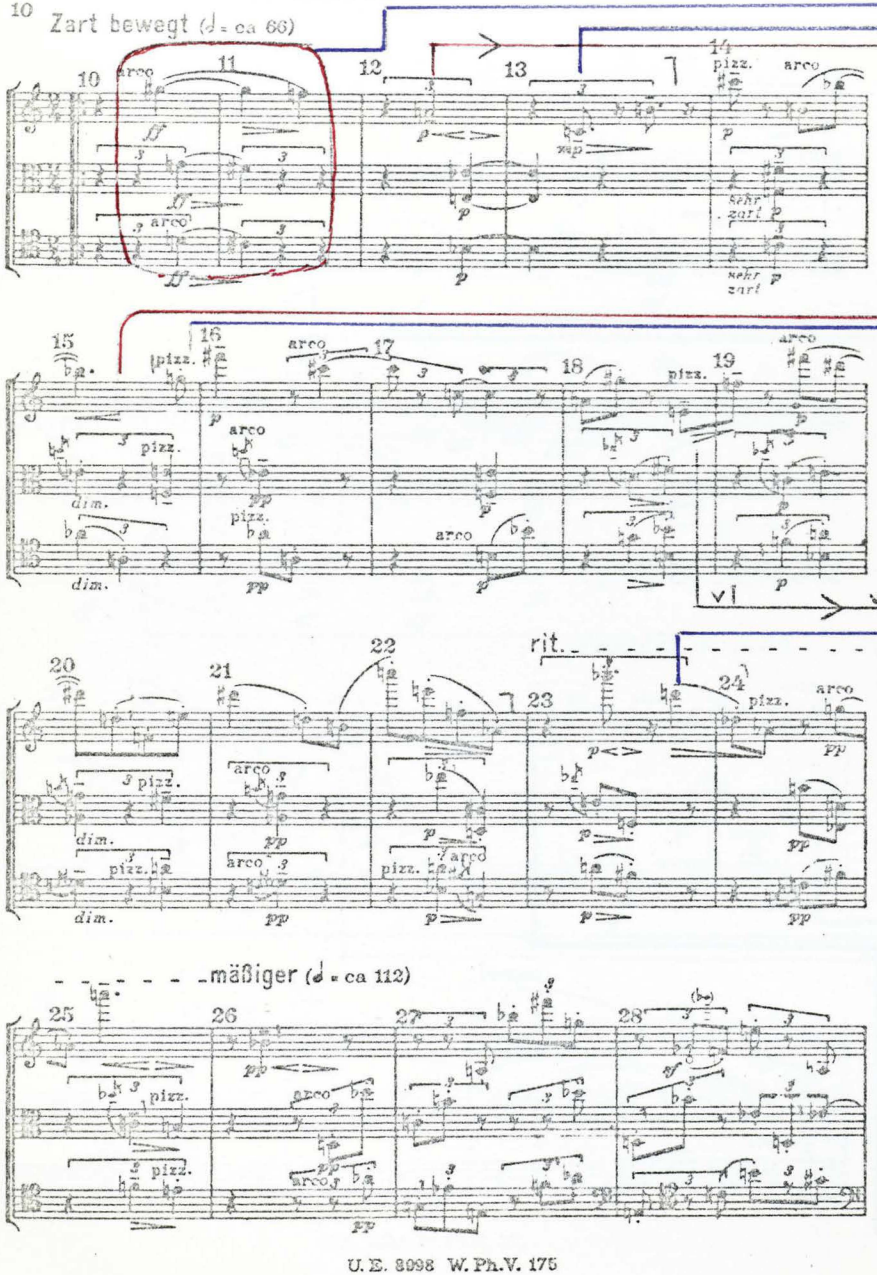
Gb	Ab	Gb	B	Db	G	Gb	Bb	Gb	G	B	Bb	C	D
p	d	b	p	d	q	p	d	p	q	b	d	d	p
136	137	139	141	142	143	144	145	149	152	153	155	156	158

Gb	E	Bb	D	Gb	D	D	Gb	B	Gb
q	q	p	b	b	q	b	b	q	p
160	162	163	165	167	168	169	171	172	173

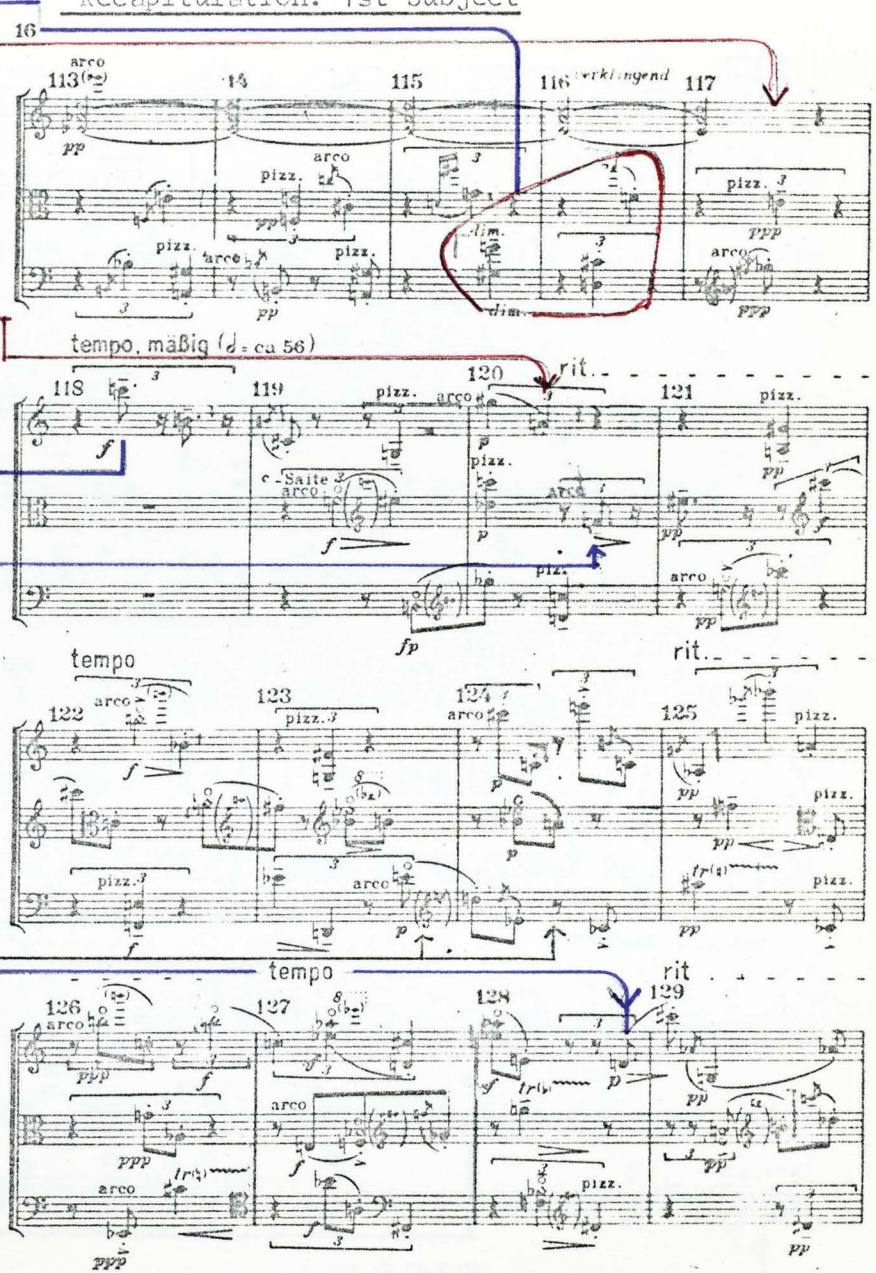
Coda

D	C	Bb	D	C	Db	E	Ab	E	F	Gb	B
d	d	q	q	q	q	q	d	b	b	d	b
174	175	177	177	178	180	182	184	185	187	189	190

Exposition: 1st Subject

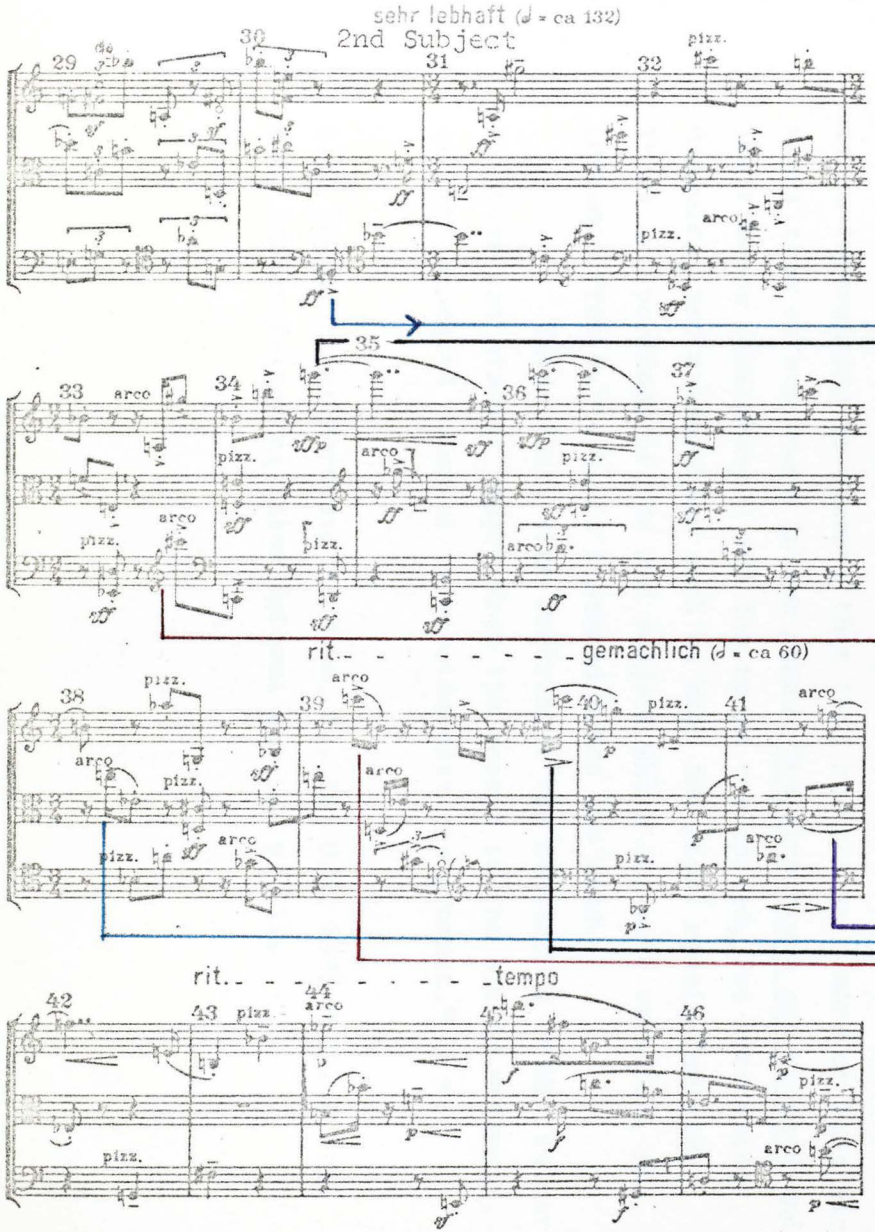


Recapitulation: 1st Subject

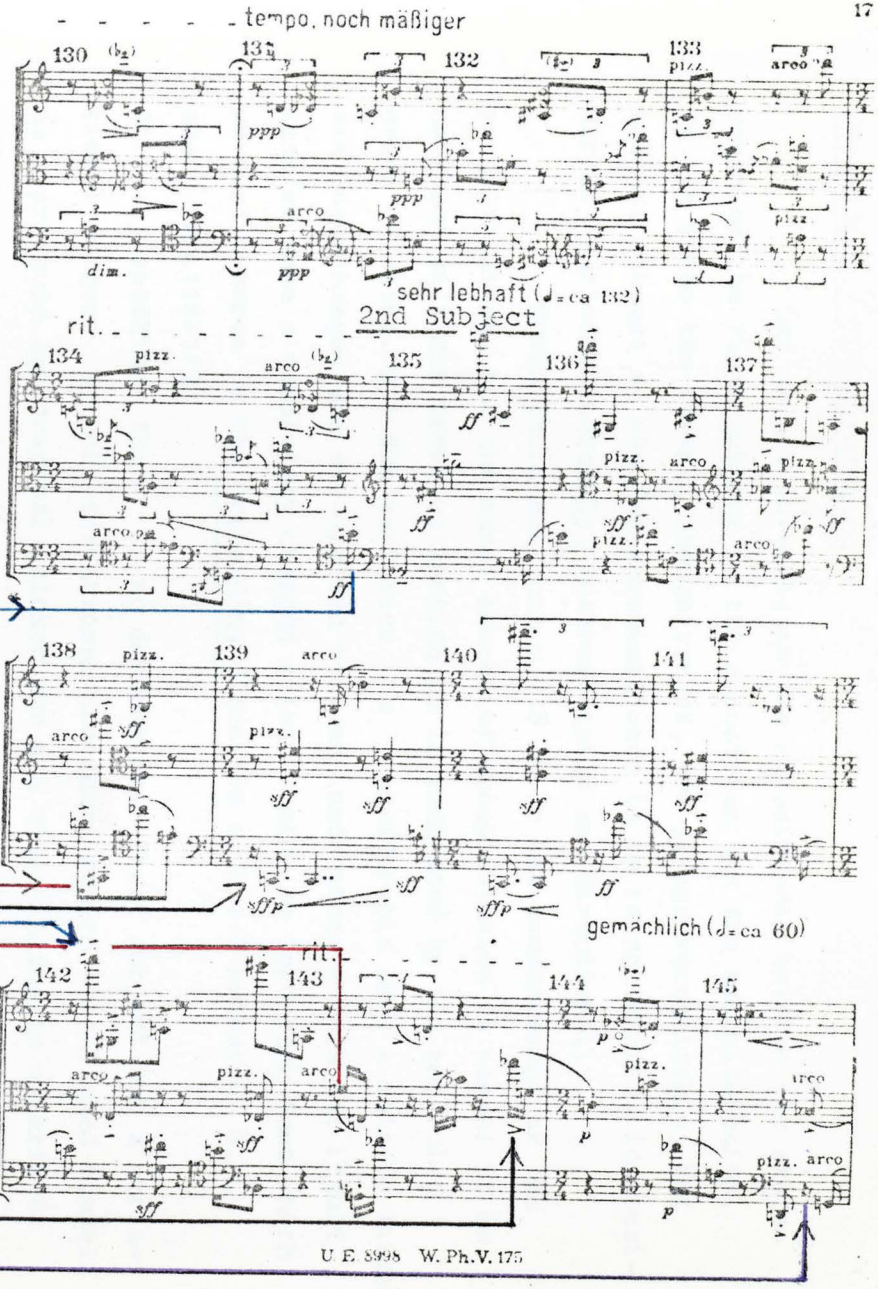


U. E. 8998 W. Ph.V. 175

Exposition



Recapitulation



String Trio, Op. 20: 2nd Movement

Exposition / Recapitulation

Let us now investigate the relationship between the statements of the first subject in the exposition and the recapitulation. In the rondo the themes, though varied, are always recognizable, but the 1st subject of the 2nd movement, when it is recapitulated, is considerably varied melodically, instrumentally and directionally.

Erwin Stein mentions m.118 to be the commencement of the recapitulation, but the exact moment of recapitulation is vague: it is so fused with the previous section as is indicated by the encircled group of notes. ✱ 1 The variation is considerable here - melodic lines are interchanged and sub-divided between instruments - with the result that we have a completely changed colour field. An important fact which we must observe is the descending direction of the 3 notes: C, B, C-sharp (mm.118-119)

Strictly speaking this is no conventional first subject but a variational subject. By this deviational procedure Webern established himself as a profound and original thinker who was ever willing to experiment and to provide new contributions as early as 1927. At the same time, however, Webern's procedure is an admission that precise classical repetition is an hindrance to complete twelve-tonal realization.

With ref. to the recapitulation of the 2nd subject, m.134, it is interesting to observe that this reverts to a more or less exact repetition as was found in the rondo. The directions are changed and instruments interchanged and the tones transposed, but note-values, dynamics, and colouration such as arco and pizz. remain invariant. There are portions of the 2nd subject which are more variable, for instance from m.156 where repeated notes are used.

These facts then contradict the contention of Mr Walter Kolneder who states: "Apart from the repeat in the second movement, all the repeated material is considerably transformed." ✱ 2

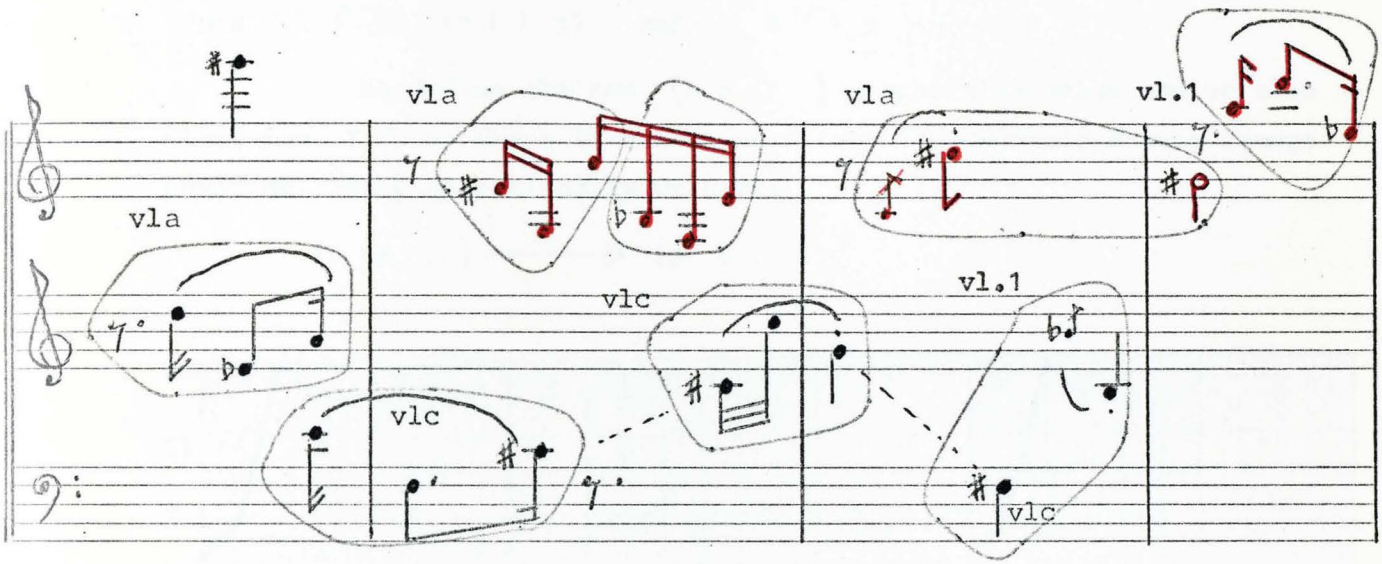
✱ 1: Erwin Stein: Foreword to Trio, Op. 20: U.E. 8998 W.Ph. V 175.
✱ 2: Walter Kolneder: Anton Webern: par. 3. p. 111.

String Trio, Op. 20: 2nd Movement

Simultaneous Rows

The melody, stated by the violin (mm.41-48) is a complete tone-row. Contrapuntal to this melody we mostly encounter the metrical pattern:  (or a variant of this). At m.145 the same melody recurs, but now transferred to the viola. This procedure is reminiscent of the 2nd movement, middle section of the String Quartet, Op. 28. (cf. Canonical properties, pp. 233-234)

With ref. to mm. 48-51, Webern is very close to the use of simultaneous rows in the way he uses these in his later works.



The two simultaneous rows are shown by different colours: Row-form, RI in black and O in red. There are 3-note motives as encircled, but the direction-variants have only two statements: (V Λ) and (Λ V). Thus aspects of a more refined use of simultaneous rows and motivic structure are present here in embryo.

Deductions

The problems, thus, confronting a twelve-tonalist in the fashioning of themes from a single row-succession have been fully dealt with herein. Furthermore the problem of a preconceived form stamped onto the music from outside has been shown to disturb other parameters from finding complete enfoldment. Proof of this is to be found in an analysis of the row wherein it can be seen that Webern does not avail himself of all the possibilities contained in the row.

String Trio, Op. 20

Analysis of the Tone-row

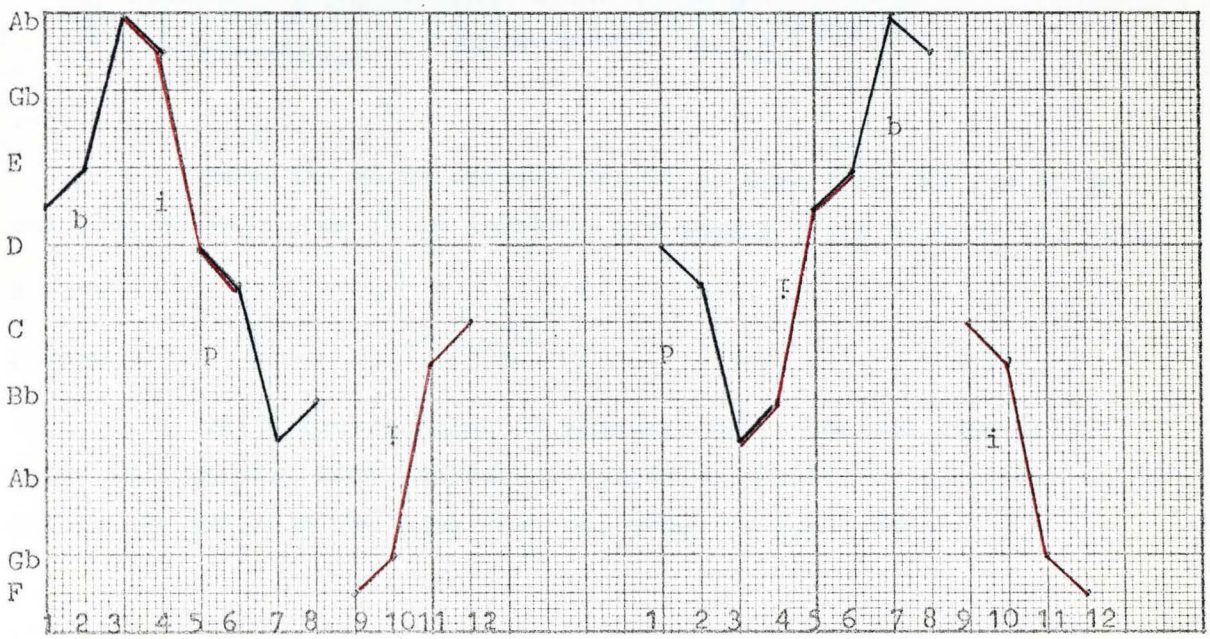
To completely understand this work it is necessary to delve deeper into the row than we have done so far. There are relations between the work and the row which cannot be discussed without such a study.

The row of this work is rather complex in that it contains 4 segments, one of which is completely hidden. There are 2 different basic segments b and i, an operation of b (reflection) which we term, p, and a R operation of i which we term $\overline{\imath}$. Moreover the set, i, is absorbed by the union of b and p.

Hence $i \subset (b \cup p)$ and $b \cap p = i$

We define the row $(b\ p\ \overline{\imath})$ graphically below and we also state its I form where it can be seen that the segments merely change position. Hence operationally we have:

$$(b\ p\ \overline{\imath}) \xrightarrow{I} (p\ b\ i)$$



Basic row in O form

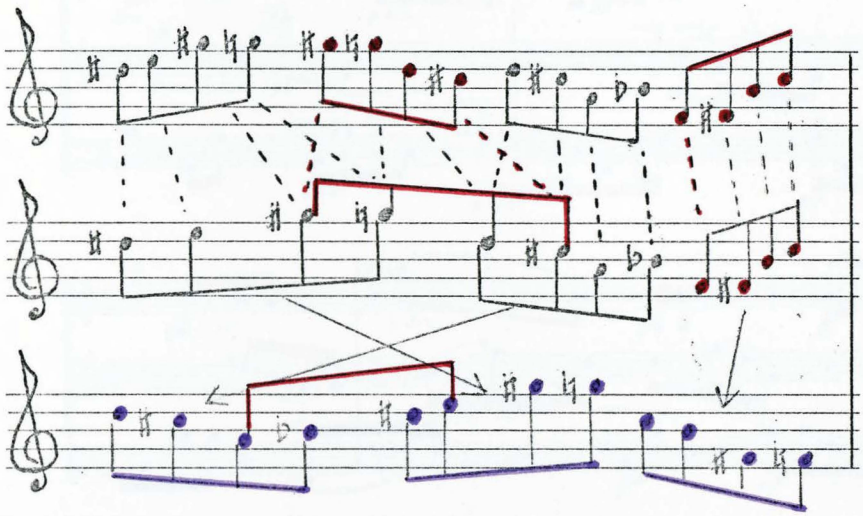
Segment i is obscure.

Row in I form

String Trio, Op. 20

Analysis of the Tone-row

To clarify matters we show this construction of the row by the following diagram. In the top line we give the complete content of the row. In the second line we give the actual row which contains, as shown the hidden segment i . The intersection of the segments is made quite clear here. The third line shows the inversion of the row.



From the above definitions it is seen that the row is so constructed that when it is inverted the segments are re-ordered, thus:

O form b i p ṭ

I form p ṭ b i

This interchanging of segments makes the row extremely flexible such that every different operation results in a regrouping of patterning while at the same time row-order is maintained.

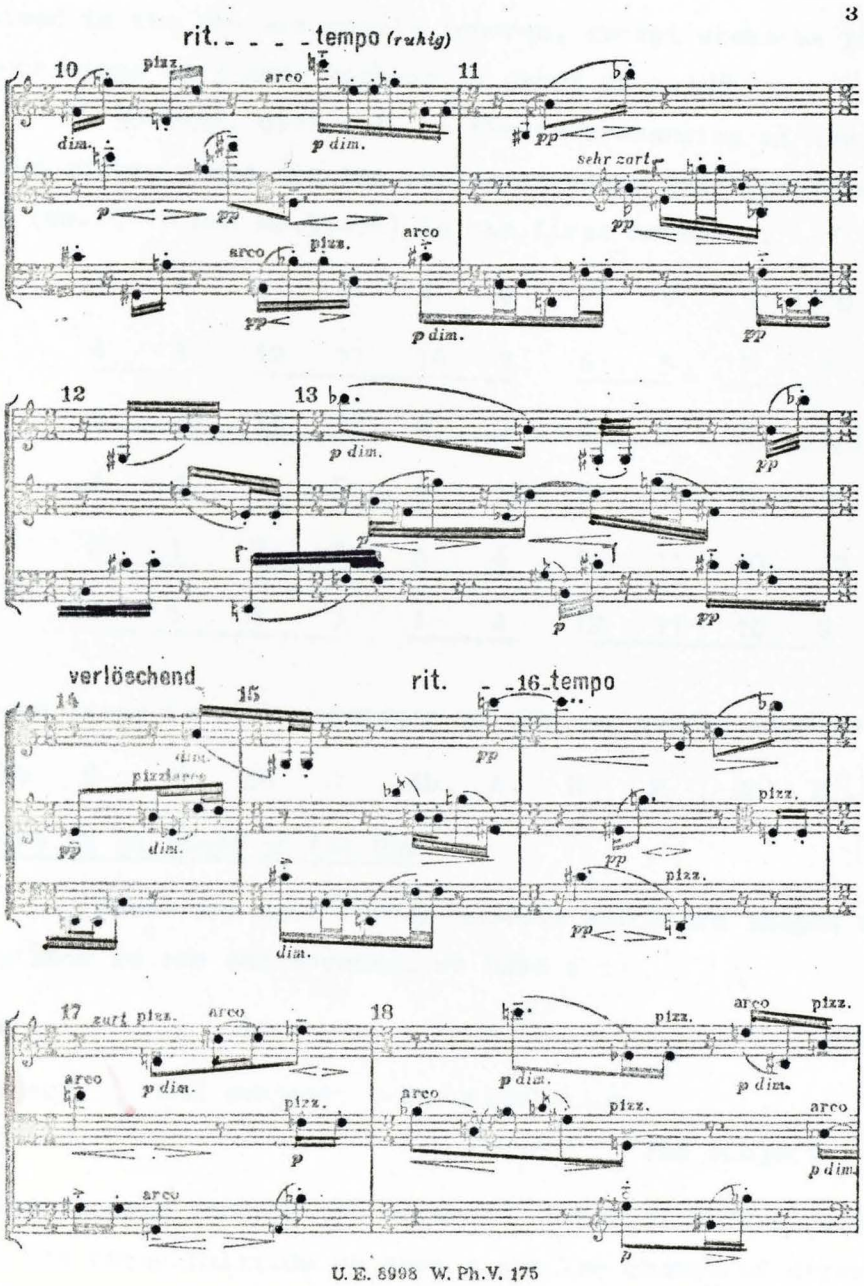
(b i p ṭ) —I→ (p ṭ b i)

(b i p ṭ) —R→ (ṭ q i d)

(b i p ṭ) —RI→ (i d ṭ q)

String Trio, Op. 20

Is the Row Imaged?



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String Trio, Op. 20

Is the Row Imaged?

Now are these properties of the row reflected onto the actual composition?

Since most of the composition is governed by single row-successions and the segments or motives are constructed out of non-successive row-order members, it is evident that the inherent motives contained in the row are mostly ignored, except where we have occasional successions of 3-note motives as shown on p.188 .

However, with ref. to the interchanging of the row-segments as shown above, there are two instances where this property asserts itself (mm.10-17 and mm.51-58) in the first movement.

m.10	1	2	3	4	5	6	7	8	9	10	11	12
m.11	4	3	12	11	10	9	6	5	7	8	1	2
m.12	9	10	11	12	4	3	2	1	8	7	6	5
m. 13	7	3	1	5	4	10	8	11	2	9	6	12
m.14	2	1	8	7	5	6	9	11	10	12	3	4
m.15	6	5	4	3	1	2	12	11	10	9	7	8

The above array is with reference to the row stated in m.10, namely

D Eb G Gb Db C Ab A E F Bb B .

Some Form is an Image of the Row

There are some formal aspects which are images of the row. For instance in the 2nd movement we have :

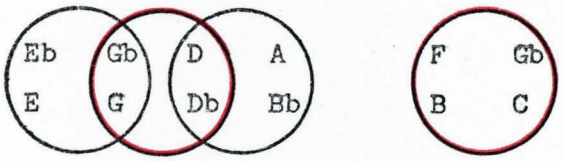
b	i	p		Row-structure
1st subject	2nd subject	Recapitulation		Formal Structure
		1st subject	2nd subject	

We notice that in the row the segments change direction: b becomes p. Thus in the recapitulation we have a similar change of direction, especially with ref to the 2nd subject where only directions are changed but other parameters remain invariant. (cf. p. 186)

String Trio, Op. 20

Is the Row Imaged?

Previously we mentioned that"the exact moment of recapitulation is vague, because it is fused with the previous section". This characteristic can be shown to be an image of row-construction by the following Venn diagram.



b i p

1st sub.

ţ

2nd sub.

We think that this relation of row to form was probably achieved subconsciously, but strictly it really does not matter whether these images are conscious or subconscious expressions (genius often expresses things subconsciously). We are mainly interested in the existence of these properties in the work. In later works, as mentioned before, the row becomes a domain of fundamental importance as a vital germinating force.

13

Criticism of

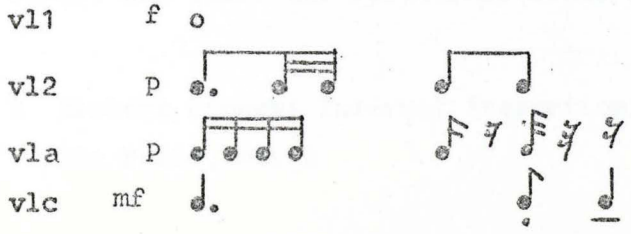
Herbert Eimert: Interval Proportions

Herbert Eimert begins his article thus:"The first movement of the String Quartet Op. 28 consists of 112 $\frac{2}{2}$ bars; the tempo of the minim varies between 66 and 84." Further on he says: "statistical analysis shows that the number of notes within each bar of the score lies between 1 and 9....." "This distribution of notes and rests," he continues, " demonstrates that the texture is widely-spun, light and transparent."

Mr Eimert's approach therefore seems to be statistical. Now let us review the information above. We note that the author has counted the number of notes and divided this by the number of bars which result is the average number of notes per bar. This average is called the mean per bar and the statistical formula for this is $\mu = \frac{\sum x}{n}$. This information with all due respects to Mr Eimert is insignificant and non-essential. Merely by glancing at the score any musician can readily see that"the texture is widely-spun, light and transparent". To know the mean of notes per bar certainly does not assist us to a better understanding of Webern, nor does it tell us what the mean of notes per bar in his other compositions will be like.

Within the first paragraph, p. 93, Eimert states the frequency distribution of notes per instrument but draws no valid conclusions from this distribution such as giving the order relations of the instruments: vla > vl2 > vlc > vl1. Though he does not state this order relation it is implied by the figures given. It should, however, be firmly understood that any order relation which is based on the frequency distribution of the notes per instrument only, is fallacious, as there are other parameters such as durations and dynamics which should be considered as well before we can state a true order relation.

To explain this , let us consider the hypothetical case:



Statistical Data

vl1	1
vl2	5
vla	6
vlc	3

Criticism of Eimert's Interval Proportions

If we now state that the order relation is

vla > vl2 > vlc > vl1 , because by mere frequency of notes the viola is predominant, we would be uttering a falsity. We have to be very careful when stating numbers to get the right perspective. The example shows that though the violin 1 only has a single note to play, this note is more important than any of the others, since the forte dynamic and the semibreve duration makes it so.

The value o can be written: 

Hence the summation of the durations should also be considered when order relations are stated.

Description of the Row

The description of the row and its structural properties is done as is prevalent in the post-Webernite criticism. Modern analysis simply states the row to be symmetric and lists the particular properties of this particular symmetry. (cf. Symmetry and Equivalence, p. 271 and Classification of different twelve-tone sets, p. 275)

For instance (b q) $\xrightarrow{R}$ (p d) such that b,q,p,d are hexachords.

(b q) $\xrightarrow{I}$ (p d)

Hence R = I

Useful information is the following: ".. the piece, besides using these four-note motives, also derives from the series two-, three- and six-note motives which each dominate a particular section". (paragraph 2, p. 93) He mentions where these sections occur on p. 99 : "at bars 17, 33, 48, 66, 80 and 96". However, we differ as to some of these sections. We make the sections to begin at measures: 16, 33, 47, 66, 80 and 96. It appears that Eimert has taken the first full measure.

* Herbert Eimert: Interval Proportions, pp. 93-99, published in Die Reihe, No. 2

Criticism Eimert's Interval Proportions

Intervals

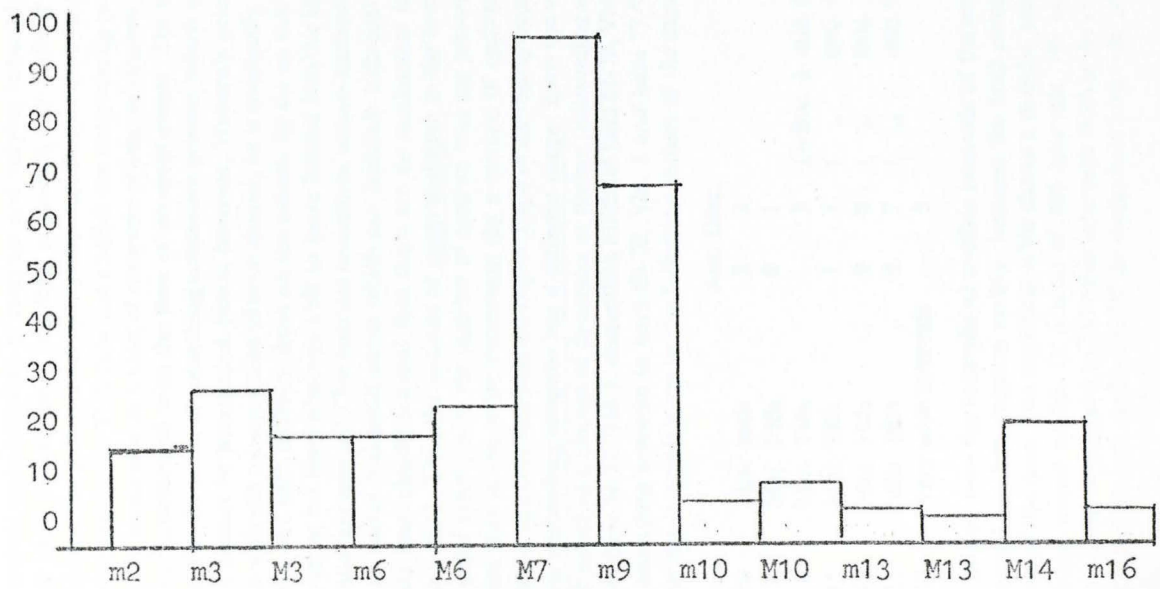
In paragraph 3, pp. 93 -94 Eimert gives a further verbal description concerning the intervallic make-up of the row. He says: "The eleven intervals of the series are made up of four descending minor seconds, two ascending minor seconds, two ascending minor thirds, two ascending major thirds and, at the turning point between two halves (each of which spans a tritone) a descending minor third."

All this is very well, but it is preferable to state the intervallic construction thus:

m2 m3 m2 M3 m2 m3 m2 M3 m2 m3 m2

In this way the properties of symmetry and structure can be seen at a glance and no unnecessary verbal descriptions are needed. We can also note that the minor 2nd occurs alternately throughout. (cf. Chordal derivation from the Row, I.3.A Minor seconds, p. 457)

On p. 94 we have another"statistical table" in which the frequency distribution of intervals is given. Now in statistics it is usual practice to present such a distribution by means of a bar graph, thus:



four descending minor seconds, two ascending minor seconds, two ascending minor thirds, two ascending major thirds and, at the turning point between the two halves (each of which spans a tritone) a descending minor third. Webern does not distribute his notes with an eye to traditional considerations of contrast and varying tensions; above all, he does not distribute them mechanically and then produce a *tour de force* of 'expression' in order to overcome the pull exerted by his material. Rather does he think *a priori* in terms of interval-proportions. This does not abolish the determining-power of the series; it ensures that the series acts as a kind of reservoir of interval-shapes instead of being a stiff framework unconnected with the flow of acoustic events. The interval becomes a 'shape' (*Gestalt*) in the sense of something concretely present, which exists in only one single form and cannot be transposed. Since, however, Webern's prime concern in his composition is with the transposition of such shapes, he is constantly inventing new ones, innumerable and each different from all the others. By doing this he was the first and only composer of his time who was able to leave behind him the idea of a contrast of construction and 'expression'. One may use inversions, octave-transpositions, derivations and the like as useful makeshift terms which can facilitate technical understanding as soon as it has been clearly realised that there are no mechanical interval-transpositions in Webern's work. Thus the number of interval-shapes in the first movement of the Quartet coincides exactly with the number of motives that are present at all. Their profusion is so great that in the entire movement (by a miracle of architecture!) there is not a single repetition of a concrete interval-object. Each of the fourty-four ascending, each of the fifty-one descending sevenths has a different shape! Even the very few literal repetitions are subjected to a change of dynamics or timbre (descending sevenths in bars 45-46, Vln. II, and bars 51-52, Vln. I: descending ninths in bars 67-78, Vln. I, and bars 74-75, Vln, II; or ascending sevenths in bars 69-70, Vln. I and bars 77-78, Vln. II). A statistical survey of the intervals gives us the following picture of the movement :

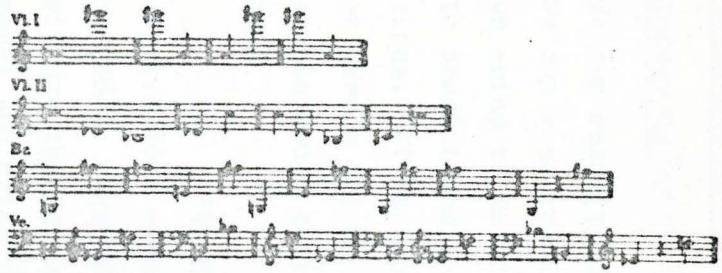
	Asc.	Desc.		Asc.	Desc.	
Min. 2nd	3	10	Min. 10th	2	3	
Min. 3rd	20	8	Maj. 10th	8	1	
Maj. 3rd	11	4	Min. 13th	–	3	(=8ve. + min. 6th)
Min. 6th	—	15	Maj. 13th	1	1	(„ maj. 6th)
Maj. 6th	10	12	Maj. 14th	9	8	(„ maj. 7th)
Maj. 7th	44	51	Min. 16th	6	7	(„ min. 9th)
Min. 9th	29	37	Very wide intervals	–	3	

This table embraces, of course, only the interrelated motivic intervals of the series, not those intervals, characterised by their extreme variety, between the final notes of one motive and the beginning of the next. The statistical table shows a definite preponderance of major sevenths and minor ninths. Of a total of 306 intervals, 161 are either major sevenths or minor ninths, as opposed to 145 other intervals. Within the range of a ninth, the minor second is the interval used least. Of the compound intervals, 14ths and 16ths again predominate.

In the first 16 bars of the movement (upbeat and bars 1–15; see Ex. 5) Webern presents a perfect example of his interval-technique; in practically no other work of his can we find this in so radical a form, reduced almost to a formula. It is as if he were going out of his way to present us with a blueprint containing the essentials of his interval-technique.

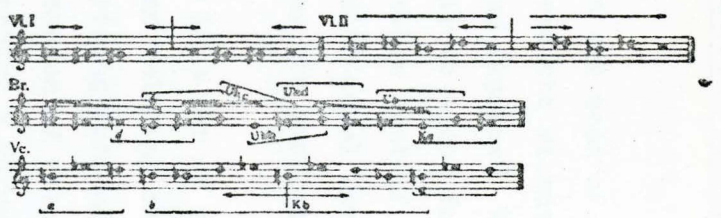
Twenty-one two- and three-note interval-motives are used, each differing from all the others. (Here again the dynamic mutation — D♭–C, *p. decresc.*, bar 8, becoming C♯–C, *f. decresc.*, bar 14). The interval-motives in the four instruments are as follows:

Example 2



The notes being laid out in this way, the series' high degree of mirroring produces in the individual parts the following connections between its component motives:

Example 3

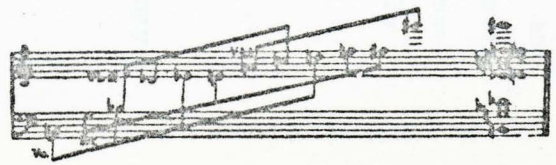


U = inversion
K,k = retrograde

When two or more notes sound together there is a comparable symmetry, as regards both their interval-proportioning and the selection of the points at which they occur – see the first and last diads of the first series (bar 1, F♯–A; bar 5, F – D), or the three-part symmetrical arrangement of the second series (bars 7–10). The simple exposition of the series at the beginning is limited 'harmonically' to diads, as is the first polyphony of crossing series in bars 16–21. Triads first begin to predominate in the transition to the motivic six-note group (bar 33) and in this group itself, and an analysis of the harmonically emphasised 'coda' would support our thesis about the proportioning of positional values and intervals.

The first series in the movement (bars 1–6) can be imagined as an instrumental line (horizontally) and as sound (vertically).

Example 4



But there are no such textbook simplifications in Webern; a merely mechanical approach to the twelve-note compass would be quite foreign to him. For him the

Criticism of Eimert's Interval Proportions

Intervals

We can readily calculate the mean of these intervals. This is 21,8. We can also readily obtain the standard of deviation, but what are we going to do with these figures? We cannot even use the numbers to predict what is likely to occur in another of Webern's compositions. It is quite possible that if we were to select intervals at random out of the twelve-tonal works of this composer, such a sample would tell us what the population distribution would be like.

"Statistics is a set of techniques for summarizing observations - data - and relating these observations to a theory or model. Ways of summarizing information are of limited value without the further dimension of relating the information to a model and using it to predict a future state of affairs". * 1

Thus merely to state data (frequency distributions) is a very rudimentary form of statistics, and one should be careful to call this statistical analysis.

Eimert states with reference to the table on p. 94: "The statistical table shows a definite preponderance of major sevenths and minor ninths. Of a total of 306 intervals, 161 are either major sevenths or minor ninths, as opposed to 145 other intervals. Within the range of a ninth, the minor second is the interval used least."

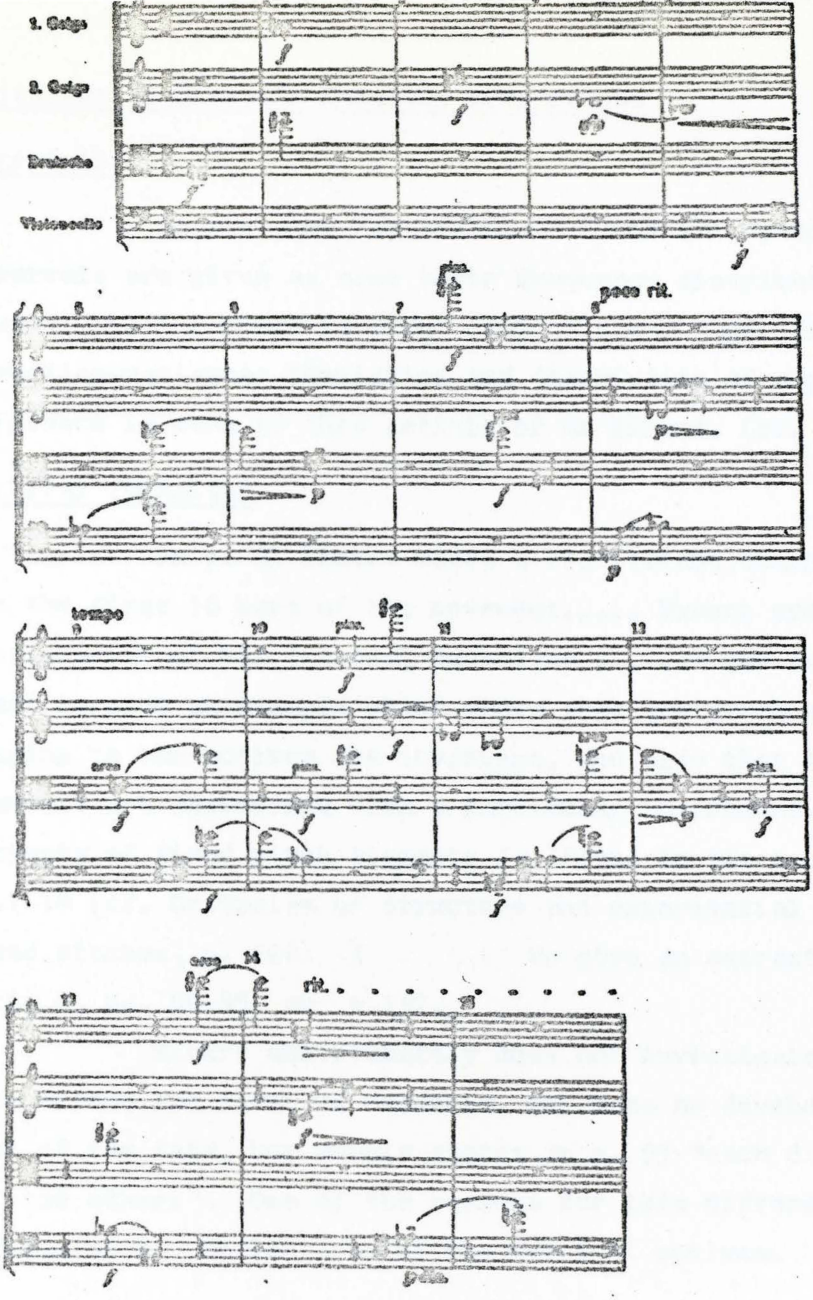
Hence the author does give some order relations. These can be summarized thus:

M7 $>$ other intervals, and m2 $<$ other intervals.

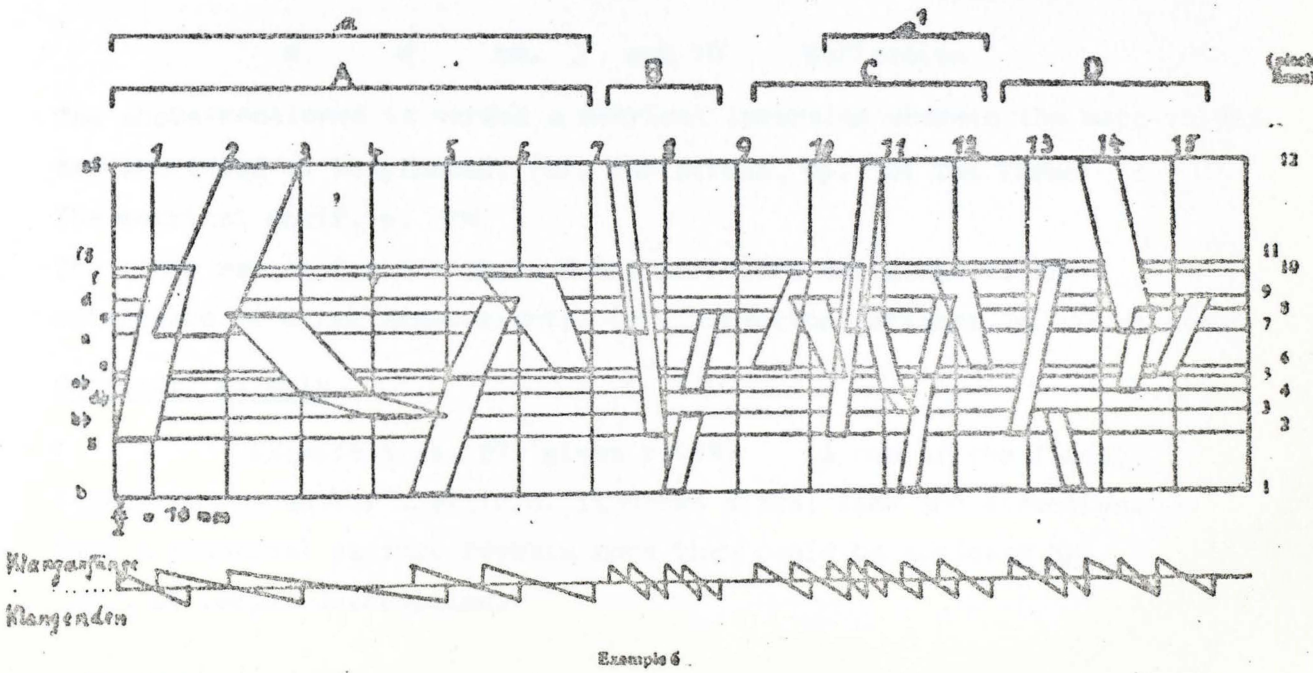
Though this information, as stated, does not prove anything, we wish to point out that when order relations are considered, especially with ref. to a set of variations then such information becomes significant. It can show us where elements become important or where they become less significant. We wish to refer the reader to the section in this thesis: Withholding of Notes, p.50 and the Criticism of Structure and experiential time: Note-values, pp.223-224 ,where statistical data stated as order relations is the only method by which significant observations may be made.

* 1: Donald J. Koosis: Statistics, p.1, published by John Wiley & Sons, Inc. New York, 1972.

Pages
96 and 97
from Eimert's
article.



Beispiel 5



Beispiel 6

1 Min. 2nd = 1 m.m.
Klanganfänge = Attacks

Criticism of Eimert's Interval Proportions

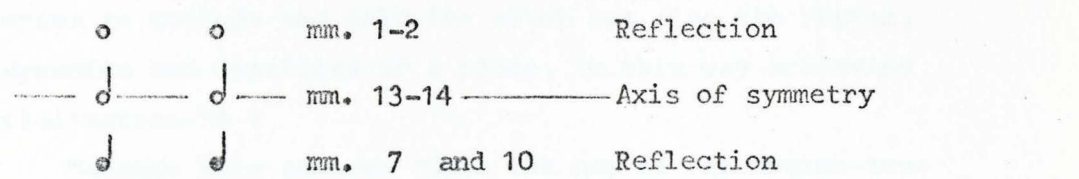
Intervals

In the same "statistical" table the directions of the intervals are given as also their frequency distribution. However, no inference is drawn from this raw data. In the chapter: Direction-variants: Statistics and description of a phenomenon, reference is made to this article of Mr Eimert. (cf. p. 156)

Interval Technique

On p. 95 Eimert makes a significant observation: "In the first 16 bars of the movement..... Webern presents a perfect example of his interval-technique....." The author then proceeds to give an example which shows that the pitch-elements belonging to the motives are invariant, and also that these pitch-elements are associated with a particular instrument. This same property of fixed pitch elements is found in the second movement mm.1-18 (cf. Criticism of Structure and experiential time: Fixed pitches, p. 228) We give an extract from Eimert's article, pp. 94-95 on p.197.

Eimert unfortunately does not investigate this observation beyond the first 16 measures, nor does he develop the content of the data, but merely states on p. 95 "each differing from all the others". One of the reasons for this differentiation is because of the reflections of the metrical motives.



The above-mentioned is termed a metrical inversion wherein the note-values are shortened or lengthened. (cf. Variations, Op. 30: The Theme: The metrical motif, p. 304)
The other reason for the above-mentioned differentiation is the occurrence of direction-variants. (cf. Direction-variants, p.158 et seq.)

Graphical Example

Example 6, p. 97 (given p.199) is one of the finest things in the author's article. It shows pitch, time and direction. Such a graphical picture reveals more than could be achieved by pages of verbal description.

Criticism of Eimert's Interval Proportions

Serial Proportion

Much of what is contained on p. 98 is concerned with a description of this graphical picture. This is rather diffuse.

In the last paragraph of this page in the last sentence, Eimert states:"We see the principle of serial proportion everywhere, and even if Webern did not apply or know such concepts ....." and what continues.

We find this statement to be slightly confused. We argue that if "the principle of serial proportion " is seen everywhere, then this "principle of serial proportion" must be present. Further: if this "principle of serial proportion" is present, then it has been applied and application implies knowledge of"such concepts ". Statistically then we must disregard the null hypothesis: namely that Webern did not know such concepts and therefore that "serial proportion" is a chance event.

The assertion, too, on p. 99,"that his mode of working is the exact opposite of total pre-determination" cannot be accepted on grounds of a partial analysis of a single movement.

There is a prevalent tendency amongst the post-Webernite writers to claim that the Post-Webernite school made significant advances with reference to total serialisation.

Joseph Machlis, Professor of Music, Queens College of New York, with ref. to Stockhausen, claims: "He has expanded the concept of the series to include not only the pitch but also the rhythm, timbre, dynamics and densities of a piece, in this way achieving total serialization."* 1

Massimo Mila states: "Once the use of the twelve-tone series was firmly established, the desire quite naturally arose to extend this serialization process to the other"parameters" of music, that is, to subject its rhythmic, timbral and dynamic aspects to the same laws governing the disposition of the pitch of the notes."

"Structuring" (the organization of musical material) * 2

* 1: Joseph Machlis: Introduction to Contemporary Music, published by J.M. Dent, London, 1963.

* 2: Massimo Mila: Notes for the RCA Victrola record entitled: New Music, conducted by Bruno Maderna.Record number: Vics 1239.

Criticism of Eimert's Interval Proportions

Serial Proportion

by means of total serialization of parameters was the first step the new music took beyond Webern. This extension of the serialization process to all parameters brought about a heightening of interest and investigation into the qualities and components of sound. The increased concern for this "tone colour" and other hitherto unstructured aspects of sound and the diminishing interest in pitch as the primary structural element made it necessary to alter traditional listening habits. Where pitch distribution had been the primary expressive unit, now the other parameters took on equal or greater importance ".

These claims are firmly contradicted in the analysis of the Theme of the Variations, Op. 30 by Webern. In this composition all parameters are serialized as is amply illustrated in the analysis. It thus seems that these authors were unaware of aspects of Webern's dimensional music. Their claim that the post-Webernite school has made significant strides in these respects which Webern had already done in 1940 is indeed strange. (cf. Analysis of the Theme, pp. 287-328)

Traditional Form

On p. 99 we find the words: "remnants of traditional form which can be found even in Webern's last works ".These words imply a criticism of Webern, namely that he was unwilling to abandon some traditional procedures. Now it is true that Webern employs binary and ternary forms, but these forms are completely different to the traditional equivalent. In Webern the forms are contained in the basic row. Thus we have a ternary second Å 1 movement, which is a symmetric form, reflected from the row. Similarly the first movement of the Variations, Op. 27 is ternary because a symmetric structure is in evidence right from the very first phrase-segment and consequently the ternary: A B A is the logical structure for the movement.

Å 1: String Quartet, Op. 28: Webern.

Conclusion

The concluding sentence on p. 99: "one may analyse only what is in the score and manifest as sound: concepts introduced from outside help little..... " .

With this statement one may wholeheartedly agree .
It implies, whichever way one looks at it, that we may not have preconceived ideas or theories such that these ideas may then distort,or cause us to,distort data so as to furnish proof of these preconceived ideas and concepts.

This of course is not only true with respect to music, but to all scientific study. Hence we should aim for complete objectivity.

Though we may disagree with some points in Mr Eimert's article, we maintain that it is, however, only by precisely describing phenomena - even the statement of raw data statistics that progress can be made in musical analysis.

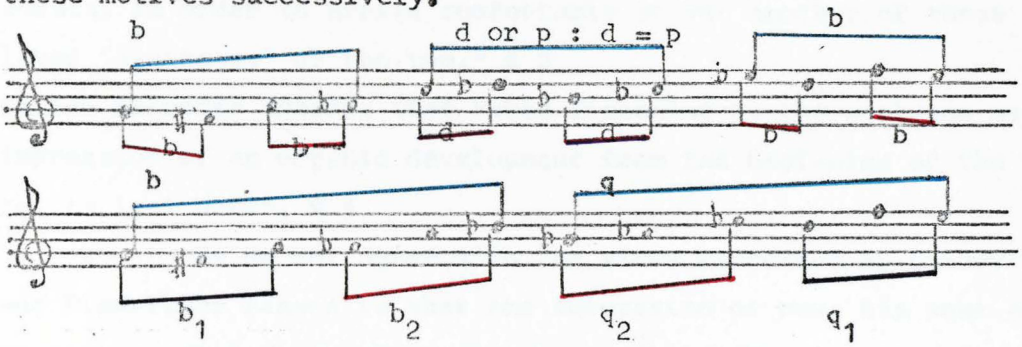
14

String Quartet, Op. 28: 1st Movement

As seen above Eimert only considers certain aspects of the first 15 measures of the 1st movement. Leibowitz also, in fact, discusses just these 15 measures. Walter Kolneder in his book, "Anton Webern", translated by Humphrey Searle, pp. 144-149 gives us a general description and some discussion of the row construction. ✱ 1 None of these authorities thus gives us a complete view of the whole first movement and the relations between various sections comprising the movement.

The Row

The row itself is very important in this work. (cf. Criticism of Eimert's Interval proportions: Description of the row, p. 195) This row is so constructed that it lends itself to motivic utilisation such that a number of different motives come into existence dependent upon application of division of the row into 2, 3, 4, or 6 segments. Thus this row can be said to be the sum of the motives and that its function is to order these motives successively.



Succession of Rows

Each section has its own particular succession of rows. Section 1, mm. 1-15 is by intersection as shown below.



Section 2 employs 2 simultaneous sets of rows such that each set intersects. Sections 3 and 4 have 3 sets of simultaneous rows stated canonically and the successions are non-intersecting. (cf. R/R version where the rows are indicated by different colours to facilitate identification).

✱ 1: Walter Kolneder: The adoption of Schoenberg's method, pp. 96-190, published by Faber and Faber, 1968.

String Quartet, Op. 28: 1st Movement

Succession of Rows

Sections 5, 6 and 7 all employ two simultaneous sets of rows all of which use intersections.

The succession of rows is such that the commencing notes of each successive row form augmented chords. This procedure is adopted in mm. 1-15 and also in mm. 16-32. This method is repeated in mm. 66-112. Here we then have a distinct formal application to row-succession.

Form (Sonata Form?)

The opinions of authorities regarding the form is as follows:

Leibowitz states: "The .... movement is a sort of "theme with variations". Its dimensions are greater than those of the two other movements, and its form is more complex." * 1

Eimert says: "Concepts introduced from outside help little, and are none the better for being taken from the golden treasury of fugue and sonata, in order to arrive comfortably at yet another of those well-loved 'syntheses' of the two." * 2

Walter Kolneder asserts that "when listening to the work one gets the impression of an organic development from the beginning of the quartet to its last bars". * 3

We do not agree with the views expressed by Leibowitz and Eimert. Our reason is that the succession of rows has some affinity to the sonata key-system and we also hold the view that there is a 1st and 2nd subject which recurs with a consequent change in the rows of the 2nd subject. The analogy to the sonata is strong. However, we shall examine this carefully in the following pages.

Canons

The whole structure, excluding mm. 1-15 is a succession of 6 canons and contrapuntal essays. This canonic property is characteristic of the whole work but especially so of the first movement. These canonical imitations and sequences tend to be too exact and regular as is seen in the R/R version. This regularity, however, is countered in the score version by the use of direction-variants and imaginary forms and relations.

* 1:Leibowitz: Schoenberg and his school, p. 246.

* 2: Eimert: Interval Proportions, Die Reihe, No. 2, p.99

* 3: Walter Kolneder:Anton Webern, p. 147, paragraph 1.

String Quartet, Op. 28: 1st Movement

Exposition

Section 1

Let us term mm. 1-15 the 1st subject. It has the qualities of a 1st subject: it is terse and contains the material out of which development may grow. By reference to the R/R version the phrase-segments are: A B A A such that

A (mm. 1-6) is similar to mm. 10-12 but in diminution (A_{dim})
A (mm. 1-6) is a transposition at mm. 12-15 (A_{tran})

Hence we can state this succession of phrase-segments:

A_o	B	A_{dim}	A_{tran}
mm.1-6	7-10	10-12	12-15

Leibowitz states: "The beginning of the movement..... is a sort of principal"theme" in four sections (I, II, III, IV)...."* 1 We have underlined the term "principal theme"to corroborate our contention that this is a first subject. Leibowitz's description of this theme is very apt. "The Webern "theme" is already a sort of development a priori; it is entirely made up of variations, and so is essentially kinetic ". * 2

Section 2

Let us term this section, mm. 16-32, the 2nd subject. This is a canon in A B A form with a constant interval of entry from mm. 16-25 of o. . This interval of entry changes at m. 26 to ♩ which is maintained to the end of the section (m.32).

We have 3-note motives, mm. 16- 21 with a middle contrasting section of staccato 2-note motives ,mm. 22-25.
The structure is:

A (mm. 16-21) is similar to mm. 28-32 where the interval of entry has been changed.
B (mm. 22-23) is canonically imitated at mm. 23-25
From mm. 26-28 interval of entry is changed as stated.
A (mm. 28-32) Repetition of mm. 16-17 such that segments overlap.

* 1: Leibowitz: Schoenberg and his School: p. 246

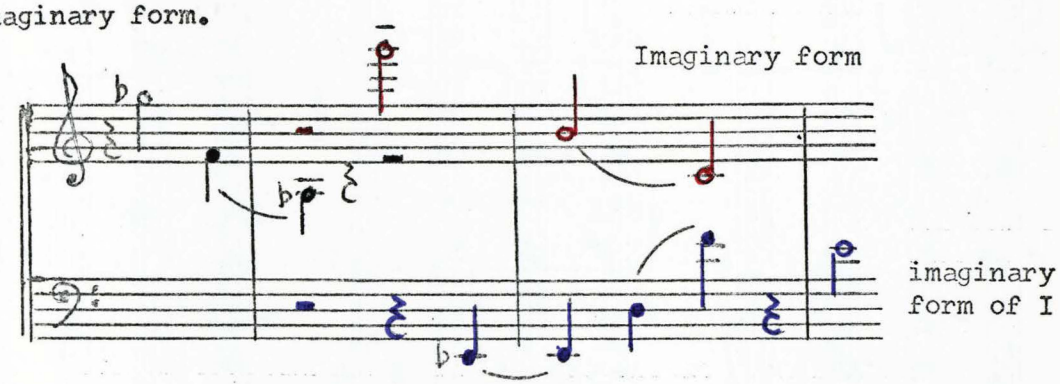
* 2: ibid, p.248, 2nd paragraph.

String Quartet, Op. 28: 1st Movement

Exposition

Section 2

The basic canonic imitation as is seen in the R/R version is countered by imaginary forms and direction-variants. At mm. 29-30 we have a truer canonic relation. Let us demonstrate direction and imaginary form.



Example illustrating imaginary relations countering actual relations. For instance motif in black is equivalent to motif in blue, and motif in red is structurally a different motif to each of the others.

Middle Section

Section 3

Section 3 is a double canon as shown in the R/R version such that notes (in black) are answered by those (in red) and those notes (in blue)are answered by those (in purple).

The segments contain 6 notes. At m. 44 the subsidiary motives contain 3 notes. This is maintained to m. 49 .
The construction is such that the first 6 notes are crotchets and the next 6 notes are minims from mm. 33-37. (notes in black and red) Then from mm. 37-40 this statement is given in R and canonically imitated at mm. 40-43 (in purple). However at m 40 the first statement in the O row-form occurs again and here the crotchets are separated by crotchet rests and the minims become crotchets (in black).
At m. 45 a subsidiary motif, based on the original motif is stated (in blue) and answered at m. 47 (in purple).

We can thus say that we have:
A the original statement and its canonical answer.
B the Retrograde of A and its canonical answer
A the re-statement of the original varied and contrapuntally developed.
Thus we have the form: A B A.

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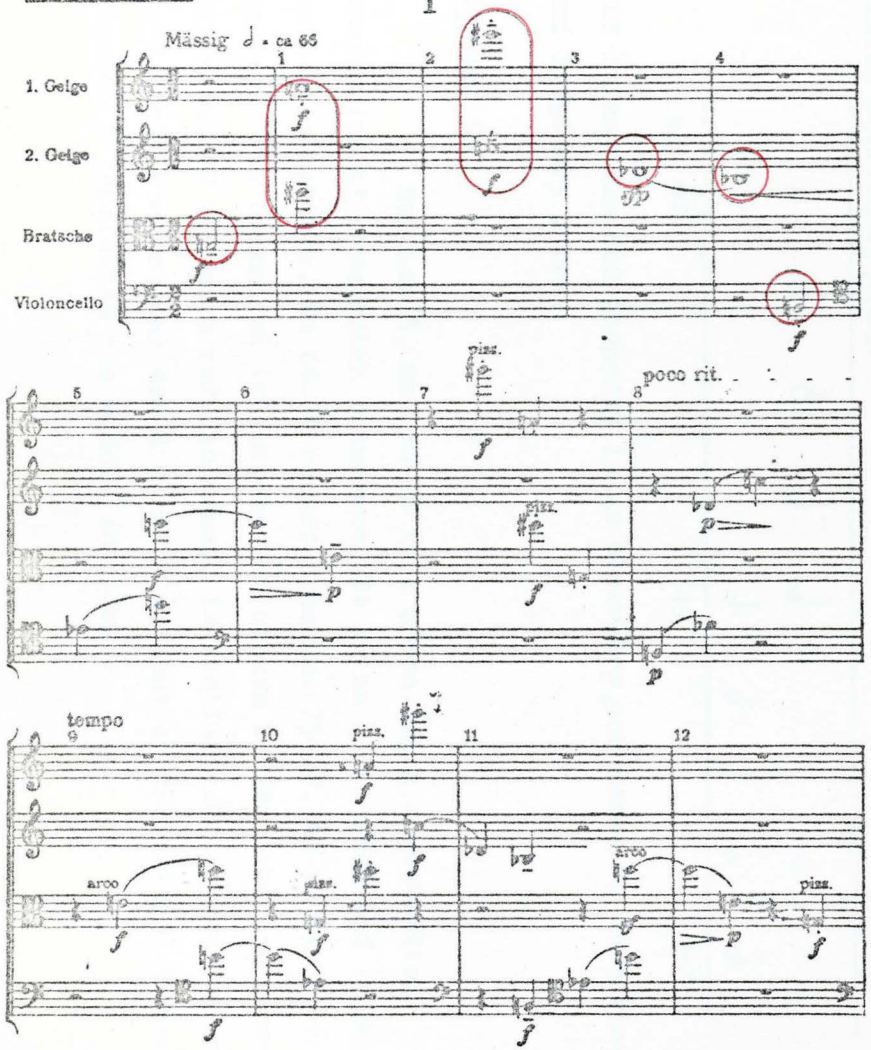
STREICHQUARTETT

ANTON WEBERN, Op. 28

Exposition

I



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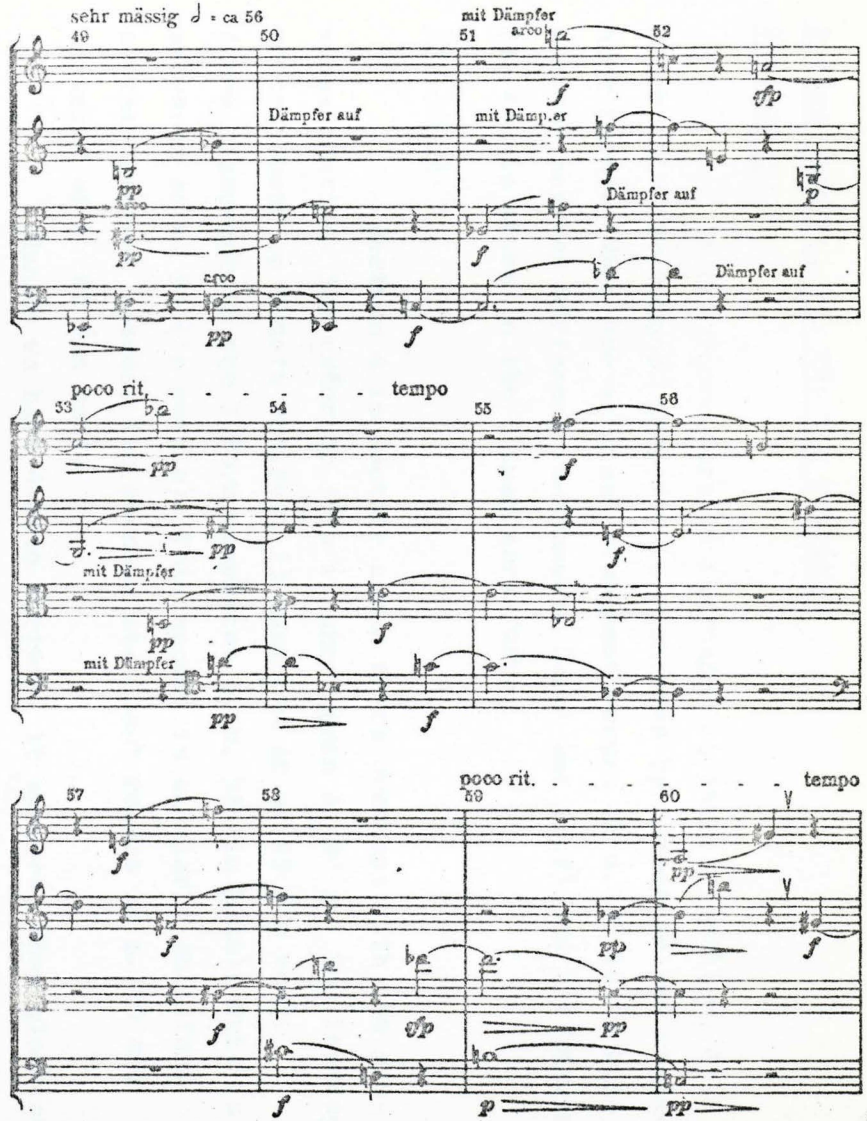

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String Quartet, Op. 28: 1st Movement

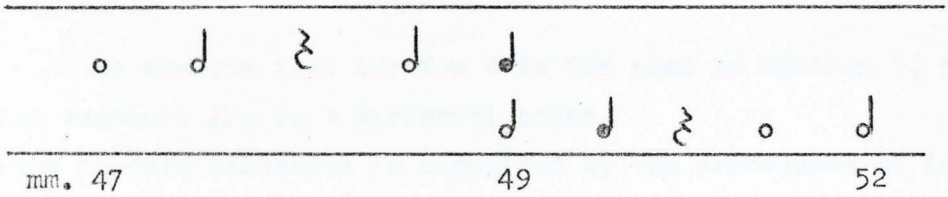
Section 3

In the score version the canon is regular until m. 43. After this the canonic property is countered by direction and imaginary forms. When the original statement recurs at m. 40 it is subdivided between different instruments (vl.1 and vl.2) and its answer (m. 43) is given in the I imaginary form.

Section 4

Section 4 is another canon which overlaps with the previous section. The exterior form is once again A B A. The leading voice, based on 4-note motives, is answered at m. 49 (in red). A new statement in the I form commences at M. 53 (in blue). This is answered at m. 55 (in purple). This answer is similarly an I form of the original answer. The opening statement recurs at m. 60 and answered at m. 62 (in red).

Though we have 4-note motives, it appears, when glancing at the score, that we have a constant succession of imitations between 2-note motives. (This is reminiscent of the 1st movement). The reason for this impression is because the 4-note motives are stated metrically, thus:



The latent canonic property is, as elsewhere, countered by directions and imaginary forms.

Section 5

Section 5, mm. 66-78 is a canon using a sequential succession of rows which intersect. It is in A B A form and is based on 4-note motives. Mm 66-70 recurs from mm. 73-78. As in the previous sections the canonical imitations are broken by the same procedure. Since mm. 67 -78 with ref. to tones, is similar to the theme at mm. 1-12, this can be considered to be a variant of the initial theme. Section 5 terminates the middle section.

String Quartet, Op. 28: 1st Movement

Recapitulation

Section 6

Section 6 is contained in mm.80-95. The silence at m.79 draws attention as well as dynamics and the listener is aware that something important is about to happen. The recapitulation of the 1st subject is ushered in at a forte-level. Here, as in the first statement of the subject, mm. 1-15, we have the same terseness of utterance and dramatic impact present.

This section is also a canon with an invariant interval of entry throughout. The subject is here varied and developed. It is not an exact replica of the 1st subject of the exposition (as in classical works). (cf. example overleaf)

A comparison between the two 1st subjects reveals the following:

Mm.80-86 (indicated in black in the R/R version) is similar note-wise - not pitch-wise - to mm. 1-6
mm.86-91 (G/F-sharp - indicated in black) is similar note-wise to mm.12-15 of the expositional 1st subject.
Mm. 91-94 (commencing on D - in black) is, as above, similar to mm.5-7.

We now see that Section 6 is the same as Section 1, except that segments are in a different order.
The strict canonic imitation is cancelled by the procedures of imaginary forms and direction-variants.

Section 7

Section 7, mm. 96-112, is both a 2nd subject as well as a coda. The structure is canonic with an invariant interval of entry and based, as section 2, on 3-note motives.

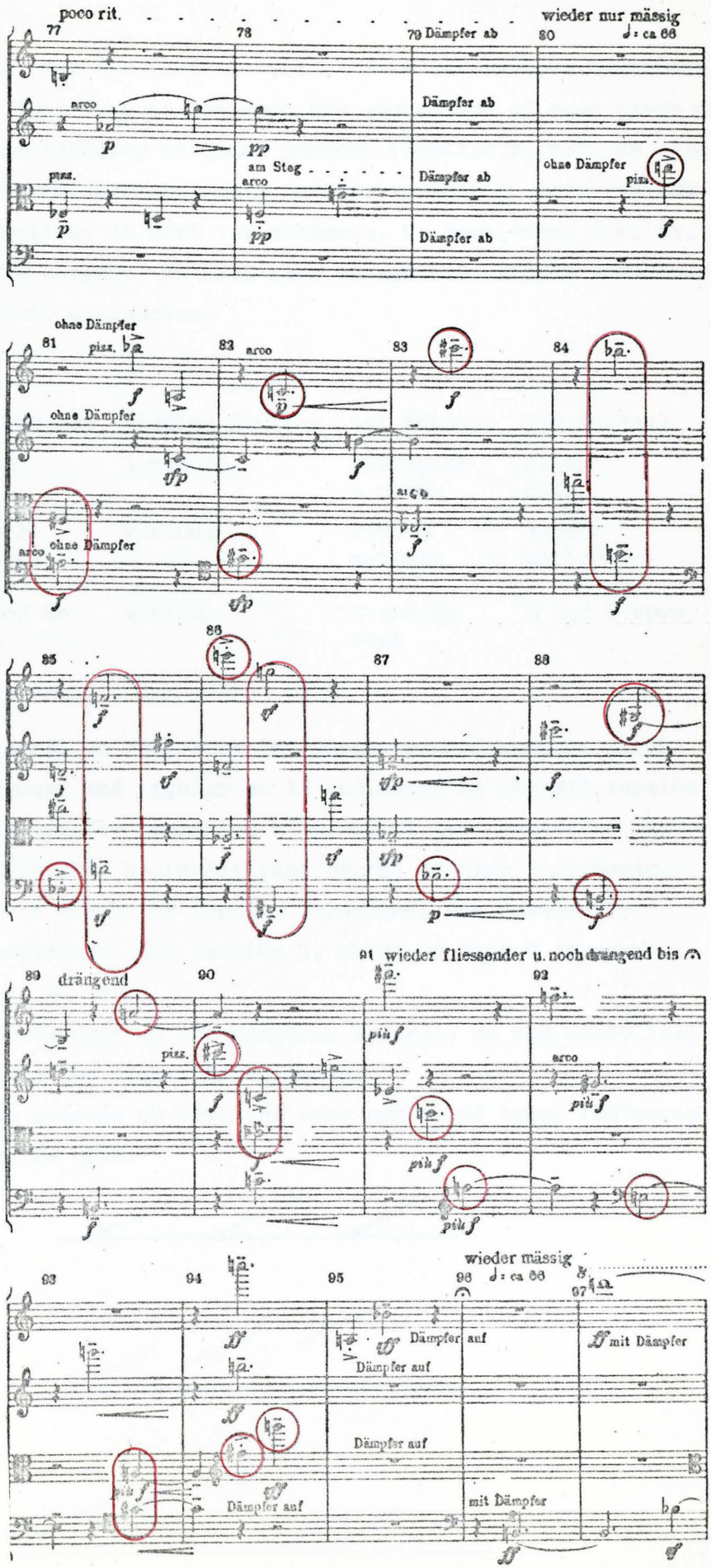
In the R/R version we note the following similarities:
mm.96-111 (in black), commencing on the note B, is similar note-wise to mm. 21-32 (in red) of section 2.
Similarly mm. 97-112 (in red) is identical note-wise to mm.19-32 (in black).

At the same time, mm.101-111, is similar note-wise to mm.1-8 of section 1. It therefore possesses the properties of summary necessary for a coda.

String Quartet, Op. 28: 1st Movement

Recapitulation

Section 6



String Quartet, Op. 28: 1st Movement

Conclusion

We can thus see that the sonata form is present, one could almost say, felt. This view is based on the succession of rows given on p.217 and on the identity of tones present (similar notes). We also have motivic structure such as 3-note motives present in both 2nd subjects and 2-note motives in both 1st subjects. As seen, every section, except the first, is a canon. We thus have an apparent sonata structure combined with canonic expression.

Sonata Form

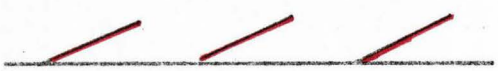
1st Subject	2nd Subject	Middles Section	1st Subject	2nd Subject
statement	canon	3 canons	statement + canon	canon coda
2-note motives	3-note motives	various	2-note motives	3-note motives
G row	Gb and Eb rows	various	G and Bb rows	B and D rows

(cf. Succession of rows, p.204 and p. 217)

In general we feel that the supra-ordered canonic structures are too frequent and regular as is indicated in the R/R version. This regularity is greatly cancelled by means of the procedures indicated above. Nevertheless basically (not heard) we have a mechanical music, especially so since the canonic structures are frequently associated with sequences. See section 5, where we have 5 sequences in succession! (cf. p. 216)

With reference to the canon in general, we can state that the canon belongs to the class: Repetitions.

Let us presume we have the same number of tones indicated by the lines, then we have:

Repetition 

Sequence 

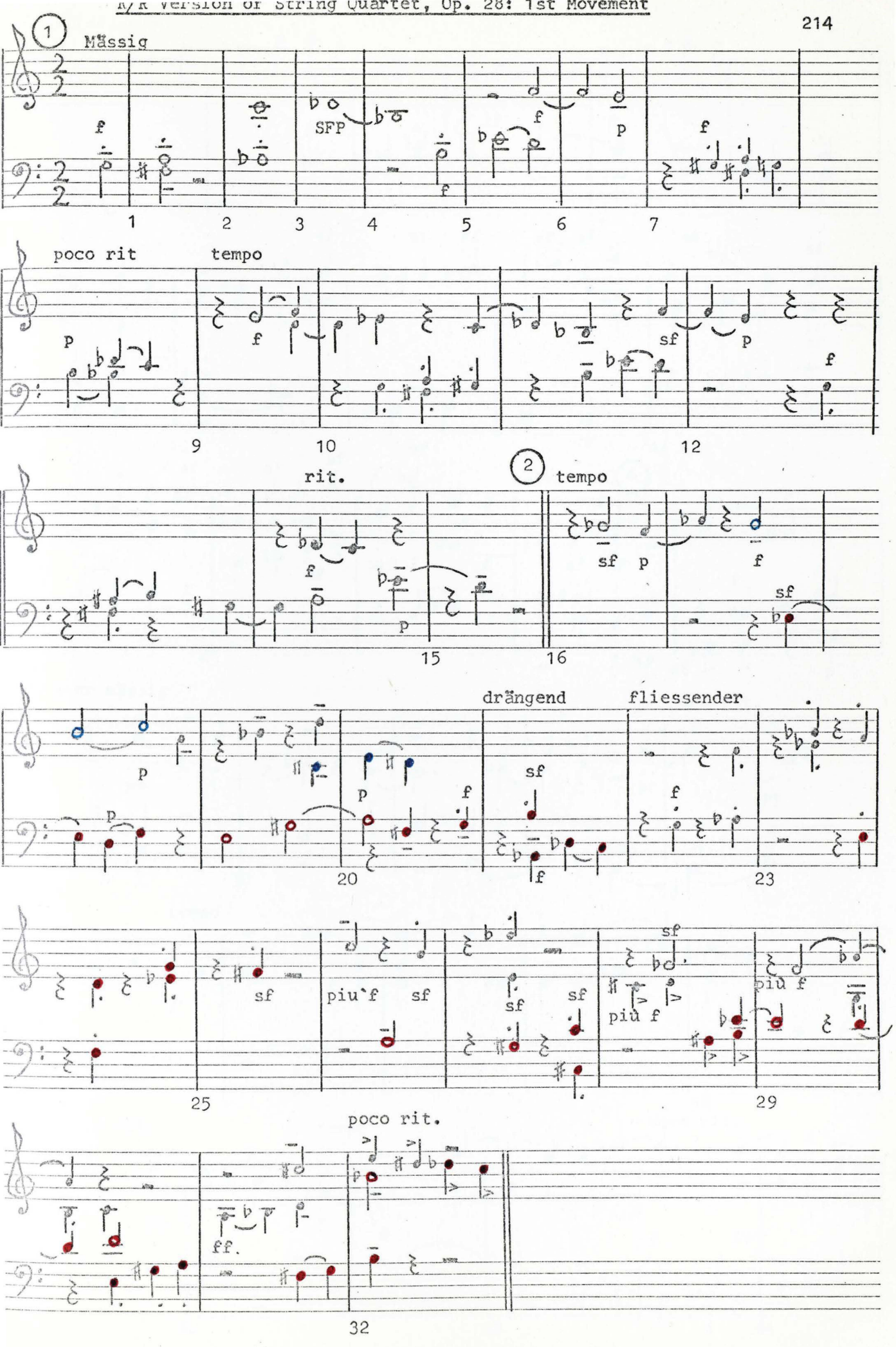
Canon 

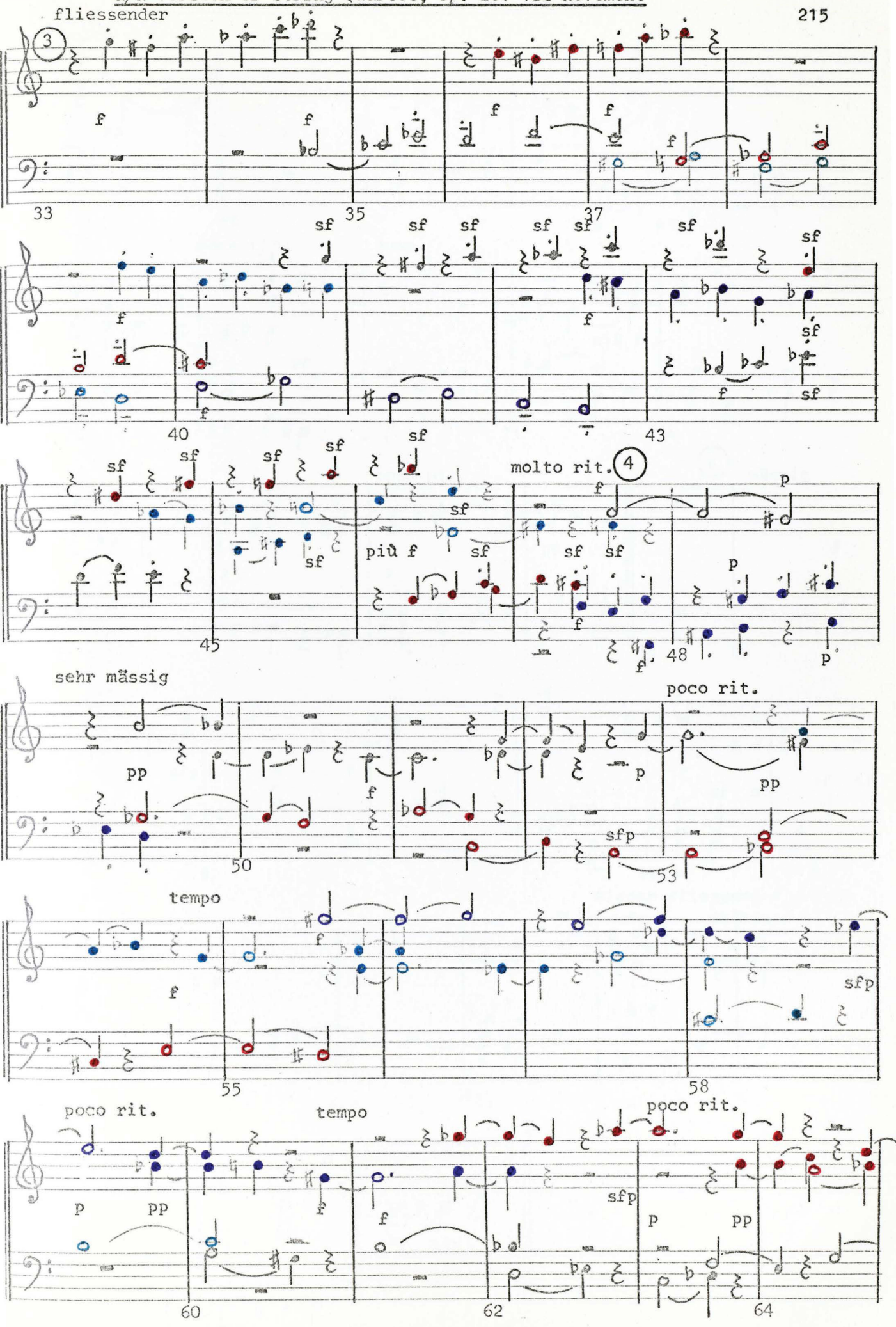
String Quartet, Op. 28: 1st Movement

Conclusion

The diagram above indicates the similarities and differences between the respective members of the Repetition Class.
In Repetition we have a re-statement in time and pitch.
In Sequence we have a re-statement in which duration is identical but pitch varied.
In Canon we have a sequence such that the interval of entry overlaps.
As shown we can also have a canon in which pitch is invariant . i.e a series of overlapping repetitions.

Now we feel that all these members of the repetition class are necessary in the musical expression of ideas, yet theorists have maintained that too many sequences or repetitions are undesirable as this is strictly speaking not invention,but merely duplication,etc.
From the diagram we can see that the same rule applies to canons.
Even though Webern has cancelled this canonic regularity we feel that basically it is there, though disguised.


1
Mässig
SFP
poco rit
tempo
rit.
2
tempo
drängend
fliessender
piu`f
piu f
poco rit.
ff.


fliessender
3
f
33
35
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sf
40
43
45
molto rit.
4
più f
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sehr mässig
pp
50
poco rit.
53
tempo
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sfp
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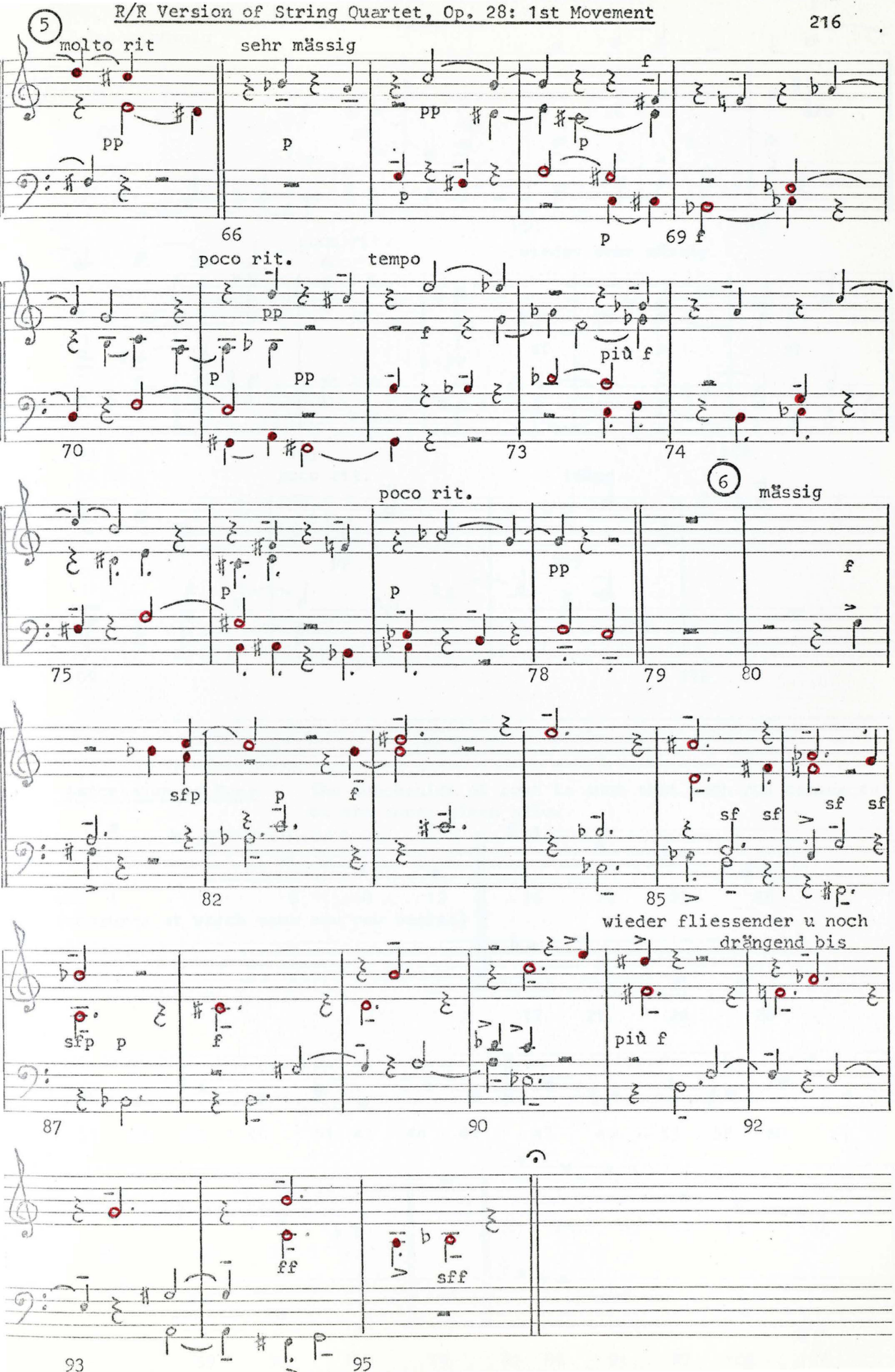
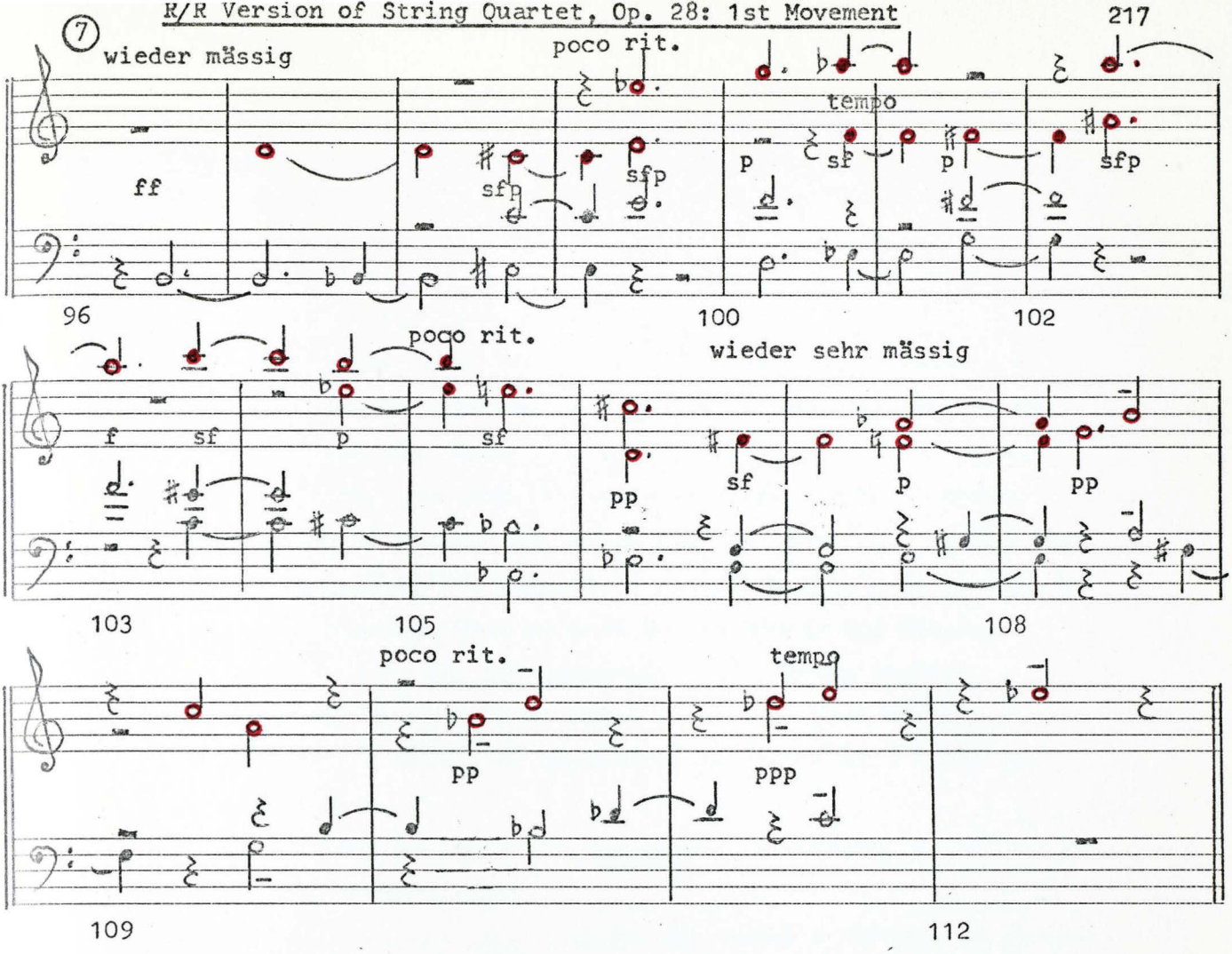
64

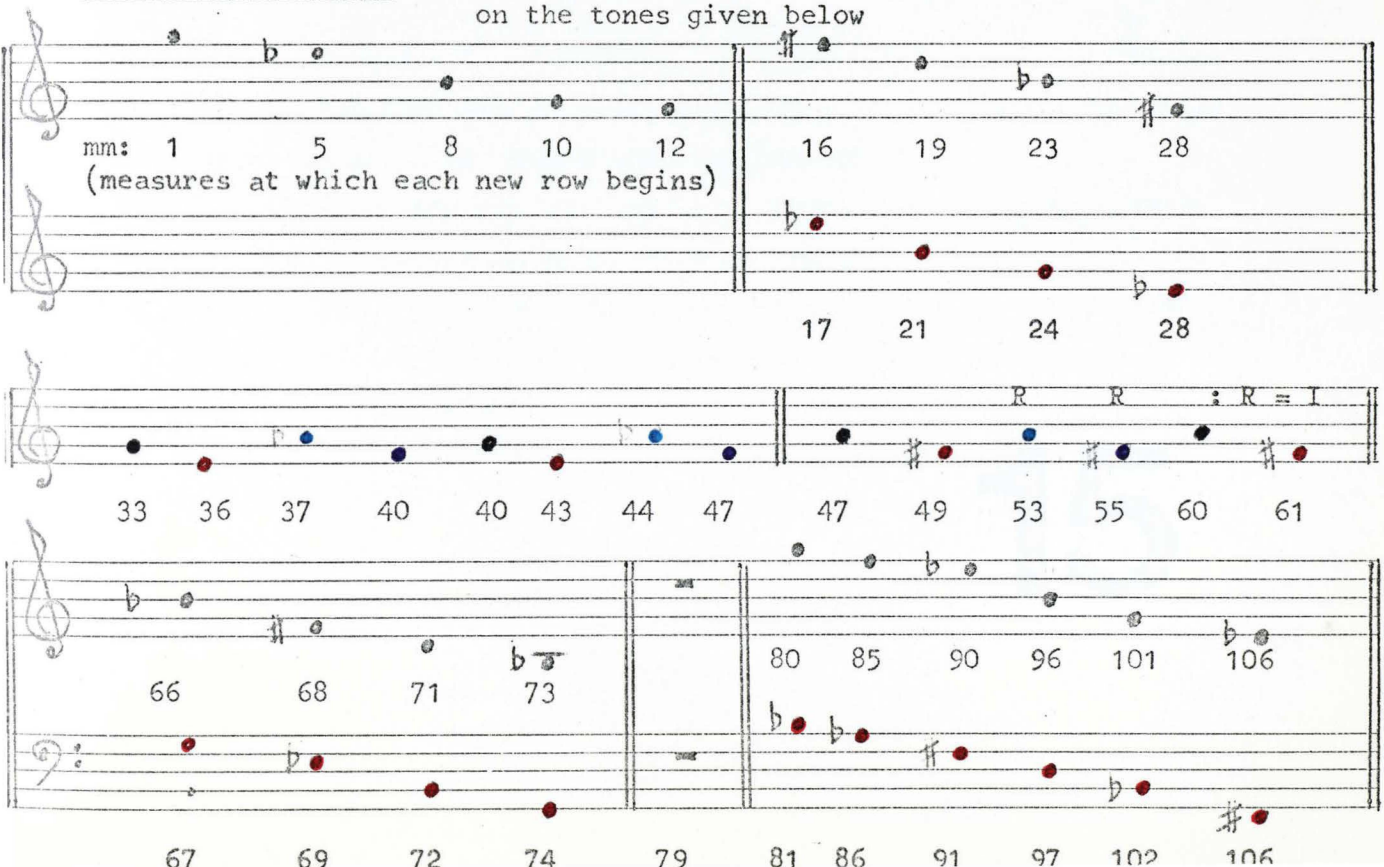

5
molto rit
sehr mässig
pp
p
f
66
69
poco rit.
tempo
più f
70
73
74
6
mässig
75
78
79
80
sfp
82
sf
85
wieder fliessender u noch drängend bis
87
90
92
ff
sff
93
95

R/R Version of String Quartet, Op. 28: 1st Movement



Succession of Rows

The succession of rows is such that each row commences on the tones given below



15

Criticism of

Karlheinz Stockhausen: Structure and Experiential Time

Peter Stadlen states: "Structure and experiential time..... belongs to that formidable brand of post-Webernite criticism that regards Webern's dodecaphonic schemes as the visible parts of the iceberg and seeks to prove the existence of further, meta-serial patterns in his music - counting, as it were, the 'ands' and the 'buts' in Holy Scripture." * 1

Our approach is contrary to that of Mr Stadlen. We are going to analyse the facts and the given data to see whether Mr Stockhausen's hypothesis is valid or not. It is only by a critical approach that we gain new knowledge and visions.

On p. 64, 2nd paragraph, Stockhausen states: "By experiential time we mean the following: when we hear a piece of music, processes of alteration follow each other at varying speeds..."

Now we can state the words: "processes of alteration follow each other", thus:

A_1 , A_2 , A_3 ..... A_n , where the symbol A denotes an alteration.

To the above we now add the words:"at varying speeds", which we state diagrammatically as follows:

A_1 A_2 A_3.... A_4

Here we see that the successions of alterations have a lesser or larger interval of time interposed between them.

i) If this interval of time is silence, then it is an alteration as silence is an alteration of sound.

ii) If the author meant that the duration of A_1 , for instance, is greater than A_2, etc., then he has not phrased his definition precisely.

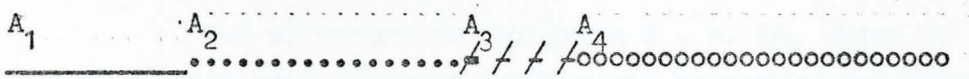
iii) If neither of these interpretations is what the author meant, then it can be asserted that "varying speed" is itself an alteration.

* 1: Peter Stadlen: Webern Symposium, p.66, published in The Score, No. 25, June, 1959.

Thus, in the diagram, the white spaces between the coloured lines are themselves alterations.

Hence alterations can succeed each other, but not at varying speeds, since any varying speed is already one or some of the elements of the set $\{A_1, A_2, A_3 \ldots\ldots\ldots A_n\}$

In the same paragraph the author states:
"We experience the passage of time in the intervals between alterations."
Since by the above diagram we noted that there are no empty spaces between the alterations, we can state the above words diagrammatically thus:



This illustrates that there are no "intervals between alterations", unless the author meant i) that after the impact of the alteration has passed, the rest of it is merely repetition or just duration. However, Stockhausen himself says that "the repetition of an event is an alteration". He even goes further than this: "Even within a single process we experience alterations; it begins, it ends." Whatever the duration is of each of the alterations, the fact is that A_1 or A_n represents a single alteration. A repetition represents another.

Perhaps the words "intervals between alterations" means: from the beginning of one alteration to the next alteration, or from one interval of entry of an alteration to the next interval of entry of an alteration.

Thus in the two cases examined above, we note that the author is not as careful as is desirable in precision of definition or description. This leads to ambiguity and diverse interpretations.

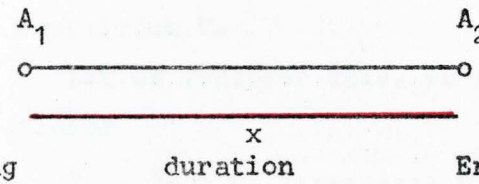
The author continues the above sentence: "We experience the passage of time..... " with the words:"when nothing alters at all, we lose our orientation in time."
Let us examine this statement diagrammatically.



Illustration of no alteration.

This is perfectly valid, yet in paragraph 3, p. 65, the author says: "If we realise, at the end of a piece of music ..... that we have 'lost all sense of time', then we have in fact been experiencing time most strongly."

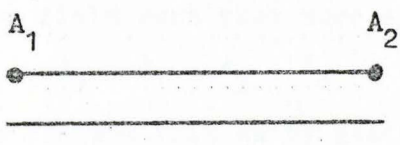
Let us return to paragraph 2 , p. 64, where Mr Stockhausen states: "The interval between the beginning and end we call duration ". We state this illustratively as follows:



Open Interval

In mathematics the above interval is termed an open interval. The points, A_1 and A_2 are excluded. ✱ 1 Frank Ayres defines an open interval: "Let a and b be two numbers such that $a < b$. The set of all numbers x between a and b is called the open interval from a to b and is written $a < x < b$. The points a and b are called the endpoints of the interval. An open interval does not contain its endpoints."

Thus Mr Stockhausen's definition should read:
The closed interval from the beginning to the end is termed duration.



Closed Interval

Similarly the words:"The interval between beginnings of

✱ 1: Frank Ayres: Theory and Problems of Caculus, 2nd Ed. McGraw-Hill 1972.

two successive processes we call the interval of entry", is invalid. A proper definition of an interval of entry could be framed thus: From and including the beginning of one process to the next exclusive beginning of a process is termed the interval of entry. We define such an interval of entry diagrammatically as follows:

 Interval of entry

According to Mr Stockhausen's definition we have the following diagram:

 which is erroneous.

Summary of Stockhausen's Hypothesis

Most of what the author describes can be summarised in the following sentence from paragraph 3, p. 64: "A constant succession of contrasts becomes just as 'boring' as constant repetition ".

Let us consider this. We have a constant succession of alterations:

$A_1 , A_2 , A_3 \ldots\ldots\ldots A_n$ such that any $A_i \neq A_j$

We have a constant succession of repetitions:

$A_1 , A_1 , A_1 \ldots\ldots\ldots A_{1_n}$ such that any $A_i = A_j$.

Hence, according to Stockhausen, if we have the constant conditions that $A_i \neq A_j$ or $A_i = A_j$, then the result is boredom. Now the author has stated in the first sentence of the same paragraph: "The more repetitions there are, the'slower' time passes." Thus he equates the words: "the slower time passes" with the condition of boredom. Consequently the words: "the 'quicker' time passes" must mean: interest, and therefore we will have a variable alteration field such that some $A_i = A_j$ and some $A_i \neq A_j$, thus: $A_1 , A_2 , A_3 , A_1 , A_3 , A_4 \ldots\ldots\ldots$ etc.

We can sum this up by stating that regularity of any kind(repetition or alteration) induces boredom and regularity with a balanced proportion of irregularity promotes interest.

Criticism of Structure and experiential time

Thus we come to the same conclusion, thus far, as Peter Stadlen where he says: ".... the term 'experiential time', ... does not seem to denote more than the degree to which a composition continues to hold our attention ".* 1

Surprise

In paragraph 3, p. 64, Stockhausen says: "The more surprising events take place, the 'quicker' time passes", does not seem to be valid under all conditions. The reason is as follows:

Since the term "surprise"is defined in paragraph 3, p.64, "there is surprise only when something unexpected occurs", then , by supposition, a most surprising event in Webern would be a completely tonal phrase. Now,if such a phrase should occur in Webern, would this mean that time passes quickly? Would not such a phrase be so surprising that it would ruin experiential time completely? Hence we can have surprise if it is contextual with reference to the idiom. A surprise exterior to the idiomatic field can simply play havoc with the intentions of the composer.

However, Stockhausen states in paragraph 1, p.65: "experiential time can pass very quickly in a slow tempo or a slow succession of processes if there is a high degree of alteration." This statement is invalid by the above, but it is also invalid by Stockhausen's own statement: "A constant succession of contrasts becomes just as 'boring' as constant repetition ". Note that a high degree of alteration is equivalent,or practically so,to constant alteration.

Conclusions

In the above, then, we have amply shown that there are inaccuracies in precision of description with the consequence of ambiguity. Added to this there are also contradictions. Even the important term "alteration" is left undefined.

Stockhausen's hypothesis "experiential time" is wholly subjective and is dependent on a knowledge of music and the appreciation of an idiom. Thus if this is absent, time is liable to pass very slowly indeed!

* 1: Peter Stadlen: Webern Symposium,p. 67, 3rd par. The Score, No.25, June, 1959.

Criticism of Structure and experiential time

It should be evident that any one not acquainted with Webern's idiom may find his music, nothwithstanding its quality, to be a very slow passage of temporal processes.
The only meaning which can be given to Stockhausen's concept is that a composition should contain a balanced diversity in unity. Thus any irregularity in a pattern draws attention to itself.



This concept of irregularity has already been dealt with in detail in the analysis of the Variations, op. 27 (cf. p.154)

Thus we dismiss Stockhausen's experiential theory in part, because it is subjective and therefore constantly variable. From it, however, we extract the idea of regularity and irregularity as stated herein.

Note-values

After the author has stated his hypothesis there is an application of this "experiential time" to 18mm of the 2nd movement of the String Quartet, Op. 28. This application is actually a descriptive analysis and an account of how the listener's interest waxes and wanes, which being subjective and therefore variable it is pointless to discuss.

In paragraph 6, p. 65, the author states: "we have a succession of thirty-five equal time intervals." He points out that this is a surprise because in the first movement we had varied note-values. This of course is true of the whole first movement, but it is also true of the whole second movement! (cf. mm. 19-36) What the author, however, failed to reveal is that the section, mm. 96-112, preceding the second movement has the set of note-values :

Note-values = { o. , o|. , o| }, whereas mm. 1-18 of the second movement has the set of note-values:

Note-values = { ♩ }

Criticism of Structure and experiential time

Note-values

Thus we see that the crotchet values have been excluded from the section prior to the commencement of the second movement. We have previously shown that Webern and, indeed, all composers withhold certain tones whenever such tones are to become prominent in the next section. (cf. Analysis of Variations Op. 27: Withholding of notes, p. 50) Herein we thus see that Webern also applies this principle to other parameters such as note-values. We have the same principle in operation with reference to Pizzicato and legato.

Simultaneities

The author says: "Of 31 simultaneities (not counting the repeat)..... 23 are of three notes, 6 of four notes..." yet in the same paragraph (at the top of p. 68) he states that there are 7 four-note chords. His words are: "Starting at the double bar we hear the time intervals 9 - 5 - 5 - 3 - 1 - 3 - 5 crotchets" (i.e the distances from one tetrachord to the next.

Thus:	9	5	5	3	1	3	5	Distances from one tetrachord to the next
	1	2	3	4	5	6	7	Number of tetrachords.

Thus we see that in the same paragraph at one time only mm.1-16 are considered and at the very next moment mm. 1-18. No reason is given why such a procedure is followed. This kind of approach makes it very difficult to grasp the meaning of the article.

Another criticism is: "Of the 31 simultaneities...." (A list is then made of these simultaneities)..... "at the beginning stand a single note..". Thus the single note is included as a simultaneity. Should this not have read:Of the 30 simultaneities?

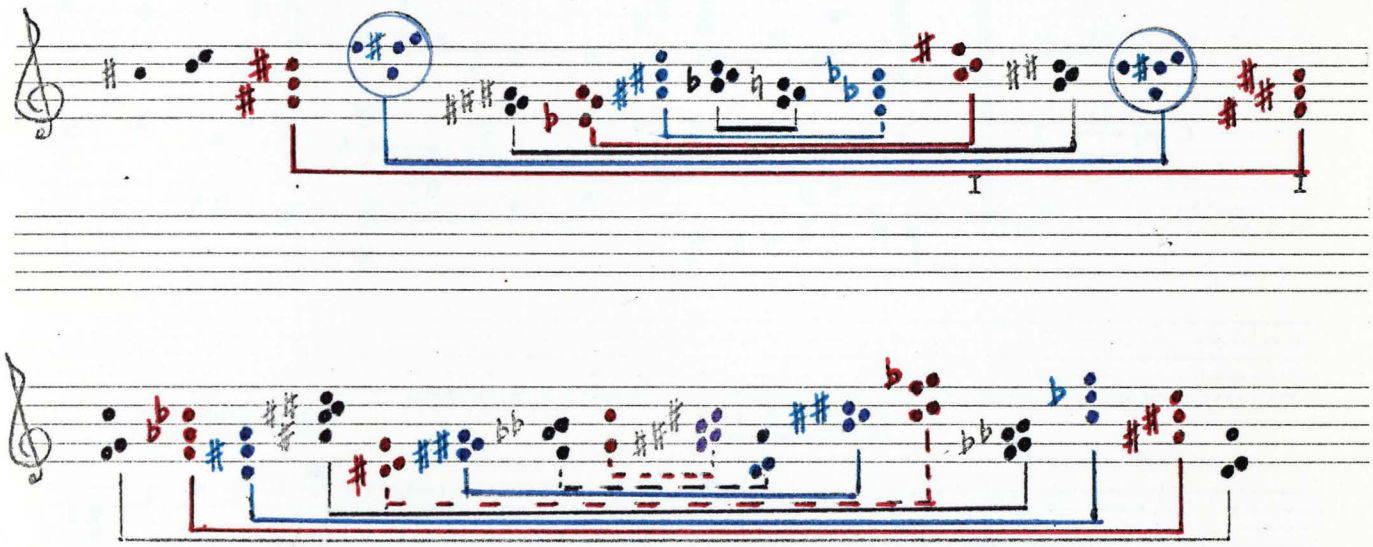
The actual data is: there are 33 simultaneities of which 24 are triads, 7 tetrachords, 2 dyads, but such that these simultaneities are introduced by a non-simultaneity and terminated by another non-simultaneity. (This is of course with ref. to mm.1-18)

Similar to the numbers given above (paragraph 2), the author considers the "density of the alterations from pizzicato", and states: "The time-gap in crotchets is 3-2-2-1-1-1-1-1-2 ", but fails to mention how these figures are arrived at. (paragraph 5, p.68) Whenever an author does this he is merely clouding information towards acceptance and understanding.

Criticism of Structure and experiential time

Vertical Symmetries

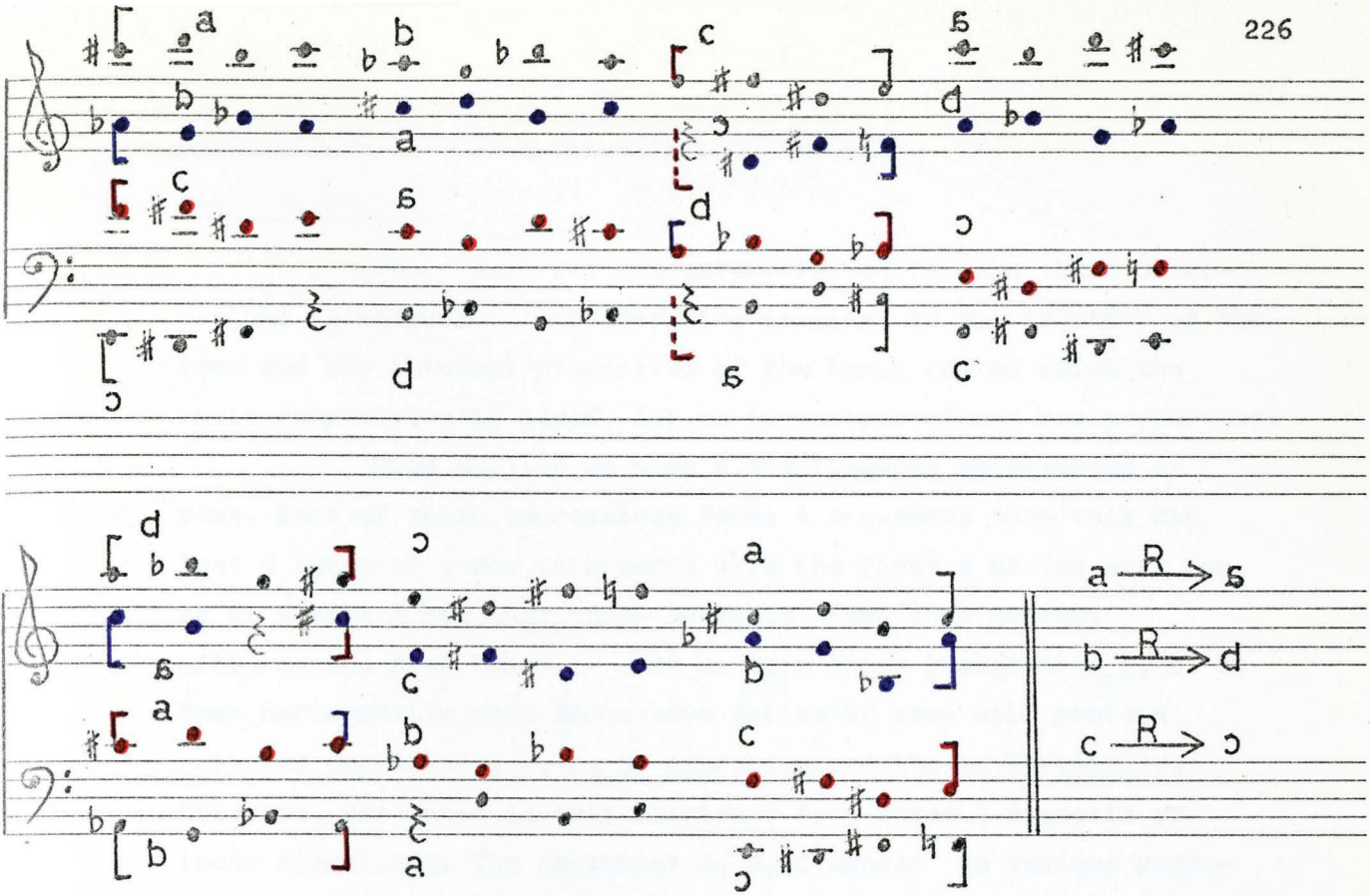
On p. 69, paragraphs 2-5, Mr Stockhausen gives significant information: he shows the symmetric grouping (according to intervallic structure) of the succession of verticalities and he is most precise in his description. This is pure analysis with no reference to the subjective "experiential time". ✱ 1
To be able to see the vertical structure to better advantage, it is necessary to state the verticalities in the prime form thus:



Symmetric series 1 has identically constructed verticalities, except the 2 verticalities (coloured in red) which are inversional. Symmetric series 2 has identical, inversional and anti-symmetric relationship with its symmetric complement. Hence we cannot class this as a symmetric series of verticalities because it contains more than one anti-symmetric element. Stockhausen is therefore wrong in classing this as a symmetric series. Compare these verticalities in the prime form with those as stated by Stockhausen on p. 67, which is as it appears in the score.

The author makes much of these two symmetries and is constantly referring to them, therefore one has the expectation that the author would attempt an explanation of why these symmetries exist and how they have been brought about.

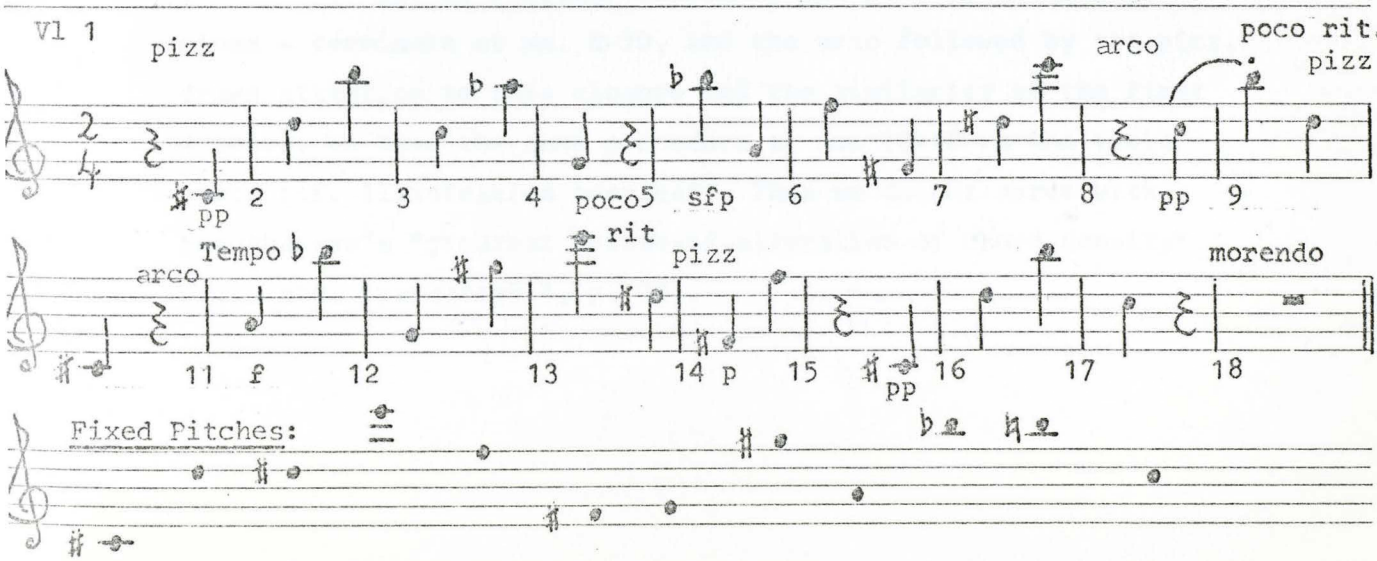
✱ 1: On p. 244 in his book, Schoenberg and his school, Leibowitz had already noticed these symmetries and illustrates them, thus we regret that Stockhausen fails to mention his source. (cf. ch.XI: The last works of Webern: B. The string quartet, Op. 28, p.244)



2nd Movement

1st Movement

Starting notes of each successive Row
Such notes form augmented triads/chords



Criticism of Structure and experiential time

Sequence of Rows

The reason why the author failed to make these observations is because no consideration is given to the sequence of the rows and the internal properties of the basic row on which the whole composition is based. Let us investigate these row properties.

From mm.1-18 we have 4 simultaneous successions of rows. Each of these successions forms 4 sequences such that the last 4 tones of a row intersects with the first 4 of the next row. If we divide a row into three segments then each segment will contain four tones. Let us term these 3 segments: a, b, c. Then,horizontally,each successive series of rows will contain only the segments a, b, c, or operations of these. Vertically, likewise, the music is only fashioned from these 3 segments or their operations. The segments: a, b, c appear in various permutations. (cf. Illustration of row-construction and successions overleaf).

Now Stockhausen wants to force dynamics to coincide with his symmetries. He states in paragraph 6, p. 69: "The group-relationships within the symmetries are made clear through dynamics"..... and what follows in this paragraph is not convincing. There is a partial correlation between dynamics and the vertical symmetries and that is all. His preconceived idea of "experiential time"hinders him to perceive the true aspect of the tempo indications and the dynamics. It is quite clear that these are form-defining sets such that we have the same dynamics and tempo for the same melodic segments.

Let us consider violin 1. The poco rit. tends to close - terminate at mm. 8-10, and the arco followed by the pizz. draws attention to this closure and the similarity to the first 4 tones. We have the same procedure at mm. 17-18 in the viola part. (cf. Illustration overleaf). Thus we do not agree with Stockhausen's "greatest degree-of-alteration of chord density" ..... etc. (paragraph 1, p. 70).

Criticism of Structure and experiential time

The legato and arco and pizzicato go hand-in -hand with directional variants, but as Stockhausen nowhere considers melodic motives, he does not observe this property.
Since the structure of the melodic lines is ignored, one feels that the author thereby misses seeing the multi-dimensional aspects of this work.

On p. 71 a graphical illustration is given. The main criticism here is that no scale of reference for frequency or pitch is given. Further, only the outer parts are illustrated. Thus we have an incomplete graphical picture.

Fixed Pitches

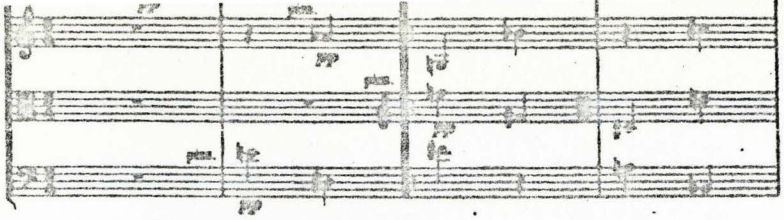
In paragraph 4, p. 72 the author states: "the fixing of each note in a constant octave-register..... is one of the most notable means of moulding experiential time, but there is in our example only a slight trace of it, as in this case it would not accord with the harmonic intentions."
It is strange that Mr Stockhausen could actually contradict the evidence as revealed in the score where in the violin part, every pitch is fixed at a particular register. (cf. Illustration overleaf). The other instruments, violin 2, viola , cello, have slight changes, but most of the notes are of fixed pitch. These fixed pitches are characteristic of this work. On p. 95 of Eimert's article: Interval Proportions, published in the same issue as Stockhausen's, an example is given of fixed pitches occurring in the first 15 mm of the String Quartet.

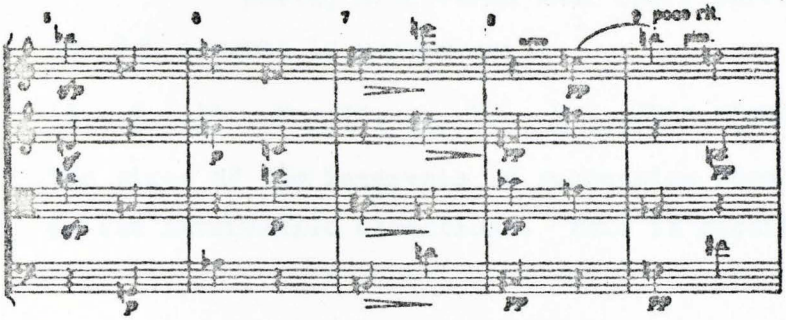
Horizontal Interval-groups

The fifth example occurs on p. 73, but there is no indication of what 13-9-11- etc. means. After pondering this a-while we came to the conclusion that these figures denote the intervallic sizes. This is derived as follows:

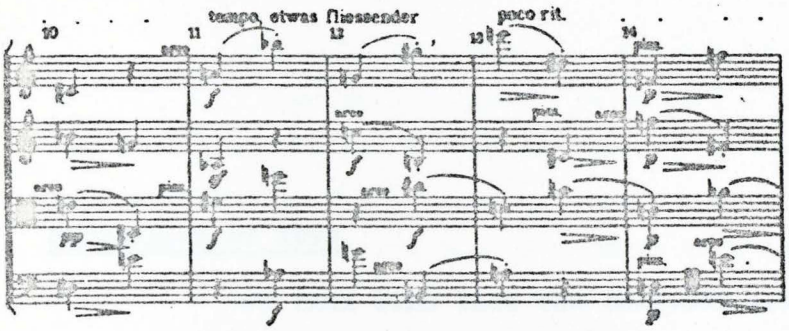
D	Eb	E	F	Gb	G	Ab	A	Bb	B
0	1	2	3	4	5	6	7	8	9

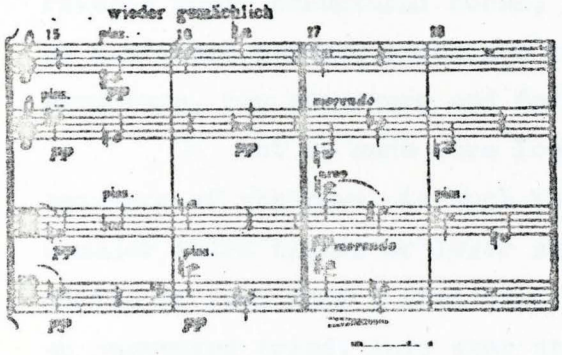
Thus the intervallic size of the interval: B-D is denoted by 9.



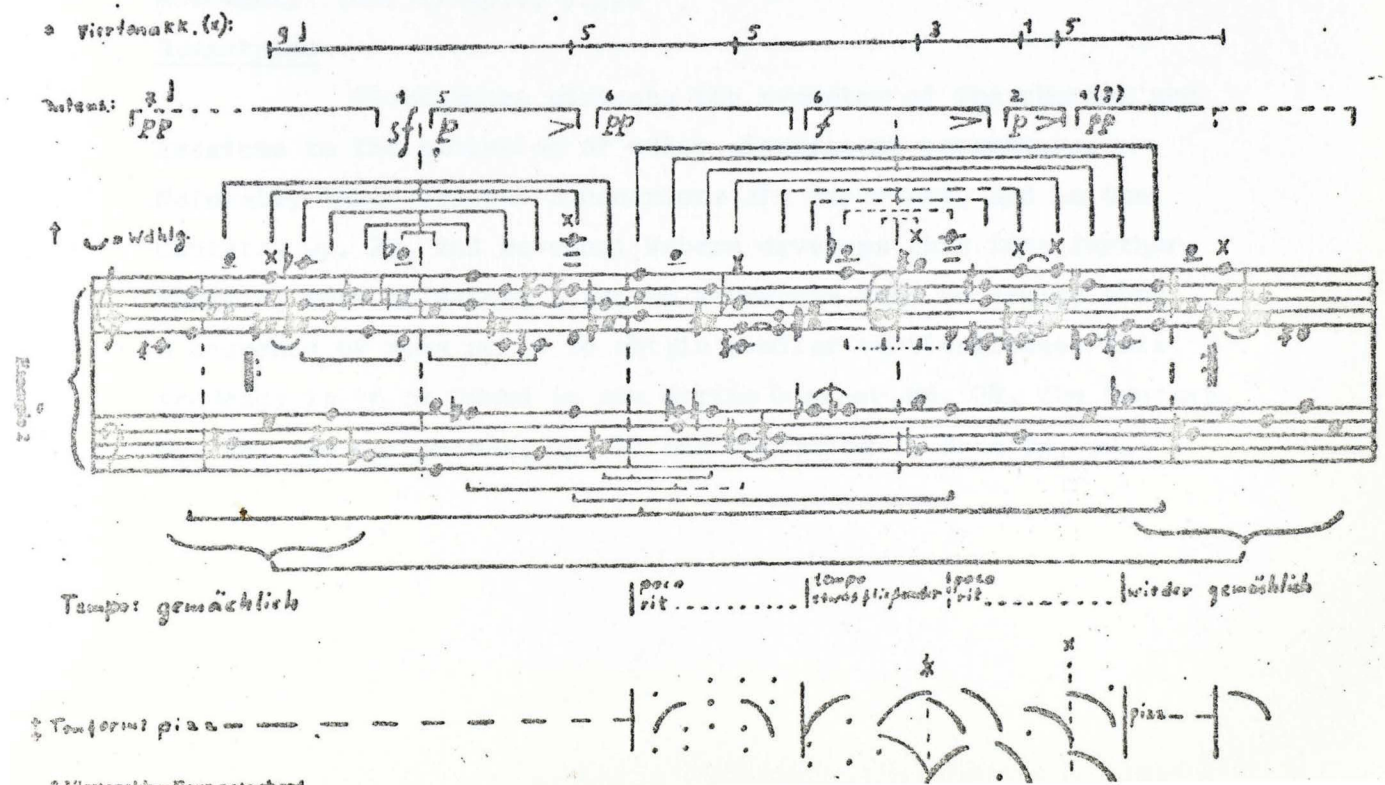


Page 66 of Stockhausen's article





Page 67 of the same article.



Criticism of Structure and experiential time

Horizontal Interval-groups

Having discovered what the figures denote we find that the 8th element is erroneous:

13 - 9 - 11 - 8 - 13 $_{15}$ 13 - 9 . This should be 8.

The sizes of the intervals in succession form 2 symmetries and so do the intervallic directions. This is significant analysis.

Succession of Rows

We thus find that the analysis given by Stockhausen reveals inner structural forms, but that there are parameters, as mentioned before, which are left untouched such as motivic structure, row structure and formal structure.

Let us once more look at the row successions. The sequence of the rows is such that each new or succeeding row is a major third higher or lower such that the entries of a particular series of rows form , when only the first note of a row is considered, an augmented triad. This same structure is in evidence in the first movement. (cf. Example, p.226)

Symmetries

Stockhausen stresses the symmetry of the chordal successions to the exclusion of other significant parameters. Naturally these chordal successions are important, and in the Cantata, Op. 29, 2nd movement, Webern develops this idea further. However, most of Webern's second movements tend to employ such a sequence of rows so as to obtain similar verticalities. This tendency is to be found in the String Quartet, Op. 28, the Cantata, Op. 29, the variations, Op. 27 and Variation II from Op. 30.

Criticism of Structure and experiential time

Symmetries

The various other symmetries, which might have been considered to be "surprising events taking place", are actually reflections of the basic row-form which is symmetric. Even the outer form of the movement, the A-B-A, is derived from this basic row characteristic.

In his later works Webern often let the musical content be an image of a particular row-property.

The main criticism is that Stockhausen has set out to project "experiential time" into a part of the second movement (only 18 measures out of 53) and has therefore chosen those parameters which are allied to his purpose. His attempts to measure "experiential time" are entirely subjective and non-mathematical. For instance: " the expectation of an alteration of note-value continues until the end of the section, so that the experiential time accelerates until roughly the middle and then slows down again: the intensity with which we expect a different time-value grows, then decreases ".
All this is merely more or less, there is nothing definite, there is no objective measurement.

On the whole then we discard the idea of experiential time, but approve of the analysis when this concept has been extracted. Where we do not agree we have referred to it in the appropriate section. One thing, however, we wish to mention and that is that a partial analysis such as this misses much of the spirit contained in the whole work. There are important relations which are left untouched.

16

String Quartet, Op. 28: 2nd Movement

In Mr Stockhausen's article there are important aspects which were omitted but which warrant discussion, for instance,the origination of the symmetries.

Vertical Symmetries

Originally the row itself is the source of the symmetries, since symmetry is a property of the row, but it is more than this. When the 4 rows are stated strictly simultaneously, then by virtue of the properties of a symmetric row 6 different tetrachords are brought into existence. We have the minor second X-sub-set. (cf. Chordal structures and their classification: II , see also Tetrachords in the same chapter, p. 473)

Webern, however, introduces each row successively at an interval of entry of a crotchet. This procedure is strictly maintained from mm. 1-18. Due to this imitational procedure other verticalities come into existence. These new verticalities are structurally symmetric or partially symmetric by virtue of the fact that the 4 simultaneous rows are related by R and I and because the sequence in the successions of the rows is strictly maintained. (cf. Chordal structures and their classification: Strictly maintained reflections in successive rows, p. 472)

For instance,if we term the 4 simultaneous rows as follows: A (in black) according to illustration on p.226

B (in blue)

C (in red)

D (in black) , then C is an R of B and

D is an R of A.

In the first movement of the Piano Variations, Op. 27 this same procedure is applied, namely that the O and R forms are combined to give a symmetric vertical succession.

Part II

Part II contains no new transpositions of the rows: the 4 simultaneous rows occurring herein are derived from the previous section, thus:

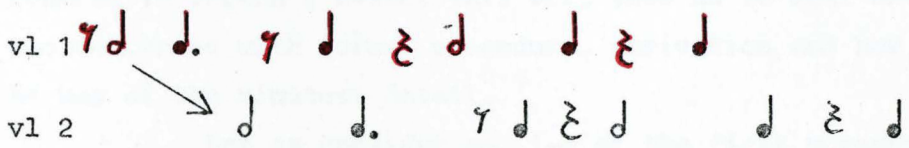
String Quartet Op. 28: 2nd Movement

E (m. 19 in black) is a repetition of D at mm.11-17
F (m.20 In blue) is a repetition of A at mm.11-17
G (m.20 in red) is a repetition of C at mm.12-18
H (m.19 in black) is a retrograde of A at mm.11-17

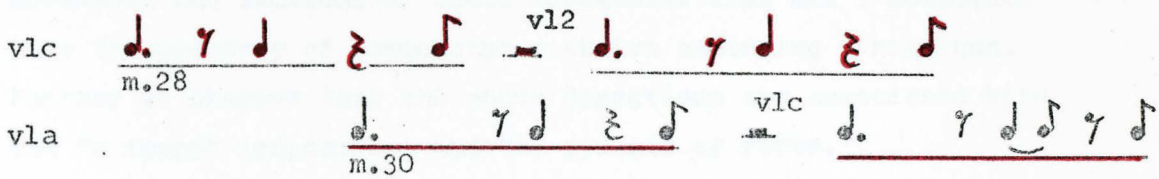
Thus this part is essentially a variant of the last half of the previous section.

Canonical Properties

The canonical properties of the previous part are also reflected onto Part II. This is a canon in two voices with other contrapuntal accompanying matter such that the leading voice (indicated in black) is imaged inversionally and metrically. We state the metrical scheme thus:



This canonical process is reversed from m. 28 such that the leading voice now follows with a different instrumental sub-division. The segments contain 3 tones and form a specific metrical motif derived from the 6-note segment above.



The leading voice of this canon can be described aptly as a chorale-like melody which is stated in 2 phrase-segments such that the first segment contains 6 notes and the second phrase-segment contains 2 motives consisting of 3 notes each. This division is confirmed by the instrumental colour and the metrical motives. We have termed this a chorale-like melody and I think there is justification for this as Webern in a letter to Willi Reich, July 31st, 1942 discussing his "oratorio" (cantata, Op. 31) says: "The "row" in itself constitutes a law,..... the row takes on a quite special importance, on a higher level so to speak, rather like the chorale melodies in Bach's arrangements ". (p. 63)

Anton Webern: The Path to the New Music, published by Theodore Presser Co. in association with Universal Edition. English edition: 1963.

String Quartet, Op. 28: 2nd movement

Canonical Properties

Around this chorale-like melody the other voices move contrapuntally in 3-note figurations much like a Bach chorale prelude. These figurations are imitational but irregularly so, first one leading and then the other

Direction-variants

Since these figurations are 3-note motives, the total number of direction-variants are only $2^{3-1} = 4$, and all 4 of these occur.

The direction-variants in this movement are important and by studying these we can learn what function they employ in general in Webern's music. This will show us to what extent Webern was concerned with formal procedure, derivation, and how conscious he was of the minutest detail.

Let us consider mm. 1-4 of the first movement where the directions: ∧ ∧ and ∨ ∨ were established to be associated with the commencement of sections wherever such commencements may occur. (There are exceptions of course).
In the example given we show the opening tones of the various movements and sections of these movements. Thus all 3 movements have the property of commencing with two ascending directions. Further we observe that the above directions are associated with the "a tempo" indications and the dynamic of forte.

The direction-variants with reference to this second movement fulfil a form-defining function in Part II.
Each new phrase segment commences with the double ascending directions and they are always associated with the f dynamic.

We have the directions	∧ ∧	and	∨ ∨ occurring at:
mm. 19-20	forte	and	a tempo
mm. 23-24	forte	and	a tempo
mm. 27	forte-piano	and	a tempo
mm. 30-31	forte	and	a tempo
mm. 34-35	pp	and	poco rit.

String Quartet, Op. 28: 2nd Movement

Direction-variants

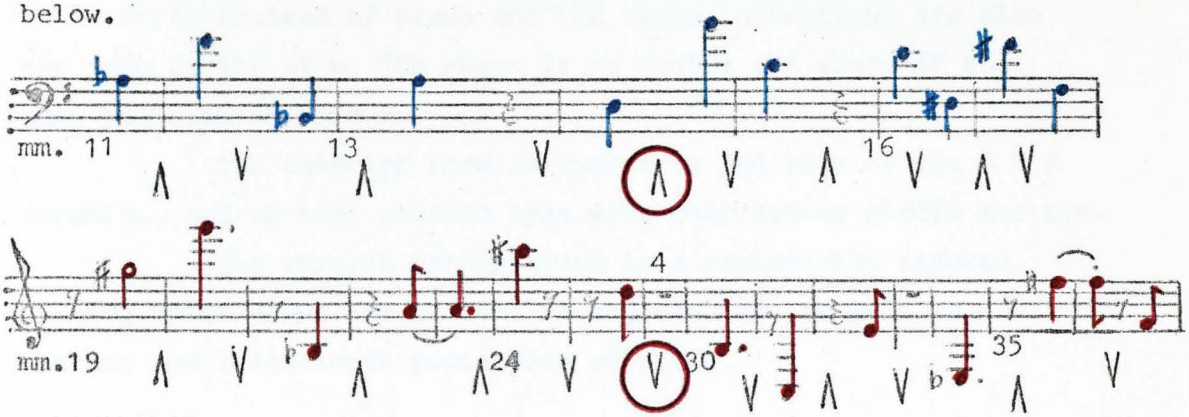
Mm. 34-35 which is typical of Webern, shows us that any irregularity in Webern is significant. Here dynamics and tempo indications draw attention to this final segment.(Cf. Sound and Silence, p. 74)

The endings of the phrase-segments are always stated by the other directions ∧ ∨ and ∨ ∧ at a p dynamic (or something akin to this such as diminuendo) and the tempo indications : poco rit. (or any other temporal lessening). We have observed that in the first movement tempo indications and dynamics are always associated thus:

rit. ⟶ p or rit. ⟶ > p or pp.

The "a tempo" is always associated with a loud dynamic. This basic compositional characteristic is therefore reflected onto the 2nd movement.

Since the structure of the chorale-like melody is such that E is a repetition of D at mm. 11-17, the direction of both E and D is identical except for the exception encircled in red as illustrated below.



Note-values

The set of note-values are { 𝅗𝅥 , 𝅗𝅥. , ♩ , ♪ }

such that the frequency distribution of the quaver is greatest and that of the crotchet value is no longer as prominent as in Part I. Further the crotchet value is common to both parts.

String Quartet, Op. 28: 2nd Movement

Part III

Part III is identical to Part I. It contains the same 4 simultaneous rows but these are now interchanged instrumentally as well as having different intervals of entry. We state these rows and their entries as follows:

Part I		Part III
a	vl 1	b
b	vl 2	c
c	vla	d
d	vlc.	a

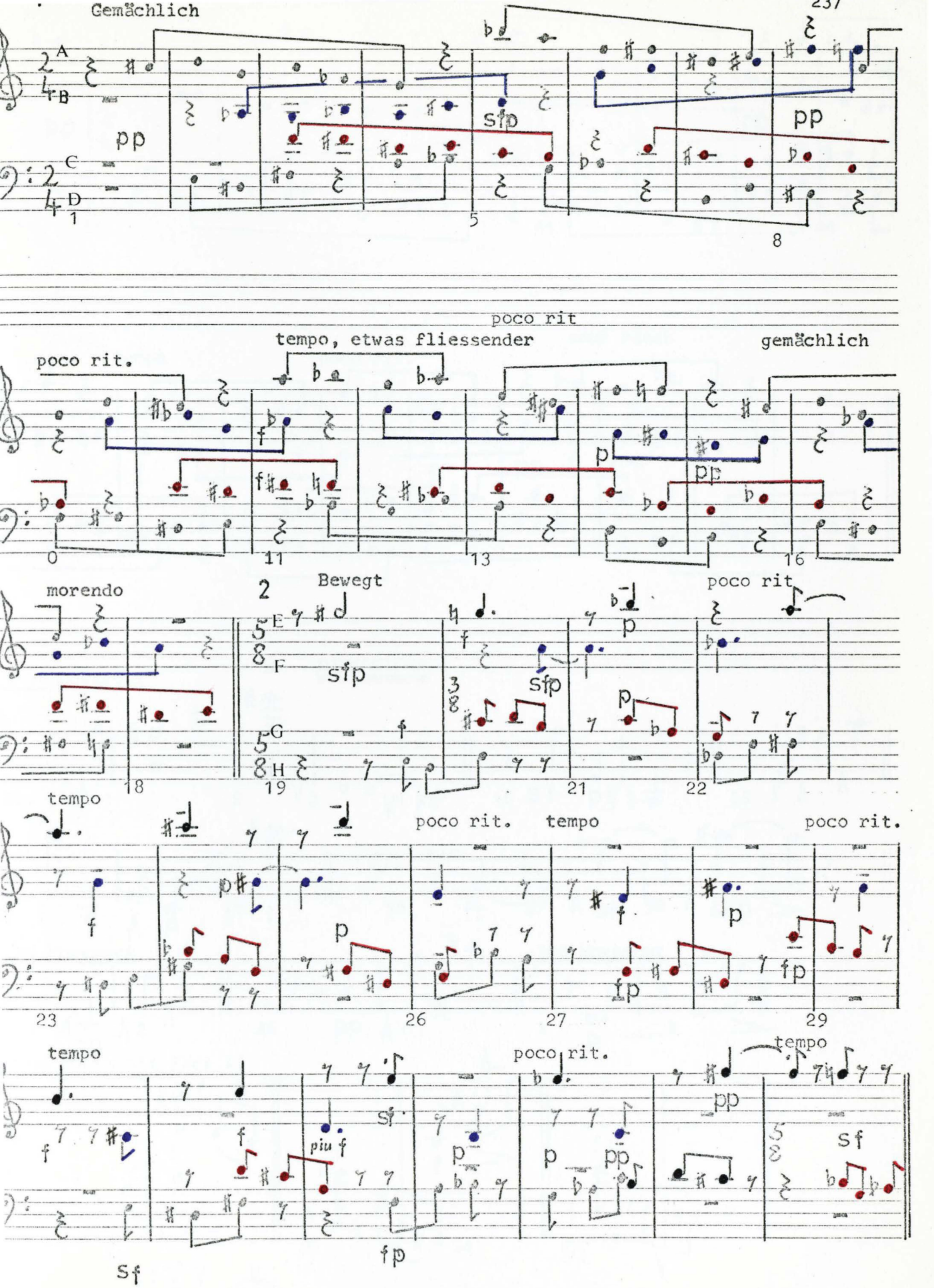
Due to this interchange a new series of verticalities comes into existence.

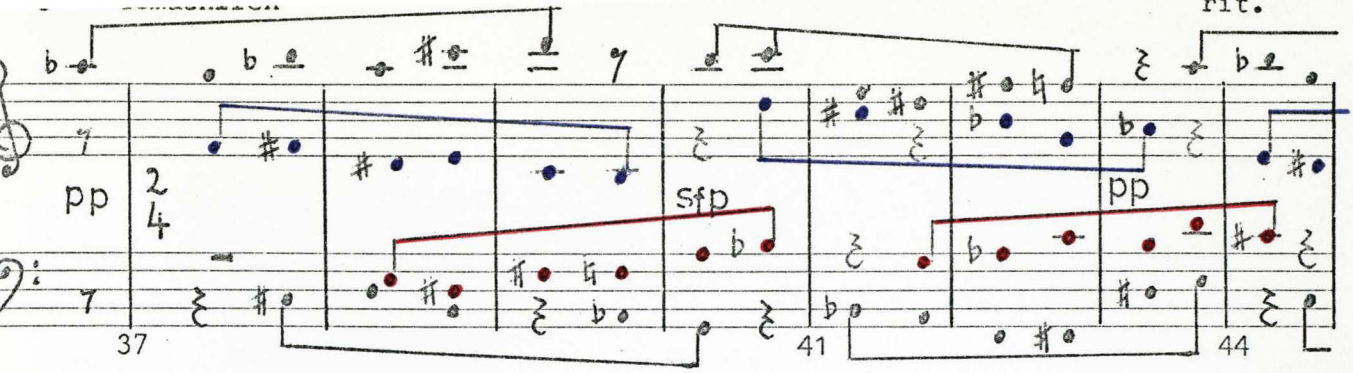
The direction of "a" stated by vl 1 remains identical to the direction of b played by vl 1. (cf. score , U E 12398 ,pp.10 and 12)

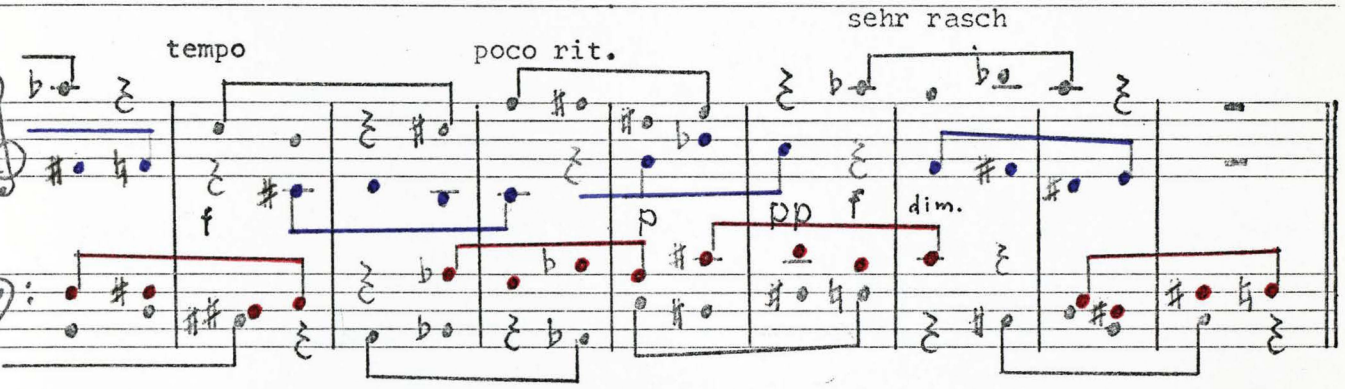
The dynamics are equivalent except at mm. 50 b where it is forte instead of piano and the tempo indications are also the same except at m. 50b where it is double the speed of the same position in Part I.

The exterior form is symmetric and thus of the A B A formula , and of true scherzo type with contrasting middle section.

The version herein given is a registrally reduced version which shows the various rows (coloured) as well as the canonic and imitational procedures adopted.

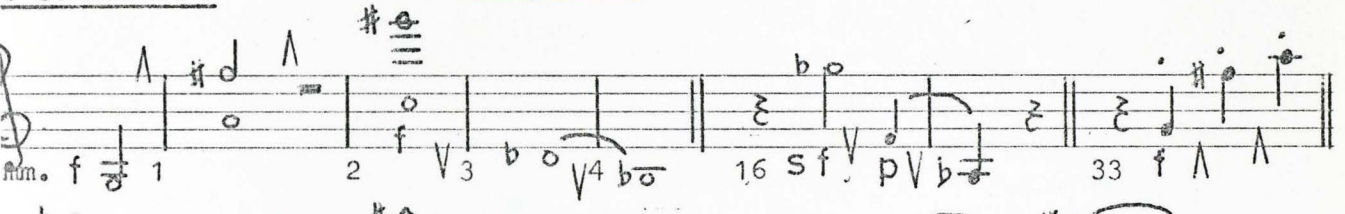

Gemächlich
237
pp
sfp
pp
poco rit
tempo, etwas fliessender
gemächlich
poco rit.
morendo
Bewegt
poco rit
tempo
poco rit.
tempo
poco rit.
tempo
poco rit.
tempo
piu f
sf
fp
sf

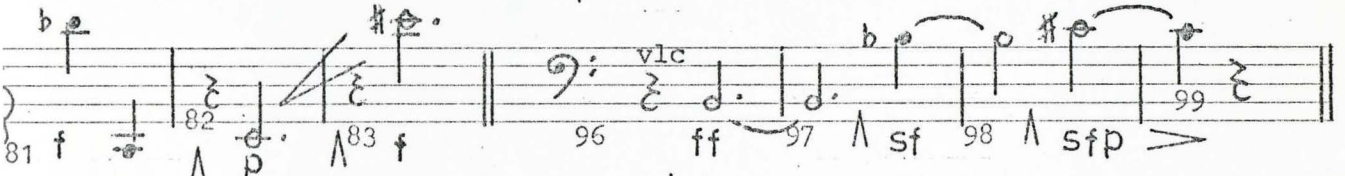




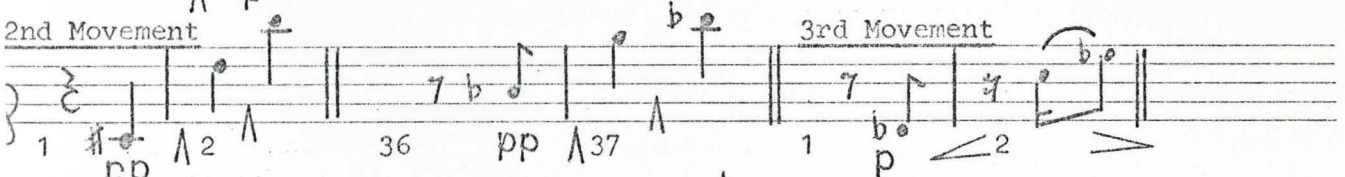
DIRECTIONS

1 st Movement



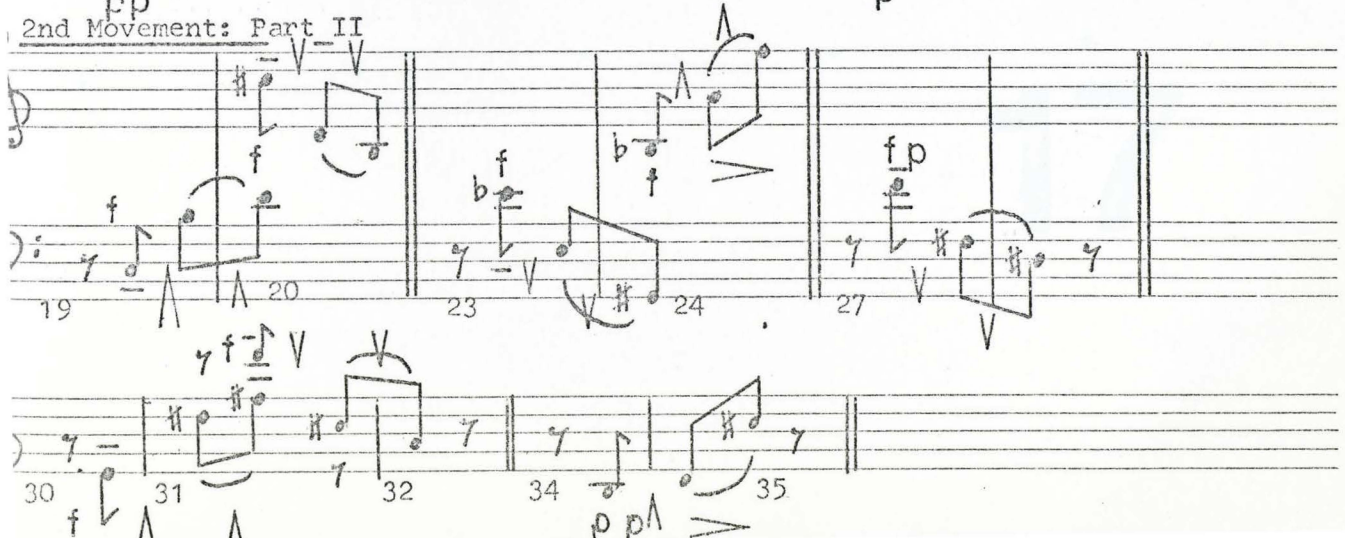


2nd Movement



3rd Movement

2nd Movement: Part II



17

Symphony, Op. 21

priori functions
Symmetry

The Symphony, Op. 21, is the first work in the twelve-tone idiom to be based on a proper symmetric set. (cf. Chordal structures and their classification, I.3.C, p. 461) The significance of this cannot be overstressed, for through the symmetric row a new realm of sound was created and new forms developed into the twelve-tone sphere. The relationship in each successive work between row and compositional parameters became more and more functional in the sense that row properties are imaged onto the composition. In the Symphony we have evidence that such a functional relation exists.

The Row

With reference to Classification of different twelve-tone sets, pp. 271- 277 , we describe this row as symmetric such that the two hexachords are related and expressed: (b , d). When the row is operated upon we have:

O ; Retro

$$(b\ \ d) \xrightarrow{R} (\overset{O}{b}\ \ \overset{Retro}{d}) \quad , \boxed{\text{Hence } O = R_{trans}}$$

$$(b\ \ d) \xrightarrow{I} (\overset{Inv}{p}\ \ \overset{RI}{q})$$

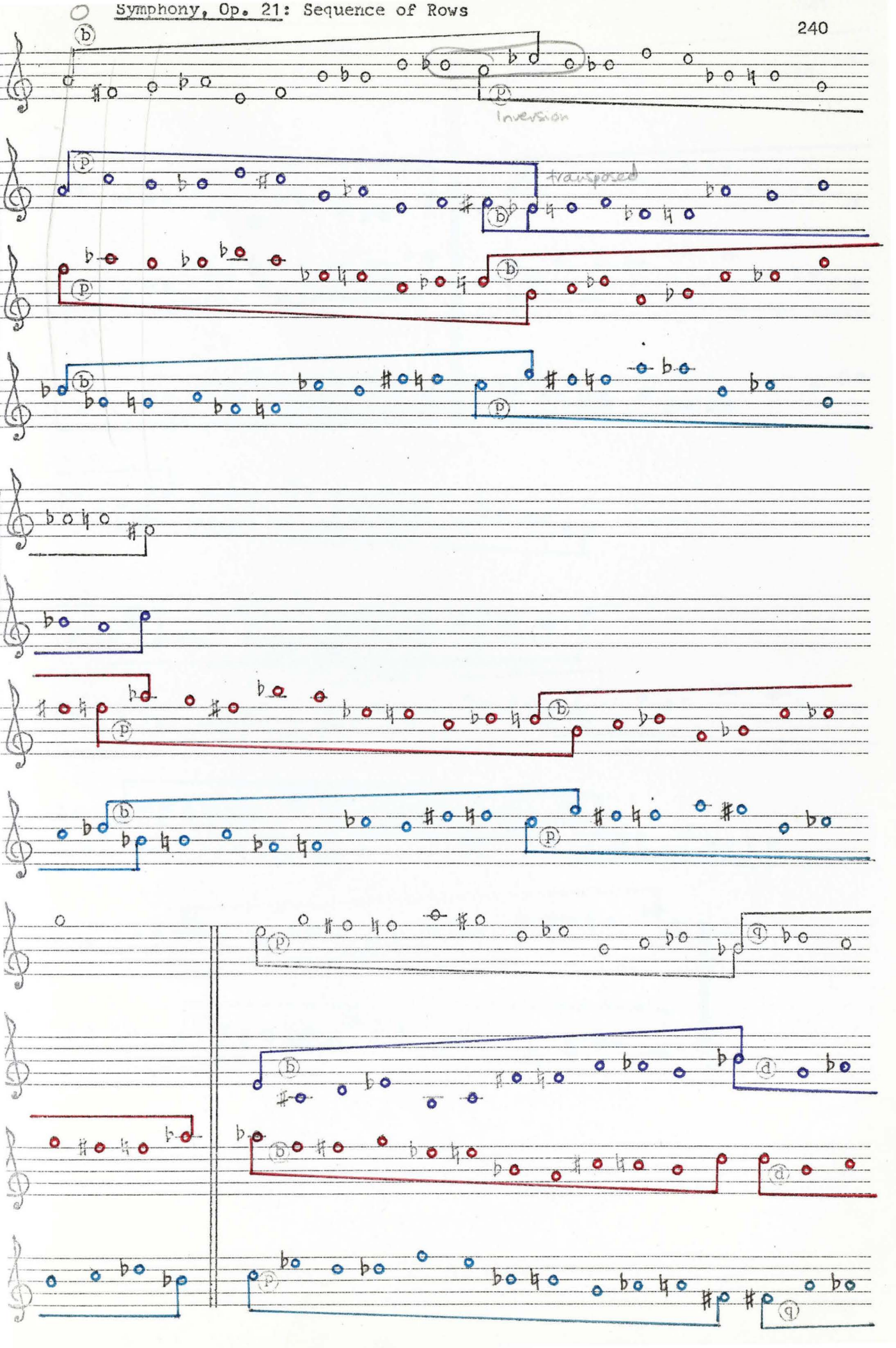
$$(b\ \ d) \xrightarrow{RI} (\underset{Inv}{p}\ \ q) \quad , \text{Hence } I = RI_{trans} \quad \text{* 1}$$

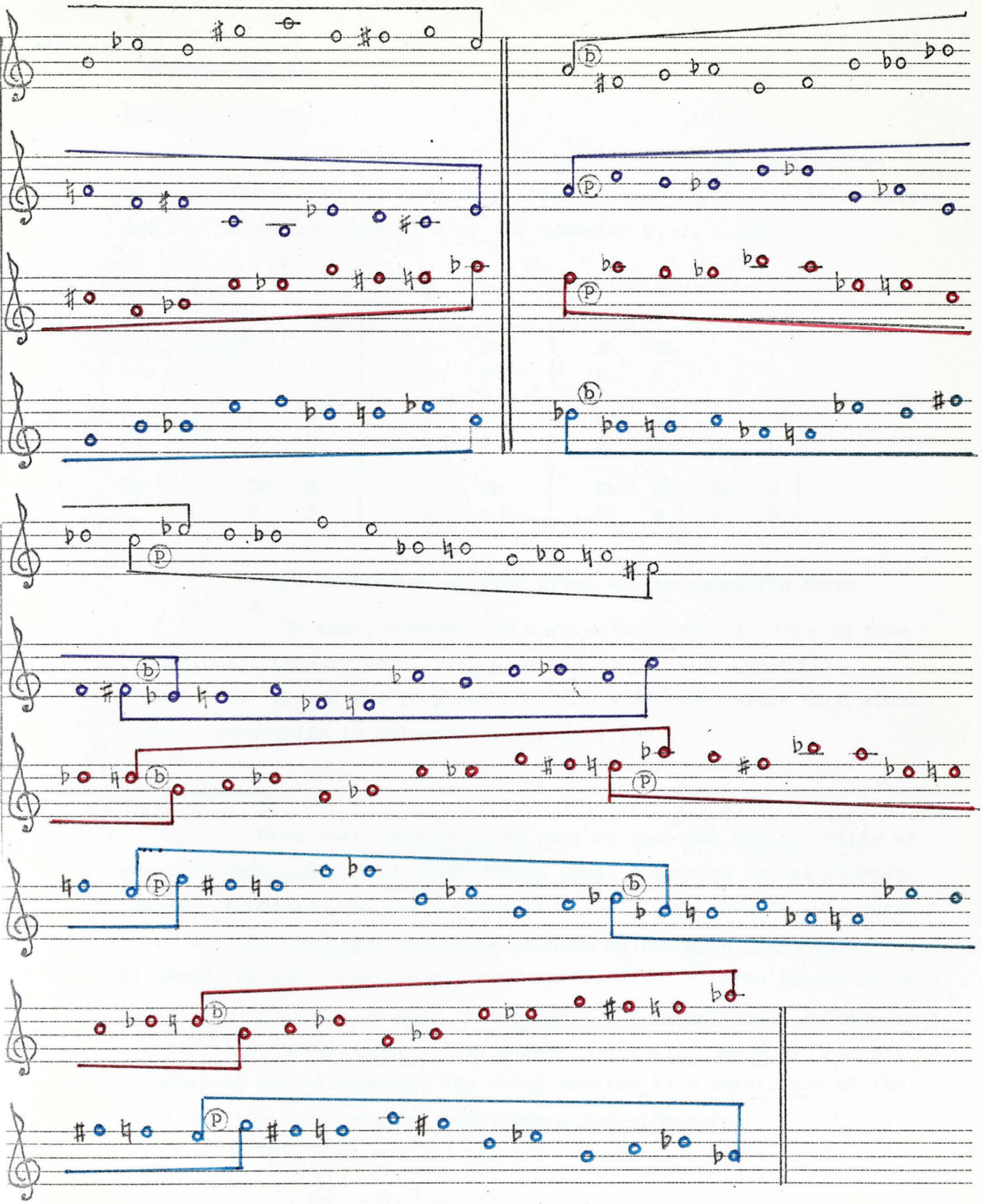
Sequence of Rows

In compositional history the Symphony succeeds the Trio, Op. 20 where rows are accidentally intersectional and where simultaneous rows only occur in certain sections of the 2nd movement.

1. In the Symphony we have fewer transpositions (there is a formidable array of different rows and their transpositions in the Trio) and we
2. have a precise organisation in the use of the 4 simultaneous rows.
3. Further the row-successions have a constant intersection (last 2 tones are first 2 tones of next row) except in the middle section where only the last tone intersects with the next row-tone. (Sometimes the last tone is repeated as the first of the next row).

* 1: The subscript "trans" is an abbreviation of transposition .
i.e. when the R form is transposed it is equivalent to the O form.


Inversion
transposed



Symphony, Op. 21

Sequence of Rows

We can state the succession of the 4 simultaneous rows such that we denote the commencing tone of each row by a capital letter and its particular operation by the symbols: b, d, p and q.

A	C					E	Bb			A	C
b	p					p	q			b	p
A	Gb					E	Bb			A	Gb
p	b					b	d			p	b
F	D	F	D			Ab	D			F	D	F	D
p	b	p	b			b	d			p	b	p	b
Db	E	Db	E			C	Gb			Db	E	Db	E
b	p	b	p			p	q			b	p	b	p

This succession of rows gives us the symmetric form:
A B A.

We must, however, be wary of interpreting this to mean conventional ternary form. (cf. p. 245 et seq.) (On pages 240-241 we append the complete succession of rows where each simultaneous succession is coloured differently.)

Verticalities

From this succession of rows we see that the principle of vertical derivation from simultaneous rows, discussed in the chapter: Chordal Structures and their classification II, pp. 464-478 is present here, but the canonical procedure adopted in the work hides this. As shown, we have simultaneous rows in the O and I forms belonging to the Unison x-subset and such that O and I are respectively harmonised strictly and equidistantly. The middle section is based on the same principles, but transposed. The final section is a repetition of the first section with ref. to simultaneous row-structure.

This work anticipates the procedures adopted in the later works.

The dyads, formed by grouping the two top row-successions or the two lower ones, are the same dyads as are contained in the 2nd movement of the Piano Variations, Op. 27, albeit in a different order. (cf. Analysis of Op. 27: p. 37)

Symphony, Op. 21

Verticalities

A similar procedure is adopted in the 2nd movement of the String Quartet, Op. 28, where the proper verticalities are hidden by the imitational procedure. (cf. String Quartet, Op. 28: 2nd movement: Vertical Symmetries, p. 232) Similar procedures are adopted in The Cantata, Op. 31, Part VI, and in the 2nd and 3rd parts of Cantata, Op. 29. However, in the First Part of the Cantata, Op. 29, we have the complete expression of vertical derivation from simultaneous rows. (cf. Cantata, Op. 29, p. 480 et seq.)

Pitch-Rows

A "pitch-row" is a tone-row in which each tone has a predetermined and definite fixed pitch. For instance the tone C in a pitch-row of this symphony is always stated an octave above middle C until the event of another pitch-row.

A "tone-row", on the other hand, has predetermined tones, but these tones may be heard at any pitch. Thus the tone C may be stated at any pitch or in any register.

In the Symphony section I is based on one pitch-row. Section III is based on another and different pitch-row, whereas the middle section, as shown in the illustration, utilises a tone-row with a varied register for each tone.

We have noticed that pitch-rows constantly occur in works which are members of the sonata genre and have discussed it fully in the chapter devoted to the String Trio, Op. 20 (cf: p. 177) In the Symphony this property is developed to a basic feature of the movement: it is an integral part of the design.

Direction-Variants

Elsewhere we have mentioned that pitch-rows prohibit some operations of direction-variants. (cf. Trio, Op. 20: Direction-variants, p. 177) In the exposition of the Symphony we find that there are only 4 operations stated in Subject I. ✱ 1 These are:

(∧ ∧ ∧) (∨ ∨ ∨) (∧ ∨ ∧) (∨ ∧ ∨)

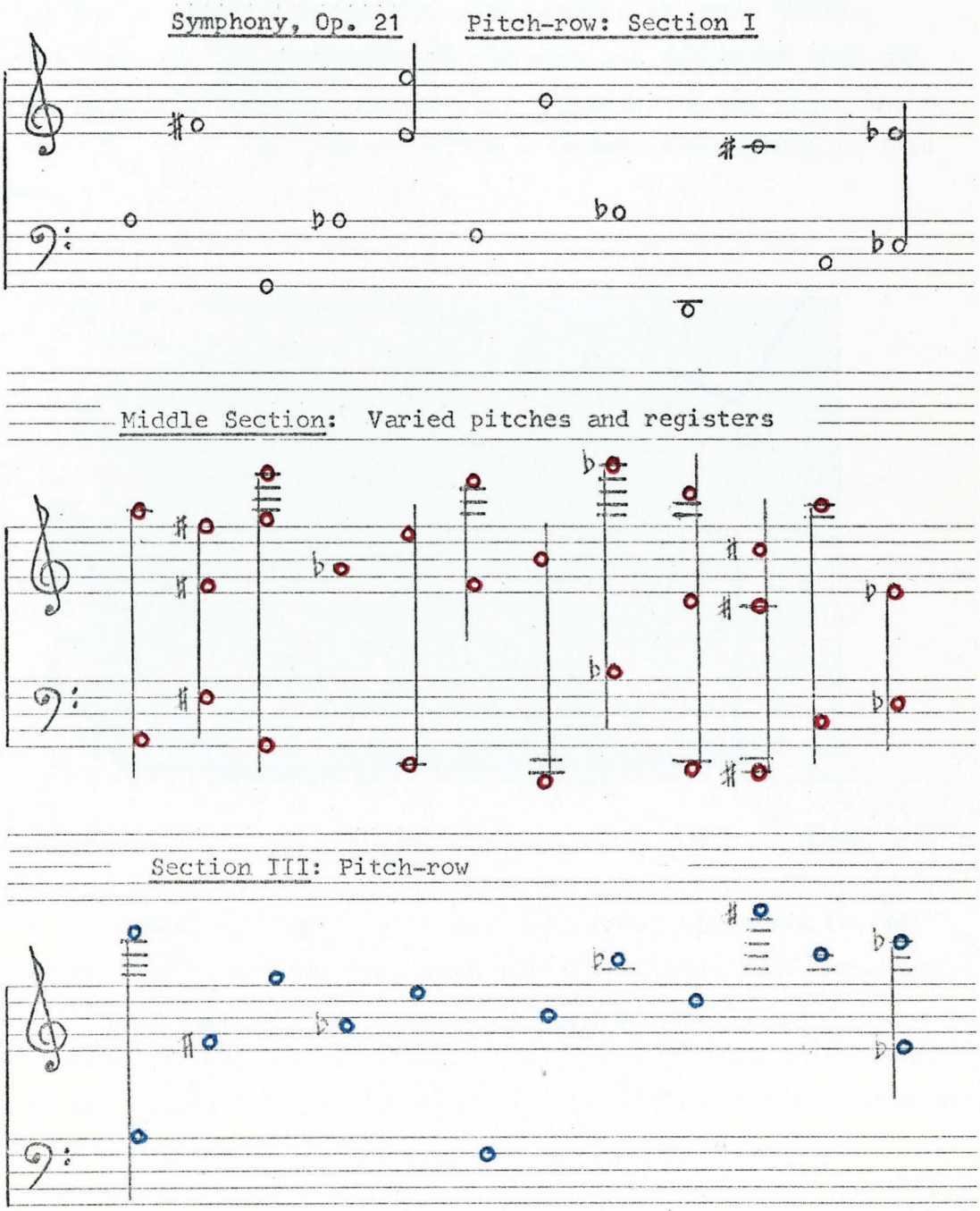
ascending direct betw 2 tones

✱ 1: cf. Is the term, Symphony, true? p. herein.

Symphony, Op. 21

Direction-Variants

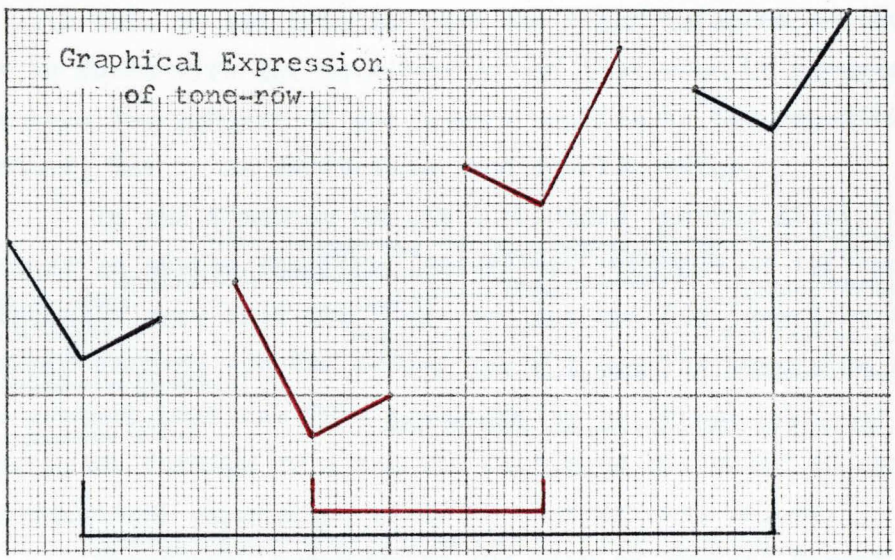
In the recapitulation we have a different pitch-row, and so consequently we also have other operations of the direction-variants. The direction-variants which are missing from the exposition are present here. * 1



Symphony, Op. 21

Is the term, Symphony, true?

In the examination of the succession of rows we found that we ended up with a symmetric form, expressed as A B A. Here we see, by studying the row graphically, that the structure of the row is imaged onto the structure of the music. Hence the row determines the outer form of the music: the form grows out of the row. This is one of the most remarkable achievements of Anton Webern that his rows and the properties of the rows are reflected onto the various musical parameters. We saw this procedure in the Trio, Op. 20 (cf, p. 192), but here we notice a further development in this respect.



A B (Symmetrical Statement) A Form

This, however, is not symphonic form, therefore let us investigate the matter further. Leibowitz states that "the Symphony begins with a double four-part canon in contrary motion ".★ 1 This is true, but Mr Leibowitz makes no attempt to show a relationship to the sonata form. As a matter of fact some authorities seem to shirk away from describing anything as sonata. Eimert asserts: "concepts introduced from outside help little, and are none the better for being taken from the golden treasury of fugue and sonata, in order to arrive comfortably at yet another of those well-loved 'syntheses' of the two." ★ 2

★ 1 Leibowitz: Schoenberg and his School, Ch. X, p.211.

★ 2 Eimert: Interval proportions, p.99, Die Reihe, No. 2.

Symphony, Op. 21

Is the term, Symphony, true?

In the Trio, sonata form is strongly in evidence, but here it has apparently slipped past unnoticed. We argue that it is senseless to call a composition a symphony if it lacks the properties of a symphony. If this is the case the work could have been termed "Orchestral Structures" or perhaps simply "Canons and Variations for Orchestra". However, such an argument is false and completely ignores Webern's evolutionary progress.

Without a proper study of the Trio, Op. 20, we are bound to lack an understanding of Webern's works in the sonata form. In our study of the Trio we saw the problems with which Webern was confronted in its composition, but at the same time in it are to be found the seeds which flowered in the succeeding works. An important innovation with ref. to the Trio is that the recapitulation of the 1st subject is fused with the development and that when it emerges recognizably this 1st subject is not a mere replica of the expositional 1st subject, but is variational and developmental.

In the Symphony Webern introduced another significant innovation: he stated the first and second subjects of the exposition simultaneously such that the first subject and its inversion form one canonic pattern and the second subject and its inversion form another canonic pattern. This simultaneity of formal expression is by no means foreign to a man who developed his music to contain multi-dimensional expression as in the Variations, Op. 30.

Therefore, contrary to the view of Herbert Eimert, we advance the argument, as stated above, that the Symphony is in sonata form. Let us compare Webern's symphonic structure to the conventional sonata form diagrammatically.

Conventional	———	———	00000000	———	———
Sonata Form	Sub.I	Sub. II	Develop-ment	Sub. I	Sub. II
	Tonic	Dom.	Various others	Tonic	Tonic
Webern's	———		(((())))	———	
Symphony:	———		))))((((	———	
	Sub.I and Sub. II simultaneously		Middle	Sub.I and Sub. II simultaneously	
	Pitch-row		others	Pitch-row	
	Particular successions		others	same successions	

Symphony, Op. 21

Is the term, Symphony, true?

By the diagram above, we see that the correspondence between the classical sonata and Webern's Symphony is not so distantly removed as Mr Eimert would like us to think. However, if, as we contend, we have a first and a second subject, then there should be a marked difference between them.

Comparison of Subjects

Instrumentally the subject statements are different. Subject I has longish sustained segments consisting of 4-6 notes which are given by horns, clarinet, cello and viola.
Subject II has short note-values in a detached context where instruments state at the most 3 notes at a time in a klangfarbenmelodie. Silence here has a lyrical quality and integrated into the sound-colour scheme. The instrumental colour contains pizzicato, harmonics and"sordino". These effects are absent from the 1st subject.

Statistics

To establish this difference between the two subjects, we can employ descriptive statistics with reference to the sets of instrumental colour, note-values and silence-values.

Instrumental Colour

Subject I

Instrumental Set =	Cor.,	cl.,	bs cl.,	vlc.,	vla
Frequency	18	8	8	6	6

Notes per instrument = 4, 5, 6.
Attack Natural

Subject II

Instrumental Set =	Hrp,	Vla ,	Vlc ,	Cor,	Vl 1,	Vl 2	
Frequency	21	21	19	8	5	3	✱ 1

Notes per instrument = 1, 2, 3 (such that it is 3 per instrument or 3 per colour of an instrument.

✱ 1: We have counted without the repeat i.e mm. 23b, 24b, 25b, 26.

Symphony, Op. 21

Is the term, Symphony, true?

Statistics: Instrumental Colour

Now let us examine the recapitulation with ref. to the instrumental colour of the subjects.

Subject I

Instrumental Set = Vl 1, vla, cl, vlc
Frequency 21 12 12 5
Notes per instrument = 2 - 6
attack natural and harmonics.

Subject II

Instrumental Set = vl 2, vl 1, vla, hrp, bs cl, cor, cl, vlc
Frequency 23 17 15 8 7 5 5 3

* In both cases we have counted no repeats, i.e. mm. 65b, 66b have been counted.

No of Notes per instrument:

1-4 notes per instrument
From m. 61 vl 1 has 17 successive notes
vla has 11 " "
vl 2 has 9 " " .

Attack natural, "sordino", harmonics

Deductions

The data above supplies us with valuable information. In the exposition we see that each subject has a different colour field. Wind instruments predominate in subject I and strings (including harp) are the overruling elements in subject II. When these subjects are restated in the recapitulation, subject I is greatly varied colouristically: strings now become predominant. In the restatement of Sub.II the colour variation is not so great, but there are changes in the order relation of the instruments. We see that strings still remain the predominant group. Thus there is unity of colour in the recapitulation.

Symphony, Op. 21

Is the term, Symphony, true?

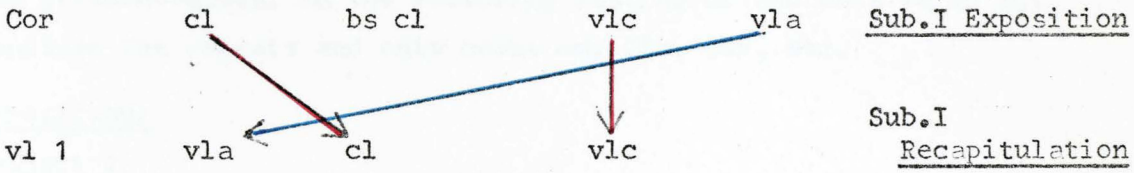
Statistics: Deductions

In the recapitulation Sub.II, from mm 61-66, is heard by itself and this, too, strengthens our argument that we have two subjects such that each subject is stated as a canon in which the imitative part is an inversion .

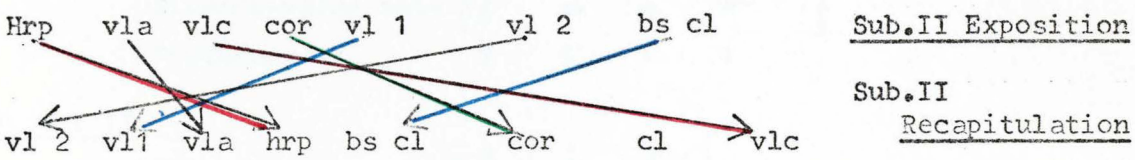
Withholding of Colours

We have noticed this principle in operation in the second movement of the Variations for piano where certain notes, important later on, are withheld in the previous section. (cf. Withholding of notes, p. 55) Also see Criticism of Structure and experiential time: Note-values wherein we see that other parameters are similarly employed. (p. 223)

The same procedure is applied here with ref. to the statements of the 1st subject in the exposition and the recapitulation where the order relations of colours which were important tend to become less important, and those which were least important or totally absent assume predominance.



In the two statements of the 2nd subject, mm.2- 26 and mm. 43-66, we have:



Statistics comes into its own in the uncovering of such subtle procedures and used this way such statistical data is valuable. (cf. Criticism of Herbert Eimert: Interval Proportions, pp.194-198).

Symphony, Op. 21

Is the term, Symphony, true?

Withholding of Colours

The above principle of "withholding of elements" can be illustrated diagrammatically (where we assume the figures to be stated in an order relation).

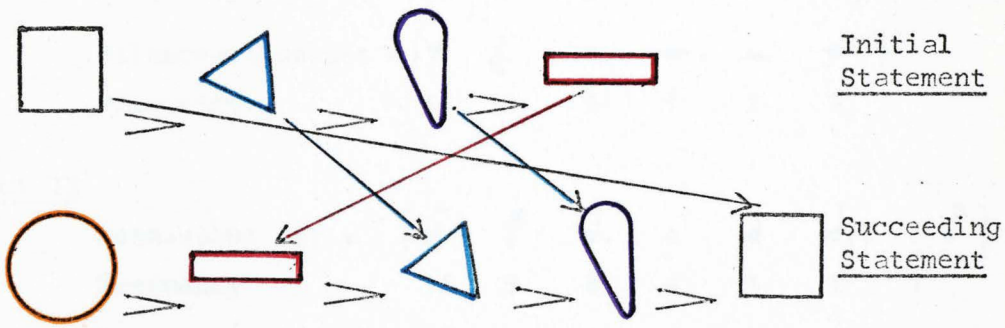


Illustration of the "withholding of Elements" wherein the elements may be any musical parameter such as note-values, pitches, colours, etc.

Statistics: Note-values and silence-values

Let us now investigate the expositional subjects and their restatements in the recapitulation with ref. to note-values and silence-values. In the following listing of the data we do not consider the repeats and only count mm. 23b, 24b, etc.

Exposition:

Subject I

Note-value set =	𝅗𝅥	♩	𝅝	♩.	𝅝.
Frequency	8	7	4	3	1
Silence-value set=	𝄽	𝄽.	𝄽.	𝄻	
Frequency	9	4	1	1	

Subject II

Note-value set=	𝅗𝅥	♩	𝅘𝅥𝅯
Frequency	31	5	4
Silence-value set =	𝄽	𝄽.	𝄻
Frequency	18	5	3	3

Thus Sub.II has a different rhythmical and metrical context wherein silence and shorter note-values predominate.

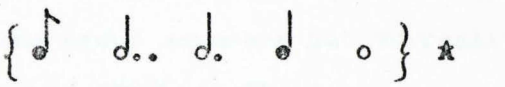
Symphony, Op. 21

Is the term, Symphony, true?

Statistics: Note-values and silence-values

Recapitulation

Subject I

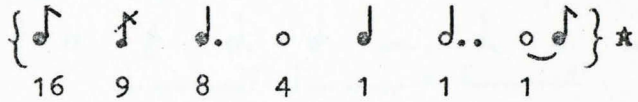
Note-value set =  ✱

Frequency 12 5 5 2 1

Silence-value set = 

Frequency 5 2 2 1 1 1

Subject II

Note-value set =  ✱

Frequency 16 9 8 4 1 1 1

✱ It should be noted that since in the canon the leading voice and the answer have identical values, only the values for the leading voice have been counted. The same applies to the values of the exposition given above.

Silence-value set = 

Frequency 7 3 2 1 1 1 1 1

If we compare Sub. I of the exposition and its restatement in the recapitulation we find the same principle of an interchange in the order relations of the values. The same applies to both second subjects. Further we see that in the recapitulation both subjects are varied considerably metrically with ref. to note- and silence-values. However, there is a common factor present serving to unify the exposition and the recapitulation. We have:

$$N\text{-}v_{Exp.} \cap N\text{-}v_{Recap.} = \{ \text{♩} \}$$

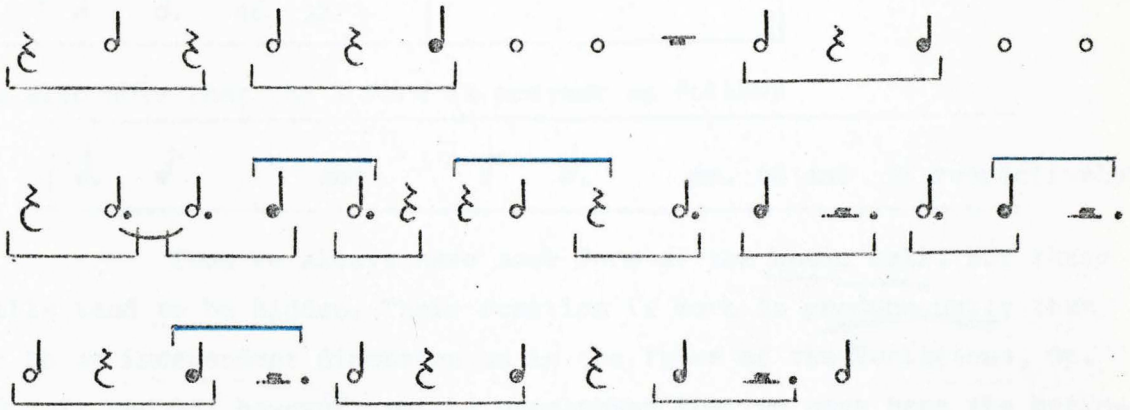
$$S\text{-}v_{Exp.} \cap S\text{-}v_{Recap} = \{ \text{𝄽}, \text{𝄻} \}$$

The development, commencing at m. 25b, is completely symmetric and is a development of colour. The recapitulation is a continuation of the development achieving a climax at m.52. The recapitulation is thus no mere restatement of the subjects. This we have also seen in the Trio (2nd Movement) and the String Quartet (1st movement) .

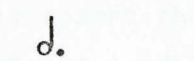
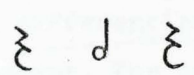
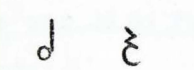
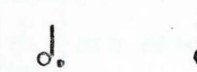
Symphony, Op. 21

Metrical Motives

When we state the metrical pattern of Sub. I, indicated in the short score in black, we cannot readily see similarities, but when we drop the bar lines and group separate but successive rests together we see the emergence of metrical cells.



We tabulate the basic cell and its various derivations as follows:

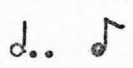
O Form	Measure	R Form	Measure
	10-11		13, 14-15
	1, 12		2, 6
			11
	13-14		

The metrical cells are thus stated in only O and R forms. The entire metrical pattern of Sub. I is constructed from a succession of these short metrical segments. This procedure produces unity in the metrical scheme.

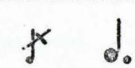
In the recapitulatory section this same cell is encountered in the following derivations.

Symphony, Op. 21

Metrical Motives

O Form	Measure	Derivation	
			53
	45		49
	46, 52		

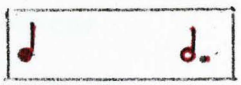
We also note that the I form is present as follows

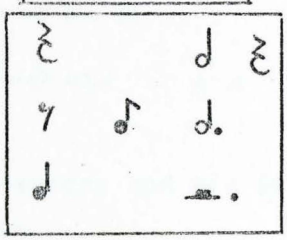
 and  mm. 60 and 58 respectively.

Thus we always have some form of the basic cell, but these cells tend to be hidden. Their function is more to produce unity than to be an independent dimension as in the Theme of the Variations, Op. 30. It should, however, not be overlooked that we have here the beginnings of metrical operations. Here it still lacks definition, differentiation and also colour association.

Silence-values

Silence-values truly assert themselves here and have as much significance as sound-values. ✱ 1 Silence herein has the function of differentiating the subjects and also functions as a variational element. For instance, the sounds:

 are also expressed as follows:



Silence, thus used, becomes an integral content of a metrical motif. This is a most significant innovation. (cf: Variations, Op. 30: pp.365-366).

✱ 1: Leibowitz: Schoenberg and his School:"The very appearance of these scores is disconcerting. Their bare bones frighten us... ..... The musical speech is chopped up by continual rests." Ch. X, pp. 210-211.

Symphony, Op. 21

Klangfarbenmelodie/ Colour Motif

"Klangfarbenmelodie" as used by Webern is only an intermediary stage in Webern's development. "Klangfarbenmelodie" grew until it attained the status of a proper serial dimension where basic colour sets are stated in O, I, R and RI as is evidenced in the Theme of Variations, Op. 30. A "klangfarbenmelodie" does not contain the properties of definition and operation chiefly because it is not integrated with a precise metrical motif.

In the Symphony, however, we already have evidence of a colour serial principle in embryo, though this has escaped the notice of analysts. For instance, Leibowitz states: "Here is Webern's experimentation with the Klangfarbenmelodie carried to its utmost limits." ✱1 Mr Leibowitz then proceeds to give the following information concerning the "klangfarbenmelodie". He says: "the first (1) (canon) is exposed by the second horn and is imitated (in contrary motion) in the answer by the first horn (I')....." ✱ 2
Joseph Machlis gives a similar description in his discussion of the use of colour in this symphony. Indeed much of this author's descriptions of Webern has the same content as is contained in Leibowitz. ✱ 3

Thus neither of these authors realise that they have here to do with a most significant innovation - colour motives and their operations. We have colours and their I operation, thus:

cor $\xrightarrow{I}$ cor

cl $\xrightarrow{I}$ bs cl

vlc $\xrightarrow{I}$ vla ✱ 4

✱ 1: Leibowitz: Schoenberg and his School, Ch. X, p.212

✱ 2: Ibid. p.213

✱ 3: Joseph Machlis: Introduction to Contemporary Music: 5 9. Three Works by Webern, p.392, par.3. Published by J.M. Dent & Son Ltd. London, 1963.

✱ 4: The colour motif is described in detail in The analysis of Op. 30: The Theme, pp. 297 f

Symphony, Op. 21

Klangfarbenmelodie/ Colour Motif

When we study the colour we realize that the colour patterns are constant, but such that we have equivalent and inversional colour relations. We tabulate these relations as follows:

Equivalent Relations	Inversional Relations
cor $\xrightarrow{I}$ cor	
vla $\xrightarrow{I}$ vla	vla $\xrightarrow{I}$ vlc
vl 1 $\xrightarrow{I}$ vl 2	vla $\xrightarrow{I}$ vl 1
hrp $\xrightarrow{I}$ hrp	
cl $\xrightarrow{I}$ cl	cl $\xrightarrow{I}$ bs cl
cl $\longrightarrow$ vla	cl $\xrightarrow{I}$ vl 2
vlc = bs cl	vl 1 $\xrightarrow{I}$ vlc (double Inversional)
	vl 2 $\xrightarrow{I}$ bs cl (" ")

Now since vla $\xrightarrow{I}$ vl 1 ..... (Inversional Relation)
and cl $\xrightarrow{I}$ vl 2 ..... (Inversional Relation)
Hence vla = cl (Equivalent Relation)

Since by the above

vla = cl ..... (proved)
and cl $\xrightarrow{I}$ bs cl ..... (Inversional Relation)
and vla $\xrightarrow{I}$ vlc ..... (Inversional Relation)
∴ vlc = bs cl ..... (Equivalent Relation)
Hence vl 2 $\xrightarrow{I}$ bs cl .....(Double Inversional)

Now it is clear to see that this emergence of a colour scheme is the direct result of the particular formal structures employed in the Symphony. In the middle section, commencing at m.25b, we have the O row-form followed immediately by the R form; the colours are also likewise reversed. This results in a symmetric colour succession.

(cl, vl 1, hrp, vl 1) $\xrightarrow{R}$ (vl 1, hrp, vl1, cl) (cf. Short score top part in black)

Symphony, Op. 21

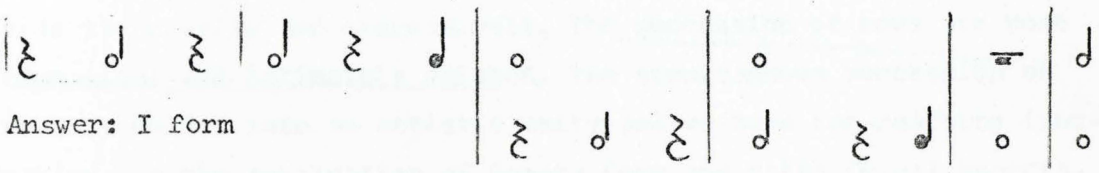
Klangfarbenmelodie/ Colour Motif

Further, since the canonic imitation is by inversion, the colours are also answered inversionally, but not always truthfully. For as tabulated above any specific colour may be answered inversionally by

i) an Inversion : cl $\xrightarrow{I}$ Bs cl
ii) an Identity : cl $\xrightarrow{I}$ cl
iii) an Equivalence : cl $\xrightarrow{I}$ vla

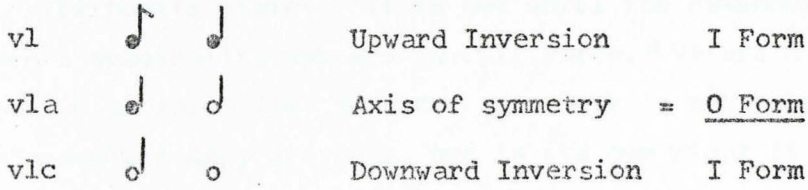
Thus we observe that canonic imitation acts against the proper functional fulfilment of colour motives. The reason for this is mainly that the metrical schemes due to the properties of a canon are the same for subject and answer.

O form



Answer: I form

A colour motif is associated with or expressed as a time unit. Thus when it is inverted up the time unit is reduced and when it is inverted down the time unit is increased. We illustrate this as follows:



(cf. The colour Motif, pp. 297-301)

When, however, as in these symphonic canons, there are identical metrical schemes for O and I, colour motives are not truthful and not properly defined. Consequently in the symphony we see the beginnings of the serial application of colour.

A notable example of colour form is seen in measures 1-24 in the statement of the first subject and its inversional answer.

Sub. I	cor	cl	vlc	cl	cor
Answer	cor	bs cl	vla	bs cl	cor

Symphony, Op. 21

Klangfarbenmelodie/ Colour Motif

The above colour pattern gives us a symmetric colour form. This is therefore an image of the row.

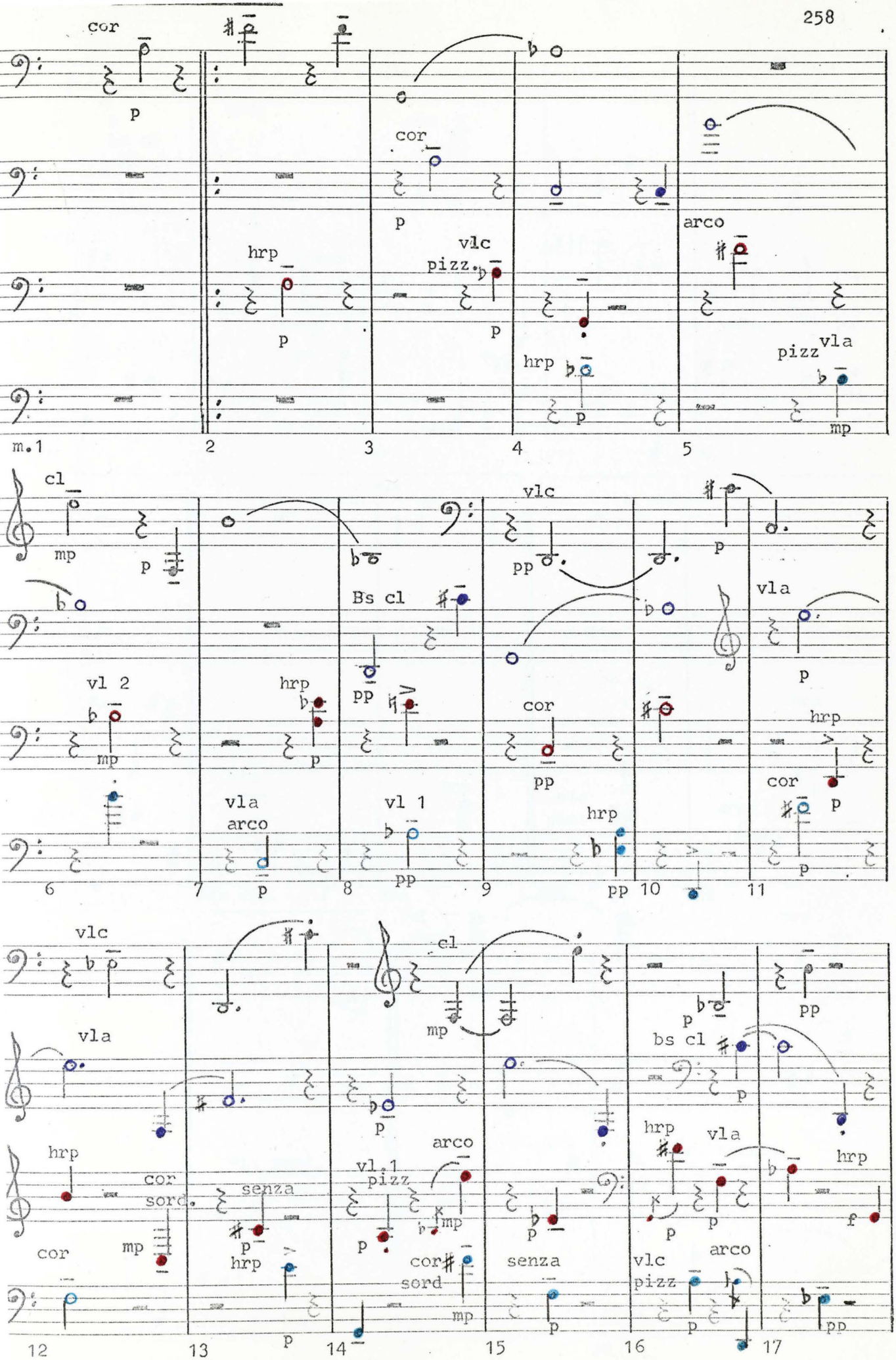
In the above we therefore see that the formal structure i) by its symmetry in the middle section and ii) by its inversional canonic answer produced a particular colour operation i.e. I forms and R colour forms. However, since structural aspects are images of the particular row-structure, we conclude that without the symmetric row on which the Symphony is based much of this colour application would have been lost. This accentuates the significance of the use of the symmetric row in this work and in Webern's development as a composer.

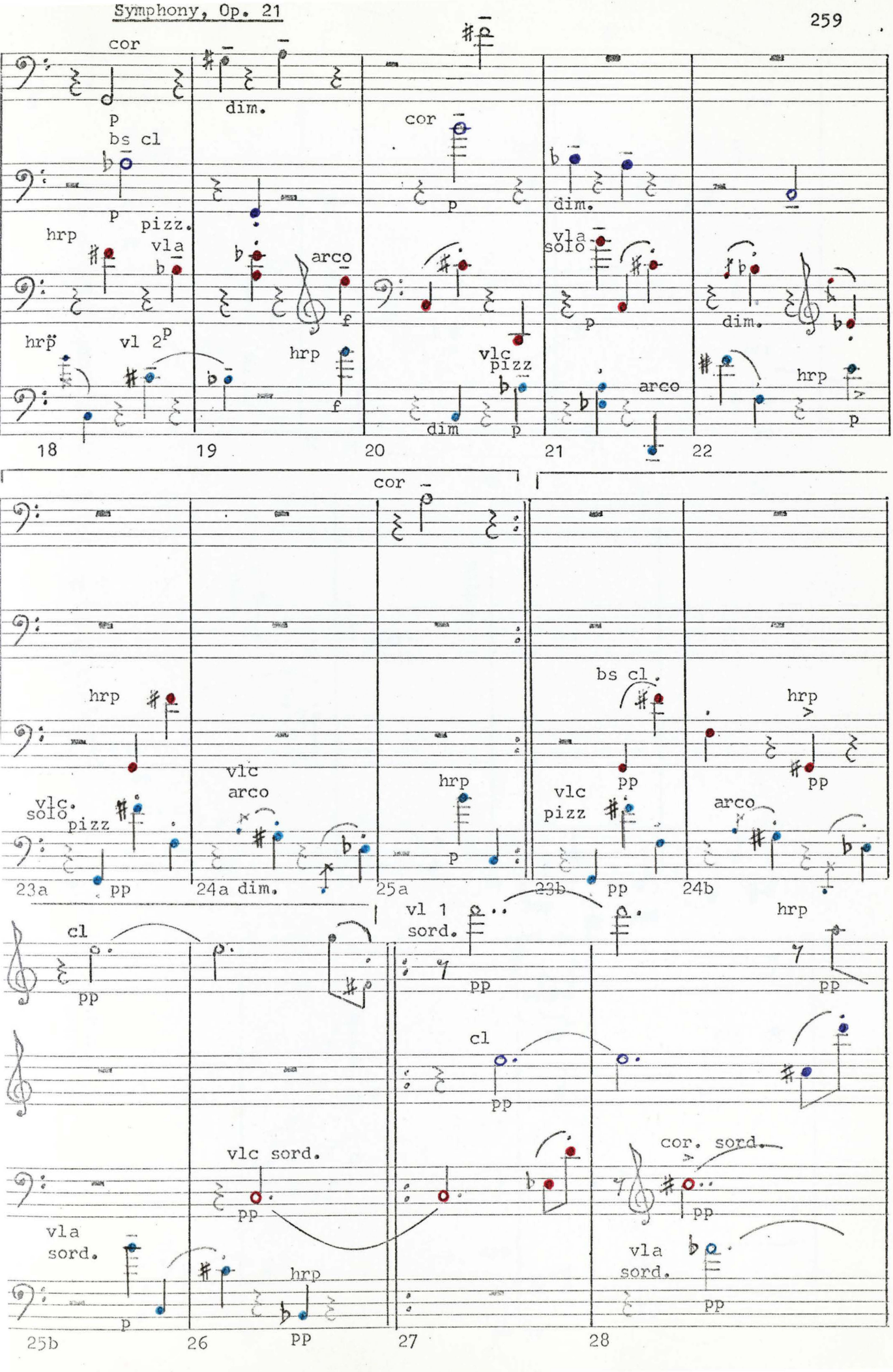
Conclusion

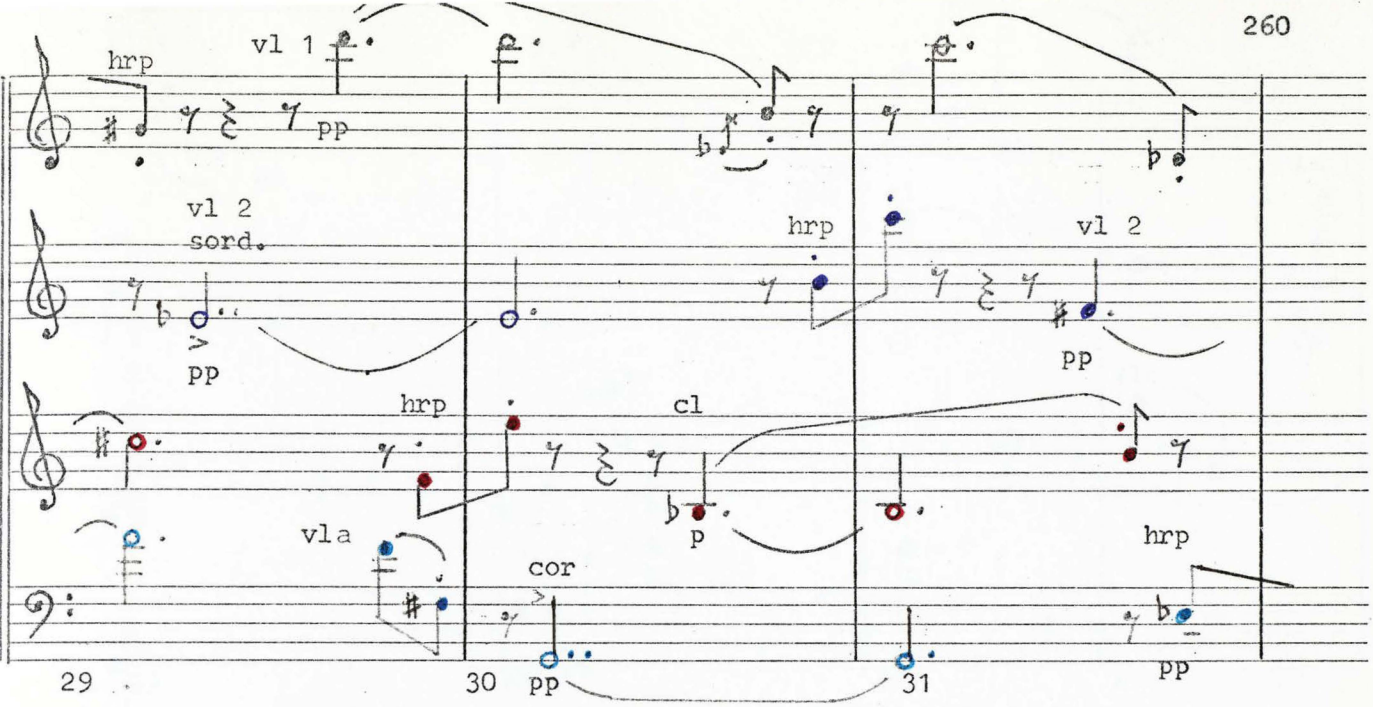
The gap from the Trio, Op. 20,to the Symphony is extremely wide technically and expressively. The succession of rows are more economical and intimately related. The simultaneous succession of rows is welded into an artistic unity and we have far-reaching innovations in the application of Sonata Form and other formal aspects. The row is no longer an independent element, but in this Symphony determines the formal structures and exerts influence over the colour schemes. We also notice the emergence of metrical and colour motives, and the silence dimension comes into its own.

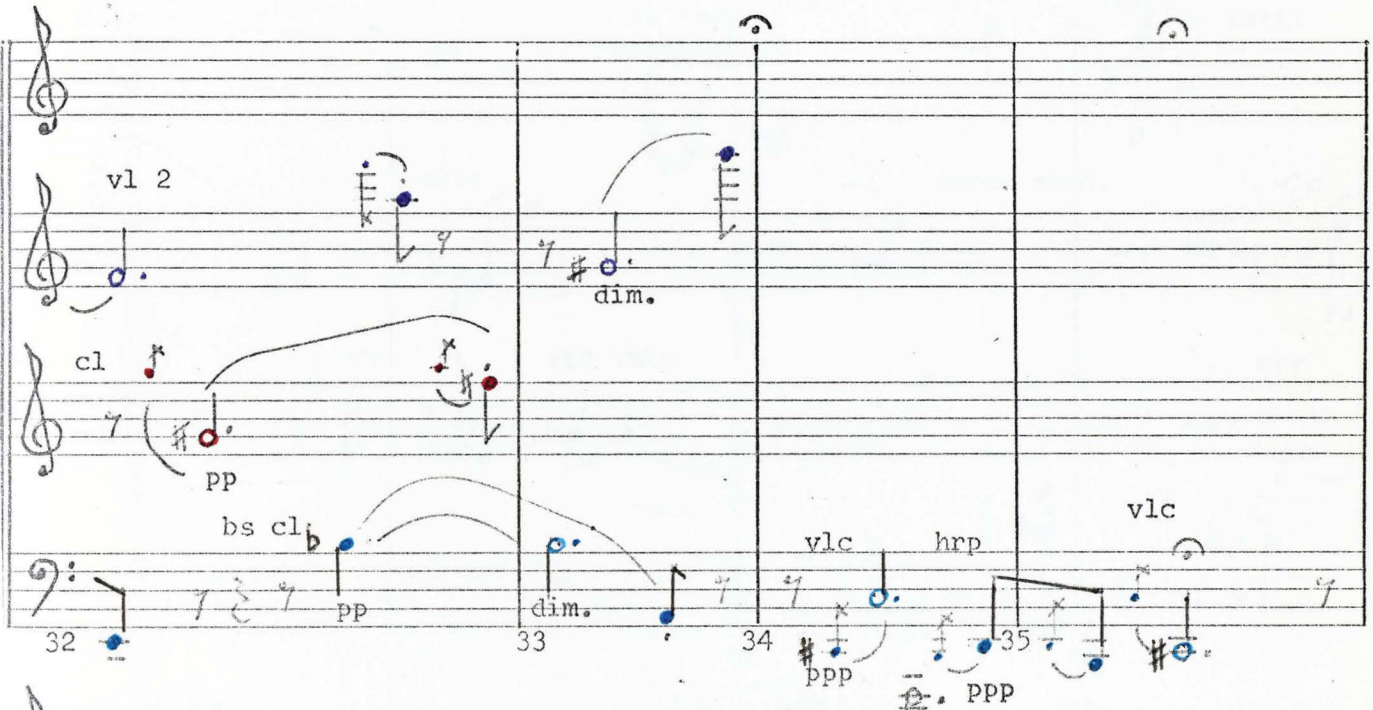
Leibowitz states: "It is not until the Symphony, Op. 21, that Webern's originality appears in full force." We are completely ✱ 1 in agreement with this view. However, this work is not only important in Webern's evolutionary progress, but in its own right it is a masterwork in which colour is sensitive and the musical dimensions, balanced, economical and masterly.

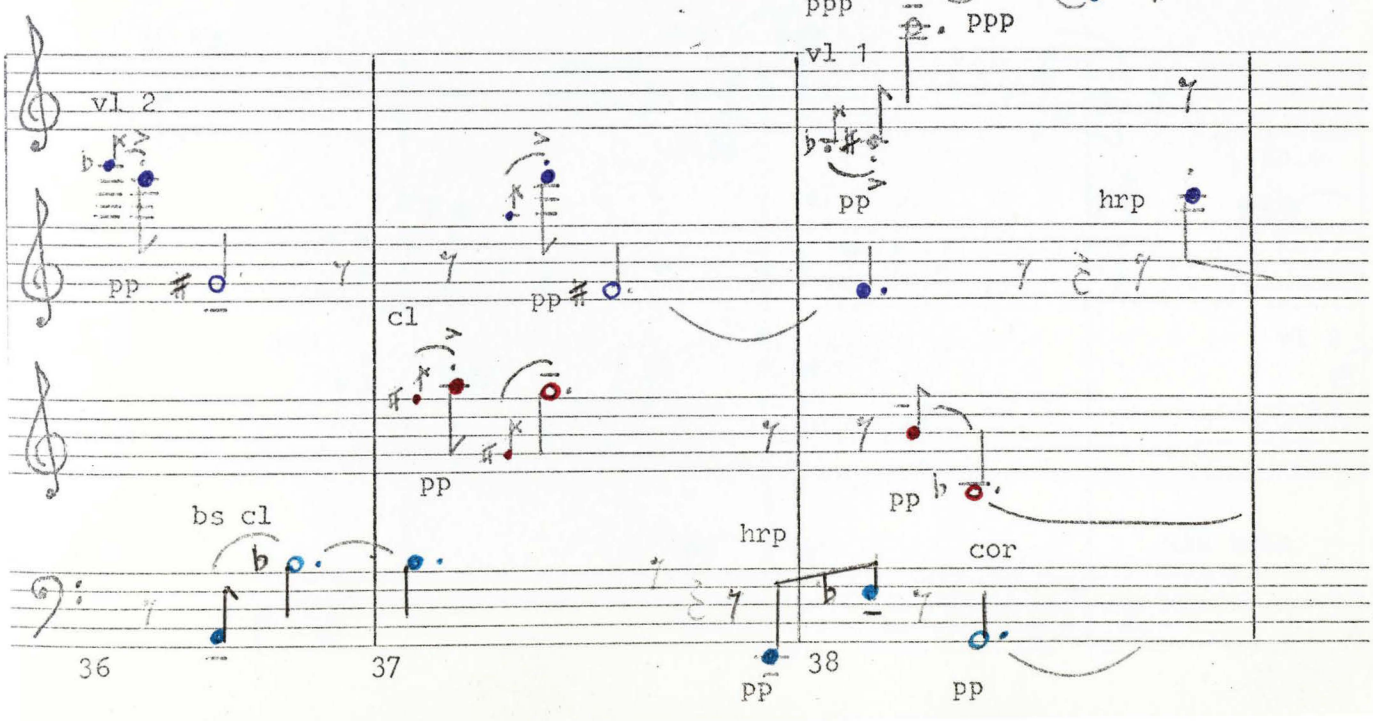
✱ 1: Leibowitz: Schoenberg and his School, par. 1, p.210.

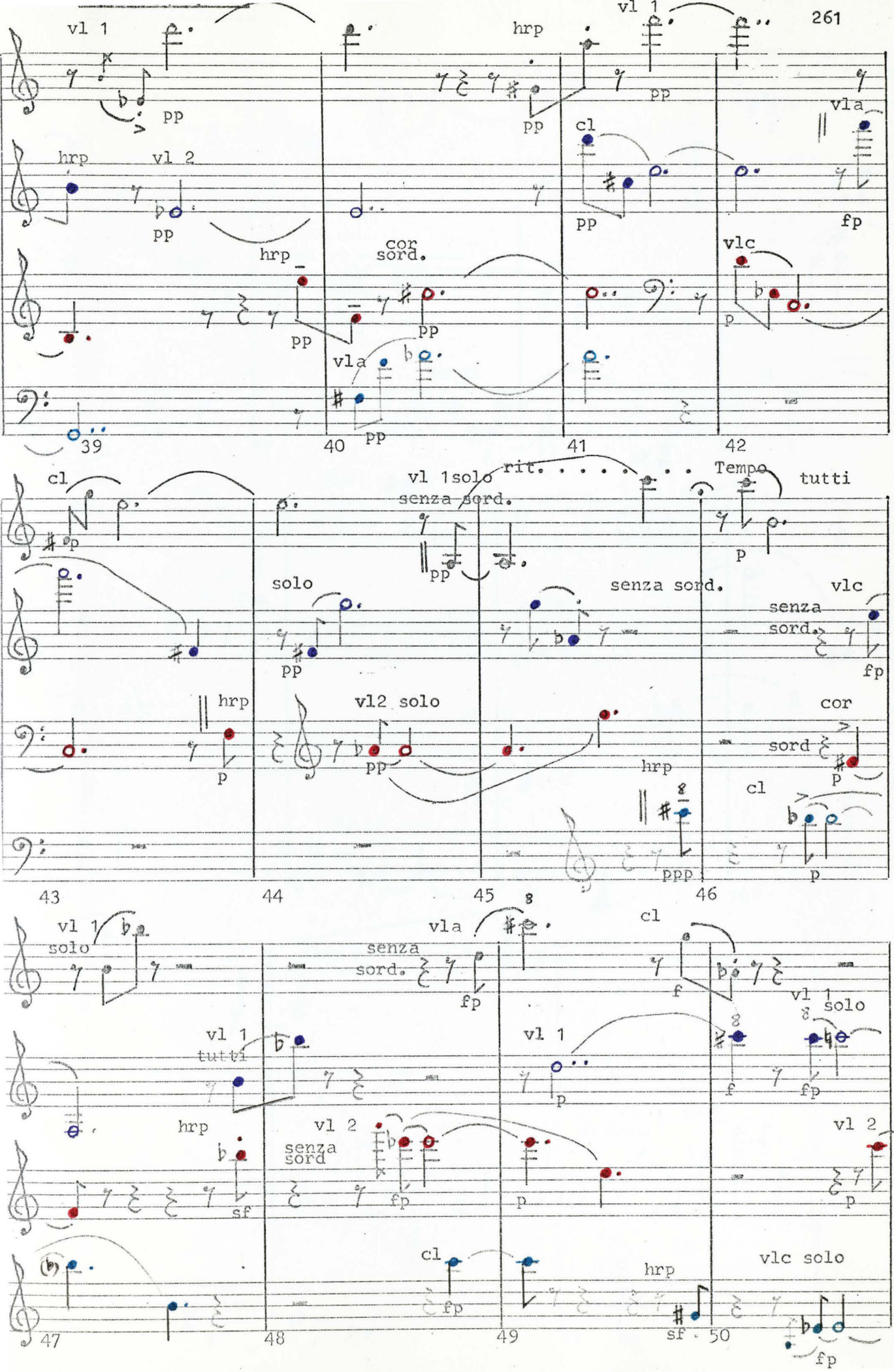

cor
p
hrp
p
cor
p
vlc
pizz.
p
arco
hrp
p
pizz
vla
mp
m.1
2
3
4
5
cl
mp
p
vl 2
mp
hrp
p
vla
arco
p
Bs cl
pp
vl 1
pp
vlc
pp
cor
pp
hrp
pp
p
vla
p
hrp
cor
p
6
7
8
9
10
11
vlc
vla
hrp
cor
sord.
mp
cor
senza
p
hrp
p
cl
mp
p
vl 1
pizz
arco
p
mp
cor
sord
mp
p
senza
p
p
bs cl
p
hrp
p
vla
p
vlc
pizz
p
arco
pp
hrp
f
pp
12
13
14
15
16
17

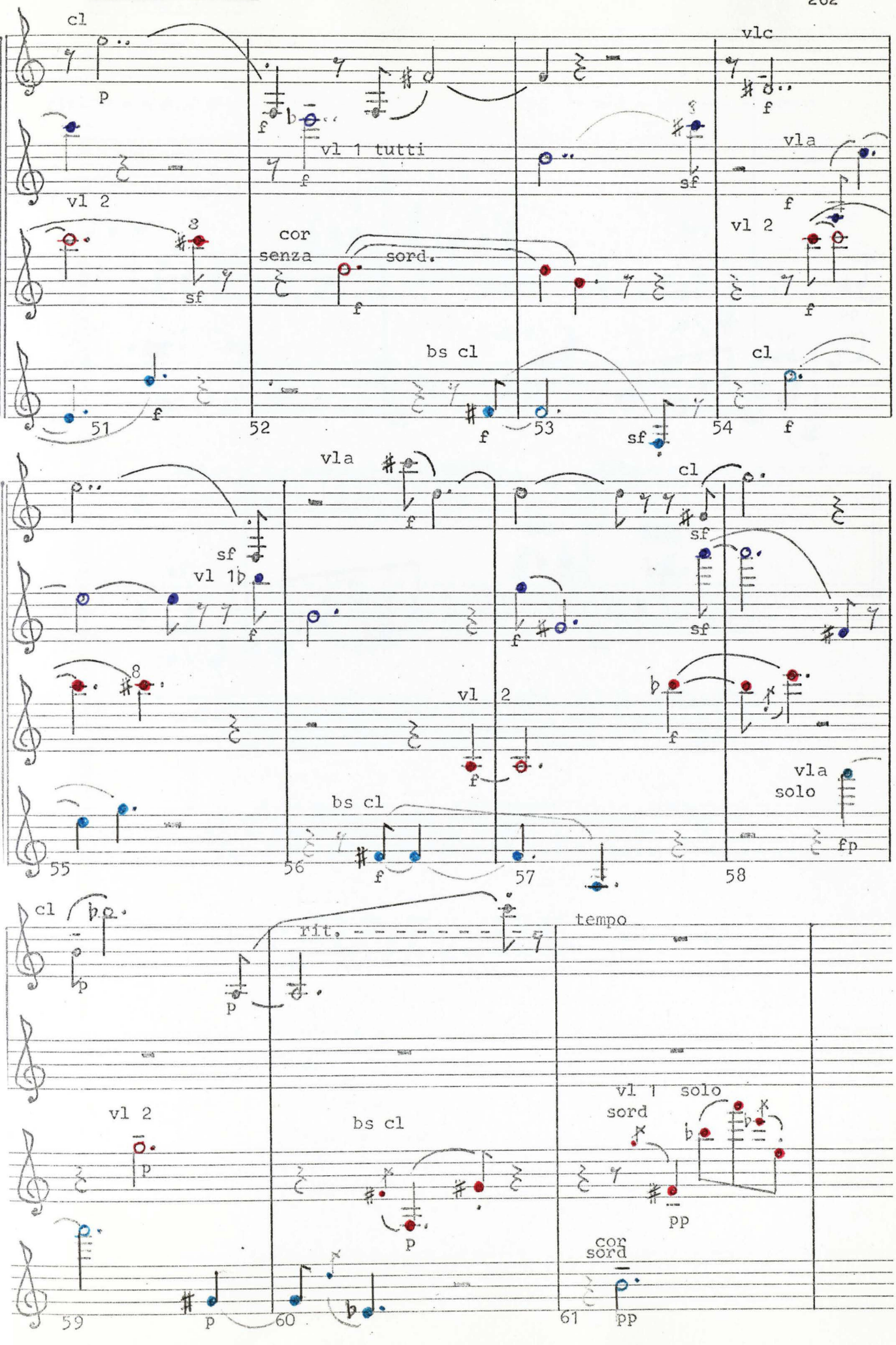

cor
p
dim.
bs cl
p
hrp
pizz.
vla
arco
f
hrp
vl 2
p
f
cor
p
vlc
pizz
dim
p
vla
solo
p
dim.
arco
hrp
p
18
19
20
21
22
cor
hrp
vlc.
solo
pizz
pp
23a
vlc
arco
24a dim.
hrp
p
25a
bs cl.
pp
vlc
pizz
23b
pp
hrp
pp
arco
24b
cl
pp
vl 1
sord.
pp
hrp
pp
cl
pp
vlc sord.
pp
cor. sord.
pp
vla
sord.
p
hrp
pp
vla
sord.
pp
25b
26
27
28

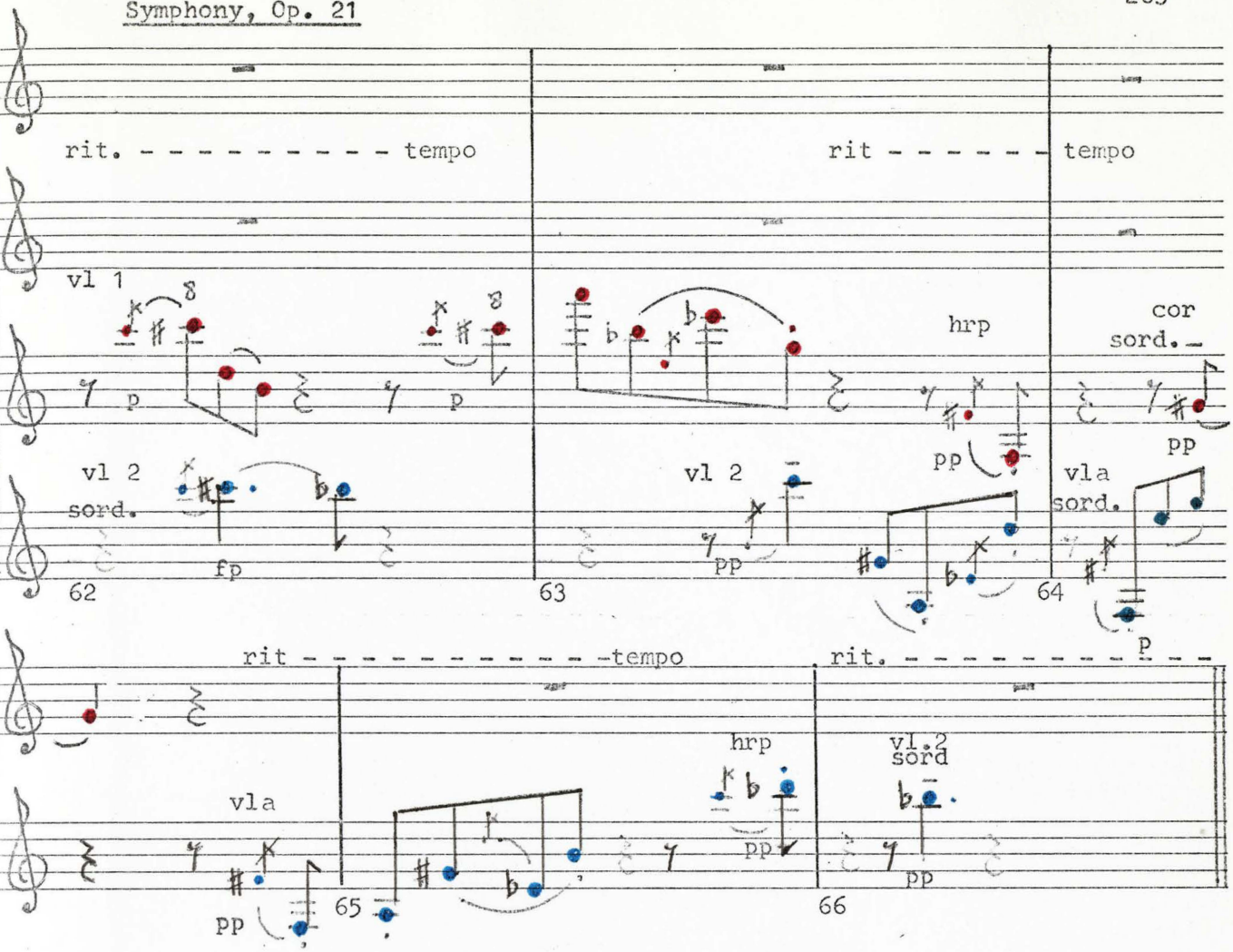

hrp
vl 1
pp
vl 2
sord.
pp
hrp
vl 2
pp
hrp
cl
vla
p
cor
pp
hrp
pp
29
30
31


vl 2
dim.
cl
pp
bs cl
pp
dim.
vlc
hrp
vlc
ppp
ppp
32
33
34
35


vl 2
pp
pp
vl 1
pp
hrp
cl
pp
pp
bs cl
hrp
cor
pp
pp
36
37
38


vl 1
pp
hrp
vl 2
pp
hrp
pp
cor
sord.
pp
vla
pp
39
40
hrp
pp
vl 1
pp
cl
pp
41
vla
fp
vlc
p
42
cl
p
vl 1solo
senza sord.
pp
rit.
Tempo
tutti
p
solo
pp
senza sord.
vlc
senza
sord.
fp
hrp
p
vl2 solo
pp
cor
sord
p
hrp
ppp
cl
p
43
44
45
46
vl 1
solo
vla
senza
sord.
fp
cl
f
vl 1
solo
vl 1
tutti
vl 1
p
f
fp
hrp
sf
vl 2
senza
sord
fp
p
vl 2
p
cl
fp
hrp
sf
vlc solo
fp
47
48
49
50


cl
p
vl 1 tutti
f
vlc
f
vla
f
vl 2
sf
cor
senza
sord.
f
vl 2
f
bs cl
f
cl
f
51
52
53
54
sf
vla
f
cl
sf
vl 1
f
sf
f
vl 2
f
vla
solo
fp
bs cl
f
55
56
57
58
cl
p
rit.
p
tempo
vl 2
p
bs cl
p
vl 1 solo
sord
pp
cor
sord
pp
59
p
60
61


rit. - - - - - - - - - - tempo
rit - - - - - - tempo
vl 1
p
p
hrp
cor
sord.
pp
vl 2
sord.
fp
62
63
vl 2
pp
vla
sord.
pp
64
p
rit - - - - - - - - - - - - - tempo
rit. - - - - - - - - - - - - -
vla
pp
65
hrp
pp
vl.2
sord
pp
66