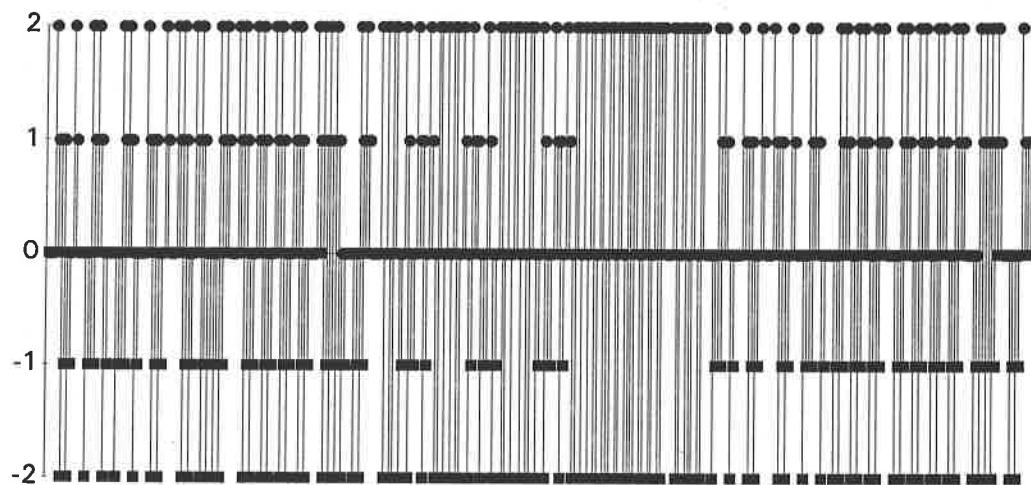


Webern's Opus 27, I

A Rhythmic-Spectral Analysis



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MuCH 614
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Introduction

During the last half century, Anton Webern's *Variations*, opus 27, has been the subject of numerous analyses. Like his other works, this composition is very concentrated in its construction. In fact, after hearing the work at the Verein fuer neue Musik on October 30, 1937, a critic for the Neue Freie Presse stated: "Here the musical solution to the much contested problem of smashing the atom has succeeded."¹ The intense complexities of this work have attracted many theorists to analyze its pitch content and overall form.² The rhythmic aspect, however, has largely been ignored especially concerning the first movement. Theorists analyzing the rhythm of this piece have concentrated on the second or third movements, leaving the first movement without a comprehensive analysis of its rhythmic structure.³ Therefore I feel compelled to solely devote this entire paper to the rhythmic forms of the first movement using my newly developed analytical method referred throughout as *Rhythmic Spectral Analysis*.

In preparation for my research I studied Allen Forte's article, "Aspects of Rhythm in Webern's Atonal Music" to gain a better understanding of Webern's treatment of rhythm and to explore how one proceeds with a proper rhythmic analysis.⁴ The following summary of Forte's article precedes a critique and then an explanation of my new analysis method, inspired by Forte's writings.

Allen Forte

Forte begins his article with two very important assumptions regarding rhythm. The first is that duration is the most important aspect of rhythm, and the second is that there is a basic "pulse" that provides for "calibration" of the music.⁵ He continues with important observations of atonal music including the need to discard traditional adjectives such as "weak" or "strong" when describing a rhythmic structure and the need to recognize that repetition and transformation compose the form instead.⁶

first six units are marked. The next 6 units are delineated by a new attack in both violins 6 units after the previous release. 18 units are defined by the attack differential of the violins and the viola. The viola releases 6 units later, followed by the violins releasing another 6 units later. In this way, Forte discovers many interesting proportions in the rhythmic structure in this composition such as the palindrome.¹⁰

Later he introduces ways in which pitch structures are allied with rhythmic patterns through simple and complex composite segmentation techniques. This procedure of linking pitch and rhythm is not the main focus of my analysis so I will not delve into a lengthy description. Simple composite segmentation refers to linking all pitches in a given musical passage to the present rhythmic pattern therefore revealing surface level relationships.¹¹ Complex composite segmentation refers to linking only a portion of a musical passage to the present rhythmic pattern therefore revealing higher level relationships between pitch and rhythm.¹² A composite segmentation analysis certainly would be my next logical topic for a future paper concerning rhythmic analysis of the *Variations*.

Critique of Forte

In general, I found Forte's assertions to be very logical and thoroughly and clearly discussed. I absolutely have no disagreement with his observations. It is his graphing technique, however, that leaves much to be desired. I find it very difficult to perceive proportional structure or other rhythmic patterning through his scale drawings utilizing lines and dots in a horizontal alignment. Both time and measured proportions are simultaneously designated horizontally or one-dimensionally, making it difficult to perceive rhythmic spatial relationships, especially between passages far apart from each other. His graphs purely reflect numerical data and do not add any new interpretive possibilities. As a result, perhaps Forte might not have discovered many of the rhythmic structures that could be only seen with a multi-dimensional graph. My new method, however, solves this problem through a multi-dimensional graph of projected vertical

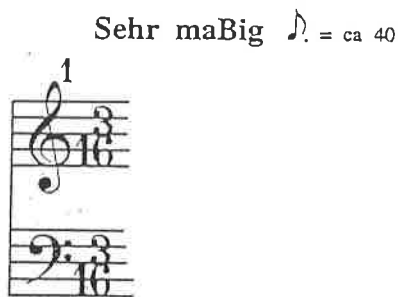
rhythmic spectra over a horizontal axis of time, allowing for a much more revealing viewing experience that can lead to new and exciting discoveries.

Rhythmic Spectral Analysis

One creates a *Rhythmic Spectral Analysis* in the following manner. As does Forte, one finds the smallest durational unit in the movement. In the case of the *Variations*, this unit is the 32nd note. The next step is to figure out the total number of units in the entire movement. The meter is 3/16. There are 6 units per measure and 54 total measures. Therefore the piece consists of 324 equal durational units.

The third step is determining how one segments the piece into individual instrument parts. For a string quartet, each instrument is analyzed individually. For a piano piece such as the *Variations*, the right hand is analyzed individually from the left hand. The fourth step requires one to examine each rhythmic unit of each part individually and to assign an appropriate number representing an attack, a sustain or no activity. The numbers 2, 1, or 0 for the right hand (or -2, -1, or 0 for the left hand) represent an attack, a sustain or no activity respectively. Therefore, in our example, we must analyze each of 324 "units." Example 2 is measures 1-4 of the first movement of the *Variations* followed by example 3 which is the rhythmic data of those measures used to create the spectra in example 4.

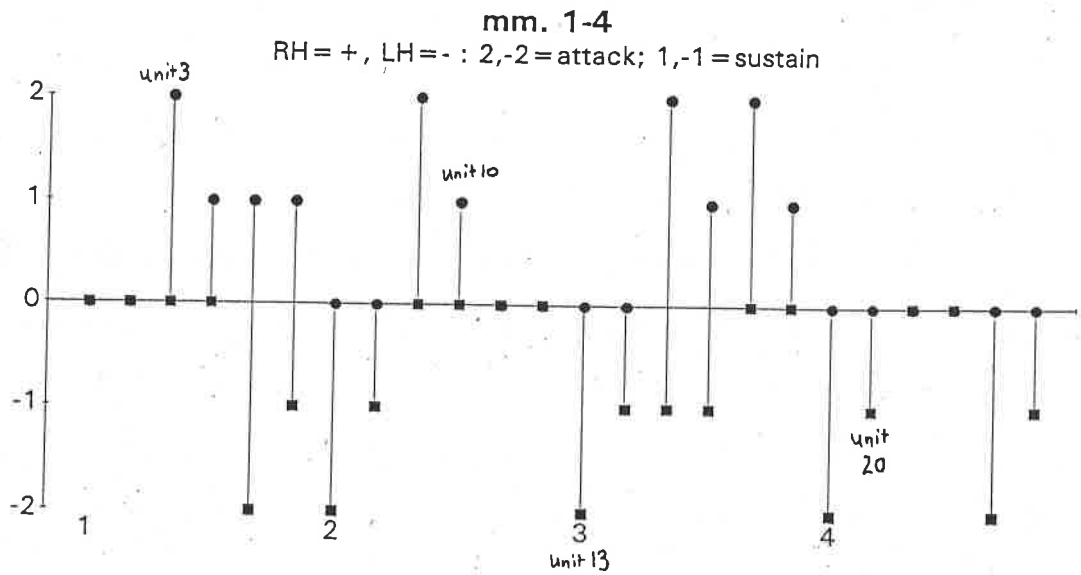
Example 2. Webern, op. 27/1: measures 1-4



Example 3. Rhythmic Spectra Data Chart: measures 1-4

Right Hand	Left Hand	unit	mm.
0	0	1	1
0	0	2	
2	0	3	
1	0	4	
1	-2	5	
1	-1	6	
0	-2	7	2
0	-1	8	
2	0	9	
1	0	10	
0	0	11	
0	0	12	
0	-2	13	3
0	-1	14	
2	-1	15	
1	-1	16	
2	0	17	
1	0	18	
0	-2	19	4
0	-1	20	
0	0	21	
0	0	22	
0	-2	23	
0	-1	24	

Example 4. Rhythmic Spectra: measures 1-4



The rhythmic spectra method is in concurrence with Forte's two basic assumptions regarding rhythm; duration is represented at level 1 or -1 on the graph, and the basic pulse necessary for calibration is represented by the constant evaluation of the smallest durational unit. Because these units are plotted as spectra, one can immediately perceive all levels of activity at once. In example 4, one can easily perceive two main gestures: all notes in unit 3 through unit 10, and all notes in unit 13 through unit 20. The right hand begins the first gesture and the left the second. Upon closer examination one sees that the rhythmic pattern of the right hand in the first gesture is mirrored over the horizontal axis by the left hand in the second gesture and vice versa. Similar to rhythmic invertible counterpoint, this idea of mirroring one hand and translating over to future gestures of the other is prevalent throughout the movement. We shall encounter other patterning as well, however.

Before I reveal my entire analysis, I want to make some general observations regarding pitch in this movement. The work is twelve-tone and it would be foolish to neglect mentioning at least how the pitch patterns might shed light onto understanding the rhythmic patterns. The most obvious is the constant use of two rows simultaneously, each the retrograde of the other.¹³ This is important to note because it strengthens the idea of mirroring as presented in example 4. One can also, however, segment the row into set classes to see smaller form relationships. Individual set classes are often simultaneously mirrored between the left hand and the right hand along with their respective rhythmic patterns. As a courtesy to the reader, I will hereon include both row and set class information in my data charts and will make any minor comments deemed appropriate regarding pitch and rhythm. A more detailed discussion of this matter is the subject of future research, however.

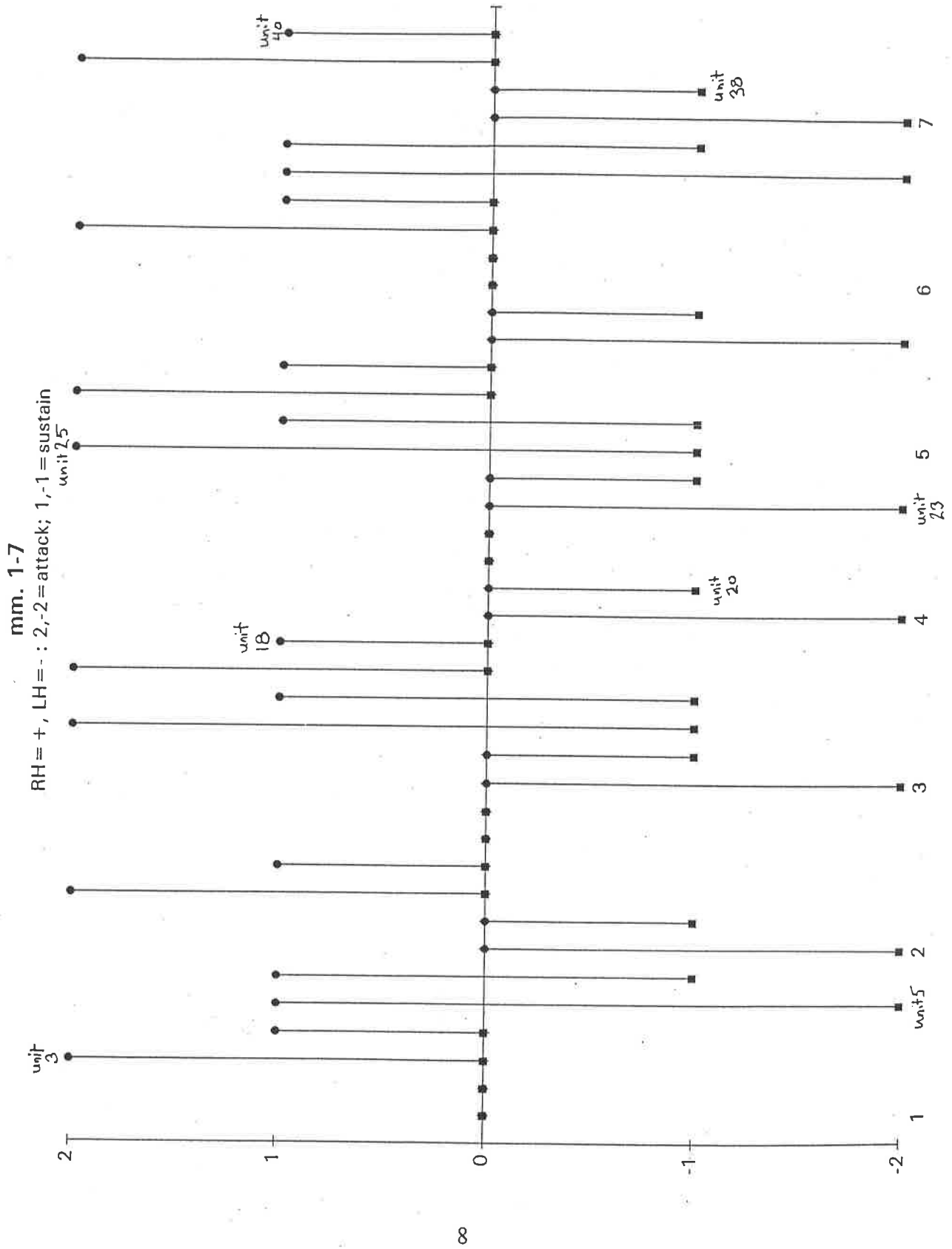
The movement is divided into three equal parts, the first and third being starkly similar, analogous to an exposition and recapitulation. The second section is similar to a development, being rhythmically more active and complex. Therefore I will begin with

an analysis of the various portions of the first section followed by a comparison to the third. I will then proceed to an analysis of portions of the second part followed by comments on the entire movement as a whole.

Example 5. Rhythmic Spectra Data Chart: measures 1-7 (section 1, partial)

Right Hand	Left Hand	unit	mm.	Set Classes		Simultaneous
				RH	LH	Row forms
0	0	1	1			
0	0	2				
2	0	3		3-3		R8
1	0	4				
1	-2	5			3-4	P8
1	-1	6				
0	-2	7	2			
0	-1	8				
2	0	9				
1	0	10				
0	0	11				
0	0	12				
0	-2	13	3		3-1	
0	-1	14				
2	-1	15		3-2		
1	-1	16				
2	0	17				
1	0	18				
0	-2	19	4			
0	-1	20				
0	0	21				
0	0	22				
0	-2	23			3-1	
0	-1	24				
2	-1	25	5	3-2		
1	-1	26				
2	0	27				
1	0	28				
0	-2	29				
0	-1	30				
0	0	31	6			
0	0	32				
2	0	33		3-3		
1	0	34				
1	-2	35			3-4	
1	-1	36				
0	-2	37	7			I8
0	-1	38				
2	0	39				
1	0	40				

Example 6. Rhythmic Spectra: measures 1-7 (section 1, partial)

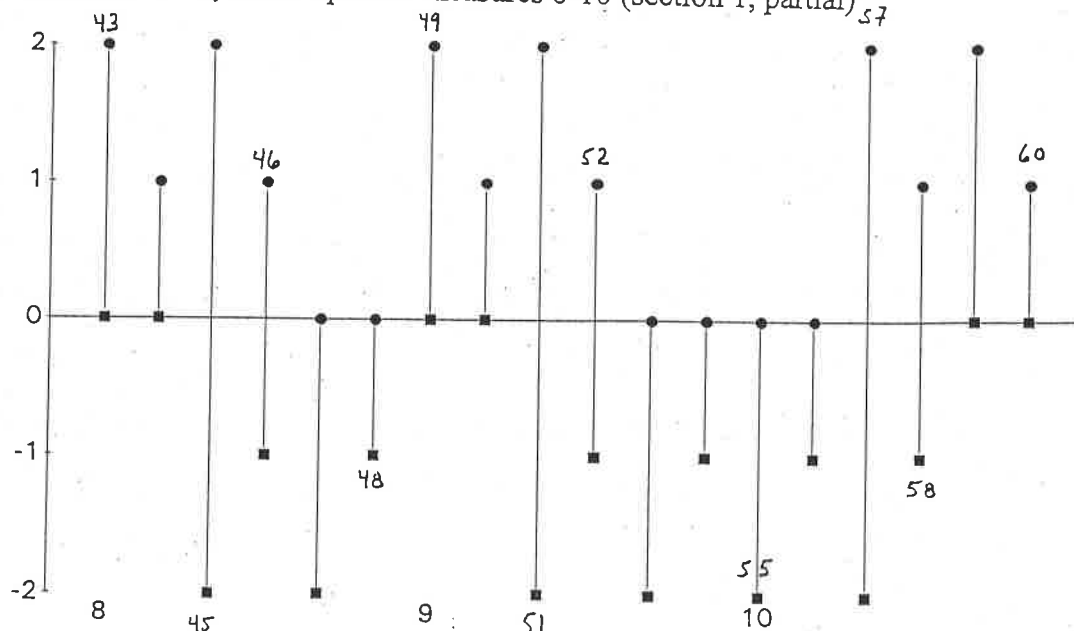


The rhythmic spectra of the first seven measures reveal that the entire pattern found in both hands in example 4 (measures 1-4) is mirrored over the horizontal axis and translated to the following portions of measure 4-7. The right hand from unit 3-18 is identical to the left hand from unit 23-38. The left hand from unit 5-20 is the same as the right hand from unit 25-40. Examples 4 and 6 are visible proof that Webern creates a larger mirrored structure from a smaller preexisting one, similar to the idea of a germ motive. Webern, incidentally, compared this first movement to a late Brahms's intermezzo.¹⁴

Example 7. Rhythmic Spectra Data Chart: measures 8-10 (section 1, partial)

2	0	43	8	3-3		RI8 (&I8)
1	0	44				
2	-2	45			3-3	
1	-1	46				
0	-2	47				
0	-1	48				
2	0	49	9	4-13		
1	0	50				
2	-2	51			4-9	
1	-1	52				
0	-2	53				
0	-1	54				
0	-2	55	10		3-3	
0	-1	56				
2	-2	57		3-3		
1	-1	58				
2	0	59				
1	0	60				

Example 8. Rhythmic Spectra: measures 8-10 (section 1, partial)⁵⁷



Example 8 shows Webern using an overlapping, mirroring procedure. Units 43-46 of the right hand are identical to units 45-48 of the left hand. The same exists for units 49-52 of the right hand and 51-54 of the left hand. Units 49-54 also can be thought of as a vertical axis over which right hand units 43-46 are duplicated in units 57-60 and left hand units 45-48 are duplicated in units 55-58.

As shown in example 10, the remainder of the first section, units 63-98, exemplify the procedure of overlapping a horizontally mirrored structure between 2 hands. In this specific example, the left hand mirrors the right hand. This process is reversed after unit 98 through the end of the first section.

Examples 11 and 12 reveal that these sections are almost identical in their rhythmic patterns. The right hand rhythm of the first section is now the rhythm of the left hand in the third section and vice versa. The only exception are measures 10 and 46, being identical in their rhythmic pattern (not a mirrored version) and the ending gesture in both sections is very similar. Beginning on the last two beats before the final measure of each section, the right hand mirrors the left hand. This gesture is overlapped in the first section but not in the third.

Examples 13 and 14 show us a continuation of the rhythmic gesture of one hand reflected over the horizontal axis and then translated over to a following gesture of the other hand. Beginning in unit 111 the left hand initiates this mirroring process, the right hand mimicking its rhythm until unit 134 where the right hand initiates the process. It is proper to start the analysis of such activity at unit 111, not at 110, for the note at unit 110 is actually a part of the previous row form RI8.¹⁵ At unit 156, the left hand resumes initiating the mirroring process through unit 177. Coincidentally, new row forms commence at the beginnings of some of the new mirror procedures - at units 111 and 156.¹⁶

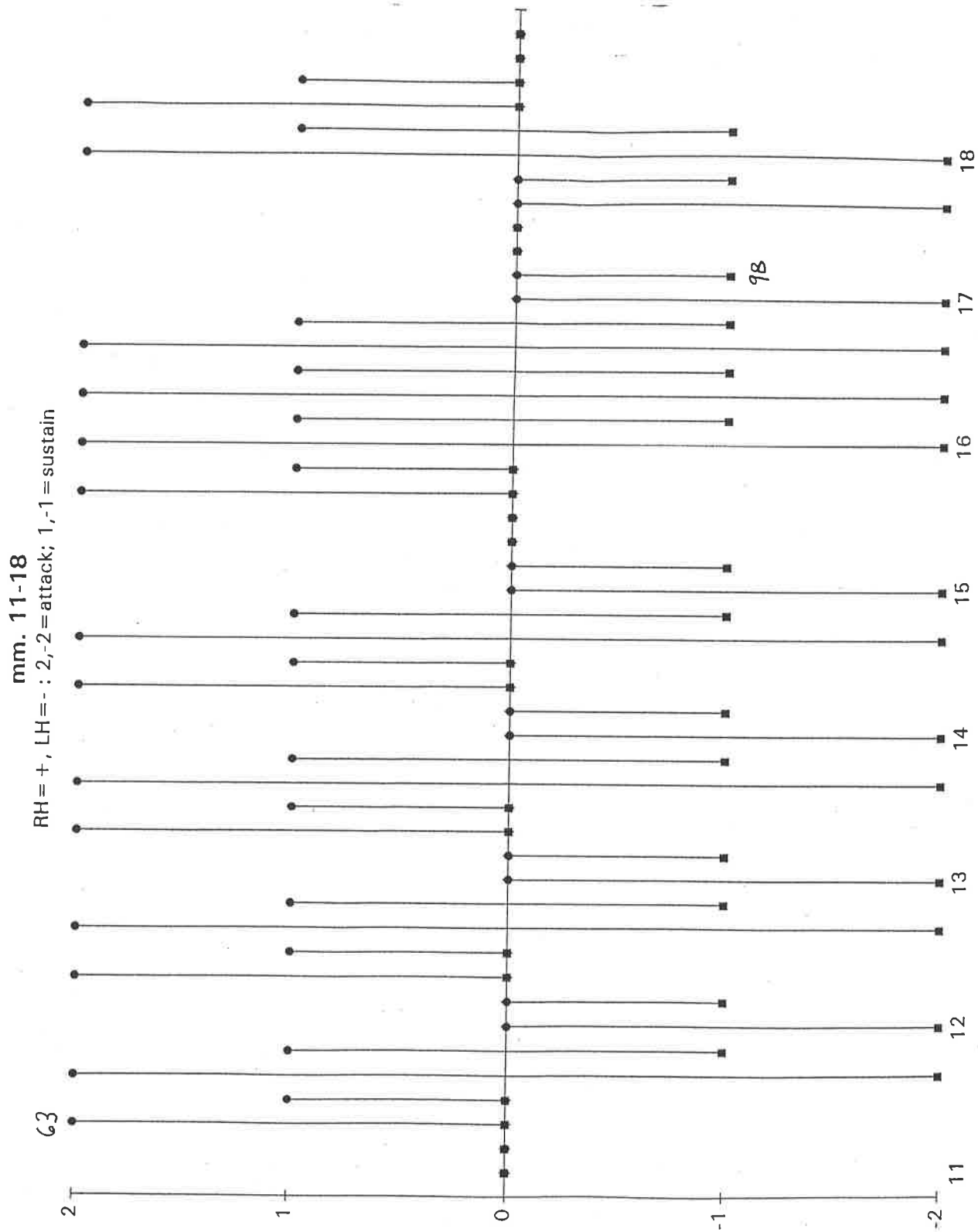
Example 14 also shows us three groupings of sustain points, each with a pattern of 1 2 1. Even at very minute levels, the rhythmic spectra reveal subtleties of the tightly

Example 9. Rhythmic Spectra Data Chart: measures 11-18 (section 1, partial)

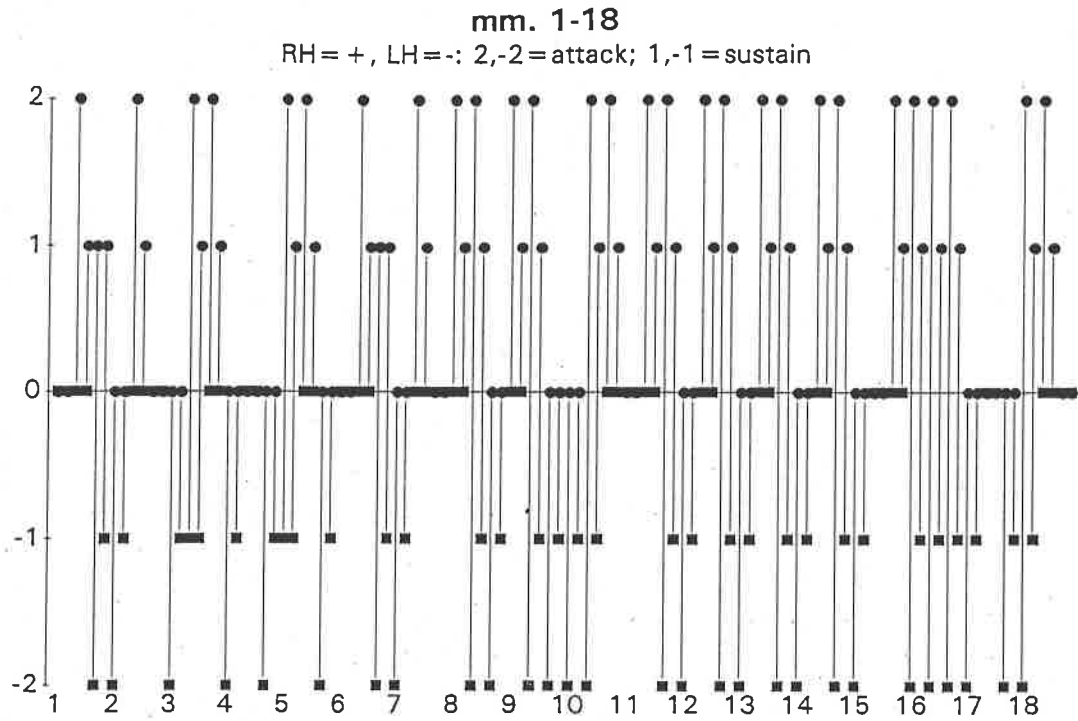
Right Hand Left Hand unit mm. Set Classes RH LH Simultaneous Row forms

0	0	61	11			
0	0	62				
2	0	63		3-3		P8
1	0	64				
2	-2	65			3-3	R8
1	-1	66				
0	-2	67	12			
0	-1	68				
2	0	69		3-1		
1	0	70				
2	-2	71			3-2	
1	-1	72				
0	-2	73	13			
0	-1	74				
2	0	75		3-2		
1	0	76				
2	-2	77			3-1	
1	-1	78				
0	-2	79	14			
0	-1	80				
2	0	81		3-3		
1	0	82				
2	-2	83			3-3	
1	-1	84				
0	-2	85	15			I8
0	-1	86				
0	0	87				
0	0	88				
2	0	89		3-3		RI8
1	0	90				
2	-2	91	16		3-3	
1	-1	92				
2	-2	93		4-13		
1	-1	94				
2	-2	95			4-9	
1	-1	96				
0	-2	97	17			
0	-1	98				
0	0	99				
0	0	100				
0	-2	101			3-3	
0	-1	102				
2	-2	103	18	3-3		
1	-1	104				
2	0	105				
1	0	106				
0	0	107				
0	0	108				

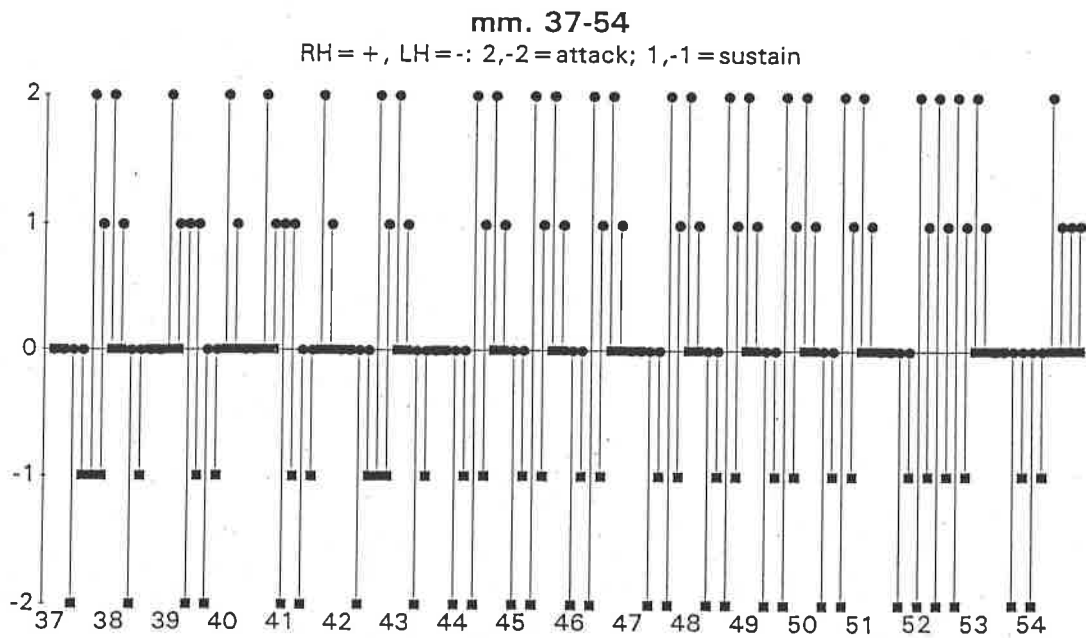
Example 10. Rhythmic Spectra: measures 11-18 (section 1, partial)



Example 11. Rhythmic Spectra: measures 1-18 (section 1, complete)



Example 12. Rhythmic Spectra: measures 37-54 (section 3, complete)



Example 13. Rhythmic Spectra Data Chart: measures 19-30 (section 2, partial)

Right Hand	Left Hand	unit	mm.	Set Classes		Simultaneous
				RH	LH	Row forms
0	0	109	19			
2	0	110		3-5		RI1
0	-2	111			3-5	II
2	0	112				
0	-2	113			01	
2	-2	114		3-2		
2	0	115	20			
0	-2	116			01	
0	-1	117				
2	0	118		1		
1	-2	119		1	1	
0	-1	120				
0	-1	121	21			
2	0	122		1		
1	0	123		1		
1	-2	124		1	1	
0	-1	125				R2
2	0	126		01		
1	0	127	22			
0	-2	128			3-2	P2
2	-2	129		01		
2	0	130				
0	-2	131			3-5	
2	0	132		3-5		
0	-2	133	23			
2	0	134		3-4		
2	-2	135			3-2	
0	-2	136				
2	0	137		01		
1	0	138				
0	-2	139	24		1	
2	-1	140		1		
1	0	141				
1	0	142				
0	-2	143			1	
0	-1	144				
2	-1	145	25	1		
1	0	146				
0	-2	147			01	
0	-1	148				
2	0	149		3-2		
2	-2	150			3-4	
0	-2	151	26			
2	0	152		3-5		
0	-2	153			3-5	
2	0	154				
2	0	155		3-5		RI6
0	-2	156			3-5	I6
2	0	157	27			
0	-2	158			01	
2	-2	159		3-2		
2	0	160				
0	-2	161			01	
0	-1	162				
2	0	163	28	1		
1	-2	164			1	
0	-1	165				
0	-1	166				
2	0	167		1		
1	0	168				
1	-2	169	29		1	
0	-1	170				
2	0	171		01		
1	0	172				
0	-2	173			3-2	
2	-2	174		01		
2	0	175	30			
0	-2	176			3-5	R7
2	0	177		3-5		

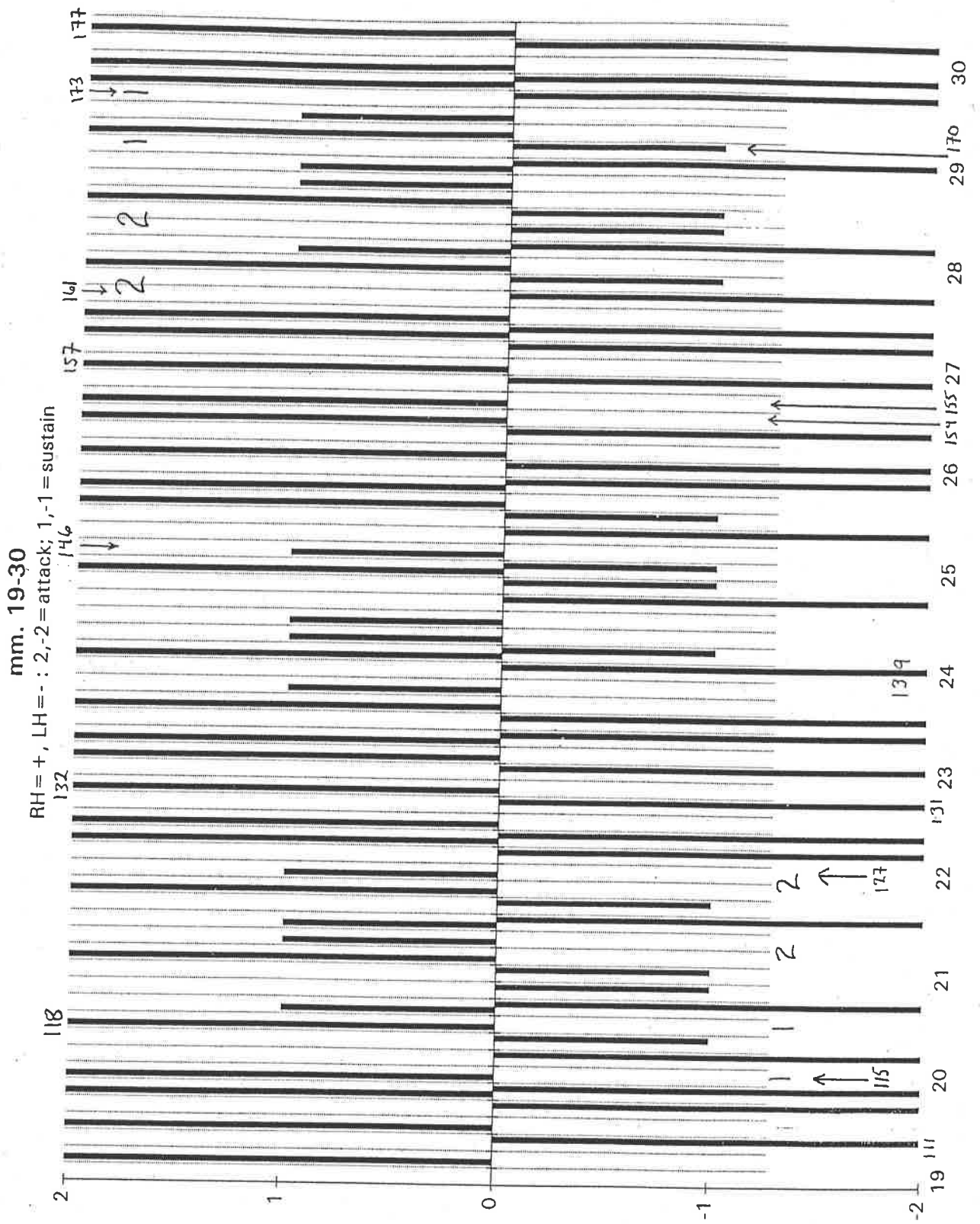
constructed nature of this piece. Like the number of sections in this piece, there are three groups of sustains each with the palindromic pattern 1 2 1. Hence, the concept of three and of the palindrome are reinforced at the smallest detail level.

Sometimes changing line thickness of a graph can allow the viewer a slightly different perspective, allowing for other patterns to reveal themselves. Such is the case with example 15. This portion of the second or development section, is similar to the opening of the piece in that the rhythm of one hand is mirrored over the horizontal axis and then translated to a future gesture of the opposite hand. Example 14 shows us that small gestures, often one or two notes are used in this process. Example 15 reveals that portions of an entire group are reflected over the horizontal axis and then translated over to future sections of the opposite hand many measures away, with slight modifications, however (for this is a development section of course). For instance, the right hand pattern from units 118-146 is a palindrome with a midpoint of unit 132. This entire pattern is reflected over the horizontal axis and translated over to units 139-140 of the left hand. This resulting pattern is slightly augmented by adding 3 units, 154-156, to the structure, thereby forming a palindromic midpoint between units 154 and 155.

Webern is even more clever with the idea of the palindrome in units 111-131 of the left hand and 157-177 of the right hand. The section in the left hand is nearly exactly mimicked by the right hand in the same amount of measures; yet a palindrome exists - not with the patterns of attacks - but with the rests! (Remember that 1 equals a 32nd note; therefore 2 is a sixteenth note). Notice the pattern of unit rests between units 115 and 127 of the left hand - 1 1 2 2. The passage between units 161 and 172 reveals a rest grouping pattern of 2 2 1 1. The entire pattern is therefore 1 1 2 2 2 2 1 1. Aside from Webern's palindromic treatment of these rests, the passages are rhythmically identical.

Example 17 reveals three palindromic structures, each reflected over a vertical axis as opposed to those previously reflected over a horizontal axis. Unit 184 serves as a reflecting point for a palindromic structure between units 178 and 190. Unit 197 is the

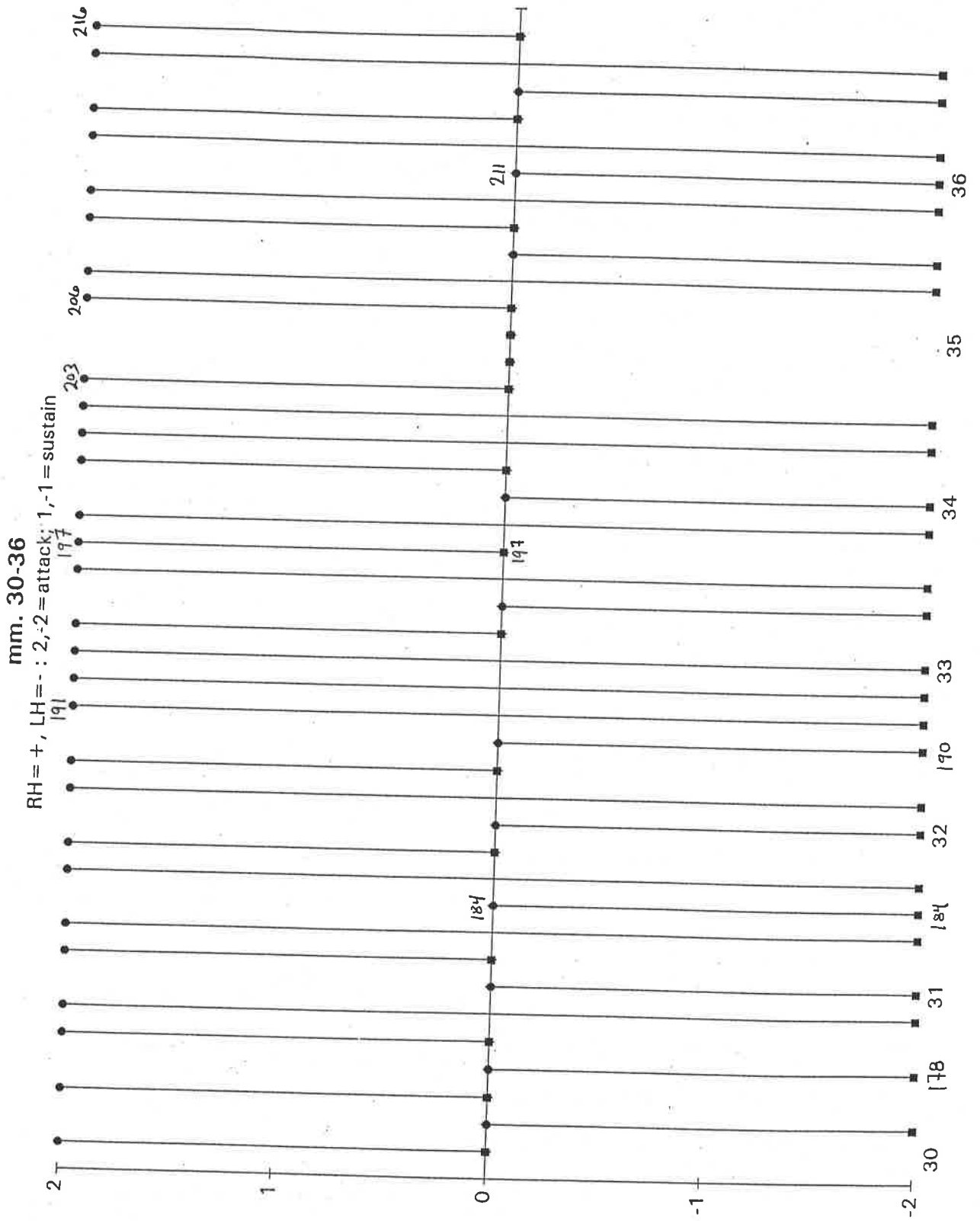
Example 15. Rhythmic Spectra: measures 19-30 (section 2, partial)



Example 16. Rhythmic Spectra Data Chart: measures 30-36 (section 2, partial)

Right Hand	Left Hand	unit	mm.	Set Classes		Simultaneous Row forms
				RH	LH	
2	0	175	30			
0	-2	176			3-5	R7
2	0	177		3-5		
0	-2	178				
2	0	179		3-4		P7
2	-2	180			3-2	
0	-2	181	31			
2	0	182		01		
2	-2	183			06	
0	-2	184				
2	-2	185		01		
2	0	186				
0	-2	187	32		3-2	
2	-2	188		3-4		
2	0	189				
0	-2	190			01	
2	-2	191		3-5		RI11
2	-2	192			01	II1
2	-2	193	33	3-2		
2	0	194				
0	-2	195			01	
2	-2	196		06		
2	0	197				
2	-2	198			01	
0	-2	199	34			
2	0	200		3-2		
2	-2	201			01	
2	-2	202		3-5		R0
2	0	203				
0	0	204				
0	0	205	35			
2	0	206		3-3		P0
2	-2	207			3-2	
0	-2	208				
2	0	209		01		
2	-2	210			06	
0	-2	211	36			
2	-2	212		01		
2	0	213				
0	-2	214			3-2	
2	-2	215		3-3		
2	0	216				

Example 17. Rhythmic Spectra: measures 30-36 (section 2, partial)



reflecting point for a palindrome between units 191 and 203. Unit 211 is the final reflecting point in this series of palindromes, marking the midpoint of a structure from unit 206-216. Again, row forms change at the beginnings of some of the new palindromes - at units 191 and 206.¹⁷

The entire spectra of the first movement allows for a more qualitative approach to an analysis. One might look for general patterns of tension and relaxation, for example. The space between the dots, or the density of the lines, reveal these sorts of qualitative elements of a composition. One element I looked for is how Webern increased the tension of the piece from the first section to the second. Looking at the 2 level of the graph, I discovered a logical progression of groupings of 32nd notes in the right hand. Beginning in measure 19, there is one pair of successive 32nd notes, next time there are 2 pairs and then 3 pairs until we enter the "dense" passage of uninterrupted 32nd notes.

Conclusion

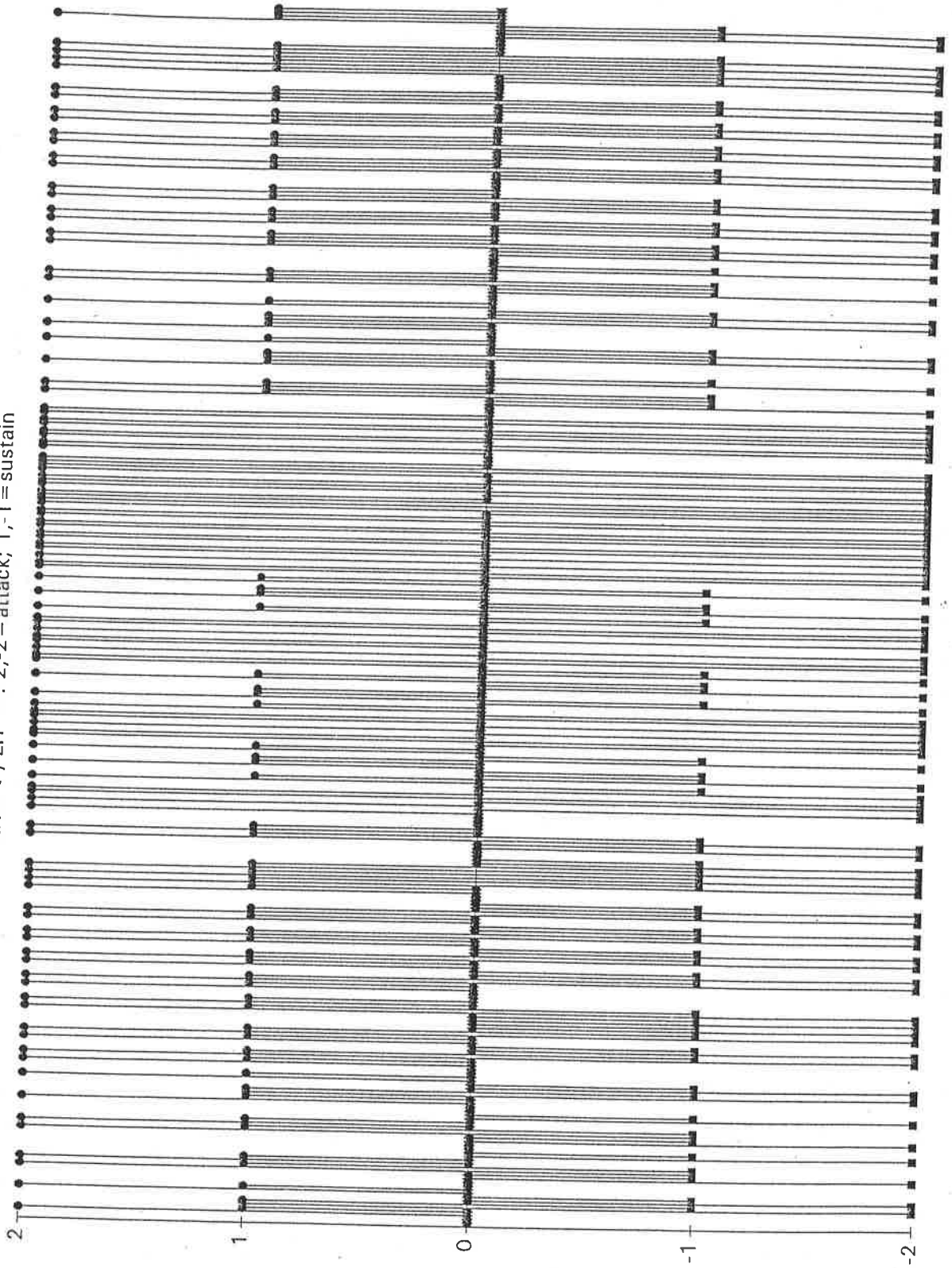
From a *Rhythmic Spectral Analysis* I have revealed many different patterns and spatial relationships of Webern's *Variations*, movement I. His use of a mirroring procedure constantly alters throughout the piece, beginning simply as a mirroring and translating operation and then evolving into an overlapping procedure. As so typical of Webern's music, smaller patterns are nested in larger ones, creating deep cohesion throughout the work. Webern not only mirrors and/or creates palindromic patterns with attack and sustain patterns, but also nested patterns of rests as one observes in example 15.

If one looked at a Forte graph of this movement, could one have visually perceived this information? Could Forte have even discovered some of the smaller nested patterns through his dot and line method? Could he have made qualitative assessments about the entire movement? Probably not, since his graph is a by-product of his numerical analysis, whereas the rhythmic spectra complements chart data, adding to the analytical possibilities. Clearly, the two-dimensional rhythmic spectra is a much more

Example 18. Webern, op. 27/1: Rhythmic Spectra

Webern - Op. 27, I

RH = +, LH = - : 2, -2 = attack; 1, -1 = sustain



effective way for analysis than the one-dimensional dot and line method. I encourage my colleagues to graph other important works in the repertoire using my method to achieve greater understanding of the masterpieces of this century.

Bowling Green, Ohio

¹Hans Moldenhauer, *Anton von Webern: A Chronicle of His Life and Work* (New York: Alfred A. Knopf, Inc., 1978), 473.

²*Ibid.*, 485.

³David Lewin, "A Metrical Problem in Webern's Opus 27," *Journal of Music Theory* 16 (1972): 124-32, is devoted to the first six measures of the second movement; James Rives Jones, "Some Aspects of Rhythm and Meter in Webern's Opus 27," *Perspectives of New Music* 7, no. 1 (1968): 103-9, and Peter Westergaard, "Some Problems in Rhythmic Theory and Analysis," *Perspectives of New Music* 1 (1962): 180-191, concentrate on the beginning of the third movement.

⁴Allen Forte, "Aspects of Rhythm in Webern's Atonal Music," *Music Theory Spectrum* 2 (1980): 90-109.

⁵*Ibid.*, 90-91.

⁶*Ibid.*, 91.

⁷*Ibid.*, 91.

⁸*Ibid.*, 91.

⁹*Ibid.*, 94.

¹⁰*Ibid.*, 95.

¹¹*Ibid.*, 97.

¹²*Ibid.*, 99.

¹³Kathryn Bailey, *The Twelve-Note Music of Anton Webern: Old Forms in a New Language* (Cambridge: Cambridge University Press, 1991), 388-389.

¹⁴Moldenhauer, 485.

¹⁵Bailey, 388-389.

¹⁶*Ibid.*

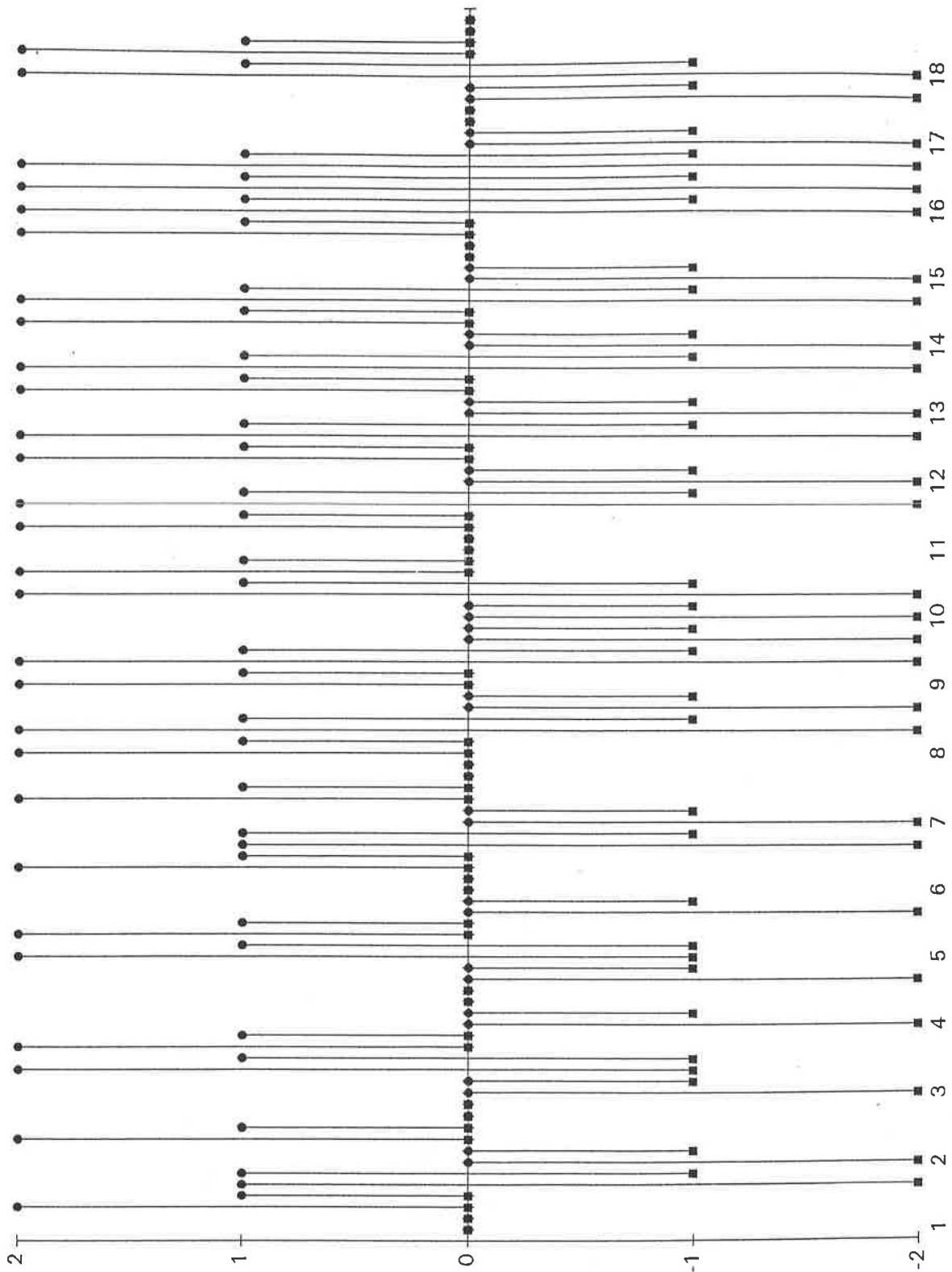
¹⁷*Ibid.*

Appendix

Rhythmic Spectra - Sections 1,2, and 3
Complete Data Chart

mm. 1-18

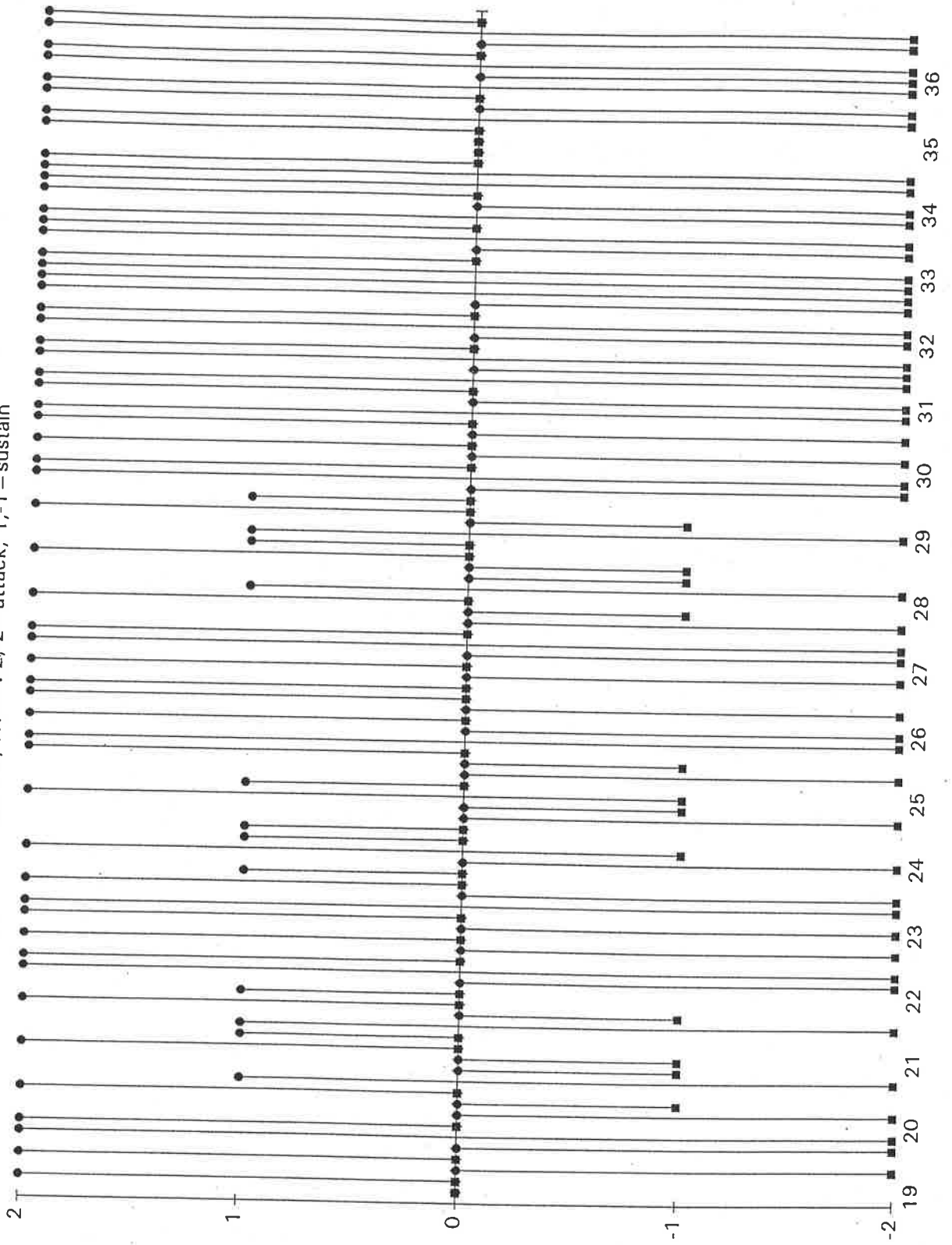
RH = +, LH = - : 2, 2 = attack; 1, 1 = sustain



WEBERN - Op. 27, I

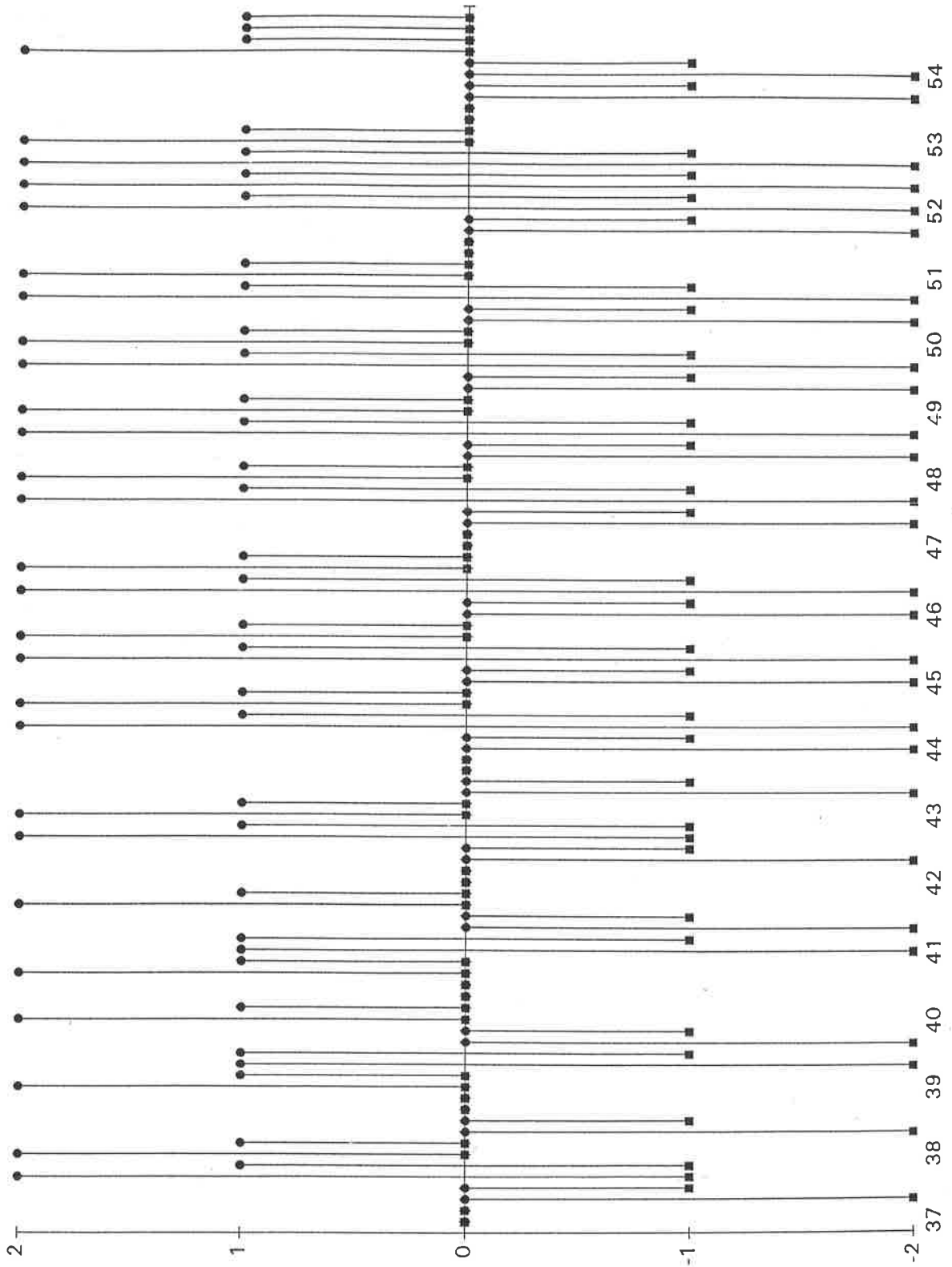
mm. 19-36

RH = +, LH = - : 2, -2 = attack; 1, -1 = sustain



mm. 37-54

RH = +, LH = - : 2, -2 = attack; 1, -1 = sustain



		WEBERN - OP. 27, I				PETERING
				Set Classes		Simultaneous
Right Hand	Left Hand	unit	mm.	RH	LH	Row forms
0	0	1	1			
0	0	2				
2	0	3		3-3		R8
1	0	4				
1	-2	5			3-4	P8
1	-1	6				
0	-2	7	2			
0	-1	8				
2	0	9				
1	0	10				
0	0	11				
0	0	12				
0	-2	13	3		3-1	
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