

Reduced Score in Concert Pitch

Bewegt (d)

2 3 4 5 6

accel. a tempo

Tbn. 3 P mute

C.Bn. 3 sf p

Flatterz. Cl. P

Harp ff

B.Ci. Ppp

Cb. mute

collegno Va. f

Tuba 3

Horn pp

Tbn. 3

E.Dv. pp

S.Dv.

8 9 10 11 12 13 14 15 16

rit. Tempo

Vn. 3

Cel. 3

Flatterz. 3 PP

Horn pp

Tbn. 3

Horn pp

Harp pp

Horn pp

Cb. 3

B.Ci. 3

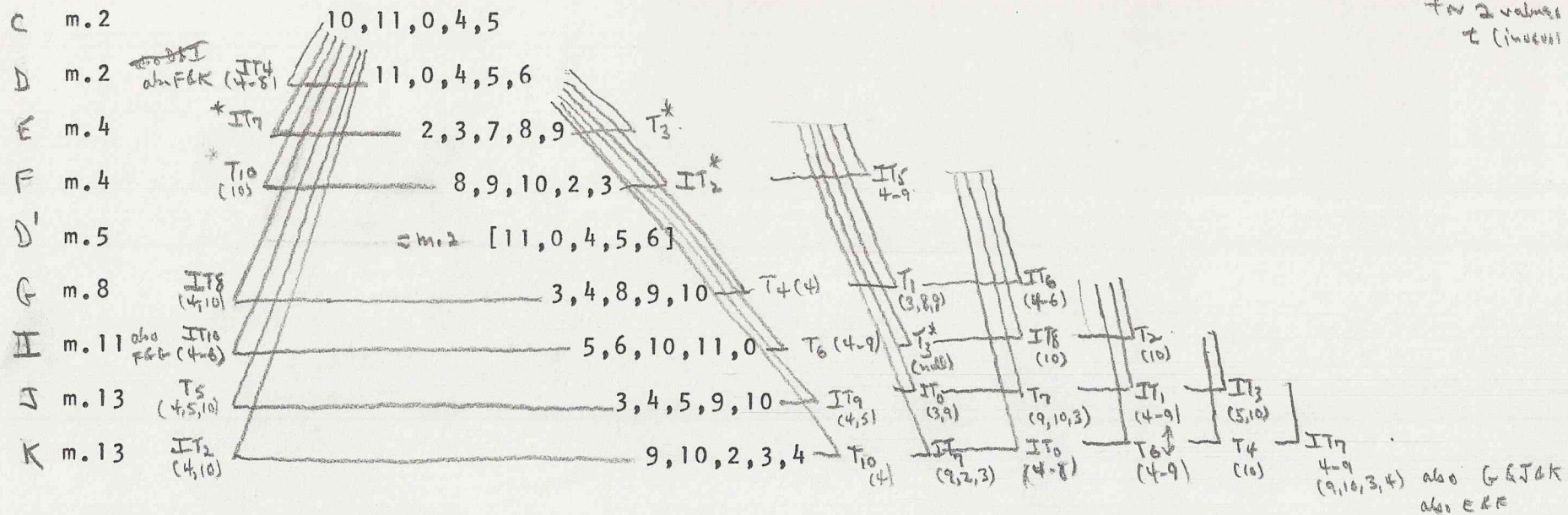
Tbn. 3

Horn pp

Tutti

5-7 More occurrences than any other structural set (9) --preponderant

* 5-7 produces complete ~~form~~
non-invariances under IT
for 3 values of t and
complete invariances under
t for 2 values of
t (invariant pair 3,

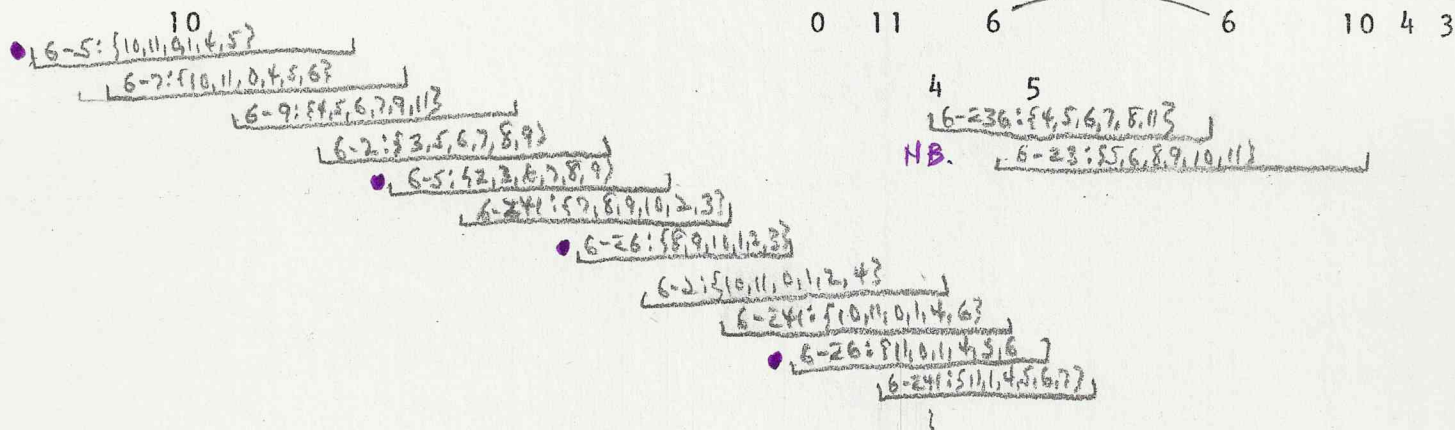
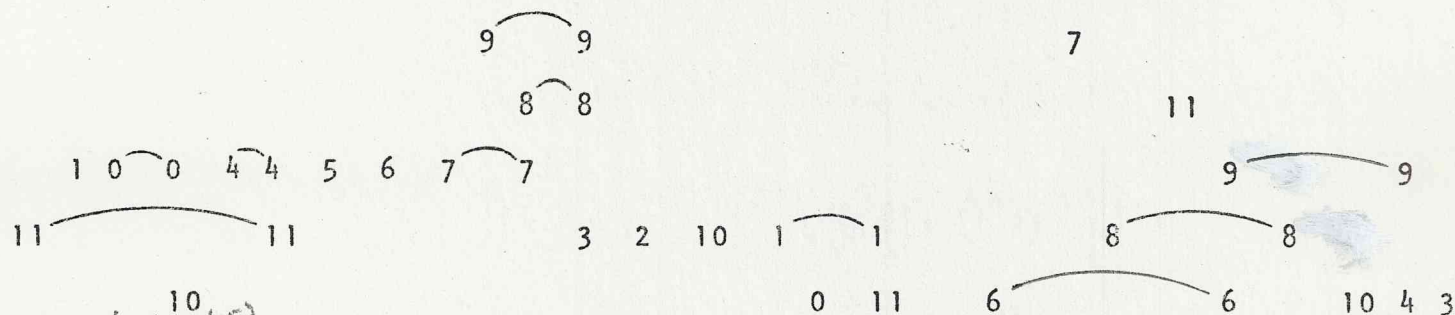


No pcl in any occurrence of 5-7, whereas every occurrence of 5-6 contains pcl.

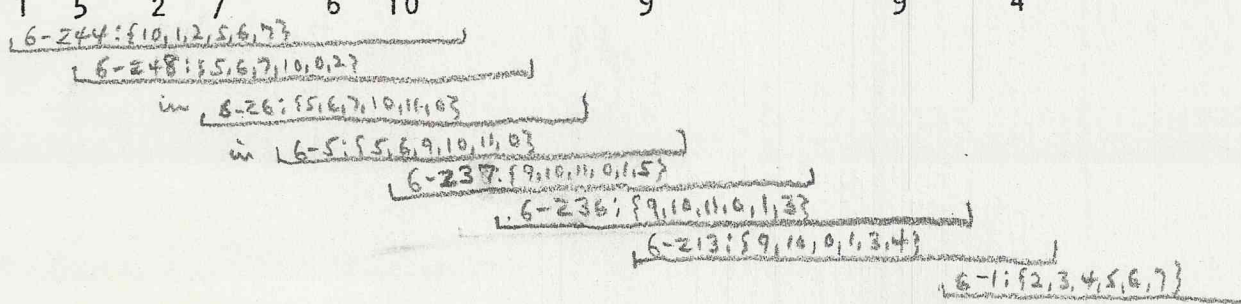
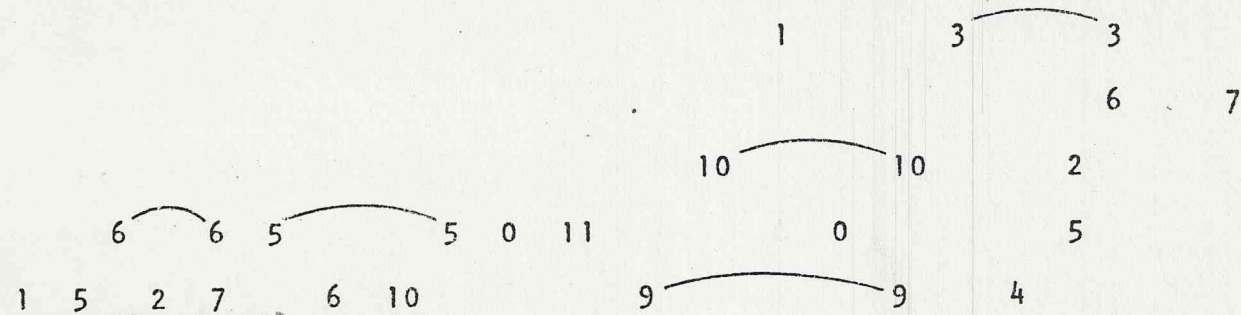
For each form of 5-7 above, all pcs are held invariant over the union of the other forms of 5-7, with the exception of C, which holds only 8,9,2,3 invariant

Segmentation into overlapping hexachords

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8



- 9
- 10
- 11
- 12
- 13
- 14
- 15



Webern, Orchestral Piece, 1913

Segmentation into sets of 4 and 5 notes

- ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

4-9: {0, 4, 5, 6}

4-5: {0, 4, 5, 6}

4-5: {10, 11, 0, 4}

5-7: {2, 3, 7, 8, 9}

5-7: {8, 9, 10, 2, 3}

4-9: {8, 9, 2, 3}

4-5: {4, 5, 6, 7}

4-5: {10, 11, 0, 4}

5-6: {0, 4, 5, 6}

5-6: {11, 0, 1, 4, 5}

4-9: {10, 11, 0, 4}

4-5: {10, 11, 0, 4}

5-7: {10, 11, 0, 4, 5}

5-7: {11, 0, 4, 5, 6}

? 5-6: {2, 3, 6, 7, 8}

add 4-6: {4, 5, 6, 11}

4-8: {11, 0, 4, 5}

add 4-5: {10, 4, 5, 6, 10}

add 4-8: {2, 3, 7, 8}

9 9

8 8

7 7

3 2 10 1 1

8 8

9 9

11

10 10

4-9: {10, 11, 0, 4}

4-5: {10, 11, 0, 4}

5-7: {10, 11, 0, 4, 5}

5-7: {11, 0, 4, 5, 6}

? 5-6: {2, 3, 6, 7, 8}

0 11 6

4 5

5-7: {11, 0, 4, 5, 6}

10 4 3

4-9: {3, 4, 9, 10}

5-7: {3, 4, 8, 9, 10}

- ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

4-9: {1, 2, 5, 6}

4-9: {5, 6, 11, 0}

4-6: {10, 11, 0, 5}

6 6 5 5 0 11

1 5 2 7 6 10

5-6: {1, 2, 5, 6, 7}

5-7: {5, 6, 10, 11, 0}

4-215: {1, 2, 5, 7}

4-9: {3, 4, 9, 10}

1 3 3 6 7

10 10 2

0 5

9 9 4

4-7: {2, 3, 6, 7}

4-215: {1, 3, 6, 7}

5-6: {1, 2, 3, 6, 7}

5-9: {3, 4, 5, 9, 10}

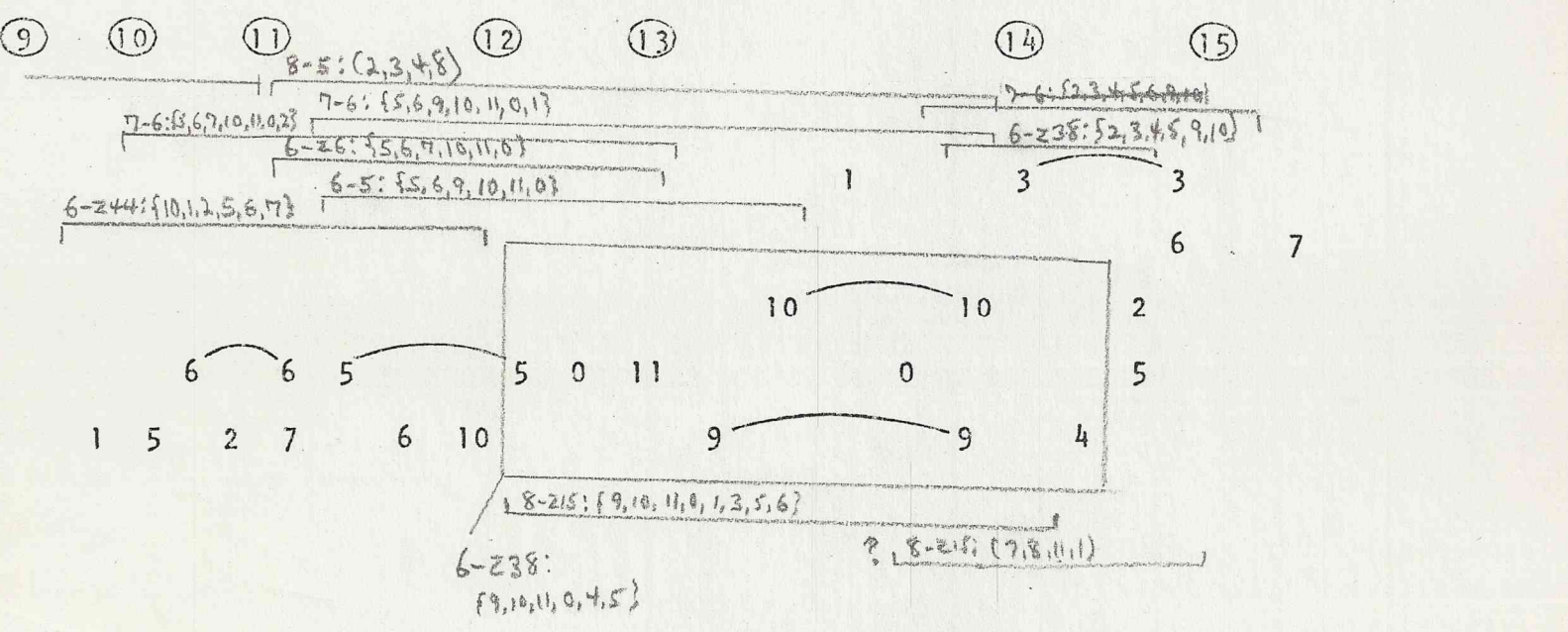
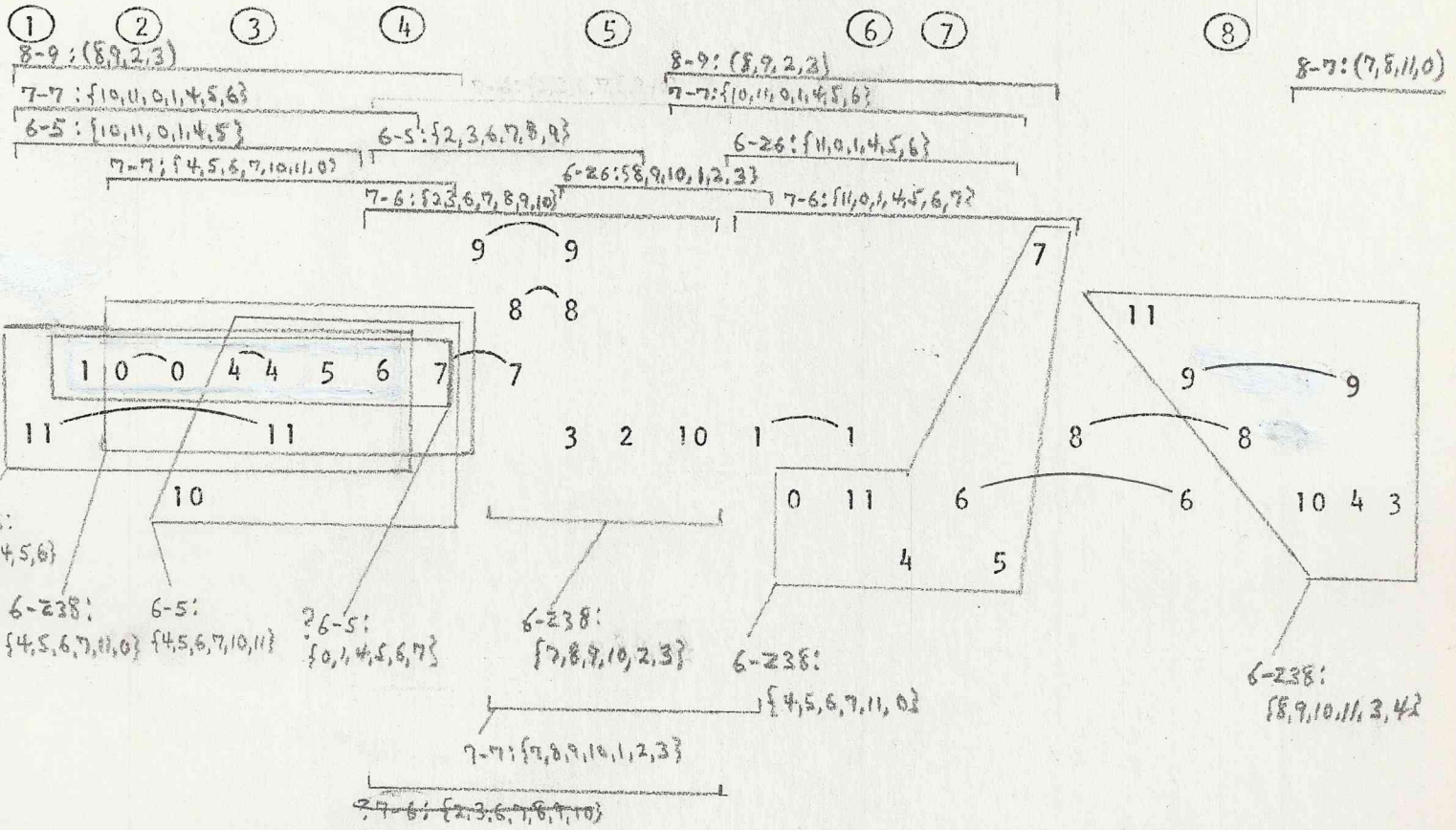
5-7: {9, 10, 2, 3, 4}

? 4-215: {9, 10, 1, 3}

add 4-8: {4, 5, 9, 10}

Webern, Orchestral Piece, 1913

Segmentation into sets of 8, 7, and 6 notes



Webern, Orchestral Piece, 1913

Segmentation by 8-note sets (cont.)

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

9 9
8 8
11 11
1 0 0 4 4 5 6 7 7
3 2 10 1 1
0 11 6 6 10 4 3

8-7: (2,3,8,9)
8-6: (5,1,2,3)
8-1: (0,1,2,3)
8-2: (10,0,1,2)
8-4: (11,0,1,4)
8-8: (11,0,4,8)
8-6: (4,5,6,11)
8-1: (4,5,6,7)
8-5: (3,7,8,9)
8-9: (2,2,8,9)
8-8: (9,10,2,3)
8-11: (10,0,2,3)
8-1: (0,1,2,3)
8-4: (0,1,2,5)
8-23: (0,2,5,7)
8-14: (7,11,0,2)
8-7: (7,8,11,0)
8-2: (8,10,11,0)
8-14

⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

1 3 3
6 6 5 5 0 11
10 10 2
6 7
1 5 2 7 6 10
9 9 4

8-23
8-14
8-7
8-5: (2,3,4,8)
8-13: (2,4,7,8)
8-5: (2,6,7,8)
8-4: (6,7,8,11)
8-14: (4,8,9,11)
8-8: (3,4,5,9)
8-25: (7,8,11,11)
with ped

Webern, Orchestral Piece, 1913

Segmentation into overlapping 7-note sets

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Two large 7-note sets
from A² in m. 7

9 9
8 8
7
11
1 0 0 4 4 5 6 7 7
11 11
3 2 10 1 1
0 11 6 6 10 4 3
9 9

10
m • 7-7: {10, 11, 0, 1, 4, 5, 6}
m • 7-7: {4, 5, 6, 7, 10, 11, 0}
7-2: {4, 5, 6, 7, 8, 9, 10}
7-4: {2, 3, 5, 6, 7, 8, 9}
m • 7-6: {2, 3, 6, 7, 8, 9, 10, 5}
m • 7-7: {7, 8, 9, 10, 1, 2, 3, 3}
7-1: {8, 9, 10, 11, 0, 1, 2, 3, 7}
7-9: {10, 11, 0, 1, 2, 4, 6, 3}
m • 7-7: {10, 11, 0, 1, 4, 5, 6, 7}
m • 7-7: {11, 0, 1, 4, 5, 6, 7, 7}

4 5
7-2: {4, 5, 6, 7, 8, 11, 12}
7-2: {4, 5, 6, 7, 8, 9, 11, 7}
7-1: {5, 6, 7, 8, 9, 10, 11, 7}
7-2: {4, 6, 7, 8, 9, 10, 11, 7}
7-14: {3, 4, 6, 8, 9, 10, 11, 2}
7-39: {1, 3, 4, 6, 8, 9, 10, 7}
7-20: {5, 9, 10, 1, 2, 4, 5, 7}
7-3
7-3

⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

1 3 3
6 7
10 10 2
6 6 5 5 0 11 0 5
1 5 2 7 6 10 9 9 4

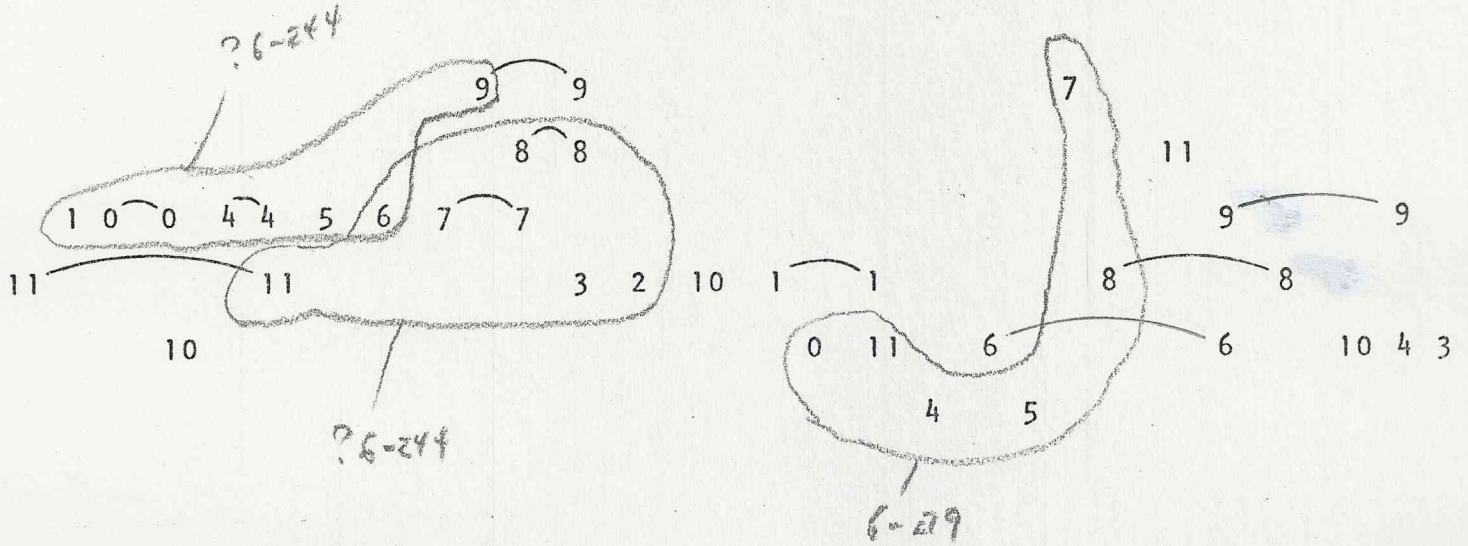
7-29
7-20
7-218
7-3: {1, 2, 3, 4, 5, 6, 9}
7-219: {1, 2, 3, 5, 6, 7, 10, 2}
7-20: {5, 6, 7, 10, 0, 1, 2, 7}
m • 7-6: {5, 5, 9, 10, 11, 0, 1, 7}
7-9: {9, 10, 11, 0, 1, 3, 5, 7}
7-4: {9, 10, 11, 0, 1, 3, 4, 7}
7-14: {9, 10, 0, 2, 3, 4, 5, 7}
m • 7-6: {2, 3, 4, 5, 6, 9, 10, 7}

7-20

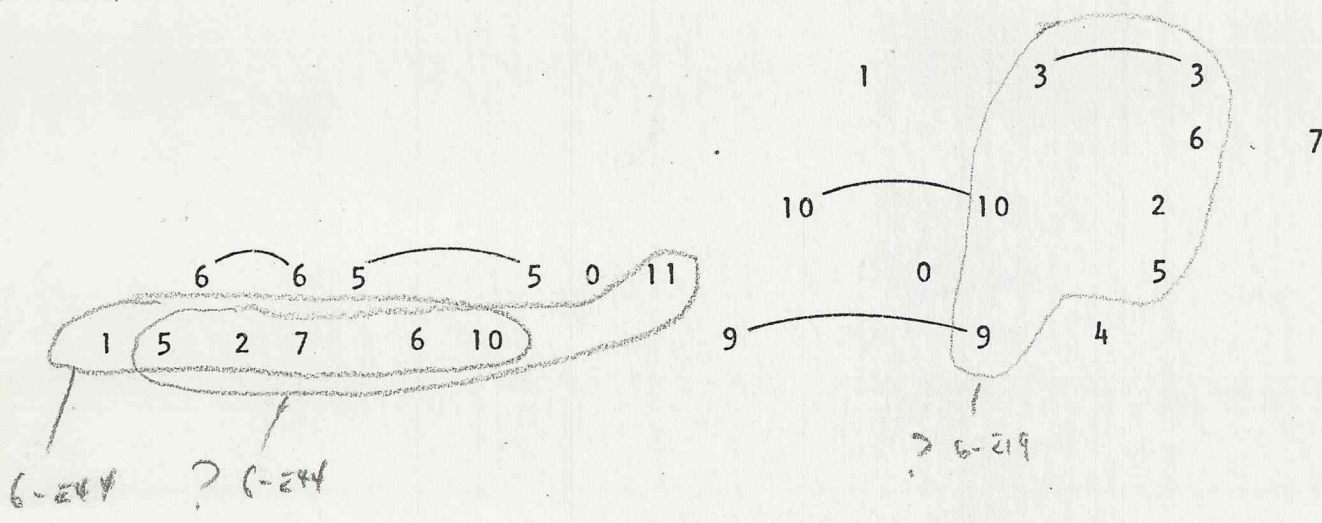
Webern, Orchestral Piece, 1913

6-244/19

- ①
- ②
- ③
- ④
- ⑤
- ⑥
- ⑦
- ⑧

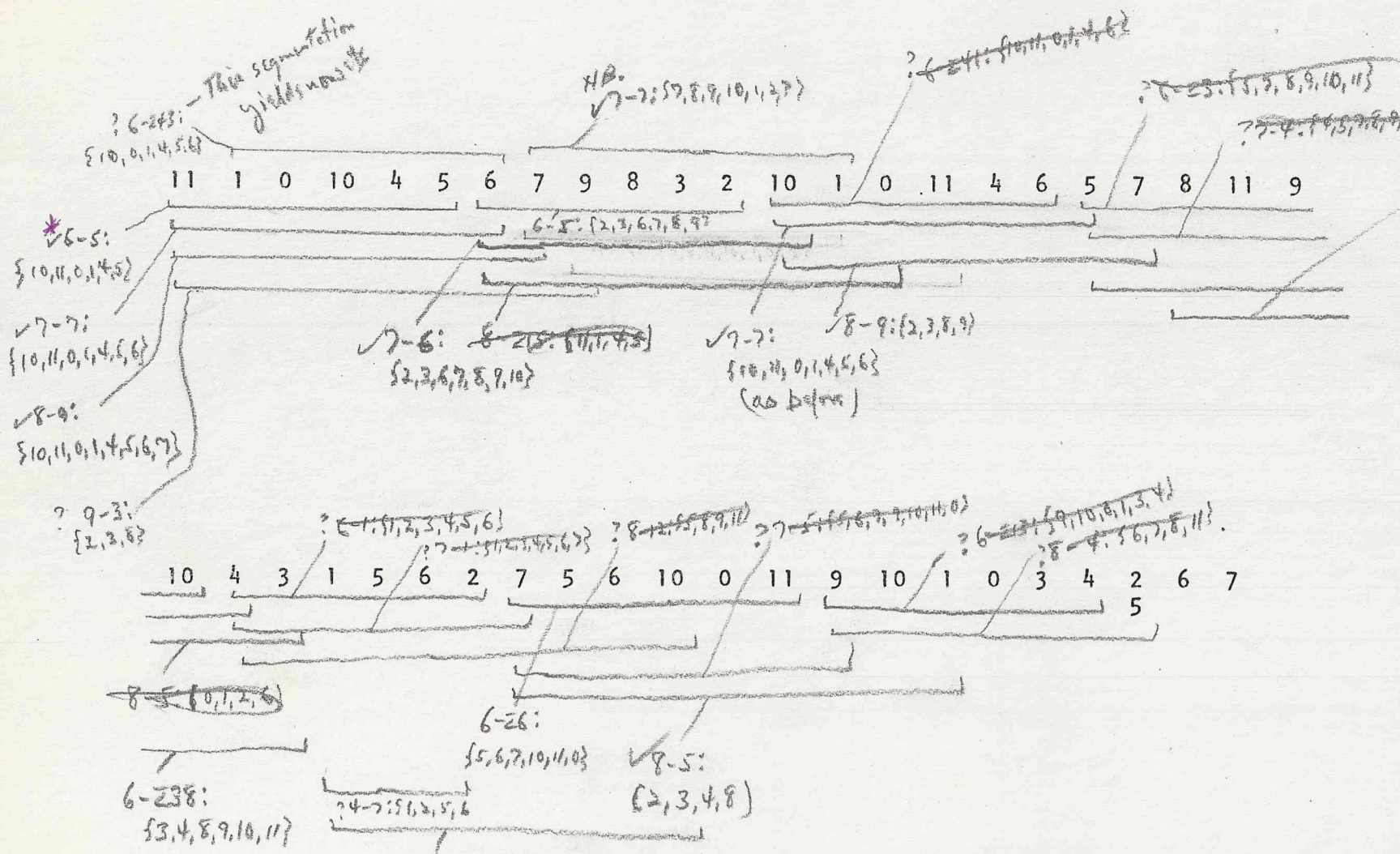


- ⑨
- ⑩
- ⑪
- ⑫
- ⑬
- ⑭
- ⑮



Webern, Orchestral Piece 1913
Attack Succession

Large adjacent (disjunct) segments — The segmentation is not systematic at the end of this piece.



Hexachord-based segmentation begins again here, after completion of 8-9 that begins opening form

* NB. Adjacent forms of 6-5 are literal complements (incipient 12-tone piece?)

Wehemi use of 6-5 and 6-26/28 in the 12-tone works:

6-5 is invariably comb. and one of 3 sets

with max. no. of Bips

* [Op. 12/1 first 12-tone work
6-235/6

Op. 12/2 6-5

Op. 20 6-5

Op. 28 6-5

6-5 and 6-26 in the atonal works:

[Op. 9/1 6-26 and 6-5
Op. 9/3 6-5 (max.)
Op. 9/4 6-5
Op. 10/1 6-26 Op. 10/4
Op. 10/3 6-5 Op. 7/3

4-7: W 9/2

7-7/5-7 in e.g. W 9/5] *

7-7 in W 10/1 and W 10/2

5-7 in Schenberg & Berg

6-5 in Schenberg's Op. 11/2

Check on special properties of 6-5!

special properties of the sets Σ used: no R_1 or R_2 (unique)

5-7 (similarity relations) -- use by Ives and Schoenberg

6-5

• Invariant

(A) 6-26: {11,0,1,4,5,6}
 5-7: {11,0,4,5,6,3}
 Invariant Intersection set is

(D) 6-26: {8,9,10,1,2,3}
 5-7: {8,9,10,2,3}*
 Invariant Intersection set is

(A) 6-26: {11,0,1,4,5,6}
 Intersection set in C again 15-7: {11,0,4,5,6}

no Bb excluded

(F) 6-26: {5,6,9,10,11,0}
 Intersection set is {5,6,9,10,11,0}

Intersection set in 4-8 {4,5,9,10}

non-intersecting

* The union of the two forms of 5-7 excludes pcs 1 and 7 - Note the critical positions of these. There are invariant between sets 11-7 (same dates)

Orchestration

Pc and Instrument Association

Pc Count Instruments

0	4	Tbn., Harp, Vn., Vc.	
1	4	Tbn., Tuba, Cel., [Tbn.]	
2	3	Tuba, Cel., Gt.	
3	3	Tbn., Gt., C.Bn.	
4	4	C.Bn., Horn, Gt., [C.Bn.]	lowest note, m.14 (C.Bn.)
5	5	C.Bn., Tpt., Cel., Vn., Timp.	
6	5	C.Bn., Tbn., Vn., ^{Cel.} B.Cl.	highest note, m.10 (Vn.)
7	4	E.H., Ob., Cel., B.Cl.	
<i>least no</i>	8	Va., Cb.	
9	3	Cl., B.Cl., Harm.	
10	5	Cb., Tuba, Gt., Harp, Cel.	
11	4	B.Cl., Harp, Bn., Vn.	

ORCHESTRATION

Webern, Orchestral Piece 1913

Instruments by entrance

B. Cl. B \flat
 Tbn. D \flat -C \sharp mute
 Cb. B \flat mute, pont., trem.
 C.Bn. E \sharp -F \sharp -F \sharp
 E.H. G \sharp
 Cl. A \sharp trem.
 Va. G \sharp col legno, trem.
 Tbn. E \flat mute, trem.
 Tuba D \flat -B \flat -C \sharp mute
 Harp C \sharp -B \sharp
 Horn E \sharp
 Tbn. G \flat mute
 Tpt. F \sharp mute
 Ob. G \sharp
 Cb. A \flat
 Bn. B \sharp trem.
 B.Cl. A \sharp
 Gt. B \flat -E \sharp -E \flat
 Cel. C \sharp -F \sharp -D \sharp -G \sharp -G \flat -B \flat
 Vn. G \flat -F \sharp -C \sharp -B \sharp mute
 Harm. A \sharp
 Harp B \flat
 Tbn. D \flat trem.
 Vc. C \sharp mute, pont., trem.
 Cb. E \flat harm., trem.
 C.Bn. E \sharp
 Gt. & Timp. D \sharp /F \sharp trem.
 B. Cl. G \flat -G \sharp

Orchestration

Pitch-class, instrument association

(20 pitched instruments)

	Instrument	Pcs.	
	B.Cl.	11, 9, 6, 7	4-11
	Tbn.	1, 0, 3, 6, 1	4-13
	Cb.	10, 8, 3	3-9
m. 4	C.Bn.	4-5-6, 4	3-1
	E.H.	7	
	Cl.	9	
	Va.	8	
	Tuba	2-10-1	3-3
	Harp	0-11, 10	3-1
m. 6-7	Horn	4	
	Tpt.	5	
	Ob.	7	
	Bn.	11	
	B.Cl.	9, 6-7	3-2
	Gt.	10-4-3, 2	4-5
	Cel.	1-5-2-7-6-10	6-244
	Vn.	6-5-0-11	4-9
	Harm.	9	
	Vc.	0	
	Timp.	5	
	WW	4, 5, 6, 7, 9, 11	6-9
	Brass	0, 1, 2, 3, 4, 5, 6, 10	6-2
	Strings	0, 5, 6, 8, 11	5-9
	Gt., Harp, Cel., Harm.	0, 1, 2, 3, 4, 5, 6, 7, 9, 10, 11	(not 8)
	Perc.	5	

Pc 5 played by all groups. Pc 6 played by all but perc.

* Pc 8 played only by strings

A 6-26: 11, 0, 4, 5, 6
 B 6-23F: 4, 5, 6, 11, 0

A 6-26: 11 (1) 0 ~~4~~ 4 5 6
 B.Cl. Tbn Tbn ~~(E.H.)~~ C.Bn. C.Bn. C.Bn.

B 6-23F: ~~11~~ 11 0 ~~4~~ 4 5 6 (7)
 B.Cl. Tbn ~~(E.H.)~~ C.Bn. C.Bn. C.Bn. E.H.

~~C 6-23F: 7, 8, 9, 10, 11, 3~~
~~D 6-26: 8, 9, 10, 1, 2, 3~~

C 6-23F: (7) 9 8 3 2 1 0
 E.H. Cl. Va. Tbn Tbn Tbn

D 6-26: 9 8 3 2 1 0 (1)
 Cl. Va. Tbn. Tbn Tbn Tbn

A' 6-26: (1) 0 11 4 6 5
 Tbn Hp Hp Hn Tbn Tpt
 B' 6-23F: 0 11 4 6 5 (7)
 Hp Hp. Hn Tbn Tpt Ob.

E 6-23F:

8 11 9 10 4 3
 Cb Bn E.Cl. G.T.

F 6-26: 9 5 6 10 0 11
 Cl. Vn. Cl. Cl. Vn. Vn.

G 6-23F: 15 10 11 9 10 ~~4~~ 4
 Vn. Vn. Vn. Horn. Harp. ~~(E.H.)~~ C.Bn.

H 6-23F: 9 10 3 4 2 5
 Horn. Harp. Cl. Cl. Cl. Cl.

6-26

A

11 1 0 4 5 6

D

9 8 3 2 10 1 1

A'

1 0 11 4 6 5 5

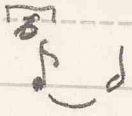
d

	pc
✓ Cb. m. 2	10
✓ Va. m. 4	8
✓ Tuba m. 5	1.
✓ Horn m. 6	4
✓ Oboe m. 7	7
✓ Cb. m. 7	8
✓ Cel. m. 10	5
✓ Cel. m. 10	2
✓ Cel. m. 11	6
✓ Gt. m. 14	2
✓ Trp. m. 14	5

PC and Duration patterns

Tbn. m. 2, pc0

①



Harp. m. 5, pc11

②



Harp. m. 5, pc0; Gt. m. 7, pc3; Gt. m. 8, pc4; Gt. m. 8, pc10. 5-6: {10, 11, 0, 3, 4}

③



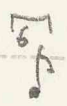
Vn. m. 12, pc0; cel. m. 9, pc1; C. Bn. m. 3, pc5; Vn. m. 12, pc11 4-6: {11, 0, 1, 5}

④



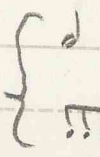
vc. m. 13, pc0; Tbn. m. 4, pc3; cel. m. 11, pc7; cel. m. 11, pc10 4-26: {7, 10, 0, 3}

⑤



Tbn. m. 2, pc1; Tuba m. 5, pc10;

⑥



Tuba m. 5, pc1; Clar. m. 10, pc2; Gt. m. 4, pc2; Horn m. 6, pc4; cel. m. 10, pc5
Timp. m. 14, pc5; cel. m. 11, pc6; Eb. m. 7, pc7; Va. m. 4, pc8; Eb. m. 7, pc8

Cb. m. 2, pc10
Harp. m. 13, pc10

8-13: {9, 11, 0, 3}

⑦



Tbn. m. 3, pc1; Tpt. m. 7, pc5; B. Cl. m. 15, pc7; Bn. m. 7, pc11

4-25: {11, 1, 5, 7}

⑧



Tuba m. 5, pc2

⑨



Cb. m. 14, pc3; Tbn. m. 7, pc6;

⑩



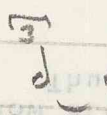
C. Bn. m. 3, pc4;

⑪



C. Bn. m. 14, pc4;

⑫

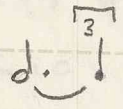



Vn. m. 10, pc5

~~10~~
~~10~~
~~10~~


PC and Duration, Cruttl.

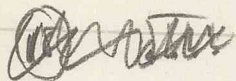
13  C. Br. m. 3, pc 6

14  Vn. m. 10, pc 6

15  B. Cl. m. 14, pc 6
E. Fl. m. 4, pc 7; Harm., m. 3, pc 9

16  Cl. m. 4, pc 9

17  B. Cl. m. 7, pc 9

~~18 ~~

18  B. Cl. m. 2, pc 11

Durations

pc with greatest total duration
pc 6

Begin → Rhythm in case of atonal
music not yet well
understood

18 distinct durations (patterns)

Longest duration

Bfl. m. 2, pc 11

d. o

Vn. m. 10, pc 5

³d d d

Cl. m. 14, pc 3

Tbn. m. 2, pc 6

C. m. 14, pc 4

³d d

[d. d Vn. m. 10, pc 6

* pcs assigned a ~~pattern~~ duration
more than 1 x: pc 2 d d
pc 5 d d

10 durations uniquely
assigned

duration assigned most frequently: d ~~(11x)~~ (11x)

(i.e., overlapping and adjacency)
Combinations of ~~distinct~~ duration patterns serve to differentiate ~~the~~
~~the~~ ~~main~~ set-formations, — importance of sets
classified
above

Duration and pc - add mode of attack? and dynamics?

Pe

0 Tbn.m.2 Harp.m.5 Vn.m.12 Vc.m.13

1 Tbn.m.1 / Cel.m.9 Tbn.m.13

2 Tuba.m.5 Cel.m.10 Gt.m.14 d assigned twice

3 Tbn.m.4 Gt.m.8 Cb.m.14

4 C.Bn.m.3 Horn.m.6 Gt.m.8 C.Bn.m.14

5 C.Bn.m.3 Tpt.m.7 Cel.m.10 Vn.m.10 Timp.m.14 d assigned twice

6 C.Bn.m.3 Tbn.m.7 Vn.m.10 Cel.m.11 B.Cl.m.14 greatest? also highest note and next to lowest

7 E.H.m.4 Ob.m.7 Cel.m.11 B.Cl.m.15

8 Va.m.4 Cl.m.7

9 Cl.m.4 B.Cl.m.7 Harm.m.13

10 Cb.m.2 Tuba.m.5 Gt.m.8 Cel.m.11 Harp.m.13

11 B.Cl.m.1 Harp.m.5 Bn.m.7 Vn.m.12 also pc 1

EX. 5

- A 5-6: {11,0,1,4,5,6}
- B 5-6: {5,0,1,4,5,6}
- C 7-6: {2,3,6,7,8,9,10}
- D 7-7: {7,8,9,10,12,3}
- A' 7-7: {10,11,0,1,4,5,6}
- E 7-7: {11,0,1,4,5,6,7}

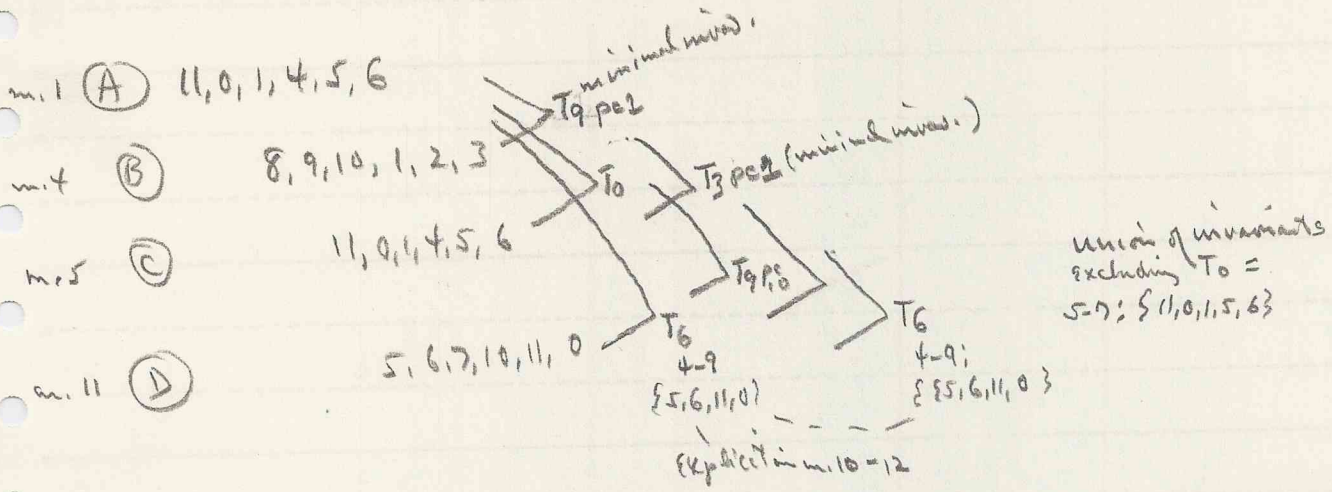
- C 5-7: {10,11,0,4,5}
- D 5-7: {11,0,4,5,6}
- E 5-7: {2,3,7,8,9}
- F 5-7: {8,9,10,2,3}
- D' 5-7: {11,0,4,5,6}
- G 5-7: {3,4,8,9,10}
- H 5-6: {1,2,5,6,7}
- F 7-6: {5,6,9,10,11,0,1}

- I 5-7: {5,6,10,11,0}
- J 5-7: {3,4,5,9,10}
- K 5-7: {9,10,2,3,4}

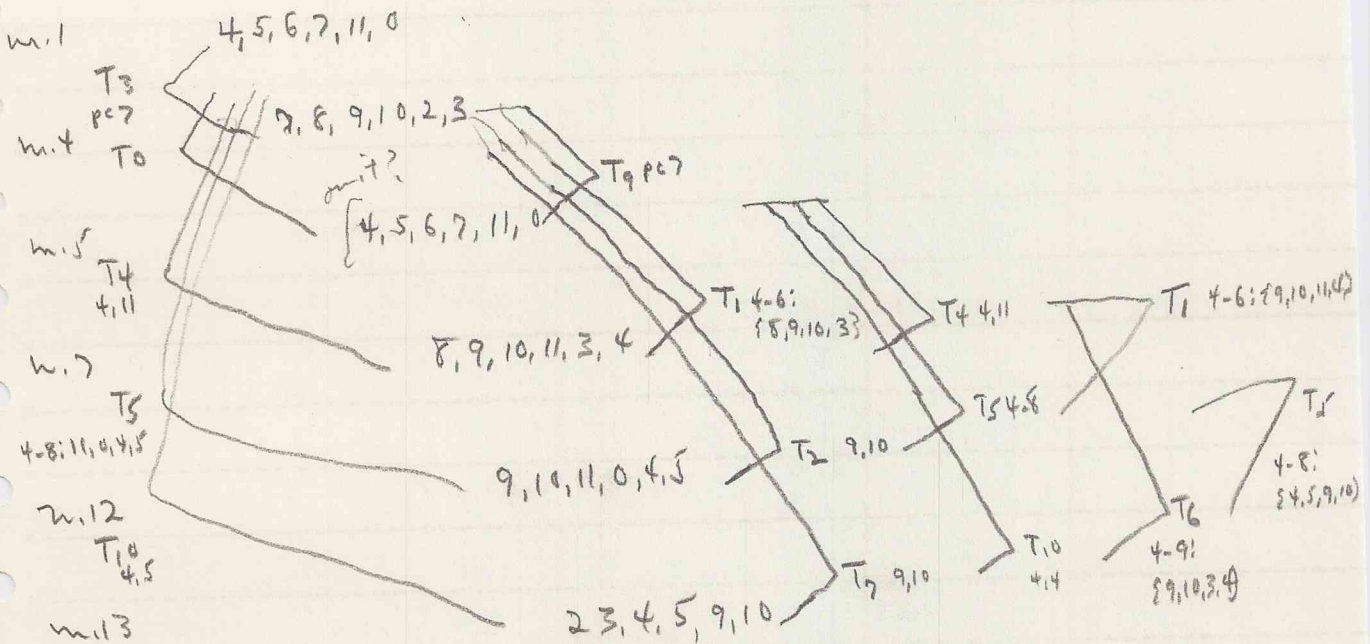
* Spans complete 'section' of extended form

6-26 Relations

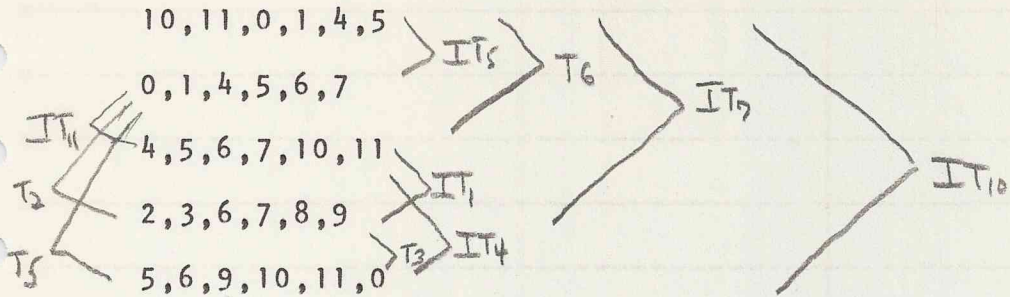
note inverse-related values of #



6-238 Relations (NB. 6-238 is predominant in terms of no. of occurrences)



6-5 relations



5-7 More occurrences than any other structural set (9) ---preponderant

~~m.2 10,11,0,4,5
 m.2 ^{IT4} 11,0,4,5,6
 m.4 2,3,7,8,9
 m.4 8,9,10,2,3
 m.5 {11,0,4,5,6}
 m.8 3,4,8,9,10
 m.11 5,6,10,11,0
 m.13 3,4,5,9,10
 m.13 2,3,4,5,9,10~~

A > IT4
 B > T3
 C > IT5
 D > IT6
 (E) > T3
 F > IT7
 G > IT8
 H > IT9
 I > IT10

11,0,4,5 4-8
 null
 8,9,10,2 4-6
 8,9,2,3 4-9
 10
 5,11
 8,9,2,3 4-9

~~IT4~~
 IT A 0 4 5 10 11
 IT B 0 4 5 6 11
 IT C 2 3 8 9
 IT D 2 3 8 9 11
 IT E 3 4 9 10
 IT G 5 10
 IT I 3 4 9 10

IT 11

~~IT 11~~

9 10 11
 0 1 2 3 4
 5 6 7

C

C & D IT₄ 4-8: {1,0,4,5} contiguous

C & F T₁₀ pc 10

C & G IT₈ pcs 4,10 contiguous

C & I IT₁₀ 4-6: {0,1,0,5} contiguous in I

C & J T₅ 3-5: {4,5,10} contiguous in C

C & K IT₂ pcs. 4,10 contiguous in C

Sum = C: {1,0,4,5}

3-5: {4,5,10}

D

C & D IT₄ 4-8: {1,0,4,5} contiguous

D & G T₄ pc 4

D & I T₆ 4-9: {1,0,5,6} not contiguous

D & J IT₉ pcs 4,5 contiguous

D & K T₁₀ pc 4

Sum = D: {1,0,4,5,6}

E

E & F IT₅ 4-9: {8,9,2,3} contiguous

E & G T₁ 3-5: {3,8,9} contiguous

E & J IT₁₀ pcs 3,9 not contiguous

E & K IT₃ 3-5: {9,2,3} not contiguous

pc 9 fixed

Sum = E: {8,9,2,3}

F

C & F T₁₀ pc 10

E & F IT₅ 4-9: {8,9,2,3} not contiguous

F & G IT₆ 4-6: {8,9,10,3} not contiguous

F & I IT₈ pc 10

F & J T₁ 3-5: {9,10,3} not contiguous

F & K IT₆ 4-8: {9,10,2,3} not contiguous

Sum = F: {8,9,10,2,3}

G Sum = G: {3,4,8,9,10}

C & G IT₈ pcs 4,10 contiguous

D & G T₄ pc 4

E & G T₁ 3-5: {3,8,9} contiguous

F & G IT₆ 4-6: {8,9,10,3} not contiguous

G & I T₂ pc 10

G & J IT₁ 4-9: {3,4,9,10} contiguous

G & K T₆ 4-9: {3,4,9,10} contiguous

I

C & I IT₁₀ 4-8: {10,11,0,5} contiguous in I only

D & I T₆ 4-9: {11,0,5,6} not contiguous

F & I IT₈ pc 10

G & I T₂ pc 10

I & J IT₃ pcs 5,10 contiguous in I only

~~I & K T₄ pc 10~~

Sum = I: {5,6,10,11,0}

J Sum = J: {2,4,5,9,10}

C & J T₅ 3-5: {4,5,10} contiguous

D & J IT₉ pcs 4,5 contiguous in J only

E & J IT₁₀ pcs 3,9 not contiguous

F & J T₇ 3-5: {9,10,3} not contiguous

G & J IT₁ 4-9: {3,4,9,10} contiguous

I & J IT₃ pcs 5,10 contiguous

J & K IT₅ 4-9: {3,4,9,10} contiguous

K Sum = K: {2,7,9,10,2,7,4}

C & K IT₂ pcs 4,10 contiguous in C

D & K T₁₀ pc 4

E & K IT₃ 3-5: {9,2,3} not contiguous

F & K IT₁₀ 4-8: {9,10,2,3} not contiguous

G & K T₆ 4-9: {3,4,9,10} contiguous

J & K IT₅ 4-9: {3,4,9,10} contiguous

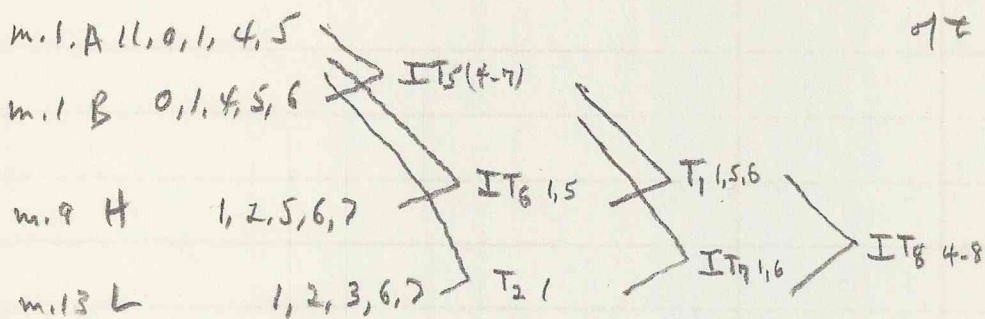
5-6 SFTI A & B	TRANSFORMATION	INVARIANTS	COMMENT
	IT ₅	4-7: 0, 1, 4, 5	contiguous (identical)
A & H	IT ₆	pcs 1, 5	Contiguous in H (first 2 notes)
A & L	T ₂	pc 1	same register
B & H	T ₁	3-4: 1, 5, 6	Contiguous in H
B & L	IT ₇	pcs 1, 6	not contiguous
H & L	IT ₈	4-8: 1, 2, 6, 7	not contiguous

General:

$5 \rightarrow$ no pc 1, ~~note~~
 $5-6$ pc 2 ^{new invariant in context of 5-7 (last pc in the piece)}
 pc 1 fixed over all forms - no pcs 3, 8, 9, 10, 11
 - trans 5-6 and 5-7 differ w/ pc content
 4-8 is only common type of invar. subset

5-6

5-6 produces complete non-inver.
cycles IT (only) for 4 values
of T (cf. 5-7)



SEE OTHER PAGE

5-7

More occurrences than any other structural set (9) - preponderant

- m.2 10,11,0,4,5
- m.2 11,0,4,5,6
- m.4 2,3,7,8,9
- 8,9,10,2,3
- m.5 11,0,4,5,6
- m.8 3,4,8,9,10
- m.11 5,6,10,11,0
- m.13 3,4,5,9,10
- m.13 2,3,4,5,9,10

mark successor & contiguous

Exhaustive list (inversions) for S-3

Successor	Transformation	Inversions	Comment
C & D	IT ₄	4-8: {1, 0, 4, 5}	contig.
C & F	T ₁₀	pc 10	
C & G	IT ₈	pc 5, 10	contig.
C & I	IT ₁₀	4-6: {10, 14, 0, 15}	contig. in I
C & J	T ₅	3-5: {4, 5, 10}	contig. in C
C & K	IT ₂	pc 5, 10	contig. in C
<hr/>			
D & G	T ₄	pc 4	
D & F	T ₆	4-9: {11, 0, 5, 6}	not contiguous
D & J	IT ₉	pc 4, 5	contig.
D & K	T ₁₀	pc 4	
<hr/>			
E & F	IT ₅	4-9: {8, 9, 2, 3}	contig.
E & G	T ₁	pc 3, 8, 9, 1 3-5: {2, 8, 9}	contig.
E & H	T		
E & J	IT ₀	pc 3, 9	not contig.
E & K	IT ₇	3-5: {9, 2, 3}	not contig.
<hr/>			
F & G	IT ₆	4-6: {8, 9, 10, 3}	not contiguous
F & I	IT ₈	pc 10	
F & J	T ₇	3-5: {9, 10, 3}	not contig.
F & K	IT ₀	4-8: {9, 10, 2, 3}	not contig.
<hr/>			
G & I	T ₂	pc 10	
G & J	IT ₁	4-9: {3, 4, 9, 10}	contig.
G & K	T ₆	4-9: {2, 4, 9, 10}	contig.
<hr/>			
H & J	IT ₃	pc 5, 10	
H & K	T ₄	pc 10	
J & K	IT ₇	4-9: {3, 4, 9, 10}	

0155

11054
0167

0156

10146)

03689

01369

23789

5610110

1,6 C & E

1,10 O & E Succession

1,17 F & D Succession

1,4 E & I

1467101

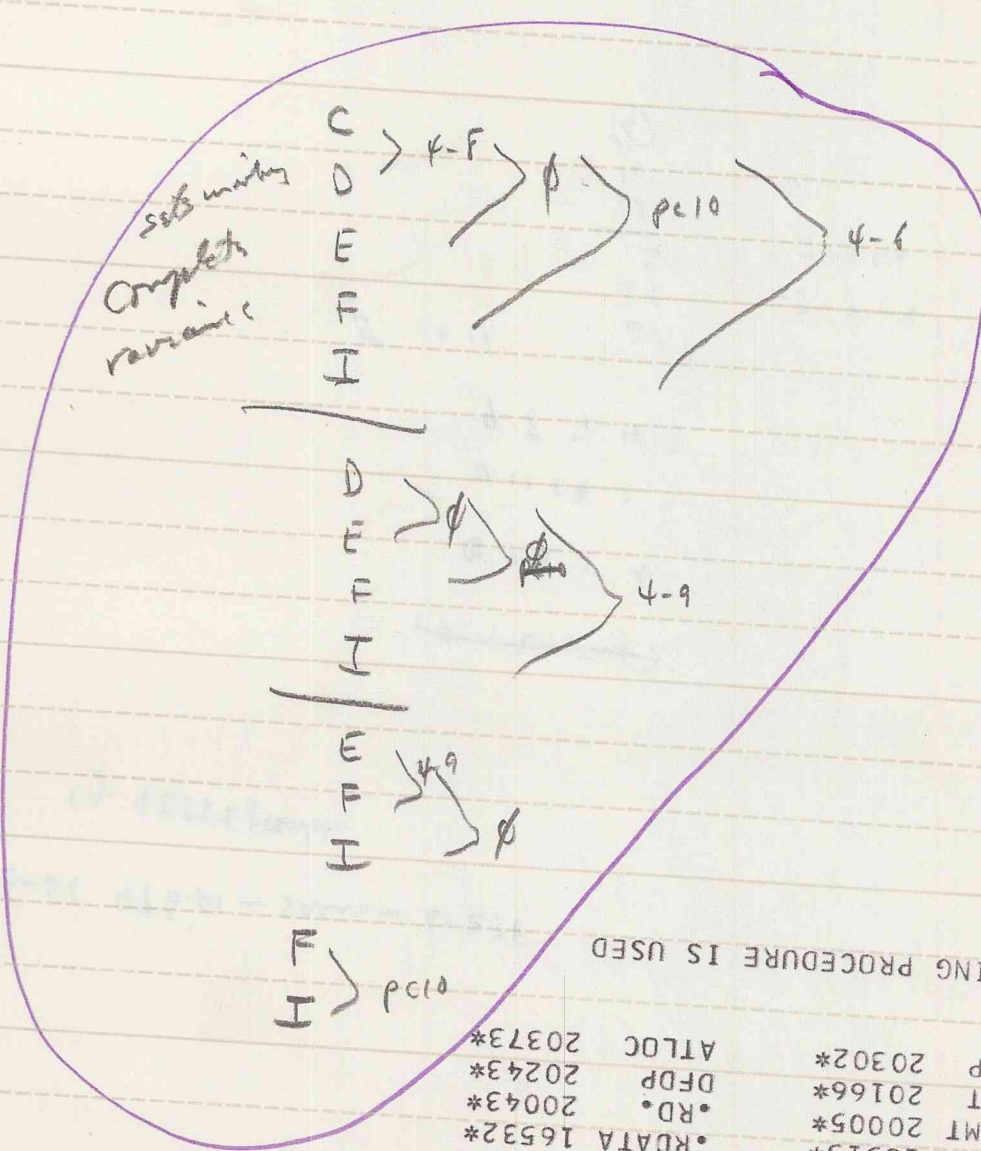
02369

03569

02469

46110

0236



ALL CORE LOADING PROCEDURE IS USED

- SCARDS 00000*
- IRI 11770*
- PCOMT 16513*
- IOFMT 20005*
- EXIT 20166*
- DFPDP 20302*
- SPRINT 00000*
- ERR 16177*
- RDATA 16532*
- RD 20043*
- DFDP 20243*
- ATLOC 20373*

with discussion of 6-5

opening segment

8-9 contains 6-5 4 times. Of these, three forms are represented as ~~contiguous~~ subsegments!

Two contiguous forms of 6-5: literal complements (incipient 12-tone work?)

Other segmentations yield: 8-9 and its complement (literal)
7-7 and its complement (literal)

Other segmentations yield nonsets (by recurrence criterion)
6-Z6 and its complement formed by all pcs excluding Bb in Cb.

Reordering of 8-9 beginning with Tuba Bb in m. 5 is such that only 6-Z6 and 6-Z38 are repeated as contiguous sets.
* (Explain 6-Z38: 4,5,6,7,11,0 as a "contiguous set".

Ex. f

Basic interval patterns for hexachords

	Interval succession	Bip	Number of Permutations
6-Z6			
A m.1: 11 1 0 4 <u>5 6</u>	2-1-4-1-1	11124 (8)	
D m.4: 9 8 3 2 10 ①	1-5-1-4-3	11345 (8)	
A m.5: ① 0 <u>11</u> 4 <u>6 5</u>	1-1-5-2-1	11125 (12)	22 sets
F m.11: <u>(6) 7</u> 5 6 10 0 <u>11</u>	2-1-4-2-1	11224 (8)	31 sets
6-Z38			
B m.1: 0 ^{11 4} 4 11 5 6 ⑦	4-5-6-1-1 1-5-1-1-1	11456 (16) 11115 (4)	
C m.4: ⑦ 9 8 3 2 10	2-1-5-1-4	11245 (16)	
B m.5: 0 11 4 6 5 ⑦	1-5-2-1-2	11225 (12)	
E m.7: ^{8 11 9} 11 9 8 10 ④ 3	2-1-2-6-1 3-2-1-6-1	11236 (4) 11226 (4)	22 sets
G m.12: ⁽⁰⁾ 5 0 11 9 10 4?	5-1-2-1-6	11256 (16)	same interval succession
H m.13: 9 10 3 4 <u>2 5</u>	11-5-1-2-3 or 1-5-1-1-3	11235 (8) 11135 (12)	
6-5			
m.1: 11 1 0 10 4 5	2-1-2-6-1	11226 (6)	
m.1: 1 0 4 5 6 7	1-4-1-1-1	11114 (2)	
m.2: 10 4 11 5 6 7	6-5-6-1-1	11566 (4)	
m.3: 6 7 9 8 3 2	1-2-1-5-1	11125 (6)	
m.11: 5 6 10 0 11 9	1-4-2-1-2	11224 (4)	

All bips contain at least two 1's - check full list

Ex. 10

Handwritten musical notation for measures 1-8. The notation includes treble and bass clefs, notes, and accidentals. Circled annotations include:

- A 4-7: {0, 1, 4, 5}
- B 4-5: {0, 4, 5, 6}
- C 4-5: {10, 11, 0, 4}
- E 4-5: {4, 5, 6, 10}
- G 4-5: {3, 7, 8, 9}
- J 4-5: {4, 8, 9, 10}
- K 4-9: {3, 4, 9, 10}
- H 4-8: {2, 3, 7, 8}
- I 4-9: {5, 8, 9, 2, 3}
- D 4-8: {11, 0, 4, 5}
- E 4-9: {10, 11, 4, 5}

Additional notes: "no line", "8-7", "no line".

Handwritten musical notation for measures 9-16. The notation includes treble and bass clefs, notes, and accidentals. Circled annotations include:

- L 4-215: {1, 4, 5, 7}
- M 4-7: {1, 2, 5, 6}
- N 4-9: {5, 5, 6, 11, 0}
- O 4-8: {5, 5, 6, 10, 0}
- P 4-8: {4, 5, 9, 10}
- Q 4-9: {3, 4, 9, 10}
- R 4-215: {1, 3, 6, 7}
- S 4-7: {2, 3, 6, 7}
- T 4-5: {6, 10, 11, 0}
- U 4-5: {2, 3, 4, 6}
- V 4-8: {3, 4, 8, 9}

Additional notes: "4-6", "no line", "8-8 spans entire section", "Not all 8 with sets omitted. note classes at 4-5-6-7-8-9-10-11-0".

Handwritten note: *no line*

*8-8 spans entire section

Not all 8 with sets omitted. note classes at 4-5-6-7-8-9-10-11-0

Operational relations between forms of 6-5

(Reference is to notational chart)

A: 10,11,0,1,4,5

B: 0,1,4,5,6,7 = T(I(A),5) invariant subset is 4-7: 0,1,4,5

C: 4,5,6,7,10,11 = T(I(B),11) invar. 4-1:4,5,6,7* = T(A,6) invar. 4-9:10,
11,4,5

D: 2,3,6,7,8,9 = T(I(C),1) invar. pcs 6,7**

E: 5,6,9,10,11,0 = T(D,3) invar. pcs 6,9

= T(I(A),7) no invariants --the one value of t at
which 6-5 is inversionally combinatorial
(combinatorial principle not exhibited
in Webern's 12-tone works)

*Since this invariant subset is not a compositional set,
the relation of C to A is regarded as the more significant

**pcs 6,7 are the final two attacks in the piece, but in the context
of 4-7 and 4-215

? Bips for 7-element sets

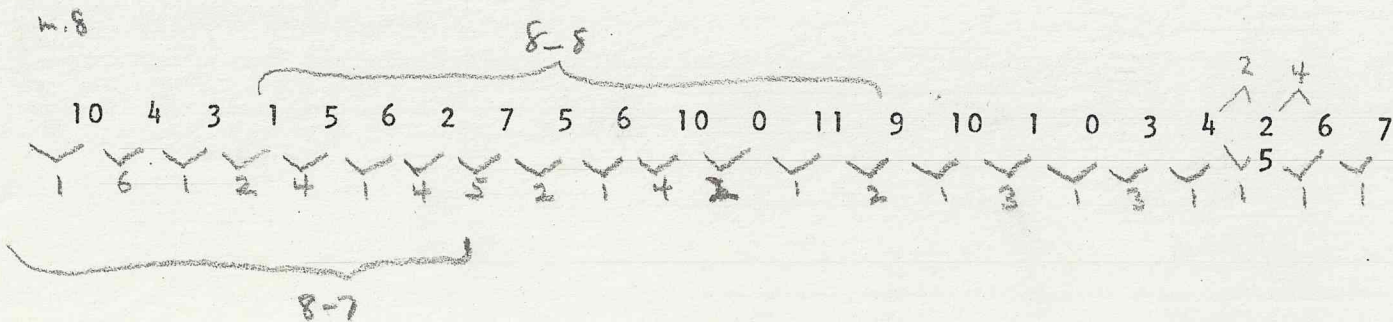
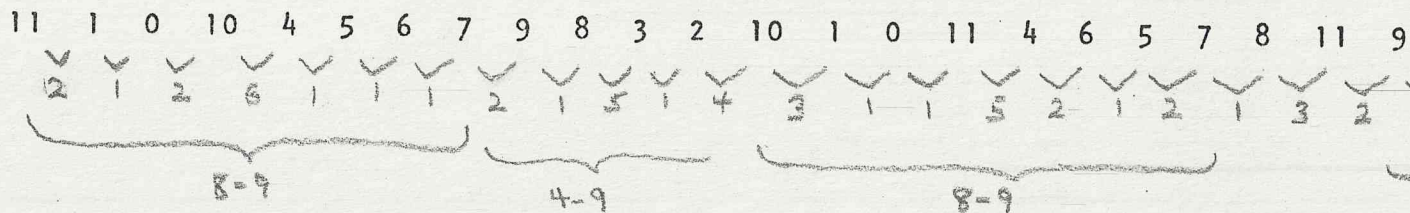
		Interval succession	Bips
7-7	A: 11 1 0 10 4 56	2-1-2- 6 -1-1	11222 111226
	B 0 11 10 4 567	1-1-6-1-1-1	111116
	D 7 9 83 2 10 1	2-1- 5 -1-4-3	112345
	A' 10 1 0 11 4 65	3-1-1-5-2-1	111235
	E 1 0 11 4 65 7	1-1-5-2-1-2	111225

7-6 C 6 7 9 8 3 2 10 1-2-1-5-1-4 111245

F 5 6 10 0 11 91011
↳ no bip

Webern, Orchestral Piece 1913
Attack Succession

and its formed by attack succession



Change order - by ordinal number

Relations among tetrachords
(Reference is to notational chart)

✓ 4-7 complement present (embedded)

A ~~A~~ m.1 0,1,4,5

M ~~B~~ m.9 1,2,5,6 = T(A,1) invariants 1,5

S ~~C~~ m.14 2,3,6,7 = T(~~B~~^M,1) invariants 2,6 = T(A,2) latter is one of 3 transposition levels that produces complete non-invariance

✓ 4-5 (occurs in part 1 only) complement in second part (not embedded)

B ~~A~~ m.1 0,4,5,6

C ~~B~~ m.2 10,11,0,4 = T(I(A),4) invariants 0,4

F ~~C~~ m.2 4,5,6,10 = T(~~B~~^F,6) invariants 4,10 = T(I(A),10) invariants 4,5,6

G ~~D~~ m.4 3,7,8,9 = T(I(C),1) no invars. (1 of 4 values of t) = T(I(B),7) no invars. = T(A,3) no invars. only such t (or t=9)

J ~~E~~ m.8 4,8,9,10 = T(D,1) invariants 8,9 (a prominent dyad)

4-6

A m.2 4,5,6,11

B m.11 10,11,0,5 = T(A,6) invariants 5,11

✓ 4-8 complement present (embedded)

D ~~A~~ m.2 11,0,4,5

H ~~B~~ m.4 2,3,7,8 = T(A,3) no invariants (1 of 4 values of t)

O ~~C~~ m.11 5,6,10,0

P ~~E~~ m.13 4,5,9,10 = T(B,2) no invariants = T(A,5) 2 invariants 4,5

✓ 4-9 complement present (embedded)

E ~~A~~ m.2 10,11,4,5

I ~~B~~ m.4 8,9,2,3 = T(A,10) no invariants 1 of 6 values of t

K ~~C~~ m.8 3,4,9,10 = T(B,7) invariants 3,9

N ~~D~~ m.10 5,6,11,0 First Vn. primary segment = T(C,2) no invariants

Q ~~E~~ m.13 3,4,9,10 = C

✓ 4-215 in part 2 only complement not present

L ~~A~~ m.9 1,2,5,7

R ~~B~~ m.13 1,3,6,7 = T(I(A),8) invariants 1,7 invariants are first and last in both instances

Example 6

Relations among 5 and 7 element sets

Reference is to the notational chart

5-6 pc 1 invariant over all/sum

change all letters

omit

A m.1: 11,0,1,4,5

B m.1: 0,1,4,5,6

H C m.9: 1,2,5,6,7

L D m.13: 1,2,3,6,7

5-7 most frequent ^{3-note} set in the piece

C A m.1: 10,11,0,4,5

D B m.1: 11,0,4,5,6

E C m.4: 2,3,7,8,9

F D m.4: 8,9,10,2,3

D E m.5: 11,0,4,5,6

G F m.8: 3,4,8,9,10

H G m.11: 5,6,10,11,0

J H m.13: 3,4,5,9,10

K I m.13: 9,10,2,3,4

= T(I(A),5) invariants 4-7: 0,1,4,5

= T(B,1) invariants 1,5,6 first 3 in C

= T(I(C),8) invariants 4-8: 1,2,6,7 not a contiguous set in either C or D

= T(I(A),4) invariants 4-8: 11,0,4,5

= T(B,3) no invariants 1 of 2 values of t = literal complex 7-7

= T(I(C),5) invariants 4-9: 8,9,2,3

= T(I(D),2) no invariants 1 of 3 values of t

= T(B,4) invariant 4

= T(F,2) invariant 10 last note of (2+4) - otherwise not special

= T(I(G),3) invariants 5,10 not contiguous

= T(I(H),7) invariants 4-9: 3,4,9,10

7-6

C A m.3: 2,3,6,7,8,9,10

B m.5: 11,0,1,4,5,6,7

B m.9: 5,6,7,10,11,0,2

F B m.11: 5,6,9,10,11,0,1 = T(A,3) invariants 9,10 9,10 contiguous in B, not in A

7-7 only in first part

A m.1: 10,11,0,1,4,5,6

B m.1: 4,5,6,7,10,11,0 = T(A,6) invariants 6-7: 4,5,6,10,11,0 not a str. set

D C m.4: 7,8,9,10,1,2,3 = T(B,3) invariants 7,10 minimal

A D m.5: 10,11,0,1,4,5,6 = A pcs 1,10

E E m.5: 11,0,1,4,5,6,7 = T(I(D),5) invariants 6-26: 11,0,1,4,5,6

Tables not needed

Common triads Rp

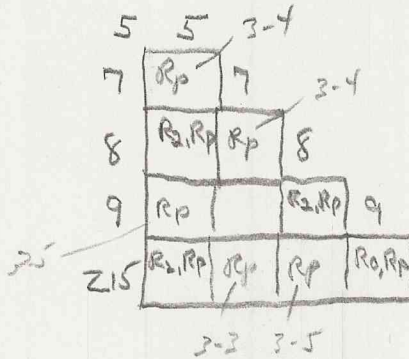
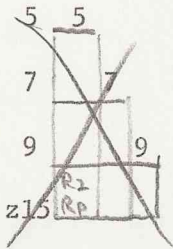
- * ~~4-5 & 4-6~~ 3-4, 3-5 B&D 3-4
G&H 3-4
- ~~4-5 & 4-2/5~~ 2-5, 3-5 no example
- * ~~4-8 & 4-9~~ 3-5 D&E | H&I
- ~~4-9 & 4-2/5~~ 3-5 no example
- ~~4-5 & 4-7~~ 3-4 no example
- * ~~4-5 & 4-9~~ 3-5 C&E, G&I
- * ~~4-7 & 4-8~~ 3-4 A&D
- * ~~4-9 & 4-2/5~~ 3-3 R&S

Webern, 1913 Orchestra Piece (No. 1)

Similarity relations

Cardinal 4

~~4-8~~



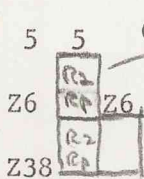
Cardinal 5



Common subsets 4-5, 4-8 (note comments on lipsh, p. 14)

discussion of EX. 9

Cardinal 6



only Common subset is 5-7

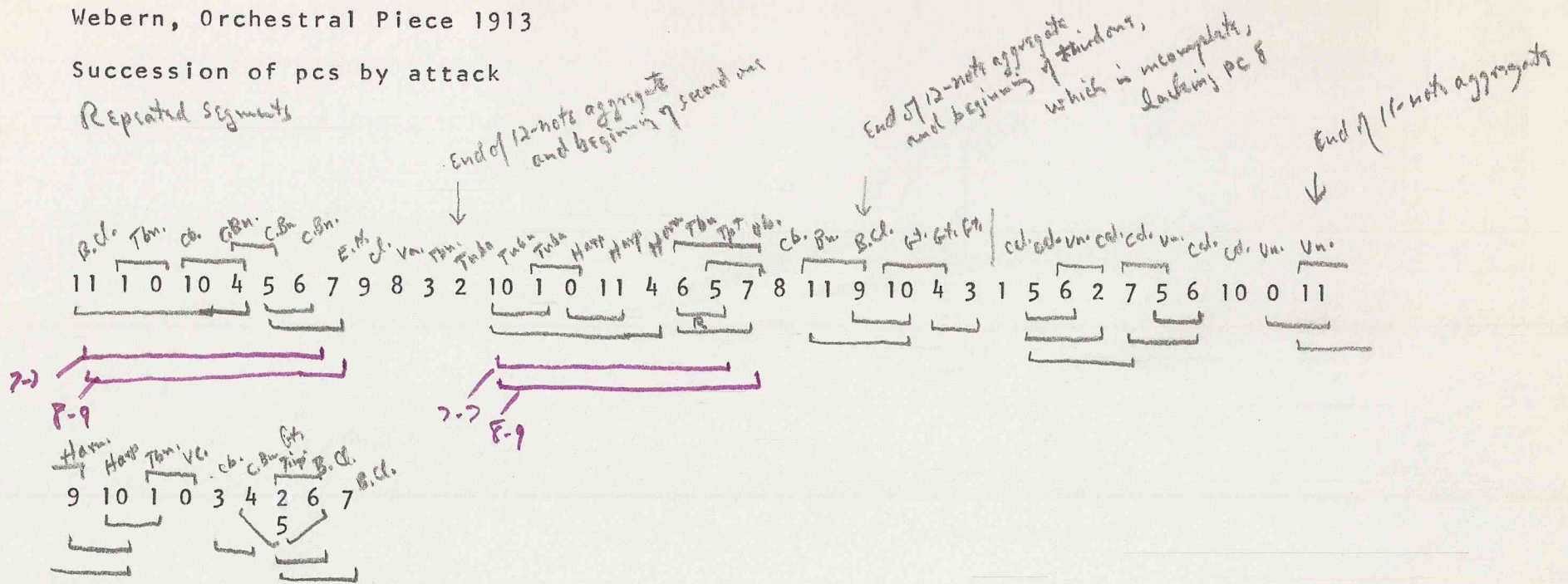
Common subsets 5-5 and 5-7

omit
5-6/5-8
in analysis

Webern, Orchestral Piece 1913

Succession of pcs by attack

Repeated segments



These segments do not form significant structural sets with reference to the entire piece, therefore are to be regarded as "foreground" features at a level closer to the surface of the music. The one exception is 7-7 and 8-9 .

Pc 8 is never a part of a repeated segment. Pc 8 is one of the two missing pcs in the final section — the other is 11

The intervals formed by the dyads are of classes 1, 2, 3, 4, and 6 only

Fixed dyads at formal junctures: 8, 9 in m. 1 and m. 8

6-5
Invariant

ⓑ 0, 4, 5, 6, 7

ⓒ 4, 5, 6, 7, 10, 11

Ⓐ 10, 11, 0, 1, 4, 5

↑ Ⓓ 2, 3, 6, 7, 8, 9

Change of
contour &
register

Ⓔ 5, 6, 9, 10, 11, 0

67 10
v 2 v
018

Outline of remainder of article

~~The 4 and 8-note sets: order relations and invariants
esp. embedded complements
Relation to tetrachords~~

~~Summary: An intricate nesting and intersection, reflected in
The abstract set-complex relations~~

Table

~~Multiple inclusions (see list) - check global invariants~~

~~? 6-5
Similarity relations (see table) - check back on com. invariants for
introduction to tetrachords~~

Pieces Not
1-dimensional

~~? Attack succession and repeated segments in terms of invariants~~

~~Interval succession formed by successive attacks (patterns?)~~

~~Specific set "functions": e.g., 4-Z15 as cadential and 4-9 as
linking~~

Other aspects: Is systematic treatment possible?

Orchestration - cf. sketchbook for 12-tone pieces

Rhythm and tempo changes

Dynamics

Mode of attack

SEE
NOTES

Rel. to sets and set-complex analysis?

? omit PROBLEM OF 6-5

→ serves to point up multiple dimensions - i.e.
the piece is not merely a succession of attacks
(give small example) - not 5-1 in
last 2 measures

Closing comments

Chronology with respect to Schoenberg and Berg (Stravinsky,
Rite!)

Segmentation like Schoenberg (mentioned earlier)

Set usage: 5-7 and 6-Z6 in other works

omit? The case of 6-5 (structural flaw?)

Why not published? -- perhaps too experimental

Check bibliography and references - write notes

Handwritten musical notation for measures 1 through 8. The notation is written on three staves: a treble clef staff at the top, a middle staff with a bass clef, and a bottom staff with a bass clef. Measure numbers 1 through 8 are written above the treble staff. The notes are handwritten and include various accidentals (sharps, flats, naturals) and stems. Some notes are beamed together or have slurs. There are also some vertical lines and symbols in the middle and bottom staves, possibly indicating fingerings or other performance instructions.

Handwritten musical notation for measures 9 through 16. The notation is written on three staves: a treble clef staff at the top, a middle staff with a bass clef, and a bottom staff with a bass clef. Measure numbers 9 through 16 are written above the treble staff. The notes are handwritten and include various accidentals and stems. Some notes are beamed together or have slurs. There are also some vertical lines and symbols in the middle and bottom staves, possibly indicating fingerings or other performance instructions.

EX. 15 (through m. 5 only)

Handwritten musical notation for measures 1-8. The notation includes notes on a grand staff with various annotations:

- Measure 1: Bass clef, notes G2, A2, B2, C3.
- Measure 2: Bass clef, notes G2, A2, B2, C3.
- Measure 3: Bass clef, notes G2, A2, B2, C3.
- Measure 4: Bass clef, notes G2, A2, B2, C3.
- Measure 5: Bass clef, notes G2, A2, B2, C3.
- Measure 6: Bass clef, notes G2, A2, B2, C3.
- Measure 7: Bass clef, notes G2, A2, B2, C3.
- Measure 8: Bass clef, notes G2, A2, B2, C3.

Annotations and diagrams:

- Measure 3: $\checkmark 3-4: 0, 4, 5$ (with arrows pointing to notes)
- Measure 4: $\checkmark 3-5: 11, 4, 5$ (with arrows pointing to notes)
- Measure 5: $\checkmark 3-5: 3, 8, 9$ (with arrows pointing to notes)
- Measure 3-4: $\checkmark 3-5: 10, 11, 4$ (with a bracket below)
- Measure 3-4: $75-7: \{10, 11, 0, 4, 5\}$ (with a bracket below)
- Measure 4-5: $\checkmark 3-4: 3, 7, 8$ (with a bracket below)
- Measure 4-5: $\checkmark 3-5: 2, 3, 8$ (with a bracket below)
- Measure 4-5: $75-7: \{2, 3, 7, 8, 9\}$ (with a bracket below)

Handwritten notes: "more project" (in purple ink, pointing to measure 8).

Handwritten musical notation for measures 9-16. The notation includes notes on a grand staff with various annotations:

- Measure 9: Bass clef, notes G2, A2, B2, C3.
- Measure 10: Bass clef, notes G2, A2, B2, C3.
- Measure 11: Bass clef, notes G2, A2, B2, C3.
- Measure 12: Bass clef, notes G2, A2, B2, C3.
- Measure 13: Bass clef, notes G2, A2, B2, C3.
- Measure 14: Bass clef, notes G2, A2, B2, C3.
- Measure 15: Bass clef, notes G2, A2, B2, C3.
- Measure 16: Bass clef, notes G2, A2, B2, C3.

Annotations:

- Measure 14: $3-3$ (with arrows pointing to notes)

Handwritten musical notation for measures 1 through 8. The notation is arranged in three staves. The top staff is a treble clef, and the middle and bottom staves are bass clefs. Measure numbers 1 through 8 are written above the top staff. The music consists of quarter notes, half notes, and chords, with some notes beamed together. A double bar line is present at the end of measure 8.

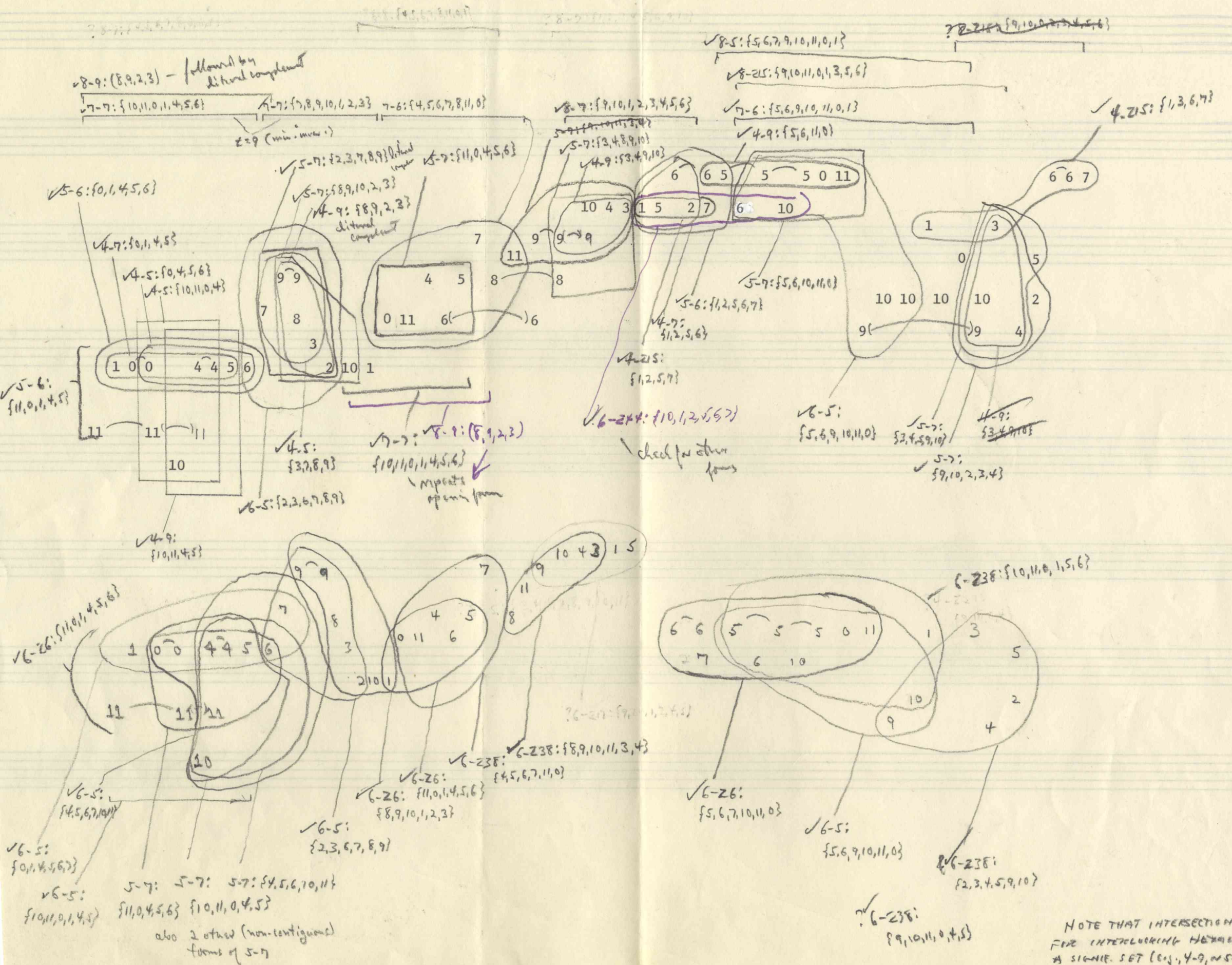
Handwritten musical notation for measures 9 through 16. The notation is arranged in three staves. The top staff is a treble clef, and the middle and bottom staves are bass clefs. Measure numbers 9 through 16 are written above the top staff. The music continues with quarter notes, half notes, and chords. A double bar line is present at the end of measure 16.

Webern, Orchestral Piece 1913
Attack Succession

11 1 0 10 4 5 6 7 9 8 3 2 10 1 0 11 4 6 5 7 8 11 9

10 4 3 1 5 6 2 7 5 6 10 0 11 9 10 1 0 3 4 2 6 7
5

See new numerical chapter



NOTE THAT INTERSECTION SET FOR INTERLOCKING HERMANN HAS A SIGNIF. SET (0,5,4,9,11,5,2) IN MANY CASES

Comparison with Op.10 pieces presumably written at the same time (Moldenhauer):

- Op.10/1 far more dense, with conventional segmentation
- Op.10/2 far more complex, mainly a tetrachord piece
- Op.10/3 features ostinato figures-segmentation not complicated
- Op.10/4 shorter than the orchestral piece 1913--perhaps the shortest piece ever written! segmentation relatively uncomplicated (in my book)
- Op.10/5 far more dense, segmentation uncomplicated

In sum, the op.10 pieces are either denser or more complicated ~~xxx~~ and do not present the segmentation problems that this piece does (in particular, the fact of only one instance of a simultaneous attack in two instruments)

The piece may have been a true "experiment" that Webern for some reason decided did not "work."

There are also specific structural "problems"-- e.g., the conflict/ambiguity of 6-Z6/38 and 6-5, although similar situations are not untypical of atonal music in general--but perhaps not so extreme as here.

*This list is misleading
in case of Z-related hexachords*

PARALLEL LIST

READ FROM YCC 352

FEB 6 1971 1'12 2718

Webern, Orchestral Piece, 1913

- ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

9 9
8 8
1 0 0 4 4 5 6 7 7
11 11
10
3 2 10 1 1
0 11
4 5
7
11
9 9
8 8
6 6
10 4 3

- ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

1 3 3
6 7
10 10
2
6 6 5 5 0 11
0
5
1 5 2 7 6 10
9 9 4

Handwritten musical notation for measures 1 through 8. The notation is written on three staves: a treble clef staff at the top, a bass clef staff in the middle, and another bass clef staff at the bottom. Measure numbers 1 through 8 are written above the top staff. The music consists of various notes, rests, and accidentals (sharps and flats) across the staves.

Handwritten musical notation for measures 9 through 16. The notation is written on three staves: a treble clef staff at the top, a bass clef staff in the middle, and another bass clef staff at the bottom. Measure numbers 9 through 16 are written above the top staff. The music continues with notes, rests, and accidentals, including some triplets in measures 10 and 11.

Webern, 1913 Orchestral Piece

Subsets of 6-5

4-5 2x
~~4-5~~
 4-7 1x
 4-9 1x
 4-Z15 1x
 5-6 1x
 5-7 1x

Subsets of 6-Z6

4-5 2x
 4-7 1x
~~4-8~~ 2x
 4-9 1x
 4-Z15 2x
 5-6 2x
 5-7 2x

Subsets of 6-Z38

4-5 2x
 4-7 —
~~4-8~~ 2x
 4-9 1x
 4-Z15 —
 5-6 —
 5-7 2x

Subsets of 8-5

6-Z6 1x
 6-Z38 1x
 7-6 1x
 7-7 1x
 6-5 2x

5-6 3x
 5-7 5x (min: two are
 044w)

Subsets of 8-7

6-5 2x
 6-Z6 —
 6-Z38 1x
 7-6 2x
~~7-7~~
 5-6 2x
 5-7 2x

Subsets of 8-9

6-5 4x
 6-Z6 2x
 6-Z38 2x
 7-6 —
 7-7 4x
 5-6 4x
 5-7 8x

(8-9 contains only 7-7 and 7-9)

Subsets of 8-Z15

6-5 1x
 6-Z6 —
 6-Z38 1x
 7-6 1x
 7-7 —
 5-6 1x
 5-7 2x

Subsets of 7-6

4-5 3x
 4-7 1x
 4-9 1x
 4-Z15 1x
 6-5 1x
 6-Z6 —
 6-Z38 1x

4-8 2x

Subsets of 7-7

4-5 5x
 4-7 1x
 4-9 2x
 4-Z15 2x
 6-5 1x
 6-Z6 1x
 6-Z38 1x

4-8 3x

Subsets of 8-8

6-5 2x
 6-Z6 2x
 6-Z38 2x
 7-6 2x
 7-7 2x
 5-6 4x
 5-7 4x