Serial Composition

Background

Serial compositions are based on a row that the composer decides upon in advance. To create a serial row, the composer places all twelve notes of the chromatic scale in an order of her choosing, making sure that none are repeated. Serial (or twelve-tone) compositions replace traditional harmony and counterpoint by basing both chords and melodies on this row. By combining inverted and retrograded (backwards) forms of the row, composers can use up to 48 permutations of the original row.

There are two very different uses of this technique in the anthology:

- Webern Quartet - 'classic' serialism which is very strict and austere but has the same sort of beauty as a crystal with its tightly organized structure
- Goldsmith music from *Planet of the Apes* - much looser use of serialism in order to create threatening music for this sci fi film.

Webern – Quartet Op. 22 (p. 160 in the anthology)

The serial material used in this piece is outlined in the matrix below. The original row is P0 (prime form), and the 11 possible transpositions can be read from left to right (P1, P10 etc.). The primes are laid out in a funny order to allow the inversions to be put in the same matrix. to be put in the same table. There are also twelve retrogrades (read from right to left), inversions (read from top to bottom) and retrograde inversions (read from bottom to top).

Explanation of serial matrix

Abbr.	Term	Explanation
P	Prime	The **original** form of the row
		P0 is the un-transposed row (starting on C) from which everything is worked out. P1 is the same series of pitches transposed up one semitone, P2 is transposed up two semitones etc.
R	Retrograde	The **backwards** form of the row.
		R0 is P0 but played starting from the end and working back to the beginning. The retrogrades are read from the right to the left of the matrix.
I	Inversion	The **mirror** form of the row.
		If P goes up a semitone, for example, its inversion will go down a semitone. Inversions are read down the columns of the matrix. I0 is the inversion starting on the same note as P0, I1 is transposed up a semitone etc.
RI	Retrograde inversion	The **mirror** form of the row but **backwards**.
		RI0 is I0 but played starting from the end. Retrograde inversions are read backwards from the bottom to the top of the matrix

	I_1	I_4	I_5	I_2	I_3	I_{11}	I_{10}	I_9	I_8	I_6	I_0	I_7	
P_1	c#	e	f	d	d#	b	bb	a	ab	f#	C	g	R_1
P_{10}	bb	c#	d	b	C	ab	g	f#	f	d#	a	e	R_{10}
P_9	a	C	c#	bb	b	g	f#	f	e	d	ab	d#	R_9
P_0	C	d#	e	c#	d	bb	a	ab	g	f	b	f#	R_0
P_{11}	b	d	d#	C	c#	a	ab	g	f#	e	bb	f	R_{11}
P_3	d#	f#	g	e	f	c#	C	b	bb	ab	d	a	R_3
P_4	e	g	ab	f	f#	d	c#	C	b	a	d#	bb	R_4
P_5	f	ab	a	f#	g	d#	d	c#	C	bb	e	b	R_5
P_6	f#	a	bb	g	ab	e	d#	d	c#	b	f	C	R_6
P_8	ab	b	C	a	bb	f#	f	e	d#	c#	g	d	R_8
P_2	d	f	f#	d#	e	C	b	bb	a	g	c#	ab	R_2
P_7	g	bb	b	ab	a	f	e	d#	d	C	f#	c#	R_7
	RI_1	RI_4	RI_5	RI_2	RI_3	RI_{11}	RI_{10}	RI_9	RI_8	RI_6	RI_0	RI_7	

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Webern writes his quartet as a series of mirror canons. A mirror canon is like a normal canon but the imitating part is inverted. In a serial piece this means that a prime form of the row is played in canon (i.e. in staggered entries) with an inversion. This relatively simple technique looks more complicated on the score because Webern keeps swapping the line from one instrument to another. This can be seen in the example below, from the opening. The canon starts in the saxophone with an inversion (I1), imitated in mirror form in the violin (P11). These lines then both pass to the piano before passing back to the sax and violin, after which they overlap in the clarinet part before going back to the piano:

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The whole piece is structured in this way as follows:

Introduction (bb. 1-5)

- Mirror canon passes between instruments in *Klangfarben* melody (P11/I1)
- Introduces main rhythmic ideas that then dominate the piece

A – Exposition (bb. 5-15)

- Saxophone plays melody (P1/P7 overlapping on G at end of bar 10)
- Accompaniment is mirror canon passing between piano and violin/clarinet (P5/I7 & I1/P11)

B – Development (bb. 16-27)

- Starts with mirror canon (I10 / P2) passing between instruments
- Passing between instruments intensifies in bar 20 (P1/I11), reaching maximum textural density at the end of bar 22 (P0/I0)
- Accompaniment is mirror canon passing between piano and violin/clarinet

A' – Recapitulation (bb. 28-37)

- Same row forms as in exposition but now with 'melody' (P1) distributed across top three instruments accompanied by piano in mirror canon on the other pairs of rows (P5/I7 & I1/P11).
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ACTION: try constructing your own row matrix and then writing some contrapuntal music based upon it. There are lots of online tools for generating row matrices, for example
http://composertools.com/Tools/matrix/MatrixCalc.html

Goldsmith – *Planet of the Apes* (p. 388 in the anthology)

The film composer Jerry Goldsmith uses serial techniques in much looser way in order to create the sense of an unknown and dangerous world in his film score for *Planet of the Apes.* In this film, some astronauts crash on a planet on which apes dominate a race of mute humans. The alien and frightening atmosphere of this world is evoked by the strange dissonant music.

Goldsmith creates chords as well as melodies from the row. For example, the four-note chords (tetrachords) in the strings at the opening help to create the dissonant and uncomfortable harmonic language.

However, Goldsmith modifies the modernist technique of serialism by using row fragments (rather than whole rows), repeated notes (which are usually avoided in by serial composers) and ostinato. In combination, these modifications create clearer tonal centres (see table above). The harsh dissonances created by serial techniques perhaps become easier to assimilate without losing their dramatic impact, particularly as the tonal centres show some relatively traditional relationships (C to G are tonic and dominant, and Eb is a third away, a common relationship in Romantic music). He also writes sections and lines that are not strictly serial, which also helps to give some parts of the music a rather more traditional feel. The matrix of possible row forms that Goldsmith might use is shown below (see explanation of row matrix for Webern on p. 2 above for more details):

	I_0	I_9	I_{10}	I_3	I_2	I_{11}	I_1	I_8	I_6	I_7	I_4	I_5	
P_0	C	A	Bb	Eb	D	B	C#	G#	F#	G	E	F	R_0
P_3	Eb	C	C#	F#	F	D	E	B	A	Bb	G	G#	R_3
P_2	D	B	C	F	E	C#	Eb	Bb	G#	A	F#	G	R_2
P_9	A	F#	G	C	B	G#	Bb	F	Eb	E	C#	D	R_9
P_{10}	Bb	G	G#	C#	C	A	B	F#	E	F	D	Eb	R_{10}
P_1	C#	Bb	B	E	Eb	C	D	A	G	G#	F	F#	R_1
P_{11}	B	G#	A	D	C#	Bb	C	G	F	F#	Eb	E	R_{11}
P_4	E	C#	D	G	F#	Eb	F	C	Bb	B	G#	A	R_4
P_6	F#	Eb	E	A	G#	F	G	D	C	C#	Bb	B	R_6
P_5	F	D	Eb	G#	G	E	F#	C#	B	C	A	Bb	R_5
P_8	G#	F	F#	B	Bb	G	A	E	D	Eb	C	C#	R_8
P_7	G	E	F	Bb	A	F#	G#	Eb	C#	D	B	C	R_7
	RI_0	RI_9	RI_{10}	RI_3	RI_2	RI_{11}	RI_1	RI_8	RI_6	RI_7	RI_4	RI_5	

An example of how Goldsmith uses the row can be seen right at the beginning of the piece. The ostinato in the wind parts (doubled in lower strings not shown) consists of three four-note chords. Each chord consists of three notes from the prime form of the row P0. So the first chord is C,A, Bb, Eb (the first four notes), the second is D,B,C#,G# (the second four notes) and so on. Goldsmith gives the ostinato a sense of a tonal centre by adding the repeated Cs in the timpani and piano. The ostinato is interrupted in bar four but a new idea, which will later also be an ostinato, which consists of the first six notes of P0:
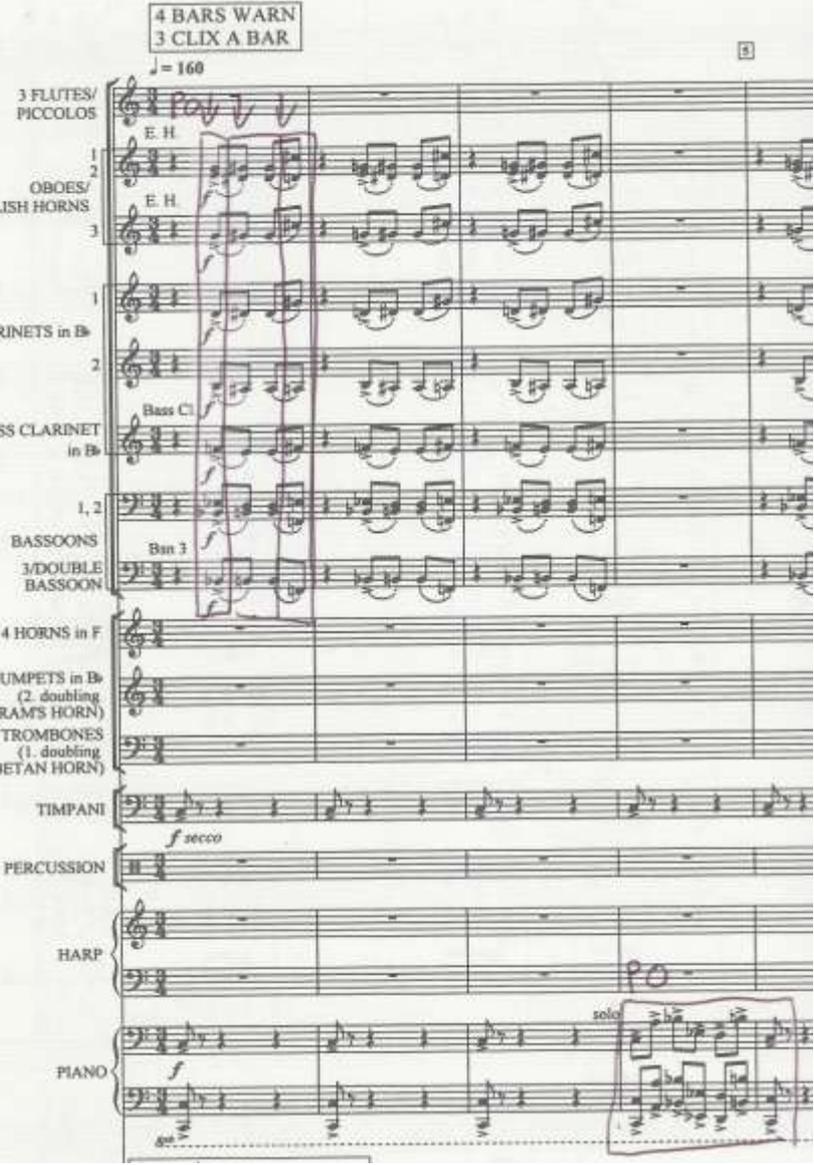
Over the page, Goldsmith transposes the six-note idea from bar 4 to create a new ostinato, which is this time the first six notes of P7. He repeats the first two notes (G and E) in the right hand of the piano to give it a tonal centre, again underpinning this with a G bass note in the lower strings. Against this, the violins enter very quietly with a C# from the beginning of R8, the next three notes of which are used to create a dissonant flourish in the xylophone, doubled in the upper woodwind (not shown).

A final way in which Goldsmith gives this serial material a more traditional feel is the relationships between sections in terms of their tonal centres. The opening ten bars are centred around C and then the following section, shown here, is centred around G, suggesting a tonic-dominant relationship.

Over the page is a table summarising the musical depiction of the action in this piece – use it to explore further ideas.

ACTION: Generating a row matrix (http://composertools.com/Tools/matrix/MatrixCalc.html) and use it to create some music for a scene for a horror or sci-fi film.

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Bar	Action	Musical Features (including use of row)	Tonal centre
1	Mutes start running …	Ostinato 1 (3 tetrachords from P0) with piano interruptions at b. 4 (P0 1st hexachord) and b. 8 (P0 entire)	C
8	- humans start running	- heterophonic link bar (not based on row)	
11	Chase continues …	First hexachord of P7 turned into piano Ostinato 2 (each note alternates with repeating E/G dyad) Interjection figure on strings ending in 3-note flourish (R8: b .11 - 1st tetrachord; b. 15 - 2nd tc; b. 19 – 3rd tc)	G
16		- new cross rhythm in congas	
22	- beaters start		
23	Beaters appear …	Ostinato 2 in wind and harp (P3) R10 against it in bassoon. Interjection figure on trombone ending in cluster (P3)	Eb
26		- stop for one bar of Ostinato 1 (P3)	
27	- mutes turn and run	- Ostinato 2 restarts now with RI8 in bassoons	
30	- humans stop	- stop for two bars of Ostinato 1 (P3)	
32	- humans turn and run	- Ostinato 2 restarts, now I3 in bassoons	
35		- stop for three bars of Ostinato 1 (P3)	
38	Cuts to mutes fleeing …	Ostinato 2 (P3)	Eb-
39		- Ostinato 2 (P6)	D?
40		- R2 moves down orchestra in sustained notes to build a 12-tone chord	
42	- guns fire	- stabbing 12 note chord (descending three note motif in trumpets)	
44	- humans drop to floor	- descending 5-note chromatic scale	
45	Panicked running …	Ostinato 2 (P0) returns but is now 8 notes long. Against it there is a pointillistic texture incl. xylophone [vn. and xylo. play P11]	C
52	Apes wheel round to face camera …	Motivically derived ideas: rams horn plays rising fifth; ascending semitone motif in bass	Eb
55	- horses spurred into action	- rising chromatic scale to triplet ostinato in semitones around G and other heterophonically similar elements [galloping horse cliché]	
59	Chase continues …	Ostinato 2 (P7 – 8-note version) on piano details picked out in lower strings emphasize G. Interjection figure on trumpets end in flourish (R2: b. 63 - 1st tc; b. 67 – 2nd tc; b. 71 – 3rd tc) False harmonics on violin electric harp	G
74	First net sets trap …	Dissonant two-part counterpoint. RI0 is distributed across parts. Vibraslap starts.	?
84	Second net lifted on ape command …	Ostinato 3 (loosely based on row) starts up in lower strings against insistent semitone clashes in upper strings and woodwind [fades out]	D?