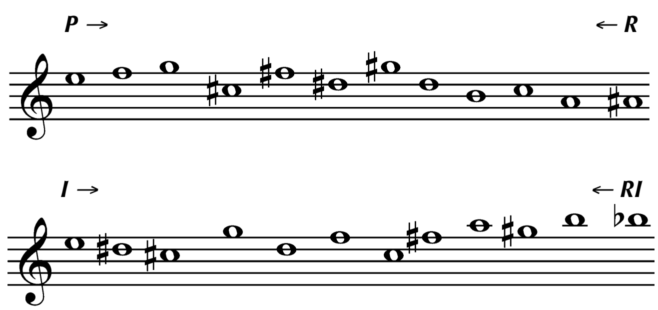
Overview, and Context[1]

The 12-note method of composition was developed by Arnold Schoenberg over a period leading up to the fall of 1921, growing out of his desire to establish a methodology for composing atonal music.

Schoenberg's method stipulates that only one basic set be used in a composition, promoting unity ('the basic set functions in the manner of a motive'[2]), and that octave doublings and the over-emphasis of any particular pitch class be avoided to minimize the "danger" of interpreting such tones as roots or tonics.

In 12-tone technique (a.k.a. dodecaphony; "classic" serialism), the 12 different pitch classes of the chromatic scale are arranged in a particular order (known as the **prime form**, abbreviated **P**), and the resulting series is manipulated according to the wishes of the composer in order to create a composition. Any given series will yield three corollaries through the process of **inversion** (**I**), **retrograde** (**R**), and **retrograde-inversion** (**RI**); each of these may in turn be transposed to begin on any of the remaining 11 pitch classes. The resultant **matrix** of 48 distinct but related forms of the series constitutes all the possible pitch material available for a strict 12-tone composition; most works composed in this manner employ considerably fewer forms, however.

From: **Schoenberg, *Suite,* op. 25** (1923)



Row Analysis

The goal in row analysis is to better understand its musical implications.

1. A good place to start is to **create a 12-tone matrix** (fill in remaining pitches & row labels):

	↓ I-0											
P-0 →	E	F	G	C#	F#	D#	G#	D	B	C	A	A#	**← R-0**
P-12	D#												
P-9	C#												
P-3	G												
P-10	D												
P-1	F												
P-8	C												
P-2	F#												
P-5	A												
P-4	G#												
P-7	B												
P-6	A#												
	↑ RI-0												

2. **Play or sing the row** several times in order to get a feel for it as a musical idea.

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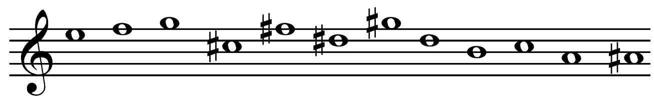
1 Adapted from my contributions to the "Serialism" article in the Encyclopedia of Music in Canada.

2 Arnold Schoenberg, "Composition with Twelve Tones (1)" (1941), in *Style and Idea*, Faber, 1975; p.219.



3. **Look for patterns**:

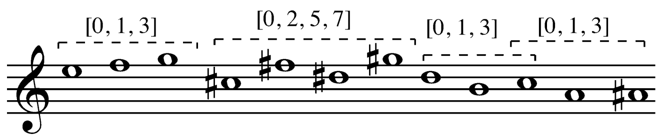
• This row begins with the first 3 notes of a Phrygian mode.

• Following a tritone skip, it then has two ascending 4ths sequenced ↑ by whole tone.

• Following another tritone skip, this is followed by a three-note figure (↓ m3rd ↑ m2nd) that is sequenced down by step (with last/first note elision = C).

• Each of the three segments identified above are separated by a tritone (including the Bb – E tritone between the last note of the 2nd sequence and the 1st note of the scalar trichord).

4. **Do set-theory analyses** of segments or patterns, if applicable. This row contains three segments with a prime form of [0, 1, 3], the first trichord of a Phrygian mode:



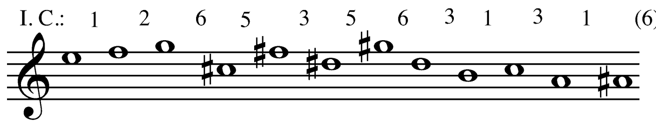
☞ More comprehensive set theory analyses are advisable, and entail calculating the prime form for *every* trichord, tetrachord, pentachord, and possibly longer sets as well, beginning with the 1st note, then the 2nd, then the 3rd, and so on. For example (fill in the last two columns yourself):

Trichords	**Prime Form**	**Tetrachords**	**Prime Form**	**Pentachords**	**Prime Form**
E F G	0, 1, 3	E F G C#	0, 2, 3, 6	E F G C# F#	0, 1, 2, 3, 6
F G C#	0, 2, 6	F G C# F#	0, 1, 2, 6	etc.	
G C# F#	0, 1, 6	G C# F# D#	0, 1, 4, 6		
C# F# D#	0, 2, 5	C# F# D# G#	0, 2, 5, 7		
F# D# G#	0, 2, 5	F# D# G# D	0, 1, 4, 6		
D# G# D	0, 1, 6	D# G# D B	0, 1, 4, 7		
G# D B	0, 3, 6	G# D B C	0, 2, 3, 6		
D B C	0, 1, 3	D B C A	0, 2, 3, 5		
B C A	0, 1, 3	B C A A#	0, 1, 2, 3		
C A A#	0, 1, 3	(C A A# E	0, 1, 3, 7)		
(A A# E	0, 1, 6)	(A A# E F	0, 1, 5, 6)		
(A# E F	0, 1, 6)	(A# E F G	0, 1, 3, 6)		

• **Observations and Conclusions:** The above shows us that [0, 1, 3] actually occurs *four* times, as does [0, 1, 6], if you include the (bracketed) sets that "wrap around" from the end of the row to the beginning. These two sets, plus [0, 2, 5] (which occurs twice), account for 10 of the 12 trichord sets, which would suggest a high degree of unity within this row.

5. **Label and make an inventory of interval classes**, including the I. C. from the last note to the first (make sure your totals add up to 12, since there are 12 notes). Note this is *not* a vector analysis (would there be any point to a vector analysis of an entire 12-tone row?). Do these reveal any patterns not already mentioned?

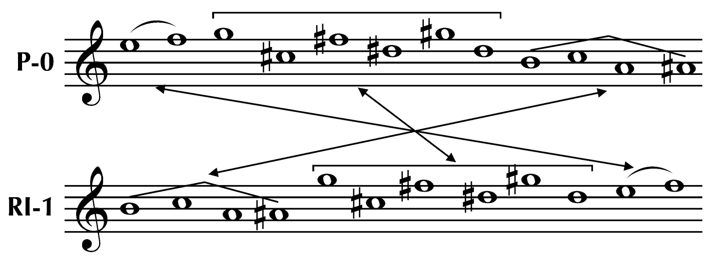
• Note the I.C. pattern of **6-5-3-5-6** below, which forms a palindrome:



I. C.:	1	2	3	4	5	6
Totals:	3	1	3	0	2	3

• The I.C. inventory shows that this row contains 3 tritones, minor 3^{rds}, and minor 2^{nds}, but 0 major 3^{rds}:

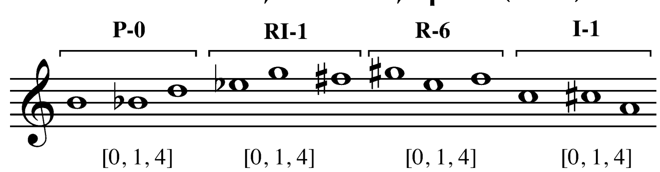
6. **Look for invariant subsets in the matrix.** Sometimes a group of notes is found in the same order in different row forms and transpositions, and these are called ***invariant subsets***. In the Schoenberg op. 25 row, for example, RI-1 is a redistribution of 3 segments of P-0:



7. **Does the row have any other special properties?** Examples of these include *derived* sets, sets *all-interval* sets, sets that *reference tonality*, *symmetrical* sets, and *combinatorial* sets. These are explained below:

7.1 **Derived Sets** are rows whose content is generated by a pattern in the first 3, 4, or 6 notes. All subsequent trichords in the Webern example below are created by manipulations of the first trichord:

From: **Webern, *Concerto*, op. 24 (1934)**



7.2 An **All-Interval Set** contains one of every interval within an octave. Usually, the intervals are all ascending or all descending, as in Berg's *Lyric Suite* (1926), but sometimes there is a mixture of ascending and descending intervals, as in the Dallapiccola *Quaderno Musicale di Annalibera* (1952).

Berg: *Lyric Suite*

7.3 Some rows are constructed with segments that **reference tonality**. This is a characteristic of several rows by Berg, such as the above example, where the first six notes could be a melody in F major, and the last 6 notes could be in C# mixolidian or F# major. Another example is the row from Berg's *Violin Concerto*: G Bb D F# A C E G# B C# Eb F.

7.4 A **symmetrical set** is self explanatory. These are sometimes found in Webern's music, as in his *Symphony*, op. 21: F, G#, G, F#, A#, A, D#, E, C, C#, D, B.

7.5 Before explaining **Combinatoriality**, let's review two related terms:
☞ **Aggregate**: A collection of all 12 pitch classes (typically unordered).
☞ **Complement**: The collection of pitch classes needed to form an aggregate with an existing set. For example, a hexachord that contains all chromatic pitches from C to F would have a complement that contains all chromatic pitches from F# to B. Similarly, a set of 9 pitch classes would have a complement that contains the 3 pitch classes missing from the 9 pitch class set.

• A 12-tone row, as we know, contains one of every pitch class, and is therefore an example of an ordered *aggregate*. **Some 12-tone rows are constructed in such a way that the first six notes form an aggregate with the first six notes of a different form** (**I**, or **RI**, at some transposition level) **of the same row, and ditto for the last six notes**. Or, put another way, the first hexachord of two different row forms *complement* one another, which means the second hexachords of those two row forms also complement one another. Rows that have this property are said to exhibit hexachordal combinatoriality. Here are some examples:

Berio, *Sequenza 1*:
P-0: A G# G F# F E | C# D# D C A# B
P-6: D# D C# C B A# | G A G# F# E F

Babbitt, *Semi-Simple Variations*
P-0: A# F# B G# G A | D# C# D F C E
P-6: E C F D C# D# | A G G# B F# A#

In each of the above rows, the first hexachord of P-0 forms a complement with the first hexachord of P-6 (and the same is therefore true of their respective second hexachords as well).

The row from Berio's *Sequenza 1* is an example of the easiest type of **hexachordally-combinatorial row** to construct: You arrange the first 6 pitches of a chromatic scale in any order, then do the same with the remaining portion of that chromatic scale, and you will automatically have created a row that is combinatorial with a tritone transposition of the same row (because the first 6 notes of a chromatic scale are a tritone away from the last 6 notes of the chromatic scale). Some rows exemplify **trichordal** or **tetrachordal** combinatoriality.

Combinatoriality allows composers to create new, related rows (called a **secondary sets**) by combining, different forms of the same row.
• There are four *types* of combinatoriality, corresponding with the four forms of a row: Prime, Inversional, Retrograde-Inversional, and Regrograde (which is trivial, since every 12-tone row is combinatorial with its own retrograde. Because of this, Babbitt, who came up with this term, originally excluded it from his list of combinatoriality types). A row that exhibits all 4 combinatoriality types is said to be "**all-combinatorial**."