Twelve-Tone Analysis – Dr Ian Percy

Rosetta Stone Four

There are twelve pitch-types:

$C – C^{\#} – D – E^{b} – E – F – F^{\#} – G – G^{\#} – A – B^{b} – B$

Note: The enharmonic equivalents of tonality are treated as the same pitch-type (pitch-class) within the twelve-tone system: $C^{\#} = D^{b} = 1$, and $D^{\#} = E^{b} = 3$ etc.

There are twelve pitch-classes numbered: 0123456789TE

Note: Many analysts use commas in-between each integer of the sequence of pitch-classes and write pitch-class 10 and 11 as numbers. However, it is just as common to see twelve-tone rows written without commas and the numbers 10 and 11 written as T and E.

There are twelve interval-types:

Unison [0], minor 2^{nd} [0,1], Major 2^{nd} [0,2], minor 3^{rd} [0,3], Major 3^{rd} [0,4], Perfect 4^{th} [0,5], Tritone [0,6], Perfect 5^{th} [0,7], minor 6^{th} [0,8], Major 6^{th} [0,9], minor 7^{th} [0,10], Major 7^{th} [0,11].

There are **SIX** Interval-Classes: (Note: Prime = 0)

Class One: minor 2^{nd}/Major 7^{th} (1 semi-tone from prime) [01E]
Class Two: Major 2^{nd}/minor 7^{th} (2 semi-tones from prime) [02T]
Class Three: minor 3^{rd}/Major 6^{th} (3 semi-tones from prime) [039]
Class Four: Major 3^{rd}/minor 6^{th} (4 semi-tones from prime) [048]
Class Five: Perfect 4^{th}/Perfect 5^{th} (5 semi-tones from prime) [057]
Class Six: Tritone/diminished 5^{th} (6 semi-tones from prime) [0,6]

Note: Paired Interval-classes negates the role of the octave in classical harmony and the variable intervallic relationships produced through harmonic inversions.

Pitch-Class Sets:

Many composers found the repetitive cyclic use of strict order twelve-tone rows restrictive and so dissected the twelve-tone row into smaller more flexible units. These subsets became known as **Pitch-Class Sets**. Any interval or group of notes can be referred to as a pitch-class set. A **PC Set** is a sequence of pitches written as a sequence of pitch-classes.

Forte Numbers:

PC sets can be identified for further research using a system developed by American analyst Allan Forte (Structure of Atonal Music). This system is referred to as the **Forte Number**. To identify the Forte Number one must first identify the PC Set (pitch-types written as pitch-classes):

$C – C^{\#} – B = 0, 1, 11$

Normal Order:

The **Normal Order** for any PC Set can be identified through rotating the sequence of pitch-classes until the span between the first and last pitch-class is as short as it can be:

0, 1, 11 and
1, 11, 0 both span twelve semi-tones, but,
11, 0, 1 only spans three semi-tones: The **Normal Order** is 11, 0, 1.

Prime Order:

Once the Normal Order has been identified, if required, it is transposed back into **Prime Order** (sequence transposed to/written from 0): 11, 0, 1 = 0, 1, 2

Therefore the **Prime Order** of 0, 1, 11 = 0, 1, 2 = PC Set: 3-1

Additional Example: $C – D – B^{b} = 0, 2, 10$
0, 2, 10 = span of 11 semi-tones
2, 10, 0 = span of 11 semi-tones
10, 0, 2 = span of 5 semi-tones = Shortest Span = Normal Order
10, 0, 2 transposed to Prime Order = 0, 2, 4 = PC Set: 3-6*

Complement:

The **complement** to any PC set is all of the notes that are NOT in the PC Set. If the original PC Set has four notes, then the complement will have eight notes (totalling the twelve notes of the chromatic scale). If the PC Set has seven notes, then the complement will have five notes. Complements play an important role in the analysis of pitch-class sets and dodecaphonic theory.

Strict Order and Unordered Sets:

Whilst twelve-tone rows are regularly transposed (often many times within the same piece), and rotate through Prime, Prime Inversion, Retrograde and Retrograde Inversions, they are almost always employed in **Strict Order** (the sequence they were conceived in). However, composers often vary the sequence of pitches within the smaller subsets of the row (PC sets) and it is just as common to see PC Sets treated as **Unordered Sets** (pitches used as a collective group appearing in any order) as it is to see **Strict Order Sets** (each note appearing in strict consecutive order).

Dodecaphonic Chord-types: PC Sets (and their Forte numbers) are often referred to as chord-types that identify how many pitch-classes they contain:

Diad (Dyad): Two-note Interval (complement is a ten-note Decachord)
Trichord: Three-note PC Set (complement is a nine-note Nonachord)
Tetrachord: Four-note PC Set (complement is an eight-note Octachord)
Pentachord: Five-note PC Set (complement is an seven-note Heptachord)
Hexachord: Six-note PC Set (complement is a six-note Hexachord)
Heptachord: Seven-note PC Set (complement is a five-note Pentachord)
Octachord: Eight-note PC Set (complement is a four-note Tetrachord)
Nonachord: Nine-note PC Set (complement is a three-note Trichord)
Decachord: Ten-note PC Set (complement is a two-note Interval)
Eleven-note Scales: (Incomplete Chromatic Scale)
Twelve-Tone Rows: Prime – Inversion – Retrograde – Retrograde Inversion – Transposition: Each note in strict order always follows/precedes the same note in the row.