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Pitch and Structure in an Atonal Context—An Analysis of the Structural Characteristics of Schoenberg's Op.16 No.2 "Vergangenes"

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Abstract: ***This article takes the second movement of Schoenberg's Five Orchestral Pieces as its subject. Using musical elements such as pitch, timbre, meter, texture, and dynamics as entry points, and drawing on the analytical thinking and methods of modern music theory, it analyzes the layout and structural characteristics of each musical element in this work through a combination of charts and textual description. By parsing the structural characteristics of each musical element and their connection to the overall structural layout, the aim is to achieve a comprehensive interpretation of these elements, moving from the micro to the macro, and the local to the whole.***

Keywords: Schoenberg, Five Orchestral Pieces, Set-Complex Theory, Structural Characteristics.

1. Introduction

The Austrian composer and theorist Arnold Schoenberg (1874-1951) is regarded not only as one of the representative figures of new music in the 20th century but also as one of the most influential figures in world music. Schoenberg's *Five Orchestral Pieces*, Op. 16, is a groundbreaking soundscape, marking his decisive step away from tonality into the realm of atonal music. Although the work employs the large orchestra of the late Romantic period, its essence is entirely different: it utilizes intricate "micro-pitch motion" and "non-functional harmony" that subvert tradition, weaving a sonic fabric that is both complex and precise, as well as fantastical, sounding a startling "music of the future" in the early 20th century. The second movement, titled "Vergangenes" ("The Past"), is particularly exquisite. Schoenberg assigns intertwining musical lines to instruments of varied colors, closely fusing melodic contour with timbral transformation, creating a remarkable auditory experience where not just notes, but entire sound planes converse and reflect each other. From the perspective of pitch, the movement's formal structure can be divided into a recapitulatory ternary structure (ABA^1). The diagram below shows the overall structure of the work and the structural division of some musical elements.

Recapitulatory Ternary Structure							
	Part I (1-22)			Part II (23-77)			Part III (77-96)
Section	Exposition (Theme A)	Development	Recapitulation	Exposition (Theme B)	Transition	Development	Recapitulation (Synthesized)
Measures	1-9	10-17	17-22	23-46	47-56	57-77	77-96
Meter	4/4	3/4	4/4	3/8-3/4	3/4		4/4-3/4-4/4

Figure 1: Overall Structure of the Work

As can be seen from the diagram above, the internal structural logic of the meter itself is largely consistent with the overall structural layout of the work. However, within this structure, elements such as pitch, timbre, texture, and dynamics exhibit different structural characteristics. Therefore, this article will conduct a detailed analysis of the structural characteristics reflected by each musical element in the work, in order to explore the organic connections between them.

2. Analysis of Pitch Structure

2.1 Organization of Pitch Materials in Each Section

The first section (measures 1-22) can be further subdivided into three smaller segments based on changes in pitch material. The exposition (measures 1-9) can be viewed as consisting of two phrases, 3+6 measures. Theme A is introduced piano by the solo cello in measures 1-3, with heterophonic melodies of Theme A layered above it in the oboe, trumpet, bass clarinet, and horn parts.

Theme A consists of the five pitch classes "$^{\#}$G, F, A, G, E" in the solo cello part, belonging to set 5-3 (01246). Furthermore, the theme itself can be divided internally into two trichordal sets: members of set 3-3 (014) and set 3-2 (013). The materials used in the oboe, trumpet, bass clarinet, and horn parts above—3-1 (012), 3-2 (013), 3-3 (014), 3-4 (015)—are all members of trichordal sets containing a minor second. Among these, set 3-4 is a subset of the thematic material 5-3, and set 3-1 can be considered an expansion of Theme A. Therefore, the materials in the upper heterophonic melodic parts are closely related to the theme.

In the development segment (measures 10-17), the meter changes from 4/4 to 3/4, and a sustained B4 (B natural) pedal point background is added, formed by the piccolo, flute, and celesta, creating a textural contrast with the exposition. Moreover, the musical materials are all derived from the exposition, with the clarinet, flute, trumpet, and English horn parts developing the expository material fragmentarily using simple imitative counterpoint. The recapitulation segment (measures 17-22) returns to 4/4 meter, and in measure 17, the flute, English horn, and trumpet parts present a varied recapitulation of the material from Theme A of the exposition. The second section (measures 23-77) can be subdivided into exposition (23-46), transition (47-56), and development (57-77). The exposition segment changes to 3/8 meter, and the thematic melody is introduced ppp by the viola, which can be regarded as Theme B. Theme B consists of six pitch classes. Based on its melodic direction, two set materials can be identified: 3-1 and 4-3. The set material in the quadruplet rhythmic pattern is 4-3 (0134), which can be viewed as a combination of sets 3-2 (013) and 3-3 (014). Overall, the prime form of this hexachord is set 6-1 (012345), which is the

superset of set 3-1, emphasizing the minor second interval characteristic. The presentation of this theme still employs the developmental techniques of the first section. Unlike Theme B, the imitating voices change the quadruplets to sixteenth-note patterns, but their melodic skeleton notes still belong to set 6-1. In this segment, through non-strict imitation of the theme in different voices, the quadruplet rhythmic pattern is fully developed, and the hexachord 6-1 expands to 9-1, creating a characteristic of both contrast and unity in pitch.

The transition segment (measures 47-56) changes meter from 3/8 to 3/4. Throughout this transition, the flute part forms an chordal ostinato pattern through "F-B" and "D-$^{\#}$C", emphasizing vertically the sound background of the tritone and minor second, belonging to set material 4-12 (0236). The celesta part forms a double linear melodic fixed sound through "$^{\#}$D-E-G-^{b}A-A" in its upper and lower voices, emphasizing horizontally the trichord set 3-3 (014) and the minor second sound background; overall, it belongs to set 5-6 (01256). The thematic melody is presented staccato by the bassoon part; this material consists of "A, F, ^{b}B, ^{b}D, ^{b}G, D, G", belonging to set 7-21 (0124589). This is subsequently subjected to rhythmic diminution, forming the abstract complement 5-21 of set 7-21.

The development segment (measures 57-77) employs rhythmic augmentation of Theme B's rhythm and uses imitative counterpoint to develop Theme B's material across different timbral groups. In measures 57-59, the oboe, clarinet, and viola parts all consist of "E, $^{\#}$D, D, $^{\#}$F, $^{\#}$E, $^{\#}$C" forming the Theme B material set 6-1, and in measure 58, the cello part makes a non-strict imitation of this material a perfect fourth lower. After five complete simple imitations of this theme via "Clarinet – Horn – Violin – Cello – Clarinet", the quadruplet rhythm of Theme B is again subjected to augmentation, and the material of Theme B is fragmented, allowing the minor second interval—the most numerous in set 6-1—to be presented in a fully explicit manner in this segment. It is worth mentioning that the development segment also reuses the double linear melodic ostinato from the transition segment; its pitch material is the bassoon's set material 5-21 from the transition. Therefore, this material forms a contrasting relationship vertically with Theme B.

In the third section (measures 77-92), the oboe part presents a varied recapitulation of Theme A, and the pitch material of this melody consists of members of Theme B's set material 6-1. In measure 79, the figuration in the flute and celesta parts is consistent with that in the transition segment of the second section; the sustained B4 (B natural) in the English horn part also reflects a recapitulation of the sustained note background from the first section. Therefore, the third section serves to synthesize and recapitulate all materials, also reflecting a summative application of the various materials.

In summary, the pitch materials of this work are primarily based on the trichordal sets containing a minor second: 3-1 (012), 3-2 (013), 3-3 (014), 3-4 (015), and their variants and developments which form trichordal sets containing a major second: 3-8 (026), 3-7 (025). Through multiple nesting and combinations of different trichords, tetrachords are formed, such as 4-1 (0123), 4-2 (0124), 4-3 (0134), 4-4 (0125), 4-11 (0135), etc., thereby forming Theme A's set material 5-3 (01246); Theme B's set material 6-1 (012345), 5-4 (01236); the frequently appearing ostinato materials 4-12 (0236), 5-6 (01256), and 5-21 (01348), among other set materials.

2.2 Set-Complex Relationships of the Work's Pitch Materials

Set-complex theory was first proposed by the renowned American theorist Allen Forte in his article The Structure of Atonal Music and is an important component of pitch-class set theory. "A set-complex is 'a group of sets related according to inclusion relations to a certain set'; this 'certain set' is called the nexus set. Set-complexes can be divided into two different types: one is a larger, broader type, denoted by K; the other is a smaller, more restricted type, denoted by Kh." [1] Among these, the sub-set-complex Kh relationship is both a concentration of the K relationship and a refinement of the inclusion relation. Therefore, set members with a Kh relationship to the nexus set are more closely related and have a higher degree of similarity.

By integrating and summarizing the various pitch materials of the work and consulting the "sub-set-complex list" [2], one can determine whether a Kh relationship exists between two sets; if a Kh relationship does not exist between two sets, then calculation is necessary to decide whether a K relationship exists or no relationship exists at all. From this, the set-complex relationship diagram for this work can be derived, as shown below:

	3-1	3-2	3-3	3-4	3-7	3-8
4-1	k	kh	kh	k	k	k
4-2	k	kh	kh	k	k	kh
4-3	k	kh	kh	k	k	k
4-4	kh	k	kh	kh	kh	k
4-11	k	kh	k	kh	kh	k
4-12	k	kh	kh	k	k	kh
5-3	kh	kh	kh	kh	kh	k
5-4	kh	kh	kh	kh	kh	kh
5-6	kh	k	kh	kh	kh	kh
5-21/ 7-21	k	k	kh	kh	k	k
6-1	kh	kh	kh	kh	kh	

	4-1	4-2	4-3	4-4	4-11	4-12
5-3	kh	kh	kh	kh	kh	k
5-4	kh	k	k	kh	k	kh
5-6	k	k	k	kh		k
5-21/ 7-21		k	k	k		
6-1	kh	kh	kh	kh	kh	

	5-3	5-6	5-4	5-21/ 7-21
6-1	kh			

Figure 2: Set-Complex Relationship Diagram of Main Materials

In the diagram above, it is evident that most sets have either a K or Kh set-complex relationship. The only hexachord does not have a Kh relationship with all trichords and tetrachords. Therefore, 5-3 and 5-4 can be considered the nexus sets of the work. The number of Kh members for 5-3 and 5-4 are 10 and 9 respectively, and all sets that do not have a set-complex relationship with 5-3 are members of 5-4. Thus, 5-3 is the primary nexus set, and 5-4 is the secondary nexus set. The tetrachords in this work are either related to 5-3 or to 5-4, except for 4-1 and 4-4. Since more other sets are related to 4-4, it becomes the auxiliary nexus set of the work's set-complex. It is worth noting that the primary nexus set 5-3 forms a Kh relationship with 6-1. Therefore, the main materials of the work are connected in their set relationships, reflecting the close interrelation between the various pitch materials.

3. Analysis of Timbral Structure

As a sonic attribute closely linked to rhythm and pitch, timbre is essentially the concrete manifestation of pitch in terms of acoustics. This attribute possesses significant characteristics of indeterminacy, as its various parameters are difficult to precisely quantify and control. Timbre is fundamentally an auditory perception and may evoke corresponding visual or psychological associations. In traditional music composition, timbre primarily served a coloristic function and did not possess substantial structural formative power. It was not until the twentieth century, particularly after Schoenberg proposed and practiced the concept of "Klangfarbenmelodie" ("tone-color melody"), that timbre gradually developed into an independent element of musical structure.

The work predominantly uses mixed timbres. The string section primarily carries the thematic exposition, while the woodwind and brass sections often develop the theme using simple imitation technique, forming multi-voiced linear counterpoint. Furthermore, the work also contains sustained note background parts and ostinatos, frequently found in the celesta part. In the work, the timbre of the celesta is present in all three sections: presented as a sustained B4 (B natural) in the first section; as a double linear melodic ostinato in the transition of the second section; and continuing the ostinato of the second section in the third section, with an added sustained B4 (B natural) in the English horn part above. Therefore, it also reflects a synthesized recapitulation of the ostinato materials from the first and second sections. Consequently, throughout the work, the celesta timbre exhibits the structural characteristics of an inverted rondo.

In summary, in terms of macroscopic timbral structure, it can be divided into two parts: one excluding percussion and harp timbres, and one including them. Therefore, the timbre of the entire work exhibits a binary structural characteristic, thereby creating a contrapuntal relationship of structural phenomenon asynchrony with the structure of the pitch material.

4. Analysis of Textural and Dynamic Structure

Texture, as expressed in Mr. Yang Liqing's A Course in Orchestration, is described as follows: "Texture is the overall combinatorial and concrete manifestation of the different fundamental elements of music, namely 'the form of the entirety of a certain structure and the constitution of its component parts.' In the musical works of different historical eras, the formative role of all elements of music—pitch, rhythm, dynamics, and timbre—and their mutual influence are always embodied through specific sonic textural structures." [3] Since the work largely develops using imitative counterpoint techniques, its textural morphology is primarily linear.

The textural morphology of the work is mainly linear, sustained notes, and ostinatos (chordal + linear melody), and exhibits recapitulatory ternary structural characteristics. In the first section, the texture is primarily linear. The ostinato texture of sustained notes added in the development segment can be seen as a contrasting element, and the linear texture reappears in the recapitulation segment. Thus, the textural morphology of this section exhibits ternary structure. Examining the second section internally, its textural morphology also reflects the structural characteristic of synthesized recapitulation. However, the third section is a synthesized recapitulation of the first two parts. Therefore, in the macroscopic structure, the textural morphology of the work exhibits recapitulatory ternary structural characteristics, consistent with the pitch structure characteristics.

"The loudness relationships reflected by dynamics, originally pitch and texture, have always existed in the work as an invisible structural element of music." [4] The loudness relationships reflected by dynamics were originally pitch and texture, and dynamics have always been a relatively musical element in works. The prevalence of sound-mass music has enabled the dynamic element to play a huge role in controlling musical sound structure. The dynamic element in the work is mostly 'p', 'mp', and 'pp'. The first section mainly exhibits a binary structural characteristic of a gradual crescendo from 'p' to mp. Because the second section is structurally large, its dynamic element also undergoes significant changes, exhibiting characteristics of crescendo, diminuendo. The dynamic changes in the exposition and transition segments can be viewed as one part exhibiting ternary structure, and the development segment as another part also exhibiting ternary structure. Therefore, the dynamic changes of the entire second section exhibit a binary structural characteristic. However, the dynamic change in the third section is a gradual diminuendo from 'p' to pp, thus exhibiting a binary structural characteristic. Since the second section contains 'mf 'and 'f' dynamic changes, the macroscopic structure of dynamics also exhibits ternary structural characteristics.

5. Conclusion

Looking at the entire piece, the work exhibits recapitulatory ternary structural characteristics macroscopically. However, the structures reflected internally by each musical element are not identical. For example, in the first section of the work's structure, the pitch material exhibits the recapitulatory ternary structural characteristic of exposition – development – recapitulation; moreover, the meter also exhibits the ternary structural characteristic of 4/4–3/4–4/4. But its dynamic element exhibits a binary structural characteristic of a gradual increase from "p" to "mp". Therefore, while the whole presents ternary structural traits, the internal structural elements still exhibit characteristics different from the whole. In the second section, the work also exhibits the juxtaposed

ternary structural characteristic of exposition – transition – development. Other musical elements in this section exhibit different structural characteristics: its meter changes from 3/8 to 3/4, exhibiting a binary structure, while the dynamic element exhibits recapitulatory ternary structure. Therefore, the pitch element in this section and other musical elements also reflect the logical relationship of polymetric structural counterpoint. Through the analysis of the structural characteristics of each element, the work reveals multiple polymetric structural relationships where the structural phenomena of various elements are not synchronized, thus reflecting Schoenberg's meticulous logical thinking.

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