Chapter 1: Attempt

In December 2017, I randomly stumbled upon Crama by Panayiotis Kokoras (b. 1974). This work was written for the flute, Clarinet, Piano, Violin, Viola, and Cello. What struck me was Crama's minimal use of pitch; performers had to make sounds instead of playing pitches. In other words, one would see a pitch on the score but hear something totally unrelated to that pitch. Crama is a sound-based composition, in which sound replaces pitch as a functional unit. As a result, there is no melody, harmony, or voice-leading in a traditional sense. Instead, timbre is the primary element of formal design in Crama. I found Crama very intriguing and decided to study the form of the piece.

First Attempt:

My first attempt was to map Crama[2] to sonata form, just as a starting point. Since this piece is a sound-based composition and pitch does not function in a traditional sense, I decided to relate the characteristics of each section of Crama to sections and subsections of the sonata form.

Bar 1-6 could be an introduction because there is a sense of space and there are introductory characteristics in the first 6 bars. In search of an exposition section, one needs to have a primary tonal group and secondary tonal group. Since Crama is a pitch-less composition, I decided to look for two contrasting themes, such as "masculine" and "feminine." Bars 7 – 20 was labeled masculine. There were two main problems with this section: 1) the motivic idea in the clarinet, bar 5, from the introduction, reappears in this section; 2) the motivic cell in the violin appears in

[2] Since the full score and recording of Crama is available at https://www.youtube.com/watch?v=h3toKwPr93I, I did not insert scores as part of this analysis.

bar 18 as part of a masculine theme. These two discoveries provided me evidence that Crama might not fall into the sonata form category.

I decided to continue and seek evidence that might link the form of Crama to sonata form. Bars 21 – 38 was labeled as a transition, but this section was too long to be a transition in an early classical sense of sonata form. Also, this section could not be labeled feminine because it did not sound thematic or provide any contrast with bars 7 – 20. Furthermore, the motivic idea in the clarinet in bar 5 returns in bar 33 as part of the "transition section." These three reasons were enough to show that bars 21 – 38 is not a transition.

At this point, though there were several pieces of evidence to suggest that Crama is not in sonata form, I decided to look further for more conclusive evidence. Bars 39 – 45 was labeled a feminine section. This section should offer a contrast with bars 7 – 20, but this was not the case. Instead, the sections had two main factors in common: 1) the rhythmic motion was a common characteristic of both sections; 2) the motivic idea in the cello, bar 7, from the masculine section reappears in bar 30 and develops in the viola. The same motive appears in cello and develops as well. To have exposition, one needs a masculine and feminine section, and since these two sections are missing, there is no exposition. Hence, Crama is not in the sonata form.

Second Attempt:

Since I found in Crama that there is a sense of continuity, transformation, and linkage between sections, I thought it might be possible to relate the form in this piece to developing variations. Although Brahms used it in many of his compositions, such as violoncello sonata op.99, he never

explained how this technique functions in his compositions. It was Arnold Schoenberg who specifically mentioned the idea of developing variations in his essays.

In his 1950 essay "Bach" Schoenberg defined developing variations as "Music of the homophonic-melodic style of composition, that is, music with the main theme, accompanied by and based on harmony, produces its material by, as I call it, *developing variation.*"[3] This means that variations of the features of a basic unit produce all the thematic formulations which formulate and provide fluency, contrast, variety, logic, unity, character, mood, expression, and every needed differentiation, thus elaborating the idea of the piece. In another essay, "Criteria for the Evaluation of Music," Schoenberg mentions "repeated phrases, motives, and other structural ingredients of themes only in varied forms, if possible in the form of . . . *developing variations*" (p.209).

Let us apply the concept of developing variations to Crama and see what results. Does this piece fall under the developing variations category?

My first attempt was to find a sense of variation in the timbre of each instrument as an individual unit through each section. There are many reoccurences and varieties of the motivic ideas in Carma. While some instruments, like piano, show a subtle transformation of timbres, other instruments, like clarinet, transform into new timbres more quickly and obviously. For example, the "flop sound"[4] motive in the clarinet returns many times with exact rhythm but different pitch.

[3] Arnold Schoenberg, *Bach*, 1950.

[4] "Flop sound: Play staccato every other note whilst you produce a double like slap tongue. It is not expected to be produced as a standard slap tongue sound. The diamond notehead indicates that the tone should not be clear and

The difference in pitch is not audible. On the other hand, the timbre transformation of the "flop sound," bars 21 – 26, is audible and apparent. The appearance of timbre transition in individual instruments is evident at almost all times. For example, the viola in bar 26 – 32 performs the short and sharp movement on the bow that becomes high-pitch pizzicato in bar 31. These two types of sound production are similar in color as well as in timbral variations.

The sense of transition between different timbres in individual instruments contributes to the holistic character of each section as a sound block. Sometimes transformation occurs via timbre dovetailing between the different instruments and eventually the sections. Crama can be heard as a series of metamorphoses. For example, the slow bow sound, bar 59, in viola dovetails, in terms of timbre, with piano performing a harp bridge sound. Also, there is a rhythmic and timbre dovetailing between the flute and piano in bar 62. Sometimes, two instruments are doubling the same timbre at the same time. For example, there is a timbre-like unison between harp bridge, piano, and angled bowing sound, cello, in bars 64 – 67.

The sense of transition between timbres, which happens via a series of variations in sound can be the reminiscence of the specifics in developing variation form. After all, *"composition begins with the 'gift' of a musical idea, which grows and expands of its own accord. Then, in a separate and fully conscious process, the composer draws all the implications and possibilities from the initial idea."*[5] Though Crama is a pitch-less composition, according to the examples discussed earlier, it employs the concept of developing variations to each individual or combination of

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some high partials should appear along with the fundamental. Moreover, a glissando upward or downward movement should be produced where indicated." From page 2 of the preface in Crama.

[5] Walter Frisch, *Brahms and The Principle of Developing Variation,* University California Press, Berkeley and Los Angeles, California, 1984, 33.

instruments. The developing variation results in a series of transformations starting at the individual instrument level and, in turn, affecting the entire texture.

I believe that the concept of developing variation does not require a melody and variations of that melody via different intervals and rhythmic manipulation. The concept of developing variation can be applied to any substance or event. Therefore, even though there is no melody or intervals in Crama, the concept of developing variations contributes to the idea of continuity of sound in the piece. According to the examples above, the concept of developing variations applies to Crama. Thus, the form of Crama is built out of the developing variations.

Third Attempt:

In another attempt, I decided to take an analytical approach to discover the form of Crama via motivic ideas. In this approach, I noticed that Crama consists of a series of motivic blocks. These motivic blocks are exchanged between different instruments, which creates a correlation between the different combinations of instruments. For example, the motive in the clarinet in bar 5, the "flop sound," appears in the the flute and the piano as a closing motive in bar 31. Another example is the "duck sound"[6] motive, bar 7 in the cello, which reappears in bar 14 as col legno battuto in the violin and recombines with other motives in other instruments. The same percussive the "duck sound" motive, bar 5 in cello, reappears in the flute in bar 18 as "breathy

[6] "Duck bowing sound: Place the bow hairs flat against the string, pressing down into the string. Make short and very sharp movements of the bow close to the frog point. Two L.H. fingers should touch the string lightly on the indicated note. By touching the string with two fingers (slightly angled), most of the harmonic content of the sound is muffled. The sound produced is noisy with a blurred sense of pitch content. [b.7]." From page 5 of the preface in Crama.

sound,"[7] and "tap sound."[8] The form of Crama might be interpreted as a wall that consists of smaller walls that transform one other via a series of color-coded bricks. Analyzing Crama by considering motivic blocks could produce new results that might compare to developing variations.

As one can see, there are many instances in Crama in which a motivic block, such as "flop sound" in clarinet, is repeated. This means repetition is one of the ingredients that contribute to the overall form in this piece. Motivic blocks create a modular character in all sections in Crama. In other words, this piece employs different combinations of modules to generate different sections. In this type of procedure, if modules ABC are placed on top of one another and repeat in different orders, they can create ABC, BAC, and CAB, but also AABAC, BBACC, and CCCAABBB. Therefore, the lengths of phrases are unpredictable, and, as a result, variable length of phrase and section is another distinguishing characteristic of block form.

A closer look at Crama shows the unpredictability of length in different sections and the asymmetrical relationship between these sections. For example, rehearsals A, B, C, and D consist of 16 bars, whereas rehearsal E, which uses almost the same modules as the above rehearsals, has roughly 13 bars. The asymmetrical relationship between different sections that employ the same motivic blocks are further evidence that Crama is in block form. Since Crama is a sound-

[7] "BREATHY SOUNDS: The square noteheads indicate the production of a rich sound mixture of tone and air together regardless of pitch range and dynamic. Direct the air flow in different angles and lip tensions to the embouchure in order to produce expressive variations of this type of sound. Blowing above and below the edges of the hole produces a rich mixture of sound and noise with which varied harmonics can be produced. The accurate and stable pitch intonation is not desired. [b.1]" From page 1 of the preface in Crama.
[8] "TAP SOUNDS: The crossed noteheads indicate the production of a percussive sound by tapping the written key. The square notehead indicates a Breathy sound that should be holding down continuously (example left, note F). The finger at the crossed notehead (G key at the example) should just create the tap sound of the key while the F note continuous, which might interrupt instantly the air flow of F note. [b.2]" From page 1 of the preface in Crama.

based composition that employs motivic blocks to form sections and continuity of sound, discovering the form of Crama via motivic blocks might be an appropriate choice. Note: the majority of the time, the modules occur on the strong beats.

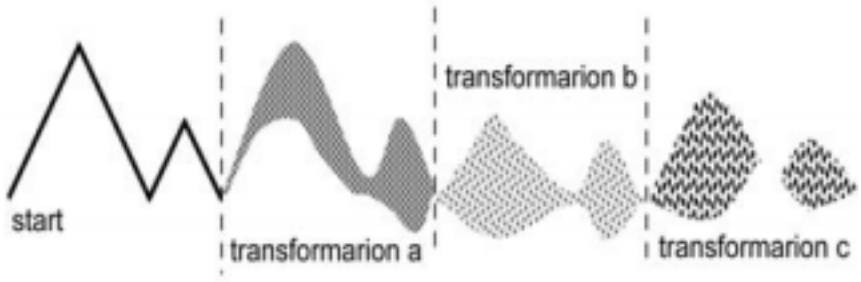
Through trial and error, the form of Crama was discovered to be that of developing variations. The repetition of the motivic blocks and their transformation are the principal aspects behind the shaping each section. Also, since it seems repetition and transformation contribute to the piece's forward motion, it follows that repetition contributes to the growth, transformation, and form in Crama.

The motivic blocks are the main components generating the form in Crama. What distinguishes one motivic block from another or links them to one another, however, are the sounds and sound qualities. Therefore, the form of Crama is based upon the sounds and sound qualities. As Edgar Varese mentions, *"Form and content are one. If there is no form, there is no content, and if there is no content, there is only a rearrangement of musical patterns, but no form."*[9] Varese suggests an idea about development that might involve variations of a musical idea. As part of this process, variation can lead an idea, color, sound palate, and rhythm, to a new idea that has the essence of the old idea but has transformed to a new idea, color, sound palate, and rhythm. This process is referred to as "transformational variation,"[10] by Panayiotis Kokoras.

[9] Edgar Varese, "The liberation of sound," *Perspectives on New Instruments and New Music,* 1936.
[10] Panayiotis Kokoras, *Morphopoiesis: An Analytical Model for Electronic Music*, 2005.
Morphopoiesis is a mindset which contributes to the creation of form. A musical composition must display four steps in order to achieve Morphopoiesis. Thease stages are prioritized in asending order. In other words, the 4th stage has priority over the other stages.

As mentioned above, in my second attempt, developing variations is one of the concepts behind the structural procedure in Crama. I suggested that each motive or timbre transitioned to another. Therefore, transition and transformation begins with a single or combination of instruments and transforms in the flux of time. This can lead to the gradual change of the entire section.

Furthermore, the composer proposed a new concept in terms of structural process. Since Crama is a sound-based composition and timbre appears to be an essential form-bearing dimension, structuring form in this piece must be different from structuring form in a pitch-based composition. Whereas earlier music employed pitch-based structures or structural processes, timbre-based music must use timbral structures or structural processes, such as transformational variations.



"Figure 1. the stages separated by dotted lines are not intended to represent a 'natural' musical flow but rather to show an example of some further steps in the process."[11]

"Figure 1 represents graphically the structural procedures by giving a simple example in three stages. The starting point represented by the black thick line is transformed to an even thicker texture in 'transformation a', although it keeps most of the melodic profile [Chion 1983] of the starting point. In the next stage, the spectral elements and the mass profile [Chion 1983] of the sound change more and the overall shape goes a step further away from the

[11] Panayiotis Kokoras, *Morphopoiesis: An Analytical Model for Electronic Music*, 2005.

previous stage. Finally, in 'transformation c', the two parts of the initial idea are separated by silence and the whole morphology and spectral components of the two sounds now become even more different from the previous stages."[12]

In the evolution of the above structural processes, Kokoras has added a concept of *transformational variations* as one of the stages for the evolution of the structural process. Transformational variations might be considered an extension of developmental variations. As the names implies, it refers to a series of transformations. These transformations might be binary transformation; AB, in which the idea A undergoes a process and transforms to idea B; ternary transformation, ABA; arc transformation, ABCBA; or perhaps another type of transformation such as transitional chain. *"As a result of this process, for a binary A to B transformation extra steps can be added in between the start point and the end point to create a transitional chain."*[13] These transformations can be accelerated or decelerated according to the textual evolution and density of music.

Based on my observations in Crama, every section transforms into a new section via different types of transformational variations. This is due to the fact that every single instrument transforms as a single unit, which results in the holistic transformation of the entire section to a new one. "*The sound units themselves can undergo a general sound process which characterizes the whole transformation."*[14] However, these transformations might occur between multiple sound units that transform, synchronized, or unsynchronized with other sound units, with similar timbres or un-similar timbre. This contributes to the unpredictable and natural quality of holistic

[12] Panayiotis Kokoras, *Morphopoiesis: An Analytical Model for Electronic Music*, 2005.
[13] *Ibid*.
[14] *Ibid*.

transformation from one section to next. This can be understood as one of the common practices in the transformational variations stage of "morphopoiesis."[15]

According to Kokoras, there are four stages of morphopoiesis. The first stage, as indicated above, is transformational variation. As an example, a single-unit sound-block level of transformational variations could be bar 46, the "flop sound,"[16] in clarinet, which switches to multiphonic trill, bar 55, then to natural multiphonic tremolo, bar 57. The fact that within 12 bars, there are three techniques that share almost the same rhythm and have similar colors creates a small sense of transition between colors in clarinet, which contributes to the holistic transformation of rehearsal I to J to K. Another example, a multiple-unit sound-block level of the transformational variations can be bar 88, clarinet, that transforms from "natural multiphonic sound,"[17] to ordinario, bar 89, and transforms back to natural multiphonic sound in bar 90. In contrast, piano switches from ordinario in bar 89, to harp bridge, bar 90, which shows unsynchronized transformation timbres in a multiple-unit sound level.

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[15] The etymology of the word is simple: Morphopoiesis is a composite word consisting of the prefix morpho- which means structure, shape, form (from the Greek *Morphe*), and the suffix -poiesis which means creation, formation, production (from the Greek poiesis, which is formed from the verb *poiein* "to make") [Microsoft Encarta 2003].

[16] "Flop Sound: The production of this sound is characterized by a fast movement of the tongue outwards that stops the airflow while wedges to the lips. At the example right, the Flop sound is combined with tap sound and followed by legato breathy sounds.
The tap sound is the sound of the keys, in order to produce the tap sound at every x notehead you should release and hit down the key. The same time the key is down you should produce the flop sound. This is produced by a fast movement of the tongue outwards that stops the airflow while wedges to the lips. Blow continuously air with the lips shaped like you pronounce 'oo', the tongue stops for a moment the air flow and then gets back again. This procedure is repeated four times per quarter. A rather blurry and energetic sound amalgam will be produced with certain timbral characteristics. [b.71]" From page 2 of the preface in Crama.

[17] "Natural Multiphonic Sound: First-Type harmonics. Play the harmonics of the fundamental as blocks. The sound is produced by greater pressure of the lips. This type of multiphonic is more effective and rich in tones in the lowest register of the instrument. It can also be effective when it is combined with trills." From page 3 of the preface in Crama.

All of the examples above create content and form as a result of transformation. As Edgar Varèse states, "form and content are one."[18] In other words, there has to be a relationship between content and form. This relationship can be created via the transitional variation which contributes to the structural process. Transformations naturally avoids creating rearrangements of the same musical idea. These transformations generate phrases, sections, and eventually form.

The second level of morphopoeisis suggests the organization of sounds units and the relationship between them in terms of note attack. In other words, in this step, almost all the sounds in the transformation usually fall into the same category, in terms of the attack of the note. Pierre Schaeffer's "In search of concrete music," suggests the organization of sound based on the attack of each sound type:

A) "Plectrum-or *plucked-* attack, in which a string was displaced from its initial position, then abruptly released. This is the steepest attack that can be found: the sound comes in immediately at its maximum level.
B) *Percussive attack* (piano): here a hammer hits a string, which vibrates after the time taken for the impulse to spread along the whole string. This attack is less violent that the preceding one, and it is also different from it mainly because the timbre produced is modified.
C) Aeolian attack (reed or violin bow), in which a string is made to vibrate very gradually, without any sort of discontinuity, for example by blowing a current of air across telegraph wire, or gradually making a violin string vibrate with rosined bow.

[18] Edgar Varese, "The liberation of sound," *Perspectives on New Music New Instruments and New Music,* 1936.

> This is the same type of attack, even more gradual, as is made by the reeds of the woodwind instrument (organ, harmonium)."[19]

In order to analyze Crama, a sound-based composition, perhaps there are other categories or sub-categories that can be added to Schaeffer's note attack categorization. I propose to add scratch tone as a subcategory of the aeolian category. Scratch tone is a result of an immediate and extreme bow pressure of an attack that can be sustained or not sustained. This extreme pressure results in a distorted noise that can be understood as scratch tone. The sustain might be agitated, as in the 64th, 32nd, and 16th notes in bars 152 – 160 in violin and viola, or might be sustained, as in bar 160 in the viola.

Forward Motion:

The third level of morphopoiesis refers to motion which is conceived via transitional variations. As mentioned earlier, in my third attempt, Crama is a motivic-block-driven composition, which consists of modules that create forward motion. According to Kokoras, motion in these transitional variations can be defined in six different categories: *"bi-directional, uni-directional, linear, curved linear, reciprocal/cyclic) proposed by Smalley is a comprehensive guide that characterizes both small units and whole phrases or sections."*[20] In this level of morphopoiesis, the main concern should not be the textural construction of sound, because if this is the case there would not be a sense of forward motion. Instead, forward motion should be the result of

[19] Pierre Schaeffer, *In search of Concrete Music* (A la recherche d'une musique concrete), 202.
[20] Panayiotis Kokoras, *Morphopoiesis: An Analytical Model for Electronic Music*, 2005, referencing Denis Smalley, "Defining Timbre – Refining Timbre." *Contemporary Music Review,* 1994, Vol. 10, part 2,"(Hardwood Academic Publishers), 35–48.

gestures and postures. Kokoras explains, *"All degrees of combinations between texture and gesture can appear within a single composition."*[21]

Finally, the last—and the most important—level of morphopoiesis correlates to the perception of a sound-based composition by the brain. This level refers to cognition and interpretation of sound units, their relationship with one another, and their perception by the listener. In other words, it refers to the listener's engagement with the form, interpretation of the sound-based composition, and the perception of form, if any, as a large-scale work. Kokoras notes this level is *"to understand the balance between units, or to connect the primary with the secondary part of the music."*[22] This means that morphopoiesis is not fully completed if the listener cannot engage.

This final level creates a very important relationship between music and the listener.
It defines the composer as the creator of form in a sound-based composition.
Therefore, compositions which employ structural-process techniques, total serialism or aleatoric, but are not able to engage the listener through their content have not satisfied all levels of morphopoiesis. As Kokoras confirms, *"it is necessary if a listener is to become aware of the new content while distrusting preconceived ideas and relying first and foremost upon what is heard."*[23]

Conclusion:

The form of Crama was discovered through the attempts I describe in this chapter. I discovered that the structural process in a composition, in which sound is the main form-bearing element,

[21] Panayiotis Kokoras, *Morphopoiesis: An Analytical Model for Electronic Music*, 2005.
[22] *Ibid*.
[23] *Ibid*.

must create a functional relationship between content and form. In other words, content should construct the form in a sound-based composition but not the other way around. I also determined that the content can be constructed via morphopoiesis approach. Therefore, morphopoiesis is an analytical tool which can be employed for the construction of the content. Furthermore, morphopoiesis creates intrinsic relationships among the sound units, which should result in an extrinsic connection with the listener and, as a result, the listener's involvement with the form of the sound-based composition on a perception and cognition level. Put another way, morphopoiesis creates a symbiotic and functional relationship between the sound units within a composition, as well as connecting the listener with the sound-based composition.