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CHAPTER

The "Serial Generation": Compositional Process, Theoretical Discourse, and Programming the Listening Experience

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Abstract

Often praised or rejected for its technicity, serialism should not be situated only within the field of compositional techniques or through its ideological background, but rather considered as an attitude toward composition that involved a great number of composers born in the 1920s. A comparative reading of philological studies and of the sources related to the compositional process sheds light on the operational horizon of the "serial generation" that goes beyond the stylistic peculiarities of each one of its members. In order to substantiate this hypothesis, this chapter shows that these composers elevated music analysis and theoretical thinking to permanent components of their creativity, which can be observed in both the editorial and analytical stakes of their working method. Finally, the chapter demonstrates that the new listening experience was an essential part of their aesthetic project.

Keywords: serialism, serial technique, mathematical series, algorithm, compositional process, music analysis, listening experience

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Theoretical Horizon and Compositional Procedures

The term "serial generation," which gives the present chapter its title, is indicative of the type of investigation that I am trying to encourage. I will consider serialism neither exclusively in the field of compositional techniques nor by searching for its ideological background, but rather as an attitude toward composition that involved a great number of composers born in the 1920s. Serialism as a generational trait emerges with unexpected evidence in a comparative investigation of the sources related to the creative process. In the last decades, research on this area has been able to take several steps forward thanks to the source materials made available by institutions such as Basel's Paul Sacher Foundation, the Music Archive of the Akademie der Künste in Berlin, and the Institute of Music of the Fondazione Giorgio Cini in Venice, as well as libraries, universities, and a number of private collectors. A comparative reading of these philological studies sheds light on an operational horizon that goes beyond the stylistic peculiarities of each composer. This can be observed on a number of levels: the consensus on emerging issues of compositional technique; the identification of long-range historical processes that the composers consider themselves an integral part of; the shared terminology and cultural environment; certain working methods; and sometimes even reciprocal influence.

The serial generation had its own stamping ground, its own festivals and journals. Its institutional center was the International Summer Courses for New Music, which took place yearly in Darmstadt and could

count on teachers such as Olivier Messiaen, Edgard Varèse, René Leibowitz, and Theodor W. Adorno, all of whom were influential in spreading ideas and paving the way for a new way of thinking, writing, and listening to music (Borio and Danuser 1997). Extensive discussion of aesthetic principles and compositional issues arose on the pages of journals such as *Polyphonie*, *die Reihe*, *Incontri Musicali*, and *Darmstädter Beiträge zur Neuen Musik*. Volume 4 of *die Reihe* (1958 in German, 1960 in English), whose emblematic title is "Young Composers," is particularly relevant to our context, since it contains monographic articles about Luciano Berio, Pierre Boulez, Hans Werner Henze, Giselher Klebe, Bruno Maderna, Henri Pousseur, Luigi Nono, Karlheinz Stockhausen, and Bernd Alois Zimmermann (all of them born between 1918 and 1929) as well as Bo Nilsson (born in 1937). An essay by Heinz-Klaus Metzger in reply to Adorno's criticism of serial music is strategically placed in the middle of the volume. This was the first step in the consolidation of serial aesthetics, which is mirrored in the success enjoyed by several compositions of the time, particularly Boulez's *Le Marteau sans maître*, Nono's *Il canto sospeso*, and Stockhausen's *Gruppen*.

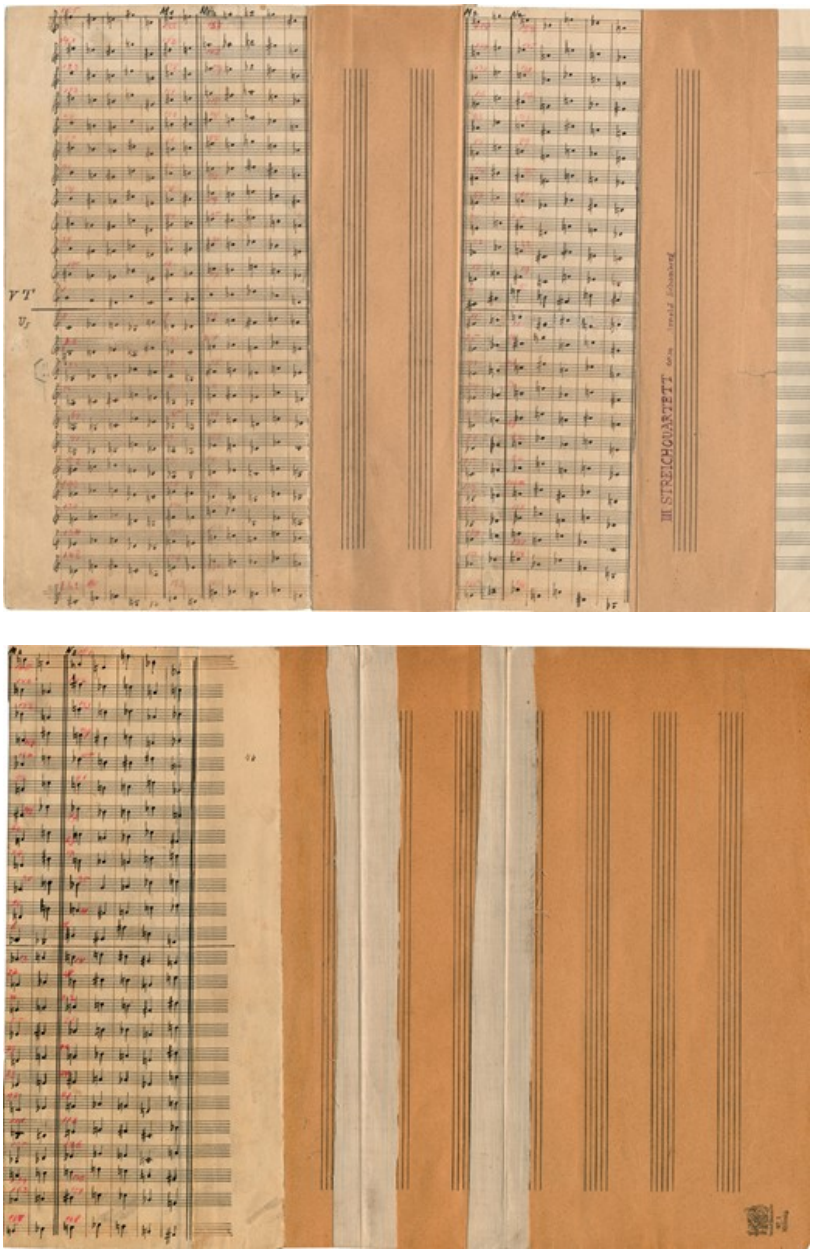
"Integral serialism" is a misleading term, suggesting that the series act in a comprehensive and homogeneous way. Stockhausen hit the nail on the head when in a 1961 article he coined the expression "multidimensional serial technique" (Stockhausen [1961] 1964, 170). On the aesthetic plane, however, the term "serial thought," as used by Jean Barraqué and Pierre Boulez, is the most appropriate, since it emphasizes the mental landscape in which the compositional work came about (Barraqué 2001a, 76; Boulez [1953, 1957] 1968a, 230). Moreover, sketch studies and archival research have demonstrated that the expression "serial music" can refer to a variety of procedures and behaviors: on the one hand, it is used to indicate the first stage of a lengthy historical process; on the other, it is strictly linked to the constructive methods of a generation of composers, who tried to produce musical sense by exploiting the potential inherent to the sound (Decroupet 1997a; Dack 1996; Cavallotti 2016). To provide a clear outline of the changes that took place after World War II, one needs to neatly distinguish between twelve-tone technique and serialism.[1] In the former, the composer fixes an interval succession (i.e., binds relationships within pitch class sets), whereas the latter refers to the organization of sound processes on multiple levels. The twelve-tone technique is inextricably linked to its founder, Arnold Schoenberg, and is rooted in the Viennese culture of the early decades of the twentieth century, even though it was then adopted by composers from different backgrounds. Instead, the international, synthetic, and multifaceted "serial thought" is not the brainchild of a single maestro. An in-depth study of its origins shows the convergence of several factors: the close reading of compositions written in the first half of the twentieth century, the investigation of the properties of sound thanks to new technologies, and the acknowledgment of contemporary innovations in literature and the visual arts.

However, we must not forget that the notion of series recalls the "method of composing with twelve tones related to one another" devised by Schoenberg. The climate of liberation and regeneration that characterized those years was certainly a determining factor in the passion with which young composers embraced the works of Schoenberg, Berg, and Webern. In several cases, interest in the Viennese School was fueled by participation in courses held by musicians who were more or less directly linked to its main advocates, such as René Leibowitz, Josef Rufer, Hermann Scherchen, Max Deutsch, and Theodor W. Adorno, while composers such as Mauricio Kagel, György Kurtág, and György Ligeti, whose careers began far from Darmstadt and Paris, found their own way without the guidance of teachers. The study of the works of the Viennese composers was critical in helping to further their intention to abandon motivic-thematic elaboration and formal models rooted in tonal composition (Boulez [1952] 1968b; Barraqué 2001b; Pousseur [1956] 2004a). For these composers, the twelve-tone series was something precious, provided that it was seen not as the starting point for thematic construction but rather as a potential for sound relationships produced according to conceptions of time and form that were defined as the work progressed. This shift became tangible in the works they composed at the start of their mature phase: Maderna's *Fantasia e fuga* for two pianos, Boulez's Second Piano Sonata, Nono's *Variazioni canoniche sulla serie dell'op. 41 di Arnold Schoenberg*, Jean Barraqué's *Sonate pour piano*, Berio's *Nones,* Pousseur's *Quintette à la mémoire d'Anton Webern*, Kagel's *Sexteto*, and Zimmermann's *Perspektiven* are just a few examples. Research on the sources has demonstrated the procedures the composers used to avoid the equivalence of series and theme, as well as the thematic elaboration that marked nineteenth-century instrumental music. Maderna organized the voices through a systematic combination of various permutations of the BACH tetrachord. Boulez subdivided the twelve-tone row into segments and then treated them as pitch class sets. Nono concentrated on the chromatic dyads of a Schoenbergian twelve-tone row. Berio spaced the components of several transpositions of the basic set, distributed on overlapping lines, thanks to a careful measurement of the durations. Zimmermann operated with three distinct twelve-tone rows, creating a cohesive melodic and

harmonic whole (Pasticci 2009; Boesche 1999; Henrich 1997, 1999; Holtsträter 2010; Neidhöfer 2009; Strinz 2012).

The difference between twelve-tone and serial techniques appears clearly through a comparison of the sources of the compositional process. In her pioneering work on Schoenberg's twelve-tone compositions, Martha Hyde identified four types of sources: row tables, row sketches, compositional sketches, and form tables and charts (Hyde 1983). The four types do not strictly correspond to stages in the compositional process but rather are related to each other, defining complementary aspects of the composition. "Row tables" are sheets where the composer has arranged the row in its original and inverted forms following a specific order of transposition; this arrangement is often indicative of properties of the basic set (*Grundgestalt*), which may have repercussions for the sequence of the row forms in the composition itself and in their grouping (the most frequent of these is based on hexachordal complementarity). These "tables" become even more relevant when—as in the Wood Quintet op. 26, the Third String Quartet op. 30, and the String Trio op. 45—alternative forms of the two hexachords appear with the consequent production of interval successions different from the ones governing the *Grundgestalt* (Hyde 1980). In Figure 1, we can observe that Schoenberg labels the basic form with the letter *T* (standing for *Thema-Reihe*) and articulates each transposition in segments characterized with key words in German form theory: *M* for *Mittelsatz* and N for *Nachsatz.* The term "row sketches" generally refers to the relationship between two or more rows and can shed light on the combination of non-adjacent pitches or the construction of harmonic structures with various degrees of affinity.

Figure 1:



Arnold Schoenberg, chart with the row forms for the String Quartet op. 30.

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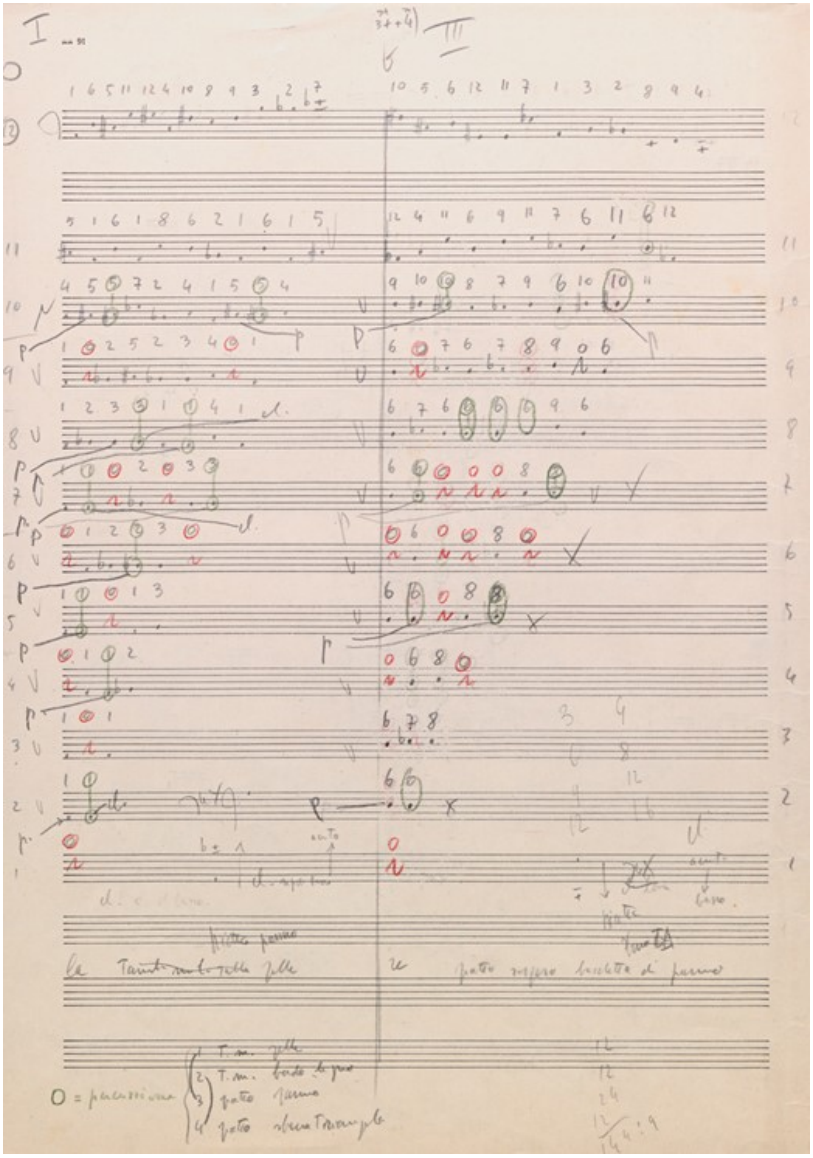
Documents of this kind are rarely found among the source materials of the serial generation. This is further proof of a philological principle that holds true for every phase of Western art music: the characteristics of a composer's sketches or drafts are closely related to the compositional difficulties he or she is undergoing at that particular moment and for which he or she has yet to find a solution. They do not relate to obvious or acquired notions, even though scholars must be prepared to put these notions back on the table when dealing with specific problems that arise in the examination of the sources. A comparison between the compositional process of the two generations is instructive because it highlights the changing horizon that already transpires in the making of series and in the handling of the various components: serial composition is no longer focused on transpositions, invariant subsets, or overlapping; instead, the intrinsic properties of the twelve-tone row assume an importance that goes beyond the horizontal or vertical distribution of the pitches. The series, which is sometimes reduced to a relational pattern, takes a new kind of normativity. In the first phase of multidimensional serialism, it was not unusual for composers to conceal the basic row and to set up polyphonic structures that work from the background. At the beginning of Nono's *Polifonica-Monodia-Ritmica*, for example, the counterpoint gradually develops from silence; Nono recodes the pitches of his twelve-tone row in numbers and then makes subtractions between each pair of numbers, a procedure that progressively reduces the linear content. In keeping with the idea of something being born from nothing, the table is read from bottom to top: every pitch and pause that results from the subtraction is assigned the value of a quaver (see Figure 2). This leads to the gradual setting up of polyphonic lines that initially present numerous pauses and repetitions (Rizzardi 2004).

Figure 2a:



Nono, *Polifonica-Monodia-Ritmica*, sketch for the beginning (facsimile).

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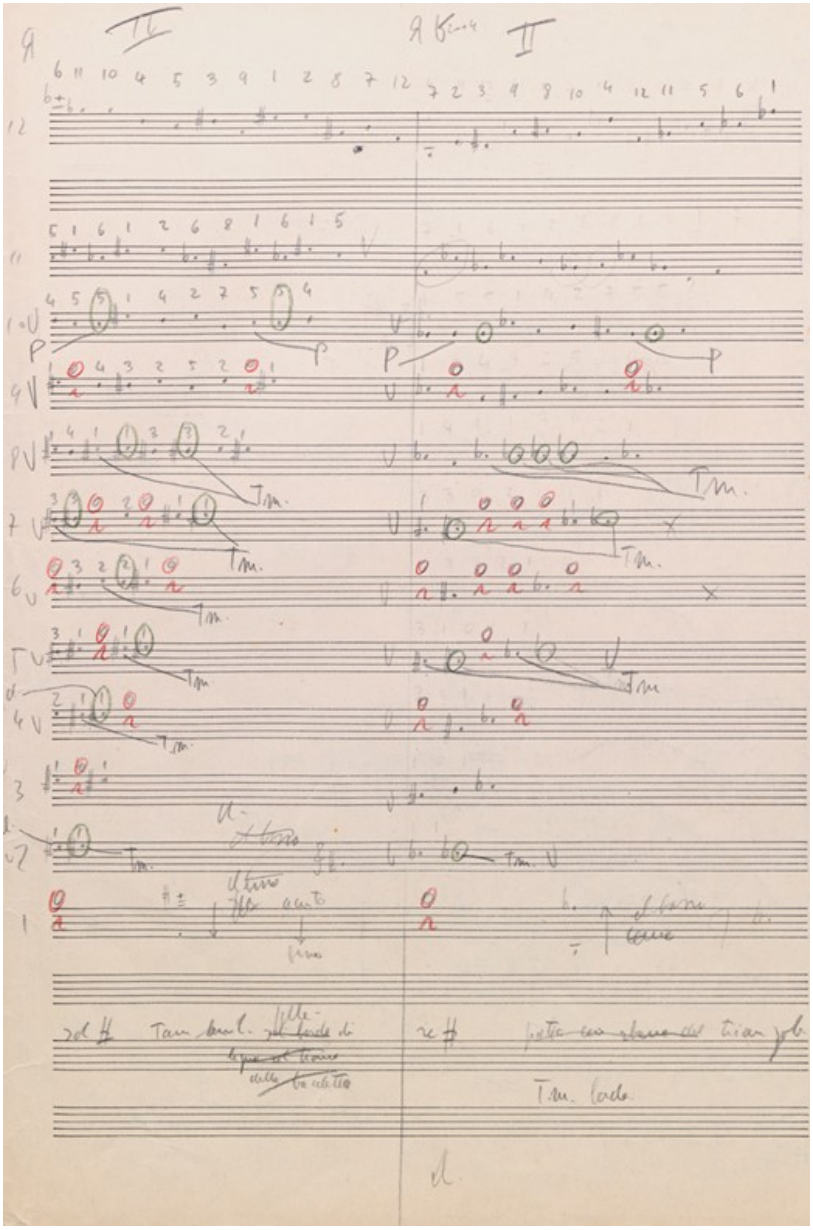
Figure 2b:



Nono, *Polifonica-Monodia-Ritmica*, sketch for the beginning (facsimile).

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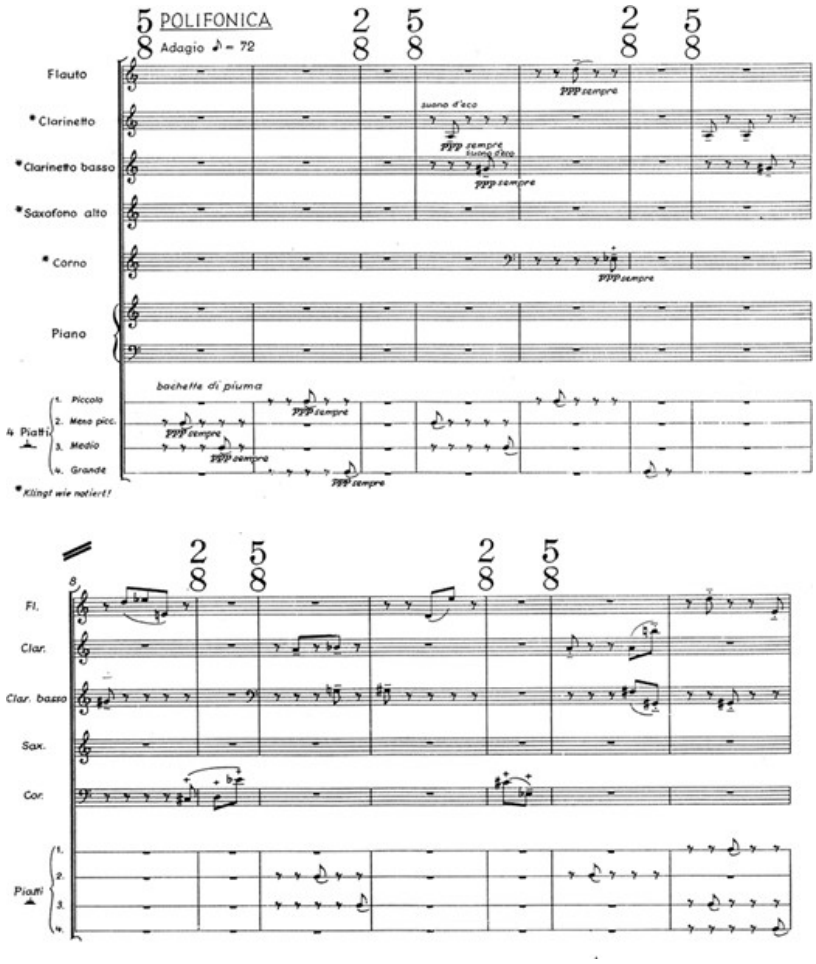
Figure 2c:



Nono, *Polifonica-Monodia-Ritmica*, mes. 1–14.

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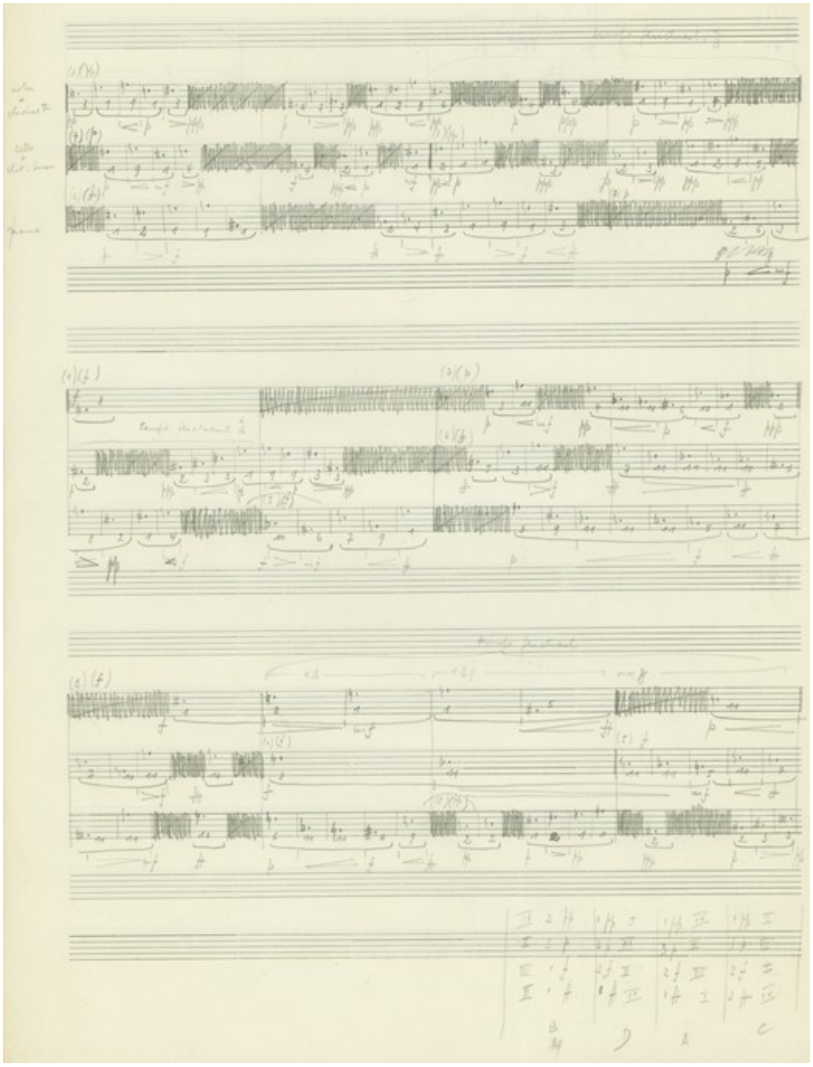
In Pousseur's *Quintette à la mémoire d'Anton Webern* the reference to Webern is not just in the title but involves the basic pitch content, the inversion of the original row of his Quartet op. 22:

C#	E	F	D	E♭	B	B♭	A	Ab	F#	C	G

Like Nono and many others, Pousseur elaborates the series avoiding transpositions and drawing attention to its deeper properties, in this case the interval vector (Decroupet 1994, 112–120). He carries out a circular permutation of the notes separately on the two chromatic sets in which the series is articulated (five and seven notes). This operation produces lines that have variable interval successions but are governed by an underlying principle, which also has repercussions for the density level (see Figure 3). Pousseur makes use of the principle of "organic chromaticism," derived from his analysis of Webernian works, filling the gaps between two contiguous pitches with all the chromatic notes (Pousseur [1955] 1958). Thus his Quintet offers two kinds of density: one is constant for each section (the number of layers made up of lines), while the other is variable (the number of "secondary" notes connecting the permutated row pitches). Each layer is characterized by a unit of duration (♪, 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯, 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯), while the delay in attack between "structural" notes is regulated by a series of numbers. The sketch also shows the way in which Pousseur has systematically eliminated the descendant chromatic segments, thereby avoiding the inevitable successions of eleven notes that would have increased the density of the texture in an excessive manner. He deals with the chromatic fields case by case, considering the best group configuration in the expected duration and excluding any unwanted relationships between the layers (see Figures 3 and 4).

Figure 3:



Henri Pousseur, *Quintette à la mémoire d'Anton Webern*, sketch for the organization of pitch classes (facsimile).

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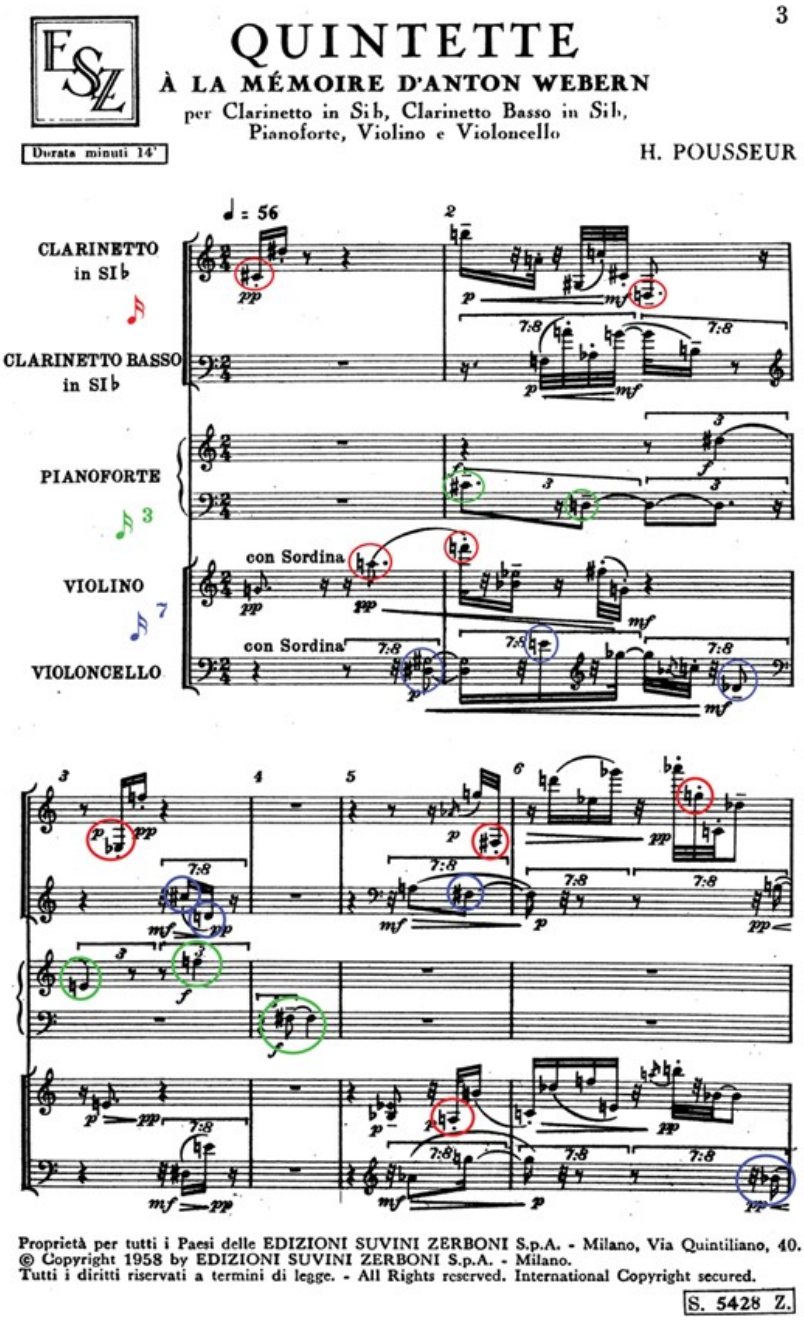
Figure 4:



Henri Pousseur, *Quintette à la mémoire d'Anton Webern*, mes. 1–6, with analytical annotations by the author of this chapter.

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The two examples discussed so far make clear that moving away from thematic composition has an impact on rhythm as well as the overall structure of musical time. The rhythm is removed from preconceived polyphonic webs and organized autonomously according to structures of small or large scale. The best-known principle of this kind is to be found in Boulez's *Structures Ia*: twelve fixed values are attributed to each element of a twelve-tone row and its transpositions. However, the most widely used method sees rhythmic cells being generated from basic values that can be expressed with a duration or with a rhythmic cell in an elementary state. As Heribert Henrich has shown (1997, 51–61 and figs. 7–13), the tables of durations used by Barraqué in the sections in "style rigoureux" of his *Sonate pour piano* are based on systematic transformations of series of eight or eleven cells that are distinguished from one another by the number of attacks and the relationship between their elements. In this case the composition follows the principle of a progressive variation and reconfiguration of the elements.

The organization of duration and rhythmic cells is the epiphenomenon of a broader issue of which Stockhausen gave a detailed account of in his famous article "... how time passes ..." (Stockhausen [1956] 1959; see also Koenig 1991, 224–297). The theoretical reasoning—full of comments on *Gesang der Jünglinge*, *Zeitmasse*, and *Gruppen*—is proposed as a radical rethinking of the problems encountered with the separate treatment of duration, as well as the fundament for a "new morphology of musical time." The observation of the physical properties of sound has indeed shown that all musical phenomena (melody, harmony,

timbre, etc.) can be traced back to time; thus, a composition may be considered as the development of temporal relations at different levels, the most basic of which is the duration of a note. A now well-established tradition of studies of the sketch material of *Gruppen* has shown how the intervals of the all-interval row, upon which the piece is based, expressed in approximate proportions, are crucial for various aspects of time: the duration of each group, the number of its phases, the duration of its individual components, the density variations within, and the pauses that separate the groups (Decroupet 1997b; 1999; 2015, 58–66; Misch 1999). The elaboration of the temporal relationships within the sound complexes has given rise to the notion of "time spectrum," a micropolyphonic organization of the groups, which had a significant impact on Nono, Ligeti, and Zimmermann (De Benedictis 2004; Decroupet 2012b). Such a dialectic between compositional experience and theoretical reflection is emblematic for the serial generation: compositional experiences of different kinds concurred in making tangible the issues related to the nature of musical time. Toward the mid-1950s these issues became a common area of compositional work, even though only the Cologne music circle developed a systematic theoretical model; finally, the theoretical achievements influenced the compositional practices of other composers, who adapted them to their own stylistic and aesthetic criteria.

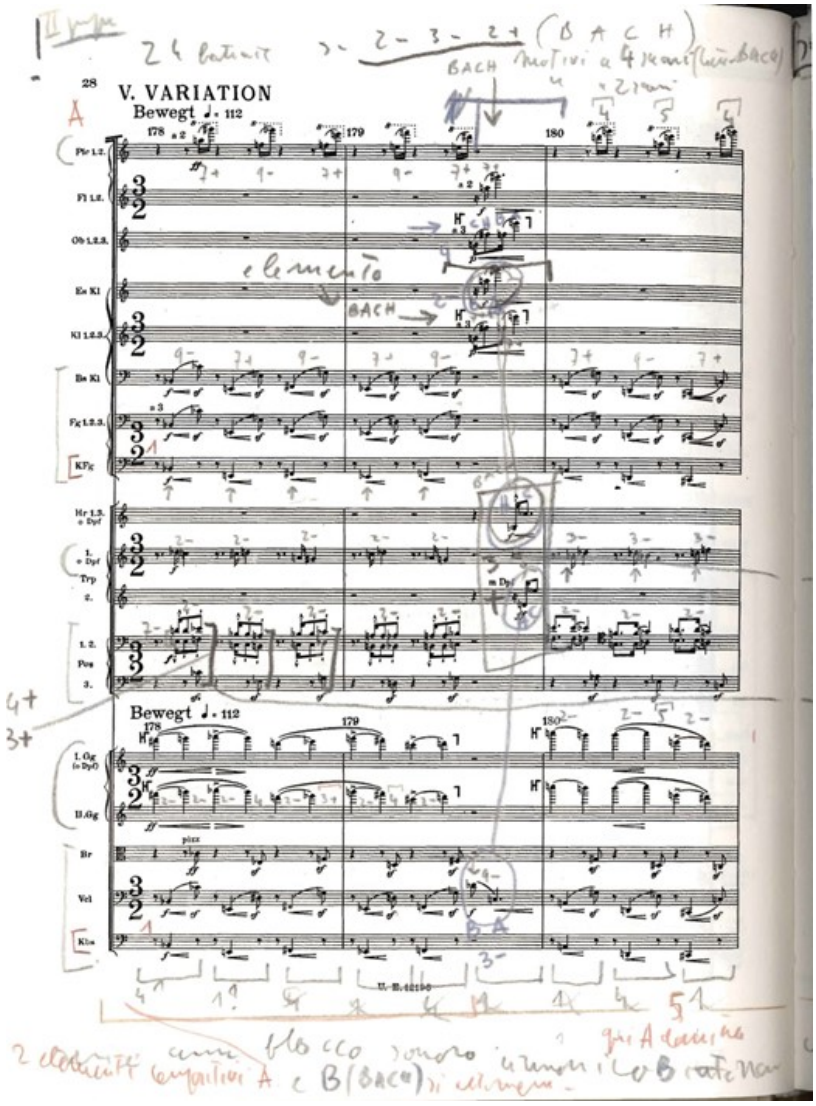
Music Analysis as a Component of the Creative Process

With the serial generation the creative process assumed a complex and multifaceted character. It is reflected in the multiplicity of sources with which any thoroughgoing research has to deal with. Besides the strictly compositional sources (tables, sketches, drafts, etc.), we may find valuable information in apparently "secondary" sources such as correspondence between composers or documents of the analytical work.[2] The latter type of source is significant because it testifies to the role played by the study and critical assessment of the compositional techniques conceived by a number of composers in the early decades of the twentieth century. Bartók, Berg, Debussy, Schoenberg, Stravinsky, Varèse, and Webern were considered as having set off a rhizomatic process whose offshoots encroached on the present. In order to determine the historical place of their own works, the composers felt the need to explore the technical procedures of their predecessors, which were considered as the driving force of musical communication and as sources of expressiveness. Music analysis, often supported by far-reaching considerations, could have different objectives. In the postwar years, great attention was paid to the structure of the twelve-tone rows and types of polyphonic composition conceived by Schoenberg and Webern; the analytical documents reveal the first steps in a gradual understanding of a language that initially appeared to be enigmatic (Kovacs 2004; Gärtner 2008, 69–85). In the late 1950s, the analyses became more detailed and speculative. Commenting upon similar phenomena in the literary sphere, Hans Robert Jauss spoke of "dialogue of the authors at the highest level," an exercise that implies an exchange of visions and knowledge unfolding over an extended time span, whereby the work can act as a representative of the absent author (Jauss 1982, 812). An important element to be taken into special consideration is that such a dialogue, which occurs via music analysis, is the result of a meeting of two horizons: the horizon of the past, represented by the analyzed work, and the horizon of the present, widely affected by the issues that the analyzing composer is facing in his or her own compositions.[3] Finally, the serial generation's practice of music analysis became a social form of its own, playing a central role in the constitution of the international community of composers; not least because it was initiated autonomously by the composers and remained completely under their domain, this form of learning radically differs from the practices of the appropriation of the past, such as the study of counterpoint by playing a keyboard instrument or copying early music.

Nono proposed an analysis of Schoenberg's *Variations for Orchestra*, op. 31, at a seminar in Gravesano in 1956 and then during the Darmstadt Summer Courses in 1957 (Schoenberg 2011). His argument stems from a sort of historiographical thesis: "From the initial 'serial' phase to the present day there is only *logical historical development*, no breaks, only the time necessary for us to become aware of time itself—that is, history—and for it to come to pass" (Nono 2018, 133). Nono focuses on all the levels of the thematic structure: the rhythmic arrangement of the main voice; the mutual integration between what he calls the "melodic projection" and the "harmonic projection" of the series; the sequence of the row forms and the function of the BACH cell. This figure does not appear as such in the row used by Schoenberg but is derived via different methods: the regrouping of non-adjacent pitches of a certain row form, the coupling of the dyads of two different transpositions, and, in most cases, the rearrangement of the chromatic tetrachord (pcs 4-1) that is a segment of the first hexachord of the twelve-tone row. Nono underlines the fact that the last of these choices has an effect on the formal articulation of the work; in other words, a number of distant but

constant references link the introduction, the second variation, and the fifth variation. This last is defined as a "development" of the second variation (see Figure 5). Since the melodic line of the theme returns in each variation in the function of *cantus firmus*, the presence of pcs 4-1 with its components distributed in various orders on the remaining voices of the two variations testifies to a sort of "projection" in space of the material. The way in which the figure is produced is dependent on the context. In the second variation, Schoenberg uses the tetrachord as a motif that jumps from one canon voice to the next one; in the fifth variation, the BACH figure is formed by the juxtaposition of the chromatic dyads on the transposition levels dictated by each pitch in the *cantus firmus*. The questions that Nono poses to the score and the way he deals with them not only are significant for the thesis of continuity between twelve-tone technique and multiparametric serialism but also reflect the goals that Nono was pursuing in his own works. For example, "projection" is a guiding principle in *Il canto sospeso*; this can be seen in the drafts of the first piece in which Nono aims to deal with the series of pitches as alternating between "melodic and harmonic projection."

Figure 5:



Arnold Schoenberg, Variations for orchestra op. 31, mes. 178–180, with annotations by Luigi Nono (facsimile).

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Equally important for understanding serial thought is Boulez's extensive analysis of Debussy's *Études pour piano* that he presented during his courses at Basel's Musik-Akademie in 1960–1961, along with an analysis of Webern's Second Cantata (Borio 2009; 2017, 64–67). In this context, the *Études* become the ground for reflection on fundamental concepts of compositional technique, such as theme, variation, and form. These concepts are captured, as it were, in a historical moment of transformation; it thus appears that Boulez's approach also implies the idea of historical continuity, albeit in a latent manner. The "theme" may be a motivic module, but also an interval, a chord, or a cadence—in short, it is a "sound object" that is open to different kinds of developments. As far as form is concerned, Boulez focuses on detail configuration and finely elaborates the time structures operating within a framework governed by simple principles (mostly cyclic or alternating forms). For example, he observes in "Pour les Quartes" a "montage of developments,

original sequences, and reminders" ("montage de développements, de séquences originales et de rappels"), whereas he understands "Pour les Octaves" as a study on the opening formula, subdivided into three phases: "Preparation, Cadence, Mirror of the Preparation" ("Préparation, Cadence, Miroir de la préparation"). "Pour les Notes répétées" is also governed by a cyclic conception, which, however, unfolds depending on the focalization times of certain figures. The guiding thread that goes through the whole analysis is the relationship between a sound object and its transformation over time (its "description," as Boulez was later to say). This approach is echoed in the compositions he wrote in those years, and it is particularly relevant for the relationship between form and material established in *Doubles* via the alternation of slow sections and "développements vifs."

Two aspects that emerge in the analyses carried out by Nono and Boulez also characterize the lessons on Webern offered by Pousseur and Ligeti in Darmstadt in 1957 and 1961: on the public side, past works are used to highlight the historical premises of the composer's current work; on the private side, the current instances of compositional technique act as a filter and as a reference for the illustration of the logical path that is found in the analyzed score. Treating music analysis in the light of sketch studies has revealed novel aspects of the notion of the creative process: the composer's action is not limited to the conception and realization of musical structures but borders on the areas of theory, historiography, and aesthetics. Writing music is thus defined as an all-round consideration that also involves, besides the material and form, the physics of sound and the psychology of listening. Traces of such thinking are found in many sources that bear witness to the use of new terms and historical references, and give hints to the meaning of the process; they in turn communicate with the composers' "explicit poetics," an aspect of public self-representation that shadowed compositional activities in the twentieth century (Danuser 1993). As a consequence, research must necessarily become a wide-ranging archival investigation that can include theoretical papers, correspondence, journals, photographic documents, and audio or video recordings. Studies in recent decades have shown that in order to understand a technique, one needs to embrace the entire imagination and experience of a composer.

Toward a Global Picture of the Working Methods: Editorial and Analytical Stakes

The examples mentioned here shed light on the important role of analysis in providing an accurate picture of the dialogue between distant generations, a crucial component in the cultural processes of the Western world. In a move anticipated by some of their teachers, notably Olivier Messiaen and René Leibowitz, the members of the serial generation elevated the analytical work to a permanent component of their creativity, thereby setting a standard for the following generations of composers.[4] Such dossiers are so extensive and relevant for the historical research that, in some cases, they fulfill the requirements for publication. Bearing in mind the peculiarities of these sources, the most suitable editorial model seems to be the facsimile reproduction of original documents accompanied by a critical-historical study, which is exactly the model used for Nono's analysis of Schoenberg's *Variations*. Scholars may thus observe a closeness even on the graphic level between this type of source and the materials of the compositional process. Similar questions arise in the publication of editions of sketches and drafts. A pioneering work in this field was the edition of a selection of sketches, the draft score, and the first fair copy of the full score of *Le Marteau sans maître*, edited by Pascal Decroupet (2005). Here the reader is brought directly in contact with the communicative mechanisms of the work and the structural decisions that the composer has taken; this publication is therefore a tool, the usefulness of which goes beyond the specialized field of philology, by involving historiography, aesthetics, and music pedagogy. In a nutshell, source editions are prime material for everyone and anyone involved in the culture of written composition; it is almost impossible to reach far into the aesthetic project without access to this kind of documents.

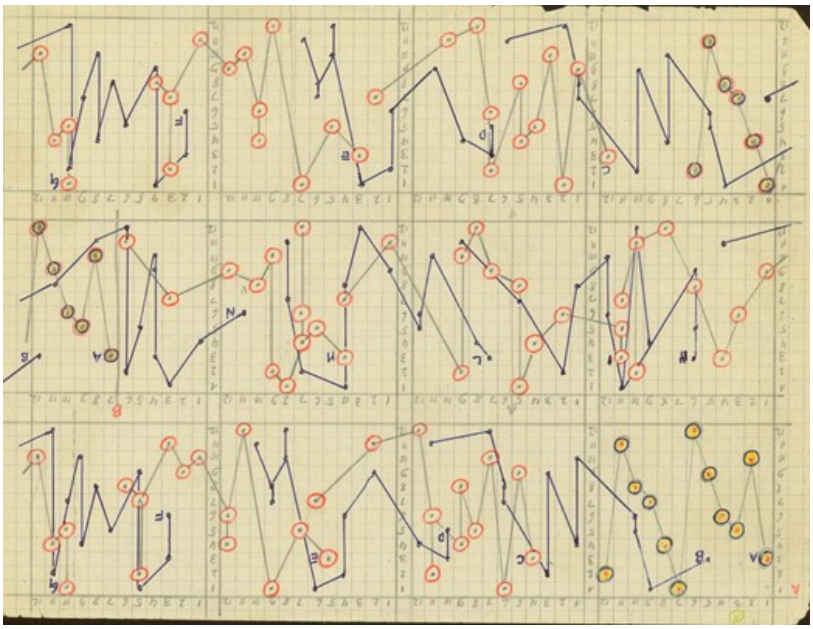
The multitude of possible consequences is a further reason that anyone planning such an edition must be aware of a series of potential pitfalls. The first of these concerns the potential infinity of philological reconstruction. Archives are repositories of all kinds of objects that document the stages in the definition and transformation of the musical idea. A dossier of sources can be understood as a network whose elements establish reciprocal links depending on the questions asked by the scholar; however, there is no guarantee that the collection is complete, and, in fact, experience shows that as time goes by unexpected sources or ones thought to be lost can appear. Thus, the publication of the sources of the compositional process has to come to terms with its own finitude. A second danger is generated by the impression of

objectivity that archival documents may convey. This aspect is of unparalleled importance as regards the sources of the serial generation, because they provide crucial information not only about the choices made by the composer but also about the work's communication mechanisms. Research that stops at a mere description of what is found in the sources runs the risk of being superficial, unless this description is considered in the light of the theoretical background and the overall aesthetic horizon. Third, the need to concentrate on a single composer or even a single work was fully understandable in the initial phase of sketch studies, given the difficulties implied by the evaluation of philological evidence that appeared enigmatic and at times astonishing; now, however, the growing consciousness of the common ground for the whole generation has broadened the perspective of comparative studies focused on specific technical or aesthetic issues.[5]

The study of the compositional process has led to the dismantling of one of the most widespread prejudices of criticism: the "pre-formation of material." An excerpt from Adorno's *Philosophy of New Music* may have given the impression that serial technique was a process external to authentic composition: "Schoenberg in fact considered twelve-tone technique, in compositional praxis, merely the preparation of the material. He 'composes' with twelve-tone rows; he disposes sovereignly over them, indeed, as if nothing had transpired. The result is ceaseless conflicts between the constitution of the material and the procedure imposed on it" (Adorno 2007, 85). This way of seeing was transferred to serial composition, initially in some articles by Ligeti and Xenakis, which deserve to be studied as stages in a wider-reaching theoretical reflection (Piencikowski 2006). Several essays, some of which are even quite recent, describe the composer's work as being divided into an abstract "pre-compositional" phase followed by a second, more concrete phase that coincides with to the automatic translation of the structures into sound (Taruskin 2010, 27–30). This does not correspond to reality. Indeed, a survey of the sources underlines the intersection of the various stages of the compositional work, and in any case the continuity between them; the imagination of the sound and the development of the material go hand in hand and sustain each other (Neidhöfer 2007). A procedure with quite clear contours emerges: the systematic arrangement of a set of usually (though not always) twelve pitches allow tables of material to be created; the composer treats this basic material with various strategies regarding the choice of partial elements, the agglomeration of different sets, and the definition of the density relationships; further elaborations imply setting the material "into time," differentiating it in terms of timbre and articulating it with dynamic changes. Depending on the case in question, the working areas can either follow one after the other, be simultaneously active, or appear in alternate phases. The much-discussed "idea of the work"—a kind of transcendent essence separated from the construction techniques—is neither superimposed on nor simply derived from the elaborative processes; in the dialectics of its constituent actions the compositional work aims to achieve a specific sound configuration and thus to program a listening experience. It is in this light that the combinatorial procedures devised by the serial generation become comprehensible.

Two of the most significant procedures are the "mutations" technique, used by Maderna and Nono from 1951 onward, and the statistical reordering of pitches devised by Boulez for the "Bourreaux de solitude" cycle of *Le Marteau sans maître*, which was then taken up by Stockhausen from *Klavierstück 1* onward. Such elaborations respond to the intention of projecting the series in a field of controlled variability, exploiting its immanent properties.[6] The method used by the two Italian composers consists, in the systematic repositioning, of each item of a twelve-tone row; this is done by using a number square whose lines or columns produce a constant sum so that at the end of the process the row returns to its original position. The numerical series that determines the displacement varies according to the piece; the choice of its elements represents a first indication of the frequency and density of sound events. The pitches are numbered starting from A = 1 to A♭ = 12 (see Figure 6). Boulez's ciphering instead starts from C; the superimposition of consecutive numbering on the series of pitch numbers determines a geometric displacement of each component within a 12 × 12 square (see Figure 7). Both processes give rise to a rearrangement of the pitches in units whose size ranges from a single sound to complexes of multiple elements, leaving sporadically empty spaces. Read horizontally, these tables propose a still abstract temporal path that is converted into a concrete temporality through the application of series of durations or rhythmic cells, which are in turn linked to a macro-temporal strategy. The set of operations is connected to the formal conception, which is therefore unique for each and every piece.

Figure 6:



Bruno Maderna, String Quartet in two parts, permutation of the basic row (beginning) (facsimile).

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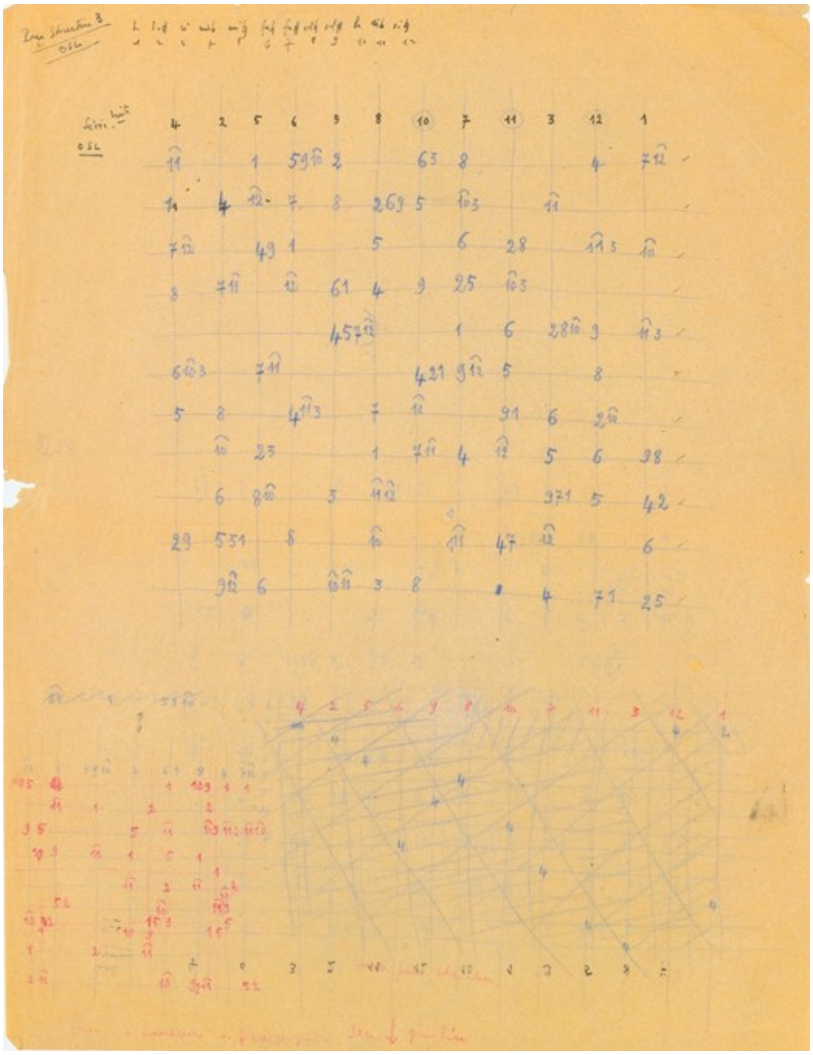
Figure 7:



Pierre Boulez, *Le Marteau sans maître*, chart of permutation for the “Bourreaux de solitude” cycle [facsimile-*Ausgabe*, p. 88].

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This rather quick comparison of the procedures used by Maderna and Nono with those of Boulez and Stockhausen may suffice to illuminate the theoretical field in which the composers identified and tackled one of the key issues in serial thinking: the relationship between the temporal and spatial aspects of the

sound process. Their goal was to achieve a new type of polyphony, one that follows a certain principle but does not resort to imitations and motivic variations. Here, the study of source material provides ample evidence of a common theoretical perspective, which becomes all the more significant since it gave rise to a great variety of sound and expressive outcomes.

When these procedures are put under the microscope, we are able to appreciate just how much importance was given to the numerical definition of the elements and their relationships. While any musical creation has a mathematical dimension to it, making this dimension explicit and exploiting it on a large scale denotes a profound change of mentality. Its origins lie in the very idea of series which mathematicians define as a sequence of numbers generated by a given rule.[7] The new perspective originates from the simple acknowledgment that any transposition of a series of twelve pitches is equivalent to a permutation of its elements. Immediate and tangible evidence of this change is offered by comparing Schoenberg's and Webern's lists of serial forms, written on staff paper and ordered in intervallic relationships, with the numerical tables of the serial generation. The next step in this field can lead to the production of new serial forms that have different relationships with the starting series. This is what happens, for example, in the seventh movement of *Il canto sospeso*, in Zimmermann's *Perspektiven*, and in Barraqué's *Sonata*. The same numerical series can then be applied to the parameters of duration or intensity. Last but not least, the numbers can serve as a means of steering the "degree of mutation" of each component in the sound process; this occurs, for example, in Karel Goeyvaerts's *Sonata for Two Pianos* and Berio's *Nones* with the use of the "synthetic number" (Sabbe 1977, 50–51; Neidhöfer 2009). The concept of "group," introduced by Stockhausen, represents a kind of extension of the "degree of mutation" insofar as it is now applied to sound complexes of different size, as can be seen in his *Gruppen* and in *Sarà dolce tacere* by Nono (Decroupet 1997b; De Benedictis 2004). A general principle for serial composition can be deduced from the sum of all these applications—namely, that the objectivity of mathematical procedures is the epiphenomenon of an imagination of sound that is characterized by conspicuously subjective components. The new conception of scientific knowledge, "giving up the search for a unique truth in favor of a plurality of partial descriptions, has devised mathematical models to be applied to the described phenomena as steps branded by subjectivity and even creativity"—such a change has a clearly perceptible impact in this area of musical experience (Locanto 2011, 74).

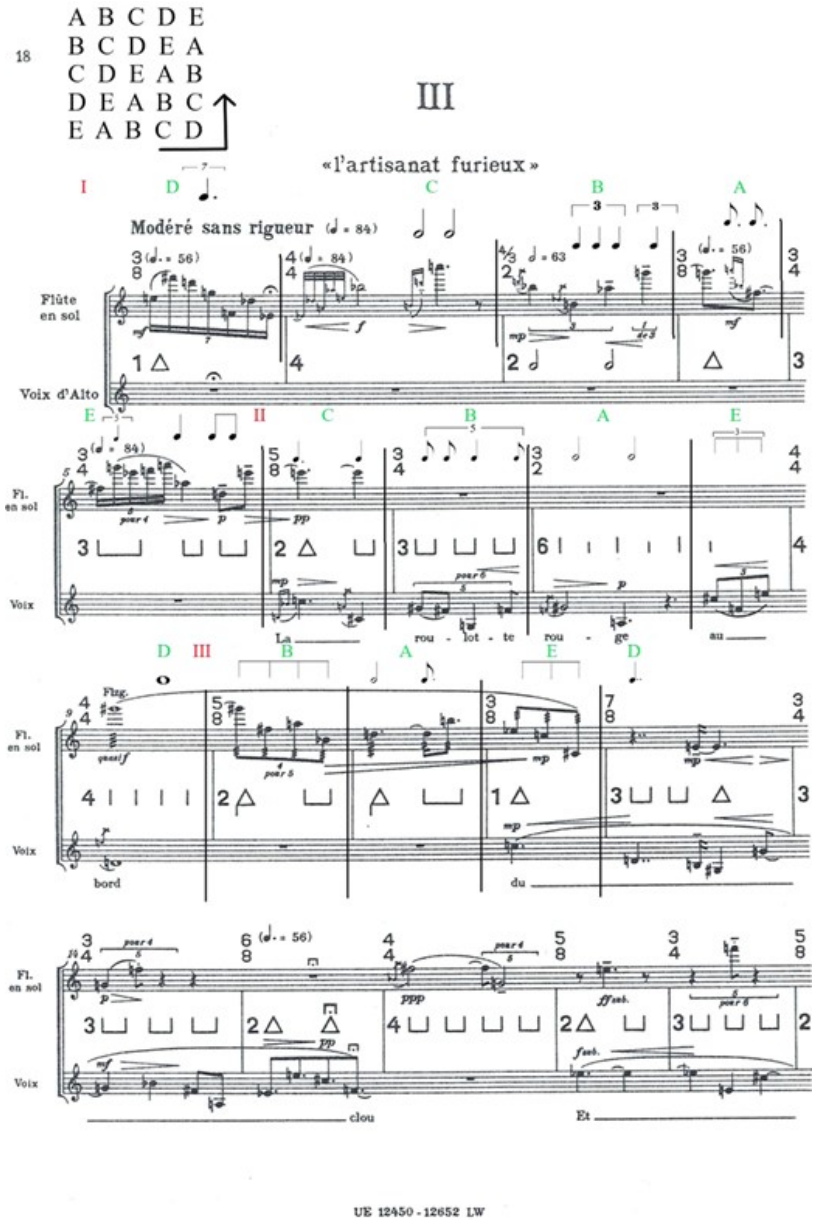
The topics we have discussed so far bring us back to the issue of how to limit the scope of the serial generation's common ground in terms of creative activity. The archival sources offer much food for thought on two complementary aspects that Decroupet, using terms derived from cryptology, has labeled "algorithm" and "key" (Decroupet 2012a). "Algorithm" denotes the basic principles of encryption, while "key" is the specific combination to be used in order to decipher the encrypted messages. Of course, it is true that putting compositional work together with cryptographic techniques could further fuel misunderstandings about serial aesthetics, in particular, the misconception that composers enveloped their activity in a halo of mystery as a means of boosting the modest amount of attention their works received; the risk is even more evident in the fundamental distinction cryptology makes between "plaintext" and "ciphertext," which is not applicable to the musical text and its interpretation (which is not decipherment). However, the approach does work, as is demonstrated by the fact that Decroupet, together with Jean-Louis Leleu, was able to reconstruct the compositional method used by Michel Fano for his *Sonate pour deux pianos* despite the lack of any original sources (Decroupet and Leleu 2011). More generally speaking, the picture of "compositional machines," evoked by Decroupet, fits well with what can be observed in sketches, tables, and drafts. In fact, this approach, which in sociological terms could be defined as the adoption of a "production mode," pertains to all the dossiers of that generation of composers, even including those who did not share the basics of serial theory; it can also be found in the next generation of composers such as Brian Ferneyhough, Helmut Lachenmann, and Gerard Grisey (Cavallotti 2006).

Programming the Listening Experience

In addition to the great care devoted to the sound phenomenon and the elaboration of the numerous facets of musical time, what singles out the serial generation is the fact that its members considered the new listening experience as part of their aesthetic project. Investigations of the compositional process allow us to clearly grasp this aspect. In fact, throughout the sources, we observe an attitude that occurs time and time again, notwithstanding the historical moment or personal style: the separate processing of sound parameters and the combination of its outcomes are implemented to construct sound objects that unfold in time; the modes of such unfolding, determined in each case through specific criteria, give rise to conceptions of form that are radically different from those of tonal music. Speaking of a "new musical sensibility," Pousseur was one of the first to consider the relationship between structure and perception as being the real core of serial thinking (Pousseur [1957] 2004b; Stockhausen [1958] 1975). He turned to Gestalt psychology to find theoretical support for this insight. Indeed, the first advocates of this theory had already explained that the perception of a shape in time is dependent on the sum of its driving forces and that any change in the latter leads to a change in its course. Following this path, Pousseur can conclude that the serial technique, which allows separate control over each compositional dimension, lays the premises for a "continuous variability of phenomena," a state unthinkable in tonal music that is based on repetition, symmetry, and periodicity, and therefore on fixed relationships between the dimensions (Pousseur [1957, 1959] 2004c, 233). The traditional dialectic between identity and difference is therefore changing: whereas in a tonal composition, identity stems from the thematic unit on which contrasts, variations, and returns depend, here identity is instead a structural principle, and the listener is involved in a process of controlled differences.

Despite the fact that the programming of a listening experience is a practice that traverses all the compositional phases, it becomes particularly evident in the first draft of a piece where the sound configuration assumes sharper outlines. This is the moment when the "compositional machine" takes a strong orientation and its results appear in more specific details; the sound process becomes unique in its physical shape. A clear example of such concretization is "L'artisanat furieux," the third piece of *Le Marteau sans maître*. This setting for alto flute and contralto voice is characterized by a sleekness that reminds one of "Der kranke Mond," the seventh piece of Schoenberg's *Pierrot lunaire*, also for flute and voice. However, quite different principles are at work here. The technique of multiplication of different portions of a twelve-tone row determines pitch class sets whose chromatic potential increases in relation to the number of components. With an operation that Boulez later defined as "description de l'objet," the components of each complex are distributed in the instrumental and vocal parts with the aim of establishing a fluctuating situation that allows certain interval relationships in variable distances to emerge (Boulez [1963] 1987, 126–127; 2005, 309–310). Leleu and Decroupet have shown how the whole piece is made up of concatenations of intervallic cycles, with interval classes 2 and 3 being the most important; the minor third interval in particular is established as the preferred cycle even in the choice of criteria for the multiplication (Decroupet and Leleu 2006). The grid that Boulez sets for the succession of rhythmic cells allows for great flexibility in the interpretation of each unit. The elaboration of details, and thus the definition of the physical sound, is triggered through several decisions: the succession of pitches in the resulting complexes is established each and every time; the units of duration can be subdivided in many ways (including the important distinction between "structural" and "ornamental" notes); and the register of certain pitches is sometimes fixed, an option that contributes to the cohesion of the whole (see Figure 8).

Figure 8:



Boulez, *Le Marteau sans maître*, no. 3, ms. 1–10, score with indications for durations, tone complexes, and linear disposition of the pitches by the author of this chapter.

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Another way of programming of the listening experience is found in the second movement of *Il canto sospeso*, which was, moreover, the origin of the dispute between Stockhausen and Nono on how a verbal text should be handled in serial composition (Stockhausen [1958] 1975; Nono 2018, 153–178). Last but not least, this piece was also the benchmark for many vocal compositions, including the *Lacrimosa* of Ligeti's *Requiem*, which depicts a homogeneous mass agitated by vibrating and irregular movements. The composition unfolds on four overlapping lines, distinguished by the units of ♪, 𝅘𝅥𝅯, 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯, 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯. Nono distributes the pitches of the all-interval row at the basis of the whole work in continuous cycles (see Figure 9). The durations are determined by a numerical table whose application to the texture results in a continual change of the harmonic structure. In this way, Nono creates a sound mass of constant density, which moves inward due to the variations on the harmonic and rhythmic planes. In this case, the task of configuring a specific experience of listening is directly related to the verbal text and the type of dramaturgy intended by the composer. Nono has organized it according to a peculiar rhythm that foresees different degrees of scrolling through and thickening the text (see Figure 10). He focuses on a few moments, thereby creating a fusion between the semantic and phonetic dimensions; this is what emphatically appears in the central section, where the passage "milioni di uomini morti" ("millions of dead men," mes. 129–135) is magnified. Such a slowing down of the textual rhythm requires many values, which in this case uses up the whole square; in fact, precisely at mes. 135 (from the contraltos' A) Nono employs some previously used numerical sequences. Mes. 142 (from the second contraltos' A) marks a turning point in the formal conception, which is confirmed in the way the text is distributed among the voices. Here Nono constructs a sort of mirror

canon whose imitations are achieved by irrational values. Without prejudice to the pitch distribution method, the way in which duration is handled (the first six numbers of the Fibonacci series are read in retrograde and then in the original sequence) results in a specular structure that is functional to a final section in which the text contents move into the future dimension.

Figure 9:

A	Bb	Ab	B	G	C	F	C	F	D	E	Eb
1	2	3	5	8	13	13	8	5	3	2	1
2	3	5	8	13	13	8	5	3	2	1	1
3	5	8	13	13	8	5	3	2	1	1	2
5	8	13	13	8	5	3	2	1	1	2	3
8	13	13	8	5	3	2	1	1	2	3	5
13	13	8	5	3	2	1	1	2	3	5	8
13	8	5	3	2	1	1	2	3	5	8	13
8	5	3	2	1	1	2	3	5	8	13	13
5	3	2	1	1	2	3	5	8	13	13	8
3	2	1	1	2	3	5	8	13	13	8	5
2	1	1	2	3	5	8	13	13	8	5	3
1	1	2	3	5	8	13	13	8	5	3	2
1	2	3	5	8	13	13	8	5	3	2	1

Luigi Nono, *Il canto sospeso*, no. 2, square for the durations.

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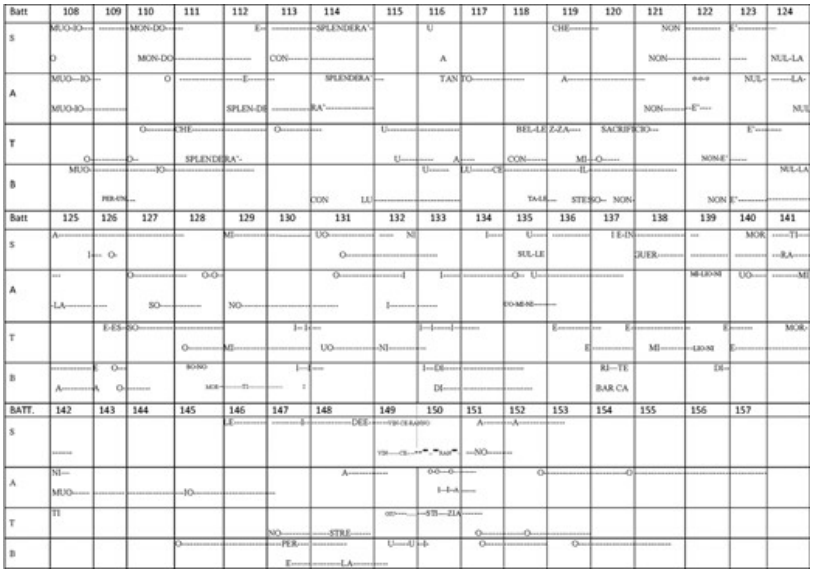
Figure 10:



Luigi Nono, *Il canto sospeso*, no. 2, disposition of the text on the voices.

Image is the author's own

The intertwining between the serial organization of compositional dimensions and the definition of an overall process with peculiar characteristics is a constant feature of the compositional technique adopted by the serial generation. For *Gruppen*, Stockhausen predisposed a time structure derived from the relationships between the components of an all-interval row, which provide criteria for the arrangement of the individual sections; at the same time he established a dramatic curve that goes from an initial situation of statistical distribution toward order and transparency; finally, he composed some groups whose conformation was not dictated by the initial plan, and he placed such inserts at strategic points in the formal process (Decroupet

1997b, 45; Misch 1998, 1999). The most significant of these inserts includes groups 114–122, found about three-quarters of the way through the work. The transparency and clear directionality of the sound process set this moment apart in terms of global dramaturgy. In groups 114–119, Stockhausen follows through on the idea of members of the instrument families performing solo, a characteristic feature of the previous two inserts (groups 16–22 and 71–77): the brass section now takes the lead and selected instruments become involved in dialogic interactions. This is followed by a virtuoso solo piano and solo percussion section that resolves in an extremely intense orchestral *tutti*. The stages of this process are defined in verbal and descriptive sketches. Such a change in procedure does not correspond to a stylistic change; Stockhausen continues to employ the contrapuntal textures, formal conceptions, and types of material that formed the basis for the work, but no longer resorts to tables and proportions. "Free" composition is thus the outcome of a technique whose path was so far already familiar to his listeners and would now be redeployed in a continuous chain of teleological events.

Translated from Italian by Sally Davies

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Notes

1 In the Anglo-Saxon [English-speaking] literature, the term “serialism” has often been used in a broader and more generic sense, which includes dodecaphony (“twelve-note serialism”) as well as other pitch- and interval-based techniques that do not use full twelve-note series (“non-twelve-tone serialism”). In this chapter I am keeping the distinction, widespread in the continental literature, between twelve-tone technique and serial composition.

2 About the consistency and meaning of the epistolary exchange, see Dal Molin 2016.

3 Examples of the reconstruction of the reception process starting from sources limited to Webern can be found in Borio 2005, Cavallotti 2011, and Neidhöfer 2019. In the rest of this section I include some results from research presented in Borio 2017.

4 As regards the older masters, analysis plays a central role in the seven volumes of Messiaen 2002 as well in most of the writings of Leibowitz, especially the unpublished "Traité de la composition avec douze sons" (1951), which exists in two versions (as manuscript and typescript) in the Paul Sacher Foundation, Basel.

5 An exemplary study in this sense is provided by Werner Strinz (2003) on the birth of the serial concept of rhythm.

6 There is ample literature on this technique. Here I shall mention just two examples: Decroupet 2015, 54–55, and Rizzardi 2011, 52–55.

7 Gottfried Michael Koenig focused on this aspect in an extensive theoretical work titled "Musik und Zahl." Two versions of the text are reproduced in Koenig 1991, 7–29 and 30–62.