

1 | Theorising Serialism

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Serialism is a virtually ubiquitous phenomenon in studies of twentieth-century music. Readers and writers alike will almost certainly understand the context in which the term is used in individual instances, but those contexts differ widely. The linguistic contrast between the nouns 'series' and 'serialism' may partially account for the vast array of contexts in which serialism is used: 'series' refers concretely to a succession of objects in a fixed order, while the suffix '-ism' in 'serialism' refers more abstractly to a belief in a particular practice, system, or philosophy. Within its various contexts, three broad understandings of serialism can be discerned, distinctions which, too, exhibit significant linguistic contrasts. First, serialism may refer to ordered successions of objects, including twelve-tone rows, in which case the context may be described as twelve-tone serialism or, sometimes, simply dodecaphony. Second, serialism may refer to the expansion and diversity of compositional approaches and aesthetics based on a series, which may or may not contain twelve elements. On occasion, this version of serialism might be viewed not as a continuation of twelve-tone serialism, but as a sort of opposition to dodecaphony. Third, serialism may refer to a way of thinking, 'state of mind' (Dallapiccola, quoted in Alegant 2010: 9), philosophy, or even ideology that reveres rigour, order, and unity as compositional principles while disconnecting them from musical style or method.

Such wide-ranging, verging on contradictory, understandings of serialism shape this exploration of theorising serialism, incorporating the notion of a row or series and fixed ordering of elements, expansion of musical parameters for fixed ordering, and the extension of the serial concept into the realm of sound generation and timbre. In my view, the absence of a singular definition should be regarded positively, adding nuance to any theorisation of serialism.

Part I: Before 1945

The Serial Concept

The serial concept in musical composition originated as an organisational framework based on the principle of fixed ordering of elements. Arnold Schoenberg articulated a 'method for composing with twelve tones which are related only with one another' in a 1941 lecture given at the University of California at Los Angeles (Schoenberg 1975a), which in turn was based on notes prepared in 1934 for a lecture at Princeton University known as the 'Vortrag über Komposition mit 12 Tönen'. The published essay came to be regarded as the definitive authorial statement on Schoenberg's twelve-tone technique, but as noted by Claudio Spies and others, the 1934 version of the material is more theoretically focused and precise, addressing compositional technique directly and dispensing with spiritual and other extra-musical elements included in the 1941 version (Spies 1974; cf. Covach 2017; Hyde 1982).

Fixed ordering of pitch classes acquired a privileged position in Schoenberg's compositional practice beginning in 1921. David Lewin described Schoenberg's twelve-tone practice as integrating the serial concept with permutations of the aggregate (Lewin 1968: 1), which is to say, related ways of ordering a particular twelve-tone series (its prime form), stereotypically by inverting the pitch relationships (inversion), or reversing their order (retrograde), or both (retrograde inversion), and by beginning any such permutation on a different opening pitch class. Uncoupling the serial concept from permutations of the aggregate is pivotal to any understanding of the concept itself.

Schoenberg described the Suite for Piano op. 25 (composed between 1921 and 1923) as his first composition to adopt serial ordering of the twelve pitch classes, but he employed serial pitch-class ordering prior to op. 25 using series of different lengths in the Five Pieces for Piano op. 23 and in the Serenade op. 24. Fixed ordering of elements in Schoenberg's early serial practice reflected compositional choices about the identity, number, and realisation of elements within an underlying theoretical framework. The series forms that appear in Schoenberg's Suite op. 25 are shown in Table 1.1, with each form analogous to its manifestation in Schoenberg's row tables from 1921, in which the row forms are displayed rather differently (Figure 1.1). Note in Table 1.1 that the inverted form begins a tritone from the first pitch class of the prime form. The four basic transformations are followed by their tritone transpositions, completing the eight row forms

Table 1.1 Row forms from Schoenberg's Suite op. 25

Prime E \sharp F \sharp G \sharp D \flat G \flat E \flat A \flat D \sharp B \sharp C \sharp A \sharp B \flat	Retrograde B \flat A \sharp C \sharp B \sharp D \sharp A \flat E \flat G \flat D \flat G \sharp F \sharp E \sharp
Inversion B \flat A \sharp G \sharp D \flat A \flat B \sharp G \flat C \sharp E \flat D \sharp F \sharp E \sharp	Retrograde Inversion E \sharp F \sharp D \sharp E \flat C \sharp G \flat B \sharp A \flat D \flat G \sharp A \sharp B \flat
T6: Prime B \flat B \sharp D \flat G \sharp C \sharp A \sharp D \sharp A \flat F \sharp G \flat E \flat E \sharp	T6: Retrograde E \sharp E \flat G \flat F \sharp A \flat D \sharp A \sharp C \sharp G \sharp D \flat B \sharp B \flat
T6: Inversion E \sharp E \flat D \flat G \sharp D \sharp F \sharp C \sharp G \flat A \sharp A \flat B \sharp B \flat	T6: Retrograde Inversion B \flat B \sharp A \flat A \sharp G \flat C \sharp F \sharp D \sharp G \sharp D \flat E \flat E \sharp

The image shows a handwritten musical score for Schoenberg's Suite, op. 25, page 27H. It consists of two systems of music, each with two staves (treble and bass clefs). The first system is labeled '27H' and contains four measures with pitch class labels T, TK, TU, and TUK. The second system contains four measures with pitch class labels D, DK, DU, and DUK. The notation includes various accidentals and a double bar line between the two systems.

Figure 1.1 Schoenberg's row tables for the Suite, op. 25

that appear throughout the Suite, with the result that all eight forms begin and end on pitch classes E \sharp and B \flat .

The eight row forms shown in Table 1.1 belong to a complex of relations within what were to become known as the classical serial transformations, which are shown idiosyncratically in Schoenberg's row

tables in Figure 1.1, completed in 1921. The layout and labelling of the row tables in Figure 1.1 will appear unconventional a century after their creation in light of more familiar representations of dodecaphonic series and matrices in the scholarly literature, but they are of great value in revealing enduring aspects of Schoenberg's serial thinking. In addition to the row forms that appear in the Suite, the sketch also includes four brief compositional drafts, explicitly blending theoretical and practical concerns within the single sketch.

Figure 1.1 consists of four quadrants. The upper left quadrant shows the prime (or basic) form and its retrograde, each partitioned into its discrete tetrachords over three staves with a brief compositional draft based on the prime form inserted between the prime and retrograde forms. The prime form is labelled T for *Tonika*, and the retrograde is labelled TK, where K refers to *Krebs*. Note that the three tetrachords of T appear, in order, in the top, middle, and bottom staves, while the three tetrachords of TK appear, in order, in the bottom, middle, and top staves. While the division of the complete twelve-element series into its discrete tetrachords on separate staves serves to display simultaneously the whole and significant parts, this arrangement conceals the linear retrograde relations. Such a multidimensional understanding of serialism from the outset became a critical component of Schoenberg's serial thought. The tetrachordal partitioning also explicitly reveals the homage to Bach, and by extension the genre of the Baroque dance suite, with the BACH motive that appears in its original form in the first tetrachord of the retrograde (TK) form (seen in the bottom staff, upper left quadrant in Figure 1.1).

The other three quadrants are organised in the same fashion. The upper right quadrant shows the inversion of the row (beginning a tritone from the starting pitch of the prime form), labelled TU, where U refers to *Umkehrung*. The retrograde of the inversion, that is, the retrograde inversion, appears to the right of the inversion, and is labelled TUK. The bottom left and bottom right quadrants in Figure 1.1 show the prime, retrograde, inversion, and retrograde inversion forms all transposed by six semitones, with D for *Dominante* replacing T in the labels. The characterisation of the prime form as *Tonika* preserves the familiar principle of a central, referential entity to which others are related, while Schoenberg's identification of the tritone transposition as *Dominante* divulges his understanding of the interval of the tritone as a type of equivalency with the most essential tonal relationship, the dominant, perhaps a strategy for mediating the radical nature of the new compositional approach with an explicit appeal to familiar, traditional relationships (cf. Phipps 1986). In addition to the

fundamental role of the tritone in the complex of row forms, the interval of the tritone as the boundary interval between the first and last pitch classes of the row (E \sharp and B \flat) ensures that each row form begins and ends on these pitch classes.

The striking brief compositional drafts that are interspersed between the prime and retrograde forms and between the inversion and retrograde inversion forms in the row tables (and their tritone transpositions) are noteworthy for their treatment of the discrete tetrachords. Within each compositional draft, the discrete tetrachords are set as a three-note sonority followed by a single pitch in beamed sixteenth notes. The setting of the first tetrachord of the prime form, consisting of the sonority E \sharp -D \flat -F \sharp followed by the single pitch G \sharp , appears to be a draft of the music that occurs in the opening bar of the *Intermezzo*. The settings of the second and third tetrachords from T in the draft replicate the same rhythmic and textural patterns, as do the settings in the remaining three compositional drafts. The three-note sonorities obfuscate the linear order within each tetrachord; they do not systematically set the first three elements, and the single note following the three-note sonority is never the fourth element. They are consistent in articulating the tetrachordal contents, but inconsistent in articulating their internal distribution. The conspicuous treatment of the row tetrachords – in the tables and in the composition – has led to some debate about whether the *Suite* should be understood as a hybrid work in which some movements are based on arrangements of tetrachords comparable to the row tables (the *Prelude*, *Gavotte*, *Musette*, *Intermezzo*, and *Menuett*), while other movements reflect the linear, fixed twelve-tone ordering (the *Trio for the Menuett* and the *Gigue*) (Haimo 1990: 84–5; Hyde 1983: 470–9; Boss 2014: 38; Whittall 2008: 32–5). I would argue that the tetrachordal partitions in the row tables, being derived from a pre-existing construct, support Schoenberg's early and full understanding of the series as a multidimensional entity. Jack Boss describes Schoenberg's flexible approach to serial ordering in the *Suite* and later works as 'a spectrum of ways of presenting the row that ranged from an unordered aggregate on one end of the spectrum to complete, perfect ordering on the other end' (Boss 2014: 37). By separating compositional practice from abstract, conceptual speculation, this spectrum of possibilities succinctly epitomises the theorisation of the serial principle and foreshadows the greater expansion of the serial concept to come.

The principle of serial ordering of pitch classes represented a radical approach to the treatment of musical materials and a venture into the avant-garde, notwithstanding Schoenberg's efforts to retain important connections

with his musical heritage. The enrichment of the serial concept in the decades following its inception continued to be characterised by radical departure from compositional norms. Schoenberg's Five Pieces for Piano op. 23 and the Serenade op. 24 are commonly regarded as precursors to Schoenberg's twelve-tone method because they employ series of fewer than twelve elements in the first four movements of op. 23 (Hyde 1985) and greater than twelve elements in the variations movement of op. 24 (Lester 1968). Recalling the linguistic shifts and nuances of 'serialism', these works are sometimes described as 'serial' so as to reserve the descriptor 'twelve-tone' specifically for the consistent serial ordering of the twelve pitch classes and the classical permutations of the aggregate (prime, inversion, retrograde, and retrograde inversion). Given the pervasive impact of Schoenberg's twelve-tone method, this is understandable, but for the purposes of this chapter, the twelve-tone method is regarded as a particular, and particularly significant, manifestation of the serial concept.

The serial concept expressed itself in the expansion of Schoenberg's treatment of pitch classes into serial treatment of other musical parameters by fixed ordinal schemes and later into more complex, derived, logical processes, reflecting new ways of thinking about musical materials. The radical nature of Schoenberg's 1921 discovery is inseparable from its iconic position in the history of musical modernism (cf. Moore 1995: 77–8), and similarly, the radical quality of later manifestations of the serial concept is inseparable from the cultural context in which they appeared. Theorising serialism must take cultural, historical, and aesthetic considerations into account.

Messiaen

Like Schoenberg, Olivier Messiaen is strongly identified with musical modernism in the first half of the twentieth century, and, though from a different aesthetic tradition, his teachings and compositions also inspired the development of the serial concept, independent of the permutation of aggregates. Messiaen is known for his idiosyncratic treatment of rhythm, characterised by eschewal of traditional metric and tonal patterns. His interest in non-Western rhythmic patterns (such as the *deçi-tâlas* collected in the thirteenth century by Śārṅgadeva), including non-retrogradable rhythms, as musical objects and his creation of independent series of pitches and durations unfolding simultaneously further underscore the multidimensional nature of the serial concept.

The first movement of the *Quatuor pour la fin du temps* (1941), 'Liturgie du crystal', scored for piano, cello, clarinet, and violin, offers a clear example

of Messiaen's early serial conception. The cello and piano parts unfold two simultaneous series in each instrument. The cello part, entirely in harmonics, superimposes a repeating short five-element series of pitches (not pitch classes) with a repeating fifteen-element series of durations. Similarly, the piano part superimposes a repeating twenty-nine-element series of chords with a repeating seventeen-element series of durations (cf. Taruskin 2005a: 237–8). The two series in the cello part come into synchronisation after every three statements of the pitch series, since five is a divisor of fifteen, while the two series in the piano part never come into synchronisation during the movement. Vincent Benitez, in discussing Messiaen's preoccupation throughout his career with time and eternity, observes the composer's division of musical time through discrete segments treated in a cyclical manner as a central interest in his serial thought (Benitez 2009). The recurring synchronised closures of the pitch and duration series in the cello part contrast with the complete absence of closure in the piano part, which would seem to go on forever or at least well beyond the span of the movement, expressing the sense of temporal spatialisation and eternity. Similarly conceived pitch and rhythmic series recur in the remaining movements of the *Quatuor*, reflecting the composer's 'spatial understanding of musical time through its quantification' (Benitez 2009: 294).

Messiaen's treatise, *Technique de mon langage musical* (1944), detaches general compositional parameters – rhythm, melody, harmony – from one another, a separation which will come to be central to later ideas of what the serial might be, while adding idiosyncratic features of the composer's own compositional practice, including bird song and his modes of limited transposition (Messiaen 1994). Beyond the technical, the organisation and tone of this unique text anticipate some of the foundational principles of post-1945 serialism. For instance, temporality is prioritised in the *Technique* by its position as the first parameter to be considered (following a brief single-page chapter on the interrelations of the three parameters). The treatise and the rational processes for treatment of pitch and rhythm in the *Quatuor* show that Messiaen's predisposition towards serial thinking was already established prior to the end of the Second World War. His creative autonomy, aesthetic independence from tradition, and objective attention to rhythm, equal to the attention given to pitch, isolate these primary musical parameters for individual treatment. Messiaen's novel conceptions of pitch, rhythm, and form became pivotal for younger composers of new music and earned for him a leadership position in what would come to seem a serial movement (Whittall 2007: 234). Yet through the later twentieth century, Messiaen

pursued his distinctive individual compositional concerns about continuity independent of the composers he had so deeply influenced in the post-war years. As Arnold Whittall explains, ‘the remarkable heterogeneity of later twentieth-century developments indicate that avant-garde convictions evolved and persisted even as more “classical” concerns with continuity re-emerged alongside them’ (Whittall 2007: 251).

Part II: After 1945

The Serial Movement

It is inviting, or even seductive, to reflect on the post-1945 period as a new beginning or *Stunde Null* (Zero Hour) in musical composition because of the impact of the enormous social and political upheaval at the end of the Second World War in Europe. A young generation of composers from different European countries, who had been deprived of the opportunity to hear and study new music during the years of political repression and war, aspired to build an utterly new and radical approach to composition that repudiated their European musical heritage in favour of isolating individual elements of parameters of compositional materials (pitch, duration, dynamics, articulation, timbre). This allowed for a focus on individual sounds as discrete objects, and the novel attitude to composition, harnessed in unique ways by individual composers, became known as serialism, implying an affiliation with Schoenberg’s twelve-tone method introduced about a quarter of a century earlier. Yet, at the same time, the most vocal of the young serialist composers rejected the classical techniques of Schoenberg’s method; their fascination lay, in many cases, with Messiaen, then later with Anton Webern, in whose music they discovered great abstraction, purity, and examples of proportional and permutational treatment of musical elements.

Nevertheless, one of those younger composers, Bruno Maderna, would later underscore continuity over rupture in post-1945 musical composition, arguing that ‘there has never been any zero-year in music . . . just as there never can be any zero-year of culture’. Maderna would stress that the idea of a zero-year (or Zero Hour) was an illusion for the young that assisted them in ‘re-ordering [their] ideas before going forward’ (Maderna, quoted in Fearn 1990: 316). Maderna’s serial practice itself was ‘as deeply rooted in the contrapuntal tradition of the past, as it was committed to the exploration of new ideas in musical expression’

(Neidhöfer 2007: 1). M. J. Grant, among others, has rejected the idea of a *Stunde Null* because, despite the prevalent belief in the creation of a new society among the younger generation, the growing polarisation created by the Cold War among other factors resulted in something closer to cultural pluralism (Grant 2001: 17–20; cf. Beal 2000: 107–10).

The infamous essay by another young composer, Pierre Boulez's 'Schoenberg Is Dead' (1952), described as the 'ultimate statement of the *Stunde Null* position' by Richard Taruskin (Taruskin 2005b: 18–19), observes Schoenberg's recent death only months after it occurred, though notably some seven years after the end of the war, but then castigates Schoenberg for taking serialism in the wrong direction by confusing series and theme, for devising a method intended for rigorous control of chromatic writing, for maintaining the outmoded texture of melody and accompaniment, and for not exploring new corresponding modes of structural organisation. The essay concludes by elevating Webern above Schoenberg for his innovations in rhythm and his avoidance of large, extended forms. Though Boulez was exposed to Webern's music through his teacher, René Leibowitz, author of *Schoenberg et son école* (1947), it is perhaps worth noting that Boulez later distanced himself from Leibowitz (Boulez 1952; cf. Erwin 2020).

The intricate narrative of discourse about new music in the years following the Second World War and into the early 1950s embraces the advancement of and later distancing from serialism by some of its proponents; it must balance the opposition of radical innovation, as in the *Stunde Null* perspective, and historical continuity, including varying stances on serial and contrapuntal practices of Schoenberg and Webern. The serial movement in Europe in the early 1950s, which was characterised by what appeared to be a core of shared compositional interests, was ultimately short-lived, as the representative composers sometimes became engaged in aesthetic disputes and pursued separate compositional trajectories (cf. Toop 2004: 453–5).

Die Reihe and Darmstadt

The journal *Die Reihe: Information über serielle Musik*, published in German from 1955 to 1962 (followed by an English edition from 1958 to 1968), launched its run, with editors Herbert Eimert and Karlheinz Stockhausen, with a volume devoted to electronic music. The foreword to that first volume pronounces the journal to be a 'mouthpiece for the younger generation' (Grant 2001: 19) and effectively exposes the far-reaching connotations of the

serial concept immediately upon the journal's launch by associating it definitively with the new medium of electronic music. The essays in the first volume impart a shared vision of a radical commitment to electronic music as a fitting medium for music of the time. This shared vision and mode of discourse embody the enlargement of the serial concept to incorporate sound generation and timbre. In his essay, 'What Is Electronic Music?', Herbert Eimert describes the radical nature of the new medium and asserts Webern as a principal inspirational source through his visionary understanding of proportion and stylistic purity (Eimert 1958). That said, Eimert was not of the younger generation purported to be the voice of the journal; yet in opposition to the journal's stated aims, his was the first text a reader would encounter. Thirty years younger than Eimert, Paul Grelinger, in his essay 'Serial Technique', explicitly portrays the new medium as an expression of serialism that features approaches to proportion and mathematical rationalisation shared with architect Le Corbusier's methods of calculating architectural proportions (Grant 2001: 165–6). Grelinger wrote: 'It is our task to describe a fundamental attitude; a principle that we may call the *Series* . . . Our aim is an art, in which proportion is everything: *a Serial Art*' (Grelinger 1958: 40; translation modified, italics and capitalisation in original).

The Internationale Ferienkurse für Neue Musik in Darmstadt acted as a locus for the study and reception of new music. Young composers from across Europe – including countries recently occupied by Germany – such as Pierre Boulez, Luigi Nono, Bruno Maderna, Karel Goeyvaerts, and Karlheinz Stockhausen, became known as the Darmstadt School, an incongruous moniker in light of the aesthetic differences and disputes among the members, as well as its relatively brief existence. It is fitting that Darmstadt became the setting for the educational and ideological platform of the Darmstadt New Music Courses, dedicated to the study and performance of new music, as Darmstadt had been a cultural centre, including a leading centre in the Jugendstil movement earlier in the twentieth century, and underwent a dramatic rebirth after the catastrophic destruction at the end of the Second World War (Iddon 2013: 1–32). While the voices of young composers, particularly Boulez and Stockhausen, strongly articulated the central tenets of the serial attitude, they were encouraged by contemporary composers of an older generation, notably Olivier Messiaen and Herbert Eimert, whose experience, iconoclastic approaches to composition, and knowledge of repertoire offered guidance and leadership.

Messiaen visited Darmstadt in 1949, and his 'Mode de valeurs et d'intensités', the second and most abstract movement of the *Quatres*

Études de rythme, written there, became emblematic for many of the younger composers (Iddon 2013: 31). Each of the three parts of the movement is based on permutations of thirty-six pitches (three divisions of twelve each), twenty-four durations, seven dynamic levels, and twelve modes of articulation. As M. J. Grant and others point out, the order of elements is not fixed; as a component of a mode, each pitch is assigned a corresponding duration, dynamic, and articulation value, but the order of presentation is flexible (Grant 2001: 61–2). The permutations are determined by disparate processes distinct from the aggregate permutations of twelve-tone serialism and reflect an interest in control over all aspects of sound. Whereas pitch material in twelve-tone serialism is strictly ordered and other parameters (durations, dynamics, articulation) are free, in ‘Mode de valeurs’ the reverse is true: the other parameters are fixed in relation to pitch while the order of pitches is free (Johnson 1975: 106–7). The allusion to the rigour and discipline of Schoenberg’s method in ‘Mode de valeurs’, not to mention the use of series of twelve elements, is clear, but the resulting three-part texture created by the predetermined sonic objects in each mode, characterised by varying levels of activity and absence of rests, avoids all reference to traditional textures and structural organisation; the interest in fundamental properties of sound production – attack, duration, decay, dynamics – reveals the link of the serial concept with electronic composition. As a performer, Messiaen was no doubt acutely sensitive to the sonic implementation of his music. Pianist Peter Hill describes the experience of preparing ‘Mode de valeurs’ for performance.

The piece as a whole began to reveal a shape, with a sense of exposition at the opening as the ‘modes’ begin to unravel, and of a corresponding winding-down at the end, where the upper stave resumes its mode in the original order. Meanwhile the interest in the central part of the piece lies in the incisive interplay between staves, especially where notes of similar dynamic come in quick succession. (Hill 2007: 89)

Hill’s account of Messiaen’s 1951 recording of the *Quatres Études de rythme*, made shortly after the completion of the composition, reinforces his remarks about the challenges of creating clarity and differentiation of the elements of dynamics and articulation (Hill 2007: 89).

‘Mode de valeurs’ had a direct impact on several of the young serial composers, in some cases reinforced by Messiaen’s recording (Iddon 2013: 59–60). Three pertinent examples are Boulez’s *Structure Ia*, the second movement of Karel Goeyvaerts’s *Sonata for Two Pianos*, and Stockhausen’s *Kreuzspiel*. A brief review of mutual precompositional

principles underlying these three works will illustrate the serial underpinning of the Darmstadt School in the early 1950s.

Boulez's *Structure Ia* (1951–2) for two pianos takes the first series or division from 'Mode de valeurs' and assigns order positions from 1 to 12 to each pitch class, treating the series as a twelve-tone row, but avoiding the classical twelve-tone permutations. The numerical values of the order positions from Messiaen's original series always refer to the pitches in the original series and are translated into representations of pitch classes; two 12×12 matrices, one derived from the original form of the series and the other derived from the inversion, display the twelve transpositions and twelve inversions of the series, respectively. The series of twelve durations in 'Mode de valeurs' is likewise read in the same matrices, while the predetermined link in Messiaen's work between pitch and other parameters is abolished. The two piano parts systematically deploy forms of the series from the matrices in reciprocal fashion for the most part, with occasional spontaneous choices or liberties, and the sense of three continuous textural layers in Messiaen's work is absent (Taruskin 2005b: 33–4). In effect, *Structure Ia*, though derived from procedures in 'Mode de valeurs', is based on very different pre-compositional strategies.

The second movement of Karel Goeyvaerts's Sonata for Two Pianos, presented in Darmstadt in 1951, does not make direct use of Messiaen's pitch material from 'Mode de valeurs' but applies algorithmic procedures to the same parameters of pitch, durations, dynamics, and modes of articulation. Goeyvaerts's compositional procedure involves the assignment of discrete values to the elements of each parameter as they pertain to notes or points in the score, absolutely or relative to an arbitrary reference point. Parametric values are summed and correspond, in principle, to Goeyvaerts's mystical idea of the 'synthetic number' (cf. Iddon 2013: 53–7; Delaere 1996; Toop 1974: 153–4).

Stockhausen's *Kreuzspiel* (1952, later revised), scored for oboe, bass clarinet, piano, and three percussionists and first performed at Darmstadt, was inspired in recognisable ways by Messiaen's 'Mode de valeurs' and the second movement of Goeyvaerts's Sonata for Two Pianos (Maconie 1976: 26). In *Kreuzspiel*, as in Messiaen's 'Mode de valeurs', pitches are fused with non-pitch parameters into sonic units. In *Kreuzspiel*'s three main sections, the sonic units unfold continual permutations that are based on systematic registral reorderings mirrored in time over the course of the work. Serial treatment in *Kreuzspiel* includes dynamic repositioning of composite elements on local and

large scales (cf. Iddon 2013: 72–5; Maconie 1976: 21–6; Toop 1974: 158–64).

Herbert Eimert, already an established composer, author, and musicologist before the war, became a leading figure in the propagation of new music through his involvement in the Darmstadt New Music Courses between 1946 and 1951, his editorial position for *Die Reihe*, and his roles as radio broadcaster and administrator in the Nordwestdeutscher Rundfunk from 1945 to 1955 (Iverson 2019: 23–4). Although the *Stunde Null* perspective on new music in early post-war Germany is associated with youth, Eimert's familiarity with new technology and his experience in administration and publication facilitated the dissemination of the serialist agenda. His influential *Musikalisches Nachtprogramm*, 'a bimonthly broadcast aimed at educating listeners on the concepts and sounds of the "new" music that had been suppressed or unknown during the war' (Iverson 2019: 23–4), helped to bring the experience of hearing new music to the young composers who sought to formulate their own declaration of a compositional philosophy. As co-editor of *Die Reihe* with Stockhausen, Eimert's engagement in the serialist agenda was particularly visible. His leadership role at the Westdeutscher Rundfunk from its beginning in 1955 (following the separation of the Nordwestdeutscher Rundfunk into the Norddeutscher Rundfunk and the Westdeutscher Rundfunk) enabled him to promote music created in the major electronic music studios in Germany and beyond as music 'that could finally take full compositional control over timbre, as well as the other compositional elements such as pitch, duration, and dynamics' (Iverson 2019: 76). In this way, understanding electronic music as a reflection of the serialist agenda, overtly expressed in the first volume of *Die Reihe*, is consistent and logical. An essay by Wolf-Eberhard von Lewinski in the fourth volume of *Die Reihe* devoted to young composers captures this linkage:

[The most gifted of today's composers] have found a new way that promises a solution for their conflict of conscience – to compose no superfluous notes and yet not to imitate Webern. They have been urged on by the timely 'invention' of electronic music . . . Webern's intentions have been regarded as completely justifying serial modes of procedure, but now they can be revived by applying them in a field that is new and spacious . . . the field of electronic musical material. Composition with this material, more than any other, requires very comprehensive laws. (Lewinski 1960: 3)

Just as serial precompositional schemes and structures regulated by numerical patterns or designs in acoustic serial music were sometimes overridden

by composers' aesthetic and poetic choices, composers of electronic music also had to make compromises for practical reasons due to technological limitations in the studio (Iverson 2014b: 345–6).

Partitioning the twentieth century into pre- and post-1945 periods serves a useful purpose and marks an undeniable point of division, but, as the quotation from Maderna above (p. 10) implies, the *Stunde Null* perspective taken literally is oversimplistic and loses sight of strands of continuity from before 1945 that persisted, including the continued interest in and extension of Schoenberg's twelve-tone techniques in spite of their renunciation by some of the most vocal younger composers. Luigi Nono, for example, some of whose early works were performed at Darmstadt in the early 1950s, wrote about the atomic concentration on individual properties of sound in terms of an expansion, not rejection, of Schoenberg's twelve-tone technique (Nono 2018b; cf. Nono 1958). Nono's *Il canto sospeso* (1955–6), a nine-movement work, exhibits serial precompositional schemes to profile individual musical parameters, including a single, all-interval twelve-tone series that governs the pitch content (Nielinger 2006). His compositional technique expresses the serialist aesthetic of rigorous permutational control over individual musical parameters but distinguishes itself with its expressive text and overt political, anti-fascist message. Similarly, Luciano Berio embraced aspects of the serialist agenda in the early 1950s, and followed practices similar to other Darmstadt composers, but did not relinquish authority to serial routines. As Christoph Neidhöfer explains, '[Berio] had a clear vision of, and maintained full control over, how the music would ultimately sound' (Neidhöfer 2009: 304).

The coherent and related expressions of serialism as a compositional practice and aesthetic in the early 1950s in Darmstadt were transitory, as the composers pursued their individual conceptions of musical material, organisation, and continuity. The cessation of publication of *Die Reihe* in 1962 perhaps similarly reflects the dearth of common ground in the conception of serialism, both as compositional technique and as a way of thinking (cf. Toop 2004: 475).

Serialism in the United States of America

Of the three understandings of serialism given in the introduction to this chapter (p. 3), only the first two (serialism in terms of fixed ordering of elements and serialism in terms of expansion and diversity of compositional approaches and aesthetics) prevail in serialism in the United States, explained in part by the different dissemination of Schoenberg's twelve-tone technique.

Before the Second World War, Schoenberg's music was not well known in the United States outside 'ultra-modern' composers such as Henry Cowell, but interest in his music grew dramatically after the war (Peles 1998: 500–4). The third understanding of serialism (serialism as a philosophy or ideology) did not evolve analogously in the United States, due to different attitudes towards Schoenberg, different wartime experience, different cultural and political contexts, and different views about history and historical consciousness (Peles 1998: 509). No cohesive school of thought or doctrine analogous to the Darmstadt School appeared in the United States, yet the end of the war coincided in the United States with a desire among many composers for artistic renewal.

Between 1955 and 1961, composer and music theorist Milton Babbitt published three articles that set the foundation of twelve-tone theory in terms of a theoretical expansion of Schoenberg's method (Babbitt 1955; Babbitt 1960; Babbitt 1961). Babbitt's music is sometimes described as aggregate music because of the successions of aggregates whose interior pitch-class arrangement is directed through the organisation of arrays (Mead 1994: 13–16). Babbitt generalised Schoenberg's techniques in mathematical terms while uncovering the potential for expansion beyond Schoenberg's practice. Drawing on mathematical group theory, he demonstrated that combinatoriality, for example, a technique explored extensively by Schoenberg, could be generalised within the twelve-tone system to reveal compositional potential far beyond that utilised by Schoenberg. Babbitt employed mathematics in his theoretical writings and music not as a compositional device, but as a means to expose a system of seemingly endless abstract possibilities (cf. Morris 1987). Babbitt was appointed to the faculty at Princeton University in 1938, and his advanced training in mathematics, formal logic, and analytical philosophy helped to facilitate the addition of the PhD in composition to its highest degrees in music along with musicology. Indeed, the expansion of access to college education was profitable to the dissemination of serialism in American higher education, as seen in the 1956 dedication of the Schoenberg Hall as a concert space at the University of Los Angeles at California (Feisst 2011: 236). With the inclusion after the war of musical composition as a subject for advanced study in the American academy, new music began to escape much of its association with the avant-garde. Serialism acquired a more mainstream image and was characterised by a wide range of compositional applications that were influenced to varying degrees by techniques of Schoenberg. Many, though certainly not all, serial composers were affiliated within a university setting (Straus 2008: 373–7).

The legacy of Schoenberg's twelve-tone technique in the United States is reflected in the compositional practices of composers such as Roger Sessions, Aaron Copland, Elliot Carter, and Igor Stravinsky, in addition to Babbitt. Sessions, who had been Babbitt's composition teacher, engaged in serial practices in his Solo Violin Sonata in 1953 only after recognising its potential in the music of Dallapiccola and Babbitt. With his knowledge of Schoenberg's music, Sessions explored the capabilities for greater control over the circulation of the aggregate (Peles 1998: 508). Like Sessions, Copland too explored serial techniques, perhaps most notably in his orchestral work, *Connotations* (1962), synthesising with them tonal strategies and sonorities (Peles 1998: 515). Elliot Carter did not explicitly espouse serial practice, but his compositional style became significantly more rigorous following the war with the development of his signature technique of metric modulation (Taruskin 2005b: 275–6), a method for proportionally transforming one metre into another, combinatorial methods of identifying subsets of the aggregate (Link 2022: 33–9), and his exploration of all-interval series (cf. Morris and Starr 1974). These mathematically inspired techniques, undoubtedly discovered independently, reflect the composer's new sense of purpose (Taruskin 2005b: 276–80). Finally, Stravinsky, who emigrated to the United States in 1939, became interested in Schoenberg's music in 1952, following Schoenberg's death. Stravinsky's direct engagement with Schoenberg's techniques waned as he explored serial techniques influenced by Ernst Krenek, particularly the technique of rotational arrays (Straus 2001: 8–21). Stravinsky had read Krenek's *Studies in Counterpoint* (1940) and attended a lecture by Krenek at Princeton in 1959 that was later published as 'The Extent and Limits of Serial Techniques' (Krenek 1960). Stravinsky became known for his application and extension of Krenek's technique of rotational arrays, explained in detail in Krenek's article, in his later works (Straus 2001: 141–82).

Part III: Conclusions

The distinction between serialism in Europe and the United States, while expedient in a discussion of theorising serialism, becomes limited in its effectiveness, partially in consideration of technological developments after 1945, including computer and recording technologies that have impacted the composition and dissemination of new music. The serial concept has in some way or another engaged aesthetic and practical interests of composers across the Western world for the last century, regardless of nationality.

Notwithstanding the absence of a straightforward, secure definition, serialism became a leading force in twentieth-century music in Europe and the United States. Universal principles of purity, rationalism, and objectivity and a demand for severance from the past seem to underlie the aesthetics of the serialist movement in post-war Europe, even if these principles, on close examination, were not held uncritically (Whittall 2008: 151; cf. Iverson 2019: 75). In the United States, the need for separation from the past after the war did not carry political overtones in the same way, but a wish for distance from the past in the spirit of artistic revitalisation can be recognised in the music of many composers. The desire to explore fresh, innovative means of musical organisation through varying conceptions of serialism created common ground across geographical and temporal divides. The common ground across the geographical divide of the Atlantic Ocean between conceptions of serialism in Europe and the United States, and the common ground across the temporal divide between debates surrounding Schoenberg's method before and after the war illuminate the adoption of serialism into the realm of intellectual history (cf. Ashby 2001).

As Marcus Zagorski explains, referring to serialist composers in Europe, attention to discipline and control over material was a connecting link that was reflected in individual compositional decisions and technique (Zagorski 2009). Such a broad characterisation of autonomy granted to individual material constituents in musical composition can similarly be recognised in new music by composers on the other side of the Atlantic, as Anne C. Shreffler writes:

If there is a common denominator in the diverse techniques and approaches called 'serialism', then it is the notion of granting autonomy to the different qualities of musical material. In the absence of an *a priori* harmonic system, pitch and rhythm were no longer privileged as the defining features of musical content. (Shreffler 2005: 221)

Recognising this common denominator, however, plays only a part in theorising serialism. Cultural context, along with the individualistic and conflicting attitudes, circumstances, and compositional approaches among key figures involved are further vital factors. Theorising serialism recognises its transmutation, in technical, theoretical, and philosophical terms, across most of the twentieth century. Acknowledging the dynamic disposition, instability, and impermanence of serialism is essential to framing its theories.