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AVANT-GARDES IN MUSICAL NOTATION AND THEIR IMPACT ON THE MUSIC

Jonathan Bell

Calling into Question the Function of Musical Notation

It is hard to determine at any time in music history whether the innovative musical ideas of composers and performers demand new forms of notation, or provocative notational statements stimulate new musical ideas and new performative situations. Since representation and realisation often go hand in hand, both processes may often occur at the same time, and a constant feedback between musical practice and the notation seems the most plausible scenario in most cases. In 14th-century France, however, a treatise attributed to Philippe de Vitry, *Ars Nova Notandi* (1322), presented new techniques of rhythmic notation. This notational system (*Ars Nova*) lent its name to, and might have shaped the genre, style, and structure of the music of an entire era. The notational inventions of the *Ars Nova* probably functioned as a catalyst, until their increasing complexity reached a presumed divorce from musical practice at the end of the 14th century: ‘A mannerism in notation which is not without recalling during the second half of the twentieth century, where *notational virtuosity* is on the verge of the absurd, deliberately distanced from the expected result, presumably sung, heard or played beforehand.’¹ ‘a manner of writing that foreshadows what happens in the second half of the twentieth century, where the „virtuosity of notation“ sometimes seems to enhance the absurdity by departing deliberately from the expected musical result or rather, could we say, played (sung) and heard [beforehand]. (ed.)

The principles of musical notation then remained fairly stable for centuries, until the 1950s, when the New York School, under the influence of abstract expressionist painters, again challenged standard notational practices. With indeterminacy and the open form (as will be exemplified with the case of Earle Brown) composers profoundly re-examined the nature and function of musical notation. André Boucourechliev – a great admirer of Earle Brown – used unconventional notation in which one or more

¹ **Bosseur**, J.H. (2005) *Du son au signe, Histoire de la notation musicale*, éditions alternatives, Paris, p. 44: ‘un maniérisme de l’écriture [qui] n’est pas sans annoncer ce qui se passe dans la seconde moitié du XXe siècle, où la “virtuosité de la notation” semble parfois friser l’absurdité en s’écartant délibérément du résultat musical attendu ou plutôt, pourrait-on dire, joué (chanté) et entendu.’

compositional parameters is determined by the performer, thus validating multiple, contrasting interpretations instead of imposing a definitive text.

In his *Concert for Piano and Orchestra* (1958), John Cage explored a wide variety of graphic notations, such as the dot-and-line notation in the solo piano part. Nelson Goodman's comments about this particular score constitute an explicit case of divergent views on what notation is or should be.² Goodman criticised Cage's notation, finding it disconcerting for the performer. For him, this work was 'not notational, for without some stipulation of minimal significant units of angle and distance, syntactic differentiation is wanting'³. What Goodman finds most problematic is the impossibility of separating and identifying different symbols, just as we traditionally isolate individual notes on a staff. 'Under the proposed system there are no disjoint and differentiated characters or compliance-classes, no notation, no language, no score'⁴. With the benefit of hindsight, it is difficult to defend Goodman's point of view: Cage's *Concert for Piano and Orchestra* and other works which used similar notational systems had a great impact upon American composers in subsequent generations, as well as on European composers such as Sylvano Bussotti and André Boucourechliev, who carried on using non-standard notations in the realisation of *open works*.⁵ Furthermore, John Cage and composers of the New York School were so closely involved with painters that they seemed to have felt that the potential of the score to perform a second role – that of a visual artwork in its own right – could not be ignored. Earle Brown's *December 1952* is a famous example of crossover-work in that regard: its score resembles the work of a painter.

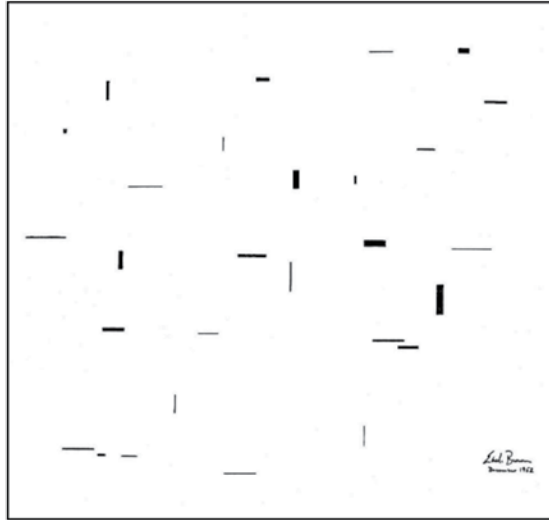
² The American philosopher Nelson Goodman placed musical notation and painting at opposite ends of a spectrum (the first being *allographic*, the second *autographic*). Goodman's conception of *notational system* was very strict. To be accepted as notational, this system had to meet some minimum requirements: each symbol had to correspond to one item in the realm, and each item in the realm must correspond only to one symbol in the system.

³ **Anderson, V.** (2013) *Sound and score: Essays on sound, score and notation*. Edited by Paulo de Assis, William Brooks, and Kathleen Coessens. Leuven: Leuven University Press, p. 136.

⁴ **Goodman, N.** (1976) *Languages of Art: An Approach to a Theory of Symbols*. 2nd edn. Indianapolis: Hackett Publishing Company, p. 188.

⁵ For readers less familiar with this repertoire it would be useful to provide a definition of Umberto Eco's notion of an 'open work'. The relevant published material is already included in the bibliography.

Figure 1. Earle Brown, December 1952



The Brown/Boucourechliev Relationship

With integral serialism imposing increasing constraints on composers and performers at the end of the 1950s, the open work briefly interested the international community, allowing for more freedom of interpretation, but quickly fell into oblivion during the 1960s, except for few composers, such as Earle Brown, André Boucourechliev, and Silvano Bussotti, who carried on experimenting in the field throughout their careers. The 21st century shows such a great renewal of interest in open works, comprovisation⁶, graphic notation, and situative scores⁷ that retracing their historical genealogy is necessary.

Earle Brown is widely associated with the New-York school of com-

⁶ Hajdu, Georg. (2016) Disposable Music, *Computer Music Journal*, 40:1, pp. 25–34, Spring 2016 doi:10.1162/COMJ_a_00342 c 2016 @Massachusetts Institute of Technology. Available at: <http://georghajdu.de/wp-content/uploads/Disposable-Music-CMJ.pdf> (accessed on 20 November 2017), p. 26.

⁷ Bhagwati, Sandeep. (2017) “Vexations of Ephemerality” Proceedings of the International Conference on Technologies for Music Notation and Representation – Proceedings of the International Conference on Technologies for Music Notation and Representation – TENOR2017. Available at: http://www.udc.es/grupos/ln/tenor2017/sections/node/15-vexations_ephemerality.pdf (accessed on 20 November 2017). Sandeep Bhagwati defines situative score as: “scores that (...) do not build on linear, pre-existing and pre-sequenced information. Information in such situative scores is only available ephemerally, i.e. while it is displayed or accessed in a particular context.”

posers, but he has evidently not achieved the status John Cage or Morton Feldman. His close relationship with New York abstract expressionist painters such as Alexander Calder and Jackson Pollock, as well as his European connections with Darmstadt, Boulez, Maderna and the Domaine musical have made of Brown one of the major composers of the Twentieth Century. However, his radical scores and his aversion to Cage's chance operations, Webern, and serialism made him – like Boucourechliev – an outsider. The Domaine Musical played Brown's music in France six times between 1958 and 1973⁸, and he sometimes also joined the ensemble as a performer. Boucourechliev attended these concerts, for which he wrote concert reviews. At that time, Europe was dominated by serialism, with Stockhausen and Boulez as leading figures. In America, the chance operations discovered by John Cage enjoyed a stronger influence. Boucourechliev remarked how much French audiences were interested and surprised by the performances of Earle Brown: 'With Earle Brown, the references change completely. This is a musician whose background and evolution differs strongly from his European colleagues; however he does not find himself isolated from them. Some French composers listen to his work with an attentive ear.'⁹

Boucourechliev also interestingly notes the difference between *ouverture* (openness, relating to the European practice, referring to Umberto Eco's *Opera Aperta* [1962] (1989)) and *mobilité* (mobility, referring to the American sculptor Alexander Calder). 'Brown's *Available forms I* is, as the title indicates, one of these *open works* as the ones found in Boulez: a network of musical elements which can be played in a different order each time, or even transform completely, e.g. with a sign of the conductor. But Brown is here far more radical than Boulez's *pli selon pli*, where the possibilities of mutation are strictly controlled, predicted [...]. In the case of Brown, there is no graspable organism, only material in development, in a pre-structural state, composed so as to be shaped historically by the performer, by the listener. Music is therefore *informal* in the same way as the term might be applied to painting[...].'¹⁰

⁸ Delaigue, O. & Poirier, A. (2002) La relation Boucourechliev-Brown "Une sorte de pont entre l'amérique du nord et l'europe", in Poirier, Alain *André Boucourechliev*, Paris, Fayard, p. 123.

⁹ Translated from French: 'Avec Earle Brown, les références changent du tout au tout. C'est un musicien dont la formation aussi bien que l'évolution diffèrent fortement de celles de ses confrères européens; pourtant, non seulement il ne se trouve pas isolé de ceux-ci, mais il est, de la part de certains d'être eux, l'objet de la plus attentive vigilance' in *Preuves*, n°145, Paris, March 1963, p.63 sq. in (Poirier, 2002, p. 124).

¹⁰ Ibid., p. 125: Original passage (translation mine): '*Available forms I* de Brown est,

The idea of a score as mobile structure brings Brown and Boucourechliev very close in different ways: first the term emphasizes their radical attitude towards notation, expressing their distance from European practice, distinguishing their work from the famous efforts by Boulez (Third Sonata) or Stockhausen (Klavierstück XI) around the same time. The score as a mobile adopted by Brown and Boucourechliev, however, was also in rupture with American avant-garde, since the choices made by the performers were of crucial importance: Boucourechliev, in particular, clarified that he was less interested in chance operations,¹¹ even by aleatoric music, than in the conscious choice, and musical taste of the performer as the piece unfolds during the performance.

December 1952 is Brown's best known work, but its level of abstraction¹² does not faithfully represent the pieces he wrote afterwards, in which the scores are more precisely detailed, combining traditional and graphic notation in very inventive ways. His pieces typically contain several independent sheets of music, whose order of performance the conductor decides on the spot. Again the idea here is not to negate the performer's (or the composer's) decision – as in the chance operations devised by John Cage – but rather to reenact the unpredictability inherent in a live performance. In *Available Forms I*, for instance,¹³ the composer's notational style is more gestural and calligraphic than that of *December 1952*. A blend of staff and graphic notation, as well as precise conventions defined for conducting yield unprecedented compositional results, actively involving the players in a way that could not be achieved with traditional notational means.

comme son titre l'indique, une de ces oeuvres ouvertes dont nous avons déjà parlé dans cette revue à propos de Boulez. Il s'agit d'un réseau d'éléments musicaux susceptibles de s'enchaîner toujours diversement, voire de se transformer totalement, sur un signe du chef d'orchestre. Or la démarche est aussi beaucoup plus radicale que chez un Boulez, dans *Pli selon pli* par exemple, où les possibilités de mutation de la forme sont "finies", strictement contrôlées, prévues (...). Dans le cas de Brown, en revanche, il n'y a pour ainsi dire pas d'organismes saisissables en tant que tels, mais essentiellement des éléments formateurs, des ensembles à l'état de pré-structures composés en vue de leur mise en forme – aléatoire – par l'exécutant, par l'auditeur. On serait tenté de dire qu'il s'agit de musique "informelle" au sens où ce terme est appliqué à la peinture.

¹¹ Boucourechliev wrote vitriolic criticisms about John Cage in "Musique aléatoire, une appellation incontrôlée" in *Analyse musicale*, n° 14, January 1989, pp. 38-40.

¹² The piece can be played by any instrument, the role of the performer being to interpret the score visually and translate the graphical information to music, differently each time.

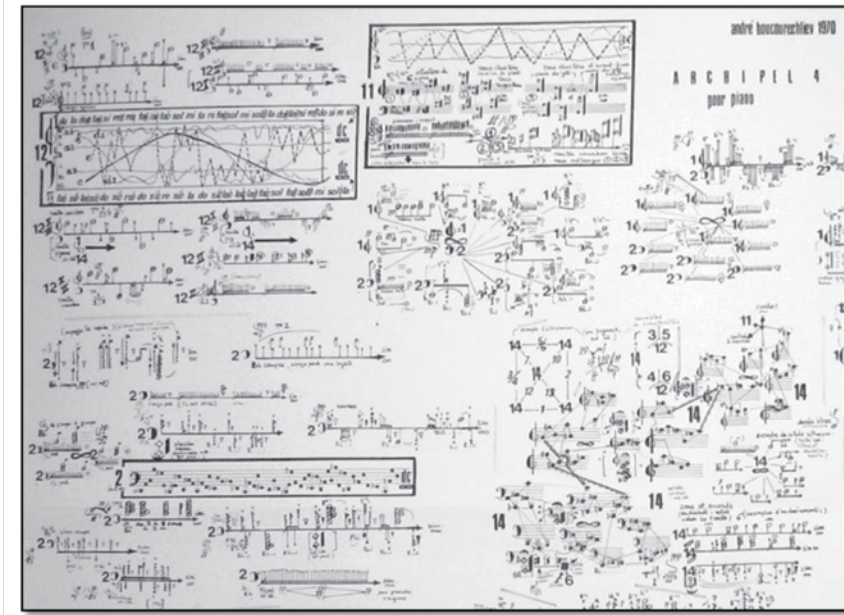
¹³ The piece can be heard on the composer's website <http://www.earle-brown.org/works/view/25>

André Boucourechliev remained absolutely faithful to the *open work* composition throughout his career. *L'oeuvre ouverte*, for him far from meaning a mere disengagement from the composer, was a way to introduce doubt, to push performers to make decisions during the performance: 'We live in a time where things are not certain or definite, where hierarchies are not *de facto* legitimate. Beethoven was the first to contest this order; he introduced doubt. No composer left as many sketches testifying of this incertitude. Romanticism carried this interrogation out of rationality. This question became the essence of life and art. In music, it resulted in putting tonality into question; after uncertainty about language came uncertainty about forms. Indeterminacy rather than certainty then became prominent within the forms themselves.'¹⁴

Boucourechliev admired Beethoven profoundly; he wrote two books about the composer. He saw a direct link between Beethoven's modernity – his abolition of classical form in the late string quartets – and answers the *open work* could bring in his own time. His piano solo piece *Archipel IV*, for example, displays an archipelago on a very large piece of paper with different musical structures or modules, in which the player freely finds his path. The free journey that was allowed between the different modules was particularly stimulating to me as a young pianist, playing each structure in a different order, with a different duration each time was an infinite source of inspiration.

¹⁴ Roy, J. 'Entretiens avec Boucourechliev'. In: *Diapason*, Novembre 1980, in Poirier, 2002, p. 191: translation mine: '*Nous sommes à une époque où l'on ne vit pas sous le signe d'un "certain", du "définitif", des hiérarchies établies une fois pour toutes. Beethoven a été le premier à contester l'ordre classique. Il a introduit le doute. Aucun compositeur n'a laissé autant d'esquisses qui témoignent de cette incertitude. Le romantisme a porté l'interrogation au delà du rationnel. Et cette mise en question est devenue l'essence même de la vie et de l'art. En musique, cela s'est traduit par la mise en question de la tonalité. Après la mise en question du langage est venue celle des formes. Le probable plutôt que le certain, l'indéterminé plutôt que le déterminé, se sont manifestés dans les formes elles-mêmes.*'

Figure 2. *André Boucourechliev, Archipel IV, score extract*¹⁵



Notational Experiments after the 1960s

Several composers engaged with the “New complexity” school of composition, as well as composers interested in extended instrumental techniques, find conventional notation limiting, and prefer tablature to the traditional pitch-oriented stave notation. *Pression* (1969), for solo Cello, by Helmut Lachenmann is a landmark example of the reappropriation of largely obsolete principles. In the score, the clef is famously replaced by a schematic representation of the body of the cello, so that the stave becomes a graphic indicator of where to perform which action upon the instrument. The concept of *Musique concrète instrumentale*, central to the German composer’s aesthetics, possesses an undeniable affinity with the gesture/tablatore notation discussed here: ‘The sound events are chosen and organized so that the manner in which they are generated is at least as important as the resultant acoustic qualities themselves.’¹⁶

¹⁵ 1971 by Alphonse Leduc Éditions musicales, reproduced by kind permission of the publisher.

¹⁶ **Lachenmann, H.** (2008) *Musique Concrète Instrumentale*, a conversation and concert with Helmut Lachenmann, p. 1. Available at: https://slought.org/resources/musique_concrete_instrumentale (accessed on 3 July 2015).

Aaron Cassidy has dedicated a significant portion of his career to the development of tablature-based notations. Most of his scores since *The Crutch of Memory* (2004) have abandoned traditional clefs in favour of multi-layered tablatures. In this work, three separate staves control different playing technique parameters for a solo string player: ‘the movement up and down the fingerboard, the spacing width of the fingers, the contact between fingers and strings, as well as the actions of the bow and right hand.’¹⁷

Figure 3. *The Crutch of Memory* (2004), by Aaron Cassidy, bars 14-16¹⁸

The resulting notation gives rise to what the composer describes as ‘decoupling’, i.e. a de-correlating of the component movements of an instrumental gesture. Tablature notation presents to the performer material whose resulting pitch content is largely unforeseeable. Therefore, the notation does not provide instructions for performance of a strictly definitive text, but rather functions as a tool which interrogates the performer’s *modus operandi*. Although highly conceptualised, the notation here seeks to communicate in a very direct, somatic way with the performer: he or she is required to find his/her own responses to the challenges imposed by the score. In other words, the performer is explicitly required to take part in the emergence of the work through a direct dialogue with the notation,

¹⁷ Cassidy, A. (2004) *The Crutch of Memory*, score extract. Available at: <http://aaroncassidy.com/music/crutchofmemory.htm> (accessed on 5 May 2015).

¹⁸ Reproduced with the kind permission of the composer.

rather than through an attempt to recreate a fixed entity; this correlates with my view of Umberto Eco's notion of a work of art: 'A work of art, therefore, is a complete and closed form in its uniqueness as a balanced organic whole, while at the same time constituting an open product on account of its susceptibility to countless different interpretations which do not impinge on its inalterable specificity.'¹⁹

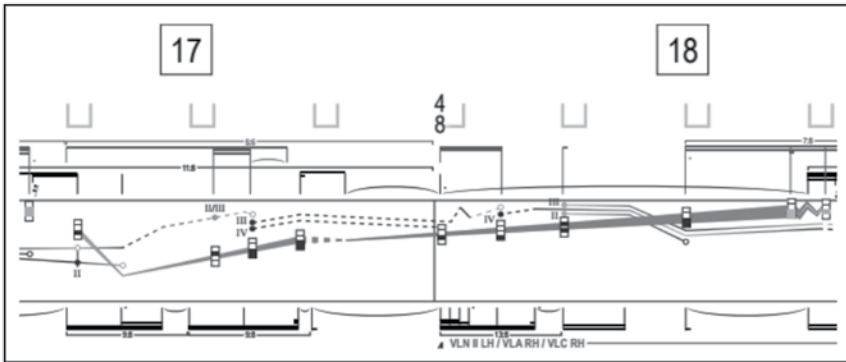
A piece such as Archipel IV, evidently, cannot be merely executed in the classical sense, and therefore requires an important implication of the performer in the creative process. Today, with young composers' interest in animated notation,²⁰ the problem encountered by Boucourechliev remains identical: the piece being different each time, some players feel in danger when performing open works in public. This addresses the issue of whether to choose for an ephemeral score, and the conceptual beauty it embodies, or conventional notation, often judged safer by performers. These frustrations, or "Vexations"²¹ with uncertainty in the use of graphical notation can found in the stylistic evolution of James Bean, a young composer studying at Harvard University.

¹⁹ Eco, U. [1962] 1984, p. 49: Original Italian passage (translation mine): '*In tale senso, dunque, un'opera d'arte, forma compiuta e chiusa nella sua perfezione di organismo perfettamente calibrato, è atresi aperta, possibilità di essere interpretata in mille modi diversi senza che la sua irriproductibile singolarità ne risulti alterata.*' (available at: https://monoskop.org/images/a/ab/Eco_Umberto_Opera_aperta_4e.pdf (accessed on 20 November 2017).

²⁰ For an overview of numerous composers, visit <http://animatednotation.com/composers.html> (accessed on 20 November 2017).

²¹ The term refers to the title of an article by Sandeep Bhagwati "Vexations of Ephemerality" extreme sight-reading in situative scores. **Bhagwati, Sandeep.** (2017) "Vexations of Ephemerality" Proceedings of the International Conference on Technologies for Music Notation and Representation – Proceedings of the International Conference on Technologies for Music Notation and Representation – TENOR2017. Available at: http://www.udc.es/grupos/ln/tenor2017/sections/node/15-vexations_ephemerality.pdf (accessed on 20 November 2017).

Figure 4. James Bean, *This will be changed and made solid II* for string quartet²²



After extensive experiments in tablature-based graphical notation, using adobe illustrator, Bean decided to moved towards a more fixed and conventional way of notating score, yet highly innovative, since animated, and customizable.²³ One of the most forward-thinking aspects of Bean’s d-nm notation environment lies in its performer-centric (as opposed to composer-centric) view. In this sense it closely relates to the works of Brown and Boucourechliev. Bean designed a performer’s interface which allows for the player to decide how he wants the score displayed, so as to simplify his task in a repertoire that is often judged too complex. Among composers interested in new technologies, one of the main contemporary successors of the *open form* heritage is Jason Freeman, as he is mostly concerned with the responsibility indebted to performers in a piece which is only partly determined: ‘My work is inspired by different trends that interestingly enough started developing around the exact same time as [...] the cassette player [...], and that is the idea of the *open form* composition.’²⁴

Finally, Georg Hajdu (a German composer of Hungarian descent) might be considered as one of the most forward-thinking composers regarding the issue of musical notation in our numerical age. Encompassing questions of compositional generativity and networked performances, his research on musical notation is of particular relevance to the findings I will expose in the next chapter. ‘I outline a new form of computer-assisted composition, in which the author, in the classical sense, recedes and his

²² Reproduced with the kind permission of the composer.

²³ A demonstration of the d-nm (dynamic notation for music), by James Bean, is available at: <https://vimeo.com/115529241> (accessed on 20 November 2017).

²⁴ Jason Freeman’s TED talk conference. Available at: <https://youtu.be/W2VLz4raGv8?t=426> (accessed on 20 November 2017).

artifact, the score – dynamically generated from algorithms – exists only in the moment of its creation²⁵.

With the emergence of screen-based notation, The concept of mobile form is, more than ever before, of great pertinence. Great potential lies in the performer being confronted with a score that is generated dynamically during its performance. Georg Hajdu realised another pioneering idea in 2000, when he unveiled what he called Networked Musical Performances (NMP), with performers connected through the internet: ‘In the performance of my piece MindTrip at the 2000 Mystik und Maschine Festival in Münster, Germany, on 28 October 2000 (the very first performance of a Quintet.net composition), the five performers were located in different cities across the globe. They were linked by the Quintet.net server running locally in Münster, connected via a 128 kbit dial-in ISDN connection to the internet.²⁶

SmartVox

The radical rethinking of notation in the *open work*, and the gradual shift away from paper to digital scores were at the heart of the conception of SmartVox during my residency at IRCAM in 2014-16. SmartVox²⁷ is (principally) an application designed to help vocal ensembles learn and perform polyphonic music. Technically, SmartVox is a distributed web application that delivers audiovisual scores through the performer’s mobile devices. From a singer’s point of view, this setup allows for the synergy between visual and acoustic stimuli, which facilitates the interpretive and performative processes, particularly in polyphonic passages. It also enables spatial separation of the performers (*cori spezzati*), and speeds up the learning process of unfamiliar musical materials (e.g. microtonal tuning, texts in a foreign language). The ubiquity of smartphones makes such a distributed system affordable and allows the use of SmartVox in multiple contexts, from professional ensembles to pedagogical and recreational practices.²⁸

²⁵ Hajdu, Georg. (2016) Disposable Music, *Computer Music Journal*, 40:1, pp. 25–34, Spring 2016 doi:10.1162/COMJ_a_00342 c 2016 @Massachusetts Institute of Technology. Available at: <http://georghajdu.de/wp-content/uploads/Disposable-Music-CMJ.pdf> (accessed on 20 November 2017).

²⁶ Ibid.

²⁷ SmartVox is open-source, the code is available at: <https://github.com/belljonathan50/SmartVox0.1>

²⁸ Bell, Jonathan & Matuszewski, Benjamin. (2017) SmartVox – a web-based distributed media player as notation tool for choral practices. Proceedings of the International Conference on Technologies for Music Notation and Representation – TENOR 2017 Coruña. Available at: <http://www.udc.es/grupos/ln/tenor2017/sections/node/30-smartvox.pdf> (accessed on 20 February 2018).

SmartVox presents an innovative form of multimedia notation that has enjoyed growing popularity since its conception in 2016. Though primarily conceived for the performance of my own compositions, it aroused great interest as a pedagogical tool. SmartVox was quickly for use with children in conservatoires, allowing for the sight-reading of diatonic polyphonies.²⁹ It was also used on a weekly basis with university musicology students in Aix-Marseille University, to help them read complex polyphonies of the Renaissance repertoire.³⁰

And the sea for voice, flute, cello and piano (2017) was the first piece composed and performed with the aid of the SmartVox web application through the internet. The parts and the electronics were composed in the BACH environment³¹ (Bach Automated Composer's Helper) for Max/MSP.³² During the rehearsal process of this piece the performers accessed the animated score through their phone or tablet, by typing smartvox.eu or www.smartvox.eu, and choosing their part on any kind of device connected to the internet. As can be seen on the website (please try loading the page, on several devices if possible), once the part is loaded and the video play button is triggered (the server needs a client-side "play" action to unlock the video), the video starts playing on its own after about ten seconds, choosing at random a specific time in the piece. The form of the piece is therefore open, and corresponds to the permutational generative strategy of the classification established by S. Bhagwati³³, the first among permutational, parametric, auto-reflexive and co-creative. The system proved helpful and easy to use for the musicians; they could read their scores without having to rely on a conductor. Thus, musicians could be placed very far away from each other, and the singer could walk freely around

²⁹ A video of the application in action is available here <https://youtu.be/hlHAeiWT28Y>. The piece/web-application is online and available at: smarkkids.smartvox.eu. Once the video is unlocked (performers need to press the "play" button to unlock their part), the conductor can start and control the unfolding of the piece via the address smarkkids.smartvox.eu/conductor.

³⁰ Some of the pieces studied can be performed with the help of SmartVox at the following addresses: tallis.smartvox.eu tallis.smartvox.eu/conductor josquin.smartvox.eu josquin.smartvox.eu/conductor canon.smartvox.eu canon.smartvox.eu/conductor dufay.smartvox.eu dufay.smartvox.eu/conductor...

³¹ <http://www.bachproject.net/>

³² <https://cyclimg74.com/>

³³ **Bhagwati**, Sandeep (2017) "Vexations of Ephemerality" Proceedings of the International Conference on Technologies for Music Notation and Representation – Proceedings of the International Conference on Technologies for Music Notation and Representation – TENOR2017. Available at: http://www.udc.es/grupos/ln/tenor2017/sections/node/15-vexations_ephemerality.pdf (accessed on 20 November 2017), p. 2.

the audience during the performance. The animated notation helped the synchronization to the eight-channel tape of electronics.³⁴

Conclusion

Whilst many compositional schools after 1945 focused on ways of generating their musical material (tone rows, chance operations, or spectral theories), André Boucourechliev and Earle Brown both had the intuition that the notation is at least as important as the notes in the score. This philosophy, which recalls Mc Luhan's famous notion that "the medium is the message", challenges the traditional relationship between the composer, score, and performer, placing the latter in the foreground. Following the path initiated by Boucourechliev and Brown, and with the advent of new technologies, many composers sought new forms of interaction with performers through animated notation, reactive scores, audio-scores, and networked music performances.

This performer-centric vision of musical notation was of particular relevance during the conception of SmartVox. The high scalability of web and mobile technologies enabled this system swiftly to adapt to the group of singers using it in each class, workshop, rehearsal, or concert environment. This research initially targeted professional performers, and was primarily designed to help singers' tuning to microtonal and spectral harmonies.³⁵ However, the simplicity of the notation provided by SmartVox rapidly encouraged musical productions involving an interaction between professional singers and amateurs, in a simpler harmonic language (i.e. diatonic, in the equal temperament) allowing, for instance, a group of eighty children to sing both in tune and in time with professionals.³⁶ The pedagogical value of this modern notational innovation is one of SmartVox's principal assets, which will continue to influence its future development in helping students at schools, conservatoires, and universities, to sing in polyphony.

³⁴ A video of the performance is available here: <https://www.youtube.com/watch?v=tQG5rYiG0PI>, it was performed by members the SKAM collective in Stuttgart, on 8 November 2017.

³⁵ The piece *SmartVox*, on extracts of the old testament, for 5 singers (De Caelis), choir and electronics, was premiered on 21 March 2017 in Nantes (France) <https://youtu.be/8R4Twc1A7Ks> (accessed February 2018).

³⁶ The piece *Le temps des nuages*, on a poem by Michel Onfray, for 5 singers (De Caelis), 5 instruments (Links), 80 young choristers and electronics, was premiered on 15 January 2018 in Châtenay-Malabry (France) <https://youtu.be/bMO2JOj-9A0> (accessed on 3 February 2018).

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Avant-gardes in Musical Notation and Their Impact on the Music

Jonathan Bell

Abstract

This paper investigates a few situations where inventive notation has opened the way to new forms of musical expression. After some observations on musical notation from a theoretical perspective, the close relationship between Earle Brown (a New-York School composer) and André Boucourechliev (a French composer of Bulgarian origins) will help define a vivid experimental field in the realm of musical notation. Closely related to the concept of the *open work*, the unconventional scores of those composers addresses crucial questions about Western Art music making in the 1950s. Although less discussed than serialism, spectralism, or extended instrumental techniques, the notational issue encountered by Brown and Boucourechliev is manifested in contemporary composers' experiments with multimedia/animated scores, and their shift away from textual to digitally augmented notation. This survey of the different solutions adopted by composers will contextualize my own practice-led compositional research, and clarify the notational tools I developed both for the performance of my own compositions, and for pedagogical applications.

Key words: musical notation, Earle Brown, André Boucourechliev, open work, music technology, composition.