

**‘...Out of and for machines...’: time-space and time-form
in George Antheil’s *Ballet mécanique***

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George Antheil, the eponymous ‘Bad Boy of Music’, wrote of his ultra-modernist *Ballet mécanique* (1924-25) that it represented a unique experiment in time-form, time-space and the fourth dimension of music. Antheil’s inexorable essay in noise was appropriately realised through instruments of his present¹ – mechanically operated pianos, percussion instruments, airplane propellers, electric bells and sirens – enabling a level of complexity of temporal organisation hitherto unknown. Antheil’s ideas gained enthusiastic support from the American modernist poet Ezra Pound who, in *Antheil and the Treatise on Harmony* (1924), argued that music should delineate itself principally by its passage through time, rather than by its ‘state’ at any moment in time. In the process, Pound reasserts the notion of the primacy of a predominantly temporally informed mode of perception: music as a phenomenon existing in time-space, and articulating time-form. *Ballet mécanique* seeks to embody a realisation of these concepts, ‘wherein time functioning in music differs from ordinary time and the series of deductive and also physical phenomena that follow it.’ In *Ballet mécanique*, the compression and expansion of events within time moments, the metamorphosis of events within a past-present-future paradigm, the utilisation of simultaneous time-series, and the placing of events in time frames that lie beyond the scope of human memory recall, are all enabled through a quasi-computational mode of composition. Whilst the manipulation of sound material in such ways is often the very stuff of music compositional practice, the use of machines in *Ballet mécanique* allowed for the construction of a previously unimagined (and unimaginable) temporally-constructed soundscape. In this respect, *Ballet mécanique* can be seen as a seed for modern computer sequenced electronic music, and a further examination of the compositional processes Antheil employed, and their relation to modernist concepts of time, will provide evidence that the piece may be viewed as a sophisticated example of ‘pre-computer’ sequencing.

Music and time

Of his work, Antheil wrote the following, in the journal *de Stijl*, in 1925:

My Ballet mécanique is the new FOURTH DIMENSION of music.

My Ballet mécanique is the first piece that has been composed OUT OF and FOR machines, ON EARTH...

My Ballet mécanique is the first music ON EARTH that has its very germ of life in the new fourth-dimensional phenomena wherein TIME FUNCTIONING IN MUSIC DIFFERS FROM ORDINARY TIME and the series of deductive and also physical phenomena that follow it.

My Ballet mécanique is neither tonal, nor atonal. In fact it is of no kind of tonality at all. It has nothing to do with tonality. It is made of time and sound...the two materials, FUNDAMENTAL materials, that music is made of...

My Ballet mécanique is the first TIME-FORM on earth.

My Ballet mécanique comes out of the first and principal stuff of music...TIME-SPACE...

My Ballet mécanique has a closer connection to life than any of the tonal music that preceded it. But it is a musical and not a literary connection.

In my *Ballet mécanique*, I offer you, for the first time, music hard and beautiful as a

diamond...

The *Ballet mécanique* is the first piece IN THE WORLD to be conceived in one piece without interruption, like a solid shaft of steel...

reprinted from 'My Ballet mécanique', *De Stijl*, vol. 6, no. 12 (1925)

If Antheil's statements may not be as groundbreaking as his rather excitable text implies, his manner of realisation is both original and entirely modern. That *Ballet mécanique* was 'composed OUT OF and FOR machines' does not simply signal it as example of the modernist glorification of the emergent machine age, but crucially allows for the aural realisation of the concepts of time-space and time-form to degrees of complexity, precision, and significantly, speed, hitherto unachievable and unknown. The use of the pianolaⁱⁱ is central here and, whilst the instrument was on the verge of obsolescence by the time Antheil composed *Ballet mécanique*, it allowed him access to the mechanical equivalent of today's computer-based music sequencer. Hand-made pianola rolls facilitate a mathematical ordering of events to virtually any degree of durational calculation, and a rendition of those events at a speed and level of rhythmic complexity beyond the scope of human performers. Whilst pianolas and their accompanying rolls vary in the specificities of their operation, the general principle remains the same: the paper rolls contain information about the note to be played, the duration of the note, the speed or force with which the keys are to be struck, and additional directions, such as pedalling, articulation and tempo changes, which must be realised by the performer. The analogy with the MIDI protocol is clear here inasmuch as both systems contain ordered, but atemporal, performance information. The activation of this information requires an additional and extraneous agent: for MIDI, an external synchronising device such as a computer-based sequencer; and for the pianola, the combined mechanism of the player piano and the human operator.ⁱⁱⁱ In performance, and at the hands (and feet) of a skilled pianolist, pianola music may contain the same nuance of tempo fluctuation, detail of articulation and dynamic variation as the most 'musical' of live performances, a key factor in the realisation of *Ballet mécanique*. In this respect, the pianola apparatus provides a real-time interface between the data contained therein and the auditory realisation of that data, to a level of sophistication and sensitivity only recently achievable in the digital domain. Moreover, the visible, and sometimes audible, manifestation of effort involved in pianola performances humanises the process of mechanical actualisation.

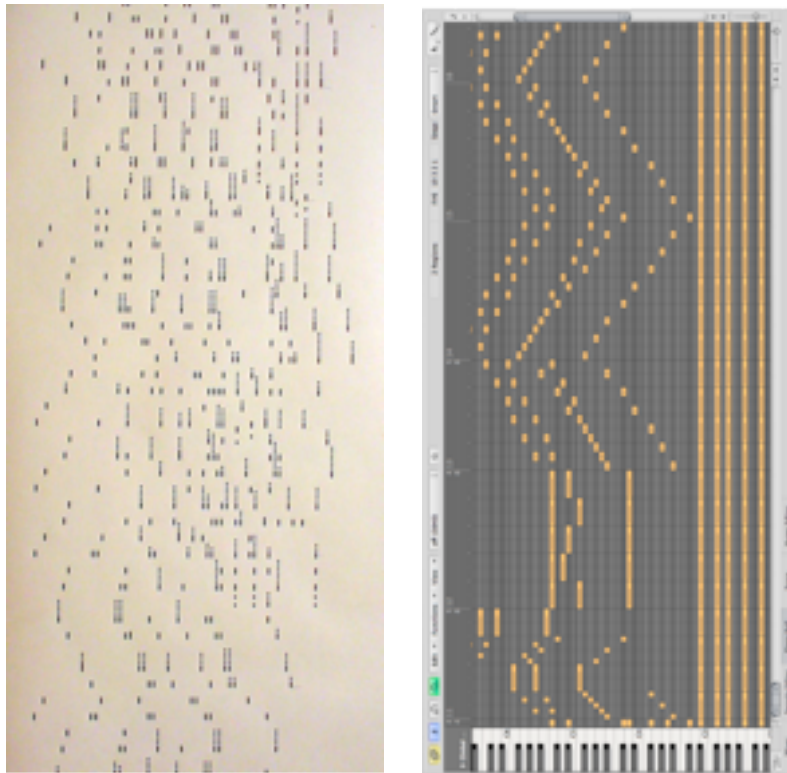


Figure 1 – Excerpt from roll 3, section 81 of *Ballet mécanique* (Artcraft Music Rolls) (left), ‘piano roll’ display of *Ballet mécanique* MIDI information within a sequencer environment (right)

Antheil’s use of the pianola as a compositional tool was not, of course, unique and he was undoubtedly influenced by his 1923 encounter with Stravinsky’s version of *Les Noces* for pianola. Stravinsky had experimented with original music for the instrument in 1917 in his *Etude pour Pianola*, whilst others, including Ferruccio Busoni and Percy Grainger, made even earlier experiments.^{iv} Antheil’s approach to the use of the instrument as a mechanism of creation rather than one of reproduction also echoes the proposals for new approaches to the use of the gramophone by the Hungarian artist and polymath, László Moholy-Nagy (1895-1946). In his essays, *Production-Reproduction* (1922) and *New Form in Music: Potentialities of the Phonograph* (1923), Moholy-Nagy calls for a ‘profound examination of the following questions: What is this apparatus (instrument) good for? What is the essence of its function? Are we able, and if so to what end, to extend the apparatus’s use so that it can serve production as well?’, statements clearly apposite to Antheil’s work with the pianola. The mechanisation of music also found enthusiastic support from the composer and musicologist H. H. Stuckenschmidt who, acknowledging the work of Moholy-Nagy (and Antheil’s own experiments with the gramophone), looks forward to the total mechanisation of musical composition and the abolition of the performer.^v

Time-space and time-form

Ballet mécanique was born out of the modernist fervour and preoccupations of the day – parallel literary, philosophical and scientific examinations, quantifications, and ultimately, unravellings of the notions of time. In this context, Antheil’s tantalising and unequivocal statements about *Ballet mécanique* present us with three interesting notions to consider: music as a *representation* of ontological time, necessarily differing from perceptions of psychological time in its progress; music arising from ‘time-space’; and music articulating ‘time-form’. Whilst Antheil wrote little beyond the statement published in *de Stijl* by way of further explanation, we are aided towards an understanding of his view of the temporal aspects of music through the writings of his some-time friend and fellow composer, Igor

Stravinsky. Writing in his autobiography of 1936, *Chronicle of My Life*, Stravinsky makes claim for the unique immediacy of the musical experience: ‘Music is the sole domain in which man realises the present. By the imperfection of his nature, man is doomed to submit to the passage of time – to its categories of past and future – without ever being able to give substance, and therefore stability, to the category of the present.’ Stravinsky’s musical ‘present’ can only exist, if it exists at all, through processes of recollection (memory) and anticipation (inference), although these processes in themselves imply an irreconcilable recursivity. As a temporal phenomenon, music continuously evades substantive materialisation.

In his *Poetics of Music in the Form of Six Lessons*, Stravinsky, acknowledging the work of his friend, the musician-philosopher Pierre Souvtchinsky (and through him, the theories of the French philosopher Henri Bergson), provided a fuller account of the relationship between musical time and ontological time:

What gives the concept of musical time its special stamp is that this concept is born and develops as well outside of the categories of psychological time as it does simultaneously with them. All music, whether it submits to the normal flow of time, or whether it disassociates itself therefrom, establishes a particular relationship, a sort of counterpoint between the passing of time, the music’s own duration, and the material and technical means through which the music is made manifest.

Mr. Souvtchinsky thus presents us with two kinds of music: one which evolves parallel to the process of ontological time, embracing and penetrating it, inducing in the mind of the listener a feeling of euphoria and, so to speak, of “dynamic calm.” The other kind runs ahead of, or counter to, this process. It is not self-contained in each momentary tonal unit. It dislocates the centers of attraction and gravity and sets itself up in the unstable. (Stravinsky, 1947)

Stravinsky proceeds to make qualitative judgements concerning the nature and merit of music that is ‘based on ontological time’ versus that which ‘adheres to psychological time.’ For Stravinsky, the former manifests itself through principles of order, repetition (an important point when considering *Ballet mécanique*), similarity and variation (that is, variation arising from a concept of unity), whilst the latter is characterised by contrast and continuing processes of development, the very matter of being for much music of the nineteenth century. Souvtchinsky, in his 1939 article *La notion de temps et la musique*, expressed this apparent polarity more forcefully, labelling ‘classical music’ as *chronometric* (that is, an expression of time) and ‘Romantic music’ as *chronoametric* (a violation of time).

The (implicitly favoured) chronometric view of music, music passing in accordance with, and subdividing, ontological time, has further significance when considering the nature of form in music. Without delving too deeply into the complex area, we might broadly summarise Souvtchinsky’s chronoametric music as that which is often (or even, generally) articulated through a *sense* of super structures – harmonic frameworks – that are implied by notions of tension and release, expectation and resolution, approach and withdrawal. Such frameworks provide an implied structure for the unfolding of the surface material – the melodies and their interplay – and inhabit a different, and often atemporal, course of progress. Chronometric music not only seeks to coalesce Stravinsky’s triumvirate of time – psychological, metrical and musical – but must, necessarily, seek out its own form in the process of unfolding. Form becomes forming.

This view finds expression through the writings of Ezra Pound in *Antheil and the Treatise on Harmony* of 1927, a work that was to cause Antheil satisfaction and disapprobation in equal measures. Pound writes, in no uncertain terms, that:

The early students of harmony were so accustomed to think of music as something with a strong lateral or horizontal motion that they never imagined any one, any one could be stupid enough to think of it as static; it never entered their heads that people would make music like steam ascending from a morass. They thought of music as travelling rhythm going through points or barriers of pitch and pitch-combinations. (Pound, 1927)

This reaction against harmonically informed music – ‘steam from a morass’ – also finds voice in the writings of fellow American composer and iconoclast, Henry Cowell. In his *New Musical Resources* of 1930, Cowell not only makes an argument for the liberation of the ordering of time through the establishment of rhythm as a principal musical determinant, but further proposes that rhythm, when manifested through the sonic articulation of periodic time events, becomes coexistent, and even coterminous, with our perception of pitch, and consequently, melody. By extension, form may be felt to arise from the path that melody, itself born from rhythm, articulates through time.^{vi} For Pound, the multi-stranded interplay of melodic lines, which is the matter of the polyphonic music of the medieval, Renaissance and Baroque periods, music whose trajectory is neither constrained nor informed by an overtly functional harmonic underlay, becomes the model to which contemporary music should return. Antheil’s time-space and time-form may therefore, in part, be seen as instances of this ancient, but at the same time, urgently modernist preoccupation.

Time repeated, time reordered, time silenced

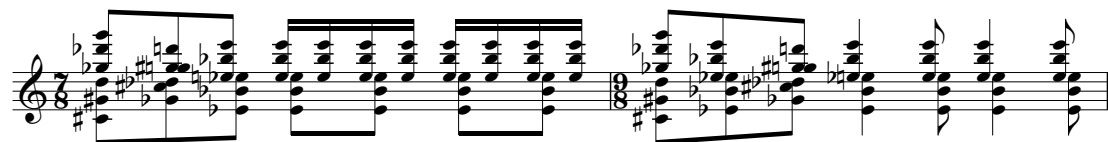
For *Ballet mécanique* the atemporal setting of the order of events within the static framework of the paper roll finds a contemporaneous philosophical rationalisation in the proposition of the ‘C series’ of time events, outlined in John McTaggart’s *The Unreality of Time* (1908). In his infamous repudiation of the existence of time, McTaggart provides three, inter-related frameworks for temporal perception: the A series – the notion of *past, present* and *future*, a relational ordering involving notions of change; the B series – the static temporal concept of *earlier* and *later*; and the C series, in which the ordering of events is non-temporal and not yet indicative of direction. McTaggart further proposes that ‘...time involves change... A universe in which nothing whatever changed (including the thoughts of the conscious beings in it) would be a timeless universe.’ Conversely, the notion of timelessness, or the cessation of change, finds a degree of sonic embodiment through the musical use of the ostinato, the unvarying repetition of (often non-melodic) motives, that may both neutralise a sense of progress and frustrate a sense of arrival. It is through repetition that much of *Ballet mécanique* proceeds, the mid-level material often comprising variations of a limited range of micro-structural material, and the use of the ostinato finds uncompromising expression towards the end of the piece, where a cluster-based phrase is repeated thirty-four times, with very limited variation [Fig. 2].



Figure 2 – cluster ostinati from *Ballet mécanique*

If this is not exactly the ‘one hundred times’ Antheil later claimed, it nevertheless provides an extraordinary example of the coalescence of – to recapitulate Stravinsky – ‘the passing of time, the music’s own duration, and the material and technical means through which the music is made manifest.’ It should be noted here that the predominance of cluster-based material, which tends towards noise, negates any sense of harmonic or melodic structuring. This is important to clear the field, as it were, for the music’s focus on the exploration of time.

As previously noted, the reception of much western music relies on a listener’s abilities to recall earlier events and to recognise their reappearance, often at structurally important moments. Furthermore, composers’ techniques of transforming events may imply musico-semiological relationships or even narrative significance. At a technical level, such transformations, which include the compression, augmentation, reflection, reversal, or superposition of various musical elements such as pitch sequences, rhythmic patterns, volume or articulation matrices, had become stock-in-trade compositional devices by the early part of the twentieth century. However, the use of the pianola, both as a compositional medium and in performance, enables these techniques to find fresh methods of realisation. For example, towards the end of *Ballet mécanique*, in the place of standard recapitulation techniques, Antheil employs an extended example of what we might term ‘fast-reverse playback,’ in which large chunks of the opening section of the piece are presented at double or quadruple speed and backwards [Fig. 3]. Recollection is challenged through the extreme compression of this earlier material, whilst the ordering of events is, of course, reversed. This section also reveals either an attempt by Antheil to indicate the unplayable – and therefore, unknowable – as the instruments cannot execute the proliferation of notes indicated in the score.^{vii}



double speed:



reversed:

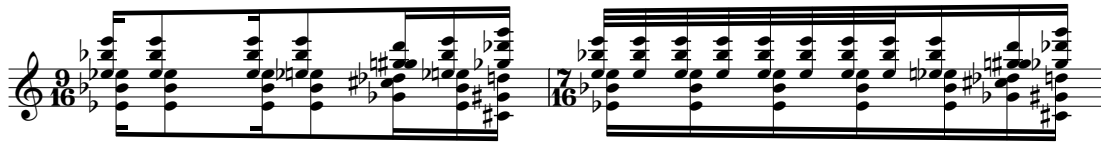


Figure 3 – compression and reversal techniques in *Ballet mécanique*

Perhaps the most audacious moments of *Ballet mécanique* lie not among the saturated totality of its noisy surface, but in the ever-prolonged silences that Antheil uses just before the close of the piece. Here, Antheil presents the listener with the antithesis of time articulated by sound, silence becoming the structural determinant. Psychological research on rhythm perception has demonstrated that listeners have difficulty connecting individual sound events much greater than 1.5 seconds apart, whilst the recognition of groups of organised sound events – rhythmic cells – is possible up to and beyond 5 seconds duration. As if to make explicit the disconnection between the chronometry of the music and the listener’s psychological perception of the passing of time, Antheil introduces ever wider gaps between the punctuating sound events (events that do little in themselves to establish a sense of ordered time), testing the listener’s ability to maintain a sense of temporal relationship within the material presented. Antheil also makes the point explicit in the printed score by somewhat pointlessly subdividing the silences into multiples of tiny units [Fig. 4]. The prolonged use of silence here pre-empts, by several years, the emancipation of non-activity found in works by John Cage and others. (Note: in performance, these silences are, in fact, not silent, but are accompanied by the surreptitious creaking of the mechanism of the pianola as the pianolist diligently pumps away.)

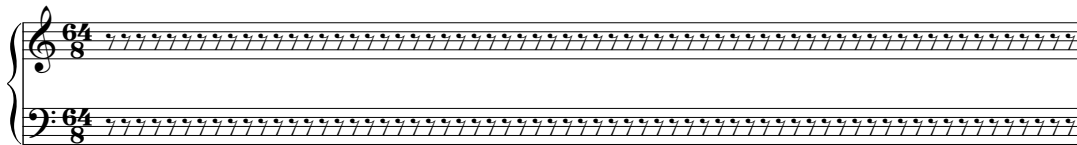


Figure 4 – from the closing section of *Ballet mécanique*

Coda

As Carol Oja has commented in *Making Music Modern* (2000), ‘the overall surface of the work is often flat and non-directional... Antheil’s *Ballet mécanique* may have aimed to generate a sense of the fourth dimension by eliminating the third – that is, by creating the musical illusion of a two-dimensional surface.’^{viii} However, in performance, *Ballet mécanique* presents the listener with an experience verging on the visceral. The inexorable hammering out of tone-clusters, the percussively non-resonant sound palette, and the virtually relentless dynamic assault serve to ensure the receptive experience remains anything but passive. Stravinsky’s ‘dynamic calm’ becomes ‘dynamic turmoil’. In addition, the *sight* of *Ballet mécanique* in performance, combining the effortful stasis of the pianola with the synchronised dynamism of the percussionists, reminds one of the human-machine environments in Fritz Lang’s *Metropolis*, which premiered in Berlin three months to the day before *Ballet mécanique*’s disastrous American debut.

Antheil’s experiment in manifesting time-form, time-space and the fourth dimension in music remains a realisation of a conglomeration of musical and philosophical concerns, strongly informed by the sometimes-febrile environment of its birth. For Antheil, *Ballet mécanique* was ‘not successful *en toto*, but it was a “try” towards a new form, new musical conception, extending, I think, into the future.’ In this respect, Antheil’s comments were prescient, finding fuller realisation in the music of many later composers, and paving the way for the

manipulation of performance data so ubiquitously employed through the use of the computer-based sequencer. In particular, the combination of human and machine agents in performance marks *Ballet mécanique* as a seminal, and still thrilling, example of Human ‘Computer’ Interface enabled musical composition.

Bibliography

- Abbott, E. A. (1885), *Flatland: A Romance of Many Dimensions*, Boston: Roberts Brothers.
- Antheil, G. (1990), *Bad Boy of Music*, Hollywood, CA: Samuel French.
- Antheil, G. (2003), *Ballet mécanique* (score), New York: G. Schirmer.
- Cowell, H. (1996), *New Musical Resources*, Cambridge: Cambridge University Press.
- Druskin, M. (trans. Cooper, M.) (1983), *Igor Stravinsky: his life, works, and views*, Cambridge: Cambridge University Press.
- Krumhansl, C. L. (2000), ‘Rhythm and Pitch in Music Cognition’ in *Psychological Bulletin*, 2000, vol. 126, no. 1, pp. 159-179.
- Lawson, R. (1996), ‘The Origins of the Ballet mécanique’ in *The Pianola Journal*, No. 9, 1996, London: The Pianola Institute.
- Levin, T. Y. (2003), ‘“Tones from out of Nowhere”: Rudolph Pfenninger and the Archaeology of Synthetic Sound’ in *Grey Room*, no. 12, Summer 2003, pp. 32-79.
- Ludington, T. (2002), *A Modern Mosaic: Art and Modernism in the United States*, Chapel Hill: University of North Carolina Press.
- McTaggart, J. M. E. (1908), ‘The Unreality of Time’ in *Mind: A Quarterly Review of Psychology and Philosophy*, no. 17 (1908), pp. 456-473.
- Oja, C. J. (2000), *Making Music Modern: New York in the 1920s*, New York: Oxford University Press.
- Passuth, K. (1985), *Moholy-Nagy*, London: Thames and Hudson.
- Pinch, T. J. and Bijsterveld, K. (2003), ‘“Should One Applaud?” Breaches and Boundaries in the Reception of New Technology in Music’ in *Technology and Culture*, vol. 44, no. 3, July 2003, pp. 536-559.
- Pound, E. (1927), *Antheil and the Treatise on Harmony*, Chicago: Pascal Covici.
- Stravinsky, I. (1936), *Chronicle of My Life*, London: Gollancz.
- Stravinsky, I. (1947), *Poetics of Music in the Form of Six Lessons*, Cambridge, MA: Harvard University Press.
- Stuckenschmidt, H. H. (1925), ‘The Mechanization of Music’ in Hermand, J. and Gilbert, M. (eds.) (1994), *German Essays on Music*, New York: The Continuum Publishing Company.

ⁱ *Ballet mécanique* was initially conceived as a film and music project with Fernand Léger, Dudley Murphy and Man Ray, and its compositional history remains unclear and complex. Antheil variously reworked it for: four pianos; solo pianola; an ensemble comprising single or multiple pianolas, pianos, percussion, sirens, bells and airplane propellers; and finally, an antiseptic version of 1953, in which the onslaught of the pianola was replaced by a tinkly ineffectiveness of the

glockenspiel. The debut public performance in Paris in 1926 – a semi-engineered *succès de scandale* – established his reputation, whilst the disastrous repeat in New York’s Carnegie Hall a year later, ruined it.

- ii The term Pianola was originally a trademark of the Aeolian Company, but came to represent the generic term for foot-operated player pianos. Antheil originally wrote *Ballet mécanique* for a player piano made by the French company, Pleyel.
- iii Player pianos, such as the type Antheil used, are differentiated from reproducing pianos, which may simply be activated by electronic means to reproduce performance information without further human intervention.
- iv The first known original composition for pianola appears to be *Introduction and Andante Grazioso* by the American composer Homer Newton Bartlett. See the web site of The Pianola Institute (www.pianola.org) for further accounts of the history of compositions for the pianola.
- v A much earlier, and eerily prescient statement about the ‘non-human’ future of music appears from the youthful hand of the Australian composer Percy Grainger. He writes: ‘Probably music of the future will be performed by machines not by musicians. Composer will make his own machine (like an inventor) most likely his own sound-colors (like painter his colors) will perfect compositions & perform nuance of same right by himself. He will complete machine which will be *vervielfältigt* [multiplied] & heard all over the shop. Fine points will come in making of machine, *crescdi*, Forte, Rit, *accel* all will be accounted for every shade of expression that the hearer can feel can be reproduced on spur of moment and be kept for ever.’ From an unpublished notebook ‘Methods of teaching & other things,’ dated Jan. 30. 1901, Grainger Museum, University of Melbourne.
- vi Cowell’s examples of periodic rhythmic events increasing in speed until they become perceived as the frequency components of newly-sustained pitches also relies on machine intervention, as the speed of repetition needed to bring such events into the range of pitch perception is usually beyond that which can be achieved by human means alone.
- vii A less charitable interpretation of such passages would indicate that Antheil had an incomplete knowledge of the capabilities of the pianola.
- viii Oja’s observation appropriately calls to mind Edwin Abbott Abbott’s 1884 pre-modernist novella, *Flatland: A Romance of Many Dimensions*, in which the narrator of a two-dimensional world, a world in which the possibility of three dimensions (Spaceland) cannot be conceived, proposes the existence of a fourth dimension (and fifth and sixth) following a visit by the three-dimensional Sphere.