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FACULTY OF HUMANITIES

Department of Music

Volume 1 of 2
(Commentary on
Portfolio of Compositions)

The Digital Studio as Compositional Tool:
Towards a Virtual Performance Platform

Benjamin Louis Mawson

Thesis for the degree of Doctor of Philosophy

December 2014

Abstract

FACULTY OF HUMANITIES

Music

Thesis for the degree of Doctor of Philosophy

THE DIGITAL STUDIO AS COMPOSITIONAL TOOL:

TOWARDS A VIRTUAL PERFORMANCE PLATFORM

Benjamin Louis Mawson

Current means for simulation of impossible sonic realities are yet unmatched in the delivery of sound. This research is a preparation for fully immersive and interactive audition of composed music.

The compositions submitted in this portfolio are experiments towards understanding newer technological 'affordances and constraints' and the possibilities these will engender. Having developed a proof of concept for my invention 3DBARE, which will allow fully immersive interaction with multi-channel digital audio, I have explored ways in which this creates new possibilities for the composer.

This commentary reports the methods and rationale for virtual performance experiments in acousmatic compositions seeking either to simulate human agency or which are palpably unreal ("impossible music") and in geo-located soundscapes.

The works submitted are explorations of uses of both physical and virtual space for controlled indeterminacy of audition, with listener-action as the controller of the heard totality of the music. The control resides in the compositional methods and outcomes; the indeterminacy arises in the free variability of individual listener action to create differentiated consecutive auditions to the same music.

Geo-location of composed sound is concerned both with augmentation of reality and the intersections of reality with virtuality. The experiments in geo-location revealed profound differences between current and proposed means of composing and of encountering composed sound.

The discoveries made in the course of this research are outlined from acousmatic simulation to geo-located soundscapes in the search for 'adequate means of listening' to virtual performance.

I have sought to identify the boundaries of auditory credulity in simulating 'liveness' in preparation for a system of immersive binaural sound reproduction: the means to 'walk inside a piece of music' and inspect it as though a physical object.

"Today with the technical means that exist and are easily adaptable, the differentiation of the various masses and different planes as well as these beams of sound, could be made discernible to the listener by means of certain acoustical arrangements. Moreover, such an acoustical arrangement would permit the delimitation of what I call "zones of intensities."

New Instruments and New Music (Edgard Varèse, 1936)

"All cities are geological. You can't take three steps without encountering ghosts bearing all the prestige of their legends. We move within a closed landscape whose landmarks constantly draw us toward the past. Certain shifting angles, certain receding perspectives, allow us to glimpse original conceptions of space, but this vision remains fragmentary. It must be sought in the magical locales of fairy tales and surrealist writings: castles, endless walls, little forgotten bars, mammoth caverns, casino mirrors."

Formulary for a New Urbanism (Ivan Chtcheglov, 1953)

"J'ai vu quelquefois que des techniciens me disaient que c'est anti-acoustique mais je m'en fiche que ça soit anti-acoustique si c'est ce que je veux."

["I've seen sometimes that technicians would say to me that it's anti-acoustic but I don't give a damn that it's anti-acoustic if it is what I want"]

(Eliane Radigue interview, 2008)

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Declaration of authorship

I, BENJAMIN LOUIS MAWSON declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

The Digital Studio as Compositional Tool:
Towards a Virtual Performance Platform

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission.

Signed:
Date: 24 December 2014

Acknowledgments

I am indebted to my supervisor the unique Professor Michael Finnissy whose wisdom, unflagging support and occasional ferocity were of incalculable help in beginning to find a way through the questions and solutions proposed in this thesis.

I owe a historic debt of gratitude to the restless curiosity of my former teacher Alexander Abercrombie, whose knowledge and encouragement opened so many early perceptual and aesthetic doors, and to the memories of Steve Martland and Gordon Sherwood, challenging and insightful teachers.

My thanks to Stephen Foster of the John Hansard Gallery for commissioning ROOM; Dr Dominic Murcott of Trinity Laban for his inclusion of " "Dreaming at the Circular Ruins" " in the Impossible Brilliance Festival; Kevin Appleby of Turner Sims Concert Hall who understood the potential of geo-location for audiences to enter inside a musical work and facilitated both my first geo-located performance and my first major geo-located commission; Dr Steve Dorney for the clarity of his explanations of psychoacoustics; Dr Filipo Fazi for his commitment of resources at ISVR to early developmental work towards a 3DBARE prototype; Iyad Assaf for early work on 3DBARE; Nacho Cossio for developing the 3DBARE prototype user interface; Dr Richard Polfreman for much technology advice, in particular with sound rendering in MAX/MSP for 3DBARE; Jeffrey Wainwright for kind permission to set his poem 'Take Me By The Hand"; Alastair McCapra formerly of the Landscape Institute for his challenging engagement with my geo-located sound work; Steve Troughton for continued invaluable assistance in performances and technological demonstrations over several years; Professor James Greerson for irreplaceable help on Nancarrow's transcription practices; Dr Thomas Irvine who facilitated this research in the first instance and opened new interdisciplinary connections; restless experimenter John Law for his continued inspiration and provocative responses to my work; Professor Sally Jane Norman of the University of Sussex for her support and challenging interest in my work with noTours and 3DBARE; Professor Andrew Pinnock and Professor Jeanice Brooks for their belief in and facilitation of my unusual musical practices; Professor Ola Stockfelt for helping to face questions of transcribing four-dimensional sound; Dr Julio d'Escrivan for introducing me both to concepts of plunderphonia and to Enrique Tomas; Enrique Tomas for developing and making freely available the remarkable noTours software for geo-location of sound; Wilfried Van Baelen of Galaxy Studios, Mol, Belgium and Jens Reule Dantas of UFO Studios, Berlin, for opening new doors of acoustic perception; Karen Woods for help with explaining technical ideas simply; composer and Eigenharpist Mike Milton for his searching discussions on virtual performance; Dr Solveig Ottmann, Maria Papadomanolaki and Kevin Logan for lengthy enthusiastic discussions on everything relating to sound, time and space; Professor Lorraine Warren for her unflagging professional and creative support; Taissiya Khorotysheva for careful, precise proof-reading and erudite suggestions; my parents for making a life in music possible and my children Daniel and Eleanor for their love, humour, 'music you can walk inside' testing and endless patience with my research.

Introduction

Two principle compositional questions are addressed in this commentary and portfolio: how can the digital simulation of 'liveness' be made more effective and how can listener interaction with composed sound in a physical space permit variable audition of fixed digital output.

In the course of finding ways to ask and answer these questions, I was also able to define their necessity. The driving motivation for this research was to discover ways of extending my musical language and practice - a formal, polystylistic hybrid owing more to Monteverdi, Scriabin, Varèse, Nancarrow and 1920s' New Orleans than to Schaffer, Lucier, Cage or Cardiff - through the agency of the digital studio as a compositional tool.

Incidental explorations of capturing and manipulating a place's ambient sounds provided insights into layered montaging, impulse response design, digital binaural effects and the alteration of listener perception of space and time. These, though, and other aspects of both geo-located and acousmatic listening confirmed and gave sharper definition to my original intentions. These were to develop compositional techniques and uncover more adequate means for presenting music developed in the digital studio which at once simulates performance and is beyond current capabilities.

The underlying concepts therefore of soundscapes and binaural sound art were informative but tangential elements in this research, primarily focussed as it is upon preparation for interactive virtual performance.[1]

Simulation of 'liveness'

I have sought to reduce the mediative presence of technology in listening to music created in the digital studio, and to overcome the recognisable artificiality of current simulation. In researching compositional techniques specifically for a means of listening that permits real-time investigation of music's inner parts, I worked with loudspeaker-arrays, binaural simulation and geo-location, using generated and found audio and MIDI simulations.

My discovery of Edgard Varèse's 1936 proposal to obtain 'non-blending' of musical textures, led to exploration of ways existing technology could be used to achieve this, resulting in my concept of "3DBARE", a proposed means for the listeners to enter the inner parts of a musical construct and make variable consecutive auditions possible.[2] This research works towards that (as yet future) goal, in search of quasi-live, variable audition to 'through-composed' digital music, for ways to make simulation more realistic and technology less tangibly mediative.

These compositions are thus part of a continuing search for an 'adequate means of listening' to simulated performance, as well as an exploration of techniques that prepare for fully interactive audition, where the music is at once entirely controlled or 'through-composed', yet a listener's experience is indeterminate, according to their interaction with it.[3] This search for ways to compose and to hear music with 'controlled indeterminacy' is a unifying feature of this research.

An essential element in realistic simulation is reducing technology's tangible mediation of the experience.[4] Listeners in geo-located soundscapes, using a small, pocket-held device, reported forgetting the presence of the technology, engaging purely with the sounds themselves.[5] This bodes well for the use of discreet equipment for audio interactivity controlled solely by listener tracking in future contexts. Other barriers to realism at present though, are persistent, such as binaural sound's movement in relation to the listener, rather than independently in space. This and other differences between geo-location and envisaged virtual performance are discussed in Chapter 4: Geo-located Music.

Under the conditions in which these compositions were created and heard, another aspect of technology's mediation remains stubbornly challenging: in MIDI, a sense of encountering artificiality is constant. Successful simulation is fundamental to interactive listening, where immersion exposes detail to intimate scrutiny that in fixed forms (with overlaps, cross-fades, harmonisation) can be masked. I explore the digital audio workstation's affordances and constraints for overcoming these limitations to realism,

although some of the MIDI simulations here are, as yet, not entirely realistic.

Caedmon's Hymn is an example of an experimental approach to the simulation of acoustic accompaniment for manipulated voice recordings. Here, the MIDI file is a digital score, from which future reproduction will be possible with greater fidelity to the imagined 'performance' than I have been able to achieve so far. Recordings of this and the other works are intended not as finalised acousmatic productions, but as versions that may be better reproduced with future technologies, which it is anticipated will afford higher resolution, increased timbral variety and greater expressive nuance. The purpose here, as with a notated score, is to demonstrate musical intent. Ongoing work will progress towards greater realism in virtual performance.

Uses of physical and virtual space

In addition to explorations of simulated performance and indeterminacy in listening, three uses of space or perceptual space have been made: [6]

1) non-conventional configuration of loudspeaker arrays [*Take me by the Hand* and *ROOM*]
2) headphone-based simulations of virtual space [*Take Me By The Hand*, *ROOM*, *Credo*, *Caedmon's Hymn*]
3) geo-location across landscape [*Take Me By The Hand*, *Audio Portrait of a City*, *Written in Water*]

Acousmatic versions of *Take Me By The Hand* and *ROOM* were relayed from DAW software containing several dozen tracks, merged via audio interface to an array of stereo amplifiers. *Take Me By The Hand* used a semi-circular array, similar to the positioning of a choir on stage. *ROOM* was heard on 12 loudspeakers in 5 partially-occluded rooms.

The second use, of simulated or perceptual space is for headphone-based audition. The acousmatic works were recorded in this way for the purpose of this portfolio.

Dreaming at the Circular Ruins (DREAMING AT THE CIRCULAR RUINS), *Credo*, *The President* and are also presented in this form. Binaural filtering is used

to virtually spatialise the twelve pianos of *DREAMING AT THE CIRCULAR RUINS*, my first compositional experiment towards the ultimate objective of listening via 3DBARE. Differences between the acousmatic and virtual versions are discussed in Chapter 2: Music for Keyboard: Dreaming at the Circular Ruins. With truly interactive audition, investigation not only of the composed sound but of a simulated acoustical environment will be possible, reverberation differing according to listener position and orientation.

Virtual space is used to simulate physical separation or movement of parts, such as the swarming of kittiwakes around the voice of *The President*, the circular arrangement in of chanting voices and avatar performers and the evocation of limitless depths from which echo the transformed voices in *Credo*.

The third use, of physical space across which listeners must range in order to interact with the musical construct, is landscape-based and the sounds and their arrangements have a close connection to the physical form and acoustical properties of the location. This is discussed at length in Chapter 4: Geo-located Music.

Chapter 1: Virtual Performance explores problems and solutions both in terminology and practice. Definitions of the concepts 'liveness', 'virtuality' and 'performance' are subject to continual revision according to individual practice. The approach I have taken in this research is outlined there. The commentaries on individual compositions in the portfolio are presented as three groups in the following three chapters.

Chapter 2: Music for Keyboard groups the *(Player-) Piano Studies* with *Dreaming at the Circular Ruins*. They were composed in the studio, they simulate hands at keys and interrogate the identity of the 'completed' musical composition.

The *(Player-) Piano Studies* alternate between avatar and human performer where, in the former, sculpted digital sound portrays an imagined fantasia-improvisation on primary motivic material. In the latter, the performer may use either a full or partial score or simply a chart of the constituent pitch

classes to produce a self-chosen form of the 'work'. The end results are variable in form, just as with geo-located sound.

A reciprocal connection exists between the fully-conceived odd-numbered *Studies*, aspiring to a semblance of spontaneity, and the even-numbered *Studies*, where an impression of exactly performed, fully composed music may be created from outline-planned notation. While the *Studies* explore determinacy and indeterminacy from dialectically contradictory perspectives, they have in common questions as to the identity of a musical 'work', in the context of seeking a way for listeners to navigate composed music at will.

Dreaming at the Circular Ruins was composed for the centenary of Conlon Nancarrow and first heard at the Front Room of QEH, South Bank Centre, on a row of 12 loudspeakers. As I had no information at the composition stage, as to how the music would be relayed to listeners, I treated this non-specific outline as an opportunity to create music that, while entirely controlled in its entirety, could provide via interactivity for an indeterminate listening experience. As the music's minute detail cannot be fully differentiated through listening in stereo, I determined to make it possible to investigate in spatially separated, virtual parts: an early experiment in controlled indeterminacy. The Appendix on 3DBARE, my intended means for ultimately achieving this, demonstrates the differences between acousmatic and interactive, virtual audition.

Chapter 3: Acousmatic Music groups composed simulations based in found and recorded audio. In *ROOM* and *Caedmon's Hymn*, audio is also combined with MIDI. While simulation seeks credibility, it also explores the oneiric properties of a single voice self-multiplied, street scenes moving within an interior space or modern instruments accompanying a 1,500 year old chant.

In *Credo*, the listener simultaneously hears overlapped, sometimes looped, often transformed chants from multiple faiths. Here, as in the other compositions presented, a 'willing suspension of disbelief' is asked, the agreement to accept non-reality as occurring for the duration of the experience. As in film and theatre, 'the production and all its elements

attempt to create an illusion of reality, verisimilitude, and "the audience completes the illusion by accepting as real what it sees and hears."' [7] The simulation's objective is an extension of 'reality', into imaginative, sensory regions beyond the physically possible.

Chapter 4: Geo-located Music deals with the third use of space, geo-location: the performative use of physical locations to which sounds have been virtually attached, with simulated spatialisation for perceptual spread and movement of distinct parts within the whole.

Site-specific work responds to, juxtaposes against and augments the situational setting. The 'affordances and constraints' [8] of a site determine to a great extent the sound materials imported, found, manipulated and combined, being characteristics of the very setting in which the work is presented and experienced.[9] These compositions are investigations into the blending of composed sound with incidentally occurring noise of a location itself. Different locations for the same composed sound yield profoundly different designs and heard experiences. These are analysed in this chapter.

Locations possess rich and changing, incidentally occurring sounds. By combining edited forms of these in situ with studio-created sounds, I sought to discover whether these contributed to a sense of musical 'meaning' for the listener.

The meanings implicit in a place's function and its perceived and self-stated identities, along with narratives individually or collectively developed about the place: how do these alter or inform a sense of the meaning within a sound construct experienced there? Can the alteration of a site's perceived sonic character (headphone-based, processed sounds from that environment) combined with composed sound, be experienced as a unified whole, as 'pure music', removed from the physical context for which it was particularly developed?

Whether communication of types ascribed to linguistic forms can be said to occur in non-linguistic patterns is a recurring question in my compositional research, even given the impossibility of direct correlation between sonic

and linguistic structures.[10] (Indeed language demonstrably enjoys no privilege in the achievement of particular specificity of its own).

In attempting to subvert listener-anticipated narratives, symbolic 'hyper-realities' of compound quotation (collected in situ or imported) are used against the assumption of communicable meaning within organised sound, by manipulation and displacement of the location's sounds. [11]

Interpretation of the music in this portfolio as analytical or representative of exterior auditory 'reality' is therefore resisted: these compositions are without programme or narrative, being essays in sound in which the time and space of their audition are at once compressed and extended.[12]

The keyboard and other acousmatic work in this submission are conceptually linked to the indeterminacy of listening in geo-located settings. They share a search for ways to organise sound that permit listeners to enter their own resonant subjectivities, where their physical position in relation to loudspeakers determines which parts of the whole they hear at given moments.[13]

While the digitally generated compositions seek to simulate impossible acoustical reality, equally, the acoustic compositions borrow from effects encountered in the digital domain. An instance of the digital informing acoustic composition is looped playback during the composition process whilst cumulative layers are added or shaped in real-time response to the effect of their combination with previously added layers.

The recursive relationship between former and current working methods, studio and instrument, digital workstation and manuscript paper and the forms of mutual influence they effect are discussed in the introduction to Music for Keyboard (p.39).

This research interrogates the boundary of the 'live' and 'virtual': virtual performance that may be encountered differently according to listener action is the common objective for which these essays are preparatory.

Whether via loudspeakers or headphones, in interiors or landscape, the

sought outcome is an extension of simulacra where the impossible becomes plausible, drawing acoustic forms and affects into digital simulation and the affordances of the digital into extensions of apparent acoustical reality: a Hegelian ‘Aufheben’ or ‘sublation’ of dialectical contradictions between the compositions making up this portfolio. [14]

Chapter 1: Virtual Performance

Definitions and methods

I have over the past years refined and tested my concept of "Virtual Performance" into this:

> As performance in effect, although not actually occurring. The digital simulation of music beyond current capabilities, seeming to be played by humans but resulting from instructions to automata. [15]

Clearly, where two words whose varied and independent uses are brought together, no single agreed meaning will result. Definitions have been found to exist in such contradictory variety or partial, qualified agreement that it seemed necessary to originate a definition at the centre of the work described here, rather than adapt extant definitions made for other purposes.

Here is one definition which exemplifies the current breadth of interpretation of "virtual performance":

> a recorded musical performance that is distributed to an audience not present at the time of the recording… distinguished from commercially recorded performances by the level and amount of sophisticated editing [in that it is] recorded in a single take and involves minimal editing, such as trimming silence from the beginning and ending of a performance. Performances recorded specifically for college entrance exams, competition screenings, and job applications all qualify as virtual performances, provided they are not recordings of traditional live performances.[16]

The author seems to consider 'virtual' any representation of an event or object at which the viewer was not originally present, implying equally perhaps that the photographic likeness is not simply a picture but a virtual person under that definition. A disambiguation between the virtual and the recorded is required: the only differentiation appears to be in the lower attention to detail one may expect in the preparation for non-live audition in the former. The virtual performance in this view is, paradoxically, not a simulacrum or enhancement of reality but a low quality, unedited recording of a 'live' event. Constricting further the delimitations of this definition, another condition is imposed, specifying the *type* of event of which a 'virtual performance' is permitted to be no more than a poor quality recording.

The definition of ‘virtual performance’ which I have proposed above arises from a need to differentiate several distinct practices in my work.

On first presenting digitally constructed compositions to concert audiences in 1997, many listeners were disturbed by and resistant to hearing ‘live’, music in which there was absence of interaction or flexibility of output. The fourth of a series (after performance of the first three by harpsichordist)[17] was delivered by sampled harpsichord, computer and monitor on stage, where the audience watched a scrolling score as the keyboard was played by sequencing software.

This disconnection between impassive audience expecting ‘performance’ and inflexible sounds relayed to them via loudspeaker-array - which may as well be, or may simply be, a recording – would lead eventually to these investigations of ‘digital liveness’ and virtual performance, engendering experimentation into structural indeterminacy of the auditory whole, where performer or listener choice create the heard totality.

As a tool for ‘extended instrumentality’, the digital studio facilitates hitherto unavailable combinations of sonorities.[18] Removal of agency in the delivery of these constructs gives the studio-based composer greater control over the output. It places formerly discursive decision-making entirely with the solitary composer. In the absence of other determining opinion in the process, this autonomy’s most notably unexpected result was an emerging equivocation regarding possible final forms that a set of sonic materials may take. [19]

This research has acquired a circularity or reflexiveness in approaches to structural priorities within the composed work that may prove to have been one of its most productive aspects. The composition process becomes one of preparation of interdependent materials whose heard interrelation will be a result of exterior action rather than compositional predeterminacy.

‘Virtual music performance’ concerns both delivery and reception of sound, as though a witnessed act. In listening to a recording which we know to be such, we are aware of the immutability of the sounds and the possibility of

revisiting them for closer scrutiny, like the photograph. Common to all performance is the fluidity and elusiveness of an unrepeatable sequence.

Virtual performance may be transcribable and/or performable although the principal focus of this commentary is on music that while seeming to be played is in fact delivered by automata: while virtual performance is not necessarily beyond the capability of performers, it is studio-composed music that cannot currently be otherwise obtained that is the primary focus of this research.

The boundaries of auditory credibility, illusions of agency or 'liveness' and extended definitions of performance are central questions. In using the digital studio to extend the 'instrumentality' of simulated acoustic performance, hybridised compositional methods emerge, informed by acoustic and digital practice alike. [20] The extensibility of 'instrumentality' is necessarily in dialogic relation to acoustic antecedents: by quotation and reference to precursors, simulation is a response to these.

Within the limited scope of this commentary, the compositions presented are contextualised within these enquiries and regarding their connection to wider practice and theory.

Virtual performance is currently inferred as equating to the 'acousmatic', generally using loudspeakers.[21] It will be argued in "Situational Music" (p.28) that the simulation of reality is undermined by the perceptible artificiality of loudspeaker transmission.

This is one of two principal factors in the need for entirely immersive new means of audition that will be afforded by the motion-controlled, virtual sound spatialisation software 3DBARE. The other is that in headphone-based virtual spatialisation, audition is still of a fixed temporal sequence with the impossibility of redistribution for inspection from different perspectives. It is impossible to differentiate minutiae and in loudspeaker-based delivery, under whatever innovative system, similar limitations prevail.

The acousmatic, as coined by Schaeffer to mark the 'perceptive reality of

sound as such, as distinguished from the modes of its production and transmission' is generally understood as a performance with reduced variables, where the materials are (until relatively recently) pre-composed, pre-performed and pre-produced. In such cases, the engineer's actions in level-mixing and adjustment to channel spatialisation are a shadow-form of the acoustic performer's (who generates sounds from original vibration). Recent research into 'live-acousmatic' performance and composition extends definitions and introduces greater variability, beyond engineering, into areas of sound manipulation and generation, in the case for instance of David Berezan's 2007 'Flux' system which sought, among other objectives,

> "to find a middle ground between the fixedness of acousmatic music, and live/improvised electroacoustic music, using live sound diffusion as a starting point (what I call "LiveAcousmatic" music and what Adrian Moore refers to as a "fracturing" of the acousmatic)." [22]

Berezan quotes Jonty Harrison's assertion that "the diffusion of a work is, possibly, the final stage of the bottom-up process of composition in electroacoustic music" and states that "this research throws new light on, and weight behind, that assertion."

Despite these developments however, 'acousmatic' listening is experientially highly similar to listening to orchestral performance: collective, impassive, often sedentary, regulated by the same social protocols as the audience at the symphony orchestra concert and, most relevant in this discussion, usually heard from a single fixed position.

Proto-virtual performance

The proto-virtual performances presented and commentated here are combinations of digitally manipulated 'live' sources and simulated constructions.[23] They were presented in diverse settings: art gallery, concert hall foyers, landscaped gardens, a city common, as well as a concert hall.

'Live' recording, found audio or MIDI control signals and digital filters have been used, including binaural rendering, equalisation, amplifier and loudspeaker simulation, reverberation delay and echo, compression, pitch

alteration, denoisers, exciters and speech enhancers.

In the piano music, primary stages of virtual performance construction involve ideas 'sketched' both on paper and the DAW. Combinations are recorded as multiple 'takes', then prioritised. The 'virtual performance' is sculpted simultaneous to the development of the music itself: approximate performance data is continually readjusted, combining recorded actions with instructions for their adaptation.[24] 'Humanisation' of the performance, introduces designed irregularities, as well as adaptations into an 'ideal' form of MIDI-recorded piano keyboard playing. Where the composition is quasi-performative (and 'impossible') from inception, the music is frequently developed from these recorded exploratory improvisations.[25]

In the Piano Studies, seemingly 'wrong' imperfections were 'tidied' and others introduced, as the 'performance' seemed to require.

The effectiveness of virtual performance therefore depends on simulating imperfect yet accomplished control, with similar inequalities and variations to those of human performance. Synchronous production of a composition and its performance in the digital studio is a dual process of manipulating sound and creating its accurate and practical graphical representations.

The studio-based composer works under irreplicable acoustical conditions and while their compositional choices must be predicated upon a belief that the sounds heard during composition are a true representation of what the audience will hear, this belief is always to some extent unfounded. Even with identical sound reproduction hardware, ambient noise and space-specific reverberation significantly alter the heard results. [26]

These vagaries strengthen the case for freely rangeable physical space as the ideal situation for headphone-based audition integrating virtual impulse responses: in these simulacra, music may more closely achieve its sought 'liveness'. Effective integration of real-time, listener-activated impulse response simulation to virtual performance will thus be pivotal. [27]

As the essential, although currently missing, element in normative listening,

which would permit exploration of a musical composition as though a physical object, interactivity is explored here through geo-located soundscapes, where composition and its physical location are gamified, laying musical experience before a listener like a 1:1 scale map constructed only in sound.

Maps

In Borges' sardonic fable 'On Exactitude in Science', zealous cartographers build an entirely literal map representation of their empire as a 1:1 ratio, 3-D model:

> The following Generations, who were not so fond of the Study of Cartography as their Forebears had been, saw that that vast Map was Useless, and not without some Pitilessness was it, that they delivered it up to the Inclemencies of Sun and Winters. In the Deserts of the West, still today, there are Tattered Ruins of that Map, inhabited by Animals and Beggars; in all the Land there is no other Relic of the Disciplines of Geography.

The absurdity of this burdensome mythical task is recognised in locative music. Composing locative music for spaces already pregnant with markers (architectural, visual, textual, sonic), interrogates, subverts and reinvent the prescribed 'meanings' of a given situational space.

Locative art is precisely about creating 1:1 maps of places, but it does them in situ and in shorthand, according to subjective agendas seeking to accentuate or diminish its functions and statements of self into other. Locative music is an abstracted form of mapping that superimposes virtuality upon physical space. It resists ready definition but may be represented by one of Deleuze and Guattari's definitions of maps:

> "The map is open, connectable in all its dimensions, and capable of being dismantled; it is reversible, and susceptible to constant modification. It can be torn, reversed, adapted to montages of every kind, taken in hand by an individual, a group or a social formation... Contrary to a tracing, which always returns to the 'same', a map has multiple entrances"

Musical composition whose domain is conventionally limited to the temporal may also be mapped, once it has been spread like Eliot's 'patient, etherised upon a table' across spaces not designated for its incursion, waiting like Dickens' Bastille-incarcerated Dr Manette to be 'recalled to life', but the

form of that mapping must be, as in more conventional cartography, an interpretation rather than a reconstruction of the complete identity of each 'live' or incidentally occurring sound in the situational setting of audition. [28]

Experience of the locative being predicated upon listener-action, the 'maps' given here, of geo-located settings, are partial, indicative translations to the visual of an unreconstitutable auditory experience. Temporal representation cannot indicate the range of eventual permutations. The maps shown here therefore highlight only general and relational characteristics of primary sonic material: their true reconstitution is a matter of 'liveness'.

For clarity therefore, visualisations of frequency and amplitude, sound types and their spatial distribution have been made. While lacking the definition envisaged by Borges' cartographers, it is anticipated that they will be more workable.

Simulation

Simulation of acoustic performance is a three-staged process of

1) production,
2) manipulation,
3) filtering.

Production is the generation of rudimentary playback of a 'score'.

In manipulation, quasi-performative fluctuations are made (tempo, dynamic range, attack, sustain, delay, release).

Filtering situates the sound in virtual space, giving appearance of physical context, without which it must be perceived as artificial, because physical audition is the interpretation of multiple effects of environment and sound-producing objects; it never occurs in 'free field'.

While sampling and physical modelling are now able closely to match the properties of acoustic sources, an obstacle to realism is the plausibility of human agency. Putative performance requires microscopic detail, including

irregularities and idiosyncrasy, mimicking and simulating human action. The processes are described in individual commentaries.

Composition in the digital studio circumvents technical limitations of player and instrument, realistic simulation of acoustic performance being only partially dictated by the physical plausibility of the specific instrumental part. Realistic performance simulation depends on a successful balance between the 'perfection' ('plausibility' rather than 'flawlessness') of digital samples and 'imperfect' fluctuations in note onsets and durations, tempo, attack and release. The efficacy of virtual performance by ensemble therefore depends to a great extent on the differentiation of 'performers', for controlled imperfection whose variances resemble those of ensembles.

Convincing simulation is not predicated solely on an accurate representation of the instrument's use but a combination of instrument and environment characteristics with performance gesture. In exploring these combinations, I have attempted to make virtual music performances which sound as though performed although they would be physically or cognitively impossible.

Although relatively successful when compared with for example the digital replication of bowed strings, the sampled piano nonetheless compares unfavourably with its acoustic analogue, lacking incremental sustain and only very partially replicating its sympathetic cumulative resonances. These limitations or constraints of sampled instruments dictate compositional decisions: effective simulation depends heavily upon compensation for these limitations.

Compensation for sampled instruments' limitations is a significant part of 'playing' them, as hybrids of a recorded physical sound source and digital transformations of them. The simulated piano is at once resonant historic symbol and illusion, which references but differs from the real instrument.

The respective affordances and constraints of mechanical player-pianos and digitally controlled software instrument affect both processes and the resulting music.

On acoustic pianos, including Nancarrow's electro-mechanical Ampico, the strike of a single key creates a complex heterodyning effect of multiple harmonic series, giving it greater timbral complexity than generally available in digital instruments. This was, until recently, unmatched in 'realism' by its digital counterparts. As of November 2014, Roland announced that simulation of this sympathetic resonance is now included in their DG range of digital pianos. I have not yet had the opportunity to work with these instruments and my compositions for (and manipulations of) the digital piano work within the restrictions of discretely sampled notes.

The Ampico however allowed no incremental sustain or una corda, giving simply on or off, as with the MIDI sustain controller. The difficulty of 'programming' (from notated score to punching score then manually making thousands of perforations to a paper roll, corrections made with sticky tape) meant a delay of up to a year between starting composition and hearing the planned work. This is a profound difference from the integral element of continual sound-testing in digital studio-based work, with feedback loops of correction and revision throughout the compositional process, working directly with the sounds resulting from their graphical representation. The dynamic range of Nancarrow's Ampico was also limited to seven fixed increments (as opposed to the 128 in the MIDI protocol) and crescendi were possible only at either fast or slow fixed rates.[29]

However, the rhythmic flexibility of Nancarrow's sound, particularly after removal of the 'quantising' grid on his roll punching machine, between Studies 21 and 22, is still barely achievable with MIDI.[30]

Free field reproduction of sampled soundsets is also problematic, as retrospectively imposed reverberation filtering can have the perceptual effect of a sampled piano heard in an idealised physical space (empty, symmetrical, regular in resonant response). [31] Digital rendition of the physically unviable by a remote 'performer' is thus readily recognised as simulation and challenges of achieving realism or credibility lie in the successful negotiation of these limitations of the tools.

In digitally creating the illusion of performance, its minutiae are emulated to include ‘error’ and imputed idiosyncrasy of the performer: wide chords are spread, with specified delays for each note, apparently unintended key depressions occur, tempi fluctuate, in pursuit of a sound apparently too raw to be unreal, and yet which is. Realistic ‘flaws’ blend with the physiologically impossible, in attempts to generate a credible analogue to human performance, of music which cannot be played.

In digitally generated composition, the work produced is a combination of its imagined and heard forms. But here, the quasi-mediative role of performer is pre-cast: how are we to investigate the full dimensionality of a musical construct if it is still temporally unalterable, like any recording? Combining virtual performance and virtual spatialisation will permit rotation and penetration of the musical construct, to examine it from many more perspectives. This research is made in preparation for listening in this way.

Delivery

Augmented musical reality is simulated; apparently acoustic instruments are transformed. The percussive piano, without possibility of alteration to sustained notes may, when simulation, be pitch-bent, have its attack removed or envelope transformed during sustain and decay in ways that no longer bear resemblance to its acoustic source. The human voice may be made to ‘say’ or ‘sing’ things it did or could not.[32]

The goal of this research is to work towards virtual performance in which multiple auditions to fixed content are possible from variant perspectives, permitting repeatedly different experiences of a whole which under close examination can conceal its hybrid human-digital origins. Listening in this way however, in exploration of a music’s parts over both time and extended physical space does risk revealing the ‘non-blended’ as a construct. The smallest details of the composition’s performance are therefore pivotal to ensure the illusion of agency is credible and expressive. [33] [34]

Distillation

The compositions in this portfolio are developmental studies in pursuit of understanding of aspects of agent-dependent audition, specifically in virtual performance.

The 1st, 3rd and 5th Piano Studies and Caedmon's Hymn attempt realistic simulation of human performance.

The 2nd and 4th Piano Studies, as two proposed compositional outcomes of primary material, examine the possibility of multiple forms for a single 'composition' which nonetheless retains such characteristics as appear to be integral to the intended heard experience. [35]

Take Me By The Hand and, to a greater extent, *Credo*, take voice recordings and extend the voices' capabilities. In the former, realism is integrally important, playing, as the piece does in both acousmatic and geo-located forms, with the blurring of boundaries between real and artificial. In *Credo*, this reaches a range that is palpably manipulated to create timbres and pitches of which the unassisted human voice is incapable. In both cases, the textures of the multiple tracks (in acousmatic form) are dense to the point that, for perceptual isolation to elucidate the simultaneous strands and micro-combinations occurring, only the 'non-blending' of virtually spatialised distinct parts will make this possible. [36]

The compositional intent of creating textures denser than can be heard with clarity through existing means - whether live performance, loudspeaker-array or multi-channel binaural mix relayed via headphones – also underlies the production of "*Dreaming at the Circular Ruins*", parts 1 and 3 . [37]

With the virtual spatialisation of simulated ensemble performance, it is possible to overcome the limitations of recording – each audition to a through-composed piece of music becomes transparent and unique, newly revealing and unrepeatable: a paradoxical result of emerging affordances of technology that music is being returned to a condition similar to that before the inception of mechanical reproduction. [38]

In this setting, combinations of multiple fixed digital audio outputs constituting the whole serve not as the musical work itself but as a basis for the listener to construct a heard experience from active exploration of these constituents, combining them while listening, according to personal choice.

The concept of the musical composition as a tangible and identifiable entity gives way to one where the listener's actions and subjective choices reconstitute the offered components into the experienced composition. It is replaced by forms that are neither predictable nor describable as a whole but only in the form of its parts and their spatial distribution.

The musical composition as currently recognised thus dissolves, becoming a dialogical engagement between the listener and the partially experienced whole. The process of composition design is altered from one of a totality to a curated collection of possible permutations. The heard composition is compiled, composited, even composed by the listener themselves. [39]

Situational music

Locative music and soundwalks

Drew Hemment [40] points to the possibility raised by Chang and Goodman ("Asphalt Games: Enacting Place through Locative Media,") that a location is not only a place onto which to project a work, but can also become a medium itself. *Asphalt Games*, inspired by the Situationists' dérive and détournement and later psychogeographic experiments in algorithmic walks is described as

> a location-based game in which players vie for territory on an online map of New York City by playing their own, modern day "street games" on real-world street corners.... intended to encourage "ordinary" New Yorkers to imagine, perform, document and share physical responses to an increasingly regulated and surveilled public sphere. [W]e hoped to change the way both active players and the physical and online onlookers understood public spaces...[41]

Locative Media in this context constitutes an attempt to frustrate or resist a place's 'everyday' functions, by exploring connections among the spaces

that fill it. *Asphalt Games* sought at once to connect users with the space of interaction and to imbue it with other imperceptible psychological resonances. Chang and Goodman argue that “public play makes alternatives to the norm of efficiency visible”. [42]

Locative (geo-located) or, more broadly, Situational music, can therefore be seen as the spatial arrangement of composed sound in a space whose designated function is not the audition of music. Listening is both collective and individuated and may be partially or entirely ‘live’.

Locative music allows the composer to explore the psychogeography of a location, responding to how people may feel, perceive or act there. In these compositions I have sought to make unconscious responses more reflective and interrogative, like the Badaud on his Détournement, allowing fixation with objects along a route to distract from prescribed trajectories, deferring or redefining perceived designations of the place. [43] [44] [45]

The controlled indeterminacy of the whole is an essential element of geo-located ‘performance’, requiring listeners to question their assumptions about musical form in several ways.

Temporal structure is no longer fixed but variable as listeners pass different routes, spending differing durations inside the composed sound. Linear narratives are disrupted through placement of designedly conflictual sounds on top of or alongside each other. Distinctions are blurred between designed sounds and those occurring incidentally at the site.

Sounds designed and presented in this form subvert conventional concepts of a ‘work’: listener agency in creating their heard music also permits transcendence of the designated function of the space. There are links here too, to Chtcheglov's formulary, where dreamlike associations create the meaning of a space, rather than its reductive, forceful impelling to consumerism and productivity. [46]

Marc Tuters’ contextualisation of location-based art projects demonstrates a preoccupation common to many practitioners, arguing that a sentiment

similar to the Situationists' proposal of "play as a means to disrupt" pervaded the discourse among members of the Locative Media Lab,

> "...many of whom came from the community of open source software developers in response to the closed eco-systems at the time of mobile phones and corporate visions of ubiquitous computing.
> So, like the Situationists, the Locative Media Lab were mostly talk but the talk turned out to be timely, helping give name to a community of practice within media arts discourse. A philosophy of emancipation, the Situationists developed tactics for counteracting the spectacle of consumer society based on notions of play. [47]

This commentary and portfolio are the documentation by case-study of a search for compositional methods and forms that will permit such user exploration. The discovery of locative media and an available tool for composing landscape-based music were unexpected tangents in my intended path from loudspeaker-based acousmatics to headphone-based virtual immersion.

The pertinence and richness in new possibilities of this tangent will be explored in the detailed sections on individual locative compositions. It gave rise to practical enquiries into controlled indeterminacy from the surprising perspective of the locative.

Locative music at once connects listeners with the space of audition and imbues the space with psychological resonances that would otherwise not be perceived. It enters them more fully into the experience of a locus while detaching them from its designated, non-musical functions. This essential contradiction of the medium and its parallels in gamifying the boundaries of reality and virtuality, gave rise to the creative fascination it held for me.

It commonly uses the global positioning system (GPS) to control the audio output of a listening device according to the listener's location, where sounds are attached to specific GPS coordinates.

Situational music may involve geo-location via GPS or may be broader in its conception, including acoustic or electroacoustic performance and/or acousmatic relay of sounds. Situational music is often presented at sites

which are not conventionally designated for music performance.

In the works discussed here, studio-composed acousmatic music was adapted, deconstructed and rebuilt for headphone-based audition in specific settings, combined with sounds captured in situ and interpretatively transformed, before the whole was compiled and attached to the landscape.

The overlaying of congruous and incongruous ambient sound (rus in urbis, etc.) with the deconstructed composition so as to blur perceptual distinction between (1) music, (2) sonic reinterpretation of locus and (3) live sounds of the locus itself, merge the composition into the landscape as integral to experiencing the place and 'un-blend' both the composition and the place itself, separating them into unitary elements that may be distinguished and encountered with new clarity.

Musical time across physical space

Sound's development over time presents the most permanent, evolving questions about the composition of music. It is understood that music exists only in time, in waiting or remembering rather than extended, present sensual interaction such as with an image or sculpture.

Using generated and/or manipulated sound to augment the auditory realities of a space permits a two-way process to occur. The listener is permitted to investigate music as though a physical structure. Additionally, music presented in non-designated listening spaces invites new interactions with the setting itself and with the sounds' relation to it.

The situation elucidates, expands and variegates reception of fixed, digital music and the music responds to its situational setting. Music in an unusual setting takes on a connection with the place of audition and is informed and infiltrated by its own 'aurality'.[48] Interactive experience of sound offers new perceptual links within music and between it and its place of audition.

The digital studio's capacity to enable composition of more complex or dense music than can be comprehended in a conventional settings gives rise

to challenges: how to permit free-ranging audition of dense textures and linear interrelations previously impossible to differentiate, to allow listeners to investigate its parts at will, different on each audition.

Rather than fixed or moving sources relayed to a sedentary audience, arguably heightening rather than diminishing the sense of artifice and ritualised presentation of a 'work', interactive sound spatialisation distances heard music from narratives of the 'work' as a fixed or tangible object and repositions the focus of listening in a place itself, its designed and incidental sounds becoming a part of the auditory experience.

Historic innovations such as the design of San Marco, Venice allowed music to be performed from several positions at once and the design of music spaces gives consideration to some aspects of the psychology of listening. Live sound-processing, with spatialisation adding physical dimensionality, can elucidate complex sonic textures. Yet the potential of fully immersive virtuality to transcend the notion of a fixed form temporal sequence remains largely unexplored, beyond the domain of online gaming.

The presentation of music via speaker array and live processing lacks the multi-dimensionality and unpredictability of human performance as well as the sensory scope of observed physical experience. A persistent limitation is the largely impassive reception of an audience who are no longer observing the actions of a musician. Increased realism enriches the simulation of 'impossible' performance, and digital transformations give generated or collected sounds new life, yet our modes of listening to such work remain equivalent to the impassivity of the television viewer.

Interactive listening, in contrast to our accustomed single shared temporal experience asks us to actively discover the music's constituent parts and assemble these ourselves into a unique and unrepeatable whole.[49]

In using space to spread the constituents of a composition out before the listener 'like a patient, etherised upon a table'[50] (Eliot's image of a city unconscious to itself, to be explored without the hindrance of its daytime commotion), multiple alternate realisations of the material may engender a

kind of liveness in reception of the digital which was hitherto unrealised.

Compositions for acousmatic and geo-located listening have been revealing preparatory stages towards this objective of fully immersive and interactive virtuality, currently a self-funded development project.[51] These experiments and lessons in the affective results of differing configurations are described in the individual composition sections.

Merging music with the space in which it is heard results in the composed work existing now in and through its relation both to the place in which it is heard and to the listener according to their investigatory movement. The composition resembles under these conditions a massive pointillist painting laid across a landscape, where listeners cover ground, forming combinations of parts, a series of snapshots, to construct an unrepeatable, individuated conception of the sonic whole.

A persistent compositional fascination which has in part led to these enquiries has been with the warping and compression that occurs in transmission from composer to listener: during construction the music is fragments, solitary lines, rhythmic pulses and amorphous half-glimpsed sonic objects which composition seeks to constitute into solid forms. Over time and repetition, false starts and returns, the material is sculpted into final form where the heard work is the last layer in the composition's development. The composer's experience of the music is evolving, granular, immersive, prolonged and magnified.

The listener, by contrast, may hear the music only once, in a formalised presentation of the polished object, as though its construction and presentation were irrefutable inevitabilities, rather than the latest stage in a complex organic process of development where myriad possibilities led to a single chosen permutation.

Geo-location offers some limited access to the interior of the whole. It permits listeners individually to determine the combinations that occur over time, the music heard according to their movement and orientation, combining once-heard fragments with perpetually looped lines or blocks of

sound. The music now may change on each consecutive hearing, its temporal permutations multiplied.

Compositional processes are necessarily challenged in combining and relinquishing material amenable to such ungoverned reconstruction. The music must be constructed to allow for such horizontal compatibilities as may be demanded by a particular listener route, in addition to the impossible number of temporal sequences that this can result in.

Under such individual scrutiny, parts which simulate human agency (and might be undetectable under the cover of other textures) must still be credible: listener differentiation of the 'virtual' from the 'real' develops apace with technology that seeks to achieve ever more powerful illusions.

Interplay between composer and listener

Spatialised interactivity is a way of reconciling the distance between a lived experience of composing, prolonged immersion in combinatorial explorations of developing ideas, and the brief singularity of a listener's exposure to it. With multiple simultaneous perspectives on the relations between parts, the indeterminacies arising are comparable to the different experience of two listeners moving around the stage during a symphony concert. [52]

In the virtual, simulating elements like physical occlusions, reverberation, extraneous or exterior sound, gives further augmentation of the simulated performance which are impossible in a purely physical setting. Thus these elements become defining aspects of the heard experience, in ways that Russolo's proposal for proto-soundwalks or the incidental ambient sounds of the Cage 4'33" experiment could only begin to suggest. [53]

In geo-located music, indeterminacy is a dominant characteristic. Not only are combinations of sounds activated by a listener, but its incidental ambient noises are beyond control. Thus the composer creates a setting, provides prepared materials, arranged as discrete, related artefacts in a

space and must relinquish further control over the output.

A listener will encounter in their investigation a series of intersections whose parts and spatial positioning were intended, but temporal relations between these adjacent, independent audios will be created 'live' by their movement. With no guide but the topography and their hearing, they compile the music according to sequential momentary choices. The arising sequence is collaboratively achieved, a unique admixture of composer's materials and the listener's exploration of them.

Towards post-locative composition

Music's transformation via mechanical, electronic and digital reproduction from an occasional, communal experience to an often continuous, solitary one, from which rituals and sociality of collective listening are absent, creates a need for new forms that can re-collectivise its experience.[54]

Spatialised, headphone-broadcast, performance is both collective and solitary; socialised yet individuated. Listeners simultaneously hear different parts of the whole, parts of the same combined sonic entity, but from a unique and partial perspective. [55]

Collective differentiated listening is thus at once both shared exposure to the sound work and a private experiential phenomenon. Listening in such a manner becomes closer to going with others to a visual art exhibition than to a concert: examining a collection of artefacts from several perspectives. It presents digital artefacts of fixed and finite totality in infinite permutations that depend upon listener action to determine their heard outcome over both time and space.

Geo-located music has a conceptual lineage from badauds and flâneurs through dérives and détournements (see [43],[44],[45]) linking it with Chtcheglov's 1953 "Formulaire pour un urbanisme nouveau" and Debord's 1967 'Society of the Spectacle' to the emergence of Locative from around 2004. [56] [57]

"noTours" software, the only open source locative platform (therefore readily available to experiment) my research has uncovered, is de facto site-specific because it is designed with the object of elucidating the interaction of a place's sounds with its physical, psycho-geographic qualities.[58]

This necessity of linkage between specific situational conditions and the sound work presented there, where the site and its properties alter the artifice virtually constructed there, informs the types and combinations of material that may be thus explored.

These investigations therefore, while revelatory of certain uses of space to the development of a principal aspect of 'digital liveness' – controlled indeterminacy – remain ultimately tangential to the formative, underlying goal of this research: the discovery of adequate means of creating true virtual performance of 'impossible music'.

The term 'post-locative' differentiates this underlying goal from 'locative', where the

> "core concept of locativity, that of proximity, is redefined in terms of tracing the connections of networked objects….and [giving] voice to multiple nonhuman ontologies."[59]

'Post-locative' resituates this research as preparatory to accomplishment of a means of creating

(1) simulacra of performance actually occurring at the site of audition,
(2) where impossible sounds in a virtual space are plausibly real,
(3) in non-designated physical listening spaces.

The post-locative situates virtual music audition in physical space and transcends the blurring of artifice and reality inherent to site-specific locative soundwalks, creating an entirely illusory experience of performance – which could not otherwise be thus heard – as though occurring in those physical environs.

The virtual and its use in augmenting a sense of place are intimately connected. [60] There is a phenomenological emphasis on the "primacy of practical engagement over abstract cognition": these new affordances for

investigation of a musical composition's parts place it under a new form of scrutiny. [61] This permits the listener to investigate in a way that concert-hall based reception cannot comprehend and demands more active, exploratory engagement. Removed as it is from fixed temporal structure, physically located immersive music is differentiated from its row-seated, recital-based analogue. The listener moves, halting or hastening, returning, reversing, to reconstitute the parts presented into a whole of their own making.

Compositional concerns and processes of the locative are not those of the post-locative. In the former, the composer seeks balances between pre-determination of material, its virtual distribution in landscape and delivery as a collection of sound objects freely navigated.

The post-locative project is a matter of using digital technology in conjunction with designed, appropriate physical space for virtual music performance of kinds which for one or more of the reasons previously outlined would be impossible to achieve through other means.

The locative experimentation was an unexpected and somewhat tangential enquiry during the pursuit of a controlled process for delivering complex simulations of acoustic composition which nonetheless has led both to the suggestion of vast new unknown territories of musical cognition residing in the possibilities of controlled indeterminacy.

Despite widespread artistic use in the years since the public release of GPS technology, there is no general sense of 'locative' emerging as new normative practice. It is thus an area of compositional research for which precedents are few and paradigms remain to be established. Given the relative paucity of activity or debate in this area, socio-psychological aspects of these newer forms of ubiquitous or pervasive listening are yet to be understood in depth. [62] Indeed, while environmental psychology identifies profound affective links between surroundings and cognition, behaviour and emotions; scant research has yet been conducted to determine auditory experience's effects upon cognition, perception and interpretation of place. [63]

Boundaries of the public and private space have been blurred and confused by ubiquitous digital technology. This radical transformation of the focus of interior and, latterly, exterior environments, is exemplified in the shift from hearth to screen: the inward and communal changed to a mutated, insular reconceptualised 'outward' in aspect.[64] This now dominates public spaces too, with large video screens in city squares and underground stations. [65]

As a result, our interaction with art and specifically, music, has been re-positioned: psychological connection to or detachment from 'proximal environments' has been radically altered by the growing ubiquity of digital communication.[66] Endeavours artistic and social have emerged in response to the detaching effects of pervasive information, seeking to inspire social and environmental reengagement.

While research has explored uses of space in acousmatic listening, this has not yet been the case with virtually spatialised, immersive experience of through-composed music: controlled indeterminacy.

The following chapters outline compositional research in preparation for the eventual use of such settings for the virtual performance of studio-composed music.

Chapter 2: Music for Keyboard

(Player-)Piano Studies, 2011-12:

These Studies were initially named "Music for Keyboard (2011)", following two previous collections (1997, 1999), then tentatively "Memory Games", after their principal preoccupation, the dialogues in composing and listening between long term, exterior musical memory and interior, short term recall and reference within a composition or heard performance.

The 1st, 3rd and 5th grew from studio-based attempts at sounds and temporal construction whose delivery seemed beyond the means of a pianist but remained within range of the plausible at the instrument.

They examine, via digital recording and editing, the instrument as a voice or sounding object rather than a tool with known physical affordances and constraints under usual performative practices.

There are two purposes in this: to test auditory credibility in the simulation of live performance and to extend techniques which I have deployed over two decades, combining transcription of recorded improvisations on thematic material with more or less formal structures. These structures emerge from processes both of pre-calculation and responsive adaptation.

Composing *Study No. 1* was a development of these practices, exploring the extents and resultant transformative processes occurring in transcription.

Before access to digital technology, I studied recordings by repetition and mimicry at the piano and violin, learning fragments and solos, for example, of Coleman Hawkins, Art Tatum, Django Reinhardt and McCoy Tyner. I learnt in street bands to play unknown music by ear, usually at the moment of 'performance'. In Indonesia, I attempted to transcribe heard music in real time, despite the inadequacy of my Western training and notational system to the task. Absorbing harmonic and rhythmic styles and techniques, while composing music that bore stronger links to Romantic traditions than later practice, the assimilation and integration of these influences into a single voice then seemed essential to the development of a 'coherent' language.

The sense of a conflict requiring resolution between diverse sources was characteristic of a fundamentally Romantic view of composition as a rhetorical, declamatory process. I continued seeking a vocabulary, hybrid in origins, but unified by certain persistent characteristics obtained from these 'foreign' elements. In eventually discarding these intrinsically limiting concerns I began to discover that absorption into a hybrid language, synthesising its sources, was incidental rather than a governing principle.

Early transcription of heard, imitated rhythms being impossible 'manually' to correlate directly to source rhythms, the digital studio's transcription tools at last made this truly possible. A process that had occupied drawn out months of repetitive listening to tape-recorded piano improvisations of rhythms I could not write without first hearing, in my *Piano Sonata (1994)*, was reduced to days – composition, while mediated, was made more possible by the possibilities of the newer tools.

An essential element in my compositional process, now as then, is transcribing from recordings, interconnected with ideas originating in the page, or now more usually the screen. [67]

Beginning these studies in 2011, a decade after previously composing for 'virtual piano', involved picking up threads of memory persisting from these previous compositions. The early intention to identify them in their title principally with 'memory', personal and collective, was superseded as other, newer considerations came to the fore.

The *Piano Studies* are an exploration of aural reading of temporal structures, music having no physical trace other than the score. Listeners perceive change or continuity over time, without possibility during a particular audition of returning to a previous point or examining two moments simultaneously.

Listening experience involves compositing recognition and memory, comparing and juxtaposing what was heard before with what is currently heard. As sounds vanish, their repetition and transformation in stages that can be compared through auditory memory are essential to the listener's

responsive construction of the work. The composer aims to convey senses of departure, return, migration, the satisfaction or denial of expectations.

The reason for stating these commonplaces of musical listening is that in geolocating musical composition, by contrast, anticipated patterns of listening are subverted in their requirement of listener intervention in order to construct the heard totality.

Questions of how duration is used to create imagined shape, colour and texture are the corollary of how music spread across space under listener-activated conditions must relate to and develop from the former fixed, temporal sequence.

So these essays in virtual piano performance constitute a necessary counterpart, both in their dealings with the representation of a fictional reality, the simulated performance, and their use solely of time, to the spatialised works in the later parts of this commentary and portfolio.

In presenting the 2nd and 4th Studies both as scores and as materials for the (re-)construction of the music, the essential identity of the 'work' is interrogated, as in the case of presenting fragments across a physical space that must be (re-)constituted into a listener-activated whole.

Several concepts of memory were dominant in composing these pieces and the "Memory Games" title initially seemed a useful pointer to this aspect of my approach to the material. In composing, one attempts to recall detail from imagined sounds, from ideas in dreams or a dream-like state: the consequent impossibility of doing this, of exactly identifying (let alone recreating) the initial sonic impulses to develop an idea into its presented form, is a central motivation for relinquishing the concept of the completed or identifiable composed music as a single particularity.

Composing is a process of encapsulating and summarising memory: linking one's perception of a growing musical entity, the developing composition, in all the minute, repetitive, lingering detail of the compositional experience to the intended experience of the listener.

The listener hears the musical whole not repetitively and cumulatively (as does the composer) but over a single period of time, attempting to make relational links through short and long term memory, between parts of the music heard and other musics, for comparisons and contrast to obtain meaning and emotion within the sounds.

This is also tied to other forms of memory the composer engages with: the unknowable pool of all other music, performed, recorded, imagined and described, of which their experience is a fragment. Connection to previous musical work, perhaps more than any other influence, informs ostensibly conscious gestures of acousmatic and notated composition alike. Direct reference (quotation, parody, imitation) and indirect reference occur consciously and otherwise. Inter-medial reference is inevitable as there is no direct analogue to a medium's particular modes of signification.

Questions of how time is represented, ridden or distorted are historically music's central focus. It has been understood that music exists more in time than space, in waiting or remembering than in present interaction such as may be had with an image or sculpture.

These piano compositions are therefore essays in the flexibility of structure to convey sound objects in relation to each other as shapes and textures, removed from fixed sequence of delivery to permit the intervention of listener subjectivity into their reconstruction.

They form an exhibit in the case for music from which the passage of designated, specified time - to engender relational patterns with quasi-rhetorical intent - is removed, to permit sound unencumbered by association with rhetorical gesture and its concomitant semiotic uncertainty.

It is hoped that through the separation of sound from temporal fixity, the sense of putative compositional intentions to be fundamentally connected to other forms of communication may be departed from, releasing it from the persistent and impossible burden of correlation to systems of signification. This point is developed and contextualised under the sub-heading "*Take Me By The Hand* – Geo-located setting" in Chapter 4.

Temporal determinacy

In considering timelines and the role of recall, remembrance or the search for full form of partially reconstituted former experience, we may consider the possibility that a musical object does not necessarily evolve over time.

Is it possible entirely to remove organised or designated time from the musical work? For all pitches, timbral characters and separation throughout a physical space to be simultaneously heard: a single 'sound word' such that deviation or development would be obscuring rather than revealing?

The monodic line's development to polyphonic texture and the musical climax are species of sonic narrative in which conditioned associations of listeners presuppose a quasi-linguistic exposition of ideas whose correlative is founded in the same ancient urges whence mythic, religious and metaphorical representations of existence and experience emerge.

In the visual and plastic arts, in the design of buildings and their interiors, of objects functional or decorative, form may equate to the sum of the work's content. In this aspect, the ascendancy of abstraction over representation gives rise to possibilities previously unthinkable, given their impossibility of assuming a parallel counterpart to verbal expression, wherein may be considered in isolation the phenomena of sound as things of wonder and fascination in and of themselves.

If, with the removal of temporal development or change, it is possible to remove from the work its association with 'expression', forms are permitted to emerge offering the listener possibilities to transcend communication altogether. In this way, the musical artifice speaks, if it speaks at all (for why should it, having no words?), solely of what it is, rather than a pale mirror to other forms.

Since all events must have duration of some perceptible value for there to be agreement that they occurred at all and arguably a somewhat greater durational value than merely the perceptible, for the senses to receive, process, respond to, remember the occurrence, is the negotiation of change over time unavoidable? The slightest sonic pinprick may be described by

fluctuating horizontal lines, showing sequential variations in frequency and amplitude from attack through decay, sustain and release. Even notes produced by plucked string or struck bottle, momentary as they appear, have duration, albeit so short that brevity is a defining characteristic.

However briefly, each sound perceived has duration. With the changes that occur during that time it may be said that rhythm originates or is suggested. It is equally possible for time to be used as a tool for the evocation or enactment of stasis, in counter-developmental resistance. Change within repeating patterns is to be found in the mechanical, electrical and digital environment as much as the natural.

Working in the late 1990s in a cemetery office, a diversion from my duties' macabre mundaneness was sitting in the vast, porcelain-lined lavatory, listening to an endlessly shifting though fundamentally unchanging balance of two echoing water drips, never simultaneous, flowing like parallel microcosmic waterways reduced to sequent enumerations of their minutest parts, like a coastline falling through a miniature hourglass.

An earlier comparable experience was the chance discovery of an entrancing sound kaleidoscope resulting from collective, simultaneous mass action and response. I sat close to the centre of the Arc de Triomphe in Paris, the inside floor plan of which is a large symmetric cross the size of a small church and with similar acoustical properties but for the missing four end walls, arched ears to the acoustical convulsions of the city, an enormous resonant stone head drawing from all sides snapshots so fleeting and frequent as to form a continuous flow of impressions so dense as to be opaque, so numerous as to constitute the river itself, where only the fluctuations of the whole can be quantified, so infinitely numerous, small and diverse are its elemental constituents.

This was the centre of L'Étoile, the monumental star-shaped intersection of six of the city's largest thoroughfares, where six lanes of traffic perpetually rotate and compete; wheels on tarmac, revving engines, coughing exhausts, squealing brakes and above all, a mechanical mayhem of klaxons, warning,

despairing, cajoling, threatening, pleading, celebrating, echoing.

Surprisingly, these horns were mostly mutually diatonically tuned. The only explanation I could make was the possibility that most cars were manufactured by the three largest French firms and therefore the klaxons' slight variation from unity was based on most vehicles likely being one of three makes, with klaxon pitch depending on vehicle size.

It appeared at times that random reiteration of small diatonic clusters was being permutated ad infinitum, like a computer calculating all combinations of a vast security code. At others, as the auditory river's flow remained unabated, effectively unaltered - if it were possible to attune focus to given pitches or rhythmic imitations, through the unending alteration and rotation of microscopic detail within - there was above all a character of constancy, of unification, whose effect stayed the very passage of time.

All perception of time passing or changing was removed during these meditations which, in recalling the experience, appears to repeat endlessly like looped time-lapse photography or a sort of acoustical strobe.

Therefore, given the fascination of these and other phenomena, what appeared like the sudden realisation of a new concept (new to me at least) emerged, like all others, from a combination of reflection over an extended period and the search for alternative solutions to questions of time addressed particularly in music of recent decades.

Perhaps the best known of these is John Cage's conceptual composition for organ, "As slow as possible", performance of which began in 2001 and will run for 639 years. Arguably the performance did not begin until February 2003 due to a seventeen month rest with which the current rendition began but this is a matter for separate enquiry.

Method and shape

The Piano Studies combine manually notated scores with edited (initially automatic) transcriptions of digital simulations of performance, emerging from investigations of how transcription, 'spontaneous' or 'improvised' and

'planned' or 'composed' development of musical ideas and live performance inform each other and overlap in continually recursive action.[68] The Piano Studies exploit the problematisation by digital mediation of these terms and explore their boundaries.

Even-numbered Studies are for performance by soloist, odd-numbered by 'virtual', automated delivery, in simulation of human agency. The 1st, 3rd and 5th were studio-composed and the virtual performance of the music was developed simultaneously with the composition of the music itself, followed retrospectively by visual transformation into a performer-usable notated form. In these, music simulates rehearsed performance of a fully scored work, in fact generated from combinations of (onscreen) notation and post-recording manipulation of recorded keyboard playing, via MIDI input.

The 2nd and 4th studies are screen-input transcriptions of simulated 'improvisations' upon identical material, first developed in manuscript, at the piano. The scores were rhythmically rationalised and simplified for live performance.

Two versions of each score were created: one demonstrates tempo and velocity fluctuations as prescribed for virtual performance, the other permits free interpretation of durational and dynamic values. These are listed in the Portfolio of Compositions: Table of Contents.

The material's simplicity and duplication between the two studies formed a desired contrast to the other, alternating studies, and duplication between the 2nd and 4th studies forms a bridge between the odd-numbered ones, interlocking the alternated mechanical and human delivery as connected and mutually reflective elements of the whole series.

It also provides an inversion of the perceptual conceit, developed in the odd-numbered studies, of improvised explorations manipulated into semblance of polished performance beyond the physical capability of the composer: the spacious and largely unspecified scoring of the 2nd and 4th studies (in contrast to the detailed automated instructions to digital performer) allow these two studies to be heard as though 'improvised' or spontaneously,

experimentally delivered, despite being a ‘formal’ performance.

The series investigates the intersection between improvisation, composition and performance, between the elements deemed by composer, performer and listener respectively to be ‘constitutive’ or ‘contingent’ elements of the composed, performed or heard music. Lydia Goehr’s description of Nelson Goodman’s theory of the relationship between these composed and ‘interpreted’ elements and how certain conditions must be met before a notated score becomes ‘adequate’ demonstrates the post-digital fluidity of these definitions: these compositions disruptively investigate them.[69] [70]

They question what constitutes ‘adequate’ notation and blur the answers by the material they expound. This musical material is inherently problematic for such questions in that the Studies are themselves constituted of literally irretrievable embellishment of simple cells into ornamented, variegated, ambivalent developments of themselves.

Here, there is no separation of composition from performance. They are simultaneously conceived and performance-designed in a virtual environment, as if being repetitively rehearsed in the physical domain.

The studies examine the piano as performance tool and disembodied voice, using digital recording and editing to test auditory credibility in live performance simulation and extending techniques to combine transcription of recordings with flexible temporal structures.

Dreaming at the Circular Ruins

I had been creating digital player piano studies for some years before discovering the player-piano compositions of Conlon Nancarrow. The digital studio, limited as it was in the mid-90s, permitted rudimentary simulacra of impossible human performance. This was a use of the studio - not to follow Varèse in creating new alphabets, instruments or mediums but - for music which sounded played but was in reality impossible, extending the putative boundaries of (quasi-) acoustic performance rather than the discovery of new synthetic timbres and modes of organising sound.[71] It was a continuation of a hybrid language responding equally to live and recorded jazz and other improvised forms as well as notated European music to create otherwise unrealisable "performances" that seek to appear to be actually occurring. The source of this fascination was the new and previously inaccessible extensibility of instruments into realms beyond the speed of a performer's recognition/translation of ideas.

"*Dreaming at the Circular Ruins*" was a continuation of these compositional concerns, composed in response to a Call for Works by the Impossible Brilliance Festival, celebrating the centenary of Nancarrow. I sought to contribute because of the affiliation between the older composer's experiments with time and my own, particularly in Suite for Four Inhuman Hands (1996), my first large scale simulation, which used a generalised sampled piano sound, from a Yamaha pf-85 digital piano controlled by a 486 pc running Cakewalk 3.1 DAW software.[72]

On starting to compose Dreaming at the Circular Ruins 1, I initially worked with a range-lengthened Bösendorfer EXS24 sample set in Logic Pro 9 DAW software, with a short reverb (a 1.3 second, 40% wet signal) and static binaural placement of each of the twelve identical instruments in a pair of horizontal rings to permit distinction between parts.

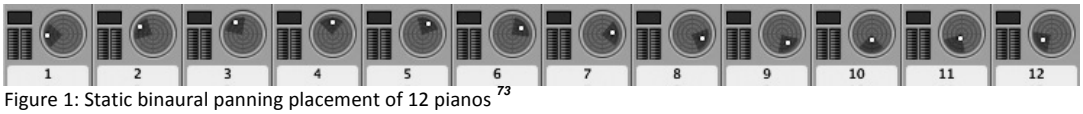


Figure 1: Static binaural panning placement of 12 pianos [73]

Composition was a combination of piano-keyboard entry and onscreen

editing, building parts across the auditory field from left to right with hemispherical binaural panning such that, as the 'outer' tracks (low and high numbered) were joined by 'inner' ones, the sound mass added layers in 30 degree increments of rotation across the auditory field. The panning effect is not of motion but of additional versions of an instrument spread in both angle and elevation around the listener.

Tracks were not pitch-prescribed but in general each one covered a limited range, so pitch was also spread across the auditory field from the high register track 1, in combination with low register track 12, followed by cumulative addition to bar 20 (0' 34") where 7 piano tracks are simultaneously heard. Only for 3 bars do all 12 pianos first sound, from bar 30 (0' 52"). From bars 33 to 61 again only 6 then 7 piano tracks are simultaneously sounding until from bars 62 to 76 the final accumulation from 8 to all 12 instrumental tracks is made.

Although aware of Tallis' restraint in his sparing deployment of all 40 voices in "Spem in Alium", in this composition the temptation to prolong use of all available capacity proved to engender a defining feature of the sound, serendipitously apposite to a 'homage' to Nancarrow, who it is imagined may have experimented with the outcome of using maximum capacity of this technology had it been available to him.[74]

Spread (in acousmatic presentation) across 12 mono channels, this first section contains 13, 509 notes in 3' 54", averaging over 57 notes per second (sequentially and simultaneously). The perceptual result of course is a blurring into bands of activity rather than recognition of discrete events.

Patterns emerge, of the simplest perceivable figures, which were not the result of conscious pattern formation but of their incidental correlation across tracks.

This perceptual result is an artefact of listening in stereo that, while unintentional, is illustrative at the most basic level of the affordances of differentiated relay equipment for the 'conducting' and 'arrangement' of 'adequate' modes of 'performance'.

Dreaming at the Circular Ruins was at once a compositional response to a specific set of situational requirements and an experiment in the creation of structures which may survive multiple translations, through varied loudspeaker-array broadcast and, imminently, via 3DBARE, for listener-activated differentiation of Varèsian 'beams' and 'planes'. [75]

In contrast to the arrangement when first heard, in a large concrete foyer on 12 Genelec studio monitors in a row,



Figure 2: *Dreaming at the Circular Ruins (1)*, QEH Front Room

the following configuration was the one for which the music was conceived, in which it is yet to be heard, where virtually spatialised instruments are audible only within a prescribed radius of a given physical point in a space, their perceived distance and direction of source calibrated according to listener position and orientation (in the software under development, 3DBARE):

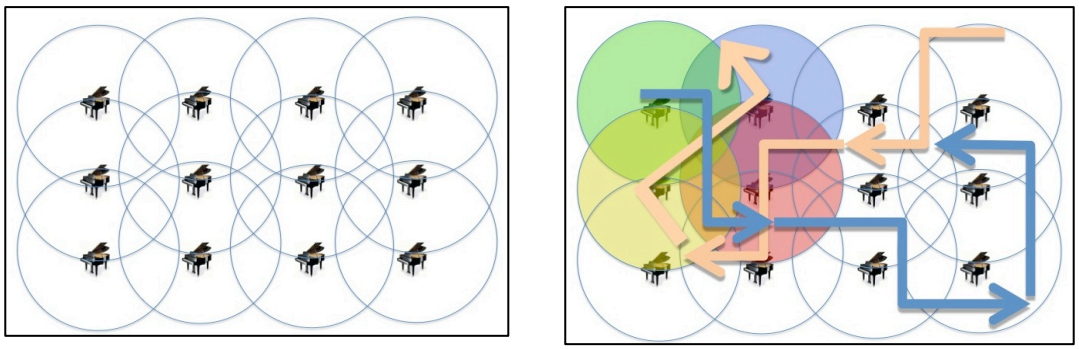


Figure 3: Envisaged relay of *Dreaming at the Circular Ruins*, virtual spatialisation to headphones via tracking

In Figure 3, twelve virtually spatialised pianos are audible only within the

circumferences described around them. A headset-wearing listener moves according to chose routes over different durations and inspects the parts simultaneously occurring, facilitating a 'non-blending' such that the entirety may be revisited for multiple differentiated auditions, each unrepeatable.

The first iterations of Dreaming at the Circular Ruins were entirely driven by the sound of the 'instrument' for which they were composed. On discovery that Gerhard Trimpin (commonly known as 'Trimpin') had uploaded, (to a private location) for use by the invited composers, samples he had recorded of Nancarrow's Ampico, I downloaded and installed these as a new EXS24 software instrument. This, Nancarrow's randomly detuned, experimentally prepared piano with tacks in the felt hammers, bore only remote resemblance to the factory-prepared generic concert Bösendorfer with which I had begun work: the previous music was entirely unsuited to the new instrument and this material was replaced by a response to the qualities of the sampled 'real' instrument.

This version, performed using Nancarrow's sampled Ampico Player Piano began as a contrapuntal series of asynchronous loops. The whole was alternately composed as lines or blocks taken forward simultaneously. When a line extended alone beyond the main body of sound, this guided the material to be overlaid.

Each line is independently developmental but generative counterpoint was used, whereby neighbouring lines may be coherently paired whilst parts on either side of the pair rhythmically or harmonically contradict or disrupt the pairing. [76] A second line was imitated, hocketed or accompanied by a third, this by a fourth and so on. From a solitary forward protruding line, outward growth developed across the ensemble.

The ensemble builds from the outset from outermost parts (separated by the widest panning distance) to gradually encompass the inner ones.

Figure 4 below shows the principal first cell of the piece:
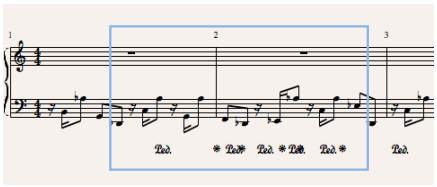


Figure 4: *Dreaming at the Circular Ruins (1)*. Opening of Track 12

At the beginning of track 12, three notes form an 'upbeat' into the repeated figure (framed), which functions, incrementally altered, as the bass.

Six beats long, each iteration is altered from the original in one or more small degrees, usually a single prominent interval. A sense of preparation for modulation is perceptible when the line is heard in isolation although expectations of resolution to a single undifferentiated tonality are unsatisfied. [77]

The transcription above (Figure 4) is from the working 'sound score' although not practical as a reproducible score, where metre and beat groupings would rather be displayed in the form below (Figure 5). Durations are 'filled' in the notated graphic, for clarity, whereas they sound thus: Note the alternating yellow and blue, denoting only two velocities (attacks) of 91 and 48 respectively (MIDI scale 0-127).

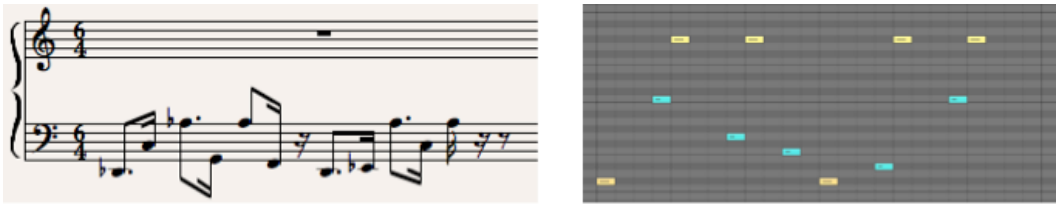


Figure 5: *Dreaming at the Circular Ruins (1)* Track 12, first repeating figure with MIDI pitch, duration and velocity shown (right)

Numbers 1 and 3 are for a 12-loudspeaker array, in a row at intervals of about 0.75m. 12 pianos play, each on a single loudspeaker. The second section is for a MIDI-controlled, solenoid-struck marimba built by sound artist and digital bricoleur 'Trimpin', according to the brief advertised in the Call for Pieces.[78] Numbers 1 and 2 were played for a month in rotation with the other festival submissions in the Front Room of the Queen Elizabeth Hall, South Bank Centre, London.

The Borges story referenced in the title of these pieces is shorthand for the interconnectedness of apparently independent subjectivities, the irretrievability of initial impulses to compose or invent in any form and the greater complexities inherent in actual than perceived causality or influence:

> "He understood that the task of moulding the incoherent and dizzying stuff that dreams are made of is the most difficult work a man can under-take, even if he fathom all the enigmas of the higher and lower spheres — much more difficult than weaving a rope of sand or minting coins of the faceless wind. He understood that initial failure was inevitable. He swore to put behind him the vast hallucination that at first had drawn him off the track, and he sought another way to approach his task." [79]

Chapter 3: Acousmatic Music

(1) *ROOM* [Loudspeaker array across five connected rooms]

I was invited to collaborate with conceptual artist Terry Smith in his retrospective show at the John Hansard Art Gallery, University of Southampton. Renowned for his 'interventions in spaces', the exhibition was entitled "Parallax". [80] The word 'parallax' and some photographs of Terry's previous work were the only clues I had in defining and executing a musical performance intended to complement his visual work.

As a starting point, I considered Alvin Lucier's 1969 piece "I am sitting in a room". Lucier's work examines the gradual overwhelming of a recording of his own voice by the resonances of the space in which it is heard, through successive re-recording within the room until it is transformed into a series of tones and pulses, the cadences and spectrum of the spoken word incrementally collapsed into a narrow band of irregular pulses, like a dimly flickering flame.

Lucier's 1969 recording is forty-five minutes long and consists solely of this process, where the seventy-five second initial voice recording is repeated after a silence of around five seconds. Sonorities emerging towards the last third of the work, unrecognisable as originating in a voice, appear like Tibetan singing bowls resonating along a high tunnel, sustaining undulating pure tones.

Lucier's offering was one of disarming simplicity in a year of profound musical polarisation that saw Wendy Carlos' release of *Switched on Bach*, Shostakovich' *Fourteenth Symphony*, Malcolm Arnold conducting the RPO in a Concerto by Deep Purple and the première of Penderecki's opera *The Devils of Loudun* at Hamburg. Continuing his essays in 'Music in Space', Stockhausen's five-hour *Fresco* was performed at the Beethoven Halle in Bonn.

Lucier's *I am sitting in a room* is characterised by a focus on observational

as opposed to presumptive listening; the technology and techniques used to create it were rudimentary, even for the time. Lucier stated that the piece could be performed using any text and in any room, rendering it possibly the most indeterminate of all musical compositions. It has been recreated several times. Despite the fact that "Room" uses both a different text and a different room, it is anticipated that this composition will not be viewed as a performance of that work.

There were several starting points for "Room", including:

1. Lucier's suggestion that sound is thus heard because of the characteristics of its physical situation whose acoustical properties may be augmented to reveal their true nature and the auditory illusion of truth or immutable unity of an object, altered in its nature by the situation in which it is met.
2. Referring to this experiment and moving immediately beyond the premise of composer as expressing 'self', exhibited as instrument, including the mannered spoken delivery with its part-controlled, part-exaggerated stutter followed by his final statement in the spoken loop that this was not so much a demonstration of a physical fact ("the resonant frequencies of the room") but a means of ironing out the very irregularities in his delivery. The high level of control in Lucier's spoken voice is gained through voice-training and yet he pronounces a stutter which training has permitted him to remove. Lucier both draws attention to self and adds rhythmic content that would otherwise lack from the voice on which the piece rests.
3. Using the space the listeners occupy as a gallery, because in this performance instance it is a gallery. Listeners are asked to move as the interest takes them, to stand or move as the sound shifts and rotates, in rising and falling confluences, juxtapositions and sudden changes of atmospheric pressure in particular parts of the space. [81]
4. Exploration of the idea of a whole listening space and several different ones within it. Each pair of ears received differing combinations from the spatialised and separated sources, a version peculiar to the combination of their physical position and the moment it occurs.
5. The text asks the listener to question both the sense of shifting impermanence of this time as other than a point in a series of startless, endless cycles and refers to the perpetual frustrated need for a sense of the numinous, of that beyond perception and self.
6. The artist's minimal brief, simply requesting engagement with the concept of a 'parallax'. In preparing for this unpredictable scenario it was interesting both to include undulations that moved through the space and surprises at particular places.

The first iteration of the text maintained intentional similarity to the Lucier of which it was initially a responsive imitation:

> "I am sitting in a room different from the one you are in now.
>
> I am recording the sound of my speaking voice
>
> And I am going to take the essentially empty sounds made by speaking these words
>
> And expose them to the natural resonant frequencies of the intellectual and imaginative processes
>
> Underlying the gradual and often painful construction of a work of art
>
> Such that all semblance of my speech will not only become transformed but unrecognisable in the timbres created from it.
>
> What you will hear, then, are some of the results of my continued investigation regarding expression of the numinous."

This was revised entirely around ten or fifteen times, until the final version used, first in complete then increasingly fragmentary forms, run thus:

I am sitting in a room, different from the one you are in now. I am recording my speaking voice and I am going to take the sound of my voice, speaking these words, and expose it to the perspective-shifted investigation which is the basis for musical composition, as though dismantling an engine powered by the energy in dreams or rushing through an infinitely expanding graphical animation in order to seek out and reunite, through limitless degrees of separation, the lost and yet inescapable coherence of the narratives of the ancients, their unknowns enviably delimited by name, their knowns and unities, forms and disfigurations encapsulated and escaped in relation to a gradually shifting lexical bulk, rending its sides and leaning towards an imagined future, itself a fleeing, yawing, rolling target whose outline form is once distinct then amorphous, bulging, through expansions, contortions until: a history of futures past becomes a feature of the studies of the present and those who live and think and wonder in it must make their own series of interconnected tales to explain to their interior what their exterior has just sensed and adding, subtracting, traducing, borrowing, recycling, remoulding, as echoes like the light from distant stars… we turn outwards and look up, expectantly.

Figure 6: Final version of text for *ROOM* as it appeared in the event programme

Uncertainty filled every area of preparation of this composition: the unknown physical configuration of the intended audition space and what, if any confluence there might be between the artist's exploration of the

'parallax' and my own. The studio space in which the sounds were recorded and combined was small, with all speakers facing me at close proximity from surrounding surfaces. The preparation for the true space of audition was therefore made without possibility of prior testing. Furthermore, such equipment as I already possessed, was able to purchase cheaply (two further amplifiers), or borrow (MOTU audio interface) were to be combined into the final set-up. Various possible configurations of loudspeakers were drafted. For details, see Appendix: Technical planning for ROOM.

While the Lucier element was both a starting point for consideration of parallactic transformations of sound over time and an assumed well-known reference point for the audience (an invited group from among supporters of the conceptual art gallery where it was heard), ROOM is a stand-alone composition, which neither investigates nor directly responds to Lucier's conceptual work in detail. Indeed, it functions with serendipitous similarity, in terms of wilful iconoclasm and conscious, necessary departure, to a partially concealed by much noted exhibit within Terry Smith's show, a 53 second video loop of the artist intoning "Fuck Nauman". [82]

Spatial planning was hypothetical and arbitrary because the John Hansard Gallery's flexibility as experiential space is the tool of the exhibiting artist or their curator: no details regarding the ultimate arrangement either of artefacts, images or physical barriers were obtainable prior to the exhibition opening.

In Figure 7 and Figure 8 below can be seen 1st and 2nd plans based on the arrangement of the gallery during the Summer 2011 exhibition of Jane and Louise Wilson's photographs of the area surrounding Chernobyl.

It can be seen in both of these Figures that a live element was originally planned, which would involve an acoustic performance happening simultaneously with the recorded sound. This idea was discarded at early stages due to the addition of further unknown elements (occlusions, acoustic response in low-ceilinged small spaces and effectiveness of performer interaction while audience move between them).

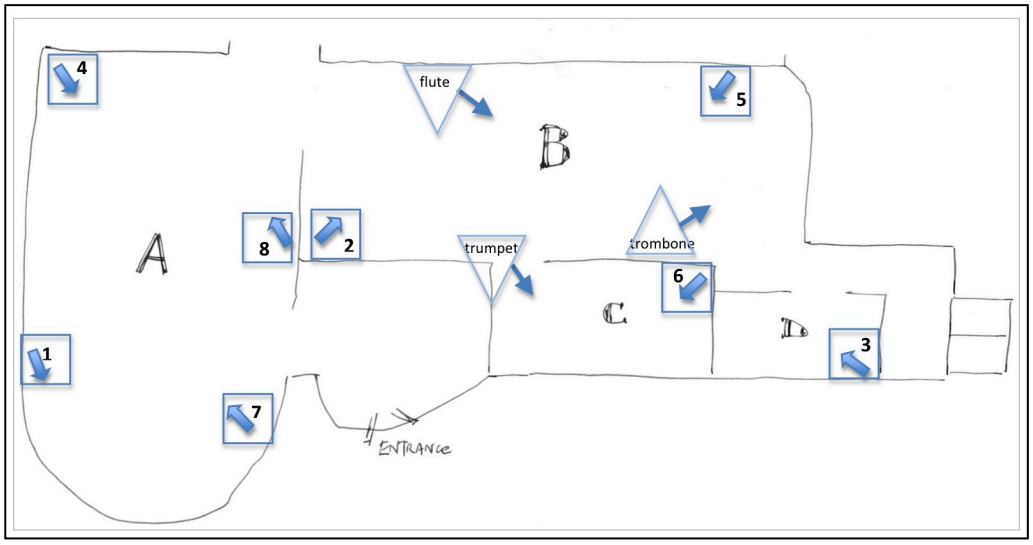


Figure 7: Draft loudspeaker scheme for *ROOM* prior to notification of actual physical occlusions

2nd plan:

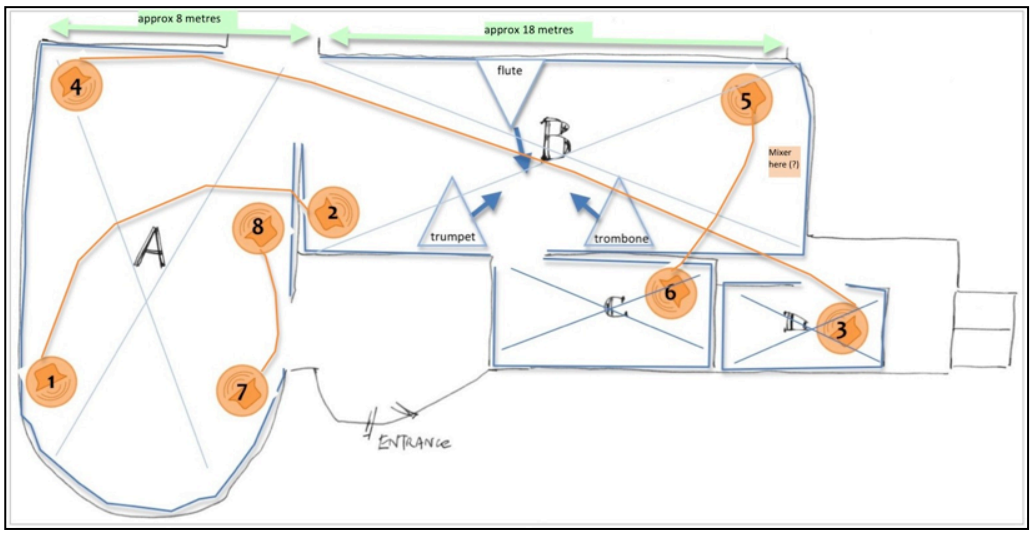


Figure 8: 2nd draft loudspeaker scheme for *ROOM* prior to notification of actual physical occlusions

Due to delays in planning the collaborative aspect of the composition and uncertainty as to whether this would be physically practical, it was therefore decided that all sound should be loudspeaker-generated.

This reduction in musical and logistical complexity led also to an initial decision to limit the material used in the composition only to the elements of the human voice, reflecting the Lucier work more directly, on which it was a comment.

This restriction did not remain in place: I ceded to the temptation to add fleeting instrumental passages and other sound objects such as the urban noise and vehicle traffic emerging in the last few minutes of the composition, as it took form. They were an attempt at emphasising the combination of recalled dream, memory and internal non-verbal dialogues that appear involuntarily during composition.

While seeking to construct an abstract temporal narrative taking place over the term of audition, I was also seeking to represent the compositional processes, with their grasping for the intangible and for a sense of how to arrange found, remembered, discovered objects in coherent form.

The occlusions in the space, encountered a couple of days before the music was to be heard, were somewhat different. Pairs and groups of channels were therefore devised during a four hour set-up immediately prior to audition. As a result, much studio-based composition and planning (where all loudspeakers were listened to in a single small space) became irrelevant: distribution of sound sources across the entire space would inevitably leave some sources inaudible at certain positions, being beyond one or even two walls.

Figure 9 below shows the floor plan to which we worked on the day of set-up, with new temporary walls shown in pink. Loudspeaker placements are shown by the orange circles.

The audience were welcomed and received a brief explanation of the visual art show. I then explained to the audience that the brief had been based upon consideration of the term ‘parallax’, gave mention of Lucier’s *I am Sitting in a Room* as a spur to the recording and transformation of my voice. I explained that I wanted them to feel free to stand or move anywhere, to explore the space and the sounds within it as physical objects. The lights were lowered to semi-darkness and I allowed around a minute of silence to separate the speaking from the first relayed sound, which emerged from a room behind the listeners. Unaccustomed to being asked to take an active role in uncovering the sounds, most people moved in a group for the entire

duration. Only one or two appeared comfortable to take independent exploratory action. This palpable discomfort with being requested to take their own decisions revealed the alienness and opacity of the experience for many of the listeners. It was clear that considerable outreach would be necessary to introduce audiences to this form of active exploration of formally constructed musical composition. That work began soon after the performance of ROOM, with my workshops and presentations of geo-located compositions.



Figure 9: Further draft configuration of *ROOM* loudspeakers

The composition was relayed on a single evening to a small invited audience. Two years later, in Autumn 2013, an opportunity arose to create a radio version of it, for BASIC.FM. [83]

The following is a short explanatory text written for the station's website:

> I feel I should come clean as to what this is the hell about, as without at least a few words to introduce it, it is likely to appear mighty weird.
>
> Commissioned for a visual art show called "Parallax" I had no guidance but that single word.
>
> We used a Mac running Logic 9 to relay 52 channels into 8 analogue inputs on a MOTU audio interface, supplying two dual stereo amps and two single stereo amps with each speaker of a pair in a separate room from its counterpart.
>
> 12 speakers were used in all, across 4 rooms in the John Hansard Art Gallery, Southampton in the conceptual artist Terry Smith's show of that name.

The audience were asked to walk around the space as sounds panned and overlapped between separate spaces, in the semi-darkness.

They were embarrassed by the request to listen actively and all walked in a flock, circulating clockwise together for the original 38 minute duration.

What you will now hear is a cut, edited, revised, added, mutated, remoulded version, returning nearly two years after that single public audition.

It has a substantially different structure and overall experience, not least because it has been reduced to surround(-ish) stereo for internet streaming as mp3 (320 kbps)

I chose to respond to Alvin Lucier's overblown and inconsequential little project of 1969, when composers with gramophones and tape recorders, wind machines and telegraph transmitters, valve radios and mechanical clocks had already been creating musical automata of great and unpredictable wonder for a very long time.

It is also, I hope, much more than just a poke at Lucier.

It concerns how we talk with our friends the dead, how we measure and comprehend the passage of time and memory along it, musical, cultural and personal.

It's also a hall of mirrors, a freak show, a day dream.

Three acousmatic versions, produced for online audition as spatialised stereo files, are included in the Portfolio Appendix: ROOM. They were 'artificially' generated: in other words, not reproduced by recording interaction with acousmatic composition (all parts playing simultaneously on loudspeakers). They were produced as studio compositions based upon the audio materials of which the 'live' acousmatic experience was comprised. Further information is given in the preface to Appendix3: *ROOM* (acousmatic) in the electronic Portfolio.

(2) The President [Binaural]

This composition was at once an investigation of the affordances of digital audio software for transforming the human voice with realism to perform unreal speech and of uses of arrhythmic, unpitched sounds as the only sources for a musical composition. The announcement by President Barack Obama on 2 May 2011 of the military murder of Osama bin Laden at a house in Pakistan provided an opportunity for a further essay in virtual representation of recorded speech with a striking and historic piece of political speech making.

I sought to change the verbal content of the speech by reappropriating small selected segments of it, combining them in ways that had not been spoken. This was a way at once of averting attention from the horrific content and context, and subverting the stated patriotic casus belli.

The first stage of the process was to identify which words seemed resonant as uttered by an American President and to determine whether these could be isolated. Analysis of Obama's speech patterns revealed that despite the apparent clarity of diction, frequent elisions in fact characterised his delivery. Where words were separated by gaps (shown by obliques: "/") to import respectful reflection, it was in reference to places or events preceding the military action being reported:

> the wreckage of / Flight 93 / in Shanksville, / Pennsylvania, where the actions / of heroic citizens / saved even more heartbreak / and destruction.

These were the least portable elements of the speech to a more abstracted setting and were among the majority of the original content to be discarded from the project.[84]

Here is the opening of the Obama speech from which *The President* was constructed with excerpted words highlighted in bold: [85]

> Good evening. **Tonight**, I can report to the American people and to the world that **the United States has conducted an operation** that killed Osama bin Laden, the leader of al Qaeda, and a terrorist who's responsible for the murder of thousands of innocent men, women, and children.
>
> It was nearly 10 years ago that a bright September day was darkened by the worst attack on the American people in our history. The images of 9/11 are seared into our national

> memory -- hijacked planes cutting through a **cloudless** September **sky**; the Twin Towers collapsing to the ground; Nearly 3,000 citizens taken from us, leaving a **gaping hole in our hearts**.
>
> ……. shortly after taking office, I directed Leon Panetta, the director of the CIA, **to make** the killing or capture of bin Laden the top priority of our war against al Qaeda, even as we continued our broader efforts to disrupt, **dismantle, and defeat** his network ……. Then, last August, **after years of painstaking work** by our intelligence community, I was briefed on a possible lead to bin Laden ……. So his demise should be welcomed by all who believe in **peace and human dignity**.

The events as described presented a most compelling snapshot of the current geo-political climate and offered powerful material to my ongoing enquiry into methods for credible transformation of auditory reality.

The intention in so recompiling *The President*'s words, removing their intended meaning, was at once to satirise the genre of political speaking of which this instant is an iconic example, aggrandising and making impossible the speakers' statements of achievement and to create a response to the detailed precision of the spoken words with an abstract, emotive representation of their explicit and associated meaning, on the expression, reception and identity of power.

The President's speaking voice initially presents as ideal for such a process of editing, with its ostensibly clear and differentiated enunciations. On minute scrutiny however, the elision of syllables and unusual personal emphases indicated the requirement for far more complex processes of transformation than were at first foreseen.

An example of this is in the reproduced word "sky", requiring three cross-faded samples of the letter 's' to remove their formerly elided previous syllable. Inevitably, the greater the requirement for editing, the greater the difficulty of achieving realism and this is one area in which the reconstruction has remained palpable.

The composition uses only 42 complete words or parts thereof, recombined from an original speech of 1,387 words lasting 9 minutes 18 seconds. [86]

Two other materials were used: fragments of an open source archive

recording of kittiwakes and of a woman's laughter. The former has a mimetic quality representing fear and danger: sea birds in vast numbers performing unknown manoeuvres and communications. Automating the binaural panning plug-in of Logic Pro 9, the swarming birds appear to approach and recede in unpredictable routes from great distance to immediate proximity, though never settling in position.

The latter, as 'objective correlative' to the 'voices' of the birds (being human and comprehensible, responds to the principal material of *The President*'s altered speech. For this contrast to the mimetic use and exaggerative effect of the birds as fearsome, unpredictable, inhuman and unknown, it was necessarily a human reply and a wordless one: the laughter is incredulous, mocking, helpless in disbelief, emotionally exhausted.[87]

After many abortive sketches that explored both other parts of the speech and various combinations with MIDI performance and audio files of piano performance, it was determined that the composition should not become a musical setting of words but for the reconstructed spoken words alone to constitute the music.

The following text is the entirety of material re-transfigured in the final version of the composition:

> "Tonight, I instructed the CIA to dismantle and defeat the gaping hole in our hearts. I took custody of peace and human dignity. After years of painstaking work, the United States has conducted an operation to make the sky cloudless."

The composition is constituted of 880 audio fragments ranging from 0.1 to 6 seconds' duration. These non-contiguous audio regions were finally reconstituted as larger single audio files on seven tracks of which four were of *The President*'s voice and three, the sea birds and laughter.

Through numerous rejected iterations, dozens of combinations of *The President*'s words were tried. In the following playful misconstruction, message and delivery remained tangibly artificial. One of several intended 'cells' for a multiple-voice montage, this and most other such experiments were rejected for this reason.

“Every time I embraced counter-terrorism professionals, we reaffirmed our love each other”:

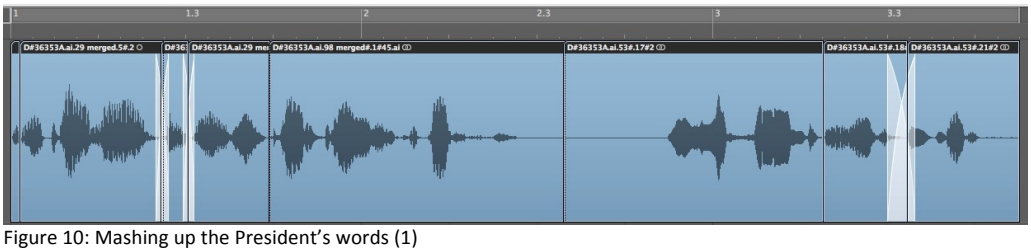


Figure 10: Mashing up the President’s words (1)

The following sequence was to be one of several of similar construction: meaningless reformed phrases montaged in a counterpoint that would render them indistinguishable. As such, the interest of the human voice transformed into uninterpretable sounds was of theoretical interest but distracted from the sought simplicity that was facilitated by the repetitive use of shorter phrases.

> "human dignity ...and on nights like this, justice has been done... tonight we are once again reminded that America can do whatever we set our mind to....whether it's the pursuit of prosperity for our sacrifices, to make the world cloudless”.

A simple heterophonic arrangement was made of the next artificially re-formed phrase:

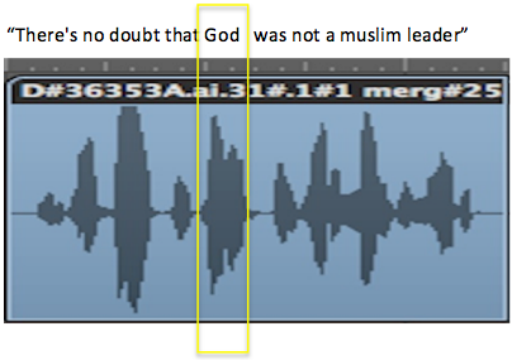


Figure 11: Mashing up the President’s words (2)

Introducing an intelligible and credible single voice, increasing its speed then adding overlapped identical versions of the original (on four tracks) the heterodyning effect was to render the whole unintelligible except for the irregular periodic prominence of the accentuated word “God”. [88] In this as in other experiments to represent *The President*’s speech in a form that referenced the original but removed or distorted its intended meaning, this was too overtly figurative a response for the intended outcome.



Figure 12: Asynchronous, cumulative looping of President's mashed-up words in previous figure

A subsequent experiment involved textual rearrangement followed by audio reconfiguration of the spoken words to remove meaning and accentuate the clichéd and contentless nature of the sentences, used at once to placate the hostile and give jubilation to the patriotic. Words in bold italics were used, those struck through were removed. The heard sequence was as shown here:

"The Pakistani people did not chose this wreckage"

I directed ~~Leon Panetta,~~ the director ~~of the CIA,~~ to make [painstaking] ~~the killing or capture of bin Laden the top priority of our war against al Qaeda, even as we continued our~~ broader efforts to disrupt, dismantle, and defeat [the Pentagon] ~~his network.~~

~~Then,~~ last August,[last week and tonight] after years of painstaking work by [the Pakistani people] ~~our intelligence community, I was briefed on a possible lead to bin Laden. It was far from certain, and it took many months to run this thread to ground. I met repeatedly with my national security team as we developed more information about the possibility that we had located bin Laden hiding within a compound~~ deep inside of Pakistan

~~Good evening. Tonight,~~ I can report to the American people and to the world ~~that the United States has conducted an operation that killed~~

~~United States and was committed to killing innocents in our country~~ and around the globe. And ~~so we went to war against al Qaeda to protect~~ our citizens, our friends, and our allies.

~~Let us remember that we can do these things not just because of wealth or power, but because of who we are: one nation~~ under God, ~~indivisible, with liberty and justice for all.~~

[and]

~~The cause of securing our country is not complete. But tonight, we are once again reminded that~~ America ~~can do whatever we set our mind to. That is~~ the story of our history,

~~whether it's the pursuit of prosperity for~~ o our people, ~~or the struggle for~~ equality for all our ~~citizens; our commitment to stand up for our~~ values ~~abroad,~~ and our ~~sacrifices to make the~~ world ~~a safer place~~.

This version too was ultimately entirely abandoned because while it succeeding in making nonsensical *The President*'s words it was drained of the sustaining element of the original speech – a narrative of heroic and righteous transcendence of tragedy and of victory over evil.

In order to represent this in the grotesque form in which I perceived it, the final version abstracts from the speech's content an interpretative image of it which, through simplification and repetition, mimics the call and response in the Christian liturgy and other forms of ceremonial speech such as oath taking and rituals of loyalty, membership and affiliation.

To illustrate a core aspect of the sought effect, it may be useful to make a distinction between *The President* and an example from among many of a commoner practice in sampling and re-use of others' material, in particular from political speech-making. Below is the transcript of a video produced by Greenpeace. It is a recent example from among many, of contemporary political and satirical uses of reconstituting fragments of speech, that has the UK prime minister saying:

> "I will never forget watching George (Osborne) with his shirt off for the TV cameras. There he was, shouting his head off, talking about shale gas companies producing filthy energy and getting filthy rich. And of course that's great but today I want a more simple message: if anyone thinks caring about people is what we are doing today, they are living in a fantasy land. Here's the deal for the shale gas industry. They can build something under your home, erm, quite dangerously actually (laughter) because this party is intensely relaxed about the future. Yes, the oceans can rise but one thing will never ever change. We don't dream of the green jobs, the wind and wave power. I say let's try and stitch up a family by building something less safe under their own home. (Applause). Some people say your home is your castle. Well, we proved them wrong." [89]

The unmistakeable, explicit ridicule of the piece is sharply contrasted to the intention in *The President*. The video mash-up of Cameron was palpably unreal, retaining immediately visible film editing cuts, sudden changes of vocal register between words, incongruous placement of audience laughter

and applause for ironic effect and a clear message attacking the hypocrisy and hubris of the UK government in regard to a specific issue.

By contrast to this example, the intended effect of *The President* is an abstraction of the overall speech from which it is sourced and the wider political context of such political oratory. The constituent parts of their source decontextualized, rendered at times unintelligible by overlapped prograde and retrograde versions of them.[90]

Structure of *The President* analysed by Sonic Visualiser:

(1) Amplitude
(2) Amplitude / Frequency

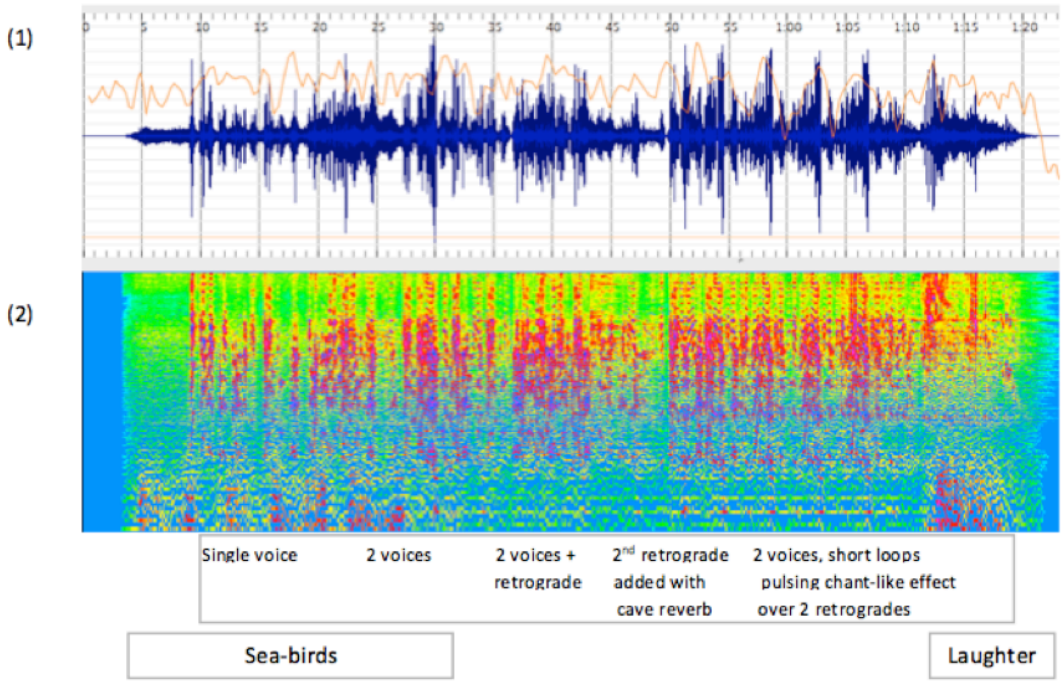


Figure 13: *The President* as interpreted via Sonic Visualiser

The President is an attempt to enact the effect of first hearing the speech from which it is formed, without directly representing or replicating the object of these reactions. The three elements of which it is constructed mimetically reproduce this response in miniature.

(3) Caedmon's Hymn [Binaural]

Caedmon's Hymn, the earliest surviving proto-English poetic text, is identified as a root of English poetic tradition. As such, it seemed an apposite text for two simultaneous musical functions.

One function was to situate the relatively recent practices of sampling and compositional re-appropriation of found objects within ostensibly continuous processes of musical development, providing a putative framework of medieval 'auctoritee' for the questionable legitimacy of the use of sound objects that are not 'owned'. A link is formed between the current and the earliest traceable origins of our written language.

The other function was an extension of the investigation into expressions of the numinous, of which *Credo* is also an example.

Just as the digital is fragile, so the oral tradition (music thus transmitted for a further five centuries after Caedmon) also vanishes without provable detail beyond fragmentary outline descriptions such as in Bede and Boethius.

It is suggested, without certainty, that texts like this would have been not spoken but sung or chanted to musical accompaniment.

Two recordings were used, of which the Bessinger reading was more assured and authoritative in its delivery. Fulk's recording was cut into its syllables and re-aligned with cross-faded grafts of its particular 'silence' to maintain the original constant low-level tape-noise. [91]

Silences occurring between the 'silence' of the recordings – where there were simply gaps – would reveal the editing more readily than by maintaining the inherent machine noise of the originals as a constant. This noise, once made constant, was partially removed with individually created hi-cut settings using the Channel EQ Logic filter.

Removal of all tape noise would have been impossible without also reducing the voices' upper frequency range so this was instead masked, with instrumental parts. [92] This approach, using unwanted artefacts in found

objects was influenced by Brian Eno's description of a studio-based process, where the impossibility of erasure necessitated combination of the extraneous element with additional layers.

The thin mandolin-like instrument that cut across sampled chanted syllables in a repeated modal phrase that was unchanged throughout also required adaptation and masking, which became an adjunct function of the instrumental writing. The two separate voice recordings were then individually filtered (high-cut, low and mid-pass) and automatically enhanced (refer to filter automation in Logic).

The result of the voice compositing should sound as two speakers sitting together in a medium-sized interior space, speaking in live unison. The calibration of their synchrony was a detailed task analogous to and informed by my ongoing exercises in simulating liveness through automation of controllers upon MIDI files. A kind of roughness, occasional hesitancy or phasing from true synchrony was designed into the final heard outcome, in order more closely to resemble live speakers following a remembered but unheard common rhythm, than the digitally precise 'quantisation' in which the first stage of preparation resulted.

To add accompaniment the voices were replayed on continuous short loops of two or three lines, to identify their cadences and rhythmic groupings more as sung phrases than spoken text. Attempt was made to enhance the resonance of the speaking voices, treated and conceived as singing, to become more so by added harmonic colours and the complementary rhythms that adorn them.

This was the simple aim, giving the ensemble a roughness, the suggestion of improvisation. This quality emerged as a result of the cumulative combination of voice splicing and instrumental phrases, was retained and exaggerated through onscreen editing of individual note's onsets, durations and velocities.

The suggestion of improvisation and of the physical presence of these imaginary bards was also intended to be enhanced by the virtual

spatialisation of sound sources (described in Figure 14, Figure 16, Figure 17 and Figure 18 below). It was hoped that the perception of being at the centre of an ensemble of chanting voices and instrumentalists would help both to clarify the contribution of individual parts and their interaction. The spatialisation was simulated using the Logic Pro 9 binaural filter. Figure 14 demonstrates the grouping and overlap of parts by instrument type. This spacing was decided after numerous earlier iterations in which there was less clarity of distinction between individual parts. They show an aspect of the composition and production process in preparing spatialised sound.

The text is a prayer of thanks, expressing wonder at creation in a language that bespeaks the humility and awe of the poet. It is also clearly a remembered, re-worked version of the scriptural and doctrinal speeches which the poet would have heard and has furthermore been transcribed and undergone numerous recensions in the two centuries between authorship and the earliest surviving manuscript versions which themselves differ somewhat both in spelling and dialect and, more occasionally, in wording (e.g. insertion of articles).

The only surviving versions of Caedmon's Hymn come from Bede's *Historia Ecclesiastica* or its translations. The version used here is the earliest known, dating from 737, in an early Northumbrian dialect.

The textual content and structure are unaltered, other than in repetition, which permits variegated, developmental musical counterpart, greater exposure of a very short text, for each line thus repeated to be considered in differing sounding contexts.

Chart of text:

Anglo-Saxon: [93]	Transliteration:	Translation:
Nu we sculon herigean	nu: ˈskʲylun ˈherjɑn	Now we must praise
heofonrices weard,	ˈhevænri:kʲæs wɑrd	the Protector of the heavenly kingdom,
meotodes meahte	ˈmetudæs ˈmæxti	the might of the Measurer
ond his modgeþanc,	end his ˈmo:dɣiðɔnk	and His mind's purpose,
weorc wuldorfæder,	werk ˈwuldurfɑdur	the work of the Father of Glory,
swa he wundra gehwæs,	swe: he: ˈwundrɑ ɣiˈhwæs	as He for each of the wonders,
ece drihten,	ˈe:kʲi ˈdryxtin	the eternal Lord,
or onstealde.	or ɑ:ˈstelidæ	established a beginning.
He ærest sceop	he: ˈæ:rist sko:p	He shaped first
eorðan bearnum	ˈældɑ ˈbɑrnum	for the sons of the Earth
heofon to hrofe,	ˈheven til ˈhro:ve	heaven as a roof,
halig scyppend;	ˈhɑ:leɣ ˈskʲep:en	the Holy Maker;
þa middangeard	θɑ: ˈmid:unɣæɑrd	then the Middle-World,
moncynnes weard,	ˈmɔnkʲyn:æs wɑrd	mankind's Guardian,
ece drihten,	ˈe:kʲi ˈdryxtin	the eternal Lord,
æfter teode	ˈæfter ˈtiadæ	made afterwards,
firum foldan,	ˈfirum ˈfoldu	solid ground for men,
frea ælmihtig.	ˈfræ:ɑ ˈɑl:mextiɣ [94]	the almighty Lord.

Textual implementation

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc

uerc uuldurfadur [1'10"]
swe he uundra gihwaes
eci dryctin
or astelidæ

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc

uerc uuldurfadur
swe he uundra gihwaes
eci dryctin
or astelidæ

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc,
modgidanc

uerc uuldurfadur
swe he uundra gihwaes
eci dryctin
or astelidæ

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc

uerc uuldurfadur
swe he uundra gihwaes
eci dryctin
or astelidæ

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc

he aerist scop [1' 52"]
aelda barnum
heben til hrofe
haleg scepen.

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc,
modgidanc

tha middungeard
moncynnæs uard
eci dryctin
æfter tiadæ
firum foldu
frea allmectig [2' 16"]

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc

[End of music: 2' 27"]

---

nu scylun hergan
hefaenricaes uard
metudæs maecti
end his modgidanc

	marks repetition
	marks end of subsection (three iterations of 1st four lines ending in repeated last word)
	marks end of text section, treated as verses

The score is a composite of the instruments' simulated performance and the edited (found) audio of the two speakers reading the poem. The twelve software instrument tracks were composed using a variety of approaches. The first problem with the audio of the spoken text was the use therein of a thin mandolin-like sound whose simple pitches were sporadic, uneven and repetitive. This was certainly an attempt at the simulation of authenticity in terms of bardic delivery but had the inverse result of evocation, being redolent of a children's instrument poorly played and an attempt at reconstruction which, in light of a near complete absence of evidence for sixth century music making techniques, was a distraction from the text's content and form. Its presence therefore influenced the pitched content, which at the beginning doubles, at a carefully slight asynchrony, the intention of which is to draw 'liveness' out of the interaction between the found audio and imposed MIDI sounds.

Asynchrony between MIDI parts is also arranged such as for a sense of a simple but predetermined composition to be played by musicians with a less metrically rigorous or exactly conceived outcome than would be normative a thousand years later with precisely circumscribed performance methods notated.

There is ensemble and illustrative or responsive gesture in the arrangement and the intention of this simulation is to convey a sense of imagined ensemble between chanted text and musical accompaniment. No sense is intended of authenticity in any regard, beyond the hope that an uninformed listener will perceive some form of liveness in the delivery and be drawn to the sound and meaning of the text upon which this simulation is founded.

The vocal and software instrument tracks are panned binaurally in a hemispherical spread, with the intention of conveying a sense of listening from the centre of a circle of inward facing performers (see figure 14).

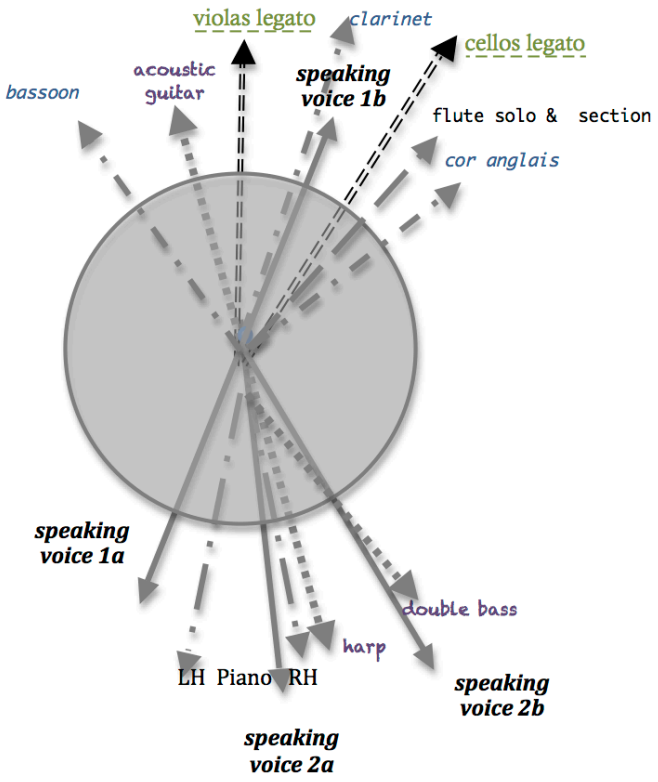


Figure 14: Binaural distribution of all parts (simulated and sampled) in *Caedmon's Hymn*

Two 'bards' :

Voice 1 (1a & 1b) mirrored at 180˚, front-back, 45˚ clockwise offset, Rear left with c. 90˚ stereo spread, shadow to front (right offset), mono, greater radial distance, sounding further away. Voice 2 (2a & 2b) to rear right. Rear, slight right offset with c. 90˚ stereo spread, adjacent (15˚ offset) shadow, mono. Greater radial distance – sounds further away. As seen in Figure 15, at only three points are there more than three instrumental voices sounding at once, none for longer than 8 seconds.

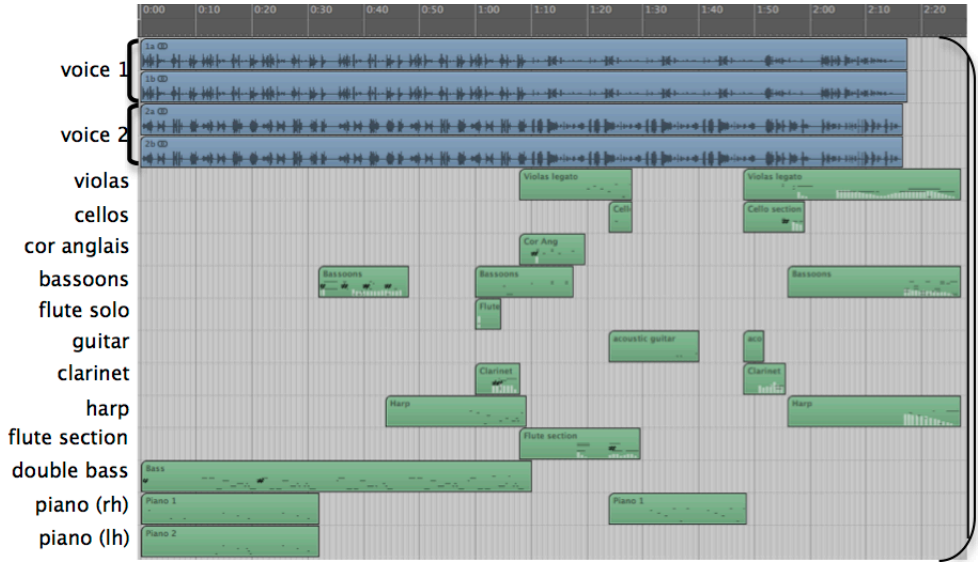


Figure 15: *Caedmon's Hymn* – arrangement of audio and instrumental parts

Woodwind :

Bassoon and cor anglais parts are brief, chordal transition passages. The bassoon is heard for approximately 30 seconds in total and (cor anglais part is only 11 seconds long, from 1' 08" to 1' 19". There is a single 4-second solo flute phrase, and a single 12 second harmonic passage, (flute ensemble, three spread 3-note chords).

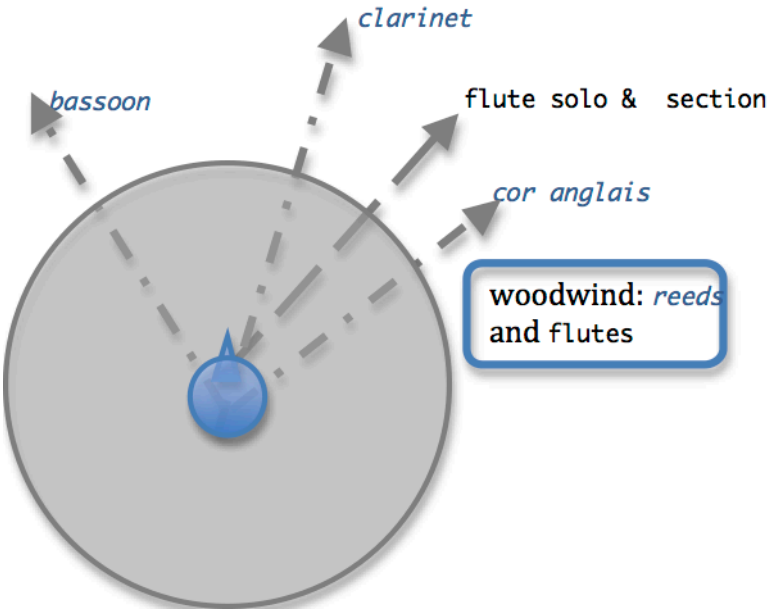


Figure 16: Binaural panning of woodwind instruments in *Caedmon's Hymn*

Stringed instruments:

Double bass enters after first iteration of verse one, with piano right hand / upper register doubling high-register mandolin-type sound embedded in voice recording. Double bass provides constant harmonic underpinning to upper lines through four repetitions of first four lines, then is silent for second half of hymn's duration.

Acoustic guitar (EXS24 classical acoustic) is used only twice for 6 and 3 seconds respectively in brief ornamented transitional moments, as spread passing chords.

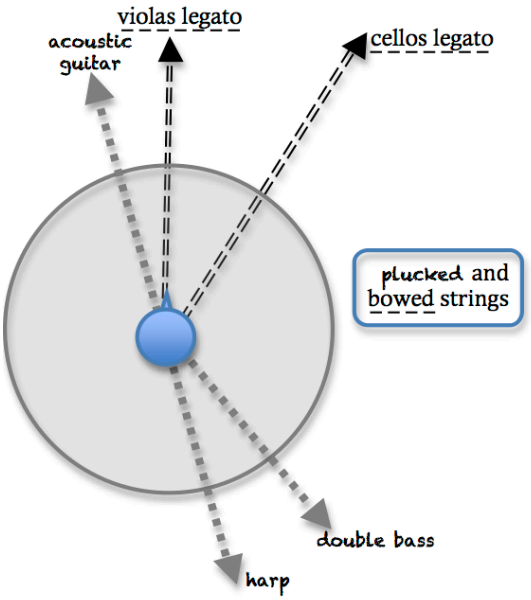


Figure 17: Binaural panning of stringed instruments in *Caedmon's Hymn*

Piano

Piano is heard in two tracks, split by pitch and sounding as though a single wide instrument behind listener for first 30 seconds and from 1'30 for 18 seconds. The first passage doubles and masks the thin plucked mandolin-type sound embedded in voice recording. The second use of piano is a repeated short phrase of alternating major sixths (one tone apart).

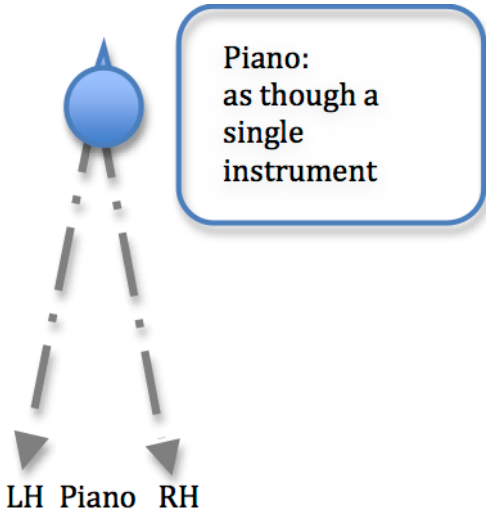


Figure 18: Binaural panning of piano in *Caedmon's Hymn*

All software instruments used have channel equalisation and (reverb plugin) Space Designer parameters applied, the latter of which are shown in the panning outlines above. The instruments are in other respects unaltered, 'factory' sounds. There is no attempt at a timbral authenticity in regard to the recognisable artifice of the instrumentation. Given the discrepancies between the pronunciations of the two late-twentieth century speakers (our reconstruction of ancient pronunciation being combinedly informed by inferred correlations between orthography and inflection and extrapolation from modern regional accents) the entire construction, including the voices upon which it is built, can only be a conjectural evocation of barely evidenced bardic or musical practices.

Like *Take Me By The Hand*, this is an essay in virtual reality that attempts, not to set the text directly but to map the contours of certain intangibles within it.

Here too, simulated instrumental performance additions to the found audio recordings are less a 'setting' than a dialectical response. Virtual spatialisation is used to suggest our presence among 'live' performers.

The uses of virtual space, even in this sparse arrangement were both further to differentiate sporadically emerging parts than by timbre alone and also to add to the deliberately untidy rhythmic cohesion in attempting a sense of presence at performance. The particular irregularity of rhythmic cohesion

between parts was an attempt to create a sense of 'live' performers familiar with a particular quasi-improvisational style of collective performance.

The composition therefore is as much one of simulating an event at which sounds are presented as it is concerned with pitches, timbres and rhythms.

Emerging from this experiment and from *The President* were realisations that each of these attempts or '*essaies*' were a single, immutable set of final decisions and relational arrangements between the constituent parts of a possible composition.

It was the immutability of the digital studio-based composition, which is a final result of multiple unrepeatable cognitive and physical processes that led to my research into the possibility of remaking the digital as though live, through the 3DBARE system.

An interim solution to assist the preparatory processes for digital composition that, as a finished artefact remains mutable, was found through starting to work in March 2012 with noTours software. This tool is used for the design and presentation of landscape-based soundwalks using GPS tracking.

noTours at first appeared to offer solutions to my specific requirements of a technology. It quickly emerged that instead it offered other uncertainties, inherent to the vagaries of multiple co-dependent systems, indeterminacy of listener action activating the combination of heard sounds and the autonomous organic acoustical fluctuations of a populated landscape as differentiated from the controlled environment of the designated listening space.

Take Me By The Hand therefore, while ultimately intended (in more complex form) for 3DBARE, was presented in loudspeaker-based acousmatic and headphone-based geo-located arrangements, as interim solutions to their fixed, delimited digital forms.

Digital studio composition, encapsulating as it does an unrevisable complete manifestation of a musical conception - from ideation of substance

and form to simulated multiple agency - requires a solution to match the vision expressed by Varèse in 1936 for ‘non-blending’, for which these portfolio compositions have marked a multi-stage developmental preparation.

(4) Credo [Binaural]

Structure and process

The process began as a developmental experiment in the use of found objects, specifically of sung expressions of the numinous from different faiths. The form was dictated by the materials gathered and unpremeditated responses to these: it was an improvised compositional process, in that experience led to intuited rather than planned decisions, in response to unfamiliar materials. The CD liner note (2011) describes this exploring of uncharted territory and of being unable, overwhelmed, at the end of the process retrospectively to chart it:

> CREDO On a recent unplanned journey through the artificially lit corridors of the online archive, its dumping grounds and lost domains, in search for rare and strange objects, I came across unknown voices singing in a hundred languages of their search for deity and the numinous. As the collection of my experience grew over days and weeks I realised, too late, the necessity of a clear recall of my route, to retrace it to the exit. I took the objects I had collected and laid them out on an imaginary table to inspect them more closely, hoping for clues within. Doors opened and as I climbed inside, the rude spirits asleep inside these objects awoke and followed, re-arranging themselves, jostling for primacy, moving whimsically around the space, arriving and disappearing as they chose. I discovered some instruments lying about the derelict building in which we had ended up and started to accompany them as they sang. If you hear this recording, please follow the sound and find us.

It is in two sections, (durations 5' 11" and 8' 13") each increasing in density until imploding under the weight of the oppositions enacted. Instrumental music was added via MIDI, as bridge and boundary between chants and between sections.

Eschewing translation of the texts (in Arabic, Bulgarian, Rumanian, Tibetan and Japanese), their incomprehensibility assisted in the selection of sounds that, as conception of the project grew and the primary material search process developed, would serve an impalpable intended outcome. Only the perceived expressive content of the sounds was in focus while using them as compositional materials: their perceptible reality was as found objects, the timbres of software instruments.

The expressive intent, if *Credo* can be said to have one, is located not in the content of the sung texts but in the simultaneous diversity of sonic forms of religious expression. Their difference seemed to enact exclusion and

oppositionality and it was in response to this that the treatment of the primary materials was most directly led.

A total of nine sources were finally used, which are listed here as they can be heard in the Portfolio appendix:

1_Credo_Messe-Notre-Dame_de-Machaut.mp3
2_Islam-Calls-You.mp3
3_Buddhist-Chant-Shingon.mp3
4_Buddhist-Chant-Shomyo-Dojoge.mp3
5_Tibetan-Chant.mp3
6_Sofia_New_Byzantium.mp3
7_TakeyeBodyChristBulgarian.mp3
8_Romanian-Paraclisul.mp3
9_Romanian-Psalm-33.mp3

The recurrence of claims to a singular deity was of interest in sourcing these sounds and the title appropriates the Christian chant to an exploration of this. The musical materials are, for the first section and in the early part of the second, entirely recognisable either as or relatively close to their original form.

During section two (itself in two parts, of proportions equal but reversed to those of the whole) the sung materials are combined and transformed beyond recognition, into masses of individual voices.

The proportions were noted only after completion, an indication of unconscious forms of control exerting their influence upon decision-making processes at all scales of the composition.

A discovery arose subsequent to completion, that the music's total durational proportions are near precisely 5:8. Those of section 2 are 8:5. The second part of the second section is divisible into proportions 5:8.



Figure 19: Retrograde and prograde golden section proportions in *Credo*

The action of the asynchronously combined fragment montages at (B) in the above figure is a mirror and augmentation of the action in the instrumental parts at (A). Retrospective analysis of intuition-led multi-layered processes may reveal repetition and the unconscious building blocks of a personal vocabulary but this proportional replication was striking for its pervasive rhythmic formalisation of the cumulative effect experienced in composition, which accidentally discovered a framework for its own presentation as though to disguise or lubricate the revolting incongruity of compositional intent against its irreverently used source material.

The tripartite structure is used to explore the development of relationships between the textures and their respective embodiments of irreconcilable singularity, internal mirroring of forms and the uses of created tonalities to connect intersecting, distinct parts or to amplify distance between non-contiguous, parallel parts, to each other incongruous.

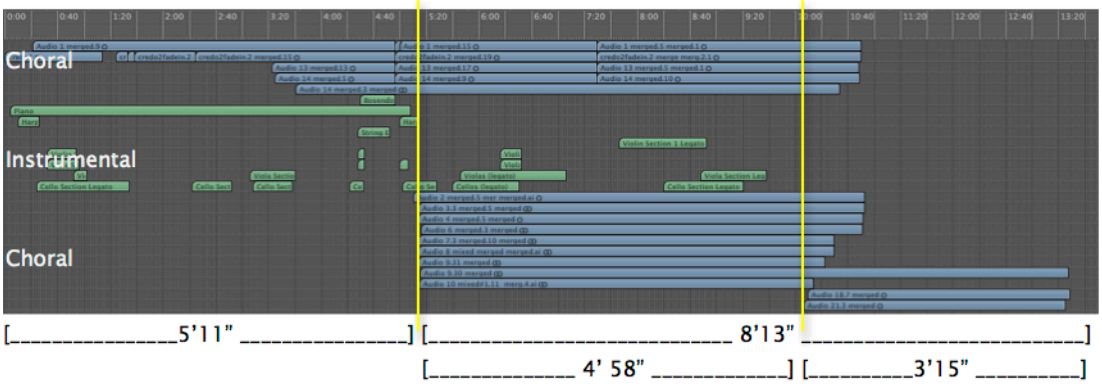


Figure 20: *Credo*, temporal proportions

From the beginning of section two (5'11"), the sung objects were combined at temporal and pitch offsets, bounced and reintroduced multiple times. The resulting dilution of original parts' expression into elements of more complex, impenetrable textures removed for the most part any interpretable

original meaning beyond occasionally recognisable syllables (if familiar with the texts, chants or the sound of the original recordings). The processes here were again intuitive or 'improvised', comprising dozens of apparently false choices which were reversed or removed to begin again with previously finalised combinations of the audio as it had been 'bounced'.

The eponymous Christian chant of the opening is heard five times, joined on first repetition by doubling in the piano then by arpegggiated harp, before the voice is pitch shifted by a narrow minor third against the original, in heterophonic reference to organum. A low register, sustained legato string part is added and the instrumental lines replace the vocal parts until a single echo of the opening "*Credo* in unum Deum".

A monodic piano line with held viola and cello chords, which dissolve to a single note, bridge to the entry in higher register of a muezzin who begins the 'Azan' (call to prayer): "Allahu Akbar / Ash-hadu an la ilaha ill-Allah / Ash-hadu anna Muhammad-ar-Rasoolullah / Hayya 'alas-Salah / Hayya 'alal-falah". [95]

Having heard the Azan many times, I never sought a translation of the words, which had taken on a combined impression of the sorrowful and the awe-struck. On later understanding the translated form of these words, after completion of this musical composition, it became clear that I had missed the expressive intentions of the singers and composers of the original music in many instances; it was not however the intention in composing this music either to respond dialogically to, or create a framework for the sympathetic and fully comprehending exposition of, others' expression. [96]

This sense of sorrow and awe in the Azan seemed closer in spirit than anticipated to the eastern European Orthodox chants heard later in the piece, the use of which was again based upon assumed, interpretative (incorrect) impressions which were then pursued as emotive strands pervading the emerging combined music.

The Azan contains a non-vocal sustained G natural note whose pitch is treated as a drone by the piano and string parts, harmonically circling,

negotiating, it. The opening *Credo* voice returns [1' 24"] with a stretched last syllable: [De]-"u---m" which is then combined at lower volume with the muezzin, repeated nine times, the second of which transposed once a semitone lower then returned to former pitch.

The result is of a monastic voice in E minor, ending each phrase on a sustained B natural, combined with a muezzin in a microtonal mode above a G natural drone whose phrases pivot on a C natural, acting as a harmonic pole to the drone.

The piano is the bridge between the parts, developing its imitation of the *Credo* phrase while split between a low B natural (the final fifth of the Christian phrase) and a high C natural (the final fourth of the Islamic phrase). This tentative and unresolved quasi-cadential leading (VI-V towards the E minor of the *Credo*) disappears [from 2' 35"] without the sung context for it.

This proximity of pitch and divergence of harmonic, melodic and rhythmic logic between the two voices made their simultaneity rich in directional possibility but the intonational fluidity and the penetrating timbres of the muezzin's voice, (in contrast to the tonal fixity and mournful obedience implicit in the monastic voice) came to dominate the harmony of both piano and string parts, in its fluctuating non-return to the pivotal G drone.

The piano and lower strings gravitate towards then veer from decisive cadential arrival into the minor key of G (closest to this being the piano at 2'50", with its parallel tenths C/Eb : G/Bb, imitating the muezzin's 'diatonicism') before the drone becomes a ninth to F minor and the 'attempts' to find key follow through incremental chordal changes by a single note at once.

Sustained chords shared between piano and sampled legato lower strings (bars 94 to 111, 3' 06" to 3' 40") underlie the two voices, returned to single form, which are again juxtaposed without transposition from their respective modalities and the piano is again the sole instrumental mediation, attempting to synthesis a bridge between the parts. In the

unreconciled, fluctuating stasis between the two voices, the piano part fragments, imitating parts of both voices in accelerating spread chords then arpeggiations.
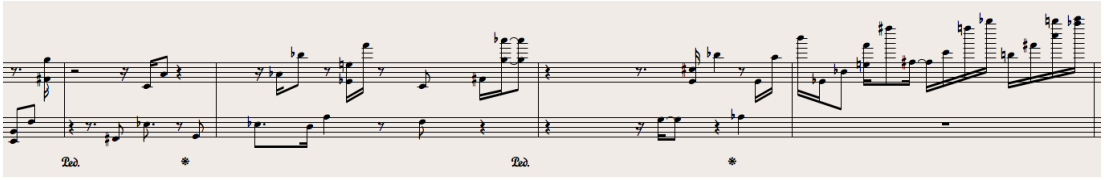


Figure 21: Piano 1, bars 130-134, *Credo*

The muezzin is multiplied in canon such that a strong dual suggestion of G & C minor modalities is created between two then four iterations of his voice, the piano, viola and cello sections enhancing this floating modal tonality until at 3' 56" (bar 119 beat 3) the '*Credo* in unum Deum' returns, in its original E minor.

A rapidly growing outburst of staccato and pizzicato strings (from 4' 22", bar 132,) is joined (4' 31", bar 136 beat 4) by a dense and rapid second piano (software instrument, MIDI) then also (4' 37", bar 139 beat 3) by a backmasked, truncated combinations of both the software instruments (bounced and re-added as 'merged audio', track 5) and fragments of recently heard syllables from the Christian and Muslim audio samples. There is a brief addition of harp, converging from its outer range then accelerating through thickening chords to silence, while the muezzin's first call is again combined with that of the Christian from the opening. From here, the transition into the second, combinations are less transparent in their constituent parts. Harmony in the choral parts is no longer even obliquely referenceable, and only three short sections of instrumental addition are made to the edited, manipulated and composited sung voices from this point forward.

Nine audio tracks each containing multiple combinations, bounced and re-added now form a choral music of wholly different form, unrecognisable in its parts. A transition into the last part of section two uses long reverb signals suddenly increased in wet ratio and length to simulate effects of presence and fading (rather than volume controlled fades).

With the fading of the middle section combination of Buddhist and Orthodox chants, the music is rapidly overwhelmed (10” 08”, bar 305) by a mass of multiple rebounces from composited fragments, mostly open syllables in dense pitch clusters imitating and magnifying those of the piano part at the transition from the first two second sections.

Compositional Rationale

Two long-term enquiries are brought together in *Credo*: building software instruments from found audio objects and reconstructing the human voice. Reconstruction took the form of manipulating existing sounds into new ones that retained recognisable connections to their earlier stated sources.

Credo is also an exercise in 'binaural' or three dimensional sound, digitally simulated. As in the case of *Caedmon’s Hymn* and *The President*, these are only as yet produced for headphone-based audition, for impassive audition. Later reproductions of these compositions will use unconventionally arranged loudspeaker-arrays throughout multiple adjoining spaces (as in the case of ROOM) and ultimately, using 3DBARE, to enable listeners to differentiate and isolate the strands from each other. In this last setting, the through composition will be supplanted by extended synchronous looping of the whole such that the music may be entered and left at any stage during its successive connected transmissions.

Building software instruments from found audio objects in this instance took the form of allocating samples from the Buddhist Shingon chants to sections of a MIDI controller keyboard and playing cluster chords of the extended and looped vocal sounds. For the most part however, these voices were manipulated by cutting, splicing, looping with cross-fades and bouncing to new contiguous audio files that could be re-inserted to unfiltered tracks, standing as finished miniature productions within the whole.

This staged process was necessary because during complex multi-stage transformations without a written or printed analogue to the digital

processes it was impossible to keep multi-layered temporal structures and processes of change in accurate recall.

Therefore the whole was montaged through the dissection and reassembly of lines along a roughly plotted continuum, concerned initially with the creation of multiple climactic crescendi falling back to single lines, themselves again cumulatively combined and transformed, each time into forms more complex and remote from their stated original material.

In this way the composition grew both vertically and horizontally, emerging from a rudimentary envisaged outline. The processes were not governed by definable rules; the composition grew as a studio improvisation where disparate strands were combined to observe their effect upon each other. As an improvised or intuitive process therefore the composition was unrepeatable and unreconstructible, as in the case of *Dreaming at the Circular Ruins* and *ROOM*.

Context

This music forms an element in the development of a technique of improvised assemblage whose effect is intended to mimic liveness, as though the collisions and convections between lines and the ideologies expressed by them were occurring as natural processes, in live view.

It is also an experiment in the construction of music whose parts are effective as intended in their fullest combination but which cannot be discerned as distinct, due to the density of the orchestration. The intention is to discover whether virtual spatialisation will be a means to improve the experience of listening to such music or if it will be necessary to compose music using the technology of audition as the only effective way to test it under development. It is not yet known how *Credo* might be deconstructed and reassembled in geo-located setting using noTours, for unmediated unravelling by listeners.

Due to the integral nature of the composition, characterised by successive

accumulations moving from clarity into apparent chaos, a situational setting of *Credo* using geo-location software would require fundamentally different physical arrangement of its parts to the other compositions presented using that system.

The greatest difference would be in the requirement of a very large area, accommodating the placement of multiple concentric circles. Each would contain a region of playing sound. In each region would be found one or more fragments or portions of a given 'track', (a single linear sonic entity), being arranged in such ways that listener action makes them either simultaneously or consecutively heard.

In this way, by approaching towards a regional centre point of multiple circles, the audio attached to each, continuing to sound as new audio is activated, might be made to approach this effect. The areas would need to be large to respond to the usually observed behaviours of geo-located listeners, who move at considerable speed seeking routes rather than pausing in a single circle to hear its entirety.

In this setting, for the temporal experience of three accumulating sections, each of around four minutes, at average listener walking speed from perimeter to centre, three or more discrete adjacent areas of c.500 metres diameter would be required.

Clearly, *Credo* would undergo such radical transformation under translation to landscape-based audition as to become again an 'open' work, similar to the reconstituting necessity in the 2nd and 4th Piano Studies and in *ROOM* with loudspeakers or *Take Me By The Hand* in geo-located setting.

In pursuit of further theoretical understanding of anticipated affordances and constraints arising in a context of full virtual immersion and listener-controlled outcomes, I have also divided the *Credo* into two separate versions: one solely of the sampled audio composites, the other solely of the MIDI-generated 'performance'. These distinct pieces of music, when separated, may be considered independent responses to the same set of conditions – the collision or elision of self-proclaimed irreconcilable claims

to ownership of unique truth in relation to a godhead.

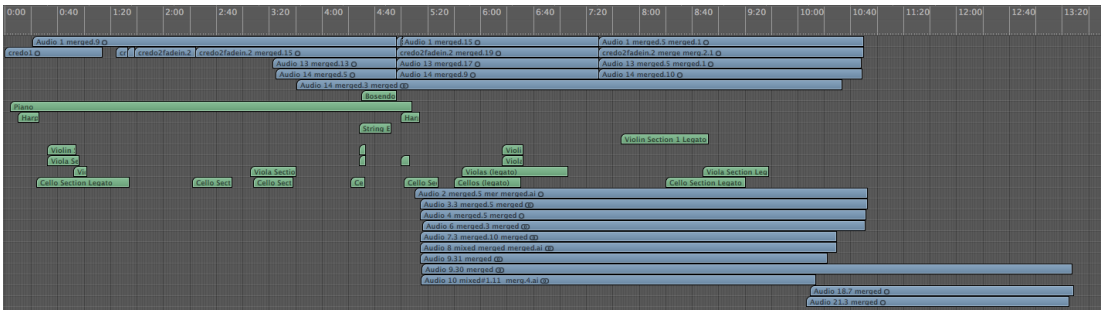


Figure 22: *Credo*, acousmatic master score. Audio in blue, MIDI simulation in green

The portfolio documentation of *Credo* includes annotated graphical score (a detailed version of Figure 22), as an analogue to a traditionally notated score and a notated score of instrumental parts. The graphical score shows constituent parts of the composition: their respective entries, durations, combinations. Source material is identified such that with use of the audio materials in the digital portfolio folder "Appendix2.Credo_sources", both reconstruction and further analysis are possible.

The project for which these compositions are preparatory is distinct from extant methods of sound spatialisation which most usually spread sounds around a physical space where all playing parts may be simultaneously heard. The object of 3DBARE is that listeners create sounds' combinations themselves by movement in physical space where headset-heard sound is virtually spatialised, including virtual occlusions and simulated distances which control sources' individual amplitude and filtering.

(5) Take Me By The Hand [Loudspeaker array]

Take me, someone, by the hand,
Lead me down the hill,
Put me by the fire's side.

The buses strain and skid on the cinders.
We totter and look upwards.
My fingers, screwed tight,
Whiten at the tip.

Take me, someone, by the hand,
Lead me down the hill,
Put me by the fire's side. [97]

Acousmatic setting

This is a choral setting of the above poem, by Jeffrey Wainwright, which I discovered in The Independent newspaper in 1999. It is an essay in virtual reality that attempts not to set the text directly but to map the contours of certain intangibles within it.

From eleven separate recording sessions, each with an unrehearsed and unprepared singer, a 'virtual choir' was constructed.

As neither acousmatic nor geo-located versions are performable, the initially intended score (as a document whose function was for 'performance' to be reconstructed) was ultimately superseded by a graphical representation of the studio-composed entirety (acousmatic) and a cross-referenced set of framework descriptions combining maps with generalised descriptions of the sounds situated there (locative version).

The composition is at once a setting of a text and a response to the recorded sounds of the singers, led as it was by the characteristics of the singers' individual voices: different recorded voices would have resulted in a different composition.

A self-imposed compositional constraint in the acousmatic setting was for no material beyond the studio-collected voice recordings to be admissible and for no vocal transformation to extend beyond the recognisably 'possible'. There are nonetheless, palpably artificial elements, most notably

in the dense single-voice heterophony of the opening, identical repetitions (such as of individual words) and transitions, using repeated breath, part-syllables and self-combined voices in both homophonic (such as entry of voice 2 at 1' 54", pitch shifter wet signal at 50%, offset upwards by a minor third) and contrapuntal (e.g. voice 8 from 10'30") arrangement.

The melodic material attempts to match the text's quality, despite its tight minimalism, of being unpremeditated. While the first verse is reiterated verbatim as the third, the melodic setting is entirely distinct on the words' repetition in the choral setting. The composition constitutes an analogous A-B-A format only in the fact of the first verse's repetition.

Recording equipment was activated surreptitiously and results where singers were unaware of being recorded were more confidently sung. In these cases, unprepared takes were used. [(Voice 8) Richard Patient, (Voice 5) Dan Clements, (Voice 10) Emma Joy]

In two cases, it was necessary to cut the short fragments of an individual take into discrete notes and alter their pitch incrementally, not to perfectly equal temperament but a closer proximity to the notated pitches for that part not to be incongruous. [(Voice 12) Lydia Rougon, (Voice 2) Bereola Ogunleyi]

Choosing and editing the primary material prioritised ensuring a close match to the singer's original sound: recorded takes were chosen that required the least transformation or editing in order to maintain the original sound of the singer. Where there was background noise such as other voices, an aeroplane or vehicle, this was removed where possible. If in other regards this was a preferred take then minimisation of the intrusion was attempted. Recording Bereola's voice took place in my former office, above a car repair workshop. Where sudden loud machine noise or laughter broke through, I replaced these sections with equally pitched identical syllables from other takes, cross-faded and bounced to generate a new single primary building block.

The composition was built much as I would develop a choral score except in

a reverse process, where instead of a notated composition presented to singers, the music was designed around the very performances of the singers involved.

As an investigation of how to construct a realistic simulation of performance it was useful: I imposed the constraint that each part remain as close as possible to the original sound of the singer. With this 'rule' in place, the harmonic implications of the lines provided a further guide.

The poem's A-B-A structure was melodically set in A1-B-A2 form. The third verse's melody (A2) was an inverted, rhythmically irregularised response to the first, for a looser and more urgent effect than created by the symmetry of the first.

This was a compositional process I had not previously used: generating material for musicians, recording their delivery and constructing the music directly in these sounds.

It is at once a development of compositional use of found objects and a means of limiting both source material and its viable permutations by these restrictions. The compositional technique was one of additive montage where the only material that may be used was that collected from the singers in the course of studio recording sessions. The sung material was either the three lines shown below or some small phrases of mono-syllabic two part harmony for lower male voices.

Random singers were invited into the studio, some with formal training, others amateurs. They were played the melody and, after short preparation, sight-sang it. The takes resulting were of exceedingly mixed quality. Many were discarded but something of each participant remained in the final music.

The intention of recording unrehearsed singers induced spontaneity of delivery and was, as hoped, characterised by immediacy and hesitancy. Their often-apprehensive delivery was – although edited, combined and transformed – an essential characteristic of the overall effect.[98]

The A-B-A form and superficial naivety of the text belie a tight structural and mimetic control that with small gestures enacts movement between diegesis and exegesis, between narratorial interiority and environmental perception. The attraction and the problem of the text were in this shift. From inside the mind of the speaker desiring quiet release to the surroundings where, despite a plea to be taken gently down the hill, to repose, clenching self-support is required during an uncomfortable journey.

"We look upwards": the avoidance of communication between public transport travellers, alienation of individuals, alone en masse. It is an image of Christian prayer, of supplication, that echoes the tenor of the other stanzas' plea. And then the plaintive plea returns, the middle – reality – having been a mere distraction from the more urgent prayer that things should be otherwise. This pairing of the interior with the exterior provides what Seamus Heaney refers to in his essay "The main of light", where a poetic window opens into a world beyond that evinced in the text itself. [99]

The linear fragmentation effected in the text has its musical analogue in both spatial dimensions and timbral differentiation: the musical construct is a series of overlapping layers of sung text and processed environmental sound, some sourced in situ, others incongruously imported. The purpose of these superimpositions is both to reflect the expressive disjuncture of the text and become a self-reflexive exploration of the processes of composing, presenting and listening to music, of planting a musical 'performance', specifically in an undesignated space with its own fluctuating sonic character. It is at once a communicative act and one that continually interrogates its own communicative function.

The first verse's melody is durationally proportioned 3:3:4 (bars of four beats) or 12:12:16 (beats) whereas the verse's syllabic proportions are 6:5:6. This asymmetric stretching of the primary melodic cell against the symmetry of the verse line lent itself to irregular heterophonic combination of the opening solo soprano voice.

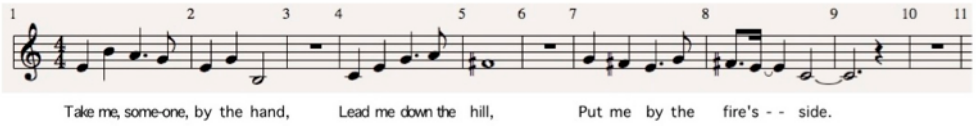


Figure 23: Verse 1 melody of Jeffrey Wainwright's "Take Me By The Hand"

The slight intonational variation of each singer was in most instances at least partially retained in the prepared materials as this served both in individuating the voices and creating natural harmonic variation between sections. The last note of the verse, again the minor sixth, C natural, was slightly flattened by this singer, in service of a perceived tonic-dominant opposition.

The first singer sharpened the minor sixth of the second phrase (bar 4, beat 1) by somewhat less than a quarter tone, brightening the second, rising phrase and suggesting a major chord of the subdominant, rather than the one imagined at that point, of a flattened supertonic diminished with B bass, or V(-9) chord. The last note of the verse, again the minor sixth, C natural, was slightly flattened by this singer, in service of a perceived I-V progression, where I had previously heard either an implicit Ia – IV or Ib – VIb.[100] At the first phrase's end, a tendency emerged among several of the singers to raise the pitch of the last note to somewhere between the B natural written and the C a semitone above. This hovering close to the flattened sixth at " '*Lead'* [me down]" and "[fire's] '*side'* " ambiguated the implicit harmonic leading from a pure dominant to a possible dominant with flattened ninth or a submediant chord. As there was no harmonisation, what was compositionally imagined but unstated is transformed by these pitch colourations into something more varied and uncertain than equal temperament diatonicism.

There is no diatonic polarity intended but in fact a modal duality between the two fifths E-B and C-G and their fourth inversions. These permit a circularity of harmonic argument with possibility of resolution perpetually delayed, similar to an implicit bass-line augmented fourth substitution. As with the fluctuations between their rhythmic delivery, dynamic range and syllabic enunciation, intonational variation was left largely unedited: the

'objects' given to me by the singers were treated as a starting point for the construction of the whole 'performance'. These small variations in the original material, when multiplied in heterophonic combination, became a prominent characteristic of the heard outcome of the opening section.

As an example of the distinction between preparing a score for live performance and the sculpting of performed sound into a digitally constructed composition, such elements typify the constraints and the newer 'affordances' or offerings of working in captured sound. Their exploitation is also central to achieving a balance between the palpably constructed and the simulation of 'liveness'.
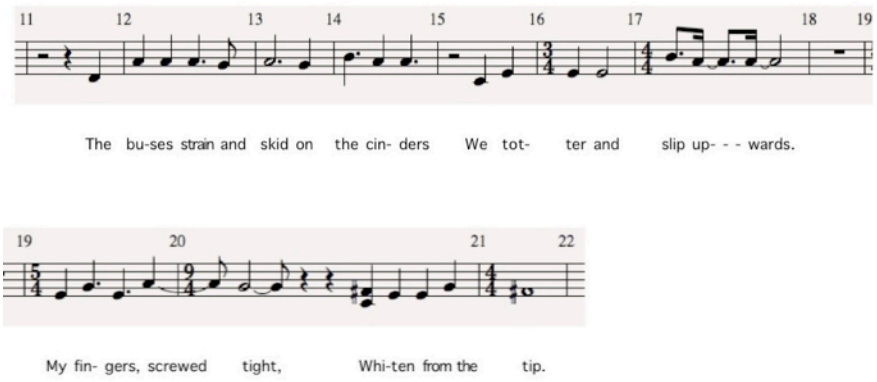


Figure 24: Verse 2 melody of *Take Me By The Hand*

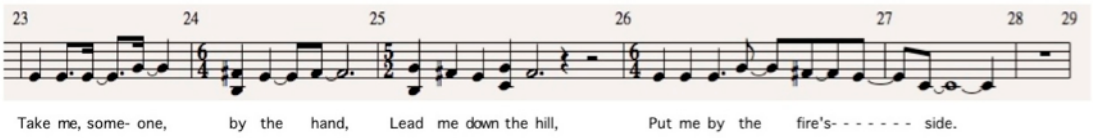


Figure 25: Verse 3 melody of *Take Me By The Hand*

Diads shown are free alternatives at singer discretion but the lower notes were not used by any singer. The screen capture below (Figure 26) represents distribution of edited and combined sections of the recording takes from eleven voices (ten singers and my speaking voice). Each is colour-coded. Time is shown in seconds and minutes at the upper margin.

Logic software requires time signatures and bars regardless of the format of

composition for which it is used. As there was no requirement for audio-MIDI synchronisation and the music was not to be transcribed for human re-performance, the default setting of 4/4 and ♩=120 remains, although there is no correlation between Logic's bars and the divisions of the music. This representation shows distribution of individual voices over the whole duration of 12'20".

Notes for the first (acousmatic) performance of *Take Me By The Hand*, as part of Turner Sims Concert Hall and Southampton City's Musical Alphabet as part of the London 2012 (Olympic Games) celebrations:

> V is for Virtual Voices:
> Choral music sculpted in the digital studio from eleven voices separately recorded. This essay in virtual reality was inspired by Jeffrey Wainwright's deceptively simple poem: I attempt not to set the text directly but to map the contours of something intangible within the words.
> The composition was sculpted in the digital studio from the performances of unknown singers, encountered on the pavement, the campus and the supermarket.
> I captured their often apprehensive sight-singing of the simple melody onscreen and on headphones, then edited, combined, transformed the sounds that these sessions generated.
> My current study of early 17th century composer and choirmaster Thomas Weelkes has also left its mark here, in the alternations between imitative counterpoint and homophony, invention and memory, reassuring harmony and the quiet terror that accompanies disintegration, unravelling.
> A composition for 'virtual choir', built upon two ideas combined. Firstly there is the way that a choral composer conventionally starts work, with fragmentary musical phrases conceived around a text.
> I have collected eleven singers' multiple takes of a short, three verse poem and am compiling a three-dimensional choir comprised only of the objects Accessed from the recording sessions.
> It is turning out to be a very exacting restriction - normally I add composed transitions, backdrops, other found objects, etc.
> Singers:
> Rachel Boucher Ignacio Brasa Daniel Clements
> George Holloway Emma Joy Bereola Ogunleyi
> Richard Patient Luke Richardson Lydia Rougon
> Steve Troughton Tom Wilson

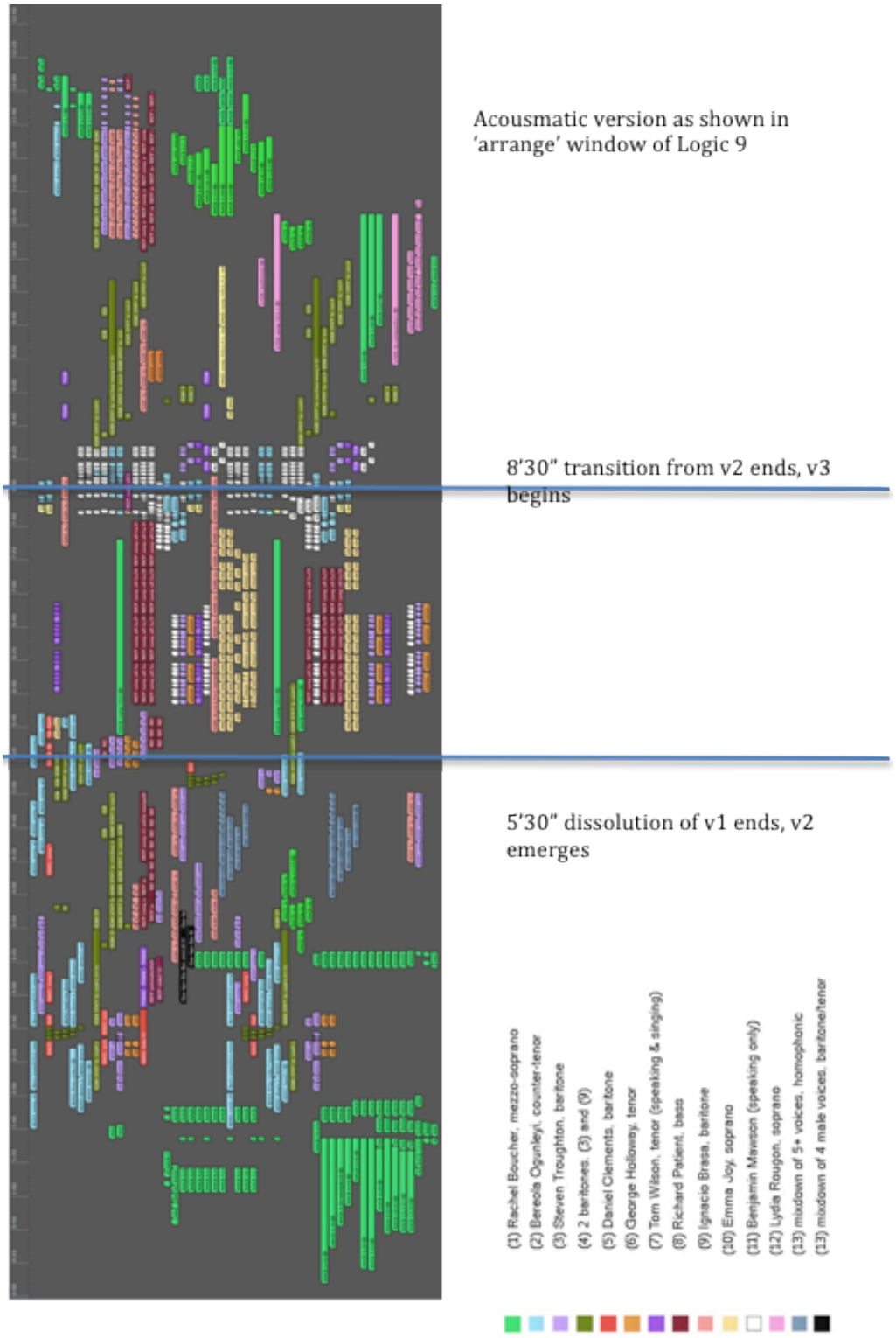


Figure 26: Arrangement of sampled singers for virtual choir in *Take Me By The Hand*

Chapter 4: Geo-located Music

noTours and 'Augmented Aurality' [101]

In contrast to deterministic "through-composition", my particular form of locative composition invites the listener to construct their sonic experience from sections of composed material and its juxtaposition with sampled (manipulated) material and incidental sounds occurring around the listener.

It became apparent in my geo-location experiments that a fundamental relationship exists between sound material placed somewhere and sounds native to that locus. The perceptual interconnection of simultaneously heard sounds, whether generated or incidental to the place of audition, creates combinations only partially within the control of the composer or soundwalk designer.

The compositions presented in this portfolio, including these geo-located experiences, (differentiated from virtual performance by their inclusion of processed incidental sounds drawn from the listening location), form experimental steps towards understanding how to compose for indeterminately interacting listeners in a virtual environment where all parts run simultaneously (like those notated in an acoustic score from a simultaneous starting point).

Unlike the acousmatic compositions included here, where parts may be virtually or physically spatialised and made selectively inaudible, the geo-located music is made up of inert elements (non-playing audio) that must be made to play by listener action. This difference means that, in the latter experience, no control is exercised by the composer over the temporal confluence of physically juxtaposed parts. At the instant the listener moves into an invisible circle (recognised by the audio-playing handset according to GPS coordinates received from orbiting satellites) the sounds allocated to that location begin to play. Therefore, beyond a combination of visual mapping and a cross-referenced digital folder of audio files, no representation can do more than give an example outcome from among potentially limitless permutations. One solution may be in the form of web-

based maps permitting multiple simultaneous audio files to be played, although this precludes the crucial live setting, an aleatory and ever-changing element of geo-located listening. Two examples of web-based representations of Written in Water can be found in the Appendix.

As it transpired through multiple iterations of the geo-located choral music, these facets of 'setting' are fundamental to the listener's experience. Whilst a controlled indeterminacy in the combinations of composed and incidental sounds desirable, the sonic experience is tightly managed in terms of musical characteristics, physical positioning, amplitude, panning, respective durations. This may include selection and spatial arrangement of materials according to season (such as the heightening of Spring birdsong for a presentation given on a dark Winter evening at University of Southampton Highfield campus in December 2012).

A significant differentiation between my aims in this compositional research and those of practitioners whose work I have encountered is in this varied degree of intentionally controlled detail. In the case for example of [102]

The three site settings for the choral piece *Take Me By The Hand* were the landscaped gardens of Southampton University's Highfield campus, the London South Bank Centre's riverside walkways and St Paul's Churchyard, London.

In the first setting, ambient noise levels were comparatively low and differentiation between a low number of pervasive, recurring sound sources made the site auditorily distinct: birds, water, footsteps on tarmac or paving, buildings' air conditioning, the movement of automatic doors, small groups in ambulatory conversation.

These situational characteristics are entirely different in form from those ambient sounds captured and re-situated after manipulation at the other, urban settings. The differences of impulse response between a landscaped garden slope from flat concrete edging a wide river or high narrow stone streets, also profoundly alter the listener's perception of place.

Accurate positioning of heard sounds is diminished by complex ambient response. The greater complexity and higher volume of ambient sounds at the urban settings required not only alterations in amplitude and balance of the imported choral material but an entirely new use of that material in relation to the situational sounds with which it was doubly combined, in the places' real-time sound production and the edited versions of it which had been re-positioned there.

This would also emerge in conversation with the noTours developers, arguing for an augmentation of the place itself as an essential difference for geo-located versions of a music to its other forms.[103]

The sense in which noTours is a tool for the creation of 'augmented aurality' is driven by the ethos of the designers[104], expressed thus in their 'mission statement' at the software's website:

> CONTEXT [Sound as a producer of sense]
> Every place, as every inhabited space, is loaded with a meaning, with a historical and relational identity that has been made out of an individual or collective process of memory. It is the result of our listening acts. Each environment and moment are inexorably tied to concrete sounds that characterize, identify and individualize them from the acoustics of other spaces or contexts. The sound that surrounds us and the sounds that we produce while a conscious or unconscious act have become an interesting material relevant to the artistic creation, the anthropology, philosophy, architecture, urbanism, ecology, history, psychology... In this context the project NoTours proposes a strategy for assuming the sound complexity of a territory, for understanding how much the sound is informing us about that place and for elaborating new ways of knowledge and expression for the ear, avoiding the silence and the usual frontality of the vision, always with the intention of creating new possible sensible cartographies of the place that surrounds us.[105]

Uses therefore of the tool as a compositional one are contrary to its intended affordances: delivering composed music is a subversion of the guided revelation of environment purported, allegedly embodying an anachronistic aesthetic of art as significative or communicative.

The first stage of platform investigation was to determine whether GPS signals required for operability were sufficiently strong and what resolution on longitude and latitude coordinates could be achieved.

Using a Blackberry phone's proprietary maps application, zoomed into the triangular path at Highfield campus, I traced a series of slow circuits, at an approximate speed of one metre per second for four or five seconds then pausing for three to five seconds.



Figure 27: Plotting GPS accuracy with Blackberry OS handheld device

The location marker updated in response to movements of around two metres but inconsistently registering direction with instant accuracy, frequent updates to position being made independent of user movement.

It was clear that GPS was accurate to around two or, more usually four, metre resolution but that both a response delay and variable accuracy of consequent readings during continuous - even slight – movement would pose difficulties for the complex interaction between tightly packed auditory zones.

After extensive research (interoperability, operating system specifications, imminent obsolescence of hardware facilitating purchase of audience-sized batch), a first handset was obtained (2010 Acer Liquid Metal, Android 2.2).

The next location-specific trial was based on a set of four audio circles in the immediate surroundings of my home.

The first circle called up a recording of 1_Islam_call-to-prayer.aif, a section of an original source for *Credo*. At the corner of two streets this should intersect first with Zone 2 then with Zones 2 and 3 in one direction and back from there towards the crossroads, with 2 and then both 2 and 4. The other audio files were materials also used in *Credo*, two Rumanian chants and a

Bulgarian chant. Their respective lengths were 17s, 52s 60s and 4m20. The longest file contained 60 seconds of music followed by a 3m20 of silence. All files were set to loop continually once activated. The 'speaker' function was specified for all, such that sounds are loudest at the centre point of a GPS-designated circle.

The listening experience was of multiple very dense simultaneous textures. It was too dense to differentiate the onset of loops and therefore this feature was found to be irrelevant to the perceived experience, when heard under the conditions of noTours. Such looping and tangible interplay, and the possibility to explore and dissect these, are not effective listening experiences because their effects and fluctuations are impossible to differentiate as would be possible with truly interactive virtual performance.

It was found therefore that composing for noTours would require radically different materials and compositional devices to be effective, from those for which I had been preparing.

Indeed after early experiments such as these, it was found that considerably thinner textures were needed, for interesting differentiation between combinations of the contents of geo-located circles. Fuller description of the methods for achieving this are explained in

Appendix: Technical notes on functionality of noTours.

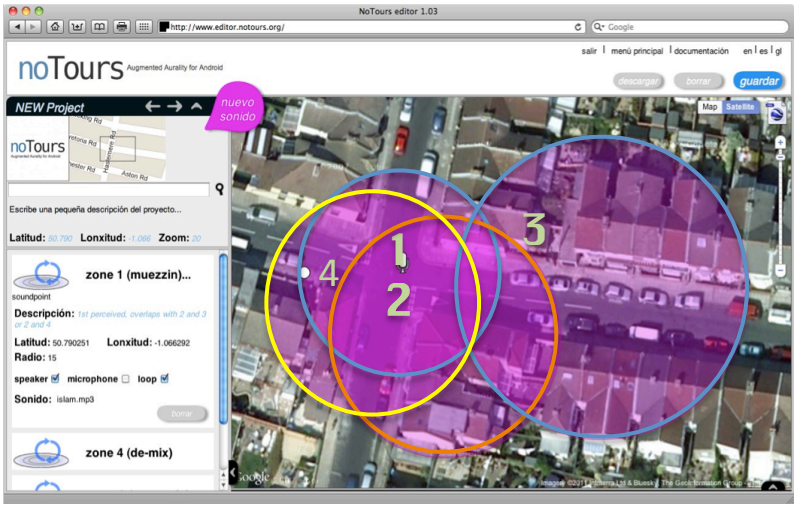


Figure 28: Preliminary experiment mapping sound regions with noTours' GPS functionality

The noTours listener activates a circle's audio on entry to a given circle. This is profoundly different from my intended use for the platform: listener activation of sounds from their starting point makes structured composition dissolve under conditions of such uncertain congruity between parts.

Planned software updates may include an option for audio files to begin simultaneously from the moment a listener activates the project on their handset, at zero volume until they enter the circle for a specific sound. This would be closer to navigating a composed score but GPS' unreliability would remain a constraint.[106]

The high order of unpredictability in listener sound activation informs compositional material and soundmap form: working with noTours differs in this regard fundamentally from virtually staging a through-composed work.[107] By way of illustration, Figure 29 below shows a simple hypothetical configuration where four circles are defined, each with separate audio associated to it.

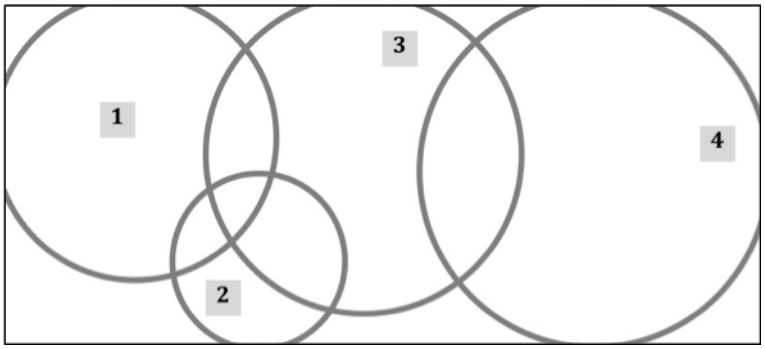


Figure 29: Rudimentary hypothetical layout for a soundwalk.

For circle 1, sound file 1.wav is specified. For circles 2-4, audio files 2-4 respectively are specified.

In circle 1, audio file “1.wav” (180s) is looped. In circle 2, “2.wav” (300s) is looped. In circle 3, “3.wav” (400s) plays once. In circle 4, “4.wav” (20s) is looped. For sound durations heard by 2 listeners, distinctions are seen between paths “A” and “B”.

In Figure 30, the listener’s route is shown.

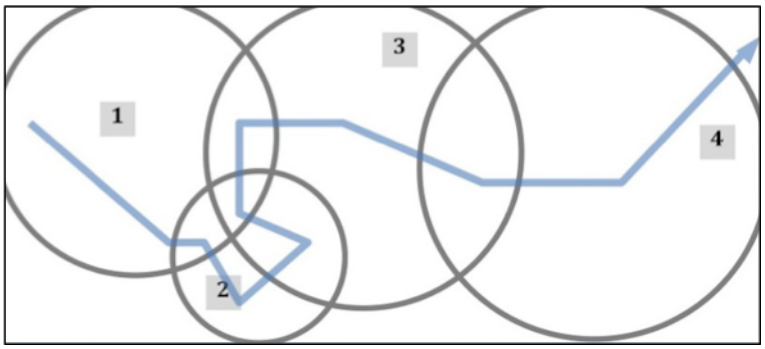


Figure 30: Listening path A

The application is started in circle 1: sound 1 begins. The user moves through ½ lens of circles 1 & 2, unintersected area of circle 2; ½ lens of circles 2 & 3; Reuleaux triangle at intersection of circles 1, 2 & 3; unintersected area of circle 3; lens of circles 3 & 4; unintersected area of circle 4. So in timed path “A”, representation of entries/ overlaps of sound can be thus: (Figure 31).

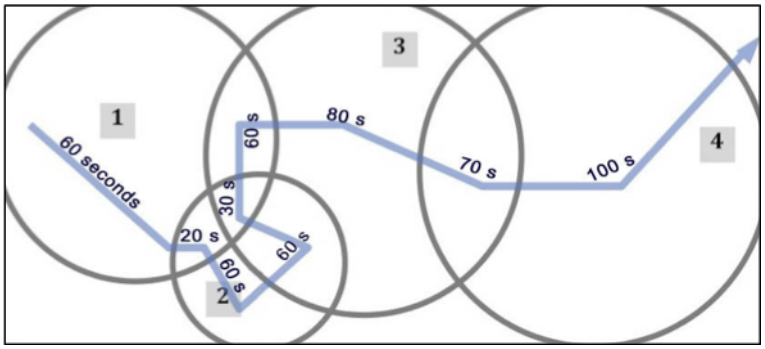


Figure 31: Hypothetical timings on path A

If instead, path "B" is taken, different results occur. Circles, audio and parameters are identical in all respects. A listener enters the area and walks the route shown: (Figure 32).

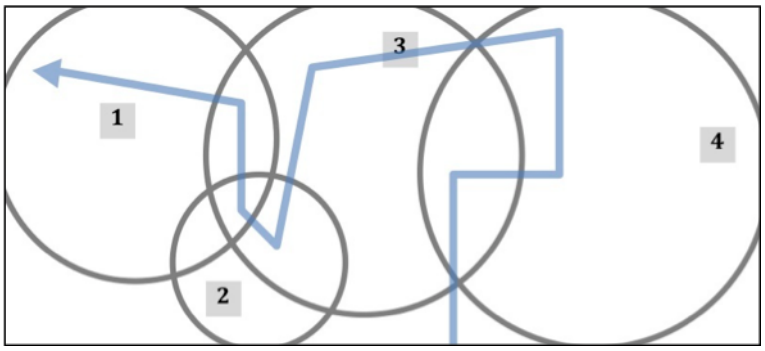


Figure 32: Listening path B

The listener investigates sounds produced by their action and experiences the audios in the order and for durations described in Figure 33.

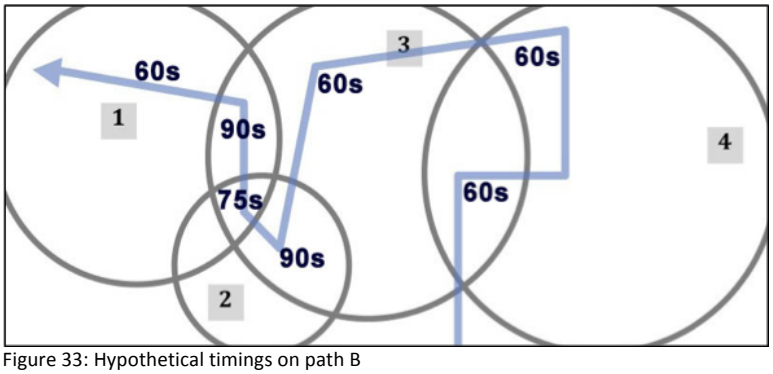


Figure 33: Hypothetical timings on path B

This simple, hypothetical example demonstrates the high degree of variability that occur between the listening experiences of two users, even in a setting with only four audio circles.

In this irregularity arises the interest of the platform: creating for the

listener a sense of inspecting an object whose aspect is continually shifting under examination, like rotating an irregular polygon in three planes to understand its whole form.

If, in the reductive, hypothetical scenario above we were to hear the musical material begun simultaneously, it would appear as in Figure 34: [108]

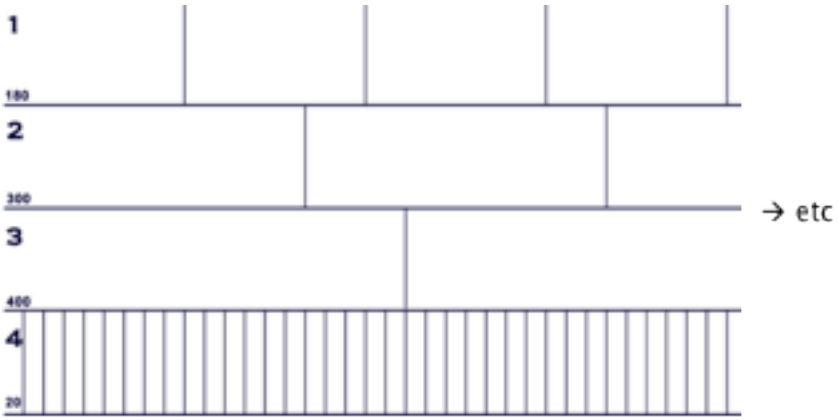


Figure 34: Cells of differing length begin synchronously

The lowest common multiple of these four durations – 20, 180, 300, 400 seconds – is 3,600 seconds, or one hour. One hour will pass from the simultaneous starting points of these four cells before they begin again at exactly the same moment.

Locative presentation, by contrast, will produce an effect similar to that shown below in the case of the same geo-located circles and audio files respectively attached to these locations (as in Figure 31, hypothetical timings of listening path A):

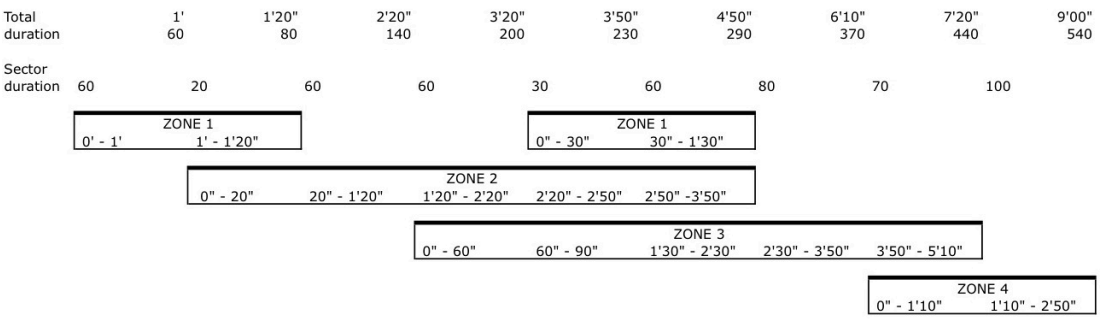


Figure 35 : Listener-activation in timed listening path A, (see Figure 31)

The sound heard in the Figure 33 scenario (hypothetical timings on listening path B) may be represented as shown in Figure 36:

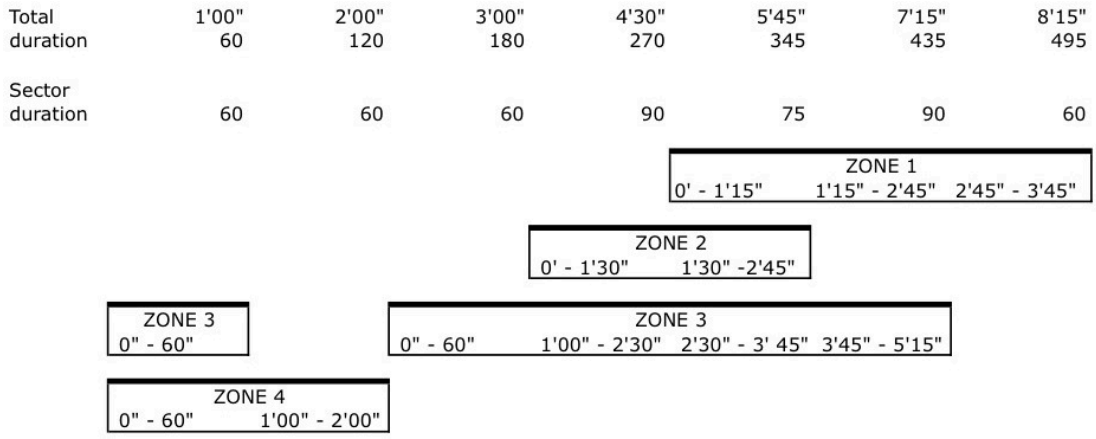


Figure 36 : Listener-activation in timed listening path B, (see Figure 33)

As the cells may contain any possible material, it is in both their harmonic and textural characteristics and their physical juxtaposition, in addition to relative durations, that successful or unsuccessful combinations arise.

These are not the introductory remarks to a case for rigorously executed pattern music but to contextualise the work discussed in the following chapters within the current 'affordances and constraints' of the system used. It was found however that, in this setting, the smallest elements of the complete structure direct the overall outcome, by multiplication and the unavoidable randomness with which they are combined by listeners.

The most successful outcomes, in terms of clarity, listener engagement and reported musical comprehension or enjoyment have arisen from combinations of the simplest elements.

Methods of composing with this platform are comparable to those of strict counterpoint in the requirements made upon primary material for simultaneous cogency and potential for growth beyond themselves into successful combinatorial forms. The similarity is limited to this aspect, given the limitations of control available to the soundwalk designer. Listener-entry to a circle triggering the sound associated with it, any new textural

superimposition, whose time from start point varies according to listener position and movement, is impossible to pre-determine.

Arbitrariness in the combination of horizontal layers is introduced which must be addressed at an early stage of composition, long before physical mapping is begun.

Dimensions and Binaural Rendering

The map's two dimensions are translated to X:Y coordinates of listener. No third physical dimension is (or can be) taken into account by the system as it depends solely upon GPS data for translation of listener movement to audio produced. It would also be impractical to instantiate in this setting for several reasons.

Firstly, it would be impossible to measure accurately, given that fluctuations in height of handset would have a maximum range of 2.5 metres (in hand outstretched above head or on ground). The ratio between these small fluctuations in height and the greater distances in the other two planes would require distinct, height-specific response (virtualised exaggeration of distances covered) and real-time binaural simulation to include complex acoustic response rendering, additionally taking into account such factors as features in the landscape to mimic real-world acoustical behaviours.

Real time acoustical responses require an exponential increase in data-processing. Realistic rendering of an environmental acoustic ambience requires continuous recalibration of delays and reverberations according to the positional relation of the listener to surrounding surfaces in order to model a space appropriately.

This is not the intended function of the noTours application. In this and other respects it differs fundamentally from true binaural rendering (See Figure 40).

Whilst it is possible to create binaural simulations in the audio output of Logic DAW software, these work strangely in the perception of a moving

listener as, while the sounds are distributed at different virtual distances from the listener's head and at varying angles and heights from each other, they are also constant in relation to the listener's moving head, thereby appearing to move with them as they walk or turn.

In this setting, whilst binaural simulation therefore permits a spatial separation between parts, the overall effect upon the listener is of wearing, instead of headphones, a sphere of speakers several metres in diameter that moves in perfect synchrony with the listener. It is at once suggestive of realism and deeply unsettling.

Binaural rendering does however offer an additional layer of variance to the textures perceived by the listener and this was deployed extensively in the final preparation of *Take Me By The Hand*.

Listener activation of sounds

The listener's entry to a designated circle triggers its attached audio to play: moving to its intersection with a second circle, the counterpoint between the units is controllable only to the extent of their individual content but not to their temporal inter-relation.

While the totality of each listener's view of the work is indeterminate and predicated on the duration and activity engaged in hearing it, each element of the composition is constructed in minute detail, with absolute regard to its viability within the whole, whether heard singly, in pairs or denser combination.

The possible forms of these permutations must be understood by the composer in order for the listener's relationship with the larger physical and temporal proportions of the music to be coherent.

A principal compositional consideration therefore is the combined qualities of physically neighbouring material. Temporal geometry of material, cycle length, repetition numbers and degrees of transformation to be undergone by each offer a limitless number of potential outcomes.

While heterophony is possible, strict counterpoint for example would be undeliverable due to the activation of parts by listeners who, even if pre-informed and rehearsed, would still be subject to the vagaries of GPS response times and distances, which can create radically different outcomes even for two listeners moving together through the space but using different handsets.

The size of a circle dictates the types of material that may be used in it: large circles take longer to pass through than smaller ones and therefore will be heard for a longer duration. They may also contain or intersect with smaller circles.

These larger areas tend to use either non-pitched ambient effects or forms of drone or ostinati, above which may be placed the occasionally occurring detail of once- or briefly-encountered smaller circles. The use of designated routes (roads, pavements, pathways) may be negotiated to provide clear paths along which for listeners to proceed in order to experience an intended sequence or the designations of the space may be contradicted, overwritten, effaced by a contrary arrangement of sounds requiring the listener to abandon habitual uses of the environment.

Responses in sound which enhance, comment upon, augment, deny or affirm, refuse or permit the structural affordances of the physical environment lead the user to reconsideration of their environs where sound is not the object but a facilitator of their attention.

The largest scale and most successful geo-located soundscape I have so far completed comprised 91 circles spread across a square kilometre of urban landscape, using streets as sequences from which tangential suggestion offered listeners choices to exit or continue with apparently self-evident routes of physical and sonic progress.[109]

Circles were also placed in difficult areas to reach or at a remove from most frequently visited parts of the compact town centre: verbal and visual suggestions were made for visitors to seek out these sounds (with no directions other than sonic clues to their discovery). As in the presentation

of acousmatic soundscape *ROOM*, where listeners were asked to move at will between moving sounds, general confusion and a reticence in the face of requests for active listening were the response of an overwhelming majority.[110] The practice of exploring sound remains for the most part confusing or entirely unconsidered by listeners for whom a constant private mobile music library is nonetheless an assumed normality.

Binaurality and simulacra

Binaural simulation replicates perceived sound reverberations, mimicking the HRTFs and ITDs of hearing and the impulse responses of an imagined space.

HRTFs or head-related transfer functions are the perceptual results of sound's filtration through the mass of the head itself as it reaches the ears and ITDs or inter-aural time differences are the measure by which distance and directionality are perceived – a certain delay to a single ear permits perceptual location of sound in the surrounding space.

Location-specific reverberance adds detail to contextual perception of sound. Reverberation is comprised of early and late responses: early responses being those which reach the surface nearest them and late ones being the response of the wider environment as the sound is reflected in multiple directions around the entire space. It is the replication of these perceptual affects with which binaural simulation is concerned. [111]

Whereas, in .mp3 lossy compression, binaurality simulated in DAW software is reduced to horizontal planar representation, .wav format audio is capable of higher fidelity reproduction of virtual spatialisation, for example in simulated spherical or spiral motion. In the post-locative setting, this is fundamentally important to realism, while in GPS-situated (but orientation non-specific) listening it is an obstructing factor, for the following reason.

A listener may stand still and perceive the movement of a source along an arc that describes the source's changing angle and distance from the

listener. If the listener rotates or changes position, the movement of the source is clearly perceived to be in relation not to the environment in which the listener is situated (as would be the case with a sound source physically situated there) but in relation to the listener themselves.

For example, a duck is heard on water to their left (where there is real water but no duck). The listener sees the water and hears the duck, then turns to face the water. The duck is now situated not on the water but to the listener's left, in a space also containing no physical duck where now its auditory representation is apparently false – is it a sonic joke, a form of deliberate transmutation to create uninterpretable effect or an accident of software constraint? The listener may not ask these questions but will be presented with the sound of a duck that rotates as they do.

The transparency of such illusion therefore can create opportunities for playfully parallactic representations of place, but ones that are seldom mistaken for actual sonic occurrences.

Concentric circles may also be used to remove the most apparent artificiality in impulse response simulation: vertiginous movement of multiple sources in independent directions bombard neurological processing power of the unhabituated listener.

If these sources are attributed certain behaviours, such as binaural rendering in fixed relation to the listener, on repeated use they become palpably unreal.

Nonetheless, they may on first listening be effective devices for blurring distinctions between reality and artifice.

A maximum of 500 audio files may be played at any one time - in theory - although this would neither be comprehensible (or tolerable) nor would any currently available handset be able to deliver this amount of synchronous data.[112]

The software now includes features that encourage the gamification of landscape, including 'milestones' which trigger entry into a new sound map,

placed in situ above the previous one. Current noTours projects investigate unintended affordances, where a lack of features is less a set of constraints according to Magnusson's framework than a liberation from directed workflows of commercial digital platforms: hacking and re-appropriation are essential to the platform's fullest uses. [113] [114]

(1) Take Me By The Hand – Geo-located settings (2012)[115]

Three geo-located settings of *Take Me By The Hand* have been constructed:

1. Highfield, Southampton (Figure 37)
2. London South Bank, Royal Festival Hall (Figure 38 & Figure 39)
3. St Paul's Churchyard (Figure 40)

Figure 37 shows a re-arrangement of the acousmatic composition, with material exclusively from studio voice recordings.

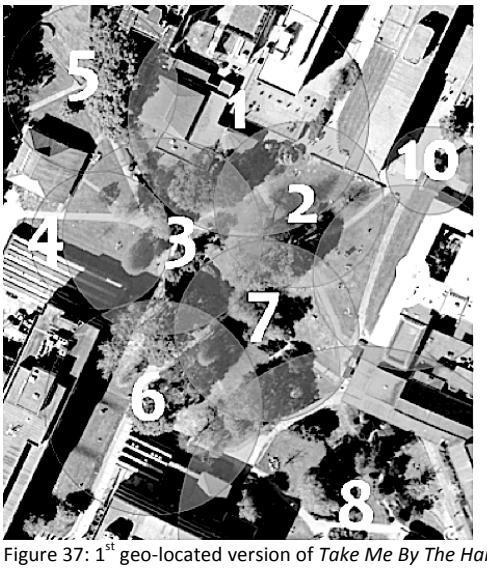


Figure 37: 1st geo-located version of *Take Me By The Hand,* March 2012, University of Southampton, Highfield

Numbered circles are points of reference during the working process, identifying areas where objects taken from acousmatic version were placed. While the numbered sequence followed the temporal flow of the acousmatic version, listeners obtained no visual aids, other stimuli or instructions.

Listeners largely stayed on the paths intersecting the slope and on observing this common reaction, circles were moved slightly such that their circumferences and intersections should occur where listeners were likely to place themselves.

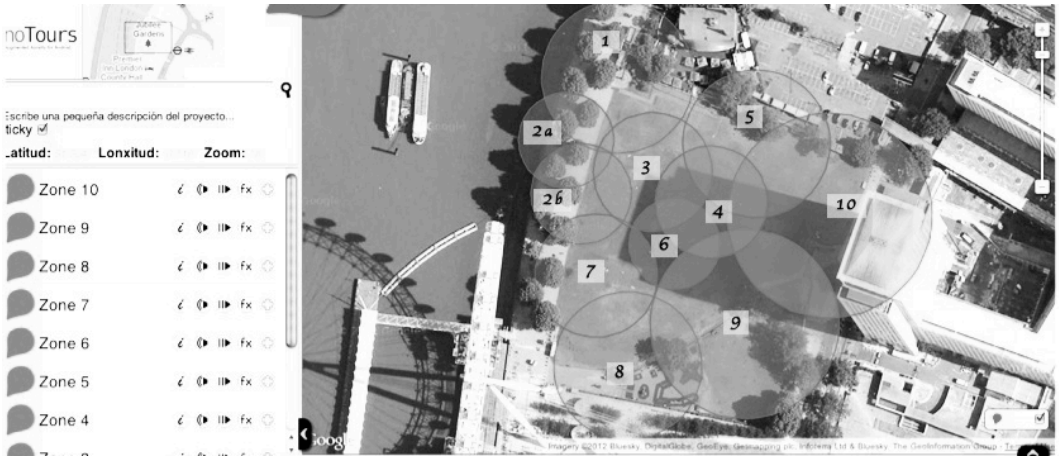


Figure 38: Sequentially numbered audio circles (*Take Me By The Hand*) at London Eye – abortive draft

Figure 38 shows a draft 2nd version of the music, transplanted and re-positioned to the area between the London Eye and Hungerford Bridge.[116] The web-based noTours editor relies on Google's satellite imagery which showed green space and wide promenades, belying the heavy building work in fact taking place. Due to the reduction in public space but high levels of human traffic, carousels, performers and hawkers, it was hard to move around and impossible to listen. I spent the night of 21 April re-situating the music between Hungerford Bridge and the Festival Pier, on the Festival Hall's riverfront.

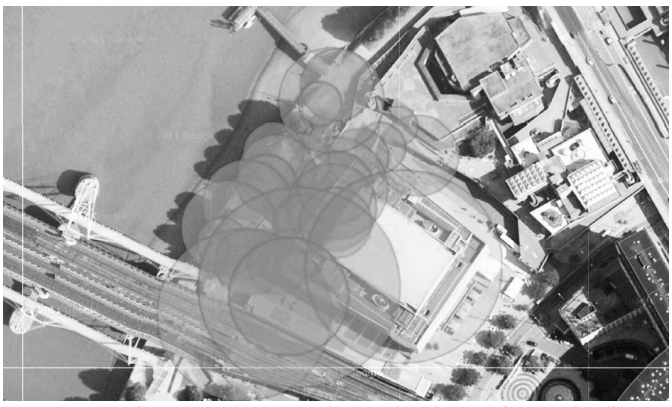


Figure 39: Geo-locating *Take Me By The Hand* to the Royal Festival Hall riverside. Completed soundwalk, April 2012

The music was the same but now compressed into a rougher configuration with certain surprises or incongruities, such as an underground train slowing into a station, the water and birds of the Highfield campus setting and recordings made at other parts of the SE1 location.

In the first soundwalk, the original music of the song could be formed by taking a circular route in either clockwise or counter-clockwise directions (the form being A-B-A and the musical elements from which the first and third verse were built, in acousmatic form, being identical).

The route taken by listeners was quickly understood to be dictated by their visual interpretation of the space and hence I set up a denser, less logically coherent arrangement of the elements of the music in the riverside setting.

The space was busy, long and narrow, bordered on one side by the Thames and on the other by restaurant terraces. Between these sides were steps, large concrete plant pots, food stalls, performers' pitches and crowds of both fluid and static humanity. Negotiating the space and discovering the auditory results were coincident and unrelated: each audition comprised a series of accidents of static duration, spatial proximity and overall route.

The 2012 geo-located setting at Highfield campus of *Take Me By The Hand* contains 56 circles with 44 unique audios (some duplicated). The area covered was around one hectare or 10,000 square metres.

Written in Water, composed in 2014, had 91 unique audios each attached to a single circle, over around 1 square kilometre (1 million square metres). This used large circles as foundations for diverse sound shapes of smaller circles within. Panning and spatial movement were essential for differentiation and clarity between multiple complex sounds, for example where spoken word had to be clear, regardless of volume fluctuations of simultaneous music playing in the encompassing circle.

As in the case of *Written in Water*, the St Paul's setting of *Take Me By The Hand* required the use of a busy urban environment as its place of audition. There the similarities end, however. St Pauls' Churchyard is visited by tens of thousands each day. Traffic, building work and tourism are in continual flow and the historic resonances of the centre of the oldest part of the capital are blended and reinvented through a 21st century prism of infotainment and the commercial imperative.

Here, the choral setting became an incidentally occurring element among the rich transient life of the place and these captured elements would form the larger part of the composition.

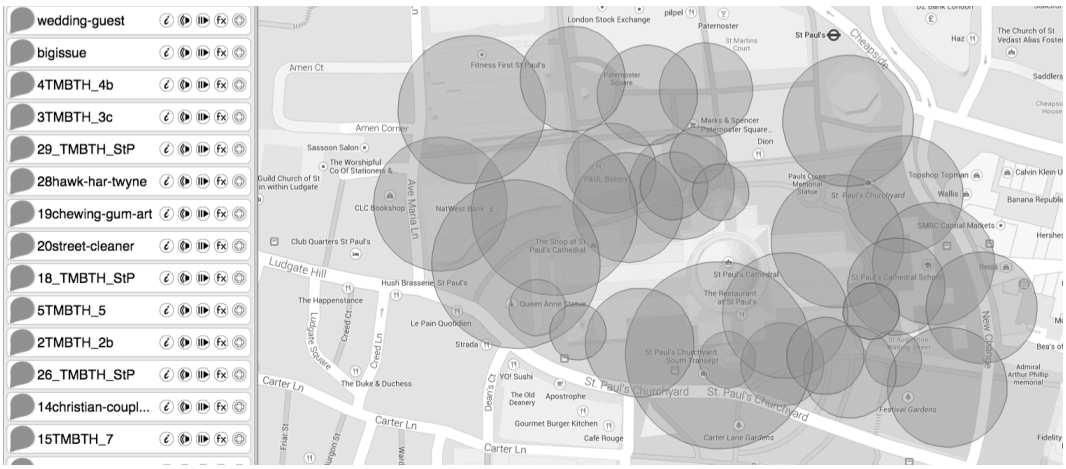


Figure 40: Geo-location of *Take Me By The Hand* to St Paul's Churchyard Soundwalk design interface

These elements would include historical re-enactors, young couples, policemen, shoppers up from the country, a street sweeper, tired protesters, a Big Issue seller, wedding guests, a policeman and an ambient flux of skateboarding, abuse, provocation, trading and confrontations captured from the sidelines with a concealed microphone.

In the locative composition process, a mimetic response (representation) to the setting (object) is structurally integral. The Platonic schema places imitative and transpositional forms of artistic representation at nearly the lowest position in the ontological hierarchy, which is exemplified by the shadow theatre in the cave. [117]

These forms are below objects in the physical world and their characteristics (at the highest level), their mathematical representation (secondary), their reduced representation in the artistic act of imitation (tertiary). Alone inferior to art are the shadows cast by it. In other words, art, as an abstract entity lacking in spatio-temporal dimensions can be argued not to exist, specifically according to the paradoxical conjunction of the following three proposals.

1) Works of art are created

2) works of art are abstract objects
3) abstract objects cannot be created

Advocates for and opponents of this knotty triad, or various combinations of it, are numerous. A survey of the discussion can be found at the Stanford History of the Ontology of Art Online but it is useful here to mention that there are those who agree uncritically with (a), those who would amend it to "and destroyed", thereby negating (b) and others who solve the problem by attenuating (c) from their considerations. [118]

If it may be said that the musical work (let us, at least at this moment, assume that such a thing may be said to exist) resides neither in the document representing it, nor its communication (performance), nor its experience or reception, can it be said to exist at all, beyond the abstract idea of it? And if not, then it is equally plausible to argue, according to Rudner, that Beethoven is not the composer of Beethoven's 5th Symphony because, as an abstraction, it cannot be said to have been brought into being? [119] These problems do not beset the identity of digital studio-originated composition in the same ways:

As a product of digital technology, composition is the sound itself. It has its forms of score, of relay (in recordings of 'performances', albeit by automata) and experience by listener, but the work is not the abstraction alluded to in the composer's notated score or strived for in the rehearsed performance.

It is the direct combination of sounds that characterises the digital-studio-originated composition and this can be quantified more or less in terms of the physics of sound. It is the emergence of these certainties of outcome – sonic outcomes, as distinct from ones of reception, which necessarily remain beyond the bounds of the artistic act – that create the urgency for new forms of ambiguation in the composition and listening processes.

Without the introduction of new unknowns, the allographic, transmutable nature of musical composition becomes indistinguishable from a recording of it, unalterable and therefore possible to know in all its limited

permutations. It risks being autographic, like the original painting or sculpture, of which only a single manifestation may exist, albeit in the case of sound, still intangible.

The geo-located virtual soundscape therefore at once seeks to subvert, by use of these fixed objects, and to reconfirm these conventionalist views in the processes of indeterminacy by which the experienced object is received. It achieves this through the necessity of interaction between object (physical setting) and representation of and response to it (in 'musical' and 'extra-musical' forms), correlating often indistinguishably to the object or setting itself, making object and its counterparts contrapuntal elements of a whole.[120]

While often called 'augmented reality', this act of intervention in - and appropriation, with all its sounding and reverberant properties, of - a space is in fact no such thing. It is entirely unreal, an artifice whose design is a response to its setting. It is art superimposed upon and contrapuntally connected with its locus, indivisible from the geo-locational conditions to which it is a response, where the

> neuropsychological laws of synaesthesia…evoke relations with musical, chromatic, olfactory, tactile, etc. sensations [121]

The purpose of working in this way is to explore the possibility of facilitating listeners' reception of sonic meaning where the sound objects used are not necessarily imbued by them with meaning or mimetic function other than as indicators of themselves.

I will illustrate this by way of analogy from extra-musical standpoints, but first refer to Hans Zender's suggestion that since "the emancipation of music from the sacral context", it has been isolated but also obtained "the opportunity of an incredible enrichment." (Enge, 2011).[122] Zender's proposal follows that

> "music's meaning is not to be found in the search for objective descriptions of musical forms but in the process of listening as the most informed (and responsible) vantage point for it." [123]

and therefore that listening should comprise a three-type progression: the

spontaneous, the reflexive and the interpretative. He cites the Buddhist psychological model of three *nen*, or stages of perception, "where the goal of meditation is a return to the primary stage of spontaneous perception", with the following as a primary justification:

> The listener compares, studies historical trends, recognizes relationships and connections. However, it seems that listening in the previously described sense, the achieving of the highest possible concentration, gets more difficult as the intellectual education increases. At the end of this development the listener appears as a glutton, as a spoiled gourmet, who only picks delicacies—or the listener as an archivist, who just categorizes and provides labels.[124]

In searching for new models on which to develop a compositional method for geo-location, for which I had access to no precedents, Zender's proposal, for a means to understanding music primarily based upon 'naïve' listening rather than contextual knowledge, was influential in rebuilding my compositional working methods. On reading Håvard Enge's article soon after its appearance online, and prior to beginning work with noTours software, I found these modes of thinking compelling in what they suggested about the compositional act as an unseen, even unperceived hand, guiding the listener towards the inner life of sounds and their sources.

In the Platonic Dialogues, the eponymous Cratylus argues for the intrinsic meaning of language, whereas Hermogenes posits a 'conventionalist' theory of the function of language within social processes. It is tempting to wonder whether, had they taken up Socrates' sardonic suggestion to take a walk together in the wild countryside, they would have arrived at some pre-Saussurian conception of 'signifiers' and 'signifieds' existing in the natural soundworld or would have concluded that only human utterance, and only of certain categories, can convey meaning of something beyond the sounds themselves.

Socrates' reduction to absurdity of Cratylus' position, for whom the very letters in words are intrinsically significative, is performatively refuted in compositional geo-location, by situating a composition in a space where it both counterpoints and reproduces that space. Synaesthetic listener experiences arise from their own response to the self-composing landscape

surrounding them, with its complex of arbitrary, conditioned neuro-psychological affects upon their perception and cognition of the location.

The constituent elements of the artifice, themselves a mimetic presentation of a musical object placed within a specific acoustical and sound-producing environment, are juxtaposed against the uncontrollable flux of the locus' sonic activity. Here, recursive and mutually cancelling expectations of signification are mutated into objects that state their sounding or reverberant natures. These are the parts that constitute the ambivalent, equivocal whole, resisting rhetorical narrative or signification: they amplify, counteract and reflect their situational setting.

The act of situational composition, as intended in the geo-located setting of *Take Me By The Hand* was to excite listener curiosity about the boundaries of compositional artifice and the arbitrary human noises of its physical setting. The blending of sonic artifice with constructed place does indeed augment neuropsychological responses of the participant within it and sonic structures can obtain unanticipated synaesthetic responses as a result, whether these be directly or associatively significative.[125]

The unifying elements of Highfield and St Paul's settings were the integration of self-composed with situation-specific found objects that by combination would reveal narratives both of moments (moments of sound capture, composition and listening) with continuities (continuing flow of change at the site, continuous composition or listening of which this exchange is a momentary glimpse).

Essential to the juxtaposition of geo-located sound with its physical situation is the invitation to a ludic view of, and interaction with, constructed landscape, after early Situationist Nieuwenhuis' proposal for

> "a ludic city dedicated to play, where 'creativity' becomes its own reward rather than a means for the accumulation of capital". [126]

The first iteration of the geo-located version contained only elements of the acousmatic composition. The singers' performances were re-constructible in a circular route (along designated pathways) from the exit of the concert

hall foyer where the acousmatic version had been heard. By moving clockwise around the paths in the gardens adjoining, the forward A1-B-A2 sequence could be approximately reconstructed, whereas by following a counter-clockwise route, a sequence approximating to hearing the acousmatic version in the order A2-B-A1 could be constructed by the listener.

In this configuration, the locative form mirrored the motion of the text, permitting along a circular path for the listener to experience its narrative sequence – interior thought, exterior conditions, interior thought – regardless of direction taken. While the acousmatic composition was constructed along developmental lines, the repetitions of verse three being a development of the musical ideas more simply stated at first, it was recognised that no analogue to the acousmatically delivered version could be achieved (particularly where verses one and three were juxtaposed) in a loop. This would have required the removal of verse three or the repetition of verse two, equally different in form from the loudspeaker-delivered version.

It further became evident that this structural totality made both the specific location and the situational placing of the music in general an irrelevance: there was no musical or narrative function to the placement of the sounds in this manner nor any interaction between singing voices and the sonic or functional characteristics of their physical setting.

Detailed inspection of the site followed, assessing topography, designated routes, full and partial physical occlusions that altered auditive cognition or prevented access, objects that made or could be used for making sound, occurrences or incursions into the space that occasion sound, the changing auditory activity throughout a day and at different periods of the year.

Developing through 14 complete revisions (March to November 2012, the soundmap extended from 21 to 56 circles incorporating the following:

- Footfalls crossing the listener or intersecting far-field
- Physically displaced birdlife and running water recorded at the site
- Conversations and footfalls in reverberant concrete environs of the

South Bank Centre
- Justin Knowles' steel columns (Highfield campus) struck with bare and ringed hands
- Transformed piano with attacks removed and decay elongated***127***
- Vintage delivery truck engine starting up, recorded underneath South Bank Centre
- Northern Line underground train passing from tunnel to station, recorded from within

With the exception of percussive playing of the Justin Knowles sculptures and importing pre-transformed piano sounds (also simulated, from a software instrument), no sounds were materially altered beyond their recognisable form. This was in keeping with pre-determined constraints upon the extent of manipulation of the recorded voices.

Hence the relationship between both realistic voices and life-like representation of ambience (whether of the situational space or from elsewhere) produced a subversive response to the site through juxtaposition of virtuality with the site's own perpetual auditory motion.

This was the experimental function of this instance of geo-locating *Take Me By The Hand*: by placing a musical composition virtually in a space whose designated function is not listening to music and combining it with representations of the space's sounds themselves, a confusion between reality and virtuality invites dilatory perception of the environmental setting, its functions, activities and people. ***128***

The diachronic presentation of anticipated temporal linearity permits dilated and repeated examination of the constituent parts of the choral elements while also performatively presenting problems of the 'identity' of an artwork. More than this deconstruction (or dereification or demotion) of the sonic artifice from the idea of a single, tangible and describable entity, the geo-location of the incongruous at an 'inappropriate' location interrogates the same qualities in the situational setting.

The 'musical' (sung, played) and 'extra-musical' (field recording) elements are constituents of the whole combined composition. Their overall compositional intent is at once to perform and to interrogate perceived forms of liveness, of performance and its setting, to question and disrupt

notions of “adequate modes of listening” and perceptually to dilate, distort or reconstitute meanings and identities of the space through auditory reframing of its evident, potential, latent or unintentional forms. [129]

This reframing occurs both through the incongruity of musical performance in the space and the re-presentation of aspects of the sounding place, altered in position, motion, volume.

Additional inclusion of alien sounds such as the decelerating Northern Line underground train, a vintage truck engine being started where there is no road, or footsteps from a more reverberant, urban setting than the place they are now heard, situates the space imaginatively somewhere liminal, less known than had been presumed.

The certainty of its function and solidity of its identity thus undermined, the physical and apparently immutable forms of architecture and landscaping become perceptual doorways to alternative imagined realities. Thus an enacted form of the textual ‘window’ described by Heaney is composed into the musical setting of the text and the mode of its interaction with the physical location of its audition. [130]

In contrast to the backmasking techniques of *The President* and more remote transformations within *Credo*, these juxtapositions invite forms of apophenia[131] or patternicity[132] in interpretation that draw upon, not only the sounds presented but, their combination with a fluctuating and unpredictable auditory setting which is made to engender unintentional artefacts. A common characteristic of visual, textual and sonic locative arts is the invitation to apophenial perception through the superimposition of fixed abstract artifice to situational fluxus. "Apophenia", the perception of connections and meanings in unrelated phenomena together was a term attributed by Peter Brugger to Klaus Conrad. [133]

It may also arise that such pareidolic experiences occur in the listener, which would be consistent with the compositional intent, to facilitate and open perceptual engagement with physical environment through inappropriate positioning of incongruous sonorities there. In scientific

research, the term has historically denoted problematic patterns of perception and interpretation. My usage relates by contrast to the later usage identified in Blom (2010): that of creating a potential for the subjective intelligence and sensibility of the individual listener to constitute a chosen and self-instigated quasi-narrative, albeit non-linear, from engagement with sonic superimpositions of non-communicative stimuli upon the ordinary auditory experience of a place.

Apophenial or, more generally, pareidolic responses may be interesting and not undesirable responses although these are not intended outcomes.[134]

The complete functional difference between the acousmatic and geo-located versions of *Take Me By The Hand* is that in the latter, its placement in landscape is an invitation to the listener to alter their psychological "Type II Errors" (failure to deduce patterns in occurrences) to "Type I Errors" (creating interpretative patterns where no meaning was intentionally communicated). These terms, borrowed from their more usual context of statistics and psychology, are altered in application here: the difference between these perceptions is exemplified in the article referenced below as (Type I) wrongful conviction of an innocent defendant and (Type II) failure to convict guilty defendant for lack of evidence.

As appropriated to the less literal domain of imaginative soundworlds, this has implications for the listener's reception of space through sound, to be transformed from one in which (Type II) no significative connection is made between sound-producing objects to (Type I) one in which unintended, unsignified affects are nonetheless imaginatively combined by the listener to create subjective meaning.[135]

An example of these forms of un-composed cognitive connections in the geo-located listener can be found in the remarks of a recent visitor to *Take Me By The Hand*:

> [As] I …. realise[d] how my movement affected the audio being played back, the interaction between audio and environment became more and more pronounced, eventually altering the course I would take through the piece. As I followed a river, hearing both the trickle of water in real time and as audio recorded at a different

> date; or as I walked amongst a group of people, unsure whether the footsteps I heard were coming from behind me or through headphones, it began to feel increasingly as though this was an experience being crafted solely for my own being, at this particular time, in this particular place. This is something that a musical composition has never offered to me before and I was surprised at the way I reacted…. I began to feel that the soundtrack was actively trying to point me in a certain direction. Naturally, I avoided the advice and continued up the hill, even consciously straying off path in an attempt to 'rebel' against any instruction. Coming to a gap between two buildings…. I was suddenly met with a wall of discordant choral voices. Determined to push on, I continued in the same direction for a short while, despite a very strong sense that I was being told to turn back the way I had come. Eventually this feeling of unease became too overwhelming to ignore and I did turn round. [136]

From the description of the composition as an 'accompaniment' to the landscape to the idea that the landscape had been sonically gamified, including listener instructions, inferences were expressed by this user which had not been considered until hearing them expressed.

(2) Audio Portrait of a City (2012)

Having worked with noTours to develop a landscape-based version of my acousmatic '*Take Me By The Hand*', this next project was conceived as a single citywide soundscape, with snapshots of Southampton in this time (2012-), a combination of sound artwork and archive, (interviews and field recordings).

After solitary early work, I recruited two volunteers to assist with interviews, field recording and sound editing/cataloguing. This initial material remains catalogued and ready for use but due to a lack of funding has not yet progressed to a geo-located version.

A collaboration was then established with Southampton Music Services to work with school groups. I delivered workshops on listening, soundscapes and interactive sound then followed these with a simple brief for the children to compose their own texts or songs in response to a particular location or theme.

The first completed section of the Portrait was built with children of Year 5 at Highfield CE Primary School and placed in Valley Gardens of Southampton University's Highfield Campus (known by the children as The Secret Garden). They wrote texts with a connection to the space. Stories, riddles and onomatopoeic group performances resulted from classroom work, which was then recorded, edited and allocated to circles across the garden.

As an extended elliptical shape, bisected longitudinally by running water and reed beds, a freely navigable soundscape (such as the neighbouring arrangement of *Take Me By The Hand*) was made impossible by the arrangement of the space. The shape and dimensions of the space's usable areas determined the placement and size of circles. In turn this was dictated by the limitations of GPS sensitivity at this location[137].

The soundwalk was arranged to cover the garden's entire area with the children's work combined into 18 circles combining 29 finally edited audio files (plus the surrounding soundtrack circle). As the space prevented a larger number of circles than this for effective GPS navigation, the shorter

audios were placed consecutively within a single audio track separated by a short silence, then played in endless loops during listener sojourn within a given circle.

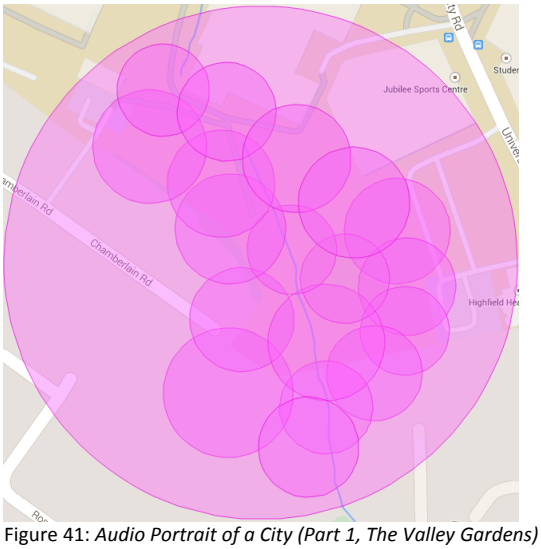


Figure 41: *Audio Portrait of a City (Part 1, The Valley Gardens)*

Calculation of the best fit for all material in as many discrete areas as possible was finalised thus (see Figure 42 below):

Zone name	Audio file	Combination of			
		1	2		
APS1_Unity	APS1_Circle1B.wav	Unifying layer covers whole soundwalk			
APS1_18	HCEP_27_FINAL.mp3	HCEP_27_FINAL.mp3			
APS1_17	HCEP_29_FINAL.mp3	HCEP_29_FINAL.mp3			5
APS1_16	HCEP_28_FINAL.mp3	HCEP_28_FINAL.mp3			unchanged
APS1_15	HCEP_30_FINAL.mp3	HCEP_30_FINAL.mp3			audios
APS1_14	HCEP_26_FINAL.mp3	HCEP_26_FINAL.mp3			
APS1_13	APS1_13_FINAL.mp3	HCEP_24_FINAL.mp3	HCEP_25_FINAL.mp3		
APS1_12	APS1_12_FINAL.mp3	HCEP_22_FINAL.mp3	HCEP_23_FINAL.mp3		zone formed
APS1_11	APS1_11_FINAL.mp3	HCEP_20_FINAL.mp3	HCEP_21_FINAL.mp3		of 2 consec
APS1_09	APS1_09_FINAL.mp3	HCEP_17_FINAL.mp3	HCEP_18_FINAL.mp3		audios
APS1_08	APS1_08_FINAL.mp3	HCEP_15_FINAL.mp3			unchanged
APS1_07	APS1_07_FINAL.mp3	HCEP_14_FINAL.mp3	HCEP_16_FINAL.mp3		
APS1_06	APS1_06_FINAL.mp3	HCEP_12_FINAL.mp3	HCEP_13_FINAL.mp3		
APS1_05	APS1_05_FINAL.mp3	HCEP_09_FINAL.mp3	HCEP_11_FINAL.mp3		zone formed
APS1_04	APS1_04_FINAL.mp3	HCEP_07_FINAL.mp3	HCEP_08_FINAL.mp3		of 2 consec
APS1_03	APS1_03_FINAL.mp3	HCEP_05_FINAL.mp3	HCEP_06_FINAL.mp3		audios
APS1_02	APS1_02_FINAL.mp3	HCEP_03_FINAL.mp3	HCEP_04_FINAL.mp3		
APS1_01	APS1_01_FINAL.mp3	HCEP_01_FINAL.mp3	HCEP_02_FINAL.mp3		
APS1_19	APS1_19_FINAL.mp3	HCEP_19_FINAL.mp3			unchanged

Figure 42: *Audio Portrait of a City, The Secret Garden*. Zones and their audio files

In the left column are the unique identifiers for each zone or virtual circle. Column two names the audio file allocated to each circle. Columns 3-5 indicate whether a single recording was used or if two were chained into a longer audio file. The audios' combination into circles was dependent solely on their duration, for all to be included in a limited physical space.

Circles took the following configuration, in which the numbering served for organisational purposes. As with all of my other geo-located soundscapes, the physical arrangement of the sound materials was not communicated to the audience but left for them to discover for themselves through exploration.

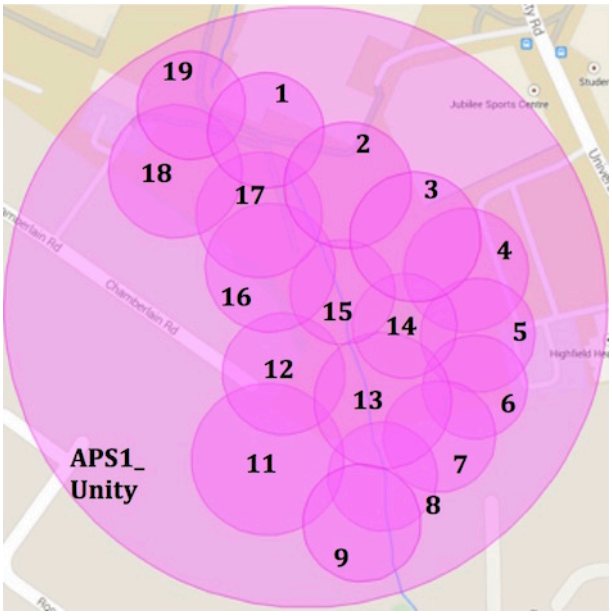


Figure 43: *Audio Portrait of a City (1: Secret Garden)* Final working audio map.

Considering the very young age of the participants and in anticipation of their inexperience of experimental or 'challenging' music, a single overarching circle was created as a simple symbolic unifier of the whole project. Stepping outside this outer boundary meant encountering silence, and therefore demarcated clearly the physical limits of the treated space. The musical materials within the boundary were tonal, melodically simple and rhythmically repetitive.

Created using the EXS24 sample library in Logic Studio, it was first conceived for the Southampton Youth Orchestra but the logistics of rehearsing and recording the music appeared to be beyond the scope or timescale of the project. In Figure 43, the surrounding circle and its smaller contained ones can be seen, each of which held either one or two of the children's poems, stories and onomatopoeic responses to the garden.

Investigating the responsiveness of the noTours software to movement in

this location, it was found that circles should have a radius of no less than around ten metres for them to be reliable. Therefore, given the overall dimensions of the garden, a maximum of 20 circles could be placed in the space without overlap of more than one third of their area.

To prevent blurring between sounds, rendering them indecipherable (particular in the case of speech), two features were integrated to each of circles. In Figure 44 below, a single circle's attributes are described.

The sexagesimal lat long GPS coordinates of the circle's centre and its radius in metres are specified and the type of circle and its behaviours or attributes are given. Here we see three specifications:

Pauseout: pause when listeners leaves, resume at same point on re-entry
Loop: once activated repeat until listeners leaves circle
Speaker: simulate loudspeaker (logarithmic amplitude increase toward centre)

Thus at its circumference a circle's sounds are significantly quieter than at its centre. This creates a motion-sensitive cross-fading behaviour between zones as listeners move through consecutive overlapped circles.

To also use the 'fade' function (for entering or exiting a circle) was found to create moments of inaudibility that during a medium or fast-paced exploration added an unwanted pulsing caused by constant volume fluctuations.

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        <title>APS1 01</title>
        <description></description>
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length="0" type="" />
        <pubDate>2012-12-18 06:32:46</pubDate>
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                <notours:level>0</notours:level>
                <notours:milestone>0</notours:milestone>
                <notours:soundsource>
        <notours:file>/sound/APS1 01 FINAL.mp3</notours:file>
                        <notours:volume>100</notours:volume>
                </notours:soundsource>
        </notours:soundpoint>
</item>
```

Figure 44: Code specifying a single noTours circle in the soundscape.rss file

For the children's peaceful and surreal vision of the garden to be successfully translated into a sonic experience, all such unpredictabilities or sudden changes were ensured against. Samples of the texts used can be seen in the following three Figures:

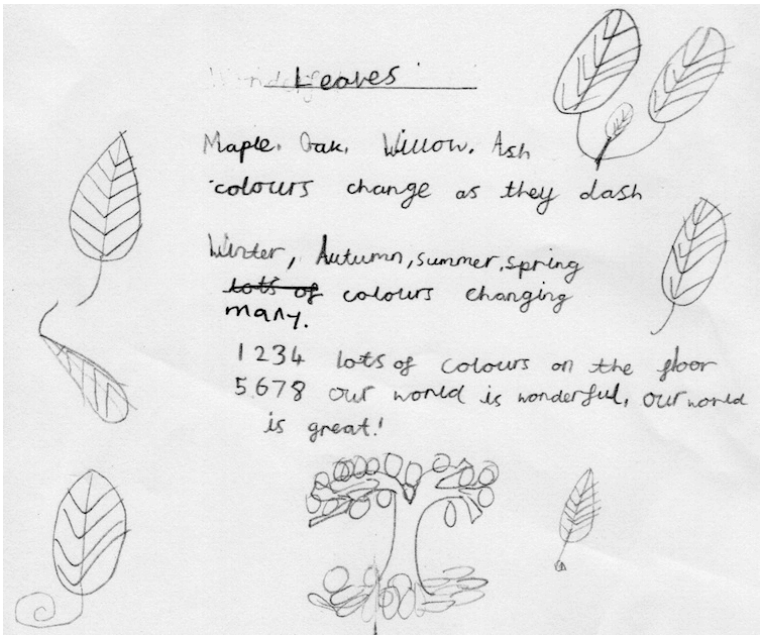


Figure 45: Highfield C of E Primary School: sample pupil text for Secret Garden

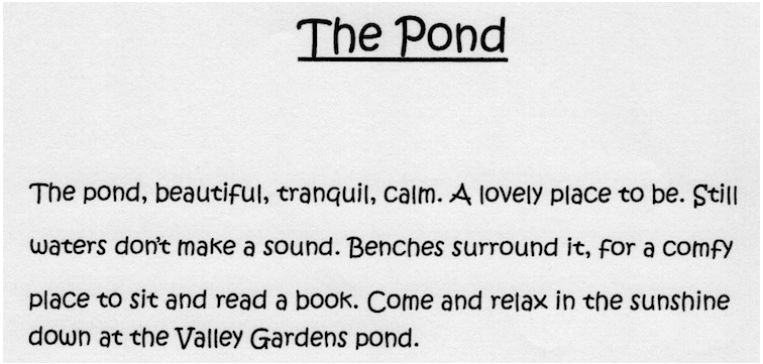


Figure 46: HCEP sample pupil text for Secret Garden

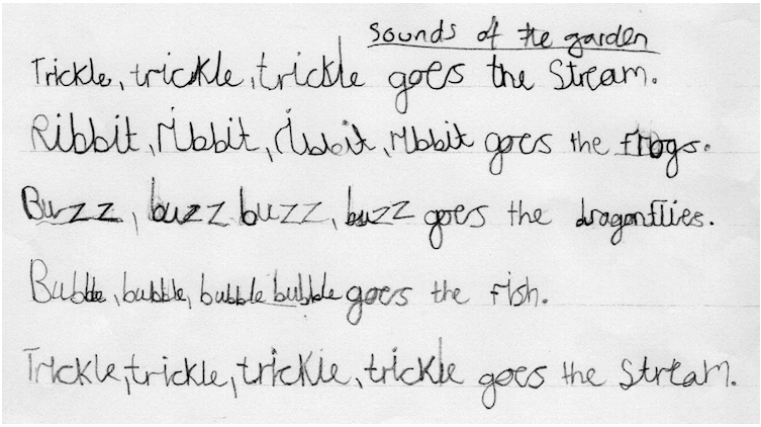

Sounds of the garden
Trickle, trickle, trickle goes the Stream.
Ribbit, Ribbit, Ribbit, Ribbit goes the Frogs.
Buzz, buzz buzz, buzz goes the dragonflies.
Bubble, bubble, bubble bubble goes the fish.
Trickle, trickle, trickle, trickle goes the Stream.

Figure 47: HCEP sample pupil text for Secret Garden

I recorded a child or group of children speaking or singing their own work. Where audio files were shorter than one minute, two of equal length were spliced into a single file which was allocated to a particular circle. In this way the size of circles and the duration of audio attached to each was consistent within a fairly narrow range. The purpose of this arranged consistency was for the children's content to be showcased in a simple and reliable way that would behave the same way for each listener.

A radio version recreates some of what one would hear from entering the gates and walking anti-clockwise around the garden. This iteration (at 2'07") is a much reduced, highly selective version of the whole, containing around 40 minutes of the children's audio material.

It is included in the Audio Appendix to the Portfolio on the accompanying SD drive.

The alternated panning that can be heard in this online version (hard left or right respectively) between the overlapping voices of consecutive circles on the soundwalk mirrors the presentation used in the landscape-based version. This permits for simultaneously unrelated speech to be differentiated. Separating the virtual space between the sounds relayed by headphones avoids potential problems of asynchrony caused by uncontrolled timing with which individuals navigate between virtual spaces.

Listeners only perceive these boundaries after having crossed them and therefore cannot know that they are about to activate new recordings from their onset.

The second section thus far completed involved work with the Year 5 children of Kane's Hill School, Southampton. Here, our theme (as chosen by the school music teacher) was "Family and Home". Again, from pupil-originated work, sound recordings were edited and combined with MIDI accompaniment – now for the children themselves, with a variety of virtual accompaniment settings in styles including the school carol and ballad to rap.

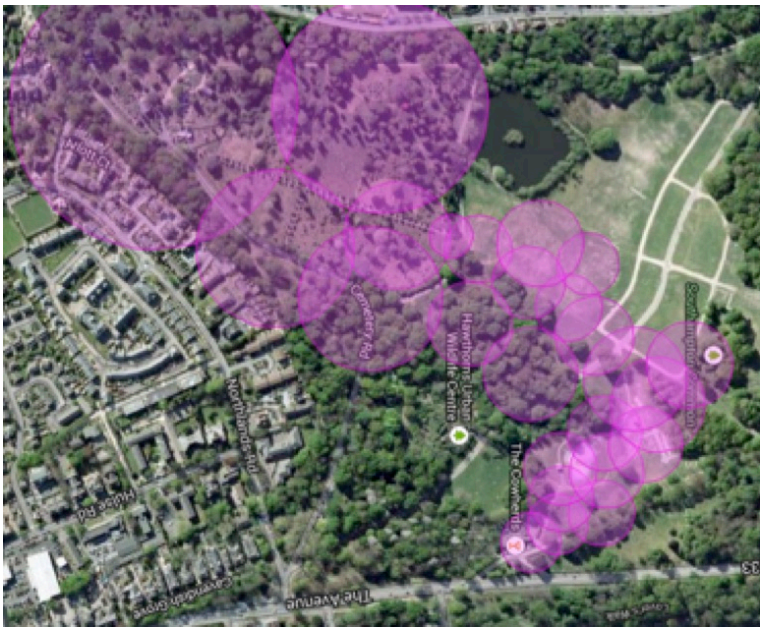


Figure 48: *Audio Portrait of a City (Part 2, "Family")* at Southampton Common

These two sections of the larger whole will be included within Southampton Festival 2016's *Audio Portrait of A City*, an unprecedentedly large-scale and physically extensive, collaborative geo-located composition, documentary and sound archive of the city's present and its living memory.

(3) 'Written in Water: Portrait of a Town' (2014)

This is the largest scale geo-located composition I have completed so far and in all ways the most challenging: without formal brief other than to portray something of the history and present-day character of Gosport, on the UK's Hampshire coast, of which I had no knowledge. The development work began with field recordings and interviews.

A small proportion of contacts invited to engage were willing to be interviewed or recorded and, as with the collection of incidental sounds of the Highfield and St Pauls settings of *Take Me By The Hand*, the people's accounts of their experiences of growing up, living or working in the town formed a significant layer of the composed work that resulted.

A maritime connection has been the principal agent of the towns; growth, development and former prosperity. These connections continue to inform its character with a tangible presence of the armed forces, particularly of naval bases, despite a sharp diminution of government commitment to defence spending in this region of Britain. The town's High St is a living picture of decay and the population evince the kind of casual apathy and despondency that drives the current trend in TV documentary making in the UK. [138]

With no brief, the process was driven by found sounds, categorised, manipulated and added to with archive recordings of broadcasts, propaganda and interviews. Sound effects from naval history DVDs and online film footage proved invaluable backdrops to abstracted sonic responses to the current and historic places, layered upon each other.

The different form of a municipal commission from a freely abstract work was that consideration must be given to the convenience of users – designated paths were used for delivery of clear narratives, such as the progress of WW2 from Chamberlain's announcement of the outbreak to Churchill's broadcast on VE Day.

Outlying regions heard my pareidolic responses to living and working in this quiet post-military peninsular, its barbed wire fences, high brick walls and

signs warning of danger and the howling winds across the mudflats of Workhouse Lake.

The work also included music performances recorded live, in concert, rehearsal and in the streets. Chance encounters, such as with a man who did not know I was recording and sang to me, provided happy accidentally discovered sounds.

Fog horns and clinking yacht masts, the perpetual whirring of a motorised security camera in an echoing metal column, the robotic intonation of recorded announcements and library MIDI music that the council use to entertain callers on hold, late night arguments and the clanking of the ferry harbour docking.

Dave the builder remembering wartime wireless broadcasts, the mayor's mother who recalled electricity outages whilst under the dentist's drill. The spoken recollection of a song from 60 years ago transformed into the song itself, distantly heard, overlapped then faded into a skiffle band performing at the diving museum.

Deep sea divers' helium-raised voices talking to ship control and the ambient sound of the submarine museum. A man who escaped domestic violence become a naval apprentice, working in the first British nuclear submarine, using the conning tower to break the ice at the North pole for a football game. The ex-marine who rediscovered his sanity through playing the trumpet. Marge, the unofficial duchess of Gosport, who as a teenager filled bombs at the munitions factory and had to find a way home through the back of the bakery during the D-Day embarkations. These were the primary materials, upon which composed music and ambient soundscapes were draped.

Further detail of the project is included in Appendix: Documenting geo-located composition, with description of two interactive online audio demos used to introduce geo-located composition to new audiences.

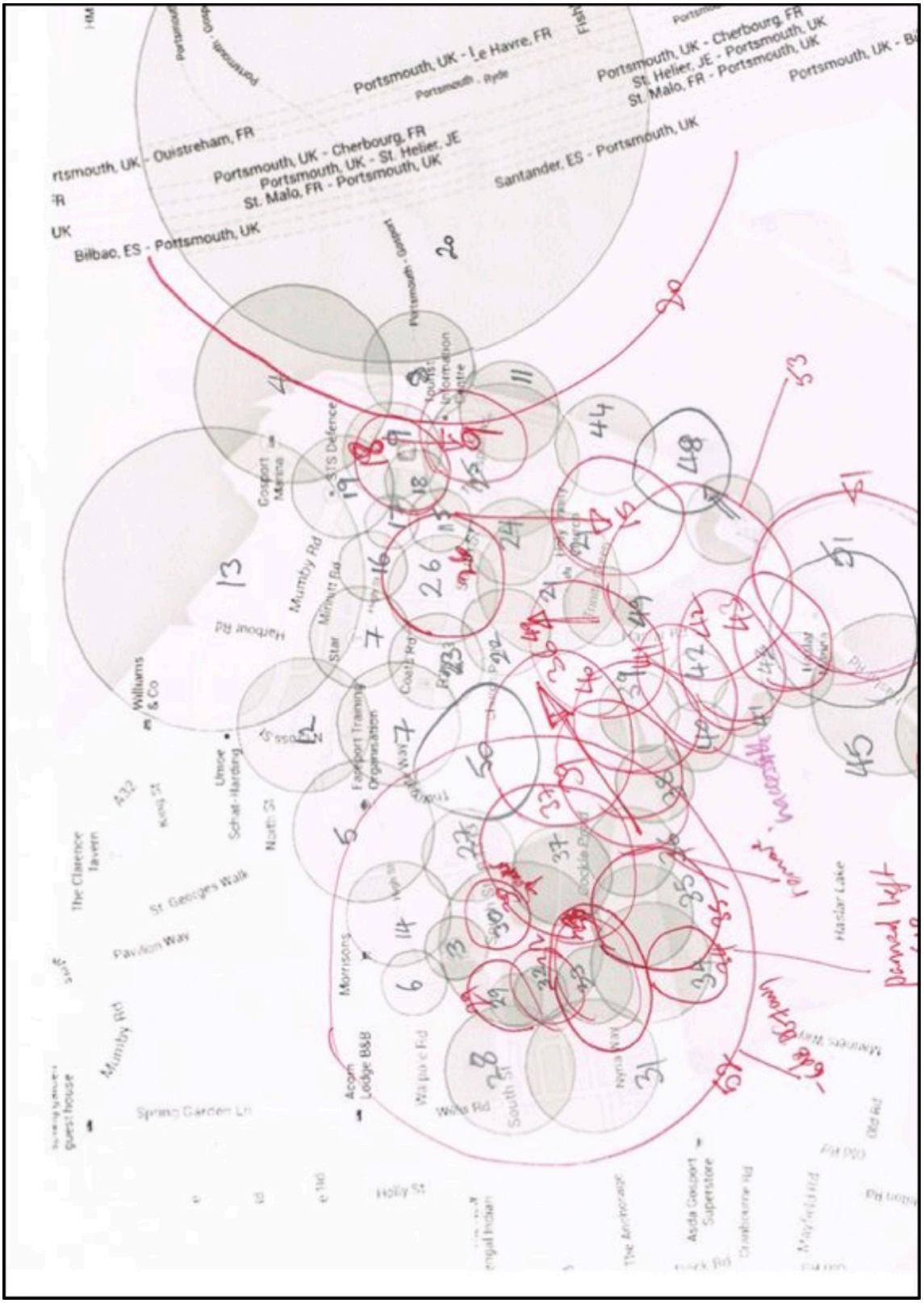


Figure 49: Geo-located soundscape *Written in Water* - sketch from work in progress (2014)

Postlude

Geo-located soundscape composition may also have an analogue in the Umweltforschung of Jakob von Uexküll, sometimes (erroneously) translated as "environmental research", but more properly rendered in the context of Uexküll's work as "research into self-world or subjective universe", a study of the cycles of "sense" (Sinn) and "meaning" (Bedeutung) of "life" (Leben) being studied (animal-consciousness of its environment), rather than 'subject' and 'object'.

> Uexküll believes, then, that a researcher can acquire some knowledge (Erkenntnis) of the subject by taking an objective look into this cycle. The genuine nature or meaning of the animal-subject's life will become manifest only once the researcher has entered, in his own thinking, into this circle; he will be trapped in the false knowledge imposed by his human judgment, or by the superimposition of human values. [139]

Still barely nascent as an art form, locative music will necessarily draw on such diverse sources for understanding of the new perceptual mechanisms at play in listeners' engagement with the sounds.

By way of more specifically musical terms, I outlined the rationale for such a compositional act in an online article, which is quoted in full in "Fluid Narratives of Virtual Music " (Appendix:3DBARE).

A consistent finding in all the geo-location projects was that a setting's own sonic character is so complex and subtle that any imported, composed music is identifiable as such and therefore can easily seem incongruous. Through a process of exploration as to how music could be spread across an outdoor space using GPS, the slow discovery thus made was that it is in the voice of the place itself that the most expressive and affective sonic experience is to be found.

Not only do the affordances of noTours software influence the soundscape composition process, to the extent that only an aura of the original remains identifiable, but by blending imported sound with manipulated situational sound, the most prominent result in each instance is a sonic accentuation of the situational setting and not, as originally envisaged, a revelation of the content of a musical composition, which task must fall, as previously posited, to the still nascent 3-D Binaural Audio Rendering Engine.

These compositional experiments have explored uses of physical space at once to elucidate constituent elements in a composition and to ambiguate boundaries between incidentally occurring reality and composed artifice.

Two aims shared by the *(Player-) Piano Studies* and *Dreaming at the Circular Ruins* were realistic simulation of human agency and the creation of music which is recognisably the same work when heard from differing or partial perspectives. The reduction of the *2nd and 4th Studies* to their essential elements and the invitation to the performer to reconstitute them is a temporal analogue to the spatialised baring of parts in *Dreaming at the Circular Ruins*, where listeners must create the heard entity by their own actions.

Manipulated found objects in the acousmatic compositions, changed into physically impossible versions of themselves were combined with unrelated other sources, either audio samples or performances simulated using MIDI. Questioning uses of physical and virtual space, to present music with indeterminacy as a principal feature of its reception, has developed my compositional strategies in ways I could not have anticipated.

noTours and geo-location gave opportunities to explore both indeterminacy and the blurring of the real and virtual. They also proved entirely different tools to the imagined one which inspired this research, which will permit listeners ingress to the inner workings of an entirely composed music, and whose indeterminacy of experience is in the mode of listening rather than that of composition.

Such a tool remains yet to be developed and the objective of this research, to develop compositional methods in preparation for such a way of listening, has been fulfilled in unexpected, promising ways toward that end.

Appendix: Technical planning for ROOM

Early provisional audio output mapping based on available equipment:

(1) 8 speaker output, 4 stereo signals
(a) MacBook to

USB audio interface (Alesis Multimix 8, 4 mono outputs only):
1st Yamaha dual stereo amp (as single stereo signal),
Left/Right (A) take Left input
Left/Right (B) take Right input

(b) PC to
USB audio interface (Alesis Multimix 8, 4 outputs only):
2nd Yamaha dual stereo amp (as single stereo signal),
Left/Right (A) take Left input
Left/Right (B) take Right input

(2) 13 speaker output, 9 distinct signals

(a) MacBook to
Imitation 5.1 surround config minus sub and Ls/Rs doubled/ spread

USB audio interface (Alesis Multimix 8, 4 outputs only):
1st Yamaha dual stereo amp (as single stereo signal),
Left / Right (A) take Left input,
L R
Left / Right (B) take Right input
L R
2nd Yamaha dual stereo amp (as single stereo signal),
Left / Right (A) take Left input,
Ls Rs
Left / Right (B) take Right input
Ls Rs
USB audio interface (Generic, 1 stereo output only):
C

(b) PC

Stereo output to Akai stereo amp 1
L R

(c) Zoom H1
Stereo output to Akai stereo amp 2
L R

Appendix: Technical notes on functionality of noTours

The platform

noTours' is comprised of a soundwalk design interface and an audio player which reads instructions from the interface-generated "soundscape.rss" file according to the GPS coordinates of the listener in motion.

The soundwalk design interface is a simple web-based xml-code generator, integrated with Google Maps, making map or satellite view of the terrain possible: both are required for different considerations. [140]

The user (soundwalk designer) zooms into the required location and selects "New Sound". A pink circle appears at the centre of the map image. This may be moved, enlarged or shrunk as required.

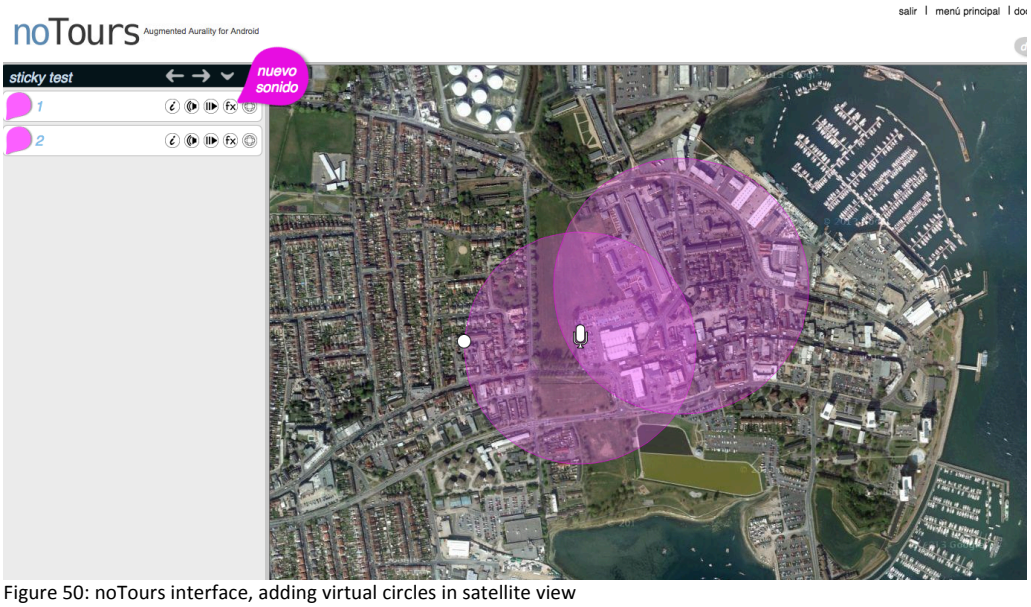


Figure 50: noTours interface, adding virtual circles in satellite view

The circle is identified by three numbers: longitude and latitude of centre point and radius in metres.



Figure 51: noTours interface, geo-location & size of an audio circle

Having specified the location and size of the circle, it must be named (e.g. circle 1) and associated with an audio file. The user continues to add circles with unique identifiers, assigning audio to each. Circles may either contain a unique or a shared audio file: behaviours of one circle do not affect those of others.



Figure 52: noTours interface, labelling a circle, allocating its audio

Any number of circles may be specified, of any size above around a 4 metre radius.[141] Circles may be discrete, connected, overlapped, concentric, of same or differing diameters. The circle diagram drawn over the map is a corresponding, sonic, representation of the landscape at the location, including instructions for how the sounds are relayed.

A circle may be a soundpoint or a soundscape. A soundpoint is a circle to which is attached a single audio file; a soundscape may contain up to four different audios or different productions of the same audio file, whose audibility is based upon gyroscopic measurement of listener orientation. This is the closest to binaural-type realism available with noTours.[142]

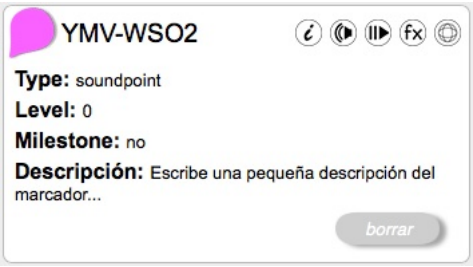


Figure 53: noTours interface, an audio circle's basic characteristics

The following features can be specified:

(1) Speaker-simulation: a virtual source at the centre of the circle is simulated, such that as the listener approaches the centre point the amplitude is increased.
(2) Vibrate: notify listener by handset vibration of entry/exit of a circle.[143]

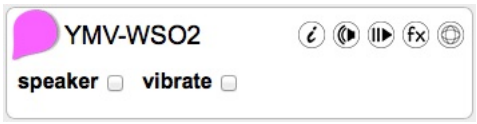


Figure 54: noTours interface, “speaker” and “vibrate” functions

(3) Fade-in/-out functions may be specified so that entering and/or leaving a circle, a 4 second fade is created, useful if adjacent sounds contain high contrast or sparse, variegated textures.
(4) Loop: a circle’s audio may be looped continuously or played once only.
(5) Pause/Play/Stop: On leaving a circle the attached audio may pause (resuming on re-entry), continue throughout rest of soundwalk regardless of listener position, or stop (to re-start on re-entry).

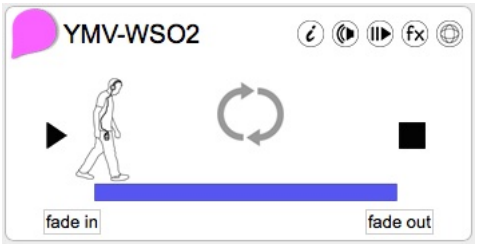


Figure 55: noTours interface, editing an audio circle’s behaviours

Appendix: Documenting geo-located composition

A simple, partial form by which to document landscape-based audio for unfamiliar listeners is a web version of the experience. I developed a rudimentary interactive online demo of *Written in Water* (see Figure 58). [144] This is replicated offline in the digital version of the Portfolio, at Appendix1.Written-in-Water_demo. The page includes a main body (static central text) and adapted, simplified representation of the town, surrounding water and virtual audio circles laid onto the landscape. (Compare with non-interactive soundscape design interface in Figure 62). Moving the cursor over an asterisk-marked circle in the map changes the text description (blue text above sound map, Figure 58). Clicking on the circle changes the content of an iframe to display relevant text and auto-starts an embedded audio file (a sample from the music composed for that location). Of the 91 virtual circles attached to the landscape, a sample of 9 were partially recreated for this demonstration:

Numbered circle	Embedded audio sample with title	Brief descriptive caption
(1)	Ostinato 2 *embed1_ostinato2.mp3*	On Clarence Rd a strange music gradually builds as if melting through the surrounding towers' walls.
(2)	Watermill Blues *embed2_watermill.mp3*	Victorian industrial machinery became a cabaret jazz rhythm section.
(3)	A random encounter in Stoke Road, Gosport, April 2013 *embed3_stoke-road-Till.mp3*	I met an old man on Stoke Rd, who sang me a love song from his youth.
(4)	Joanna, volunteer at Holy Trinity, talks about her church *embed4_reminiscence3.mp3*	Holy Trinity Church (1697), its organ played by Handel. Joanna loves the place dearly.
(5)	Montage of submariners and deep-sea divers at work (excerpt) *embed5_51_submus5.mp3*	Deep-sea diving equipment was invented in Gosport. Later it was home to submarine fleets.
(6)	Big Noise Community Samba Band (field recording at Ferry Gardens) *embed6_52_BigNoise1.mp3*	Big Noise Samba Community Percussion Band - 30 fantastic local drummers
(7)	Nat Gonella, "Shine", 1936, remixed (excerpt) *embed7_shine.mp3*	British jazz trumpet and singing star Nat Gonella lived in Gosport
(8)	Despite Gosport's pivotal role supplying the Navy, progress was slow and painful. Mrs Smith, 92, remembers. *embed8_reminiscence5.mp3*	92-year-old Mrs Smith, mother of a former Mayor talked about kids at the dentist during power outages
(9)	The magnificent Compton Cinema Organ at Thorngate Halls *embed9_6-RPB1-novello.mp3*	The amazing 1930s Compton Cinema Organ at Thorngate Halls is performed every month.

Figure 56: Online demo of geo-located composition function in landscape with 9 audio samples

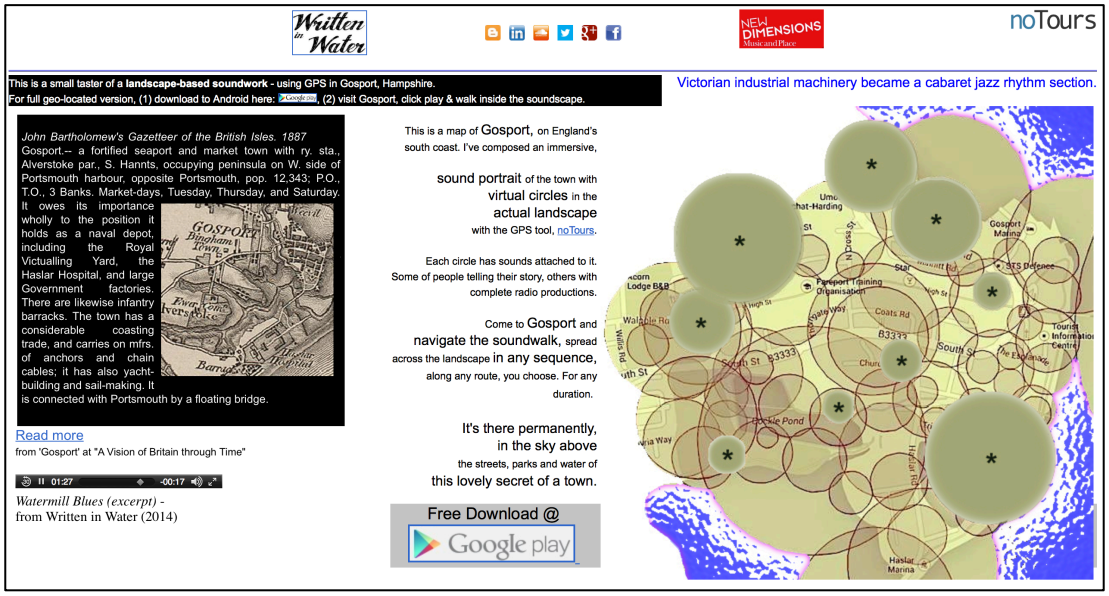


Figure 57: Interactive online demo of *Written in Water* (1) at benjaminmawson.com

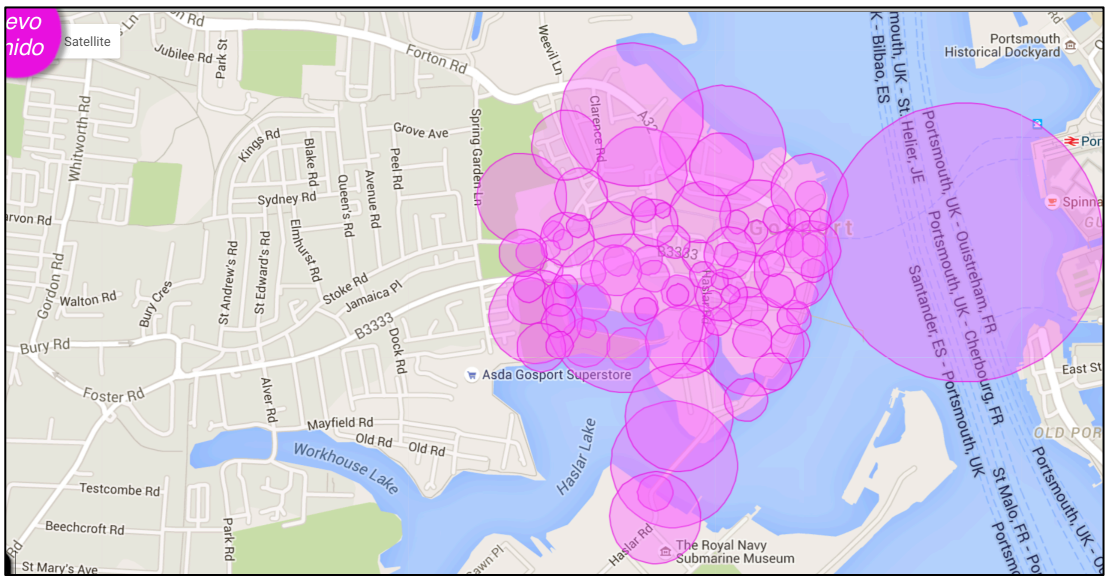


Figure 58: noTours soundmap editing interface, virtual audio circles laid onto the landscape

The New Dimensions web demo of Written in Water can be seen here below (Figure 60), based upon my original in Figure 58.

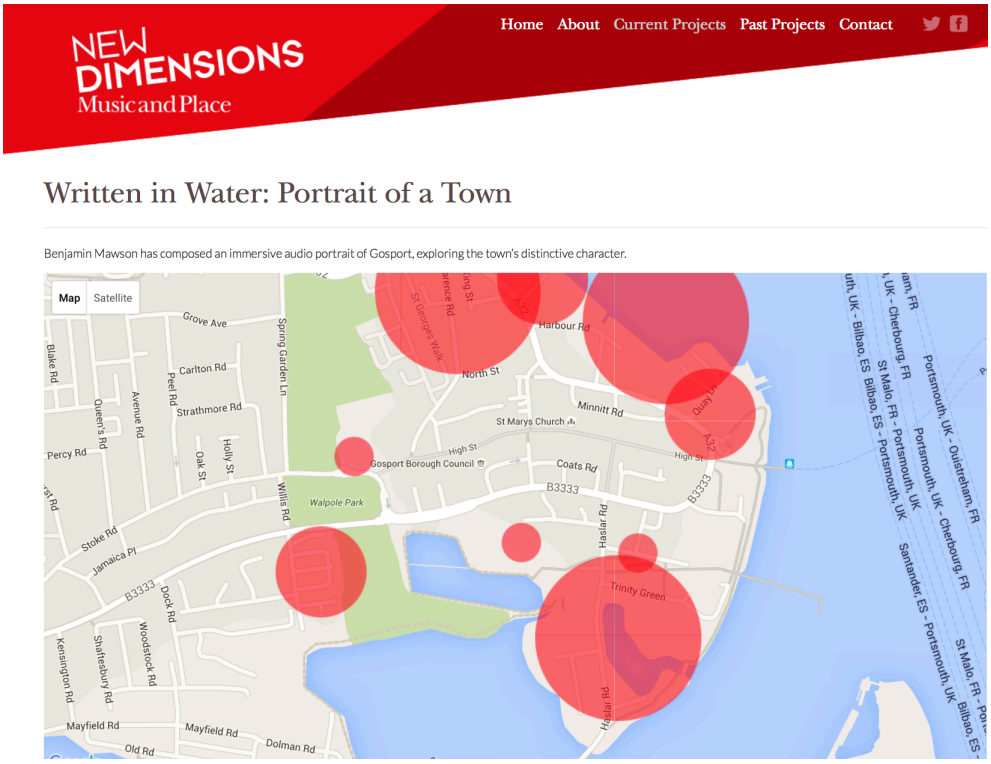


Figure 59: Interactive online demo of *Written in Water* (2) at newdimensions.org.uk

Clicking on red circles produces a pop-up window with captioned remote audio file at external service provider, soundcloud.com.

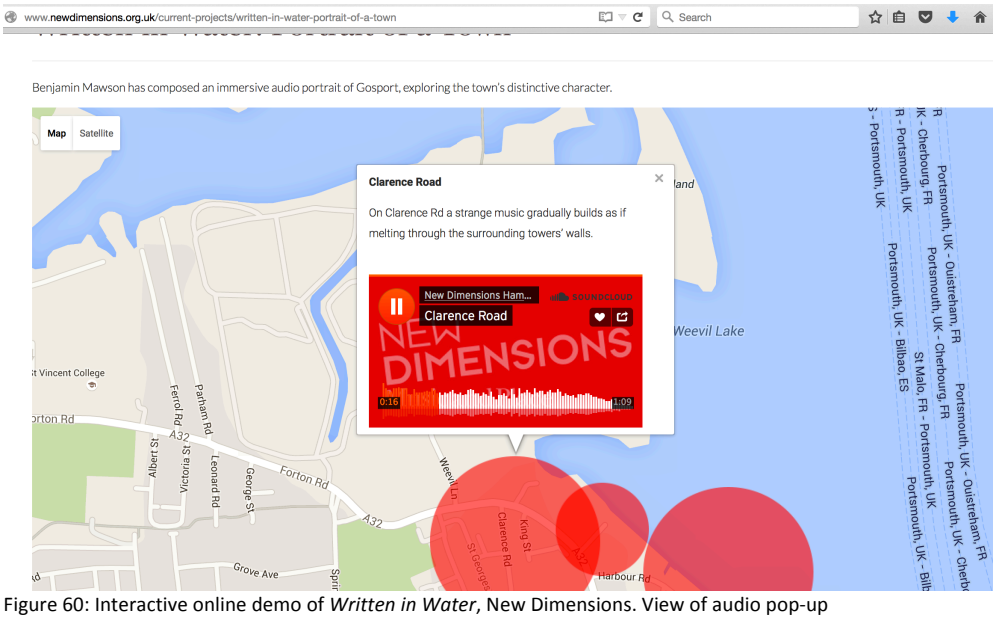


Figure 60: Interactive online demo of *Written in Water*, New Dimensions. View of audio pop-up

Appendix: Written in Water interview, BBC Radio

KM: Katie Martin with you across the South here on BBC Radio Solent. Now, how would a composer paint a picture of a town, without a canvas and paints, but instead using voices and memories and music [plays preview excerpt]… sounds absolutely fascinating, and really interesting to know how people feel about where they live, and to hear those thoughts and feelings in such a creative context. Well the thoughts and memories and viewpoints of people in Gosport have been bound together by a composer from Southampton to create an 'audio portrait of the town. Ben Mawson can tell you all about "Written in Water: Portrait of a Town". Welcome along.

BM: Thank you Katie, nice to be here.

KM: Really great to have you here, now tell me a little bit about the project. How did you become involved with this, or is it all your idea?

BM: Well, I've been working with this tool called noTours which uses GPS to allow people to walk in the landscape and listen to sound for a couple of years and it was a commission from New Dimensions which is Hampshire County Council-based and the brilliant Kevin Appleby of Turner Sims Concert Hall was the person who put this together in the first place and what was scary was I had a completely free rein: there was no brief. They said "paint the landscape with sound and make it a portrait of the town". And so I met people, I interviewed them, I recorded the ferry, the birds, the streets and, as I compiled this material, I started to see how it told stories. And to edit and composite it. And then the exciting part was putting circles in the landscape, going outside and seeing how they worked when they overlapped. So you walk along the High St with a handset, or along the waterfront, through the parks and there are ninety-one circles now in the landscape, each of which is a multi-channel kind of little production in itself but they are made to overlap with each other in ways so that the sequence that you hear is impossible to predict, if you didn't build it. I know, but…

KM: So what exactly is a circle in the landscape then? Is it a physical thing that you can go and visit?

BM: No, it's invisibly hung above the landscape. It's an imaginary circle, but the GPS on your handset says "okay, so you are now in a circle - an imaginary circle - with this radius at these points,

KM: Right..

BM: and we'll therefore play this track to the listener. So, the software which I use to build this: I make these circles on a map and I put sounds there and I tell them how to behave and then I download them onto the handset. The handset finds the satellites in outer space and it knows where you are and it plays the sounds to you according to your movement. So yesterday, at the launch, we sent people off in all different directions, different routes through the parks and open spaces and they all came back with a different story of what they'd heard. Very exciting to watch people using it because you have to let the thing go. It just becomes…

KM: Definitely, and I suppose it's entirely up to the audience member, as it were, the listener to the direction they go in, how long they stay in a certain place, which order they might visit certain circles, so it's completely different every time somebody uses it…

BM: Yes it is. And there's an awful lot of material. So what I've done is create the possibility for you to sit down on a bench and hear a particular story or a particular sequence of events so, perhaps you should tell me.. I don't know whether I should let people know where those spots are, if they should find them themselves

KM: I think maybe yeah, I think let people find them themselves, I think…. well, how will they find out whereabouts they are? Have you got a website that then people… or will people come along and find out some information….so they know which direction, vaguely, to go in.

BM: Yeah. Of course, well, we've got my own website, benjaminmawson.com has some links to the project on soundcloud and on Facebook of course so we're delighted to have lots of people 'liking' the page, but if you come to the Discovery Centre you can pick up a handset and borrow it for free and walk around the landscape for as long as you like and, in a couple of weeks time, we're going to have the whole thing as a bundle on the Google Play Store, so you can download the software to your Android phone, for free, then you can visit the place and walk in the landscape.

KM: So, will that last forever then?

BM: Yup.

KM: That's quite cool, isn't it? To know that you don't just have to be part of something while the exhibition is going on, that those stories are recorded and are now a digital archive, for that town, ongoing! Why Gosport, if you don't mind me asking?

BM: Well, it's one of four towns that got a budget from New Dimensions so I was asked to do this project and it's unique amongst the things that New Dimensions are doing. And indeed there isn't that much GPS-based, geo-located music in the country at the moment, but we're working to expand that. We're hoping to build circles eventually all over the UK.

KM: And when you were going round collecting the stories and the memories we've heard on a few occasions during the programme this afternoon, times when you've asked people 'what do you think of Gosport?" or 'how do you feel about Gosport?" and they've not held back in telling you what they think, so why did you choose to ask that question in particular?

BM: Well, I didn't know the town at all, until I started working there. So I was asking people to tell me what their experience of the place was. Really more in the hope…I, I always have a sound recorder and I go around talking to people and picking up wonderful sounds like the security cameras with their echoing mechanics and the sound of the ferry taking off… but then when I started talking to people, the real story was in fact not the noises of the place, which are themselves distinct but how people describe where they are, when they're put on the spot…

KM: Hmm

BM: They don't know who they're talking to and they just speak very freely, and then I met some wonderful people who were members of different community volunteer groups who talked to me much more personally about experience, about their life in the town. I spoke with an old submariner who had at the age of fifteen found himself driving the first nuclear submarine, so I heard these extraordinary stories and one of my favourite moments was when an old man walked up to me on Stoke Rd and simply sang to me. And I had my Zoom in my pocket and just picked it up. I've tried to find out who he was, but can't. And he sang the most wonderful Tom Jones song to me for thirty seconds and disappeared.

KM: (laughs) Wow, I mean I suppose it's one of those things isn't it that you might, in your lifetime be sat down on a park bench and strike up a conversation with the person sat next to you and they might tell you a wonderful story, or, you might not, they might not, you might never bump into them, but now, this digital circle as you say exists above said park bench, anybody can go there and meet that person, virtually, any time they like can't they?

BM: That's right, and when you record a place at a certain time of year, as I have in Spring, if you go back there in Winter, you have the real place and an imaginary version of it

superimposed so it's very strange, listening to the bustle of the market at two in the morning on the empty High Street is very interesting and I've been walking around every night, in the dark, testing my circles, because it's the only time you can hear everything with real clarity and…

KM: (laughs) You don't!

BM: …and I kept really alarming myself…

KM: I was going to say aren't people going "oh that fella's back again"?

BM: (laughs) Absolutely, I think I've got some strange looks!

KM: Is that a Zoom in your pocket or are you just hanging around in the park? Er, is, is, well, actually sorry carry on I interrupted you. So you've been testing things out to make sure that they're going to work?

BM: Yeah, absolutely. You do a day's work and then you go out and you spend a couple of hours walking and noting what's wrong, what's working. And you come back and do it again. And I've been doing this for hundreds of days and it's done and it's out there! And I'm thrilled with the response that we've had so far because…. the great challenge of this was that it wasn't an original composition. It was about collecting people's opinions, their feelings, their expression of themselves and finding a way to represent those truthfully and to, to honour the people who just helped make it the project it is. I feel enormously grateful for dozens of people just being willing to be involved in it.

KM: It's really nice as well that it's about a town which is right next door to a city. And it would be very easy to do it about Portsmouth. Or to come back down the road and do it about Southampton, or maybe to go to one of the big tourist resorts, Weymouth, Bournemouth or one of the resorts on the Isle of Wight and do it about there. But actually it's about Gosport, which is…just where people live.

BM: Well, it is, in some ways just where people live, but it's…. What's been interesting about this project has been digging below the surface of what the town is in order to see what makes it so particular. It's… it was recognised a thousand years ago as a borough and its long history involves close connection with the Navy of course and so they were supplying the Navy. They were making barrels, making rope. They were loading tobacco and meat and wine and brandy onto ships for hundreds of years. And the Navy have been training there. They… they D-Day troops embarked from Priddy's Hard in Portsmouth Harbour, so there's a story by Marge, who was seventeen when she worked in the bomb factory, filling shells with TNT and then pushing these enormous heavy carts down to the docks, and she tried to get home when the D-Day troops were preparing to launch off to France and she couldn't get into her house and she had to find a way through the bakery. She told me this story over a long interview, one of many very funny things she told me about and to be able to put Marge back into the landscape, talking about the places where seventy or eighty years she particular experiences. It's, it's very moving to see people's response to these things, watching listeners stop at a certain street corner and just smile with pleasure at the surprise that they're hearing…

KM: Well, it sounds as though it's going to make many people as you say smile and also many people think about where they are and, and how much more Gosport has to offer and the, the long and important history that it has, er, as you say, when people listen to your stories, when they visit the various circles, er, around the town. So just remind people where they need to go, in order to pick up one of your little audio devices?

BM: Well, anybody who's got an Android phone can go to the Google Play Store any time after the 8th of May and they'll be able to download it for free. Er, if they haven't got an Android phone or they just want an easy option they can go to the Discovery Centre which

is the big library/museum next to the Town Hall on the High St, and there's free parking, which is one of the benefits of a small town…

KM: Always good…

BM: Actually, the quick way to get there is to go to Portsmouth on the train and get the lovely ferry and then if you've got your own phone, you can hear my bonus secret circle which hangs above the harbour. You can only hear it on the ferry.

KM: Sounds wonderful. Well, it's really great to have you on the programme and than you very much for coming in to tell us all about "Written in Water: Portrait of a Town", Ben Mawson, thank you.

BM: Thank you so much Katie.

[Jingle]

KM: What's happening in the South? Let's take a look ahead to tomorrow. Here's Sam and "The Guide".

The audio recording of this interview can be heard at https://soundcloud.com/benjamin_mawson/written-in-water-bbc-radio-solent

Two audio previews were released prior to launch and these can also be heard at the above SoundCloud account. These and the radio version of *Written in Water* are included on the accompanying USB audio files drive, in the supplementary audio files section.

Further commissioning body and tourist information webpages:
www.newdimensions.org.uk/written-in-water-portrait-of-a-town
http://www.gosportheritage.co.uk/written-in-water-portait-of-a-town/

Appendix: 3DBARE (3D Binaural Audio Rendering Engine)

3DBARE: pronounced 'threadbare"

Evidence of artifice embodied in loudspeaker delivery is an obstacle to immersive auditory illusion. It follows a concert-hall-based model for presentation of musical composition as a 'thing' to an impassive audience, albeit with little or nothing to see. In virtual delivery, magnification of detail and of scale is possible such as in the listener's perceptual distances from sounds.

In electroacoustic music, decades of experimental research and development have created numerous diverse solutions for real-time sound diffusion. Accessibility of platforms such as MAX/MSP has enabled a vast range of solutions for spatial sound in the electroacoustic domain, such as recent work by David Berezan (the 'Flux' system) and Erik Nystrom (Synthesis of Spatial Texture Topology in Composition and Performance).

In these scenarios and others such as York University Experimental Electronic Music Studio's early work on ambiphonics and, more recently, Southampton University's I.S.V.R. collaborating with Huawei to develop a giant spherical 40 loudspeaker 'super-surround-sound system', the focus is on uses of sound spatialisation to differentiate textures and create individuated interactivity. Galaxy Studios, Belgium have developed the Auro-3D system which creates an 11:1 audio mix for very high resolution spatialisation in music and film audio production.

In Chapter 1 I covered some of the essential differences between loudspeaker-based and headphone-based listening.

The difference between these systems and 3DBARE is in the replacement of complex hardware with a small device such as Android or iPhone handset (placed in the pocket and forgotten by the user).

This permits a number of departures. Firstly, virtualisation of directional

sound (retaining its putative physical position in the space, via real-time listener tracking control) to individual listeners makes each individual's experience different according to their choices of movement, stasis and orientation. Secondly, by virtualising sources it is possible to move between virtual environments of audition. An example of this would be the simulation of an occlusion between two imaginary spaces, achieved purely through different BRIR filters imposed at certain coordinates. Moving two metres across an empty room, the listener emerges acoustically speaking from a tiled corridor to wide rocky valley. The simulation of these or any other environments is only possible in generalised forms using loudspeaker systems.

Loudspeaker-listening is characterised by unavoidably audible bleed between outputs, a shared temporal experience by all and the impossibility of gamifying the listening experience. Combined with logistical simplicity, affordability and greater access, the case is shown for 3DBARE's unique offering of truly immersive, interactive experience of virtual music.

In the case of simulating acoustic performance, rather than relaying the palpable artificiality of the electroacoustic, significant new challenges arise. To name three: the vast detail in variance between multiple voices of a part[145]; real-time response of the virtual environment according to source and listener position; congruent interplay between lines whose isolated combination would be inaudible in the entire sound previously heard.

The possibility emerges of hearing new combinations of individual versions of a part (e.g. the first violins section or a soloist), such that on consecutive auditions the listener may familiarise with the minutest constituents of the whole, gradually familiarising with the sound world in the detailed stages of which a unique musical experience occurs. See Note 52.

It thus becomes possible to make audition of digitally created music at once unique and unrepeatable. In resolving that these experiments would be performed by machines, experimental paths were taken that would have been profoundly different to the virtualisation of live-recorded sound.

The most detailed possible prescription of inflection, phrasing and the most realistic available sampled instruments were used. The scale of work to make simulation truly credible is vast. Each instrumental part will be allocated to a unique channel and the performance will be re-built with the closest achievable simulation of the instrument's variable timbres, attacks, decays and sustains. Each part will be a simulacrum of an orchestral player. The number of audio channels will subsequently be reduced such that on a given output two or more players of the same part will be grouped.

Contrary to current mainstream thought, influenced by Varèse, Russolo et al, 3DBARE is a proposal for technological means to accomplish ostensibly in the real world that which was impossible without the affordances of the digital. A philosophy of technology's requirement of its own new artistic languages has been perpetuated without effective challenge to the point that it is now assumed to be self-evident that, as stated by Bonacic:

> "[the] computer must not remain merely a tool for the simulation of what exists in a new form. It should not be used for painting in the way that Piet Mondrian did, or for composing like Ludwig van Beethoven. The computer gives us a new substance; it reveals a new world before our eyes. In that new world, after many years, scientists and artists will meet again, driven by a common desire for cognizance." Bonacic's reference to Mondrian was a critique of Michael Noll's experiment with a computer-generated Mondrian-like drawing.[146]

Since fewer listeners have yet experienced Mozart's Requiem from behind the timpani than in serried ranks behind the conductor, they have not yet had the chance to consider the potential for renewed perspectives on music which they assume from current modes of listening to be familiar.

Current development of 3DBARE

A screen based user-interface running in Processing permits the soundscape designer to position the individual tracks of an ensemble around a virtual space, viewed as a floor plan.

The UI sends real-time coordinates and orientation of listener avatar to a MAX patch combining open source MAX/MSP binaural audio rendering objects. The listener moves and rotates their screen avatar to virtually move between the sounds as though spread in two horizontal dimensions.

The relay is currently 'free field' although some light reverb has been added to the tracks used as demonstration material.

Modelling of the early and late responses of specified types and dimensions of space will follow and the system will ultimately be ported to iOS for Bluetooth-tracking of listener handsets. A beta version is currently under preparation for demonstration early next year.

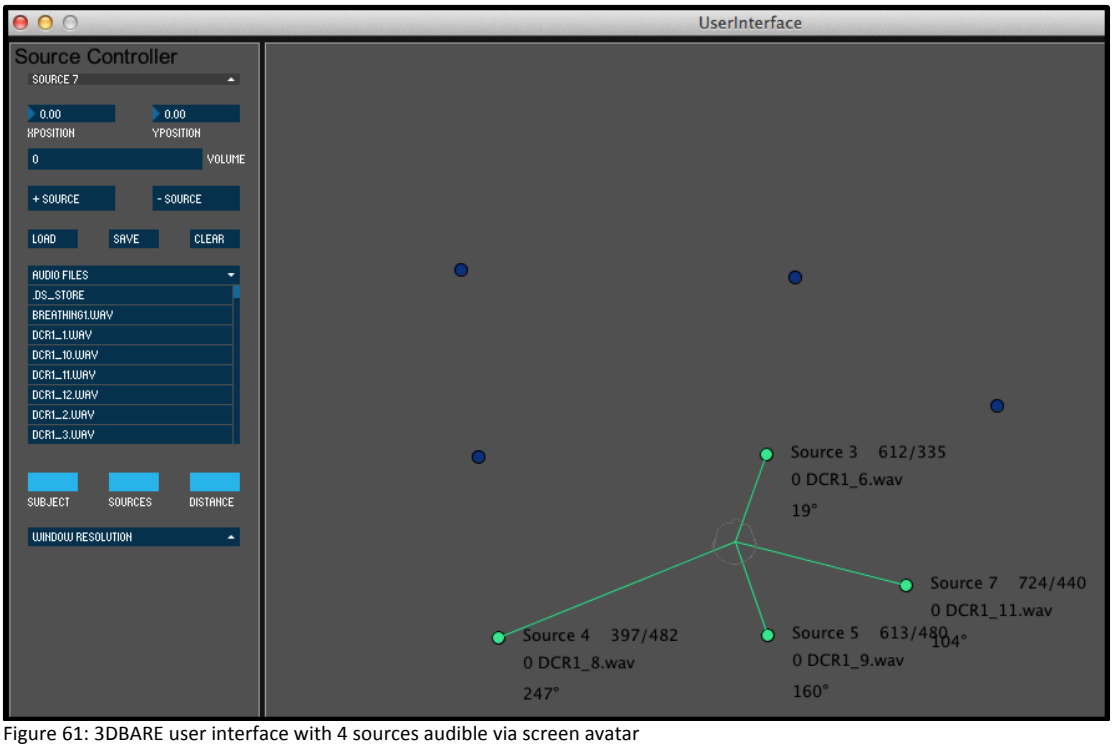


Figure 61: 3DBARE user interface with 4 sources audible via screen avatar

In the left section of the interface (Figure 61) audio sources are specified and added to the listening space (main screen area). This is a hypothetical space seen from above, where the avatar (at apex) hears four sources. Movement towards/away from a sound fades it in/out. All sources play from the start concurrently, like a live performance. Distance at which sounds become inaudible is changeable and sounds' positions can be changed. The audition space size may be specified according to requirements. In the following pages are articles written for the Web to explain the musical purpose behind the concept of 3DBARE and more generally, of Virtual Performance.

The screen captures in Figure 61 and Figure 62 show the current iteration of 3DBARE's user interface. The green dot at apex of radial lines shows the user's avatar listener. As the avatar is moved, the twelve pianos playing *Dreaming at the Circular Ruins* 1 can be approached and heard to the exclusion of further away performers.

With between four and seven of the parts audible in this configuration, the listener hears a selective version of a whole too complex to differentiate at once. If she is stationary, only those parts shown by radial lines will be heard. Combinations of static and moving listening create unique and irreplicable versions of the music on each détournement.

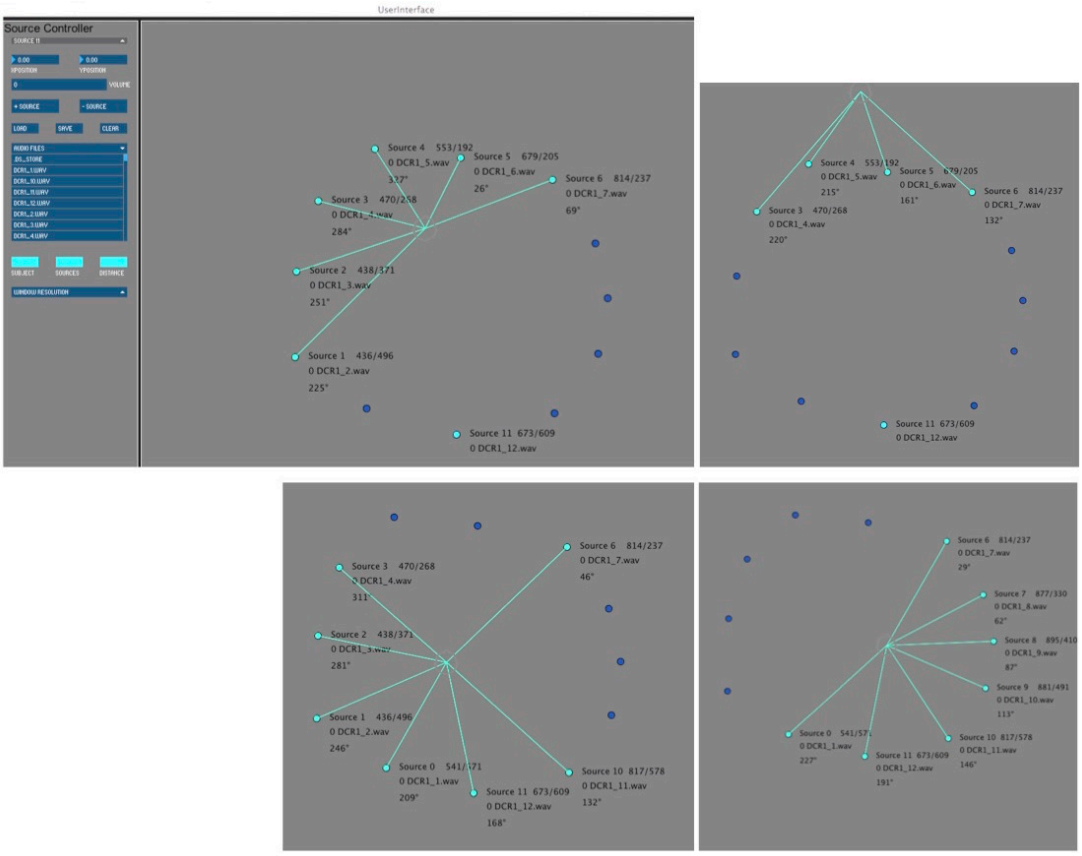


Figure 62: 3DBARE UI. As avatar is moved, listener isolates/amplifies separate parts

3DBARE and Virtual Music Performance

Virtual Performance: a way of making things seem to be happening that are not.

When I work on a new piece of music, whether in manuscript or in a digital studio, like almost every other composer in the world, I wonder if and how it will be performed and consider ways to do this.

A significant problem for the relationship between composers and audiences is the general decline of concert-going.

Most of us own an iPod or a music-playing phone. Since the Sony Walkman in the 1980s, private listening on the move has been a norm for millions of music listeners.

There are still two cultures of music listening but live music listening, already a minority activity, continues to lose ground to digital media.

If I want to hear Azeri mughams or the Louis Armstrong Hot Five or Richter playing Chopin, I have YouTube, iTunes, Spotify, Yandex, Bleep. . . A universe of free recorded music instantly available on demand to flick through, glance at, stockpile. . . but this can lack two crucial elements:

- the meditative transport of sonic immersion in a complete musical work

- the experience of being in an audience, listening collectively with others.

For many reasons, both practical and aesthetic, composers are creating music in a digital format, and increasingly for sole release via download.

My work is partly concerned with how to use the digital studio to extend the capacity both of our auditory credulity and the technical range of the imaginary performer.

I can write music that sounds as if it is being played, even though it is impossible: it allows me to continue learning from the ancients, building upon, adapting, responding to the music of forebears and to create performances of music for one the most successful instruments ever invented, the piano.

The compositional decision is now not whether it can be done, but entirely whether the composer thinks it will sound effective - one instructs the computer in minute detail how to render those notes, to make the music sound humanly performed, and music that could never have been made now enters the ears of listeners, tickling their senses with half-glimpsed fancies and fantasies of an ethereal world of memory, impossibility and hopefully, intuitive truth, authenticity of expression.

On instruments other than the piano, such as strings, this is far harder to achieve. Firstly of course, one must create a sound which the listener finds believable, convincing. If simulating an instrument, it must sound like one that a performer could actually play. So, dense, continuous un-spread chords on a simulated violin would sound bizarre, unrealistic and like something quite different from a violin.

Our accustomed sense of what can be done on a violin is ingrained in even listeners of no musical training. So, realism of digital delivery depends on the performance being plausible - if a chord is sounded across the arched strings, it must be spread in live playing.

Each note of the chord will have a slightly different attack, be held for a longer or shorter time and will ring more or less in sympathy (clearly) with the other notes according to the general intonation of the instrument, tuning of strings and other acoustical properties.

It is so complex a task to simulate, not only violin performance but the tiny fluctuations that occur on any instrument - and each one sounds different from the next, in terms of resonance and responsiveness - that we have not yet achieved anything like realism in attempts to simulate them, although the potential for this approaches gradually closer.

On the other hand, the piano already permits extensions of reality (almost) seamlessly into virtual experience.

The piano's sound is characterised by a short attack followed by variable length sustain, depending on how long the note is held or the sustain pedal depressed.

Technical feats may now be achieved at the virtual piano, that players of idiosyncratic brilliance like Erroll Garner and Art Tatum would be astonished by.

The difficulty of the digital composer's task lies in achieving the complex subtleties that characterise such pianists: apparent mastery of a fluctuating, teasing route around the implicit beat that always returns in a way perceived to be bang on the nail - the ear is frequently deceived, perceiving accuracy and rigidity where there is in fact considerable fluidity.

Too much accuracy quickly becomes dull, the wrong sorts of inaccuracy just sound wrong.

So, the minute process of ironing, ruffling, sculpting out the humanoid curves of a digital performance is generally as complex and difficult as the composing itself.

The conception, composition and performance of the music are now blurred.

All stages, from the composer's intangible, incorporeal, half-remembered dream to the heard performance and the listeners' own new subjective memories of the music, are knotted, interdependent layers.

This current work is all about the quest for new forms and structures, for music that exists in space only or simultaneously in space and time, compositions whose complexity and density is so wild and immense that no-one could ever hear the whole piece of music at once - and is obliged to inspect it a fragment at a time.

Strides forwards in many diverse fields are making it possible now for new sounds to emerge from the musical vocabulary with which we are familiar, engendering warps and fluctuations of our auditory expectations, new expressive possibilities emerging from collisions and interweavings of the almost familiar, nearly remembered...

But how is this music to be heard? On speakers, in a concert hall or pub venue? In the car? The challenge of giving a live performance of a digital work is enormous but very exciting and the experience is coming this way. [147]

Fluid Narratives of Virtual Music

When I started building an engine (3DBARE) to allow the listener to walk inside a piece of music, I thought it was a tool to help me carry on doing what I was doing – just a better way of listening. But allowing a listener to determine the temporal content of music by their position and route through space means that all or many of the former controls held by the composer / performer / producer are removed.

The listener is in charge: they are attracted or repelled by sounds and their combinations, and they negotiate a path ‘blindly’, feeling without signposting for a way through the experience. If the ‘work’ presented tells a story or – now more likely – allows a series of associations between the materials experienced and personal memory, visceral responses to these, thereby giving the listener the tools to construct their own narrative, how can we determine the outcome, some aspects of the whole?

The narrative of a ‘classical work’ is necessarily abandoned. Its message resides as firmly in form as in tonal colour and harmonic content. The formula – of embarking on a sometimes

choppy but ultimately protected journey before returning to the comfortable shores of the original key (and 'tune') – has, for all but a few music-makers, become necessarily historical.

The scope which we now enjoy for example of the exploration of textures was simply impossible in the pre-electronic age. Digital transformation of the familiar and unfamiliar into and through each other lets us explore weird new identities. The skewed reality of dreams becomes communicable, merging and overlaying in impossible but plausible juxtapositions allows music to reflect the complexities of our sensory and cognitive experience.

Music is not something we present people, like a cake or a pair of shoes. Music is the ordering into communicative structures of sound. You cannot touch, see or smell sound. You cannot write anything about it that approaches the reality of hearing those sounds. So why have we spent a couple of centuries telling ourselves that the musical composition was an object like a cake, like shoes, like a painting?

I refer you to the multi-million-word discussions of others on this thorny matter. My business is struggling to make the er, not-stuff, that music is. So if we want a narrative in our music, let's put one there. I witness stories on the top deck of London buses, as I drive through landscape, sit in a city square. Amalgamations of snapshots, overheard snippets, accents, phrases, references, calling up an un-knowable back story from every voice, each noise that flashes past and evaporates.

Composers cannot hope to control the tale they tell: there is no more agreement about the import of a Mozart string quartet than those of Morton Feldman. We do though, have access to an unprecedented level of complexity in the material we present to our audience and the combinations in which these may, endlessly, be sensed.

The big issue for me has been how to deliver all this magical, vertiginous potential: no one can play it, read it, hum it. Sounds that cannot be reproduced. Combinations that cannot be heard if sounding all at once.

Here's what we do: let the listener combine the materials as they proceed, like Amelie collecting photo booth snaps, or Cage with his same-different-same seas of traffic.

Why don't we present the listener with a shoebox full of letters (maybe some distractions thrown in, certain pages strategically removed) – and ask them to tell us the life story of the unknown protagonist?

Then we can proceed beyond the need for a narrative altogether: removing the imposition of structure, particularly the temporal, is not an act of abandonment, of irresponsibility – it is the most generous gift you can make to an audience.

To present them with a collection of the most closely, finely wrought pieces of work possible, in placements and combinations that have been tested, over and again, until the swirling whole, this whirlpool of memory and desire, amusement, terror, revulsion, meditative curiosity, rage, sleepy contentment, laughter become not a fixed structure but like the inner and outer worlds flapping like Einstein's dimensions against each other as we walk between them.

It is the fluidity of virtual narratives that can bring the virtual to life.[148]

Zones of Intensities: Auditory Hyper-Reality and Virtual Music Performance

"Today with the technical means that exist and are easily adaptable, the differentiation of the various masses and different planes as these beams of sound could be made discernible to the listener by means of certain acoustical arrangements. Moreover, such an acoustical arrangement would permit the delimitation of what I call Zones of Intensities. These zones would be differentiated by various timbres or colors and different loudnesses. Through such a physical process these zones would appear of different colors and of different magnitude in different perspectives for our perception. The role of color or timbre would be completely changed from being incidental, anecdotal, sensual or picturesque, it would become an agent of delineation like the different colors on a map separating different areas, and an integral part of form. These zones would be felt as isolated, and the hitherto unobtainable non-blending (or at least the sensation of non-blending) would become possible."

Edgard Varèse: The Liberation of Sound, 1936

Having composed music using a digital workstation for over fifteen years which draws on, responds to and extends Western classical or concert techniques I have sought to create music which both seems to be played by musicians and yet is impossible for hands on an instrument to achieve.

The piano soloist can play complex rhythms at great speed, repeat patterns that could not be maintained for such durations, crisply define widespread twenty note chords, change tempi in contrary motion with inexorable, unhesitant resolve. Finely balanced dynamics may be achieved at very low or high volumes, absolute control of articulation perceived amidst compelling momentum.

This is amongst the most interesting offerings of a technology whose principal outcome is sometimes perceived by opponents of the use of digital technology in music to be the instant gratification with pleasing results for the untrained user.

Digital reproduction may used to examine and develop our assumptions about music, as composers and listeners, extending the boundaries of expressive possibility in new directions. Despite these remarkable developments there remains nonetheless a significant divide between the practices of listening to this new music and its older counterparts, played to sedentary audiences by players of orchestral instruments.

The spectacle of performance, its social rituals, the formal artifice of the event, variability of musical experience from one performance to another, the unpredictability of even an apparently familiar work: these cannot be matched by listening repeatedly to a fixed, uniform reproduction through speakers or headphones possibly alone, in transit or semi-attentively whilst performing a task. Experiments though both in interactivity and an increased physicality of music listening have been conducted since before the invention of recording.

The separation between performance and listening to recordings - and particularly to works which only exist as recorded productions - however remains profound.

Whilst it is possible therefore to give voice to new musical utterance with digital production, the means by which the listener in fact hears this remains deeply inferior to the experience of attending amongst others a performance in which communication occurs between artist and listener. Concert experiments have been conducted by modernist composers using computers and arrays of speakers either alongside or in replacement of performers.

In John Cage's 1942 Imaginary Landscape No.4, he used a performer tuning multiple radios on a stage. With the music of later electro-acoustic composers, often the only operatives on view to the listeners are engineers at mixing desks and computers, instructing automata by movement of slider controls to perform the predominantly unseen, invisible sonic transmissions.

It remains rightly unproven to audiences at large that these experiences can be as compelling or expressive as watching an accomplished soloist coax successive wafting bubbles of tactile sonic geometries from a strung wooden box or valve-stopped brass pipe.

Consider then the following scenario: Attending the first performance of a new work, instead of being seated in an auditorium to await the opening notes performed by musicians, on arrival in the performance space the listener puts on wireless headphones and the music begins. They find themselves at a particular point within a three dimensional sonic projection in which an invisible orchestra and soloist seem to be playing music impossible to perform. Imaginary musicians are perceived all around, spaced perhaps as an orchestra but floating in height, separation and orientation.

The listener investigates the phenomenon, moving to find themselves closer to a particular sound and further from another. Moving through the empty space, it is as though amongst ghostly performers of music that human hands could not achieve.

An opportunity is presented by the combined use of certain technologies to entirely shift the impassive role of the listener - it is now the part of the listener to approach, examine, select from the combination of sounds as they would do at an exhibition of sculpture or painting.

The starting point of this project is the composition of music ostensibly for acoustic instruments but which is in fact unplayable by human hands, having been designed in a digital studio with minutely detailed simulation of live performance.

Digital realisation of music is now at a point where it can obtain subtlety and nuances of delivery as to be barely distinguishable from human performance; new uses emerge for the digital studio creating entirely new ways of hearing music, of greater complexity than possible by live musicians. Expressive extensions can be reached for, beyond extant technical boundaries, of the centuries of musical practice already engrained in our collective consciousness.

This project is based on a composition for solo player-piano and 72-part string ensemble entitled "N". It has its roots in Western concert music traditions of orchestral and concerto composition but appropriates digital technology to demand more of the "performer" than would be humanly possible, partly with the aim of achieving such effects imagined by Varèse and others, at last possible seventy five years later.

By using the computer to compose and determining from the outset that this would be the principal medium of the music's performance, certain of the constraints associated with composing for particular instruments are removed, in that the technically impossible is now theoretically possible to achieve.

Chords of many notes may be played at speeds where live articulation, however well rehearsed would be imprecise amongst such a large number of players. Subtleties of tempo change, or several occurring at once, can be achieved through automata with accuracy impossible in the orchestral setting, even before consideration of the obstacles presented both by orchestral conservatism and lack of rehearsal time for highly complex or dense music, not instantly audible in all its parts.

The former process by which the composer's musical intention, codified in score was then interpreted by conductor and musician is fundamentally altered by digital production. There is now a direct link between the composer and listener. A performer's interpretation no

longer features in the process. The source of the music is now the very instructions programmed by the composer into the digital workstation.

The score's new form, a hybrid set of parameters defining the machine's mode of sound production, is similar to the instructions to a musician. Its difference however is a profound one. This data contains minutely precise instructions to the automated performer that would be impossible to convey to a musician or expect to be accurately rendered. The data and its sonic results also never change. Each rendition is identical, exactly as with forms of mechanical reproduction. The absence, in unwaveringly uniform digital music, of a tangible "aura" or "spirit" as bemoaned by Walter Benjamin is perhaps more vividly evident than in any other medium. Whether heard on two or ten speakers, in a hall or a vehicle, it is essentially identical.

The challenge of humanising musical automation has a long and singularly unsuccessful history, most especially since the advent of digital sound sources. A principal reason for this has been the low power, until quite recently, of processors. It is now possible to process CD-quality audio in real time on multiple output channels. In other words, the rates at which audio data is read, interpreted, adapted, transmitted, are now so high as to be imperceptibly different from the continuous stream of information entering the ear from pre-digital sources.

Through these means smooth curves of transformation, occurring at speeds whereby they are only subliminally perceived, may be achieved. The distance between the best sampled instruments skilfully used and their sources is now frequently short enough for there to be considerable uncertainty whether a performance is real or simulated.

In exploiting the sequencer and digital audio workstation in this manner multiple questions present: How may boundaries of musical sensory credulity be extended? If attempting to extend extant orchestral timbre, beyond what point has the simulacrum become so distant as to be merely referencing rather than representing performance on acoustic instruments? Once the music is composed, what are the ways to simulate a live performance? Is it a dilution of such an auditory experiment to retain actual performers?

In this project, five live performers are added to the simulated parts, at times doubling them and at others in counterpoint. The overwhelming majority of sound to which the audience listens is generated by computer transmission of recorded sound. Interplay and overlap between the live and recorded/generated lines obscures the sources' identity whilst adding clarity to doubled lines and to the combination of live sound sources' correlation to the generated music. The listener's ambulatory interaction with and movement between real and virtual sound sources whose perceptual distance from each other has been extended and emphasised sets up such a combination of variables that each audition is unique.

In motion-tracked wireless headphones, the listener moves within a hall, hearing music as though played from various points within the physical space, approaching and listening more closely here, moving away towards other sources of sound that combine as determined by the listener's position. The principal distinction between music heard via electronic reproduction and in live performance, lies in the presence (in the latter) unforeseen and uncontrollable factors. It has been this unpredictability and variation from one experience to another that for most listeners defines the live performance as superior in interest, colour, expressive power.

In this proposed setting, the natures of public performance and private listening become entwined and interchangeable as the listener moves around the space, inspecting at will the individual elements that constitute the composition, built of lines played by live performers and a combination for virtual musicians and sonic found objects distributed around the space.

A combination of audio and meta-data (Cartesian coordinates and directionality of sound source) is transmitted on each output channel. The "mix" heard by each listener is a uniquely rendered version of the three-dimensional recording which simulates movement by the listener amongst virtual performers. The output is spatialised and remains statically placed, throughout the music. As the listener moves around the space, the relation in distance and direction between each instrument and the listener is re-expressed to give the impression that they are moving inside an environment containing actual sources of sound.

Example: A room is 10 m long and 10 m wide. 2 m from the far left corner, a violist plays, facing the entrance. The listener enters the door at back left of the space and approaches the viola; when directly in front of the violist, the listener turns to the right. The instrument has been simulated, in response to the listener's movement, to approach, playing directly towards the listener then suddenly moving behind the listener's left side. This effect is simultaneously rendered in multiple layers, repositioning the sources of sound from the listener's ears which are at the shifting centre of a virtual sound field.

From the first mapping of sound sources' virtual spacings to correlation of these with the listener's actual position a large amount of data must be processed and used to form a live output mix to each individual listener in the space. Additionally, as listeners enter the space at different times, each hears the composed work from the beginning from separate starting points.

The "performance" begins at the moment the listener puts on their headset: the music is broadcast to their headset and rendered according to their position. Many listeners partake of the experience at once, each joining at will and listening to the performance in their own way, governing its character by the way in which they move investigatively around the physical space.

The experience of the listener is at once private, unique and non-replicable. Whilst simultaneously engaging with the same broadcast sounds at the same time in a single public space, the audience are engaged in an act of solitary examination and engagement with the music.

The motion capture software relays the data about the listener's position back to a computer relaying the 3-D sound and processes, as they move about the space and listen, a unique version of the sound according to where they stand in the space. The listener experiences sound as though walking between the performing musicians of an orchestra, into streets, amongst machines, from one glimpsed conversation to another, through vast caverns into tiny rooms and into the open air.

A vast variety of sound sources can be heard in one space. Unlike the experience either of surround relay of recorded sound or listening to a live performance, where one is stationary and impassive, the listener moves around the sonic environment, lingering or moving through zones at will.

Distances are distorted, amplified, warped: movement of a metre may create the impression of having moved twenty away from or towards a sound source. At particular points in the space it is possible to identify and separate certain less distinguishable middle parts of complex sonic textures and listen to the relation of those parts to musically more prominent, but now perceptually backgrounded, elements.

The musical composition is based in simultaneous elaborations of a centrally developing theme - in their entirety an indistinguishable, incomprehensible mass. In separation, the fragmentary elements comprising the whole may be inspected and absorbed by each listener in unique combinations of more or less audible parts at a given point in time and space.

Auditory distance between sound producing objects is amplified such that when the listener moves a metre, they have crossed thresholds of buildings, traversed a street, shifted to an entirely different acoustic environment. This permits an amplified, magnified inspection of individual detail, untainted by surrounding activity: it is as though the instrument whose coordinates are notionally one metre away were playing on the other side of a high wall.

Music producers were initially concerned over the advent of stereo, where the vividly distinct timbres essential to mono production for a listener to distinguish between instruments and voices had the potential to be crudely overridden by mere spacing for their differentiation. The advent of quadraphonic, and later surround sound was met with enthusiasm by practitioners and audiophiles whilst the majority of listeners remained unaware of them.

They were influential upon electro-acoustic composers seeking sonic spatialisation as an additional textural layer to their work. Nonetheless, their limitations were equal: at best a ring was made of moving sound around the static listener. Listeners could walk, ride or drive around the space but they would never obtain the asomatous wonder of walking through force-fields of invisible music in a space empty of all but other wanderers at a different stage and position in the illusory cycle of a ghostly, androidal band.

The vision of Varèse referenced in the title is now possible through combined ingenuity to achieve: "In the moving masses you would be conscious of their transmutations when they pass over different layers, when they penetrate certain opacities, or are dilated in certain rarefactions."

The process requires new forms of musical notation and close collaboration between composer, acoustical engineer and software developer. The conventionally-notated score is the basis for a graphic restructuring by instrument, each of which will be output on 8-12 tracks, dependent on the complexity of multi-sample simulation of the acoustic or real-world counterpart.

This secondary score describes physical distribution and movement of the virtual sound sources. Individual tracks are recorded with a dummy head, a mannequin with microphones where should be ears, placing these in certain positions and orientations and recording individual tracks to each head in its separate position, projecting the sound from speakers arranged in all axes around it.

A final mix of the binaurally recorded tracks is created to regenerate the perceptual position of the listener to a sound emanating from multiple sources for each individual track. The sound may then be reproduced via headphones such that it appears to emanate from every dimension and distance within and beyond the limits of the auditorium.

Realisation of this performance will be achieved through an integration of motion capture with 3-D sound virtualisation, an area of rapidly expanding expertise which deploys systems of "cross-talk cancellation", which take account of the head-related transfer function (HRTF), whereby each ear perceives through the head certain signals directed at the other and removes this additional perception. By overcoming the constant of HRTFs it is possible to overcome the limitations of a pair of (left and right) sound sources and simulate the emanation of sound from all points in a hemisphere.

Digital signal processors capture data about each listener's coordinates and orientation, reproducing a continually responsive production of the music. The music is output as a static, spatially separated series of sound sources: as the listener moves amongst them, she is treated by the data processor as though static herself and the virtual music is moved in relation to her changing position, thus creating the powerful illusory sensation of moving between static sound producing instruments and objects.

I am working on a system for the integration of extant technologies: motion capture data's conversion to MIDI instructions which command real-time sculpting of the spatialised sonic output driven by Logic Pro software on Apple Mac computers.

As the composer-originator of this project I am excited by the richness of possibility for increasingly direct, interactive communication with the listener and for future possible uses of this technology as we rethink the experience both of public and private music listening.

A significant outcome to the project may be the creation of a commercial system for the realisation of virtual performance spaces with reactive three-dimensional sound projection, a versatile production software suite through which multi-channel binaural output can be controlled by motion-capture data to reproduce music and sound with unprecedented distance, direction and clarity. . [149]

Concepts for Virtual Performance. Part 1.

Building music in the digital studio is directly crafting sound, rather than designing written instructions for it to be recreated by others. In the digital studio we still write these instructions; they are refined and layered over multiple “rehearsals” with the machines in the virtual band, to create this thing, this performance, that is the heard work. But it isn’t a thing. And I’ll come back to that.

Having written notes on paper for years (well, decades) I am now mostly using digital tools to manipulate found or partially-formed sound objects.

Problems about simulation are delicious because they are new and have not yet been answered with authority. How far can we take the sound of the piano - seeming in respect of its touch and handling, as closely as possible to be 'played' - beyond the current capabilities of performer or instrument?

Many new questions dominate these compositional inquiries and the tentative development of a Concept of Virtual Performance is an attempt to address these. With acousmatic music’s absence of palpable communication – from a player to a listener – there are problems for some in deciding how to encounter the music.

It does not seem to be like a told story where the teller and the tale are a part of the same experience. The movie is the closest form in another medium and yet this - of course - contains representations of people and their interactions. Even if without a traditional plot, the movie contains elements that are both within and outside (commenting on) the story - diegetic and exegetic elements - between which the viewer attempts to differentiate.

If music by unseen, inhuman hands is embedded in a space, blended with it, not directly presented but allowed to be experienced, a radically new relationship is formed between the artist and the listener, the listener and the work. The seated listener at the symphony concert engages both with the sounds directly and something beyond them, which the sounds are perceived to embody. So does the listener to a recording or at an acousmatic 'performance'. But two profound differences intervene when we try to make a direct parallel.

Firstly, acousmatic music is not always discernibly distinct from its surroundings, because the place, for which the sound structure has been built, contains its own auditory character, activity and flux.

Secondly, there is not necessarily an intention to communicate a message, an object. It may be that the sounds have been so organised to represent an analogue to a physical form or phenomenon, a process of change or a simultaneous condition of stasis and motion (a

delirious favourite of mine, since hearing, as a child in the middle of an orchestra, Bartok's Dance Suite.

**Incidentally, compare the Concertgebouw's orchestral performance with Andras Schiff's piano version for an example of the difficult matter of "what is a musical composition?").

And the composer or sound artist no longer necessarily attempts to communicate in a quasi-linguistic form. They may be asking you to consider the juxtaposition of two sounds. The pulsing that such a combination creates.

Two frequencies added. Each of them. Their total. Their difference. All audible, whether between two violins slightly out of tune with each other or between more complex, harmonic textures that change slowly over time:

Now it is not the perceived commencing journey that is interesting - harmonic direction back towards its starting place - but the shifting, restless sonic moment. There maybe a mirroring of the place in the artifice apparently flung down there with such casual ease.

If it is possible – as I sorely hope – to de-reify music and composition, to replace the idea of music as a 'thing', with the truer idea of an attempt at reconjuring fleeting dreams or visions, such that a musical composition becomes less an isolated artefact and more a sensory element of the place it is encountered, just as the noises of a building, street or seashore cave characterise our sense and memory of it, then...then new functions for music, transcending the ritualised offerings of music as 'things', with a social job to do, a message to impart, as has existed in the concert hall and church setting for centuries, may finally in some senses be achieved.

From a perspective of authenticity of reproduction - be that reproductive of an entire illusion or a construct of recording - headphone-audition offers a more believable experience than speaker arrays and can be used to create a more illusory boundary between environmental noise and the deliberate contents of the sonic artefact.

Unfortunately, for anyone reading this who says "Yes, but what the hell happened to art that makes sense, tells a recognisable tale that we can discuss as though it were an object covered in symbols whose meaning is widely agreed?", I have some difficult news.

In Hervé Vanel's study on John Cage and Muzak, or what French composer Eric Satie advocated in the 1920s as 'furniture music', he refers to Lev Thermin's 1919 electronic musical instrument, the Theremin.[150]

To quote,

> "As Cage perceived it, the Theremin was undoubtedly 'an instrument with genuinely new possibilities…nevertheless, the problems remained that the Thereministes…did their utmost to make [it] sound like an old instrument…performing upon it, with difficulty, masterpieces from the past" and that it "amounted to imitating the past rather than constructing the future."

Cage complained that the new affordances of this radically different sound-producing object were being ignored, betrayed even, by a continued pursuit of old practices, the hunt for old meanings through new tools.

Implicit is the futility of finding a new means of sound production if it is only to be used for making "old" sorts of sounds. Another advocate of new technological affordances for the discovery of new ways to communicate new things, was Edgard Varèse in "The Liberation of Sound":

> "the new musical apparatus I envisage, able to emit sounds of any number of frequencies, will extend the limits of the lowest and highest registers, hence new organizations of the vertical resultants:

> chords, their arrangements, their spacings, that is, their oxygenation.
> Not only will the harmonic possibilities of the overtones be revealed in all their splendor but the use of certain interferences created by the partials will represent an appreciable contribution.
> The never before thought of use of the inferior resultants and of the differential and additional sounds may also be expected. An entirely new magic of sound!
> I am sure that the time will come when the composer, after he has graphically realized his score, will see this score automatically put on a machine, which will faithfully transmit the musical content to the listener."

Varèse' prescience could foresee the specific challenges of turning automated transcription and transmission into music or the insecurities of digital preservation.

We are still though in a very 'primitive' technological state. We have new, magical tools whose affordances for sonic production we are still learning to match – for reasons both of ability or willingness - with new, magical thinking, to sound ourselves in languages entirely different from those we have ever spoken.

Furthermore, Varèse' and others' predictions - that automata could be well enough instructed to deliver, without intervention, 'soundscapes' whose richness of expression equals or surpasses the possibilities of acoustic performance - could neither anticipate the dependence of users on 'plugins' to "re-humanise" an entirely quantised sound.

Incidentally, it seems so counter-intuitive first to input uniform sound data then use automation to make it seem human, an embodiment of some notion that two machine processes can equate to one human one. Humanising or giving the appearance of sentient, mediated, 'delivery' (note please, not 'performance') must be the most exciting challenge of new digital technology - and yet celebration of the tools themselves seems to take precedence over using them to do something, at once enough of a continuation of extant practice to be a recognisably communicative form, and yet to make a promising departure from it. . . .

The complex arts of simulating human agency in things at once physiologically or cognitively impossible and yet plausible - these are my obsessions. I have never met any other composer or artist in another medium who shared these fascinations. It seems strange to me that the digital studio should be so shortly explored as a means - not only as it widely is, of creating new 'unrealities' but - of extending the plausible yet impossible. Of permitting what Bach and Scriabin could only imagine but never dare to transcribe for fear that it was inaudible to all but them.

Digital music seems either to involve MIDI for acoustic composer to demonstrate to performers or an exploration of the tangibly inhuman, whether in house, trance or electroacoustic languages, of sounds that (in the latter) carry little connection to the neuro-physiological activity that thousands of generations of practice and inheritance have stamped upon our tiny, biological responses to stimuli.

And of course, makers of music in all fields remain suspicious of each other's ability to speak credibly; the same tribalisms exist as, for example, when fighting broke out over the reported death of tonality, more than a hundred years ago.

A universe of expressive, evocative possibility lives in the tools and yet the fact of their 'machine-ness' seems to remain problematic, necessary to remember, like noting but avoiding acknowledgement of a person's difference.

Varèse speaks from an age of detailed, manual craft, with a vision of the same application, of commitment, to its implementation through tools then unavailable; he cannot foresee the cultural changes, or absence of them in music composition that will eventually be engendered by these tools.

Maybe it's that they are still just too new to us and the new digital instruments are still in their infancy; but as he foresaw, we are already finding it

> *"necessary to abandon staff notation and to use a kind of seismographic writing much like the early ideographic writing originally used for the voice before the development of staff notation.*
> *Formerly the curves of the musical line indicated the melodic fluctuations of the voice, today the machine-instrument requires precise design indications." (Varèse 1936)* [151]

Concepts for Virtual Performance. (2)

Thanks for reading the article and the fascinating responses already received to Concepts for Virtual Performance (1) through Google+ and Twitter.

I look forward very much to a wider discussion about the terms we use to consider "performance" "liveness", "participation", "audience". . .

Below is a message about Virtual Performance from Mike Milton, composer, multi-instrumentalist, Eigenharpist, movie-music consultant and my tentative responses.

_____

[MM]

So, - virtual: not physically existing as such but made by software to appear to do so. - musical performance: The act of performing music

[BLM] What is the difference between performing and other forms of sound production?

I would say it is particularly in the sense of playing To a person or group, of structuring a communicative act.

We cannot perform in solitude. It is therefore, even if an identical act to the music played when alone, essentially differentiated in this deliberate conveyance of ideas or sensations to another.

{MM 2} Is the reason you feel one cannot perform in solitude that the audience plays a role other than being there? If so, what is that role and how does it contribute to the performance? If not, why could one not perform in solitude? Is a rehearsal in solitude a performance? If a tree falls in the woods.... The key thing you mention is that a performance cannot be in solitude. I'd rephrase that to say a performance requires an audience (and I'd add that the audience must matter to the performance)

[MM] I suppose that a virtual musical performance then uses software to give the appearance and it would rise above the level of a recording. It might not require (or allow?) the person offering it to participate at the time of performance.

[BLM] I'm not sure I understand about it being "above" recording – does this mean it is more valuable or "authentic" because it is being delivered to specific persons at a particular time and place? Surely while the historic time constraints of early recording are not a limitation on live playing, there is still a process of constructing an experience at which the listener is present, of speaking to oneself while witnessed in the act?

Does virtual performance therefore exclude the live-mixed delivery of largely pre-completed sound, such as electro-acoustic / tape music? I agree that VMP uses software to give the appearance and effect of a live rendition (although there are pre-digital precedents in mechanical musical automata), but it could (and perhaps more commonly does) also imply the blurring between a performance perceived to have actually happened and one that was simulated – in other words a non-live or recorded transmission of that event.

So if the transmission is not of an act of performance being simulated in real-time, then perhaps it could also be said that a highly edited recording was equally a form of virtual performance.

{MM2} I intended only that a recording lacks some aspects of a performance such as the results of an interaction with the audience for the recording (even if there was an audience for the recorded performance. The effect of giving a performance is to somehow include the audience in a material way.

I'd say that what the sounds are made from is not relevant to something being a performance. Perhaps the underlying question (that we skipped over a bit) is: What is a performance? On reflection my earlier comments define performance as an interaction between the performer and the audience. Defined that way, it might be easier to see why a recording (even a recording of a performance) is not *itself* a performance even though the viewer can see that the performer *was* performing for others and may react much like the original audience. The key difference is that their reaction and any impact of that reaction is absent from the recording. Performances never repeat exactly, recordings do?

Was the editing done in solitude? If not, was the act of editing the performance or is the result of editing the performance or both?

[MM] Is a person giving a concert on Second Life a virtual performance? Many would probably say it was since the audience sees avatars (software entities that render the appearance of the performance). I think it is either a real performance delivered in a virtual space or, if it is not real-time, a recorded performance delivered in a virtual space.

[BLM] Yes, I believe it can be. I know of (but didn't have the weird pleasure of attending) a Suzanne Vega concert that took place some years ago on Second Life. My erstwhile PhD advisor, Richard Polfreman, who develops digital interfaces for 'performance' and 'composition' was in contact with the person who built her virtual guitar (for which he was paid in real-world pound notes). One of his tools uses adapted drivers for the Novint Falcon, an interactive motorised joystick controller which gives powerful haptic response to virtual objects used as musical instruments. If the "string" plucked is not a string but a piece of code describing some of the acoustical properties of a string, accessed through a digital controller and a software interface, even if the sound is produced before an audience,

surely there is a strong contingent of virtuality to the communication? But even if you don't concede that, and maintain that it's a live performance on a virtual instrument, how, if we are unable to say with certainty if it is happening now or being relayed to us later, can we say whether it is a virtual performance or a recording? Indeed, the recording is, at least in some circumstances, a virtual performance.

{MM2} I believe it can be (but often is not) as well. The condition for this is that the audience matter to the outcome. Tim Exile sourcing sounds from his audience for his performances are a good example (that I'll mention again). I'd still suggest that a recording of that performance can be entertaining but is not itself a performance and the listener does not experience being an audience member or any facsimile of that experience.

I'd say the original experience IS a performance even though it is delivered online but not a virtual performance because the audience <-> performer interaction is real and not virtual. If Tim Exile 'canned' the ability for a future audience to interact with a SW system that simulated what he did in his performance, *that* would be a virtual performance.

[MM] Is a person playing a virtual instrument to an audience a virtual performance? No, it is a real performance of a virtual instrument. Is a video of a concert a virtual performance? No. It isn't a performance at all, just the recording of one. (Why? it is static and unresponsive. The things that change from performance to performance are simply replayed identically)

[BLM] The qualities of stasis or responsiveness are not exclusively the defining ones – I think of Sviatoslav Richter's insular manner on stage. He appeared before a crowd and played the music. Incredibly. But arguably not to them or even for them. There was a strong sense that he did not wish to be before an audience in order to get his cheque. For different reasons, Glenn Gould retired from the stage to work in the studio, sculpting 'perfect' performances by splicing segments of his innumerable striving takes together into a subjective ideal. This is how I and many composers work now, with all the apparent greater ease of the DAW over the magnetic tape splicer, always though, bearing in mind the affordances and constraints of the tools which, just like the particular qualities of two different pianos, suggest and lead one towards particular types of music-making. But that is for another place.

{MM2} Good points. However, we are discussing performance as well as music. There is no question that wonderful music can be created in the absence of performance and in some cases could not be created in a performance. So we agree on the point and on the notion that it does not do much to inform this discussion. That said, people who choose to construct music as you describe above sometimes take conversations about performance as a slight on their preferred path to creation.

They should not do this as there are both possibilities and impossibilities on either path. They are simply different vs. being better or worse or more or less effective. Oh and do you really think that a delivery of (even the most wonderful) music that completely ignores the audience is [not] a performance? I Do think so for the perverse reason that the audience will react and some will react to being ignored and that, even by dismissing this reaction, the performer is interacting.

[MM] Is a person directing a computer performance in real time (say using Reactable or pre-programmed music parts in a DAW) a virtual performance? Possibly, but it seems too

close to a real performance in that the performer is interacting in real time, directly. They are, in fact, performing even if they are assisted in doing so.

[BLM] I completely agree: however underwhelming it may be to watch an engineer operate sliders and pots at a lamp-lit mixing desk - in comparison to Satchmo's eye-popping high register, heroically summoned from a coiled brass tube - it is in some senses still a performance: actions undertaken in front of a crowd gathered for the purpose of witnessing these actions.

{MM2} Which is *exactly* why an Eigenharp exists. While it is not limited to the hybrid approach of performing with pre-programmed components, it allows it in a more front-of-stage way.

One specific design goal was to allow for a full throated performance by such an electronic musician. It would be a great way to enhance, for example, the performances of Tim Exile.

I particularly appreciated his use of audience supplied sounds in performance (which was online BTW) as one perfect example of audience being material to a performance.

[MM] So, it seems to me that a virtual performance should work like generative music except that the software acts on performance aspects rather than (or in addition to) the musical aspects.

[BLM] This is, for me, the confusing part of what you write here Mike: isn't "generative music" more a compositional process, even a genre or style of production – a way of thinking about the content of music produced - rather than necessarily to do with virtuality, performance, recordings or liveness?

{MM2} Yes, sorry, not very clear. I was suggesting that approaches similar to those used in generative music could potentially create generative performances.

[BLM] Certainly the virtual performances which I build would not easily sit in the same category as say Brian Eno's music. For me, the essence of virtual performance is that it seems to be a performance, it seems to be plausible as a performance and could be happening. But it isn't. And since the only reason I can think of to make a performance that seems to be happening but isn't, is that it couldn't really be performed.

{MM2} Another reason is to allow time and place shifting of a performance so that audiences who are not there, then can experience a performance.

[BLM] I compose music then edit the delivery of that sound to try and make it appear that it is being or has been played by human hands.

{MM2} To me the issue isn't the appearance of being played by human hands but the experience of being played for me as an audience. Should one applaud a recording? Why would this matter?

[BLM] The fact is, those hands and brains would in fact be incapable of playing this music for reasons of finger strength, agility, stamina, hand size, speed of thought, complexity of rhythm and so on. So for me virtual performance is the creation of an event or the apparent record of an apparent event where that which is not happening and could not happen, appears to be happening.

Here are two examples:

(1) a pretty unrefined essay in virtuality from 1999, Songs from an Island in the Moon No.16 – an incidental piece for a stage setting of William Blake's prose satire, An Island in the Moon. https://soundcloud.com/benjamin_mawson/sfaiitm16

(2) a very recent (2013) composition that takes both played (MIDI and audio input) and generated performance (through instructions to a DAW, written and drawn on the screen) and transforms these beyond what either player or instrument could physically do, Virtual Piano Study No. 1. https://soundcloud.com/3dbare/virtual-piano-study-no-1

[MM] The author states the rules but then the software alone creates the performance. It is not a recording because the performance will vary based on inputs that feed the rules.

{MM2} My take would be that the software creates a musical rendition. If the software has inputs from the audience, then is also creates a performance. These inputs could be realtime (is the audience quiet or loud, moving or still, and so on) or made in advance by answering questions (are you happy or sad, is your hearing full range or limited, do you prefer jazz or blues, etc.)

[BLM] I agree, that would be a potentially interesting way to work although I for one have never done it, so I wouldn't recognise the method as a defining one for the more general practice of Virtual Performance. A nice idea although I would be so consistently in need of interference, adaptation, editing, that this would only be a starting point for building primary objects to compose with – my end results are always as specifically determined in their minutest detail as I can make them, more like an edited film than teaching an automaton to act for itself so, I suppose, closer to a recording than to something that can truly be called a performance. Going back to the above examples, for me the Virtual is the principal part, the fact that it seems to be done but in reality could not be done.

{MM2} For me the principle thing is that the audience and player interact or seem to interact (even if that interaction is to ignore one another)

[MM] Consider Tom Jackson's approach to live music production.

He provides a number of performance tools and coaches performers to deconstruct their music into 'moments' that can be used as components to deliver their song in a way quite different than as a recording. Specifically, in a way that lets an audience see 'into' the construction of the song and allows the performer to point out things they would otherwise miss (like a nice little riff or chord change or piece of percussion or a key lyric). 'Improvising' in this context is simply drawing out, repeating, or eliminating these moments as part of a specific performance for a unique audience. One might anticipate that a generative approach to doing this would result in a virtual performance.

[BLM] Sounds like a really interesting approach to music-making and certainly one that would yield surprising results. I have been listening to the lush, post-Romantic piano music of Stephan Beneking. I asked his permission to sample and use some fragments from his work - compositions making of his material collaged, reflective responses: would it depend on whether you believed you were hearing them delivered (1) in real-time or (2) by a human pianist to call them virtual performances?

Definitions may be more problematic, limiting, than illuminating in this area, at this early stage in the subject.

I started using the term Virtual Performance to describe my simulations of sonic/musical things happening that could not really be happening. Then I stretched that to other areas, like something that could conceivably be played if adapted or could readily be played if transcribed and rehearsed by a human.

Then it became, like for Gould, a seeming performance that was in fact sculpted, was in fact a recording: frozen.

Perhaps this is no longer a Virtual Performance?

Is simulating rhythms from recorded water drips a virtual performance, given that the drip was a naturally occurring phenomenon and not a human act?

If not, do we call Reduzent's "Solenoid Concert" a performance?

https://www.youtube.com/watch?v=g_hiz-Kx0kM

"a software-sequencer controls 8 solenoids, that knock on different things and therefore produce some rhythmic noise. made with Pure Data, an arduino board and a self-made relay board to control the solenoids."

{MM2} So, this is full circle. We agree on a great deal and differ about the number of angels on the head of a small pin. I'd add just one angel which is a material role for the audience before naming something a performance. Perhaps this is the appeal of concert recordings. They are not performances but at least they reflect and deliver what one performance for an audience was. It isn't clear to me why a concert recording would be different than a studio recording except for the extent to which an audience is a part of a performance. ***152***

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badaud:
Origins of the term are obscure but thought to emerge from Occitan: bader v.n. <avoir la bouche ouverte> ('vieux' Mon 1636 ; 'autrefois' Fur 1690—Trév 1771 s.v. badaud)
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Notes

[1] Schafer's awe at the discoverable beauty within the endless field of incidental sounds is something I share (and write about: see e.g. "Temporal Determinacy", p. 43) but I differ from Schafer in believing not that it is music itself but that it may give rise to the combination of craft and intuition that constitutes the act of composing – of putting together – sounds into music.

> "..a continuous field of possibilities lying within the comprehensive dominion of music... the new orchestra: the sonic universe! And the musicians: anyone and anything that sounds!"

Similarly, the use of found objects as in the works of Dallas Simpson, Janet Cardiff or Christina Kubisch played a part in my discovering how to insert musical compositions to non-designated spaces of audition, but the artistic intention here was not so much to accentuate listening to the space as to create flexible means of exploring the formally constructed compositions being presented.

Simpson's statement therefore, about his own binaural soundscape works, that "the subject of each recording varies from natural surroundings to artificial environments" is distinct from the intention in my geo-located compositions, of framing composed music within a specific situational setting. (http://www.dallassimpson.com/ , last accessed 14.12.2015)

[2] (Varèse 1936)

[3] (Stockfelt 2007)

[4] Magnusson (2010)

[5] This has been repeatedly observed in the behaviours and verbal reports of listeners attending geo-located presentations, who became immersed and fascinated in what they could hear, rather than the technology permitting them to hear it.

[6] Dialectical contradiction in terms of approaches to indeterminacy: through-composed music for acoustic piano deconstructed to its harmonic sequence for reconstitution as fixed temporal whole vs. presentation of parts to listeners for their 're-construction' (in. geo-located setting) where their action controls the output of a single heard totality among numerous possible permutations.

[7] Cassady, M., The Art of Storytelling: Creative Ideas for Preparation and Performance, p.28, cited in "Theatre Theory", http://novaonline.nvcc.edu/eli/spd130et/theatre-theory.htm

The 'willing suspension of disbelief' is a phrase coined by Coleridge in his "Biographia Literaria", 1817, Chapter XIV, describing his intended part in co-writing (with Wordsworth) the 'Lyrical Ballads':

> *"… it was agreed, that my endeavours should be directed to persons and characters supernatural, or at least romantic, yet so as to transfer from our inward nature a human interest and a semblance of truth sufficient to procure for these shadows of imagination that willing suspension of disbelief for the moment, which constitutes poetic faith."*

[8] Magnusson (2010)

[9] Unlike controlled music environments, the auditory character of non-designated musical settings can be fluctuating and unpredictable. My discovery of the possibility of situational music occurred while sitting for several hours L'Étoile in Paris in November 1992, listening to the klaxons of six lanes of encircling traffic. (Mawson 2013)

[10] Notwithstanding those cognitive mechanisms shared between music-syntactic and language processing, "such as the integration of incoming elements into complex hierarchical structures, or the serial prediction of upcoming elements in sequences", the structural functions of musical syntax

differ from linguistic ones in that they are solely context-dependent. (Koelsch 2012)

[11] 'Reality' [OED online, 2nd ed, 1989] "the quality of being real or having an actual existence" / "having objective existence," [to exist: having "place in the domain of reality."]

Oberly presents 'hyper-reality' by contrast to these inherently problematic definitions, being circular and self-reflexive, as embodying "the dislocation of object materiality and concrete spatial relations. . . . .The slippage of reality, its elusiveness encountered even in a basic search for a definition, is an element of the hyperreal – a condition in which the distinction between the 'real' and the imaginary implodes". . . . . He proposes, as the concepts most fundamental to hyperreality, (1) the simulation "characterized by a blending of 'reality' and representation, where there is no clear indication of where the former stops and the latter begins" and (2) the simulacrum "often defined as a copy with no original, or "an image without resemblance" (Deleuze, 1990) . . . . . "Certain historical contingencies allow for the wide scale reproduction of simulacra so that the simulations of reality replace the real, producing a giant simulacrum completely disconnected from an earlier reality; this simulacrum is hyperreality." . . . . . "Baudrillard (1994) maps the transformation from representation to simulacrum. . . . .where the last stage "has no relation to any reality whatsoever: it is its own pure simulacrum" (SS p.6). . . . .Deleuze, Baudrillard, and several other theorists trace the proliferation and succession of simulacra to the rise of hyperreality and the advent of a world that is either partially, or entirely simulated."

(Oberly, N., "reality, hyperreality (1)" at The University of Chicago :: Theories of Media) http://csmt.uchicago.edu/glossary2004/realityhyperreality.htm (Accessed 01.11.2014)

[12] For example, 'Dreaming at the Circular Ruins' may be transmitted either as a through-composed singularity or in perpetual loops projected via headsets with virtual sound spatialisation for audition as virtual performance that may be entered or left at will, the fixed, singular trajectory from beginning to end thus removed. [See alternative repeat marks in portfolio score.]

[13] 'Dreaming at the Circular Ruins', 'Take Me By The Hand' and 'ROOM' were composed with the intention for consecutive differentiated experiences of the heard totality according to listener position and movement throughout the place of audition, containing unconventionally arranged loudspeaker arrays.

[14] "To sublate has a twofold meaning in the language: on the one hand it means to preserve, to maintain, and equally it also means to cause to cease, to put an end to … Thus, what is sublated is at the same time preserved; it has only lost its immediacy but is not on that account annihilated." Hegel, Science of Logic, p.107 Remark to §3.

[15] "Current capabilities" was the far-seeing suggestion of Michael Finnissy, in place of my own "impossible"

[16] PhD dissertation, Norris Mason Conklin, University of Oklahoma, 2011 http://www.conklinstudios.com/wp-content/uploads/2011/11/Conklin-Dissertation-Text.pdf, Last accessed 24.06.13

[17] 1st performance of "Music for Keyboard 1997", Penelope Cave, harpsichord [1-3] & 486 PC running Windows 3.1, playing Yamaha pf-85 digital piano (sampled harpsichord) via Cakewalk 2 DAW software [4], Canal Café Theatre, Maida Vale, London W2, September 1997

[18] "Extended instrumentality": (Croft 2007)

[19] Hence the inclusion here of two iterations of identical material, in Piano Studies No. 2 and No. 4 and their open scores for further forms of them.

[20] [Semantic]: rather mimetic signification through reference and association than quasi-linguistic structures

[21] Schaeffer's coinage 'acousmatic', marking the 'perceptive reality of sound as such, as distinguished

from the modes of its production and transmission', in reference to the 'akousmatikoi' who heard but could not see Pythagoras as he spoke from behind a screen.

[22] Berezan, David. Flux: Live-Acousmatic Performance and Composition. http://www.ems-network.org/IMG/pdf_BerezanEMS07.pdf Last accessed 21.11.2015

[23] Not true virtual performances but preparatory stages towards virtual performance, constituting recordings of work presented either in acousmatic or geo-located settings.

[24] In these compositions, Logic Pro Audio 9 software was used with various input controllers including Disklavier, digital pianos, miniature MIDI keyboard LPK25 and OSC controllers for iPad.

[25] An example of this is Player Piano Study No.1, opening on a conflicting alternation between a C# - D#/Eb whole tone (their ambiguity persistent and ongoing, between tonic / supertonic and leading note / flattened supertonic) and the keyboard note between, D, as tonic of an ascending minor scale. Around an hour of different 'takes' of the primary material was played into a Logic 9 DAW software on a Mac laptop via Yamaha Disklavier, then edited onscreen.

[26] During the period September 2012 to March 2013 my composition studio was an empty office building of 4000 sq. ft. I composed sound effects there for (1) a stage production of Bulgakov's "Heart of a Dog", set in early 1920s Moscow . [The play was first staged in the wooden, 60-seat, horseshoe-shaped 'Old Operating Theatre' at London, SE1, then transferred to the LSE, a 1,500 seat, concrete double saucer. The re-calibration of output for the 2nd setting was as complex as the simulations themselves.] (2) the Cotswold Motoring Museum's new annex, a breeze-block rectangle, with 5.1 surround effects of vintage motor racing. [Much additional editing in situ was required subsequent to discovering the acoustical response of the situational space, to make distance and directionality of sound 'realistic' in the particular setting where they were heard.]

[27] Appendix: 3DBARE

[28] Mimetically representing the expressive function it seeks to describe, incongruously citing "Let us go then, you and I, / When the evening is spread out against the sky / Like a patient etherized upon a table;" [opening lines of T.S. Eliot, "The Love Song of J. Alfred Prufrock" IN Prufrock and Other Observations. London, The Egoist, 1917.] and "He opened it in the light of the coach-lamp on that side, and read—first to himself and then aloud: "'Wait at Dover for Mam'selle.' It's not long, you see, guard. Jerry, say that my answer was, Recalled to life." [from Charles Dickens, A Tale of Two Cities, Chapter 2, The Mail]

[29] http://conlonnancarrow.org/symposium/papers/willey/willey.htm, Last accessed 1.09.2014

[30] "Nancarrow, in an interview I conducted with him in 1983, clearly said that Study No. 21 (the famous Canon X) was the last one he composed prior to having the quantizing device removed from his hole punching machine. I just looked through a published copy of that interview but didn't find the reference. It was edited down from the entire interview and I think that bit was omitted. In Kyle Gann's book on Nancarrow, on page 106, he says "After No. 21 Nancarrow had the machine altered so that, instead of punching holes at points indicated by notches on the mechanism, it would move along a smooth continuum, capable of placing a hole at any point."

As far as I know it's not really known what year that would be. Nancarrow was always averse to details like that about his music for some reason. In any case Study #22 would have been the first piece written with the quantizer removed." Email from Professor James R. Greeson, 6.09.2014.

[31] (Haines, et al. 2008) http://www.cs.cmu.edu/~rbd/papers/reverb-lncs-preprint.pdf , last accessed 04.12.2015

[32] Portfolio: The President, Credo, Take Me By The Hand

[33] "expressive": capable of imbuing the subjectivity of the listener with additional depth, perspective and colouration through auditory experience

[34] Fuller explanation of proposed outcome and means of implementation follow in Appendix 1: '3DBARE'

[35] Here, the identity of the composition is intangible and indescribable, falling somewhere between originating concept and achieved performance or delivery of the concept, whether based on combinations of precise sounds or the auditory experience of a form of process.

[36] "Today with the technical means that exist… the differentiation of …masses and …planes as beams of sound could be made discernible to the listener.…[to] permit the delimitation of…Zones of Intensities… [and these] would become agents of delineation like the different colours on a map…an integral part of form. These circles would be felt as isolated, and the hitherto unobtainable non-blending…would become possible."

The impetus for 3DBARE came from two articles by Edgard Varèse, commonly referred to as "The Liberation of Sound", (Varèse, New Instruments and New Music 1936), (Varèse 1967)

[37] 'Dreaming at the Circular Ruins', composed April 2012 for Impossible Brilliance Festival, celebrating Conlon Nancarrow's centenary. Part 1 was relayed in rotation for the following month at The Front Room, Queen Elizabeth Hall, South Bank Centre on a row of 12 equidistant Genelec studio monitors (approximately one metre apart). I first was able to listen, selecting combinations at will, via user interface-based experimental version of 3DBARE, on 5 September 2014 finding, as hoped, that the 12 pianos also work well as various combinations of smaller groups.

[38] (Collins 2008)

[39] "*This is the first time I have felt totally 'immersed' in a piece of music. You are in the music and not passing by it. The most fascinating places for me were the 'sweet spots' where the sound from two or more points in the piece mixes together, and incredible harmonic textures flow over each other until you decide to move on. It sounds completely natural and spontaneous when it is of course the most carefully composed part of the whole experience.*" From article on listening to geo-located version of "Take Me By The Hand" in "Landscape: The Journal of the Landscape Institute", Spring 2013 by Alastair McCapra, Chief Executive of the Landscape Institute. http://www.landscapethejournal.org/culture, Last accessed 04.06.13

[40] Locative Arts, Drew Hemment, LEONARDO, Vol. 39, No. 4, pp. 348–355, 2006, http://eprints.lancs.ac.uk/30971/1/leon-1.2006.39.4.348.pdf , Last accessed 19.03.13

[41] Chang, M., Goodman, E., "Asphalt Games: Enacting Place Through Locative Media", at Leonardo Online, vol. 14, issue 03, 2006 www.leoalmanac.org/wp-content/uploads/2012/07/Asphalt-Games-Enacting-Place-Through-Locative-Media-Vol-14-No-3-July-2006-Leonardo-Electronic-Almanac.pdfLast accessed 04.04.13 (See also THE SHAPE OF LOCATIVE MEDIA, Pope, S., "Mute" Vol. 1, No. 29 – The Precarious Issue, 9 February 2005, http://www.metamute.org/editorial/articles/shape-locative-media , Last accessed 13.05.13)

[42] Ibid

[43] Origins of the term are obscure but thought to emerge from Occitan: " bader v.n. « avoir la bouche ouverte » ('vieux' Mon 1636 ; 'autrefois' Fur1690-Trév 1771 s.v. badaud) " Le dictionnaire étymologique et historique du galloroman (français et dialectes d'oïl, francoprovençal, occitan, gascon), Französisches Etymologisches Wörterbuch, Walther von Wartburg
http://stella.atilf.fr/few/batare.pdfLast accessed 10.09.13

"The badaud is curious; he is astonished by everything he sees; he believes everything he hears, and he shows his contentment or his surprise by his open, gaping mouth." Grand dictionnaire universel du XIXe siècle (1867)

Larousse (Paris), 1867-1890, Source : Bibliothèque nationale de France Relation : http://catalogue.bnf.fr/ark:/12148/cb35154396x Description : Collection : Archives de la linguistique

française ; 225 Date de mise en ligne : 15/10/2007

An early use of the term "badaud" is found in Chateaubriand: “Les badauds sont toujours ébahis d’admiration ; et ébaubi de celui qui reste les yeux grands ouverts devant l’objet de son admiration.”

['Badauds' are always astounded with admiration; and dumbfounded by what stands before them eyes wide open in front of the object of their admiration] Translation BLM

[44] "Physiologie du flâneur", Huart, L., Paris, Aubert et Cie, 1841 http://gallica.bnf.fr/ark:/12148/bpt6k62352r

Source : Bibliothèque nationale de France, département Estampes et photographie, Est Oa-295 http://catalogue.bnf.fr/ark:/12148/cb32260134tLast accessed 10.09.13

[45] "A User's Guide to Détournement", Guy Debord & Gil J. Wolman IN "Les Lèvres Nues" #8 (May 1956), Translated by Ken Knabb http://www.cddc.vt.edu/sionline/presitu/usersguide.htmlLast accessed 15.09.13

[46] Chtcheglov, I., ‘Formulaire pour un urbanisme nouveau (Formulary for a New Urbanism) 1953, (Translation of the Newly Published Complete Version), trans., Ken Knabb http://www.bopsecrets.org/SI/Chtcheglov.htmLast accessed 19.12.2012.

[47] Marc Tuters, ''A Pointless Vision for Amsterdam's Future' at the PICNIC Seminar in Amsterdam, European Journalism Centre, September 2011, http://vimeo.com/29372441Last accessed 01.10.2014

[48] See Chang and Goodman on their *Asphalt Games* project or the descriptions made of visiting geo-located setting of Take Me By The Hand by Alastair McCapra and David Trevithick (List of References).

[49] Where the performer must reconstitute Piano Studies 2 and 4 from fragments.

[50] “Let us go then, you and I, / When the evening is spread out against the sky / Like a patient etherized upon a table;” : the opening lines of T.S. Eliot, "The Love Song of J. Alfred Prufrock" IN Prufrock and Other Observations. London, The Egoist, 1917.

[51] An award of £7,000 was received from NEMODE via #SXSC3, in November 2013, to develop 3DBARE to Proof Of Concept. This was done with the assistance of a freelance Processing programmer and the advice of Dr Richard Polfreman of the University of Southampton’s Music Department, concerning the conjunct operation of a Processing patch as screen-based user interface and an open source binaural audio rendering patch built in MAX. See Appendix: 3DBARE. Current work involves both new compositional research using the existing screen-based interface as a mode of listening and fund-raising for the development of an iOS-based app controlled by listener movement tracking.

[52] The richness of possibilities afforded by 3DBARE was clearly demonstrated at a performance in Romsey Abbey of Mozart’s Requiem. Seated at the rear of a high, long nave for the first few movements, I changed seats to observe the orchestra from a closer position. Finding only a side seat, behind the timpani and trombones I gained a perspective of the music as never before, where the I-V duality of the timpani gained hitherto unnoticed expressive power a structurally irreducible essentiality.

[53] Luigi Russolo, “The Art of Noises”, 1913 (L’arte dei Rumori; letter to Francesco Balilla Pratella), first published, Edizioni Futuriste di “Poesia”, Milan, 1916

[54] Notwithstanding phenomena such as silent disco, mobile clubbing and silent gigs, which deploy headphone-based audition either of stored or transmitted sound – whose forms are focussed not upon the sound content (which is often in important respects arbitrary) but upon the sociality of listening.

[55] This view that the composition's reception in this form is 'adequate', to adapt Ola Stockfelt's term, even though partial, is expounded by composer Eliane Radigue:

Je fais une repetition qui pour moi est mon travail important, en fonction des haut-parleurs, de la salle, la disposition des haut-parleurs, la manière dont le son doit remplir toute la salle, la manière dont chaque auditeur où qu'il soit doit être confortable dans ce bains musicale.	I do a rehearsal, which for me is my most important work, in terms of the loudspeakers, of the room, the positioning of the speakers, the way in which the sound has to fill the whole space, the that each listener wherever they are must feel comfortable in this musical immersion.
Mais ça, c'est à la répétition parce que je mets la materielle technique dans un placard où dans un autre piece, c'est à dire moi je n'apparait pas.	But that's in the rehearsal, because I put the technical equipment in a cupboard or in another room, that's to say I never appear in person.
Alors quatre haut-parleurs sont mis en croix, il n'y a pas de stéréo, ça n'existe pas. Ensuite, selon la réponse acoustique de la salle je peut même les tourner quelquefois.	So four loudspeakers are arranged in a cross, there's no stereo, that doesn't exist. Then, according to the acoustical response of the space, I can even rotate them sometimes.
J'ai vu quelquefois que des techniciens me disaient que c'est anti-acoustique mais je m'en fiche que ça soit anti-acoustique si c'est ce que je veux. C'est à dire éviter la direction du son sur les gens qui écoutent, c'est a dire, pas besoin de dire "mais toi au centre, c'est là où on entend le mieux."	I've seen sometimes that technicians would say to me that it's anti-acoustic but I don't give a damn that it's anti-acoustic if it's what I want. That's to say, to avoid directing the sound at the people listening, that there's no need to say "but you should sit in the centre, that's where you will hear it the best."
Non, normalement on peut être dans le moindre des coins et entendre de toute façon la globalité de ce qui se passe: c'est a dire dans chaque endroit dans la salle c'est peut être une histoire different mais c'est quand même une histoire totale.	No. Normally it's possible to be in the smallest corner and to hear in any case the entirety of what's happening: it's to say that in each part of the space it maybe a different story but it is nonetheless a complete story. Translation: BLM

IMA Portrait documentary, https://www.youtube.com/watch?v=D2U0q4lZiFg , Last accessed 14.09.2014

[56] "From mannerist situationism to situated media", Marc Tuters, Convergence 2012 18: 267 DOI: 10.1177/1354856512441149

[57] [An abridged version appeared in Internationale Situationniste #1 (Paris, June 1958), a translation of which was included in the first edition of the Situationist International Anthology.] http://www.bopsecrets.org/SI/Chtcheglov.htmLast accessed 10.09.13

[58] A so-called 'sticky' function has been activated in more recent platform updates (2014) which permits the soundscape map to be activated anywhere, its proportions maintained in self-relativity rather than with reference to absolute latitude and longitude coordinates. The dependency upon GPS however marks it as an outdoor mode of listening where ambient sonic activity will be factors in the listener's experience. Under 'sticky' function use, this correlation can no longer be anticipated and prepared for in the sounds presented to the listener.

A similar feature characterises the iPhone locative sound projects of #Satsymph, which can be activated anywhere. Listening to their Temple of Hermes at an Iron Age hill fort in Brecon, the non-correlation between physical situation and organised sound encountered there was as potentially rich in perceptual possibility as their designed interlacing: http://benjamin-

mawson.blogspot.co.uk/2014/05/geo-located-soundscape-at-iron-age-hill.html

[59] "From mannerist situationism to situated media", Marc Tuters, Convergence 2012 18: 267 DOI: 10.1177/1354856512441149 Last accessed 18.02.14

[60] See for example: (1) San Cornelio, G., Ardevol, E., Practices of place-making through locative media artworks, Communications. Volume 36, Issue 3, pp. 313–333, August 2011, http://openaccess.uoc.edu/webapps/o2/bitstream/10609/20102/1/COMM.2011.pdf (2) Varnelis, K., Friedberg, A., Place: Networked Place, http://networkedpublics.org/book/placeLast accessed 09.05 2013, (3) Biocca, F., "The Cyborg's Dilemma: Progressive Embodiment in Virtual Environments" IN Journal of Computer Mediated Communication online. Proceedings Second International Conference on Cognitive Technology (pp. 12-27). August 25-28, 1997, Aizu, Japan.) http://jcmc.indiana.edu/vol3/issue2/biocca2.html

[61] Driver, P., Embodiment, Technology and Locative Play, https://dl.dropboxusercontent.com/u/1105743/Embodiment%20Technlogy%20and%20Locative%20Play%20Paul%20%20Driver.pdfLast accessed 24.05.13

[62] Kassabian, A., "Ubiquitous Listening and Networked Subjectivity" IN ECHO: a music-centered journal, Volume 3 Issue 2 (Fall 2001) www.echo.ucla.edu/Volume3-issue2/kassabian/kassabian.pdfLast accessed 10.03.2011

[63] Karin Bijsterveld, K., "The Diabolical Symphony of the Mechanical Age: Technology and Symbolism of Sound in European and North American Noise Abatement Campaigns, 1900-40" IN Social Studies of Science, Vol. 31, No. 1 (Feb., 2001), pp. 37-70 Stable URL: http://www.jstor.org/stable/285817 Accessed: 28/05/2011 07:41

[64] (1) "The television set dominated the living room in most homes.... In many cases the warm flicker of the fireplace was pre-empted by the television's electronic glow." Pulos, A., "The American Design Adventure, 1940-1975" p. 299

(2) "Our Yule log video brings you the festive warmth of a glowing fireplace on any TV set or VCR... 60 minutes of a warm, crackling fire." Bloomingdale's By Mail, Christmas Catalog, 1989

These two examples cited in Tichi, Cecelia. Electronic Hearth: Creating an American Television Culture. New York: Oxford University Press, 1991

[65] (1) "Sponsoring Tube 'could improve stations', say Tories" http://www.bbc.co.uk/news/uk-england-london-24741733 , Last accessed 30.10.13

(2) "Exterion Digital delivers large valuable audiences.... affluent, young and influential consumers; reflecting the hyper-connected light TV viewers that frequent London's busiest areas.... Strategically placed in London's most iconic locations, we can communicate with this desirable and valuable audience right in the heart of Europe's number one city...Exterion Digital is synonymous with movement. Movement attracts the eye and the peripheral pull is king with our assets.... With the individual positioning of the screens in our environments, their scale and the uniqueness of these formats, we can deliver your brand messaging to your target audience. Whether it is through dwell time or frequency formats our digital assets are seen when and where it matters."

http://www.exterionmedia.com/uk/what-we-do/our-media/digital/ , Last accessed 16.08.14

[66] Stokols, D., Montero, M. (2002).Toward an Environmental Psychology of the Internet. In R. Bechtel and A. Churchman (Eds.) , Handbook of Environmental Psychology, (661-675). New York. John Wiley & Sons

[67] As variations on a theme, the Piano Sonata was a study of developmental forms of a single motif in three parts, respectively of 4,5, and 6 notes. The entire structure grew as a set of interconnected departures from the statement of this theme, which is the unifying element of the episodic whole. Bridge sections and cadenza-like passages using unrelated material are integrated to a whole whose

structure was planned and continually revised during the compositional process.

This element, of documentation and mapping, ins now more integrated to the workflow of DAW based composition making the shaping of primary material (such as explorations of treatment of a motif, recorded 'live' via MIDI) and structural planning of the composed whole (plotting significant structural events on a digital timeline before the intervening passages are complete) actions that develop in parallel.

http://benjaminmawson.com/music/1994_Piano_Sonata_no1/Mawson-Piano-Sonata-1994-op15.pdf

[68] It is acknowledged that, in apparently 'spontaneous' action, learned behaviours and pre-compiled vocabularies play significant roles and conversely the 'planning' process is a fluctuating combination of the so-called 'instinctual' and calculated.

[69] Nelson Goodman, Languages of Art, "The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music", Goehr, L. , Oxford University Press, (1992), pp. 29-31

[70] borrowing from the usage in Stockfelt: Adequacy being equated here to that which is genre-normative. An example of conceptual difficulties for the composer to challenge in the development and presentation of their work are the genre-normative passivity of listening and ritualised presentation of a 'work' as though it were an autographic object whose description could take analogous forms in its graphical, textual or music notational representation. "Adequate Modes of Listening', Stockfeld. O, Audio Culture: Readings in Modern Music, Ed.s Cox and Warner, Continuum (2007)

[71] "Our musical alphabet must be enriched. We also need new instruments very badly... In my own works I have always felt the need of new mediums of expression... which can lend themselves to every expression of thought and can keep up with thought.", Varèse interviewed in New York Morning Telegraph, 1916

[72] First digital performance, Canal Café Theatre, Maida Vale, October 1997.

[73] Figure 1 shows angle of rotation (where top is front centre) and elevation (hemisphere viewed from above) according to distance from centre where circumference shown is vertical middle and centre is top (above listener's head)

[74] Use of physical digital instruments (such as the Yamaha pf-85 used in Suite for Four Inhuman Hands) prevents multiple simultaneous instances of a single note, because the later instance cancels the first, causing clipping and an unwanted glitch effect. Where, as in the case of 'Dreaming at the Circular Ruins', multiple instances of a pitch are played, these are produced as simultaneously activated identical instances of the same audio sample. Now, an augmentation of loudness is the only effect of this simultaneity.

[75] (Varèse, 1936)

[76] This technique is a means of establishing coherence between virtually spatialised parts of which only a limited (and indeterminate) number will be simultaneously audible. Taken to logical developments, generative counterpoint is an increasingly used device in my composition since that time, where parts all bear relation to an unheard corollary.

[77] The lowest note of this ostinato figure falls from a D flat (bars 1-22) to a B flat (bar 23). The figure is chromatic and therefore 'modulation' is not strictly possible. Nonetheless repetition establishes, when parts are heard in isolation or in groups of three or fewer, a quasi-tonal harmonic base with suggestion of transformation in certain quasi-tonal directions.

[78] "During the festival this installation will play a selection of Nancarrow pieces plus new

compositions. We are inviting composers to create pieces that will be played a number of times during the weekend. Duration: 1 - 5 minutes. Pitch range: C0 (MIDI note 24) chromatically to B4 (MIDI note 83). Dynamic range: MIDI velocity 50 (quietest) to 75 (loudest). Fastest note repetition: 1/32 notes at 120bpm. Submission format: Logic, Ableton Live or Max/MSP file, or simply a standard MIDI file. Submission deadline: 2nd April, 2012 For more information about the installation see: http://www.artknowledgenews.com/Trimpin_Gerhard_Trimpin.html "

[79] Borges, J.L., "The Circular Ruins' IN "Labyrinths" Trans. Yates, D., Irby, J.E., USA, New Directions, 1962 ISBN 978-0-8112-0012-7

[80] See for example, David Thorpe (curator of Hansard Gallery show "Parallax") at http://oneartspace.com/pdf/TerrySmith-Press-Release.pdf (Accessed 15.11.2015)

> Terry Smith represents a surprisingly uncommon strand in the practice of contemporary art in the UK. His practice, which has been developing over twenty-five years, has its roots in Anti-Form European and American conceptualism. And although Smith studied at Goldsmiths and was working in London throughout the heyday of the YBAs, he was never seduced by the glamour and high profile achievements of his contemporaries preferring to pursue his investigations into the way in which the complexities of ideas, materials and the everyday can combine to make poetic statements that predate the fluidity of an art scene that has steered clear of any strong uniform trend. To paraphrase Gerhard Richter, he has "no medium, no style, no continuity and no intention to change."

and Colin Perry's review of "Parallax" at the John Hansard Art Gallery:

> *"During the construction period of Tate Modern in 1996, Terry Smith spent three months hacking chunks out of the original Bankside Power Station, creating temporary works on walls destined to be torn down or built over. The cavernous main space has since been transformed into the Turbine Hall; all that remains of Smith's works is an archive of striking photographs, including Ladder Parallax (1996/2011). This image was shown at the artist's illuminating recent exhibition, titled 'Parallax', which acted as a sort of mid-career retrospective. The show comprised a significant presentation of a body of works delineated by an ethos of contingency (Smith's interventions have often been made illegally in buildings destined to be destroyed) and resourcefulness (he likes to make works with whatever is at hand).*
>
> *'Parallax' bristled with the cultish glamour of rumour: you had to be there to see it. But Smith's practice also poses questions about how we assign value to works of art, opening up possibilities of action beyond the commercial realm.*

http://www.frieze.com/issue/review/terry-smith/ (Accessed 15.11.2015)

[81] Whether such presentation can be called 'acousmatic' may be disputed by some readers. I defend its use in two ways:

(1) with reference to Berezan, Harrison et al (see Note 21) who propose extending the definition to include real-time manipulations which themselves may be classified as 'live performance'

(2) with reference to Schaeffer's original definition, the "perceptive reality of sound as such, as distinguished from the modes of its production and transmission", which (disregarding the question of visibility of sources and whether the loudspeaker is a source or merely a relay-point of that sound) characterises the listening experience in '*ROOM'*. In this composition,

> the modes of production are various and overlapped such that their 'live' production would be impossible (manipulated samples combined with simulated acoustic instruments and multiple simultaneous impulse responses).

Whilst interactivity was not an original component of acousmatic listening, it is Schaeffer's definition which I have followed, rather than precedent set by the more common concert-hall settings in which much acousmatic music was first heard. A notable exception to the frequent absence of interactivity is the 1958 Poème Electronique of Edgard Varèse, using 350 loudspeakers across nine different 'paraboloid hyperboloid' spaces in the Philips Pavilion, designed by Le Corbusier for Expo '58. :

> "The interior was to be shaped in a manner similar to the stomach of a cow, with the concept that audience members would enter in groups of 500 at ten-minute intervals. For two minutes, as the audience filed in through a curved passageway, they would hear a short transition piece. Then the room would go into darkness, and spectators, who remained standing, would then be subject to the interior music and lights for eight minutes.'

In the Le Corbusier/Varèse experience, interactivity is still limited to a timed, guided passage through sound-producing spaces.

http://iem.kug.ac.at/fileadmin/media/iem/altdaten/projekte/publications/paper/poeme_electronique/poeme.pdf , Last accessed 21.11.15

While, then, there is often an aspect of interaction in the acousmatic, that which is categorised as locative or geo-located is often highly limited in its interactivity. (see 102)

[82] Terry Smith's 'Fuck Nauman' acknowledges the influence of artist Bruce Nauman and the video object, made in 2005, formed a striking (and almost concealed) element of 'Parallax'. For reviews of the exhibition see (1) "Art Exhibition: Terry Smith, Parallax", http://fussedmag.com/05-2012/blogs/page/50/#.VolQU9ZLHrk posted 25.11.2011 (last accessed 10.12.2015)
(2) "PARALLAX", https://www.wessexscene.co.uk/features/2011/12/13/parallax/ posted 13.12.2011 (last accessed 10.12.2015) and interview with Terry Smith by curator David Gryn (Art Basel) https://davidgryn.wordpress.com/2015/03/07/strangelove-interview-with-david-gryn-and-terry-smith/ (last accessed 10.12.2015)

[83] Broadcast Art, Sound and Independent Culture

[84] In later work, I removed all subject references and most nouns from found conversations to decontextualize the heard voices. In *'November Tea Party'* for internet radio station BASIC.FM a recording of a conversation between renowned advocate of the theory of evolution Richard Dawkins debated with creationist Wendy Wright was used in order to explore uses of the voice by the two speakers to negotiate extreme opposition. The result was a conversation whose sole remaining tangible quality was the discontiguity of the speakers' positions.

Richard Dawkins interviews creationist Wendy Wright, http://www.youtube.com/watch?v=-AS6rQtiEh8 , Last accessed 10.10.2013

[85] http://www.whitehouse.gov/blog/2011/05/02/osama-bin-laden-deadLast accessed 2 May 2011
http://www.youtube.com/watch?v=ZNYmK19-d0ULast accessed 2 May 2011

[86] The White House website video and transcript of the Obama speech from which "The President" was constructed: http://www.whitehouse.gov/blog/2011/05/02/osama-bin-laden-dead The speech on the White House's YouTube channel http://www.youtube.com/watch?v=ZNYmK19-d0U

[87] "The only way of expressing emotion in the form of art is by finding an "objective correlative"; in other words, a set of objects, a situation, a chain of events which shall be the formula of that particular emotion; such that when the external facts, which must terminate in sensory experience,

are given, the emotion is immediately evoked." T.S. Eliot, "Hamlet and His Problems" in The Sacred Wood, 1921. http://www.bartleby.com/200/sw9.html Last accessed 01.02.2014

[88] The waveform depicted (screen capture from Logic 9) is misleading in that although the word 'doubt' has a higher amplitude, the resonant "ä" in "God" sounds louder.

[89] https://secure.greenpeace.org.uk/page/s/fracking-david-cameron-most-shocking-speech?source=fb Last accessed 28.07.2014

[90] In later work such as my "November Tea Party" for internet radio station BASIC.FM, I removed all subject references from the conversation between Richard Dawkins and creationist Wendy Wright in order to explore uses of the voice by the two speakers to negotiate extreme opposition. The result was a conversation whose sole remaining tangible quality was the discontiguity of the speakers' positions.

Richard Dawkins interviews creationist Wendy Wright, http://www.youtube.com/watch?v=-AS6rQtiEh8 , Last accessed 10.10.2013

[91] Audio recordings of Caedmon's Hymn : these were originally sourced at Youtube.com (distributed on Standard YouTube License) but are now only available at the site of publisher Norton and Co. (1) http://www.wwnorton.com/college/english/nael9/section/volA/audio.aspx Read by J. B. Bessinger, Jr. & (2) http://www.wwnorton.com/college/english/nael/noa/realmedia/CademonsHymn.rm Read by Prof. R. D. Fulk

[92] "I had four musicians in the studio, and we were doing some improvising exercises that I'd suggested. I couldn't hear the musicians very well at the time, and I'm sure they couldn't hear each other, but listening back, later, I found this very short section of tape where two pianos, unbeknownst to each other, played melodic lines that interlocked in an interesting way. To make a piece of music out of it, I cut that part out, made a stereo loop on the 24-track, then I discovered I liked it best at half speed, so the instruments sounded very soft, and the whole movement was very slow. I didn't want the bass and guitar - they weren't necessary for the piece - but there was a bit of Fred Frith's guitar breaking through the acoustic piano mic, a kind of scrape I couldn't get rid of. Usually I like Fred's scrapes a lot, but this wasn't in keeping, so I had to find a way of dealing with that scrape, and I had the idea of putting in variable orchestration each time the loop repeated. You only hear Fred's scrape the first time the loop goes around." Eno, B., "The Studio As Compositional Tool", Lecture given during New Music New York, the first New Music America Festival sponsored in 1979 by the Kitchen. http://music.hyperreal.org/artists/brian_eno/interviews/downbeat79.htm , Last accessed 04.03.2011

[93] Among the 17 surviving manuscript texts several orthographies exist: this version was used in the score for its proximity to the pronunciation of the speakers heard in the audio montage. The examples below demonstrate a few of the numerous discrepancies:

Nu sculon herian heofonrices Weard,	Nu scylun hergan hefaenricaes uard,	Nu we sculon herigean heofonrices weard,
Metodes mihte and his modgeþanc,	metudæs maecti end his modgidanc,	meotodes meahte ond his modgeþanc,
weorc Wuldorfæder, swa he wundra gehwæs	uerc uuldurfadur, sue he uundra gihuaes,	weorc wuldorfæder, swa he wundra gehwæs,
ece Dryhten, or onstealde.	eci dryctin, or astelidæ.	ece drihten, or onstealde.
He ærest scop eorþan bearnum	He aerist scop aelda barnum	He ærest sceop eorðan bearnum
heofon to hrofe halig Scieppend.	heben til hrofe, haleg scepen;	heofon to hrofe, halig scyppend;
þa middangeard mancynnes Weard	tha middungeard moncynnæs uard,	þa middangeard moncynnes weard,
ece Dryhten, æfter teode	eci dryctin, æfter tiadæ	ece drihten, æfter teode
firum foldan Frea ælmihtig.	firum foldu, frea allmectig.	firum foldan, frea ælmihtig.

[94] This transliteration sourced from the Wikipedia page on Caedmon cites its authority as A. Campbell, Old English Grammar (Oxford: Oxford University Press, 1959)

[95] Translated: Allah is Most Great / I bear witness that there is none worthy of being worshipped except Allah / I bear witness that Muhammad is the Apostle of Allah / Come to prayer / Come to Success [translation source MASS04 channel, YouTube, https://www.youtube.com/watch?v=EAvlimEYEpQ Last accessed 25.10.2014]

[96] Credo is an exploration of expressive possibilities under specific technological affordances and constraints: working with a particular set of tools towards composing music for listeners to encounter interactively according to their position, orientation and movement. It was with this in mind that the interpretative and improvisatory approach was taken with the materials collected.

[97] Permission for use and quotation in part or whole obtained from the poet, Jeffrey Wainwright, February 2012. Published in The Independent Thursday Review, Thursday 25th February, 1999; page 5; (issue 3855).

[98] In transplanting the musical 'work' from its expected setting in the concert hall to an undesignated space, it was intended also to remove from it a sense of the rhetorically formal. The act of geo-locating a composition is one of exploring how it can be made to appear one with its physical setting while acting as a lens through which to re-examine the character of the place into which it has been transplanted.

[99] Heaney, S., The Main of Light, in The Government of the Tongue, Faber, 1989. The essay describes the dramatic perspective-shifting function of Shakespeare's Sonnet 60, line 5: "Nativity, once in the main of light,"

[100] I a – IV: 1st inversion E minor (with doubled third) ascending G – E – B – G followed by chord of subdominant, A minor: ascending A – E – A – C. This is also suggestive of a III – IV progression.
I b – VI b: 2nd inversion E minor with G falling to supertonic F# suggesting passing dominant followed by 2nd inversion chord of C major.

[101] I have only encountered the term 'augmented aurality' as a strapline for their software by the makers of noTours software. It is a shorthand both for the perceptible sonic character of a location and for the visitor's perception of this. The recursiveness of perceiving a heard character into existence seems to be well represented by this coinage. http://www.notours.org/about , Last accessed 12.10.15 My account of working with this tool (that allows ambulatory listeners to combine audio fragments across space) must necessarily also be fragmentary: a textual account is given in philosophical and artisanal terms at Fluid Narratives of Virtual Music

[102] In the 2015 street theatre production "Monument" by director David Rosenberg and music production team Ben and Max Ringham, the requisite app download is a time-activated audio file that begins to play at a given scheduled start time. The visitor then follows the instructions to move to different parts of central London and is given a realistic time to arrive there. The interactivity between recording and place is built into the events of the theatrical action taking place within the crowds where the audience find themselves.

Another example, from 2012, comes from the BBC Proms website, which offered a "Music Walk" [http://londonist.com/2012/08/bbc-proms-hosts-music-walk-in-south-ken, last accessed 04.12.2015], (Original site http://promsmusicwalk.co.uk/ now obsolete) where listeners were able at a time of their own choosing to walk given routes around South Kensington in London, listening to mp3 recordings of compositions inspired by their suggested listening locations, although the lack of true interactivity could arguably place this experience outside the definition of geo-located composition. Certain 'live' elements were added:

> "For example, the breezy weirdness of Joe Cutler's fragmented, remix-laden The Greatest Hits

of Prince Consort Road will be performed outside the Royal College of Music with a strange, theatrical cameo from the composer himself (giving no more away). Elsewhere, the music, all of which has been written with location in mind, ranges from instrumental music to pre-recorded sounds, from the atmospheric to the experimental. None of it is boring.

The idea was inspired by Cage's 1958 piece Music Walk and by his interest in the sounds of the city (he lived in the centre of New York) and ambient sound in general. His most famous work is 4'33", four minutes and 33 seconds of performer(s) playing nothing at all. The piece was featured in yesterday's late-night Prom — listen again here."

[103] e.g. Recorded conversation between Enrique Tomás, co-inventor of noTours geo-locational software and composer Maria Papadomanolaki. London, November 2012.

[104] Members of Galician sound art collective 'www.Escoitar.org': Enrique Tomás (developer of noTours Android player), Horacio González (developer of online UI for soundwalk construction at www.editor.notours.org)

[105] http://www.notours.org/about , Last accessed 12.10.15

[106] Rather than playing audibly a timer function tracks the duration between project start and moment of activating a particular audio file and begins to play it at that point. This reduces processing inefficiencies, averting likelihood of system crash and engenders precisely the intended temporal relation between parts of the music.

[107] Where listeners are sedentary or immobile and listening to fixed position sound sources (whether or not they are combinedly simulating the movement of sounds around the audition space).

[108] Only the duration of cells is shown, to reduce the point of comparison solely to that of metrical correlation.

[109] Self-evident because they follow designated routes (e.g. pavements and paths), which listeners are observed to prefer, in conformity with prescribed norms. See 'Written in Water: Portrait of a Town' (2014).

[110] See Chapter 3: Acousmatic Music. (1) ROOM

[111] "Reverberation, or reverb, is a series of acoustic reflections that occur within a space when sound is created. The timing, frequency, and volume of the reflections will vary depending on the size, shape, and contents of the space. Whether natural or simulated, reverberation provides depth to a recording and provides the listener with clues about the environment where the performance took place, or is being represented as taking place." Garrison, M., The Encyclopedia of Home Recording, http://music.tutsplus.com/articles/why-reverb-is-the-most-essential-effect-in-your-toolkit--audio-14924 Last accessed 31.09.14

[112] More than any other feature of noTours, too, this multi-simultaneity is precisely contrary to its experimental function in exploring uses of space for the ultimately actuating the Varèsian ideal of 'non-blending'.

[113] Magnusson (2010)

[114] (1) Geo-located soundscape covering the city of Canterbury with 3rd year BA Music Production and Technology students at Canterbury College. The collaborative composition by 16 student composers will be compiled as xml code within a universal soundscape.rss file, comprising the content of all students' soundscapes. This will then be necessarily edited outside the noTours interface (which currently lacks open/save as/undo functions) but respecting the limitations of the handset software that must read the final document.

(2) Audio Portrait of a City: massive collaborative documentary / music composition project spread across Southampton's green spaces, in collaboration with Southampton City Festival, which will also

involve a combination of user interface input and post-facto coding to ensure mutual compatibility of elements, edited as xml to out put a single soundscape.rss file for the handset player to take as its instructions.

[115] 3 separate geo-located forms of Take Me By The Hand have been built. This commentary will concentrate only on the one at Highfield, Southampton. The version at Royal Festival Hall was a transplanted setting of the choral circles only (April 2012, at early stage development of Highfield version, prior to use of non-choral materials). St Paul's Churchyard differs in the urban situational setting and concomitantly different character both of non-choral materials used and the sonic/acoustic characters of the environs themselves. Due to these non-choral materials' subordination to significantly lower prominence of the choral materials, this setting was retitled "Audio Portrait of St Pauls"

[116] For demonstration during the weekend of 21-22 April 2012 while attending the South Bank Centre's "Impossible Brilliance" Centenary Festival of Nancarrow, at which two of my acousmatic compositions were heard.

[117] Concluding section of PLATO, Republic, Book VI

[118] http://plato.stanford.edu/entries/art-ontology-history/#PlaParCre, Last accessed 01.09.14

[119] Rudner, Richard, 1950, 'The Ontological Status of the Esthetic Object', Philosophy and Phenomenological Research, 10 (3): 380–388., cited in [50]

[120] Definitions of the term 'locative' are debated and the breadth of that discussion would distract from the present purpose. I will use the term in a broadly accepted usage which is of 'specificity to and integration with a physical location'. 'Geo-location' is a subset of the 'locative', utilising longitudinal and latitudinal coordinates of the user or listener as the controller of their experience.

[121] JAKOBSON, R., '*Six Lectures on Sound and Meaning'*, Cambridge, MA, MIT Press 1978, p113, quoted in WEISS, A., *Varieties of Audio Mimesis: Musical Evocations of Landscape*, , Errant Press 2008, pp15-16

[122] ENGE, H., '*The moment and the tradition: Zender's and Cage's concepts of listening'*, 2011. Published in German translation as "Der Augenblick und die Tradition. Zenders und Cages Konzepte des Hörens" in Neue Zeitschrift für Musik 6/2011, pp. 32-37. English version, Last accessed 01.03.12, at: http://www.academia.edu/1164492/The_Moment_and_the_Tradition._Zenders_and_Cages_Concepts_of_Listening

[123] ibid

[124] Ibid

[125] See Note 39

[126] Cited in HATHERLEY, O., "*The New Ruins of Great Britain",* London, Verso, 2010, p123

[127] Excerpted from Virtual Piano Study No.1, Mawson, B.L., https://soundcloud.com/3dbare/virtual-piano-study-no-1 (4'55"-6'45", 9'03"-end)

[128] In Chapter 4: Geo-located Music (1) Take Me By The Hand – Geo-located settings (2012) , two contrasted uses are explained of the primary material for Take Me By The Hand in alternative geo-located settings, in terms of mapping audio circles and the relation between acousmatic source material and situation-originated audio.

[129] 'Adequate Modes of Listening', Stockfelt, O., in "Audio culture : readings in modern music", eds. Cox & Warner, New York [u.a.] : Continuum, 2004.

[130] see Chapter 3: Acousmatic Music, (5) Take Me By The Hand, Acousmatic setting, paragraph "We look upwards"

[131] In this case, intended to involve a "cognitive reordering by the individual of their relationship with the environment, unconsciously formed through repetitive engagement": see NÚÑEZ DEL PRADO, P. (aka Autódios), (2014), "Apophenial Codex", http://pdfcast.org/pdf/apophenial-codex, Last accessed 01.08.14

[132] "Why do people see faces in nature, interpret window stains as human figures, hear voices in random sounds generated by electronic devices or find conspiracies in the daily news? A proximate cause is the priming effect, in which our brain and senses are prepared to interpret stimuli according to an expected model….Is there a deeper ultimate cause for why people believe such weird things? There is. I call it "patternicity," or the tendency to find meaningful patterns in meaningless noise." SHERMER, M. (2008), "Patternicity: Finding Meaningful Patterns in Meaningless Noise". *Scientific American Magazine*, December 2008 http://www.scientificamerican.com/article/patternicity-finding-meaningful-patterns/

[133] BRUGGER, P. (2001) "From Haunted Brain to Haunted Science: A Cognitive Neuroscience" IN HOURAN, J. and LANGE, R. Ed.s *Hauntings and Poltergeists: Multidisciplinary Perspectives*, USA, McFarland, 2001, p.195 http://books.google.co.uk/books?id=3ROOCSPXahQC - see also POULSEN, B., 2012, "Being Amused by Apophenia", *Reality Play*, http://www.psychologytoday.com/blog/reality-play/201207/being-amused-apophenia, Last accessed 01.08.14 - see also BLOM, J.D. (2010) "*A Dictionary of Hallucinations*", New York, Springer, 33 http://books.google.co.uk/books?id=KJtQptBcZloC&pg=PA33 , Last accessed 11.09.14 for explanation of etymology and psychiatric context, where apophenia is seen as a "neuropsychological substrate of pareidolia, auditory pareidolia, the Dark Side of the Rainbow and other cognitive illusions. Today the term apophenia tends to be used in a much looser sense, not necessarily relating to psychiatric disease or heuristic sensitivity leading to the discernment of patterns or connections in random or otherwise meaningless data"

[134] (1) "Pareidolia: the tendency to interpret a vague stimulus as something known to the observer, such as interpreting marks on Mars as canals, seeing shapes in clouds, or hearing hidden messages in reversed music." BERETSKY, S., What Does 'Pareidolia' Mean and Why is it Dangerous?, http://blogs.psychcentral.com/panic/2012/01/what-does-pareidolia-mean-and-why-is-it-dangerous/ , Last accessed 18.09.14

(2) ABSTRACT: By definition, visual illusions and hallucinations differ in whether the perceived objects exist in reality. A recent study challenged this dichotomy, in which pareidolias, a type of complex visual illusion involving ambiguous forms being perceived as meaningful objects, are very common and phenomenologically similar to visual hallucinations in dementia with Lewy bodies (DLB). We hypothesise that a common psychological mechanism exists between pareidolias and visual hallucinations in DLB that confers meaning upon meaningless visual information. Furthermore, we believe that these two types of visual misperceptions have a common underlying neural mechanism, namely, cholinergic insufficiency. The current study investigated pareidolic illusions using meaningless visual noise stimuli (the noise pareidolia test) in 34 patients with DLB, 34 patients with Alzheimer's disease and 28 healthy controls. Fifteen patients with DLB were administered the noise pareidolia test twice, before and after donepezil treatment. Three major findings were discovered: (1) DLB patients saw meaningful illusory images (pareidolias) in meaningless visual stimuli, (2) the number of pareidolic responses correlated with the severity of visual hallucinations, and (3) cholinergic enhancement reduced both the number of pareidolias and the severity of visual hallucinations in patients with DLB. These findings suggest that a common underlying psychological and neural mechanism exists between pareidolias and visual hallucinations in DLB.
YOKOI, K., NISHIO, Y. et al , *"Hallucinators find meaning in noises: pareidolic illusions in dementia with Lewy bodies."* Neuropsychologia. 2014 Apr;56:245-54. doi: 10.1016/j.neuropsychologia.2014.01.017. Epub 2014 Jan 31. http://www.ncbi.nlm.nih.gov/pubmed/24491313 Last accessed 01.09.14

[135] "Type I error, also known as a "false positive": the error of rejecting a null hypothesis when it is

actually true. In other words, this is the error of accepting an alternative hypothesis (the real hypothesis of interest) when the results can be attributed to chance. Plainly speaking, it occurs when we are observing a difference when in truth there is none..... Type II error, also known as a "false negative": the error of not rejecting a null hypothesis when the alternative hypothesis is the true state of nature. In other words, this is the error of failing to accept an alternative hypothesis when you don't have adequate power. Plainly speaking, it occurs when we are failing to observe a difference when in truth there is one." http://www.stat.berkeley.edu/~hhuang/STAT141/Lecture-FDR.pdf Last accessed 14.09.14

[136] Part of a review description of Highfield setting of Take Me By The Hand written by David Trevithick, Community Arts Assistant, the d.@rt centre, Southampton

[137] GPS responsivity is determined numerous factors, including weather variation, locational topology, architecture and aspect. As low ground surrounded by high buildings or higher ground, responsivity was low, necessitating larger circles than usual. These circles had a diameter range of 42-61 metres, averaging at 48 m. By contrast, other settings such as Take Me By The Hand arranged around the high, south-facing slope of Highfield

[138] As the largest town in Britain with no railway station, a regular and prominent statistic in nationwide health statistics and some of the lowest property prices in southern England, the local economy has had to adapt rapidly to the removal of its large naval customer base. One in four shops in the High St is a charity shop. Numerous pubs and hotels have been turned into flats and there is almost nowhere to go at night. Access to the town is either by 6 miles of congested single carriageway or passenger ferry across Portsmouth Harbour to the railway and bus station there.

[139] "Of Animals and Men: A Study of Umwelt in Uexküll, Cassirer, and Heidegger", Chien, Jui-Pi, Concentric: Literary and Cultural Studies 32.1 January 2006: 57-79, http://www.concentric-literature.url.tw/issues/Animals/3.pdf, Last accessed 14.09.14

Uexküll's work was in part a response to the literary-historical critical concept originated by Hippolyte Taine of "race – milieu – moment", where Umweltforschung stands in as a study of (formally and conceptually altered) 'milieu', in 'Umwelt'. Taine's 'milieu', in the context of his historicist criticism, is frequently translated as 'environment' or 'surroundings' although I would suggest 'situational context' to differentiate from 'cultural context' and 'temporal context' in overcoming the controversial reductionism of single parallel terms for 'race' and 'moment'.

[140] The unreliable currency of Google Maps satellite images was evinced after plotting a version of Take Me By The Hand for demonstration in London on 21-22 April 2012. What appeared to be the lawns of Jubilee Gardens, SE1 were now a four acre building site, surrounded by high fences. The music was remapped to the Royal Festival Hall riverside, now complete but depicted by Google as in progress. From 2005 to 2014 a large passenger jet plane appeared to be stationary above Russell Sq., London WC2.

[141] The minimum workable radius for a soundwalk circle is around 4 metres although at this size it is uncertain that the circle will always remain exactly where placed in terms of handset response during real-time GPS position updating.

[142] If four equal quadrants each contain a filtered output appearing in inverse correlation also to rotate 90° (turn 90° left, hear the same sound 90° right) the soundscape circle partially simulates binaurality. Individual angles may be specified.

[143] Responses from listeners indicated that a majority favoured the vibrate function as it permitted them to understand the spatial mapping of the composition to a certain extent without resort to the visual information on the handset screen.

[144] http://benjaminmawson.com/written-in-water/ (Created 14.12.2014

[145] E.g. the 16 virtual members of the first violin section

[146] See: Vladimir Bonacic, “Moguchosti kompjutera u vizualnim istrazivanjima“ / “Possibilities for Computer Applications in Visual Research,“ in Boris Kelemen and Radoslav Putar (eds.), Galerije grada Zagreba, Zagreb, 1968, pp. 45–58. Vladimir Bonacic “Umjetnost kao funkcija subjekta, spoznaje i vremena“ / “Arts as Function of Subject, Cognition, and Time,“ in: Boris Kelemen and Radoslav Putar (eds.), Galerije grada Zagreba, Zagreb, 1971, pp. 129–142. http://darkofritz.net/text/Images_Sound_Vladimir_Bonacic.pdf

[147] January 2011 http://benjaminmawson.com/music/virtual.htm

[148] http://benjamin-mawson.blogspot.co.uk/2013/12/fluid-narratives-of-virtual-music.html , 02.12.2013

[149] January 2011 http://benjaminmawson.com/music/ZI.htm

[150] A recent resurgence in interest in the Theremin after a period of oblivion, accompanies the accelerated development of digital musical interfaces like the Eigenharp, the Håken Continuum and the Roli Seaboard.

[151] October 2013, http://benjamin-mawson.blogspot.co.uk/2013/10/concepts-for-virtual-performance-part-1.html

[152] http://benjamin-mawson.blogspot.co.uk/2013/10/concepts-for-virtual-performance-2.html 20.10.2013

UNIVERSITY OF SOUTHAMPTON

FACULTY OF HUMANITIES

Department of Music

Volume 2 of 2
(Portfolio of Compositions)

The Digital Studio as Compositional Tool:
Towards a Virtual Performance Platform

Benjamin Louis Mawson

Thesis for the degree of Doctor of Philosophy

December 2014

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Declaration of authorship

I, BENJAMIN LOUIS MAWSON declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

The Digital Studio as Compositional Tool:
Towards a Virtual Performance Platform

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission.

Signed:
Date: 21 December 2014

MUSIC FOR KEYBOARD
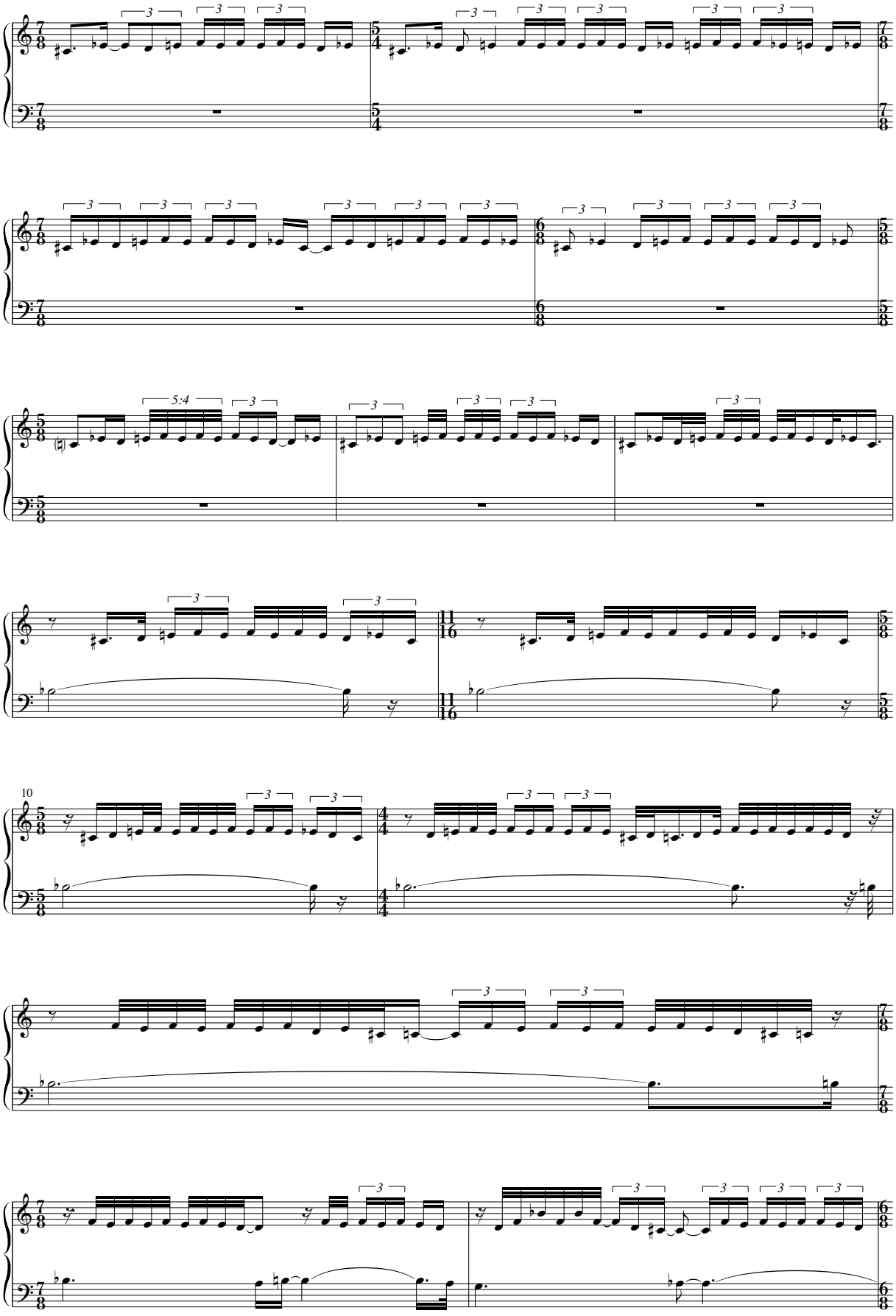
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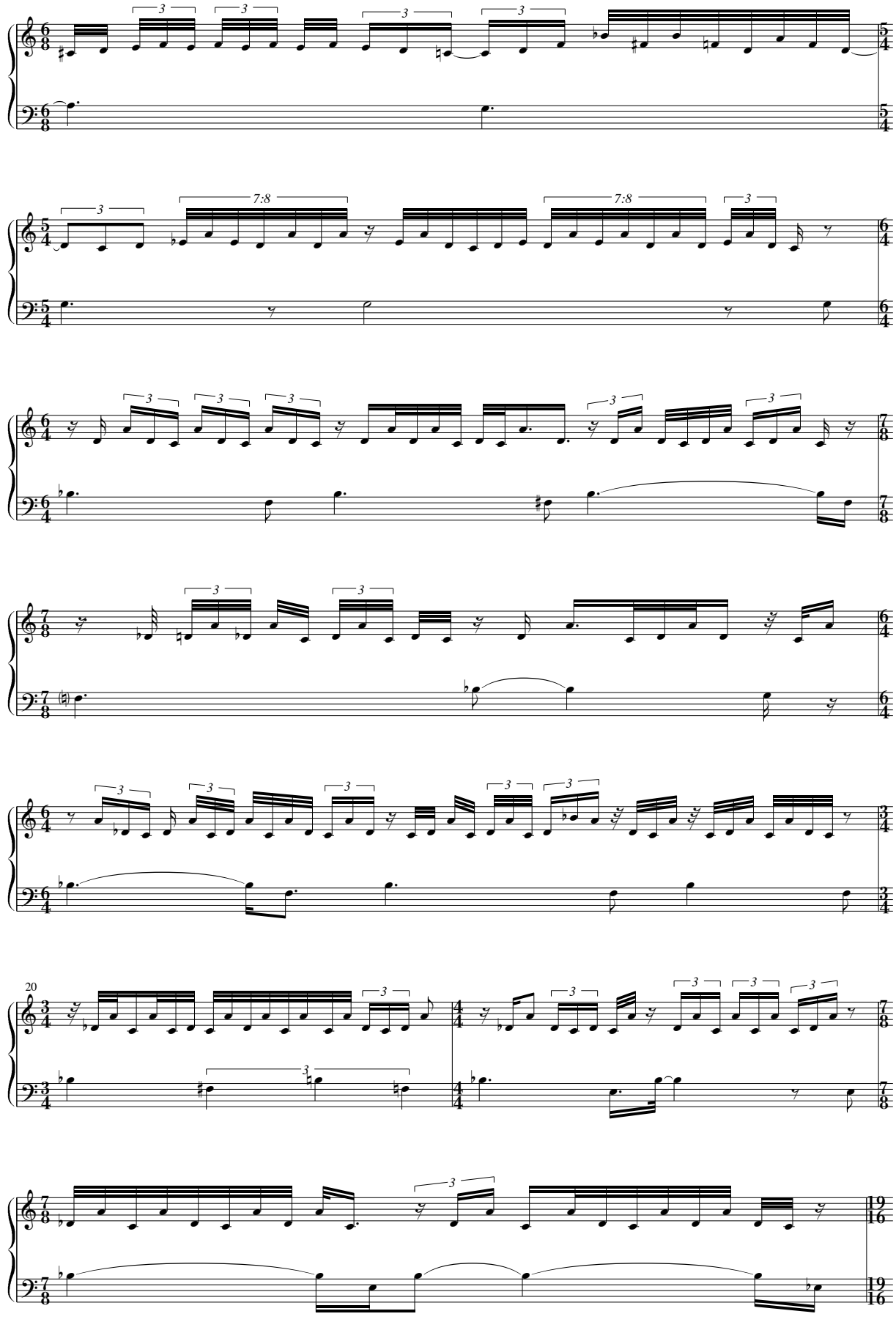
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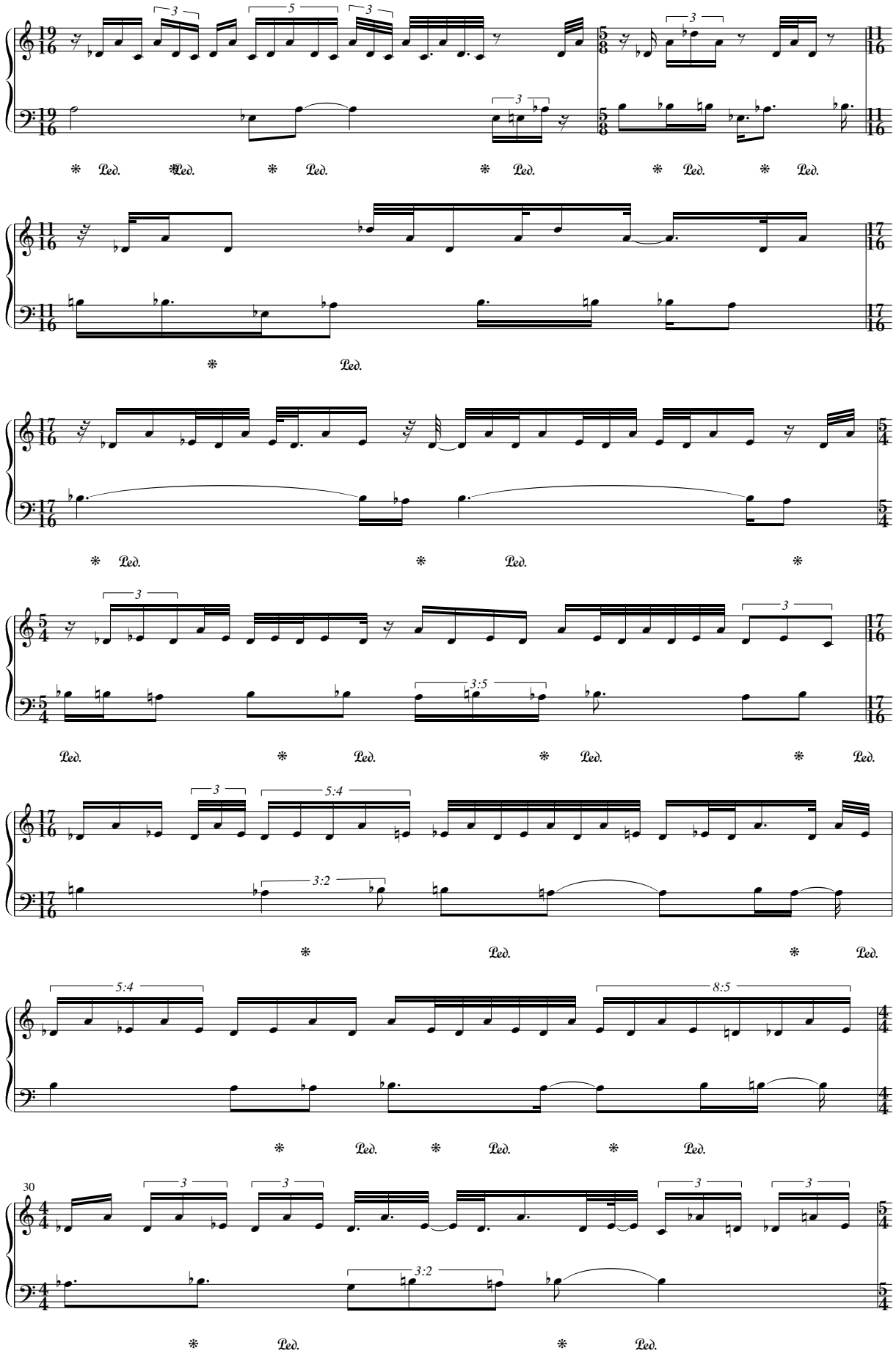
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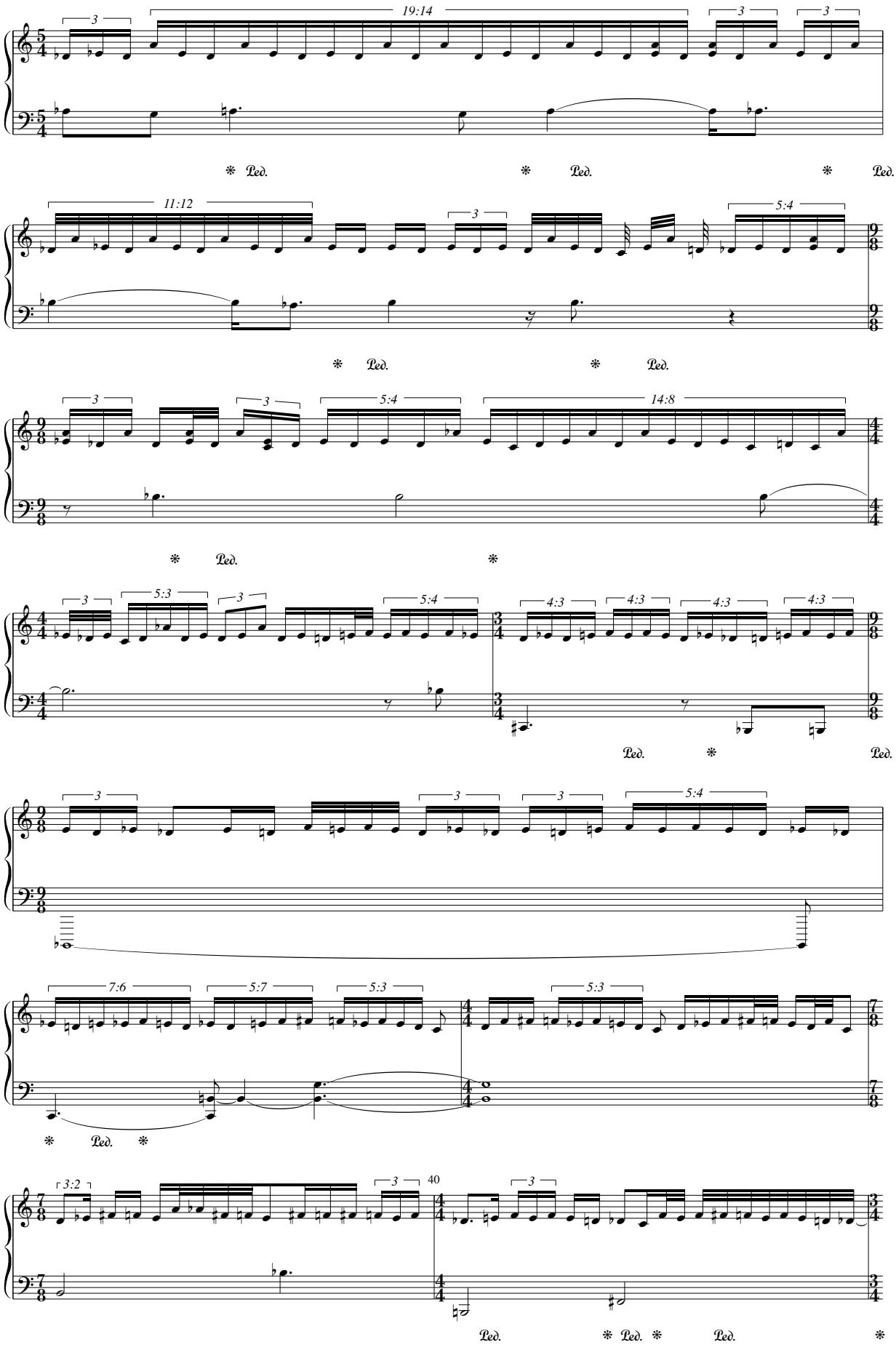
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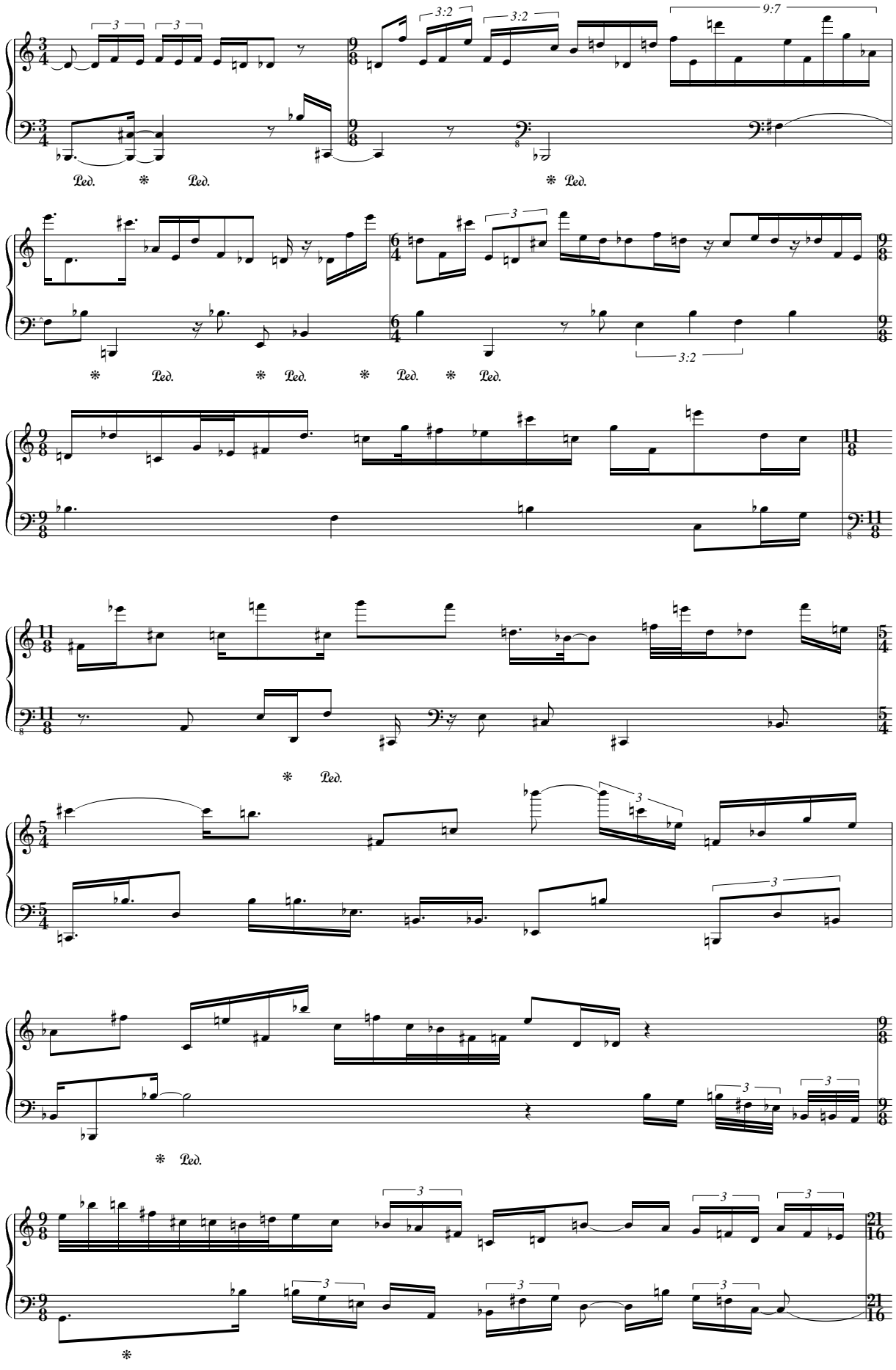
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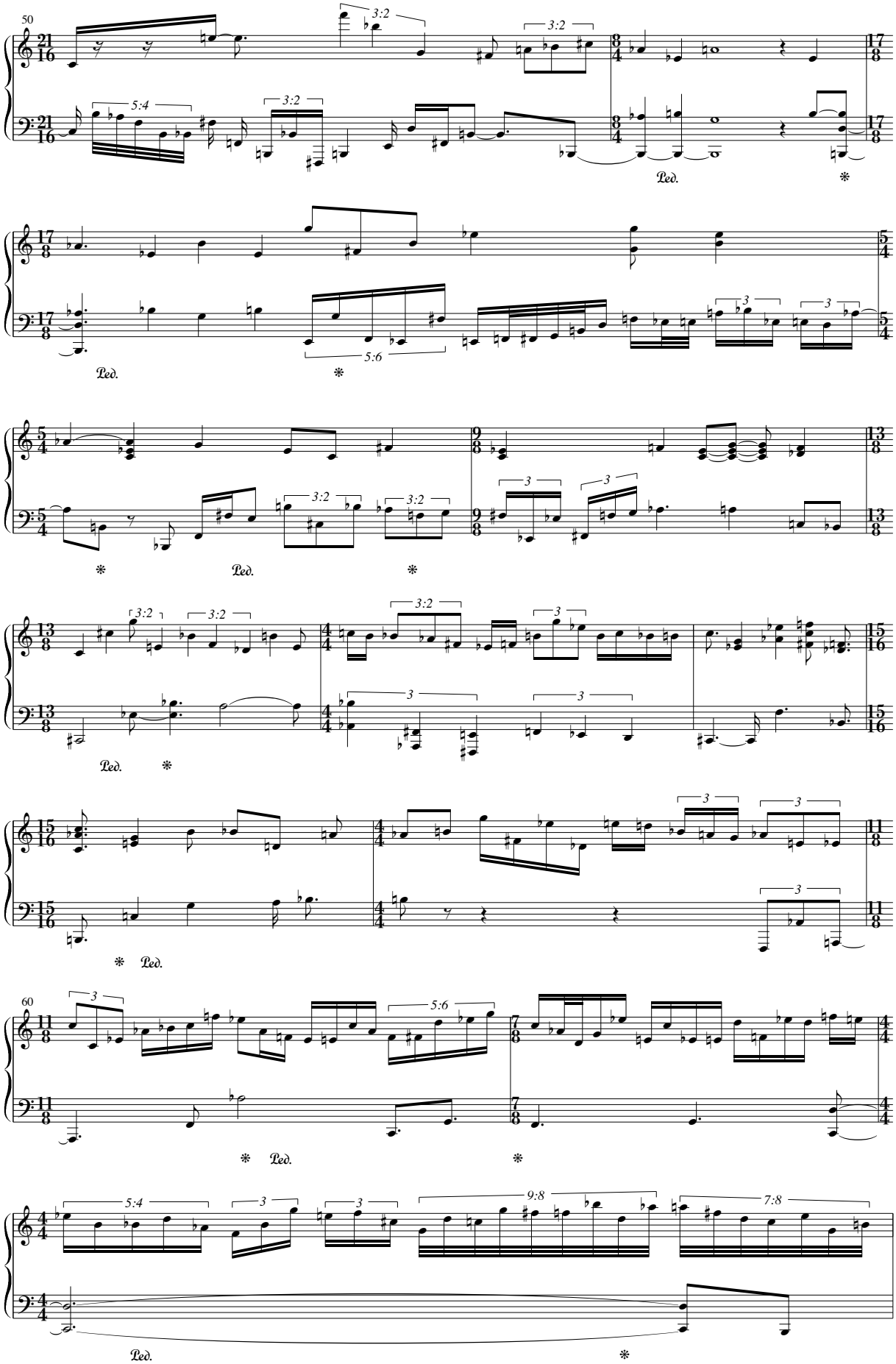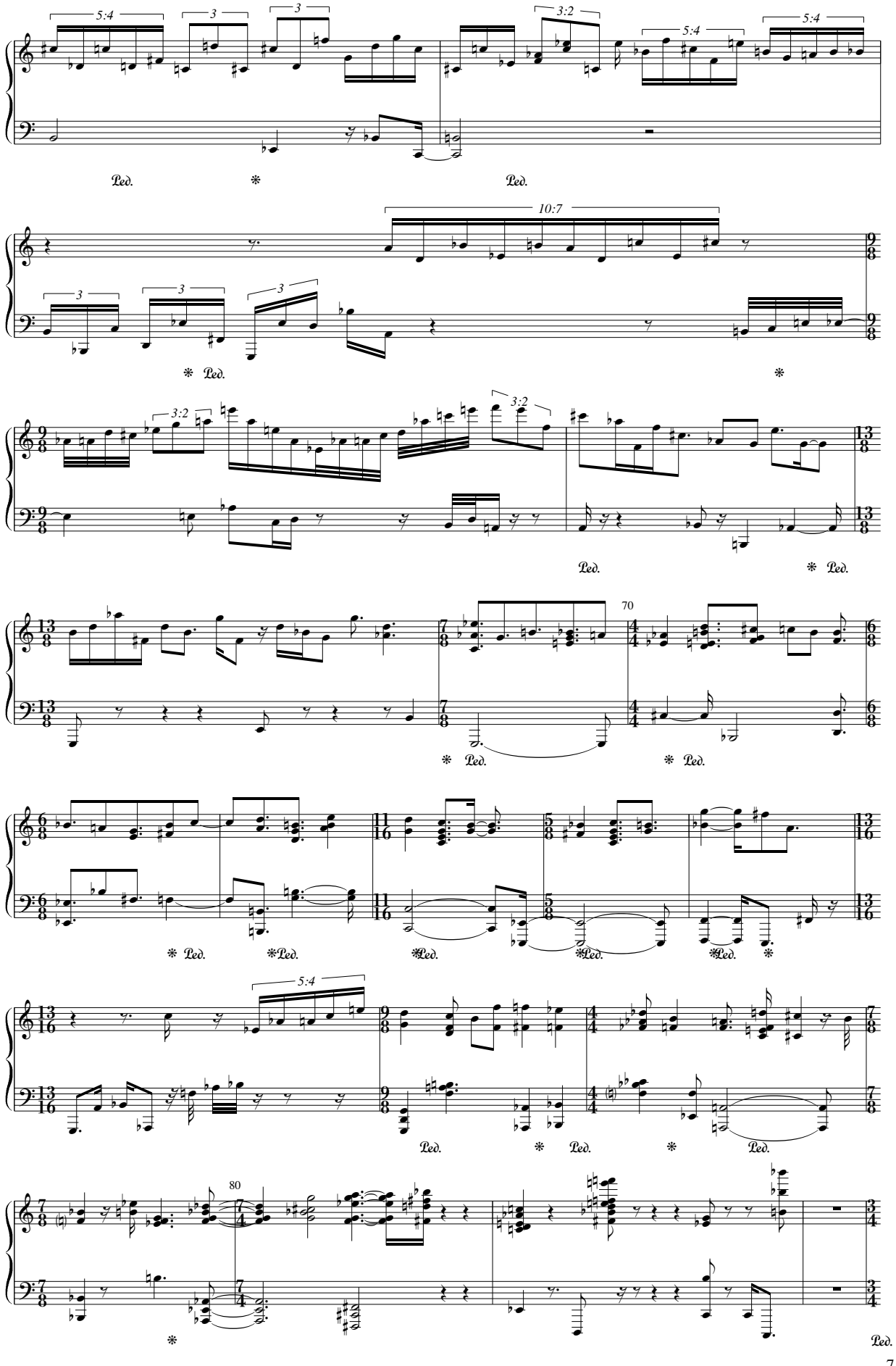



20
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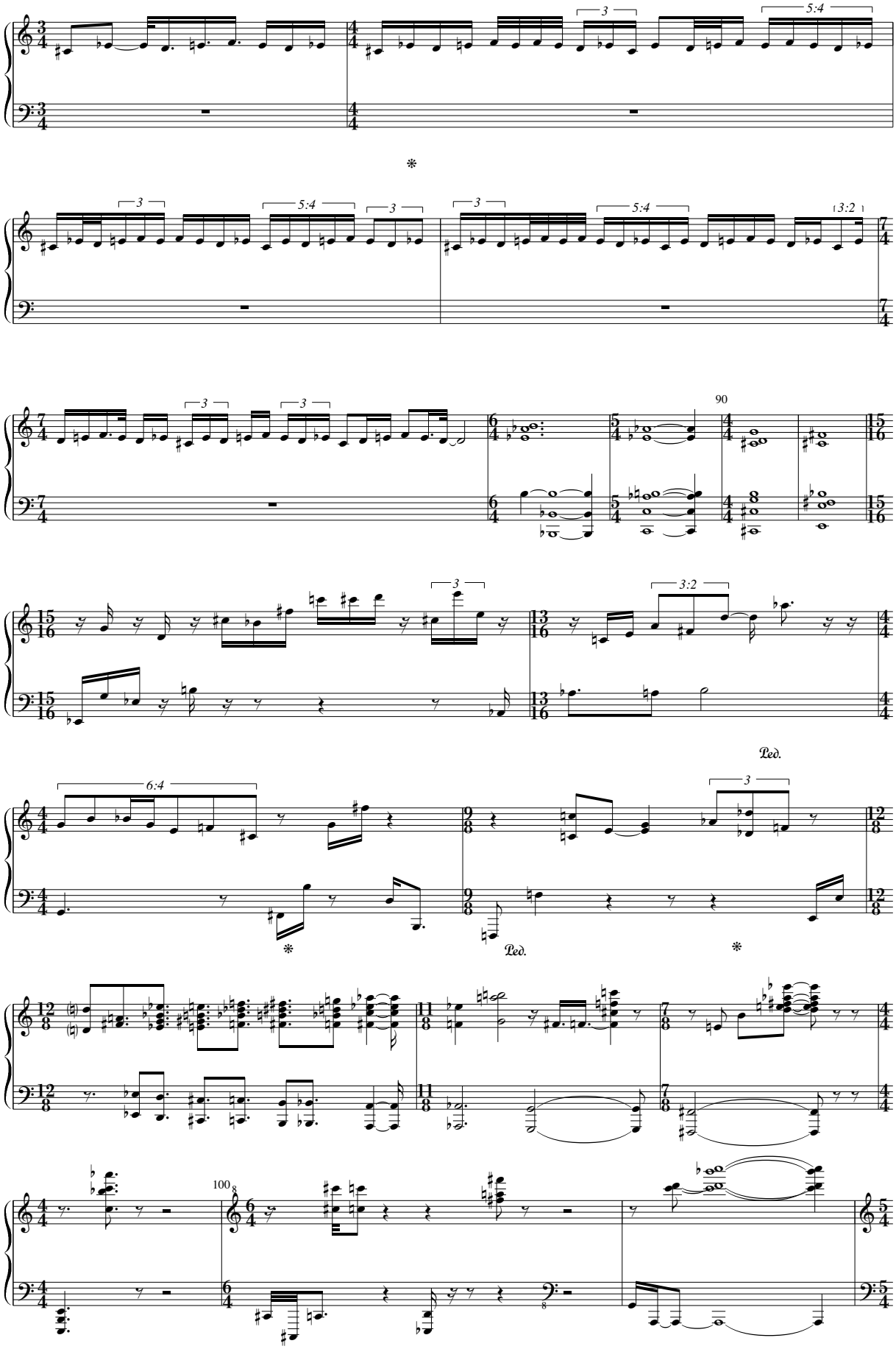

Ped.
3:5
3:2
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8:5
30
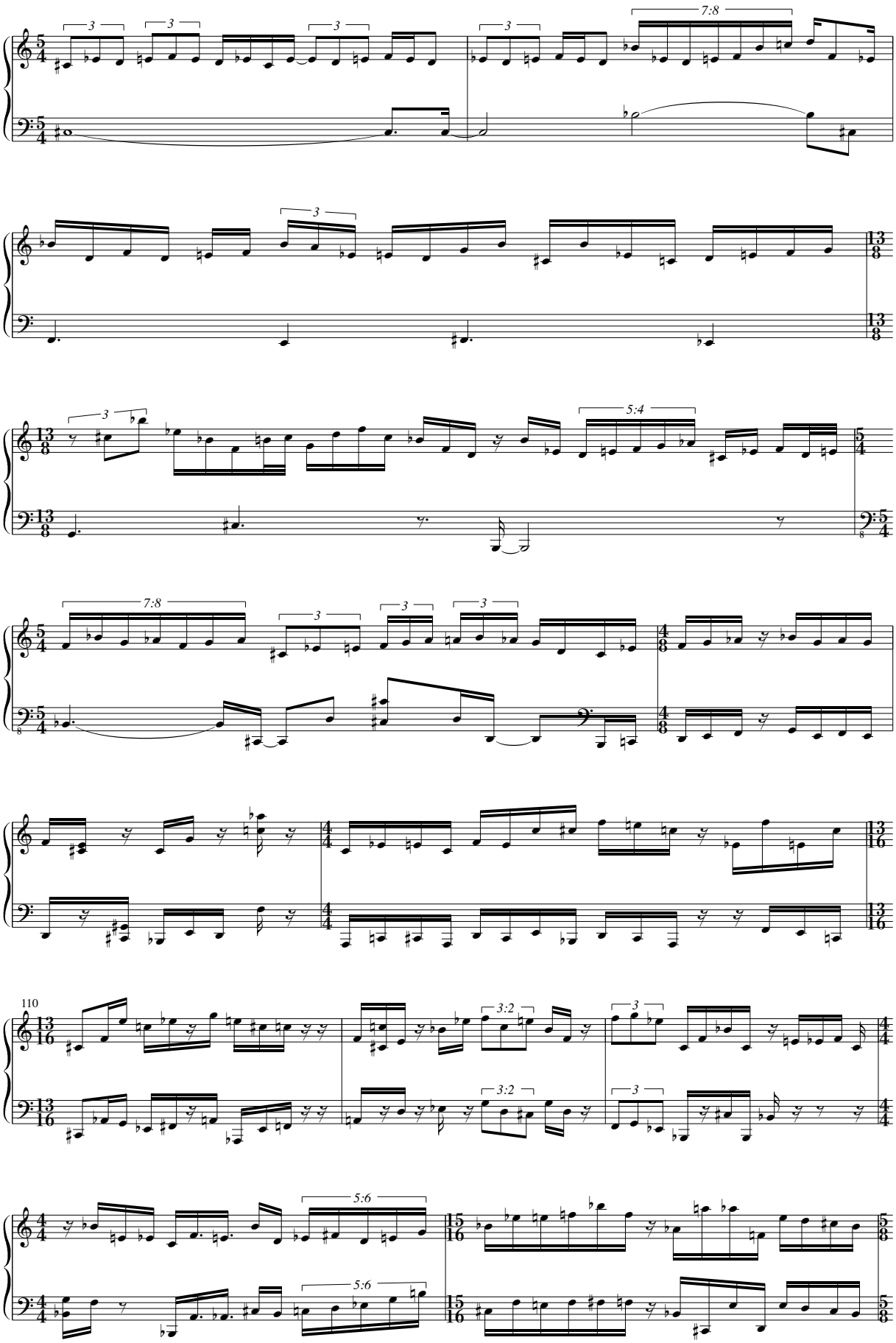

19:14
11:12
14:8
40
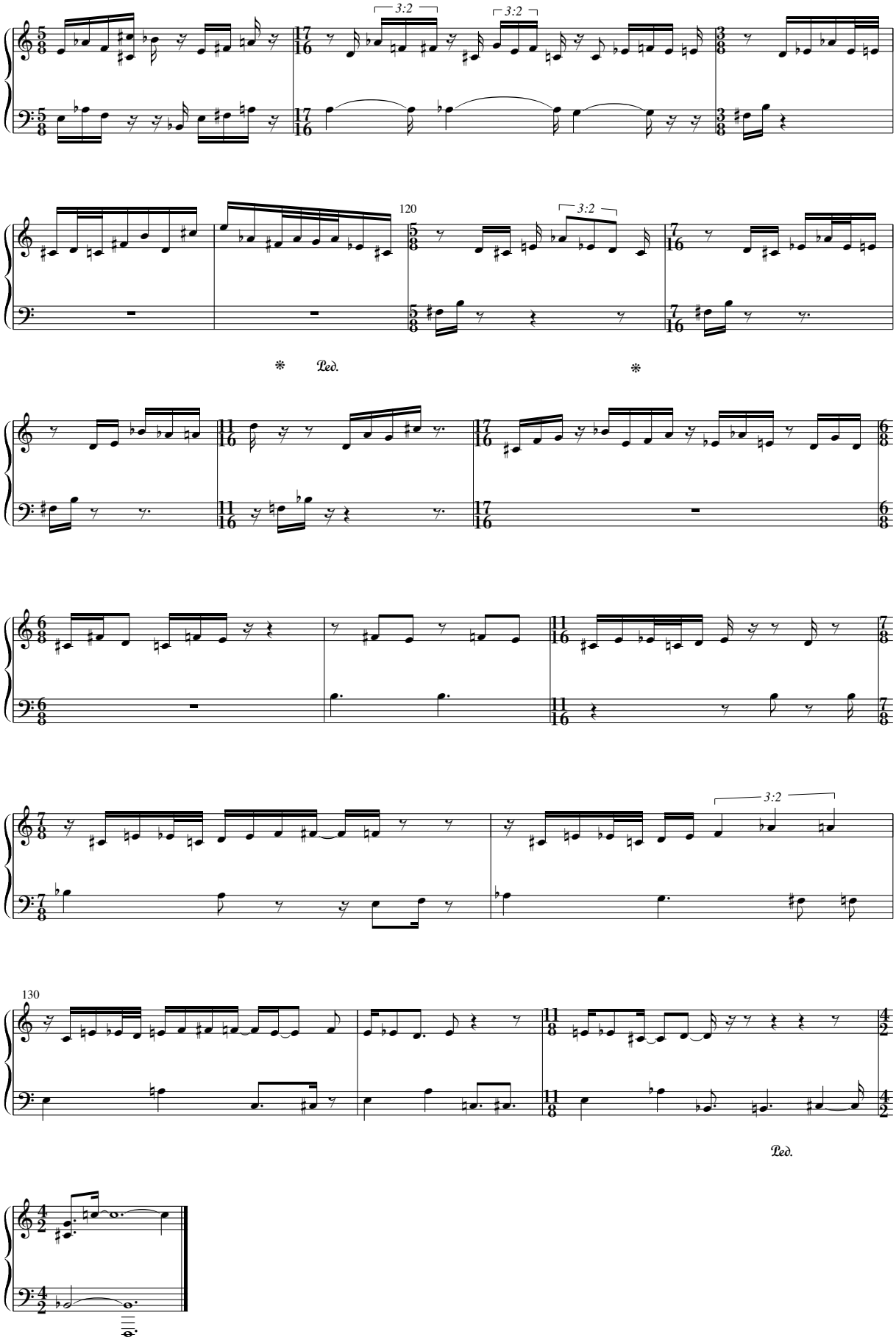

3
3
3:2
3:2
9:7
Ped.
Ped.
Ped.
3:2
Ped.
Ped.
Ped.
Ped.
Ped.
3
Ped.
3
3
3
3
3
3
3


50
60
Ped.


5:4
3
3
3:2
5:4
5:4
Ped.
Ped.
10:7
3
3
3
Ped.
3:2
3:2
Ped.
Ped.
70
Ped.
Ped.
Ped.
Ped.
Ped.
Ped.
5:4
Ped.
Ped.
Ped.
80
Ped.


3
5:4
3
5:4
3
3
5:4
3:2
3
3
90
3
3:2
Ped.
6:4
3
Ped.
100


3
3
3
3
7:8
3
5:4
7:8
3
3
3
110
3:2
3
3:2
3
5:6
5:6


3:2
3:2
120
3:2
Ped.
Ped.
3:2
130
Ped.

Piano Studies 2 & 4

Prefatory note to Piano Studies 2 and 4

Piano Study 2: Typeset score (tempo ad lib)

Piano Study 2: Graphical representation

Primary materials (1) – as spread chords
Primary materials (2) – as modes

Piano Study 2: Typeset score with graphical tempi

Piano Study 2: Manuscript score

Piano Study 4: Graphical representation

Piano Study 4: Typeset score (tempo ad lib)

Portfolio (1) Music for Keyboard, Preface to Piano Studies 2 and 4

These studies share a common series of thirty-eight groups of notes, shown in notated and graphic forms as follows. There is a score of each, with rhythm and metrical detail prescribed throughout. A further score contains a tempo map beneath each system, indicating one possible performance which may be used or ignored as the performer decides.

The studies were at first developed at a DAW as both composition and 'virtual performance' with each note given specified onset, duration and velocity, to simulate one possible heard outcome.

Live performance may be either from manuscript or typeset scores (of which one contains full indications of tempo, also optional). Here, only rhythmic and metrical delineations indicate fluctuations in volume, attack and tempo. Tempo and intensity should be decided by the performer.

The first alternative arrangement gives the pitches in the order in which they are scored, omitting tempo, dynamics or phrasing. These may be decided according to performer preferences. The second alternative arrangement reduces the detail offered simply to a chain of 38 groups of notes, each in ascending order.

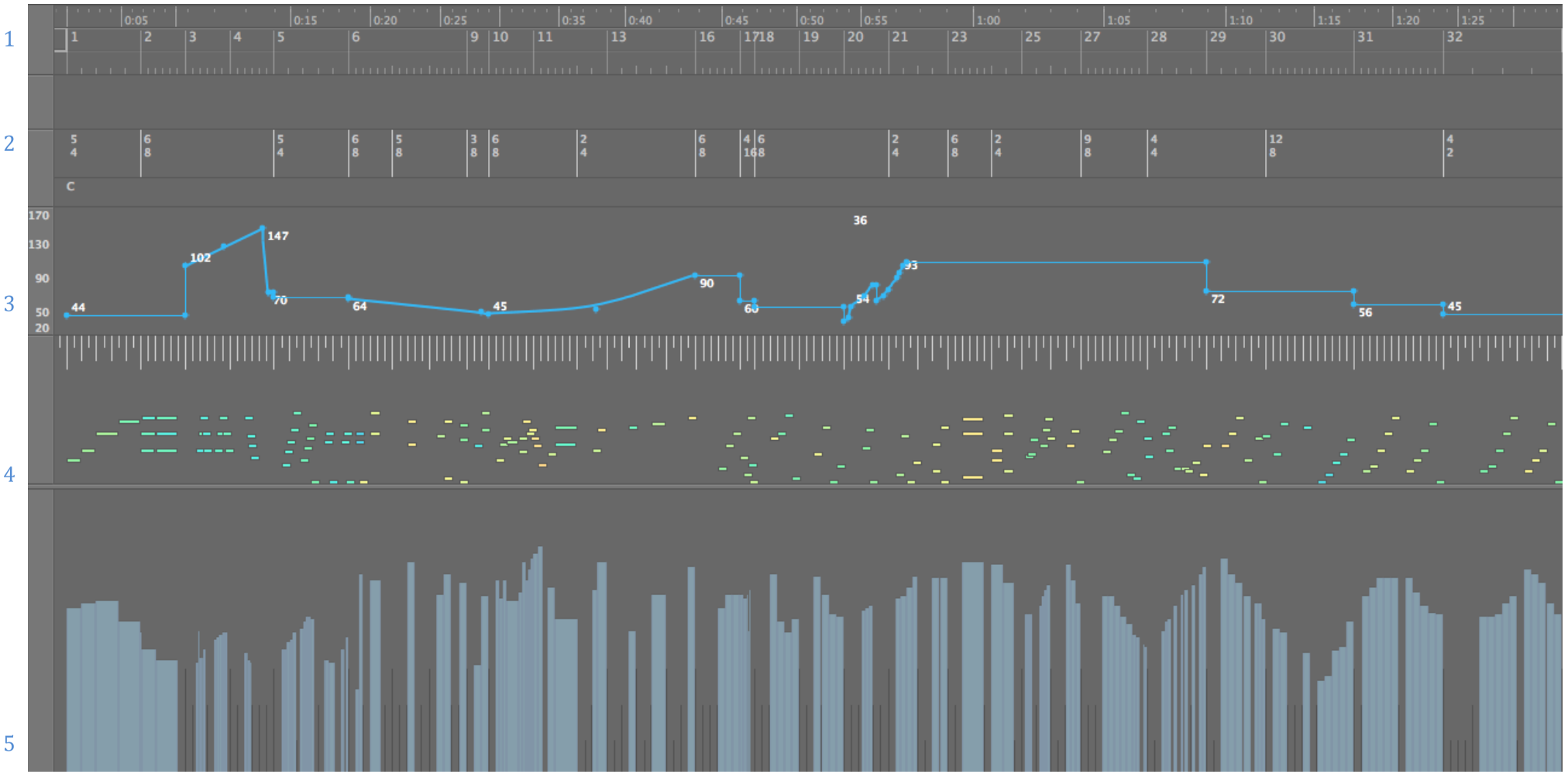
These two arrangements may be played any number of repetitions, at any tempo or dynamic setting chosen by the performer. These differing versions of the original material are presented in the context of my ongoing questions about where the essence of a musical composition exists: whether in the heard performance, the detailed organisation of the material, or something more elemental.

My increasingly equivocal responses to these questions are informed by many years' experience as a jazz improviser, so these studies may be treated as scores of a fully conceived work or as the basis for an invented performance prescribed only by the harmonic outline given. The performer may chose the form that best suits their performance intention.

Piano Study No. 2

June 2011
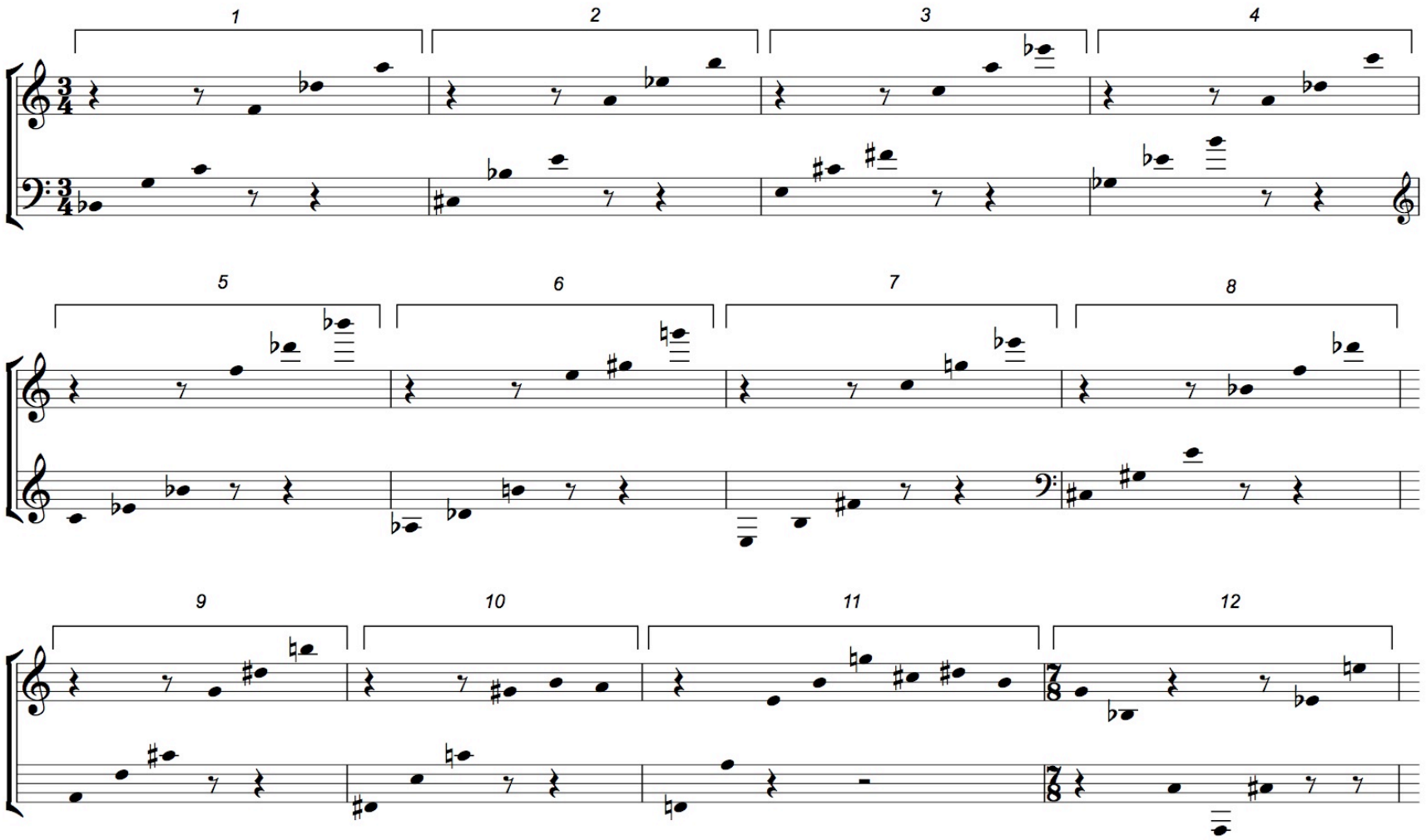
Timeline-map showing (1) bar numbers and time (m:ss), (2) time signatures, (3) tempo fluctuations, (4) colour-coded note velocities and (5) velocity bar chart.
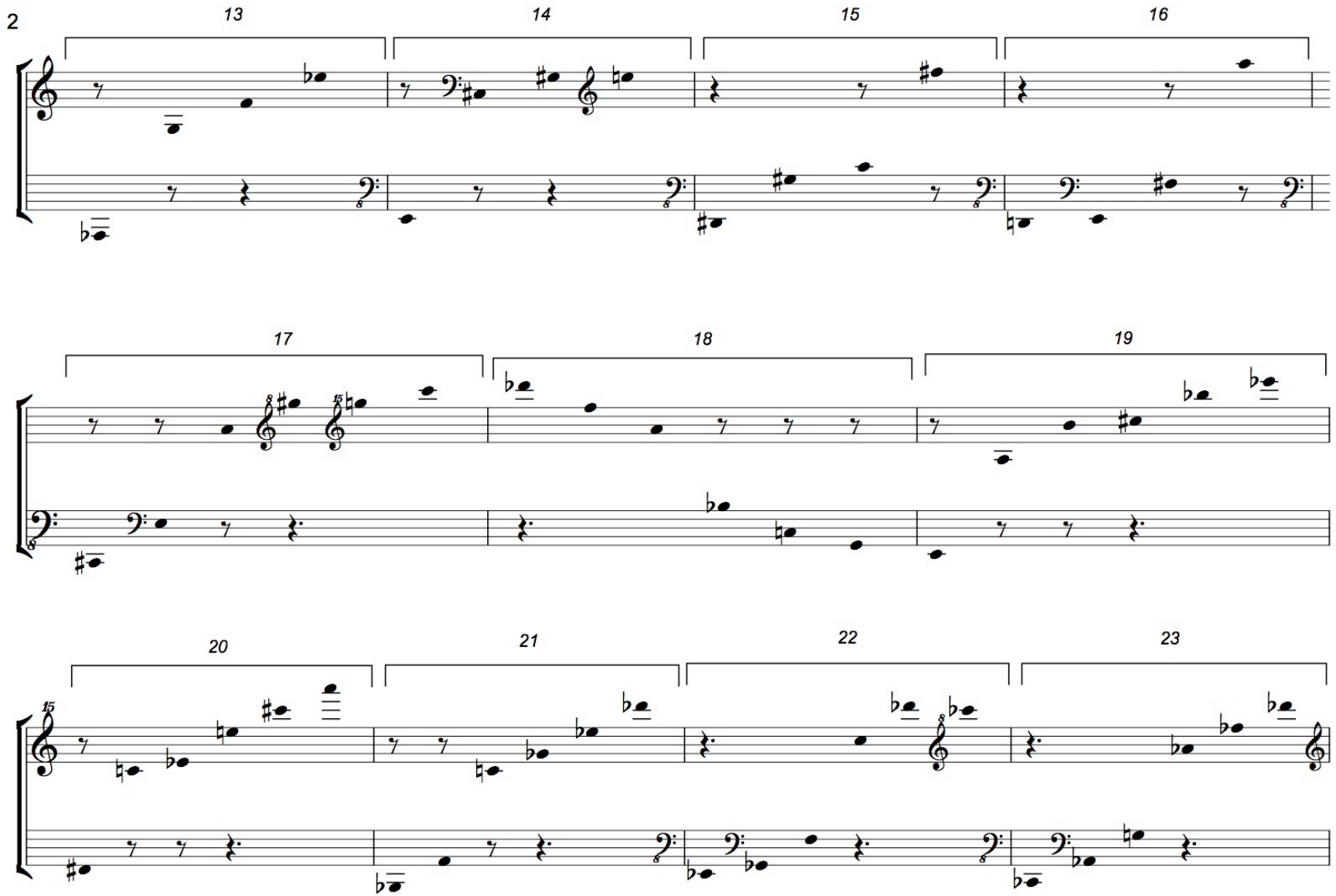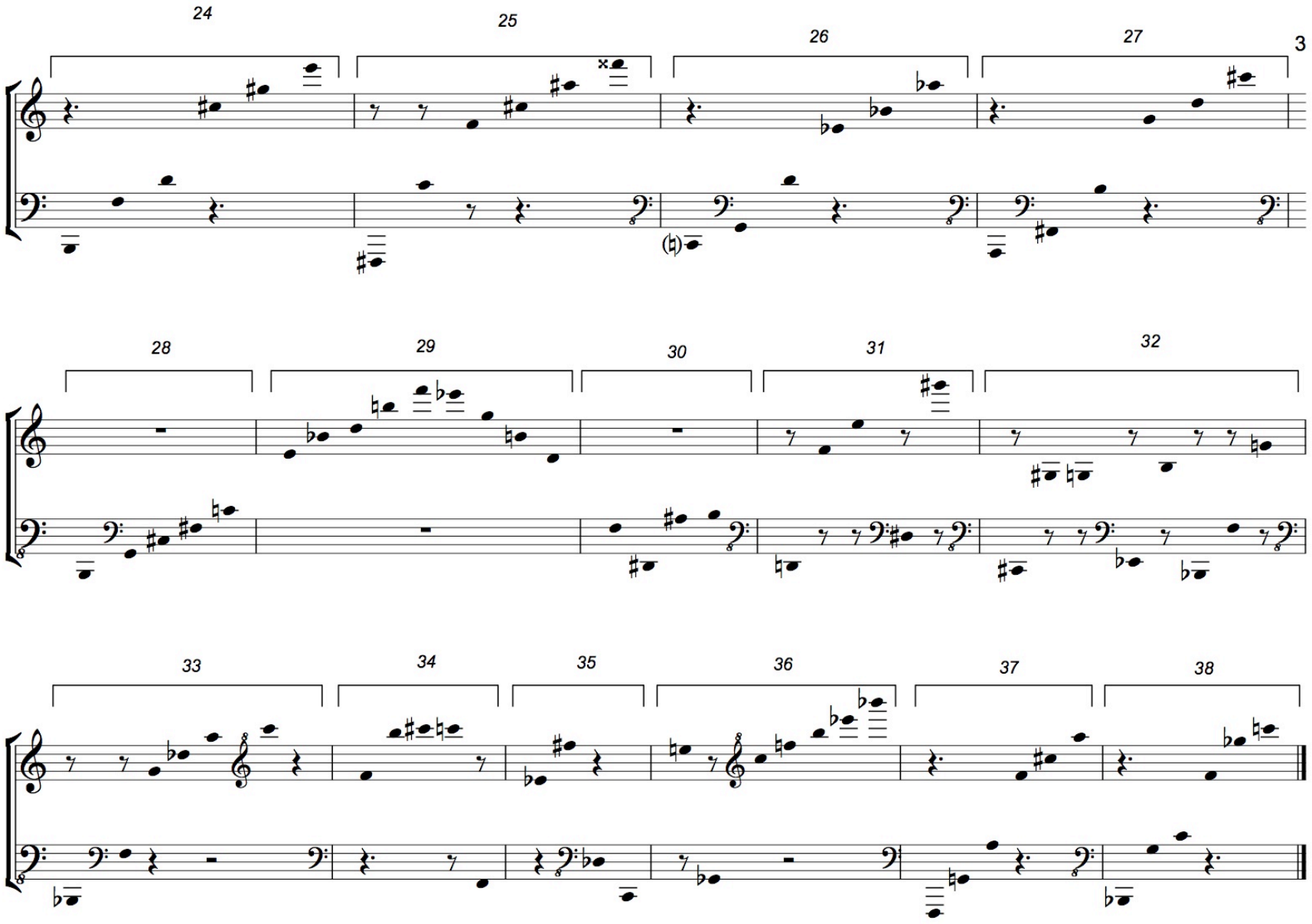


Arrangement 1 of 2

Primary Material for
(Player-) Piano Study No.s 2 and 4.

Benjamin Mawson
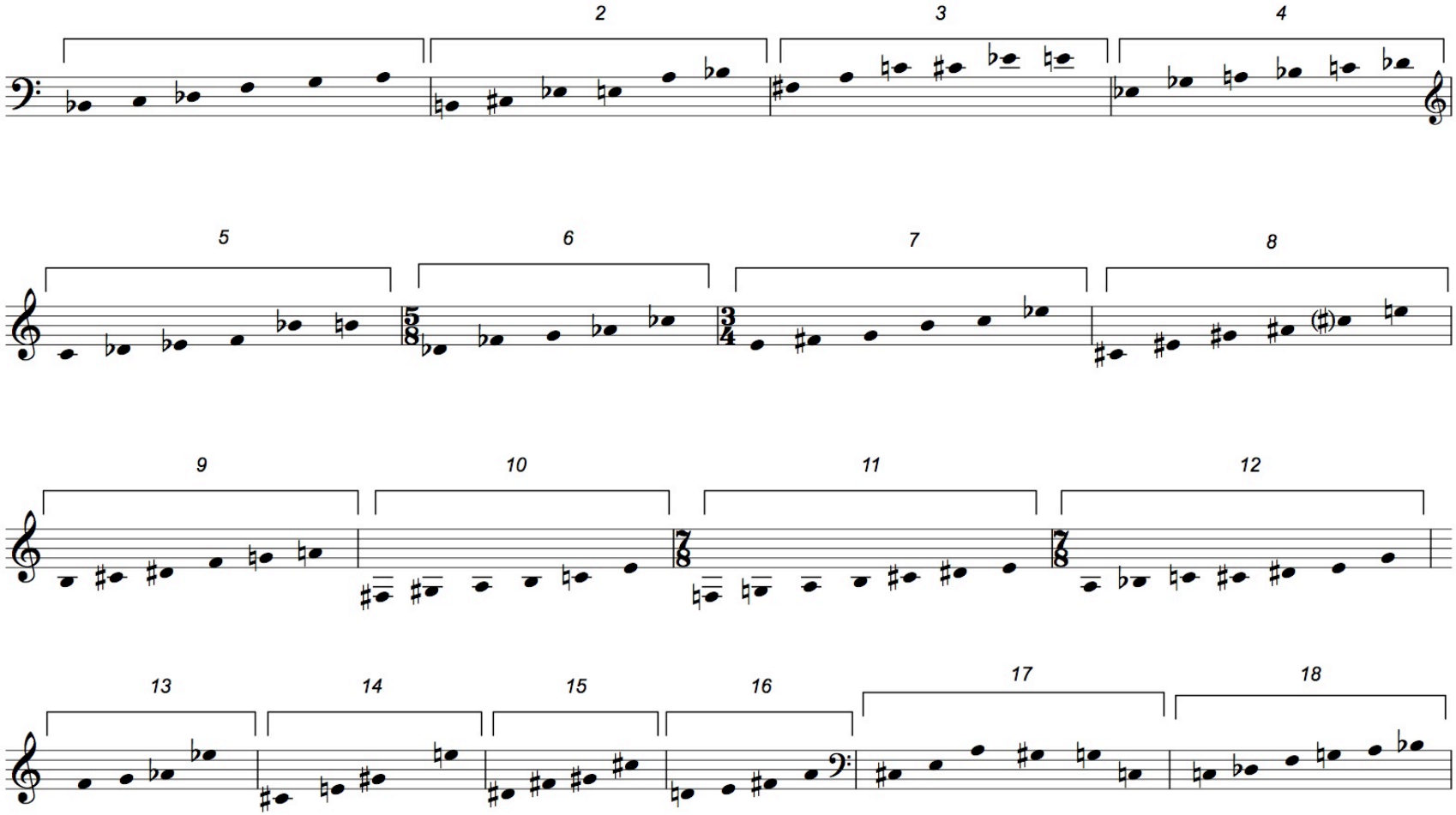



2
13
14
15
16
17
18
19
20
21
22
23


24
25
26
27
3
28
29
30
31
32
33
34
35
36
37
38

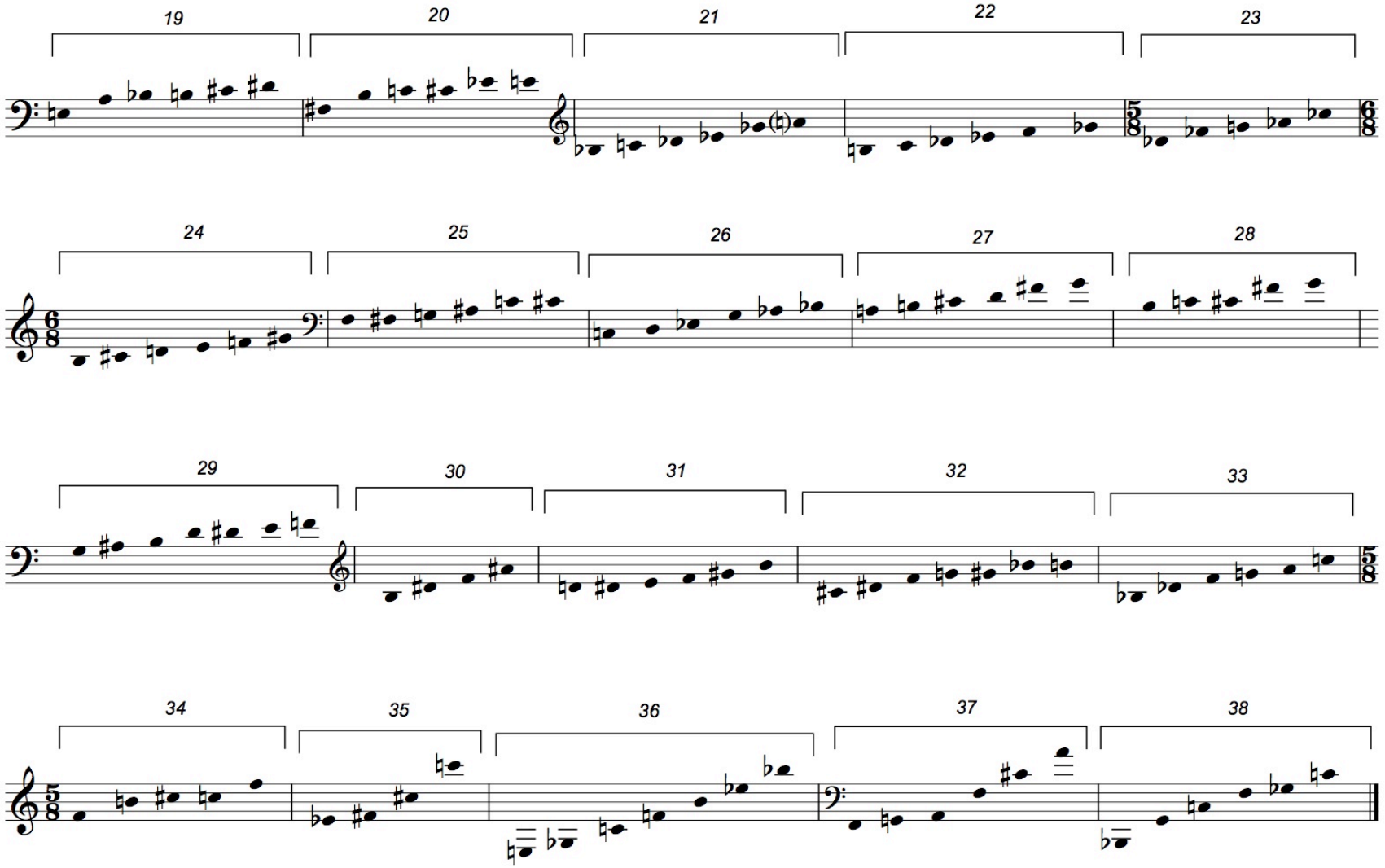
Arrangement 2 of 2

Primary Material for
(Player-) Piano Study No.s 2 and 4.

Benjamin Mawson
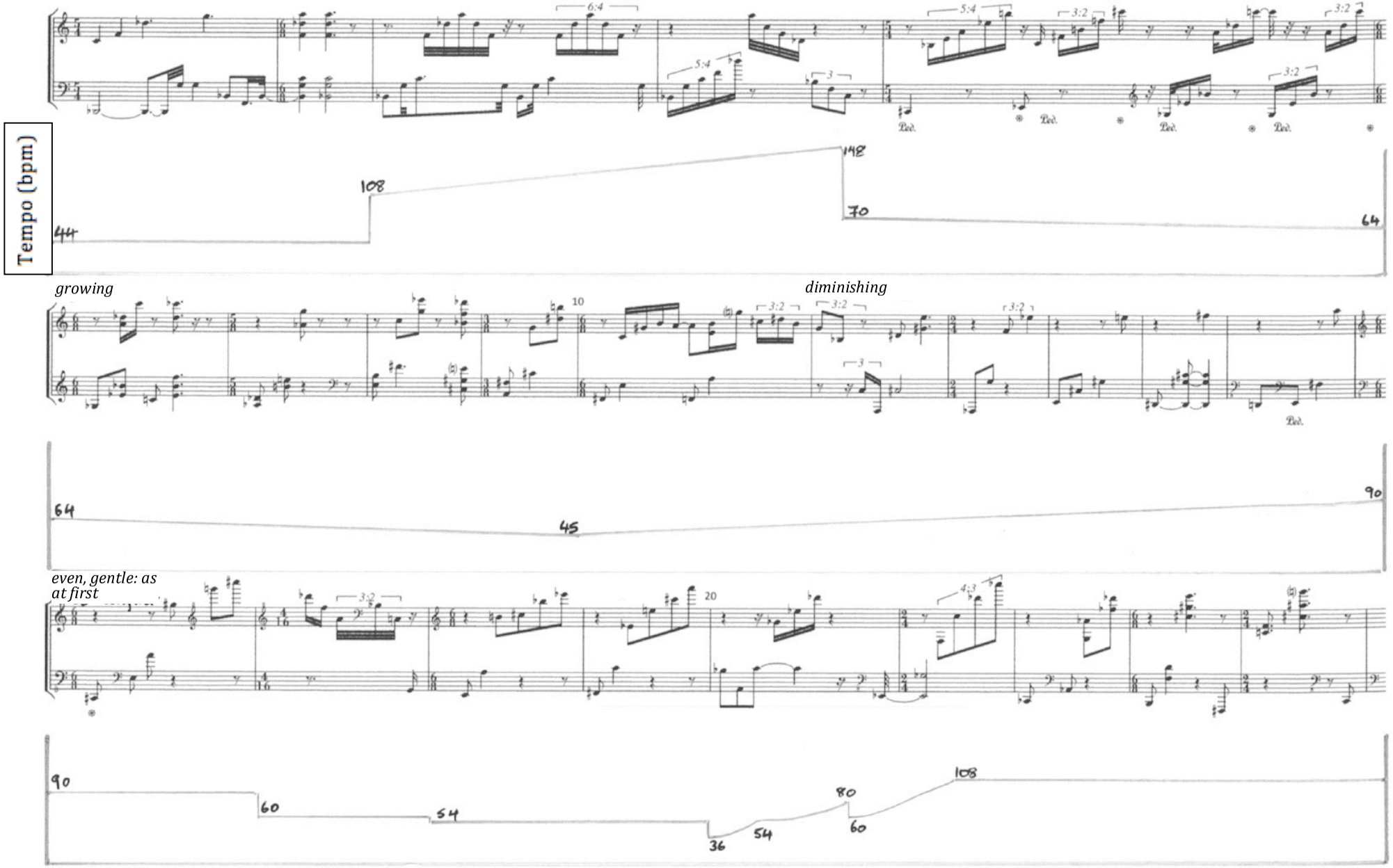


2
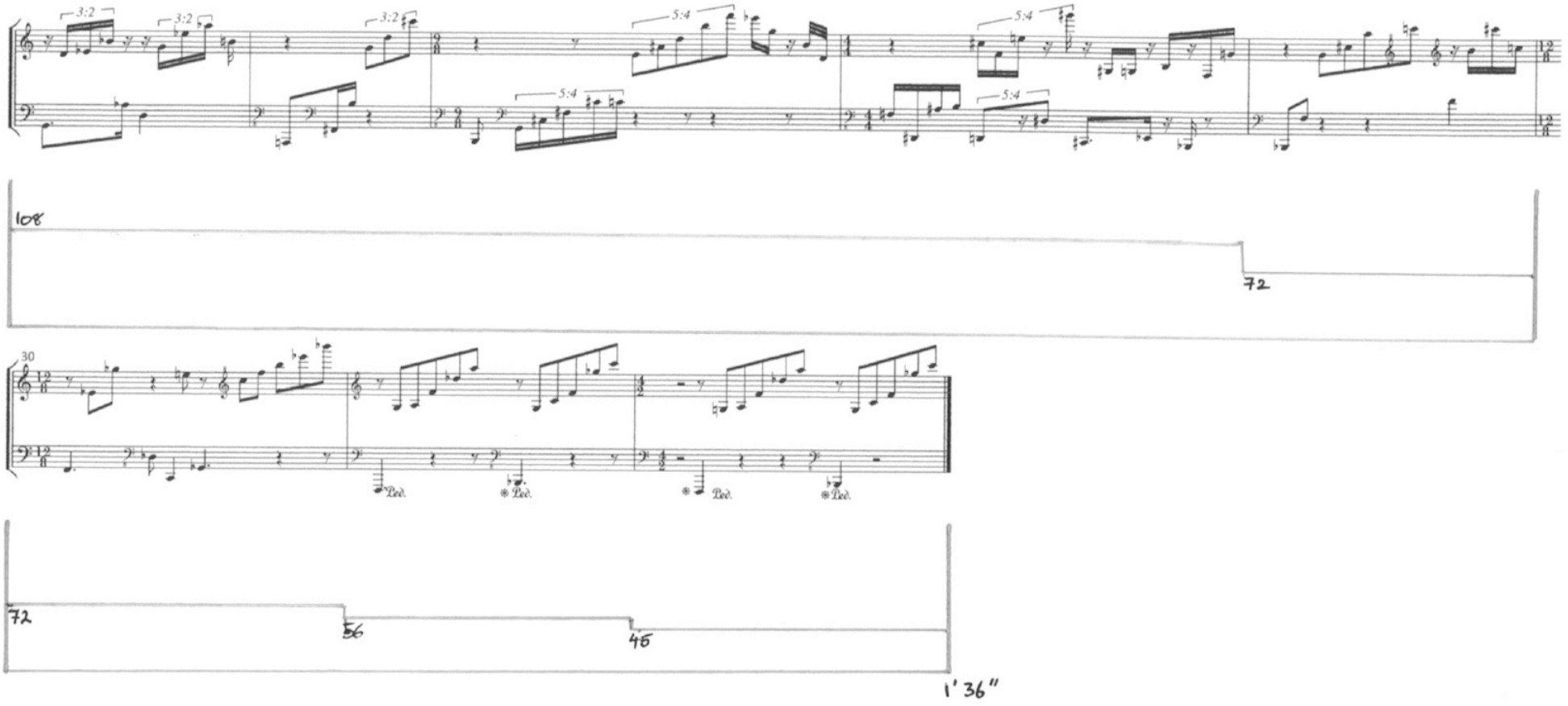


Piano Study No. 2

July 2011
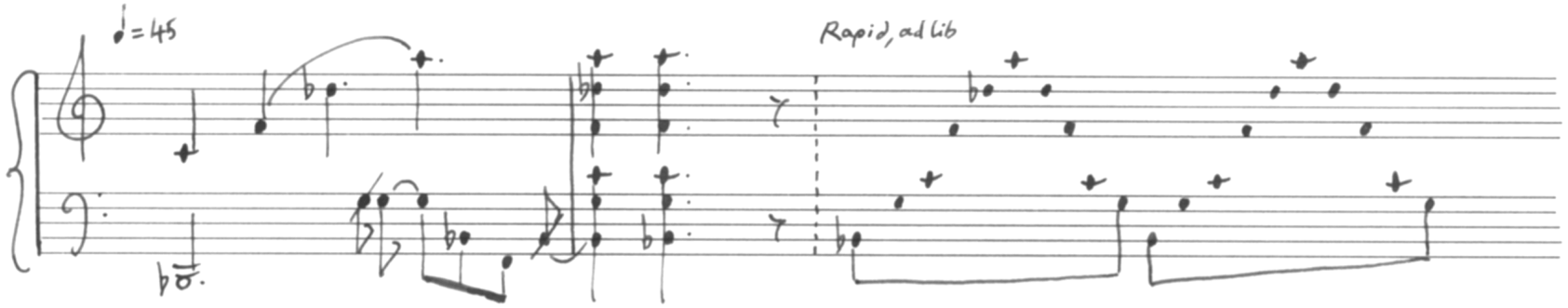
Even, gentle

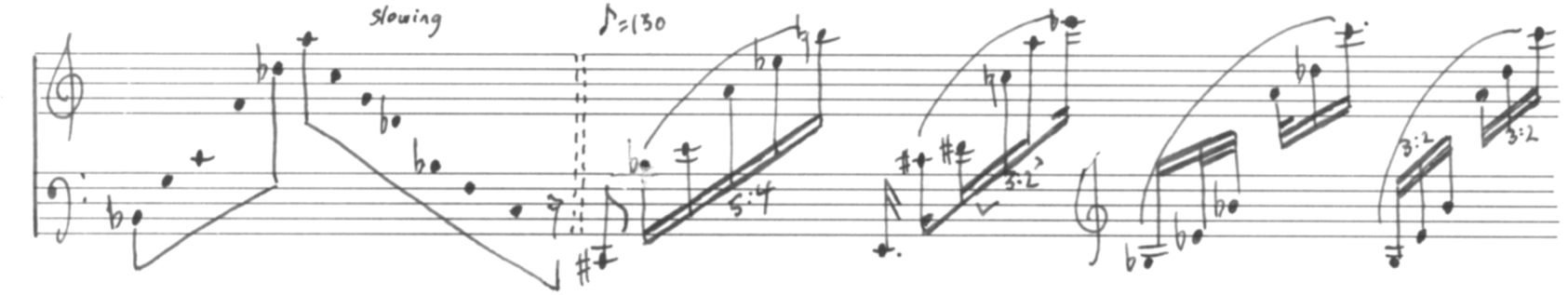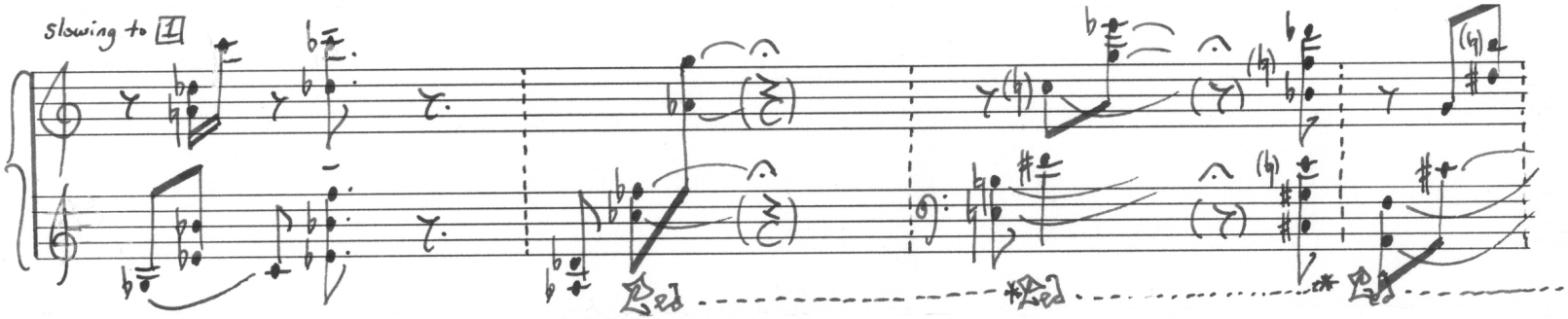



3:2
3:2
3:2
5:4
5:4
5:4
5:4
108
72
30
Ped.
Ped.
Ped.
Ped.
72
56
46
1' 36"

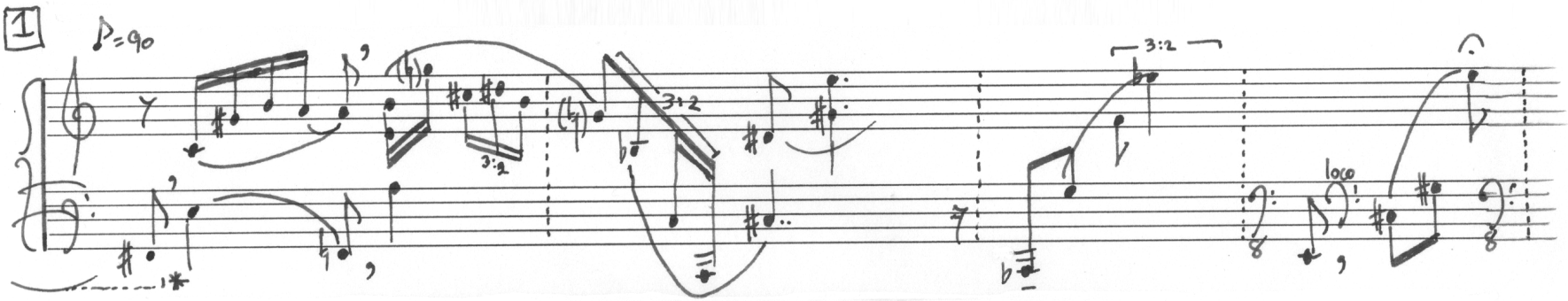
Piano Study No. 2 (manuscript)

Score from which first live performance was made, with some unspecified durations and minimal tempo directions. The non-specificity of this score allowed a closer approach to the wandering, exploratory intent sought in the more rhythmically prescriptive printed version. These two studies are also performable from the material alone.
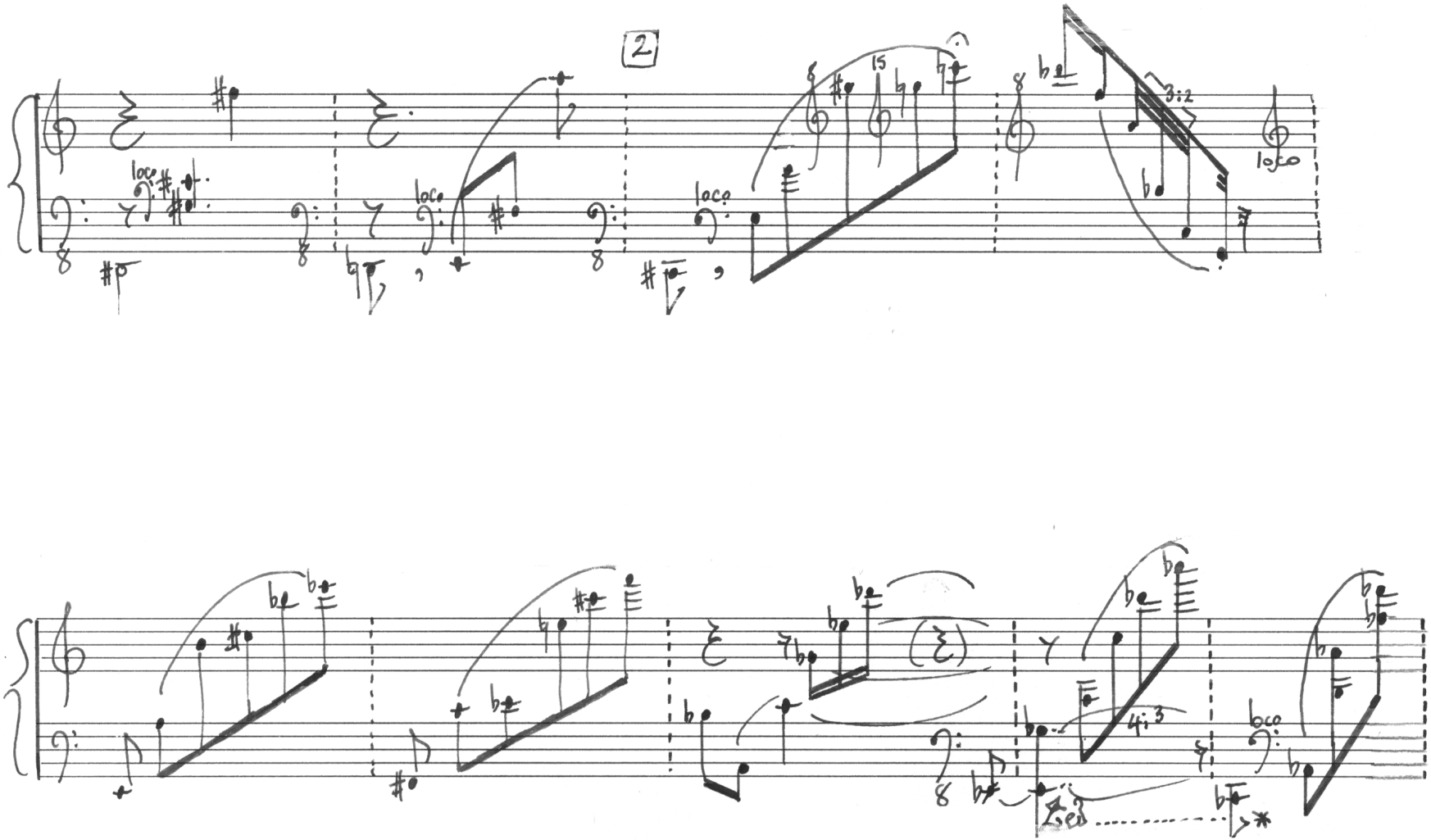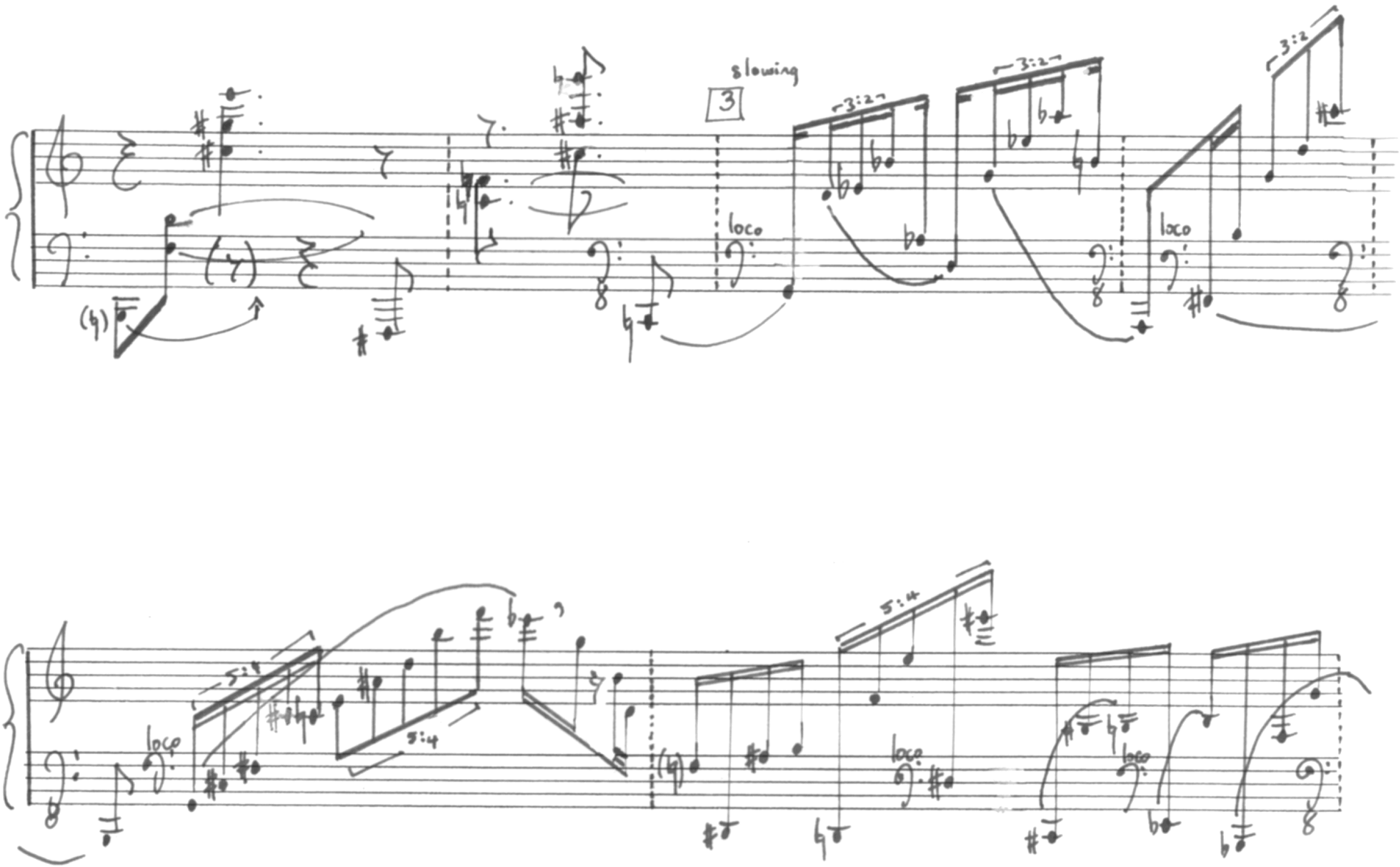






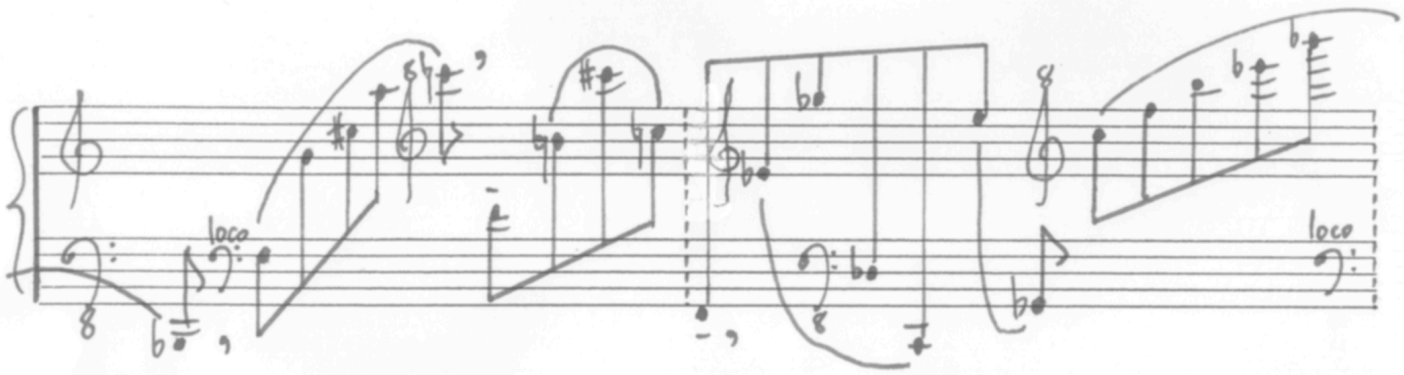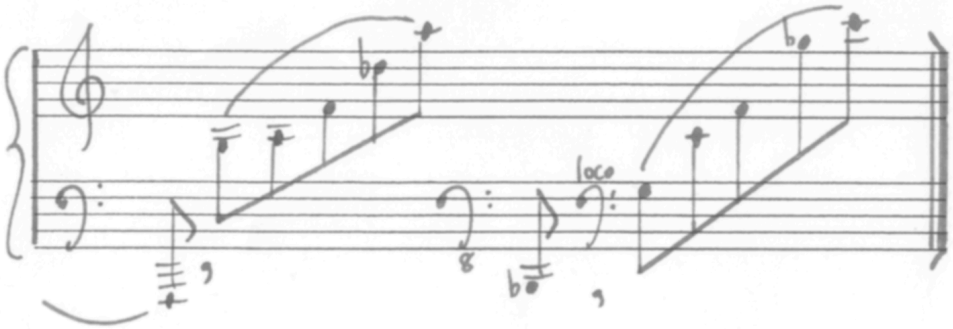


2


2
loco
15
3:2
loco
4:3
Sul G
3



4

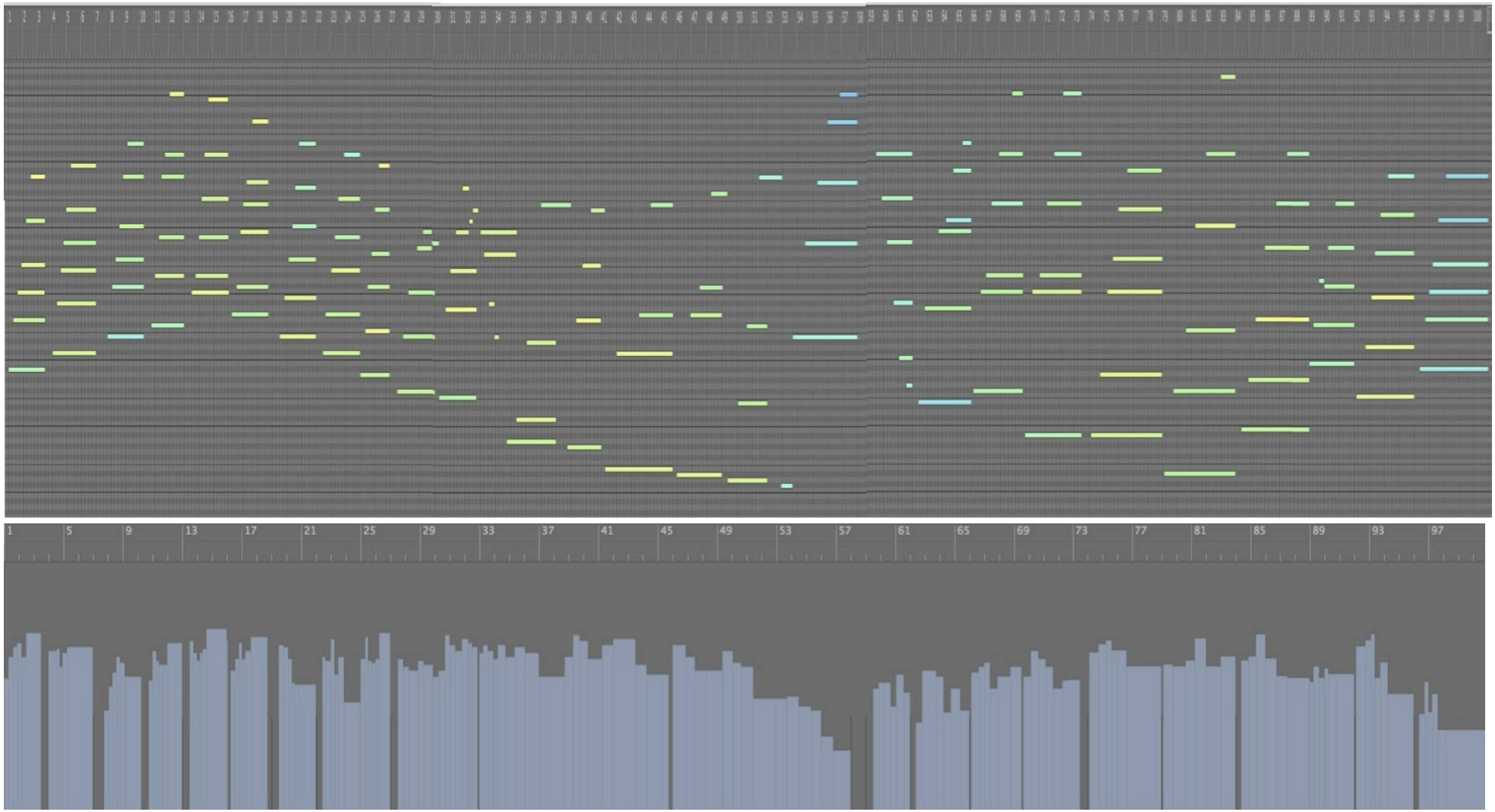




5
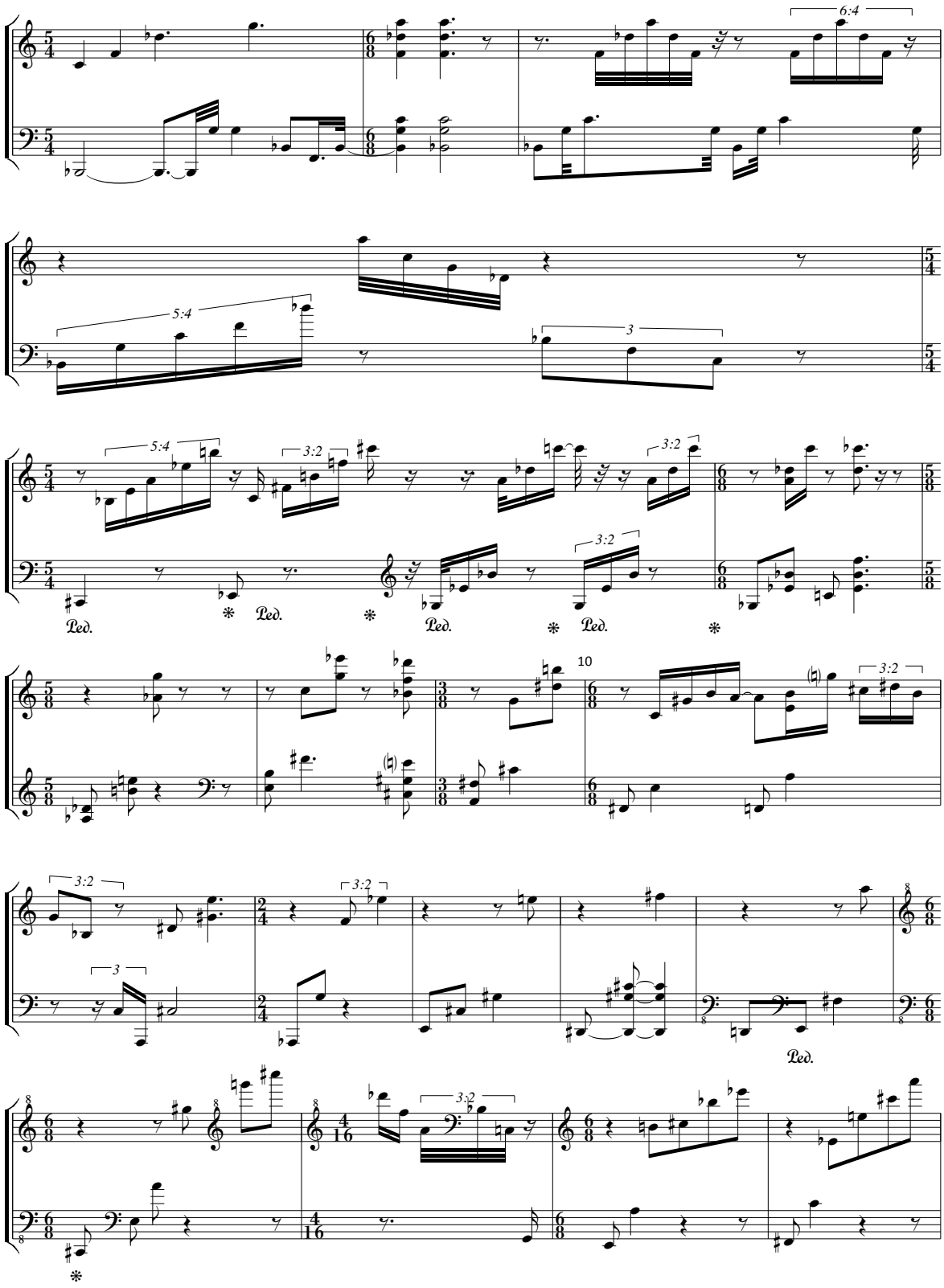
Piano Study No. 4
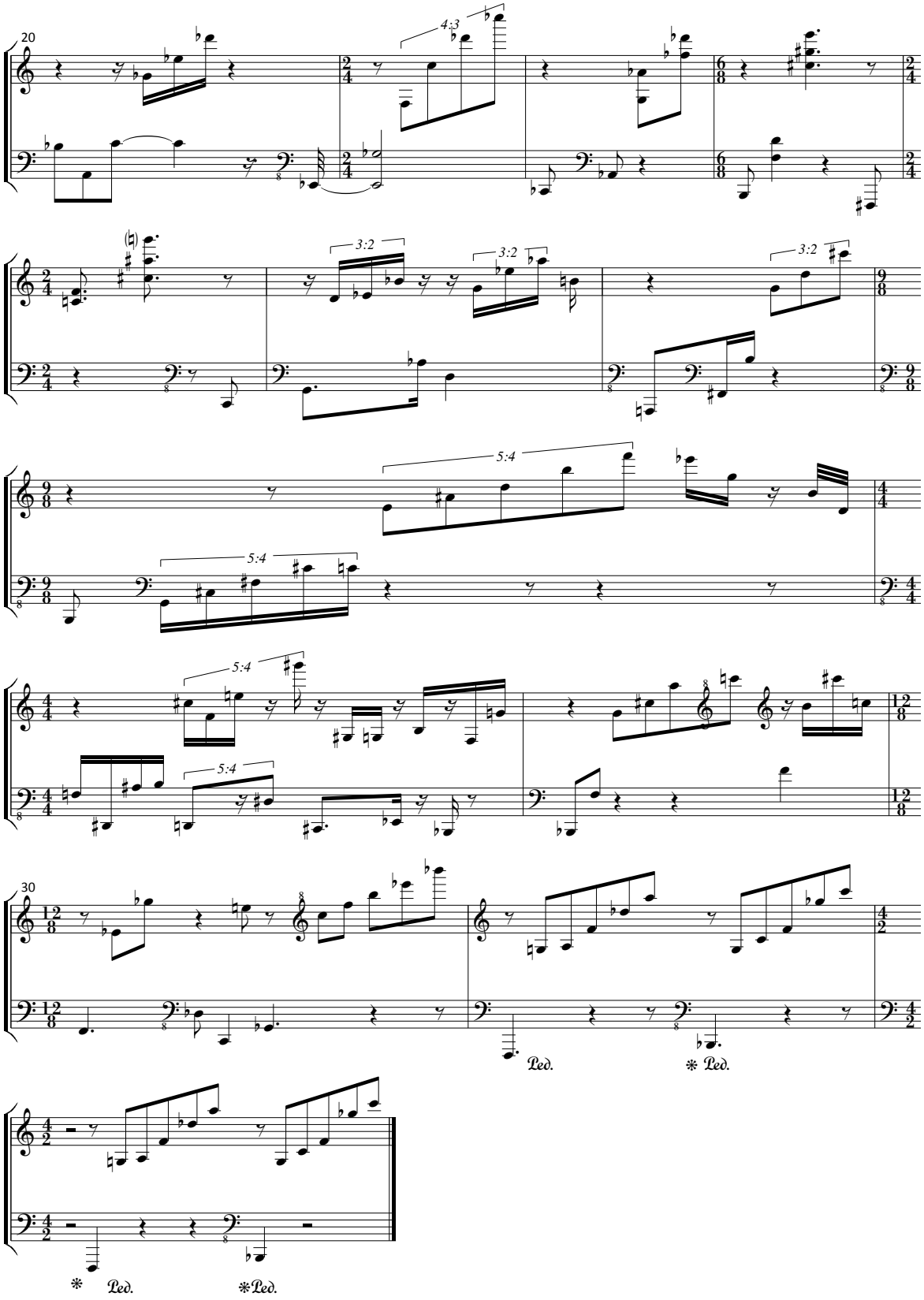
Timeline-map showing (1) bar numbers, (2) colour-coded note velocities and (3) velocity bar chart. There are no changes of metre or tempo in this study.



Piano Study 2
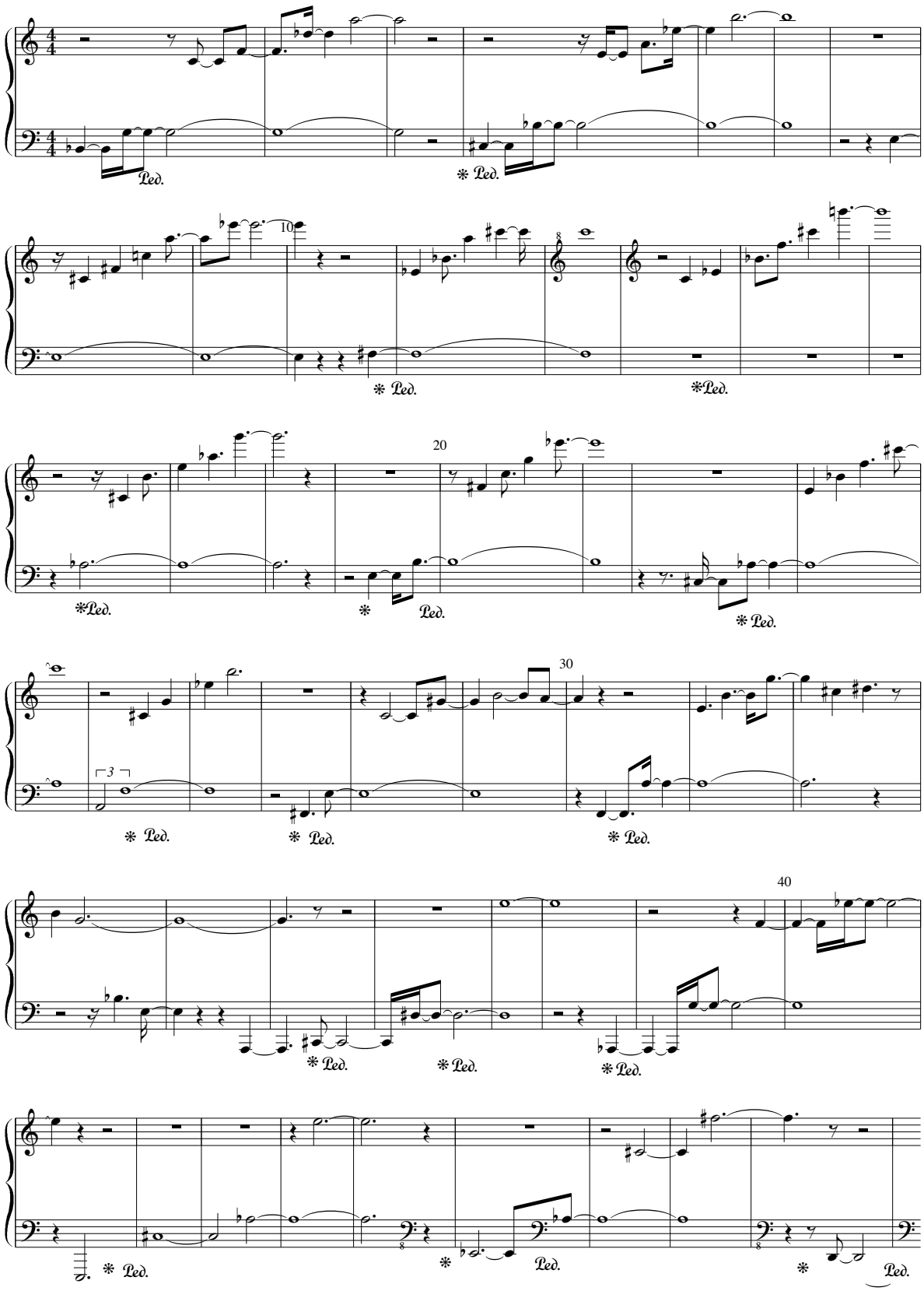
Benjamin Mawson 2012
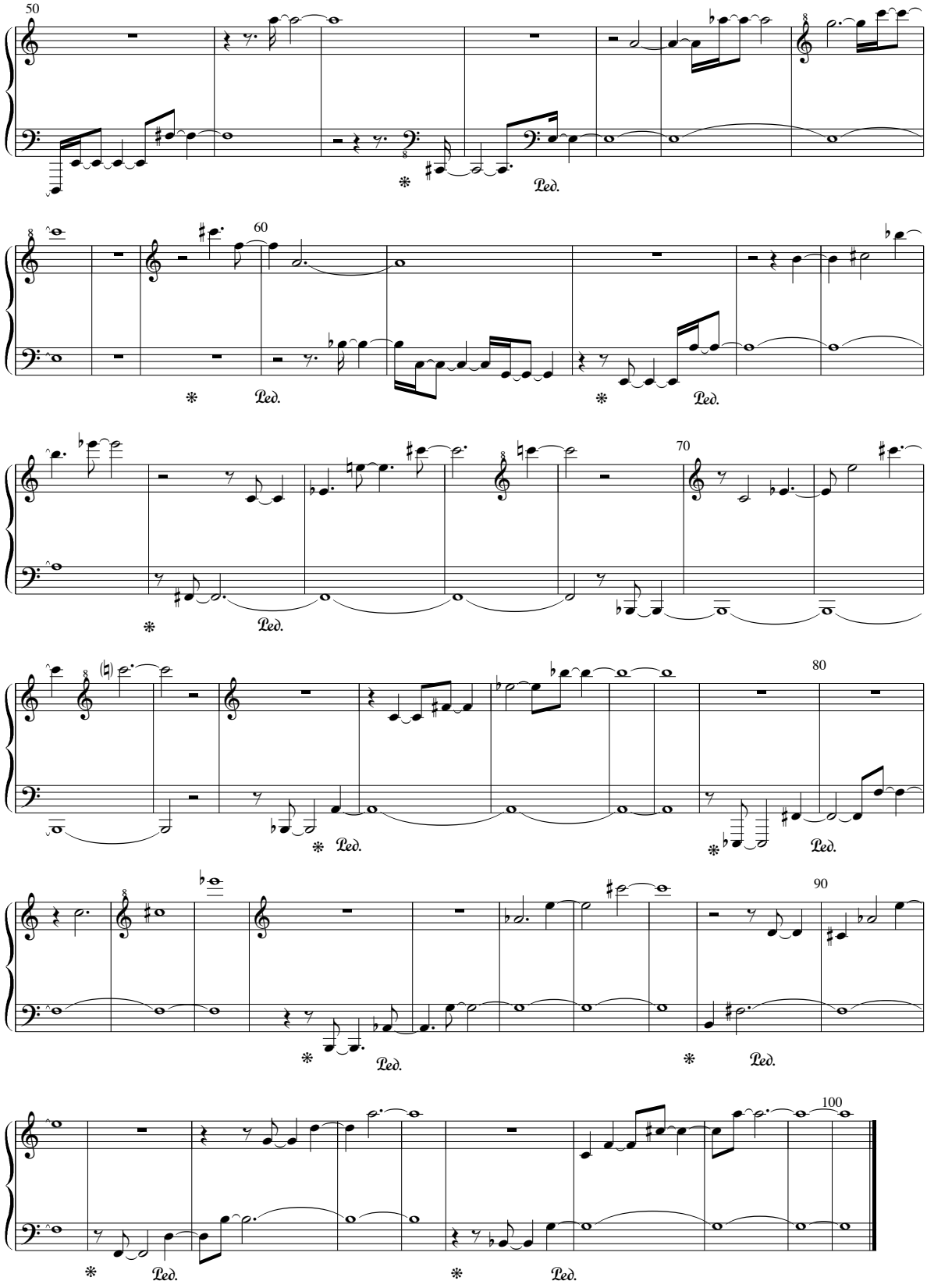



20
4:3
3:2
3:2
3:2
5:4
5:4
5:4
5:4
30
Ped.
Ped.
Ped.
Ped.

Piano Study 4

Benjamin Mawson 2012




50
Ped.
60
Ped.
Ped.
70
Ped.
80
Ped.
Ped.
90
Ped.
Ped.
100
Ped.
Ped.
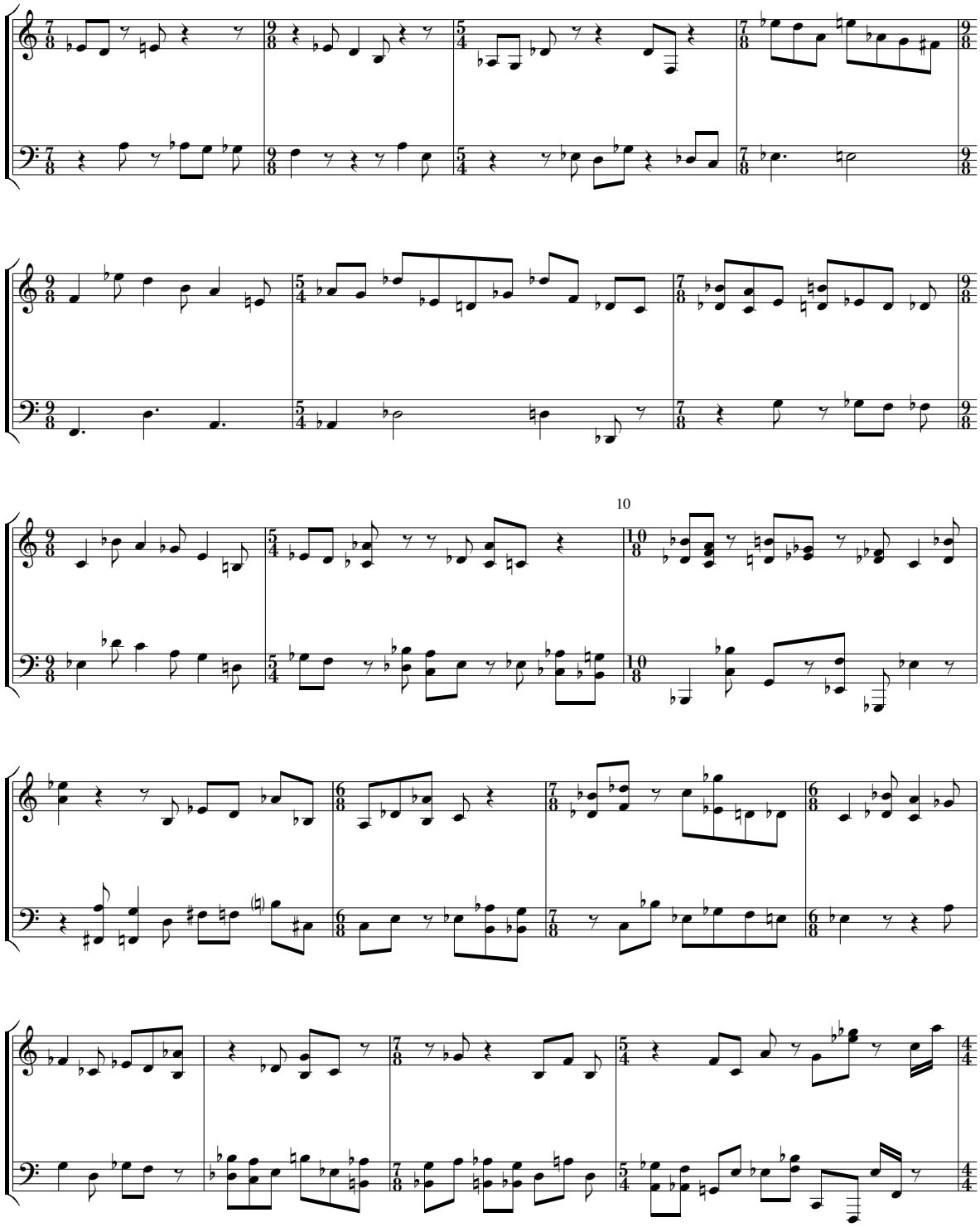
(Player) Piano Study 3
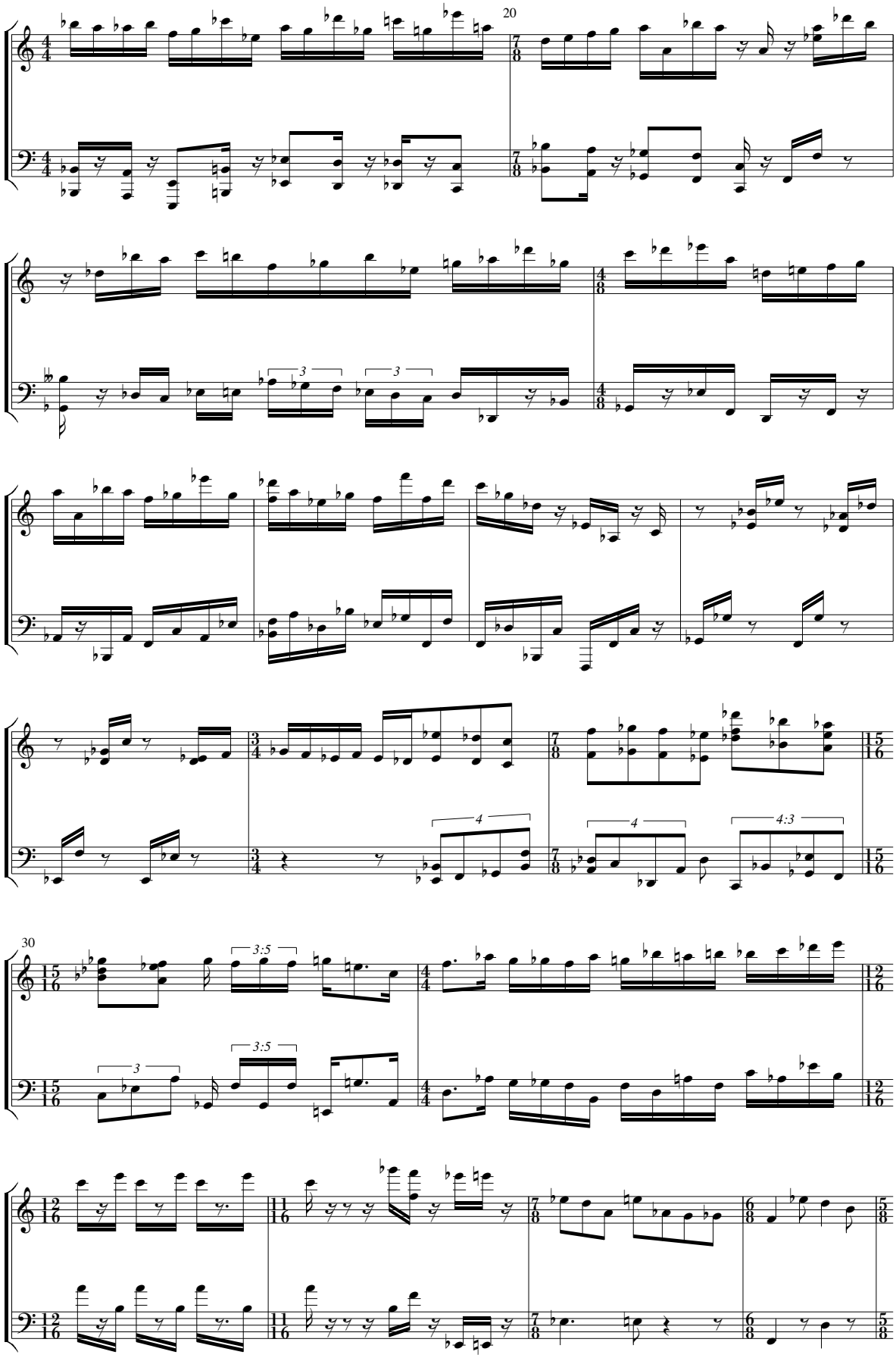
Typeset score
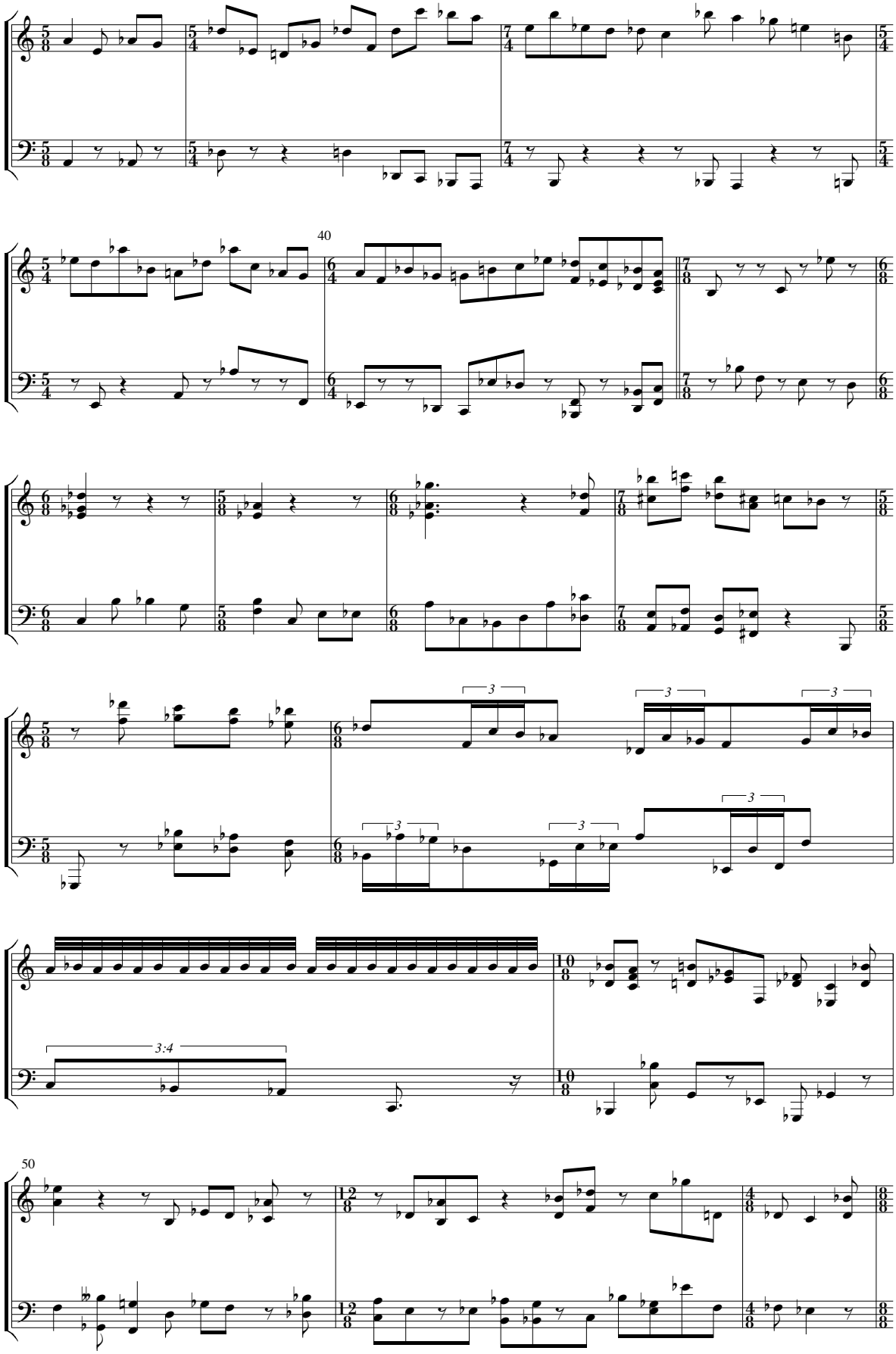
(Player-) Piano Study 3
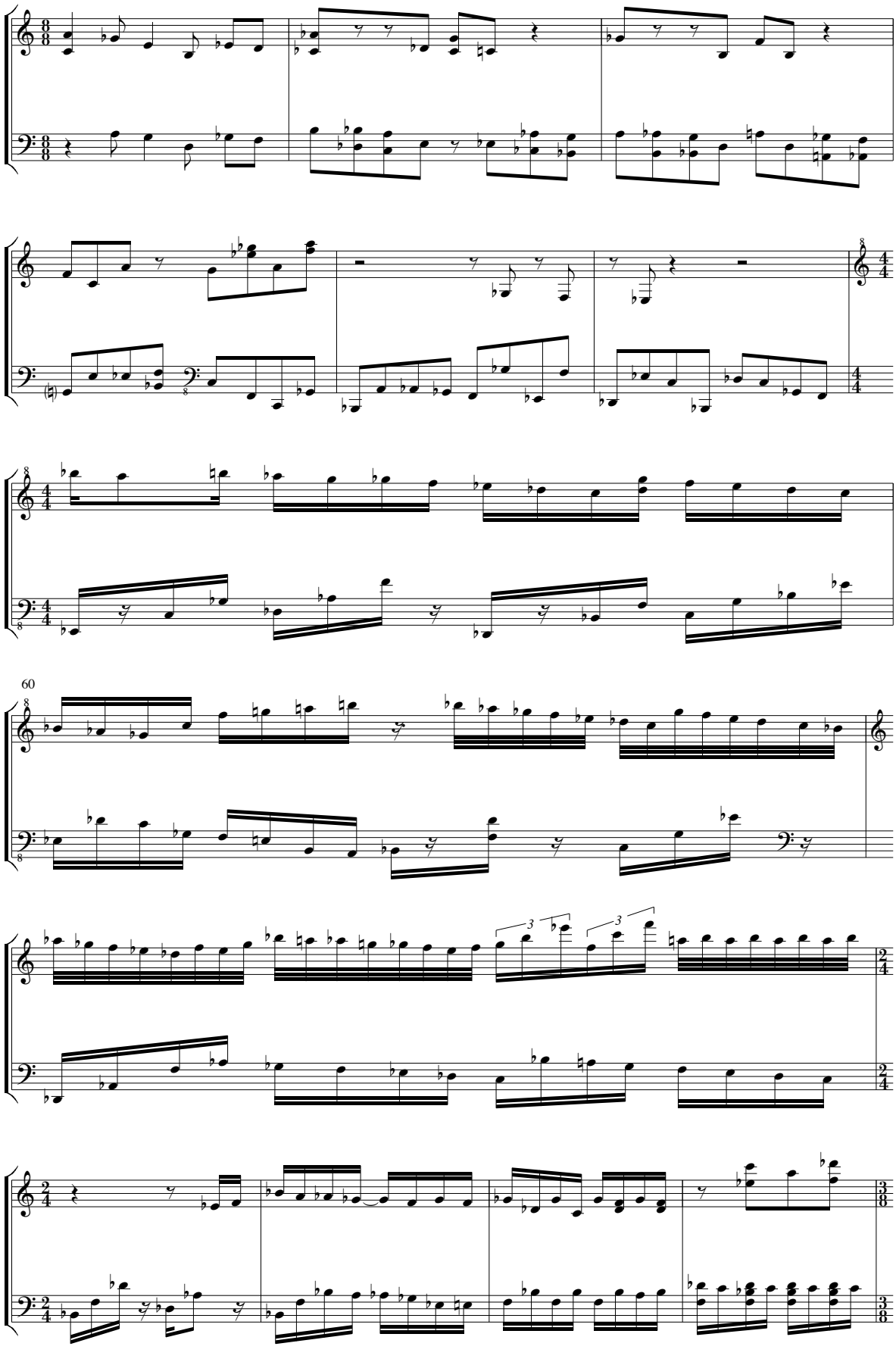
Benjamin Mawson 2012
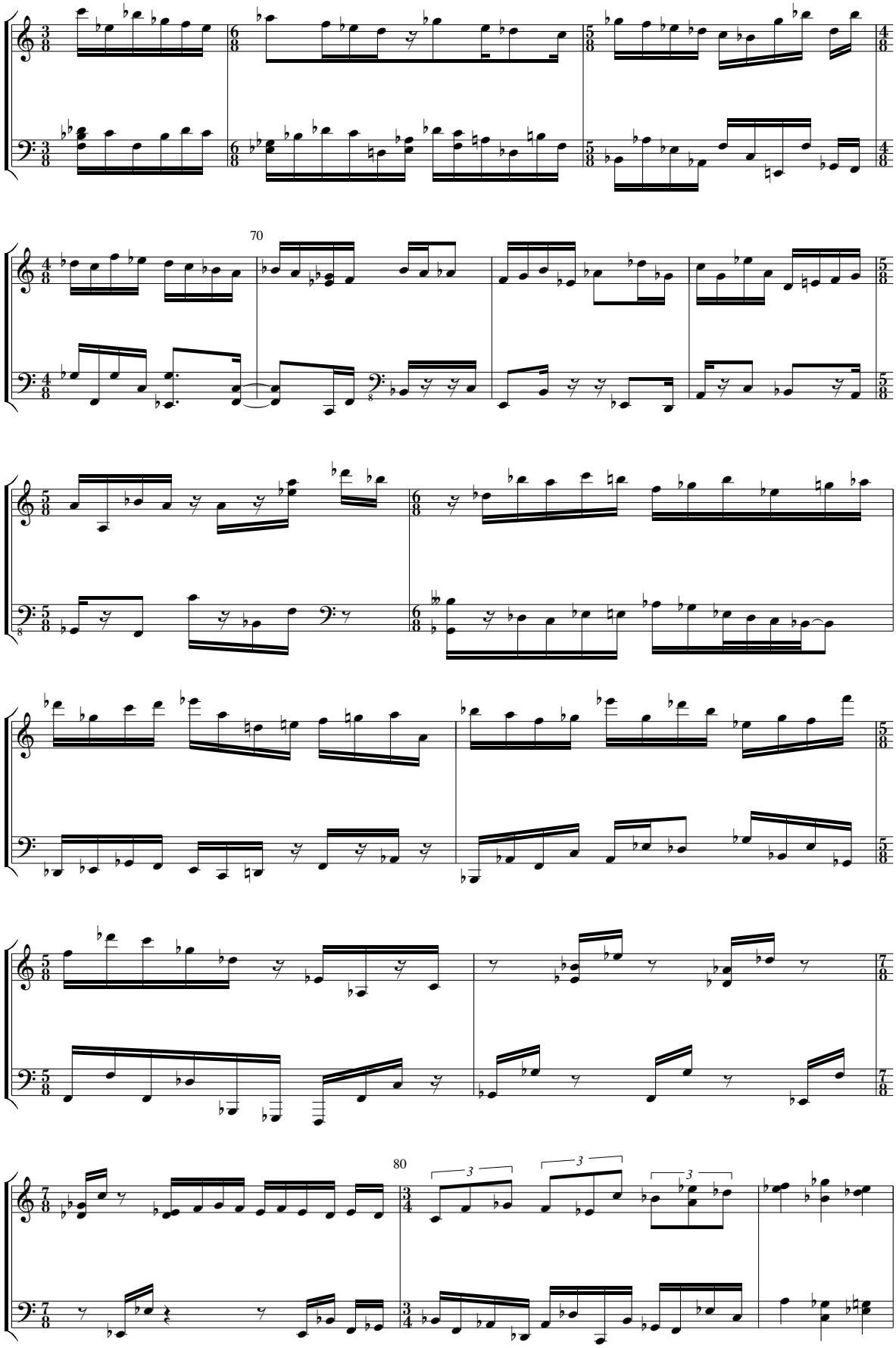
1/4 = 112
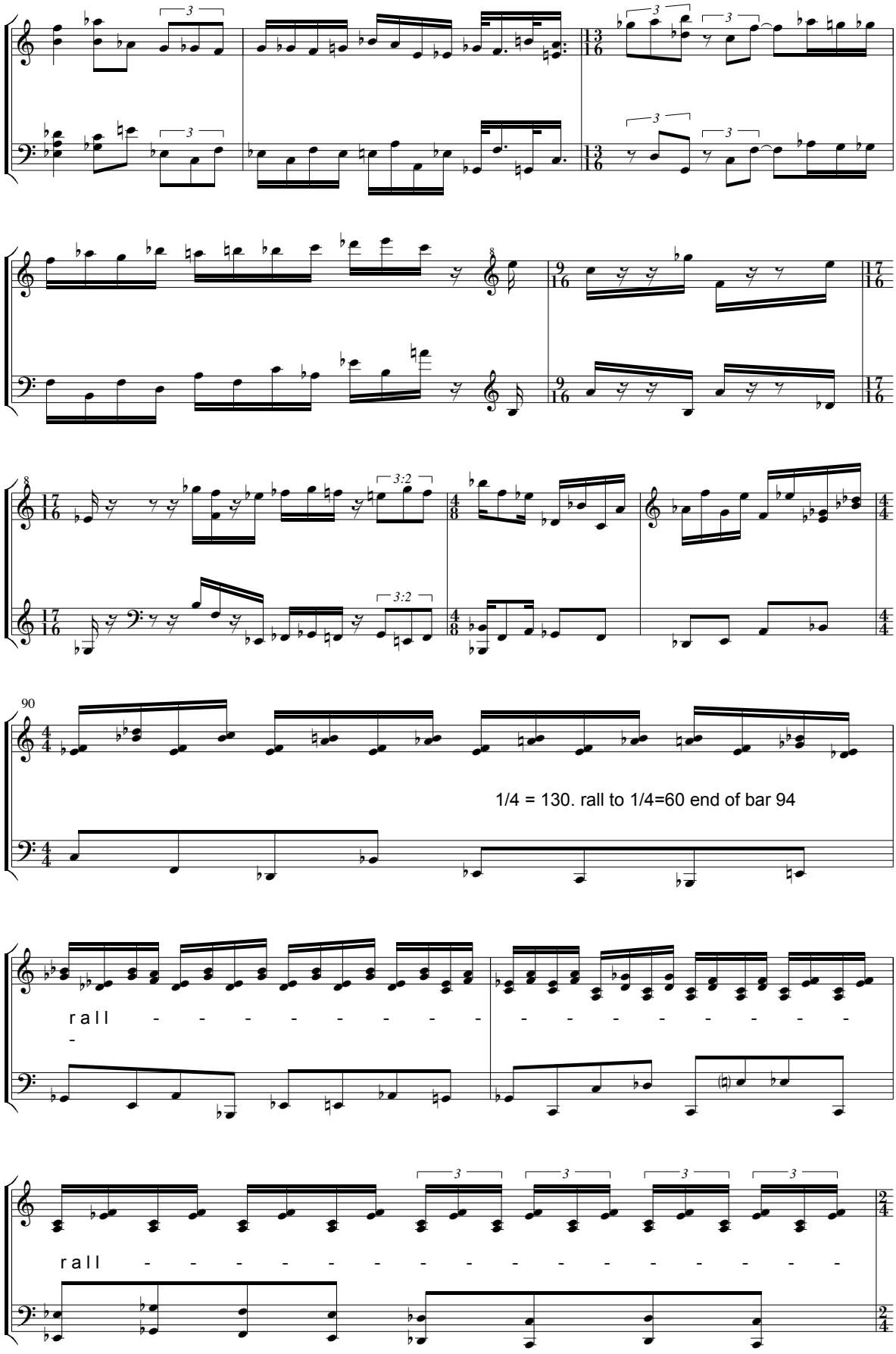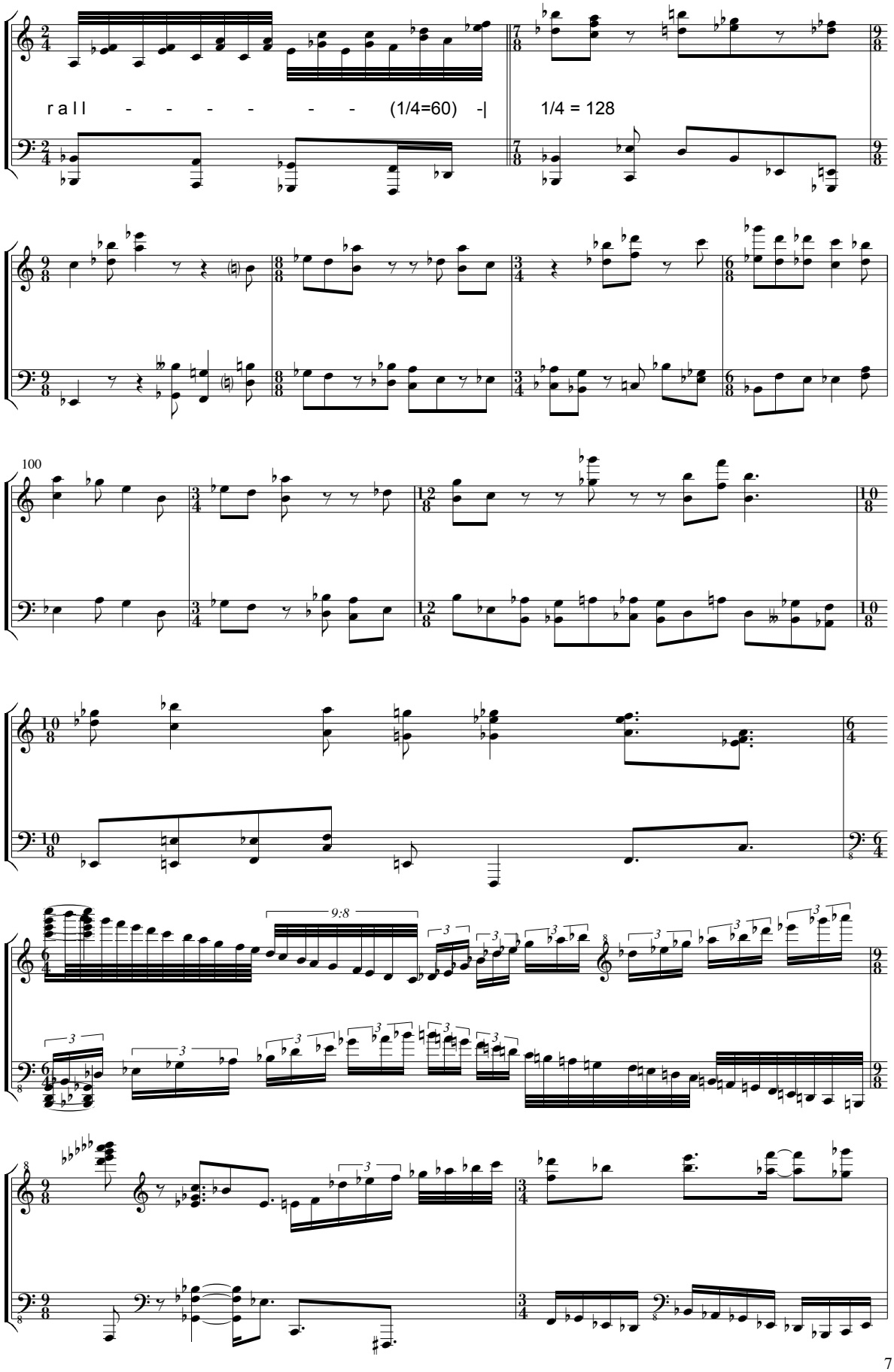



20
3
3
4
4
4:3
30
3:5
3:5
3
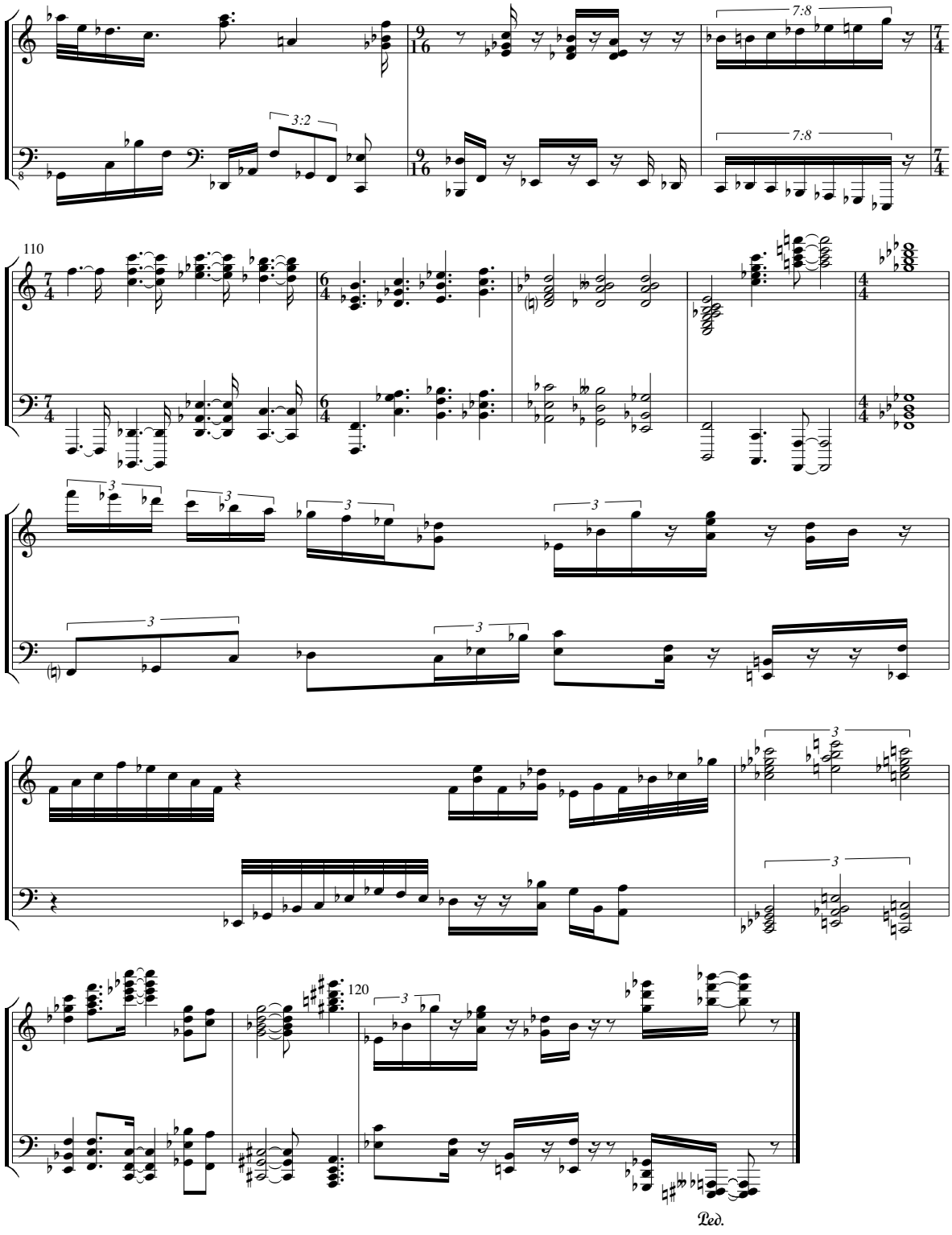

40
50
3
3:4


60


70
80
3
3
3


90
1/4 = 130. rall to 1/4=60 end of bar 94
rall
rall


r a l l - - - - - - - (1/4=60) -|
1/4 = 128
100
9:8
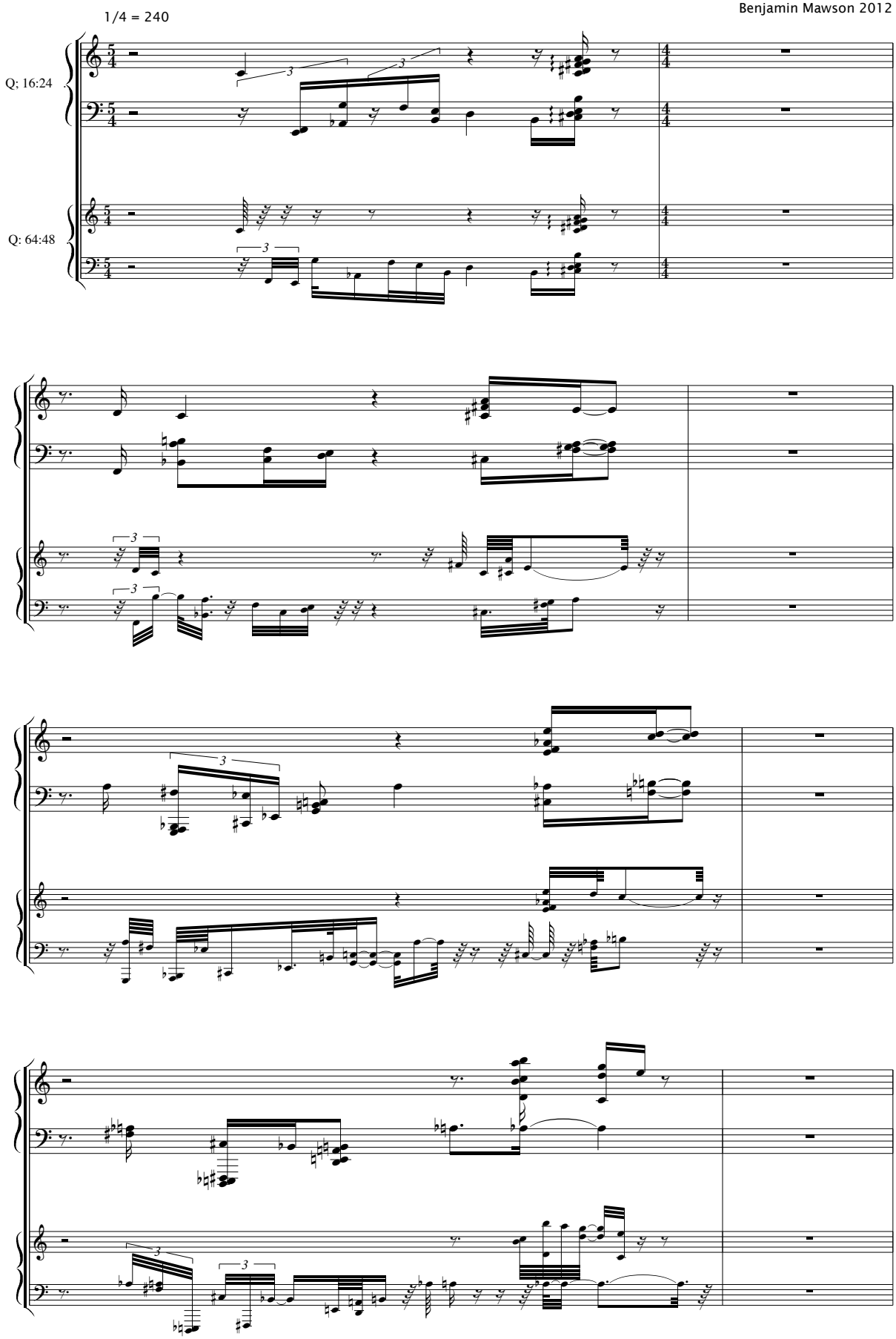

7:8
3:2
7:8
110
120
Ped.
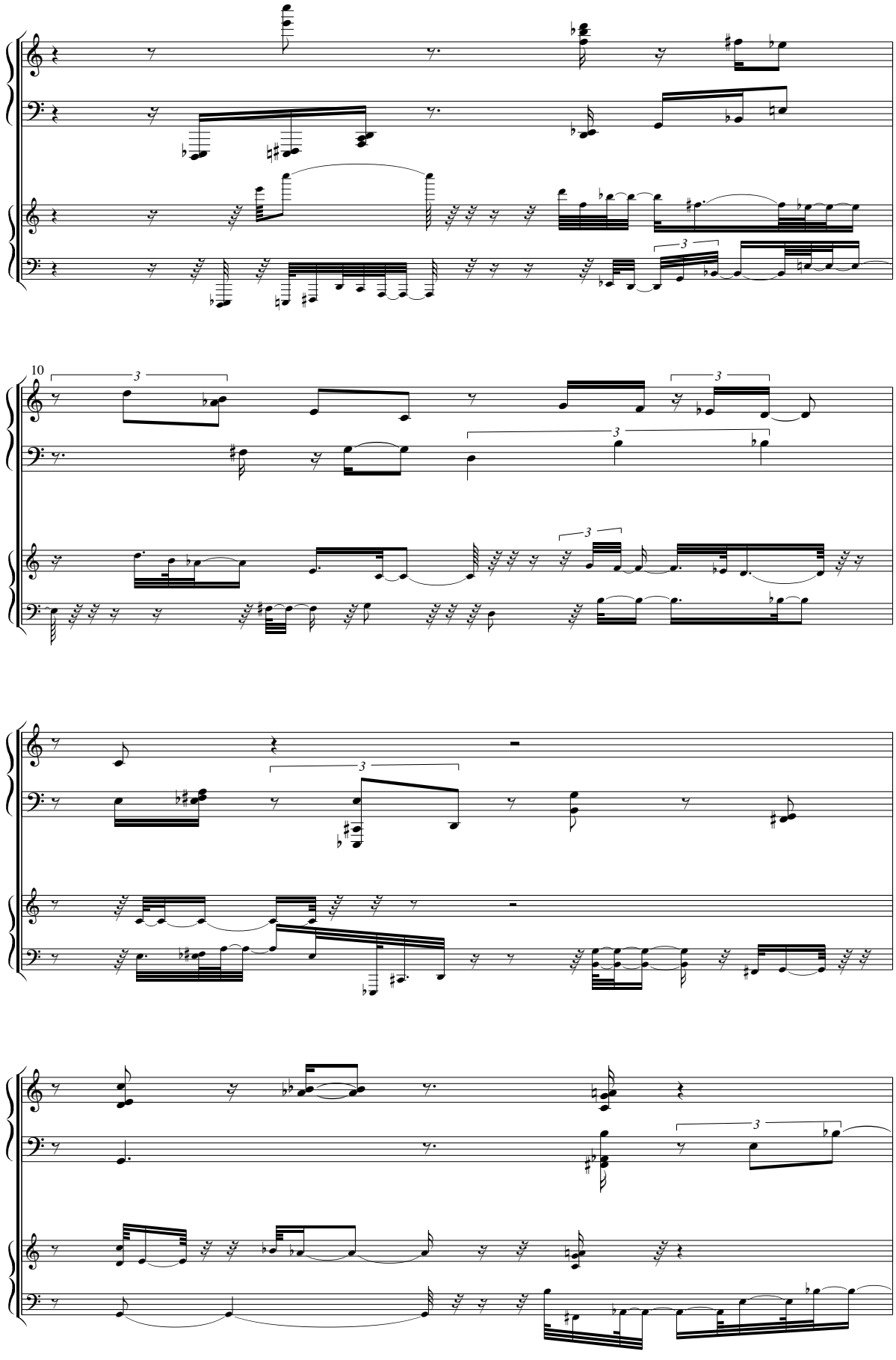
(Player) Piano Study 5
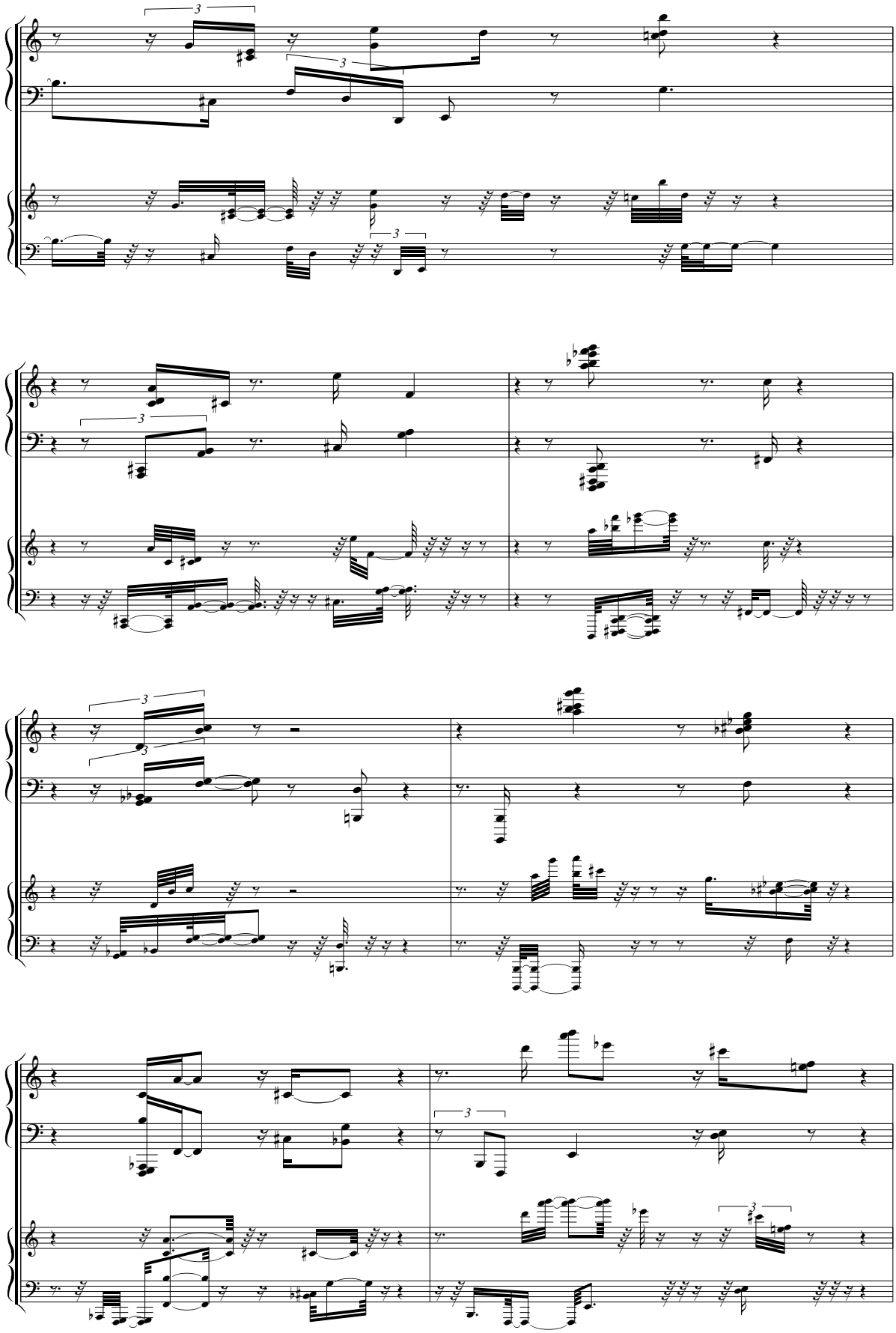
Typeset score
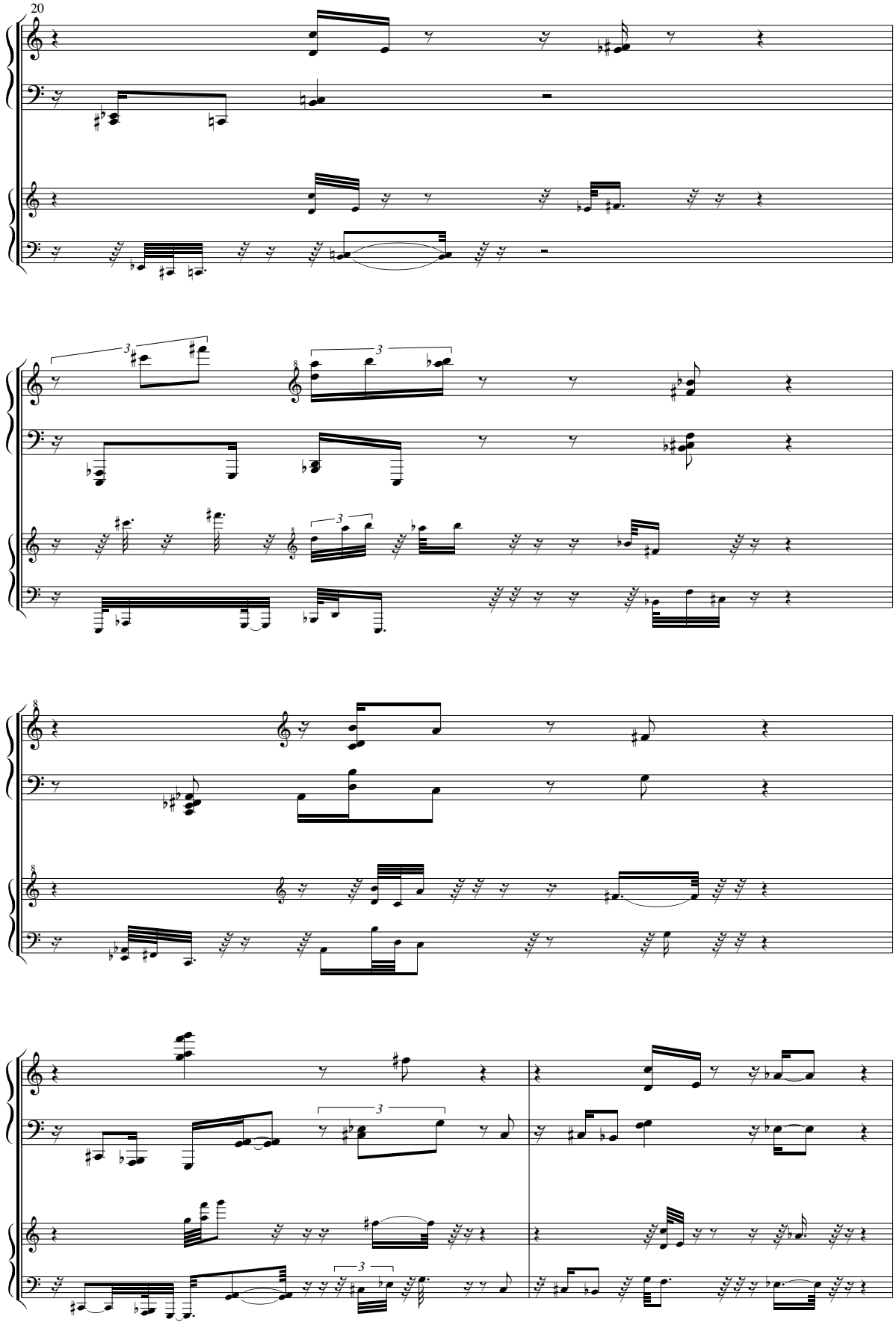
(Player-) Piano Study No.5
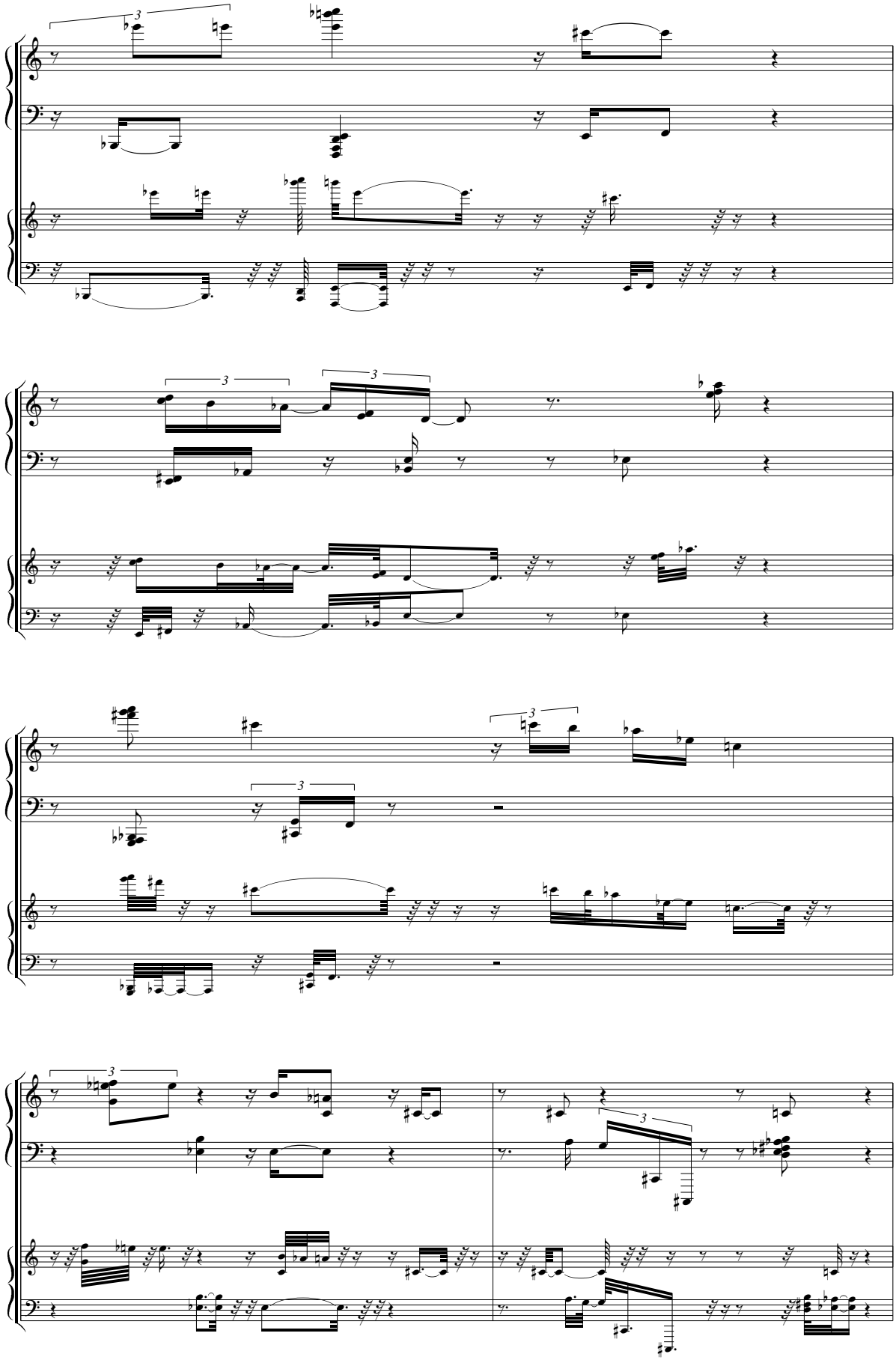
Benjamin Mawson 2012
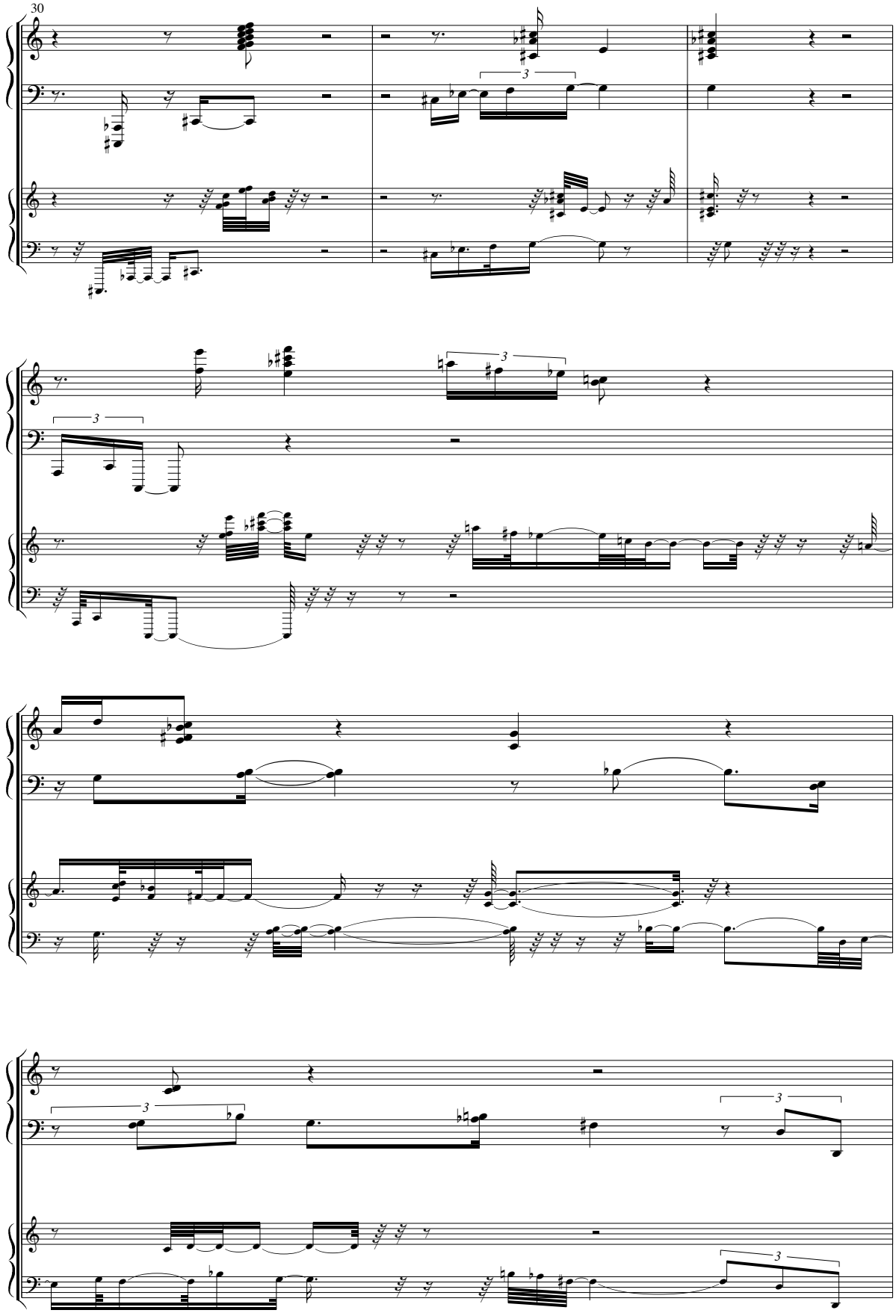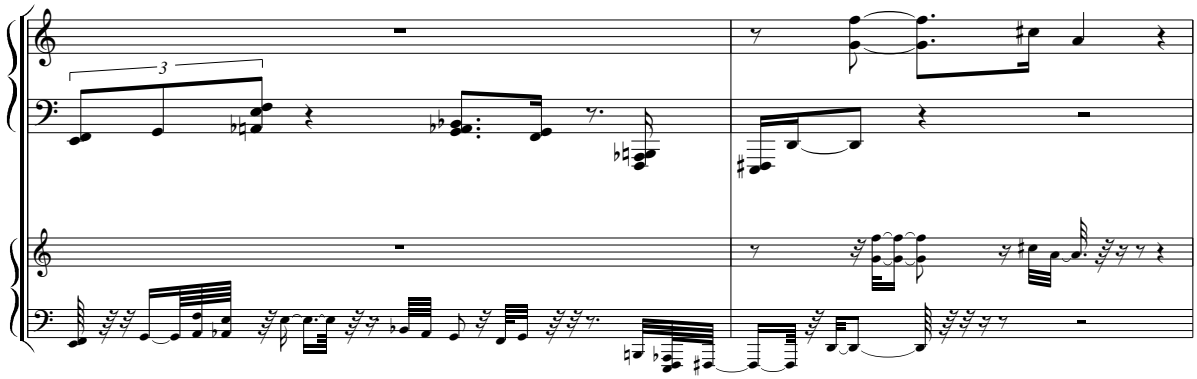



10
3
3
3
3
3
3
3

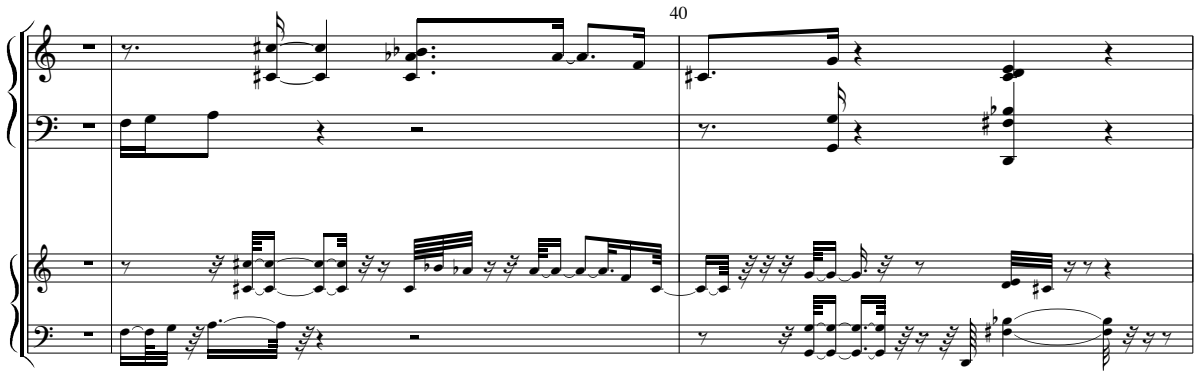


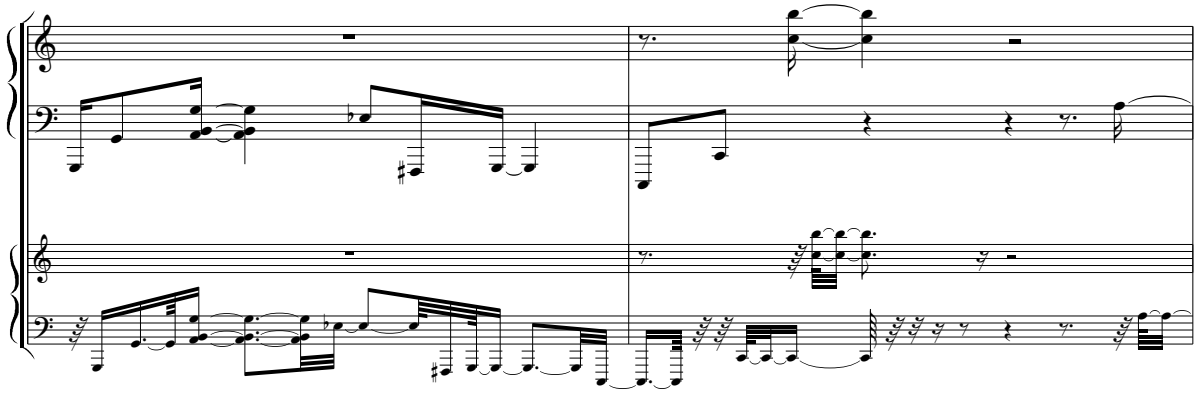

20
3
3
3
8
8
3
3

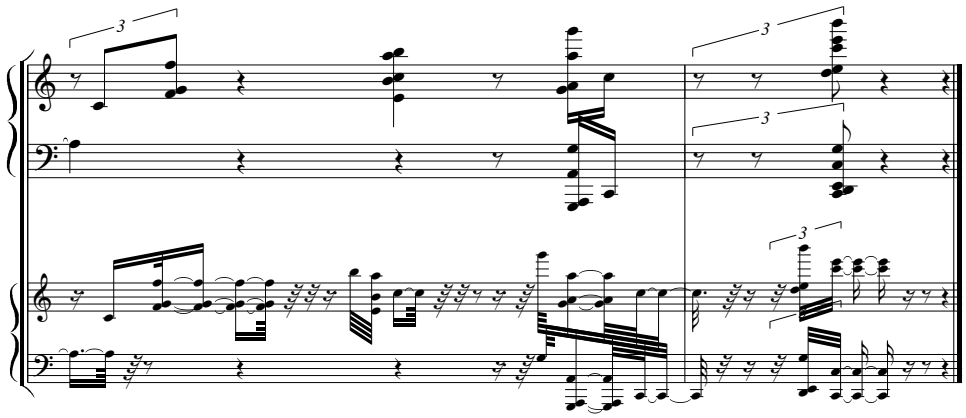



30
3
3
3
3
3
3




40
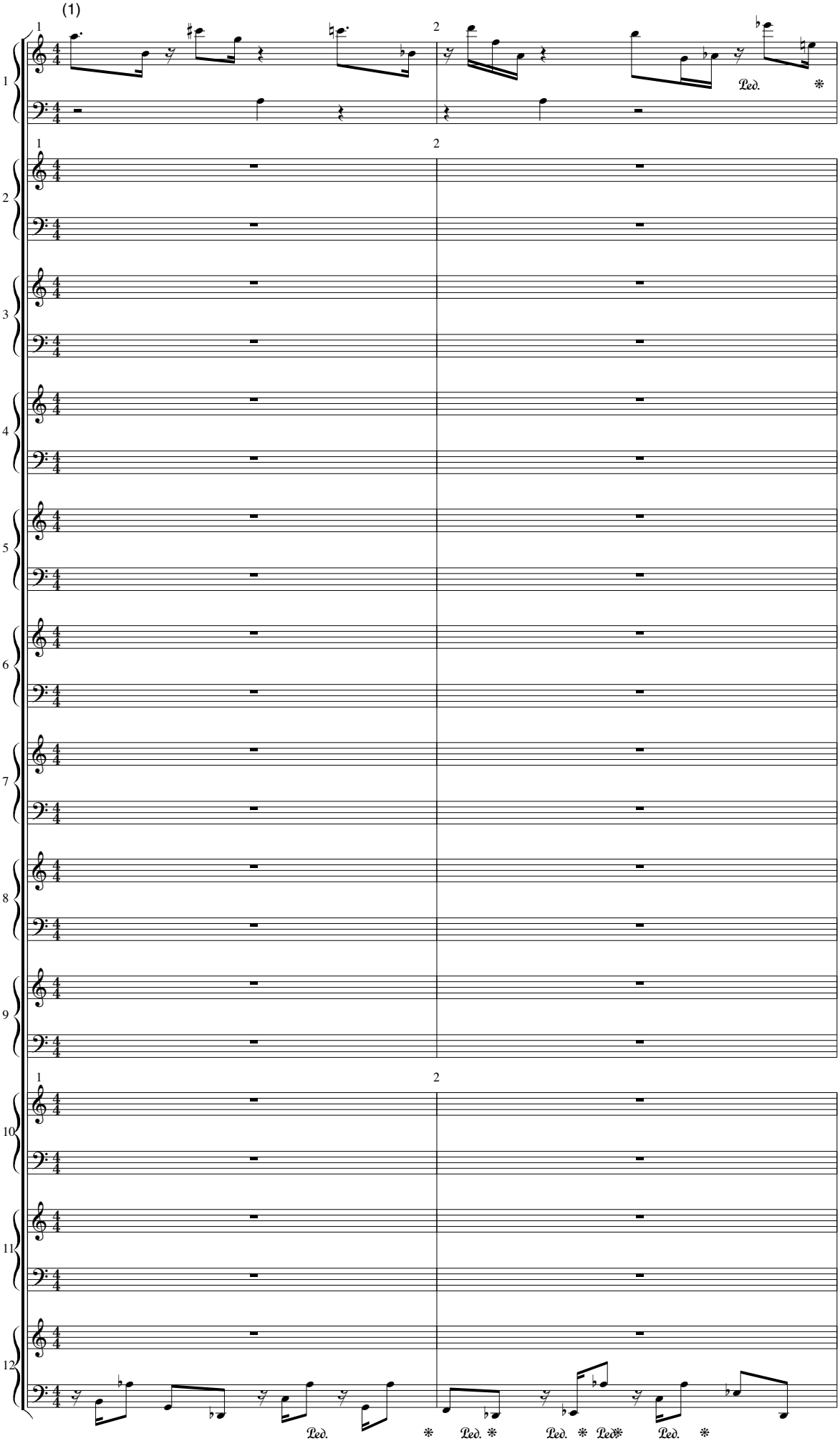


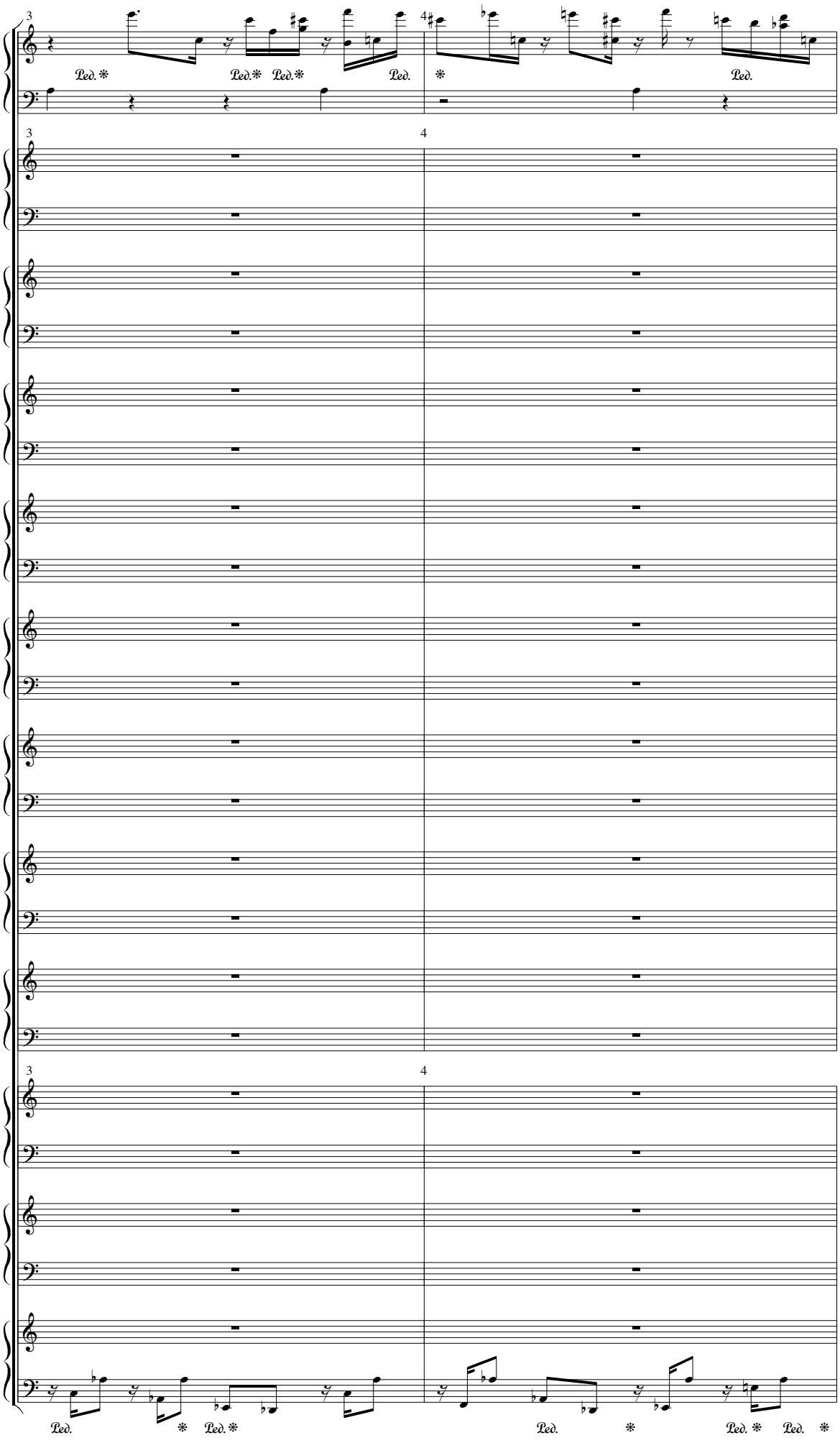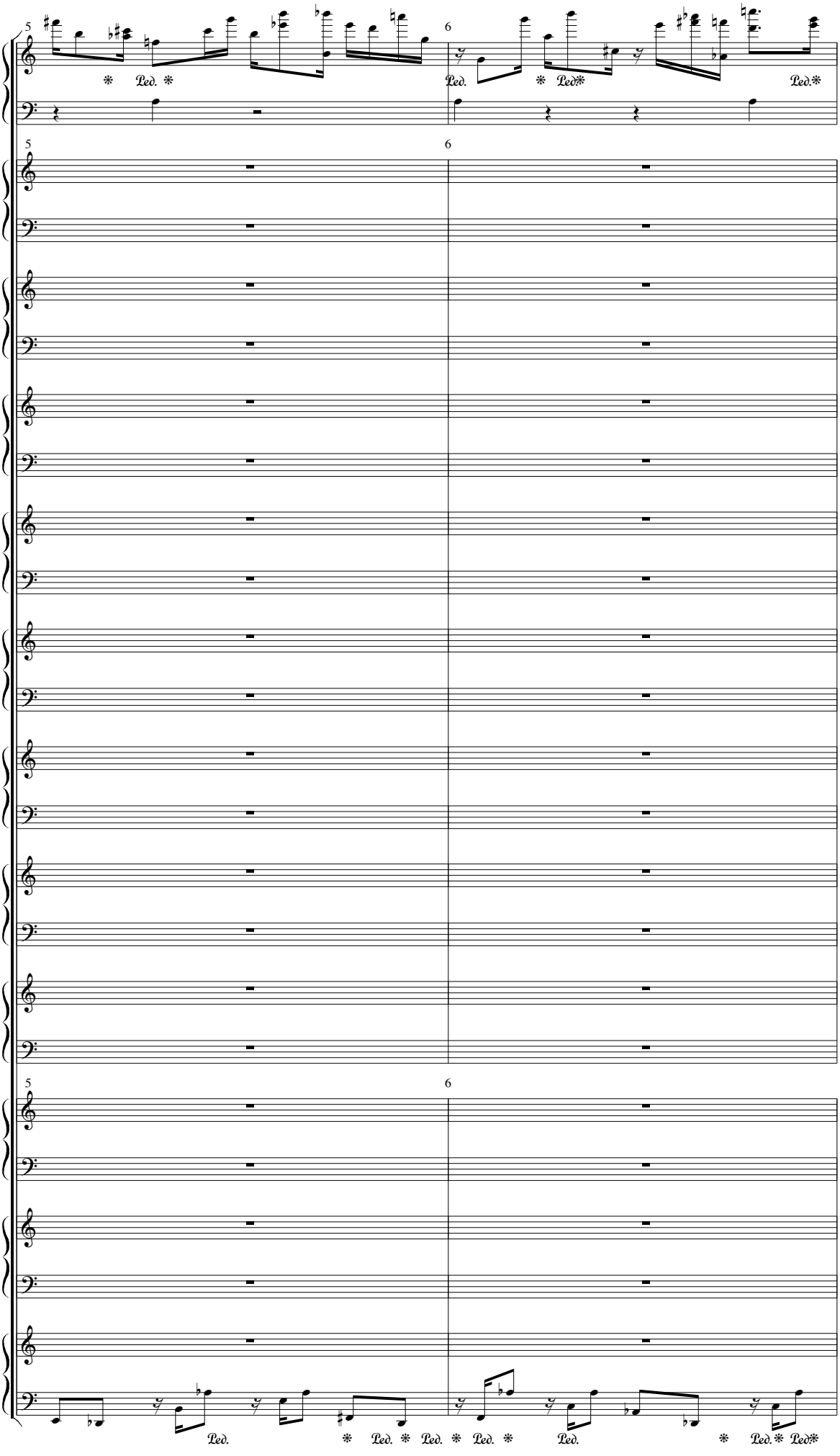


Dreaming at the Circular Ruins

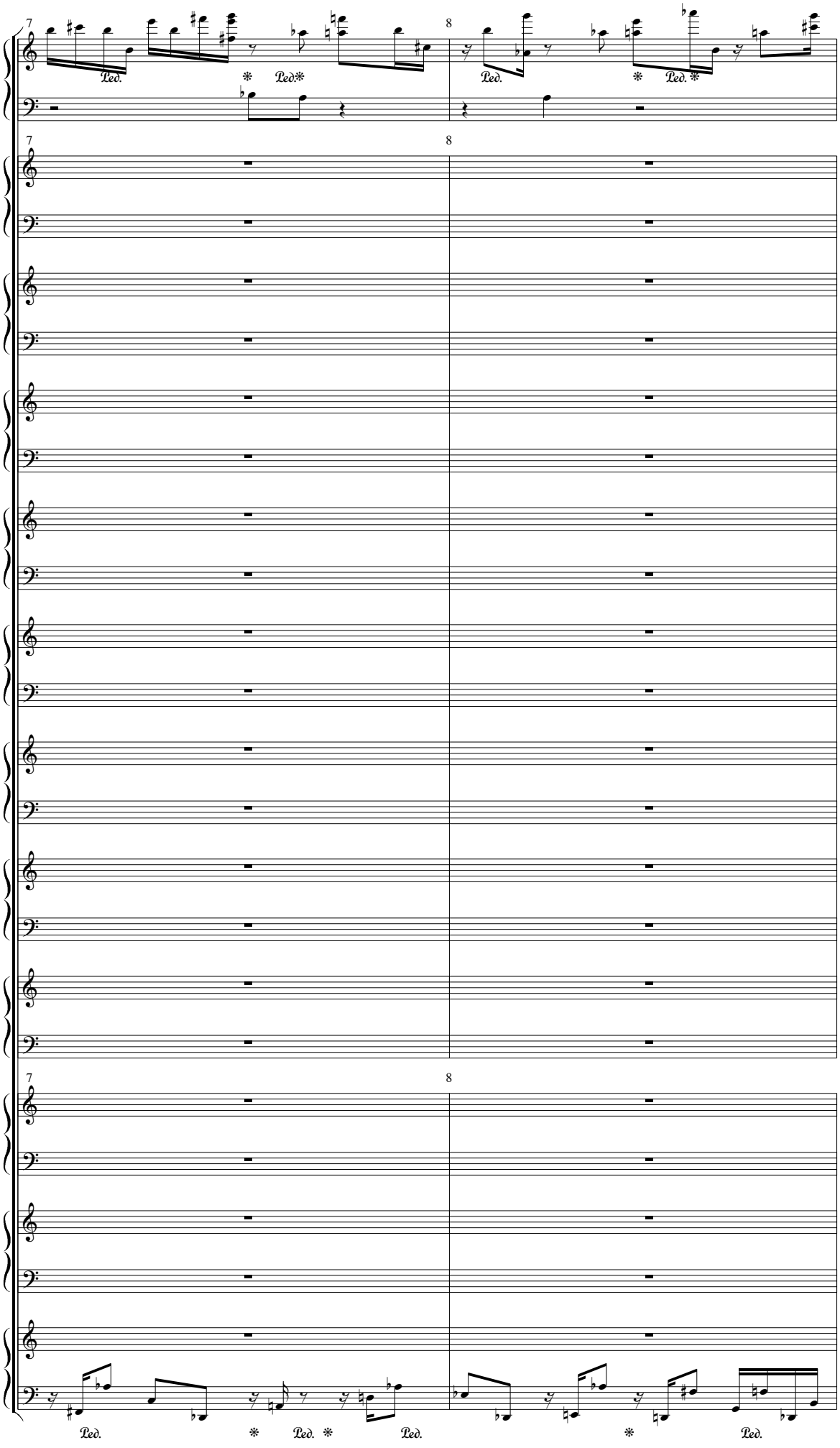
Dreaming at the Circular Ruins (1)

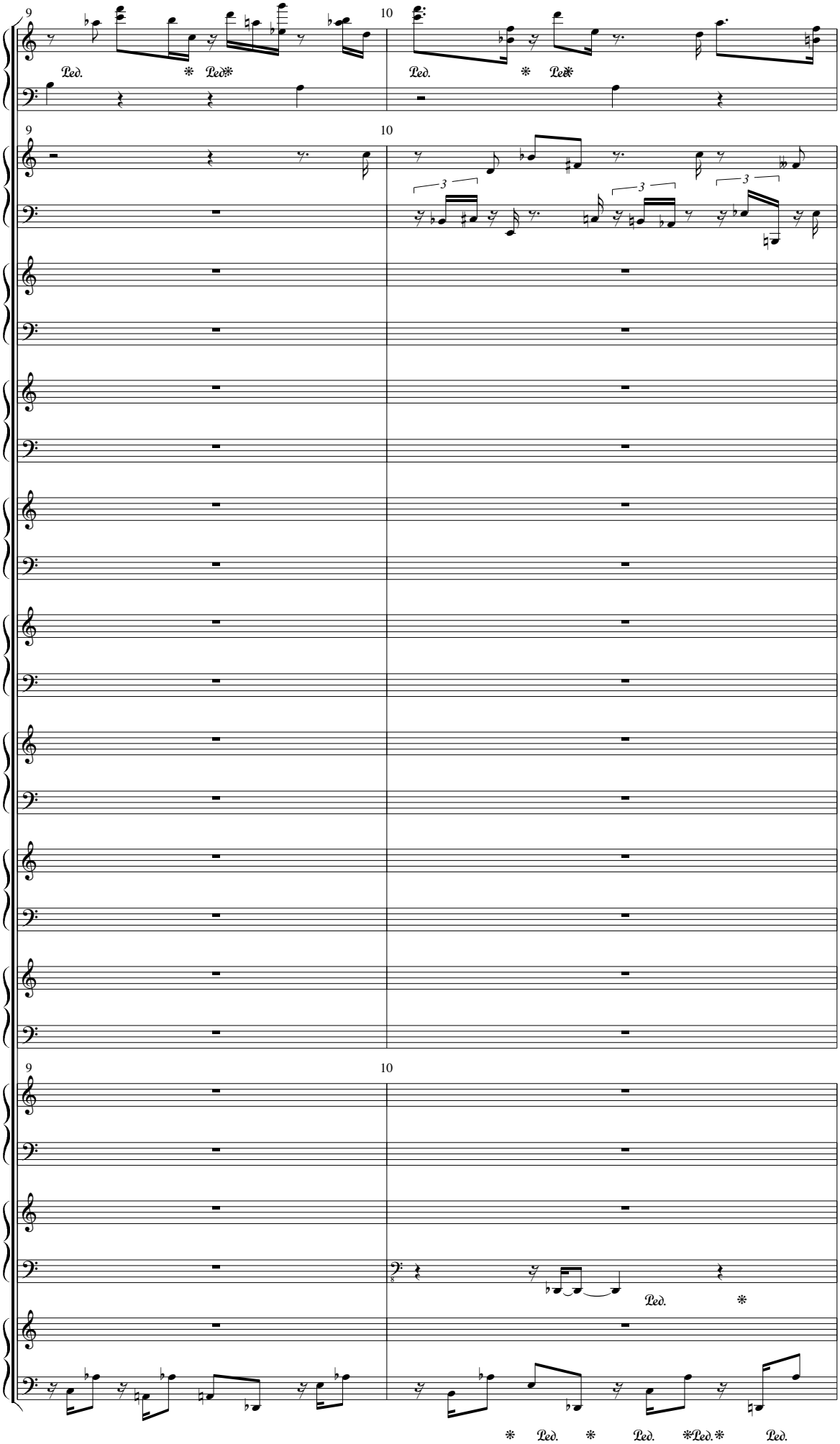
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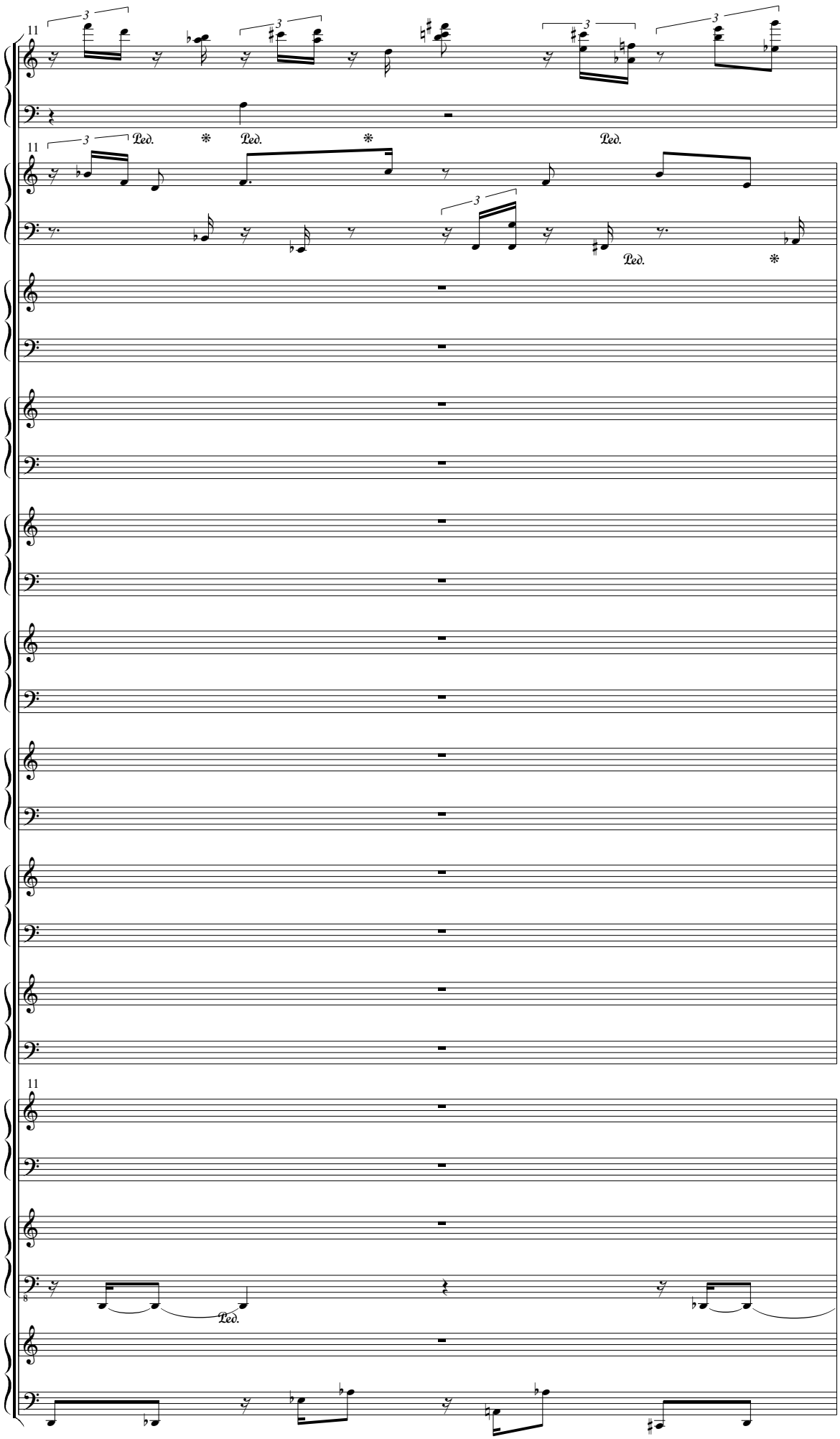


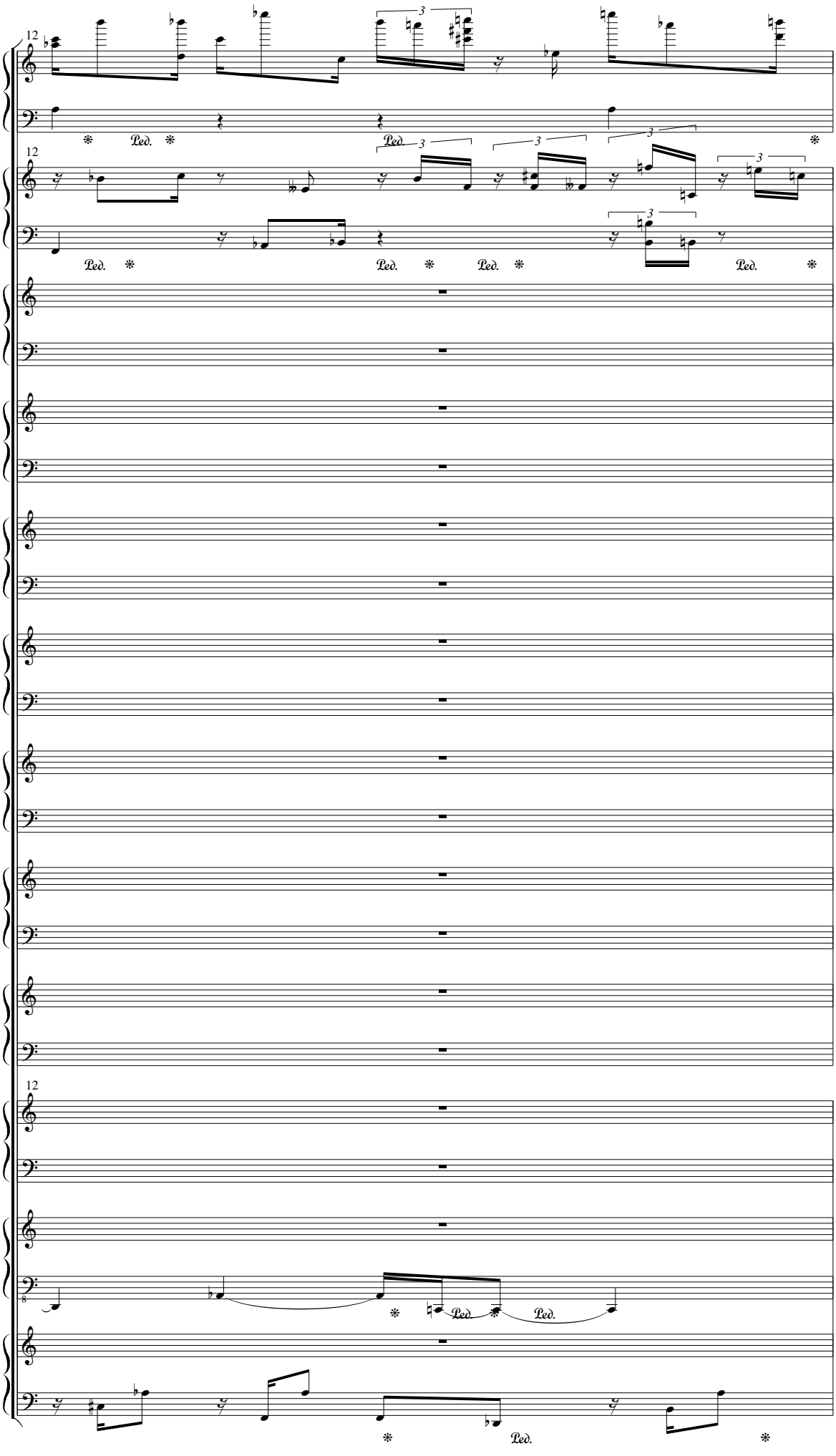

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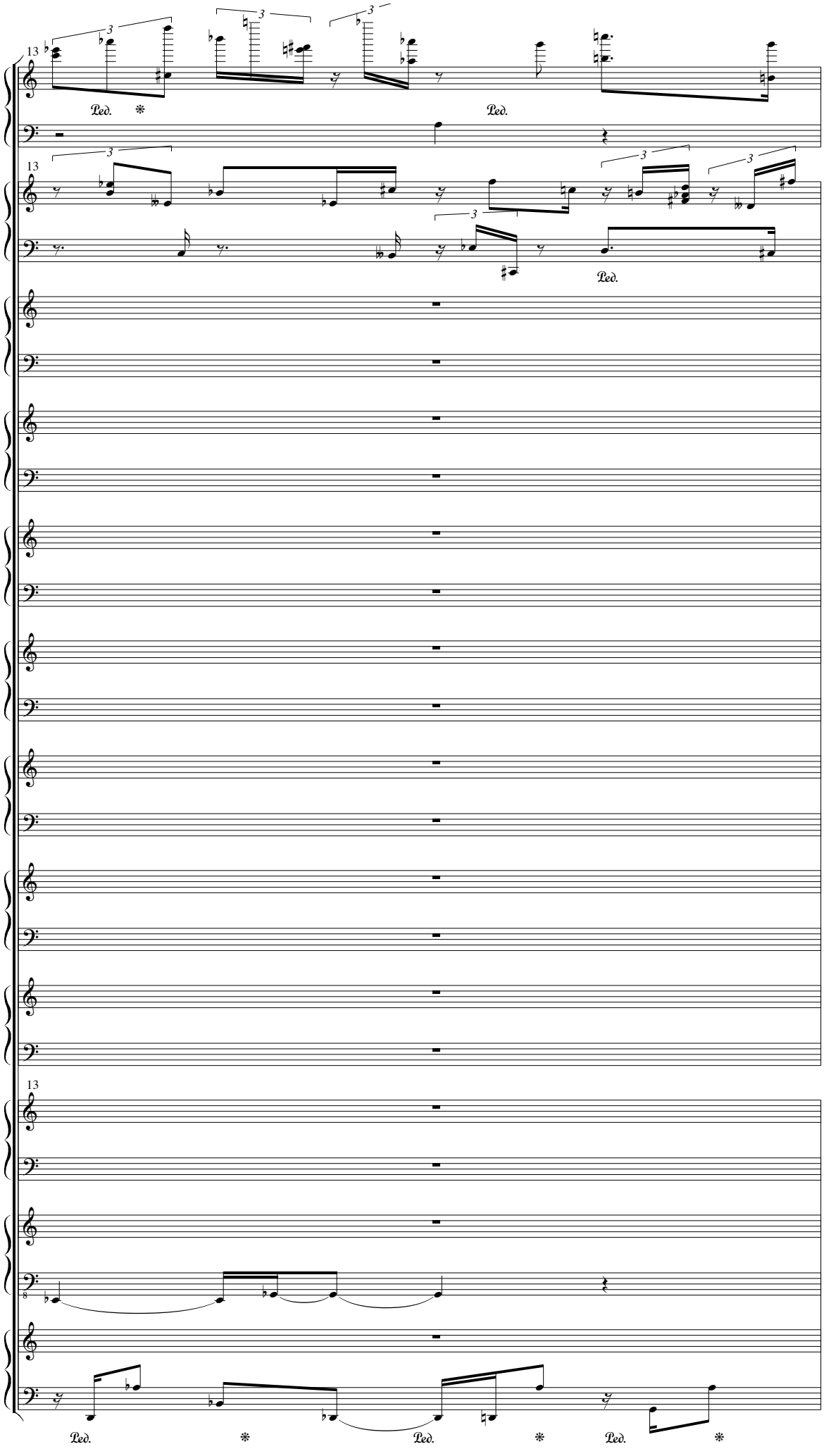

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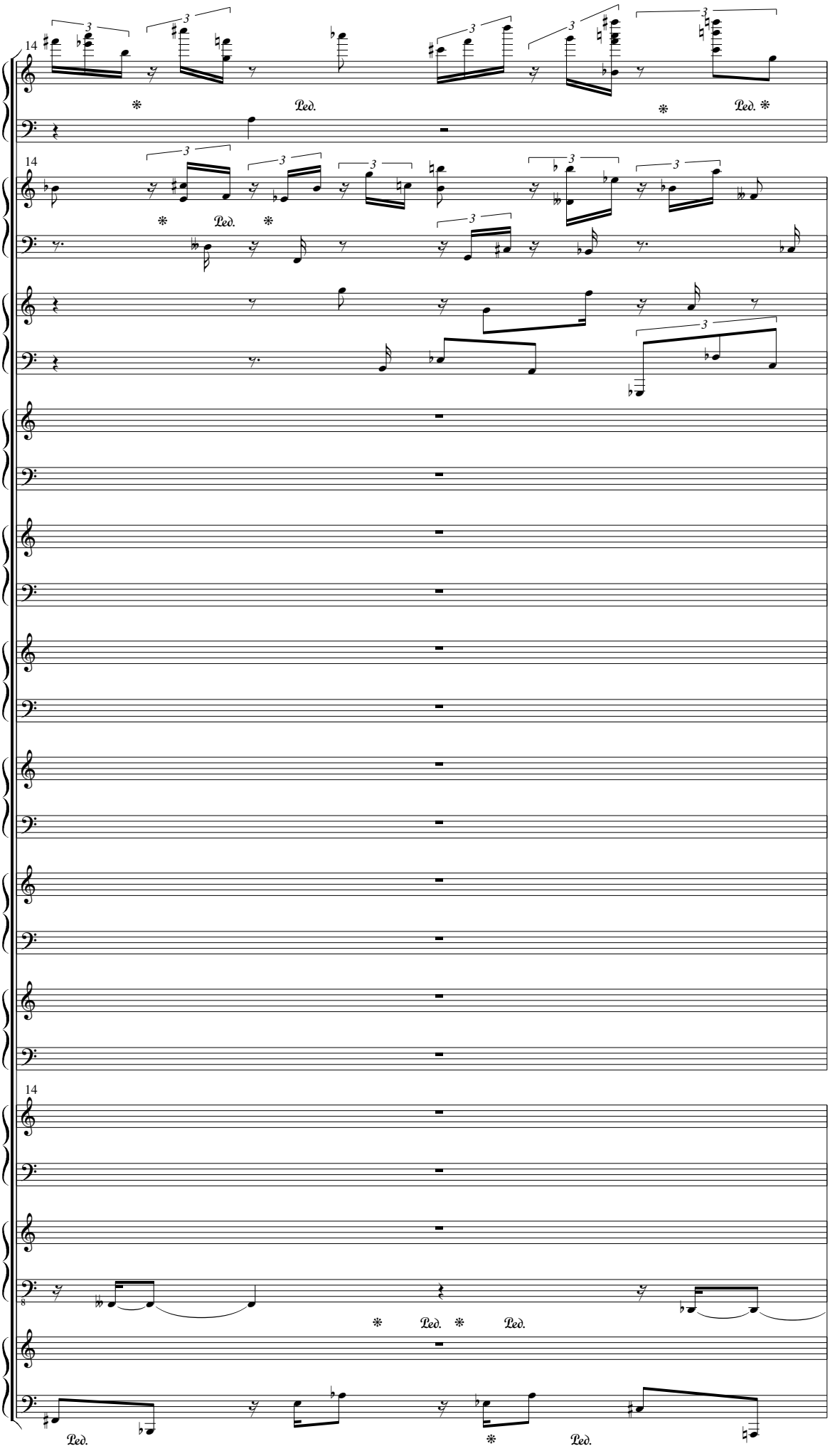

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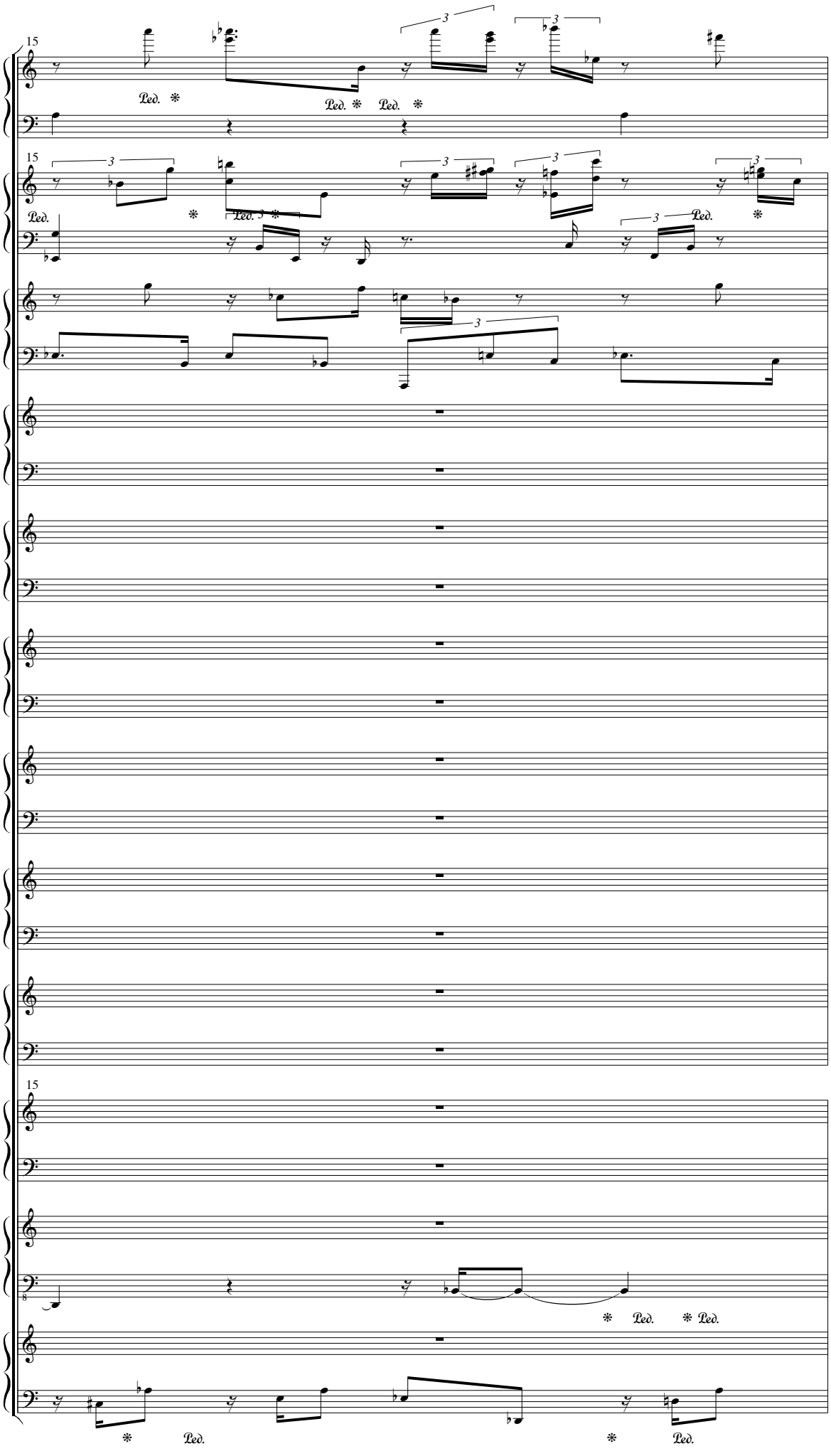

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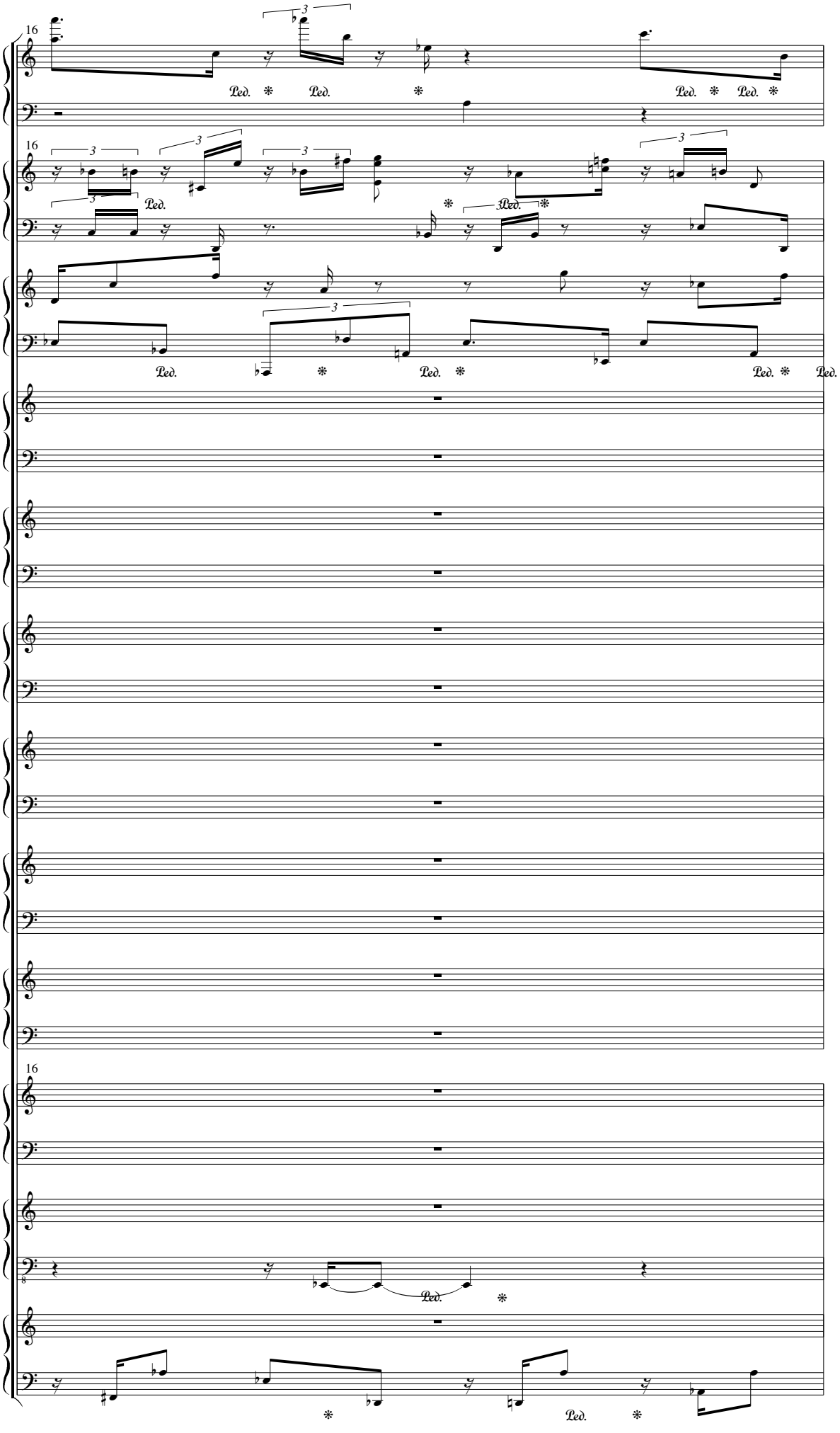

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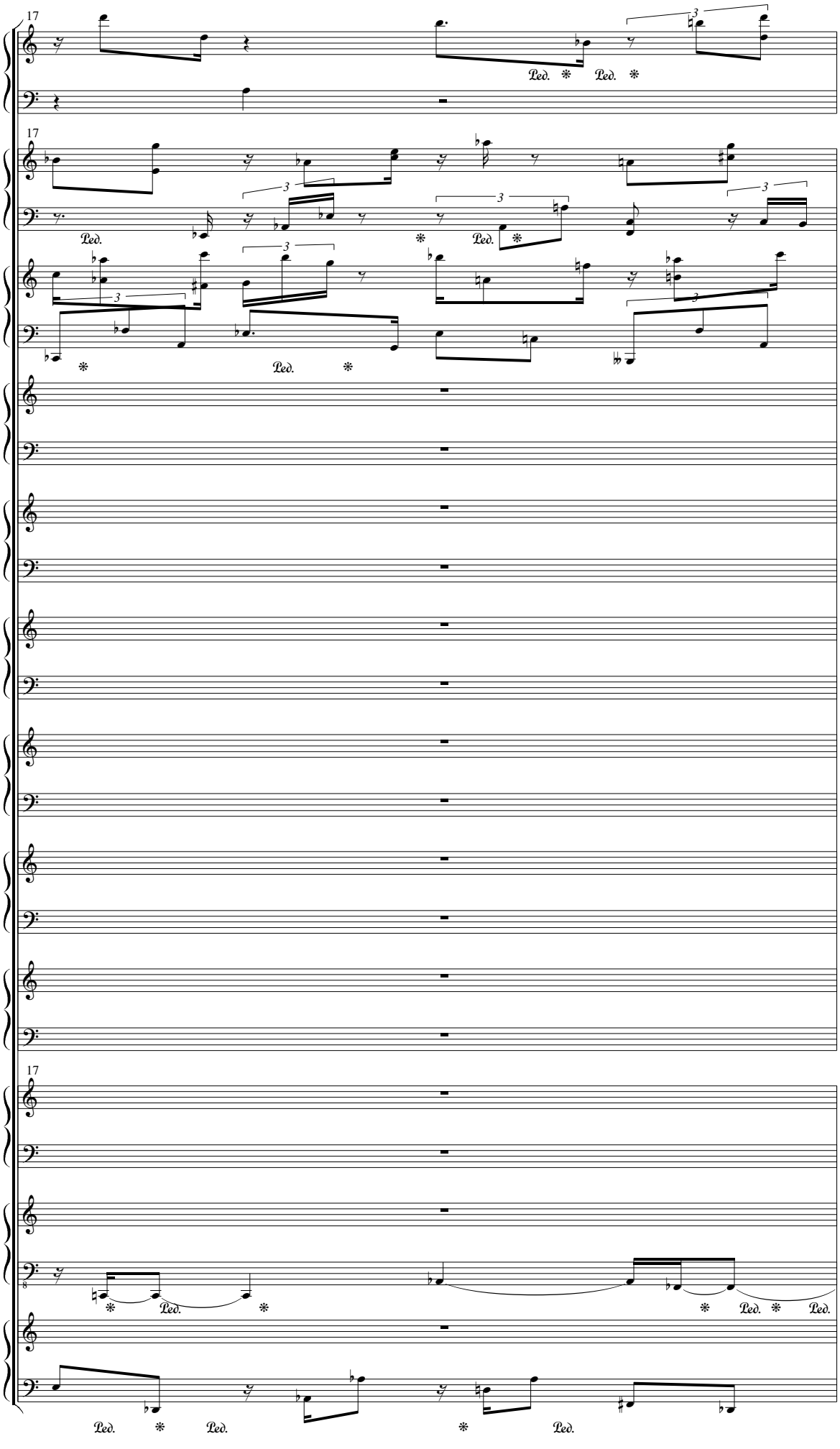

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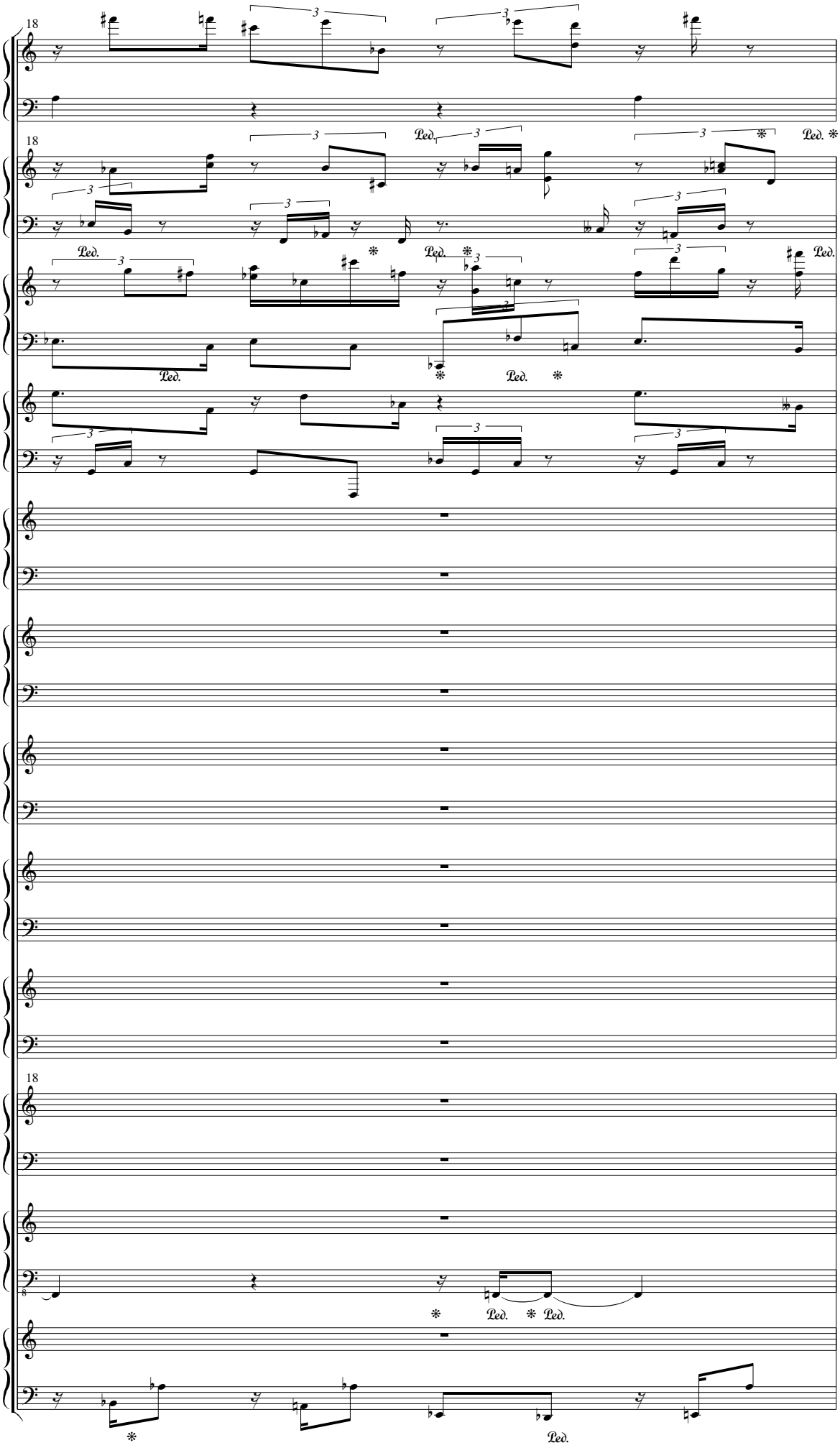

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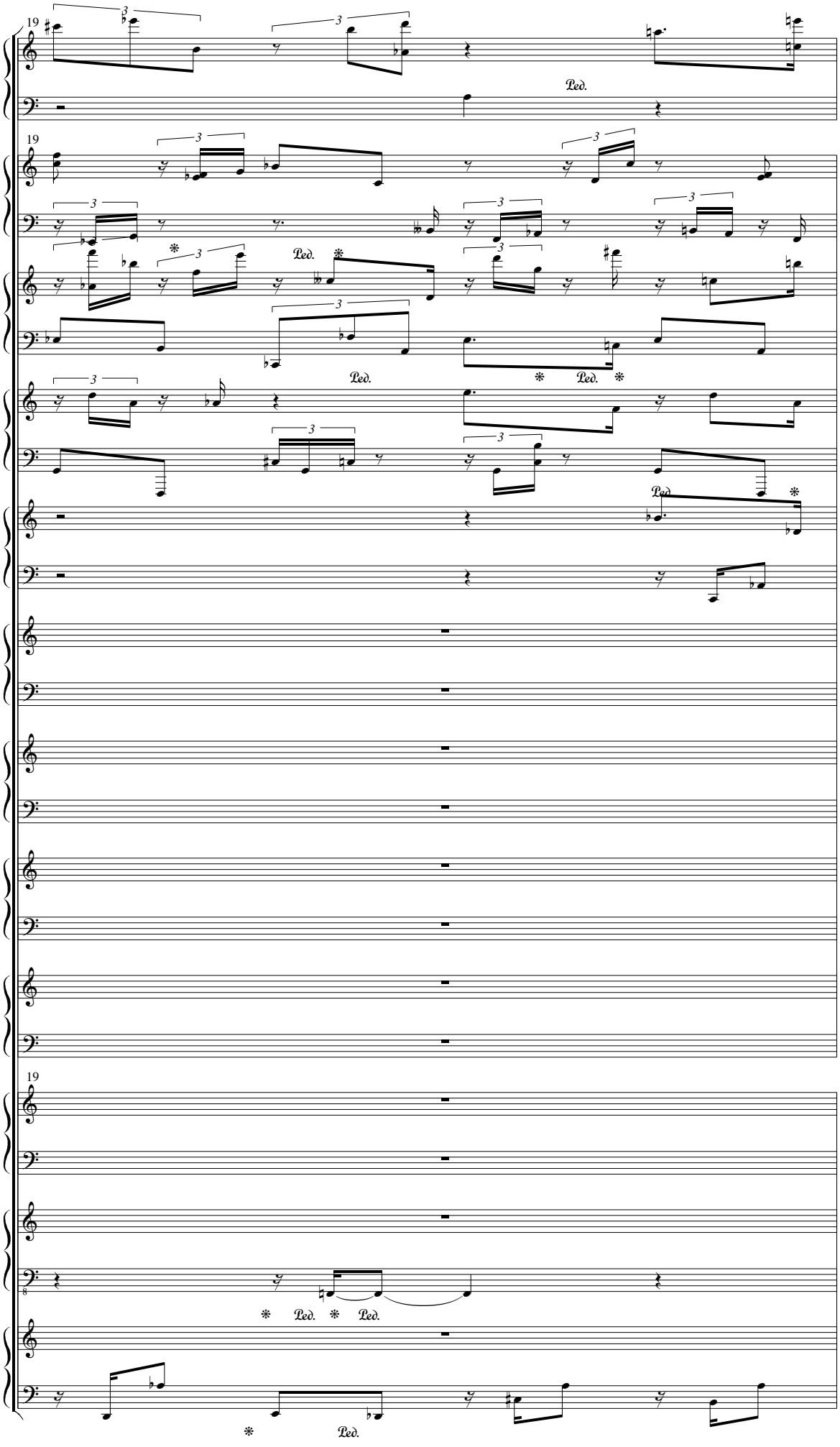

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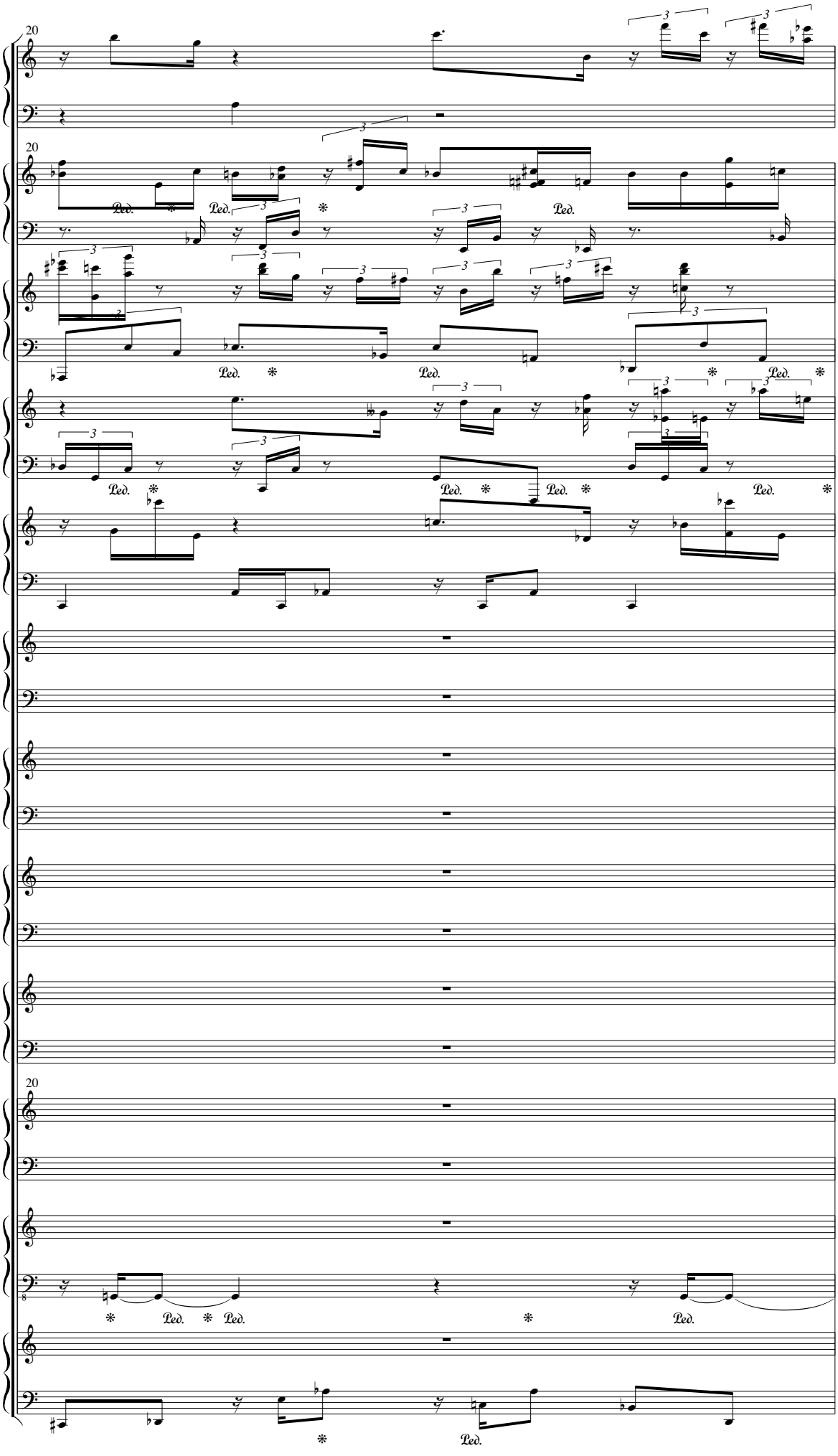

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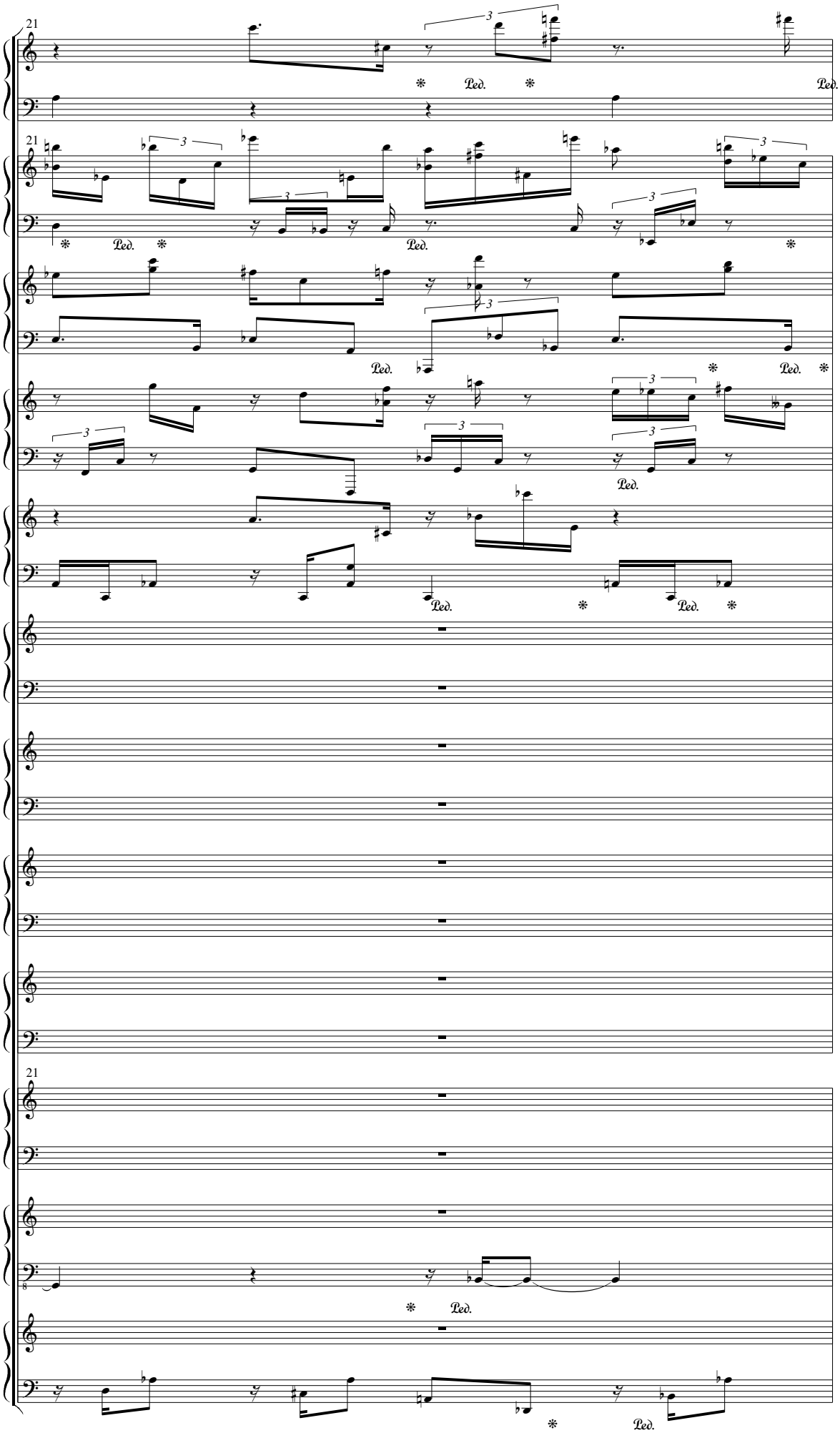

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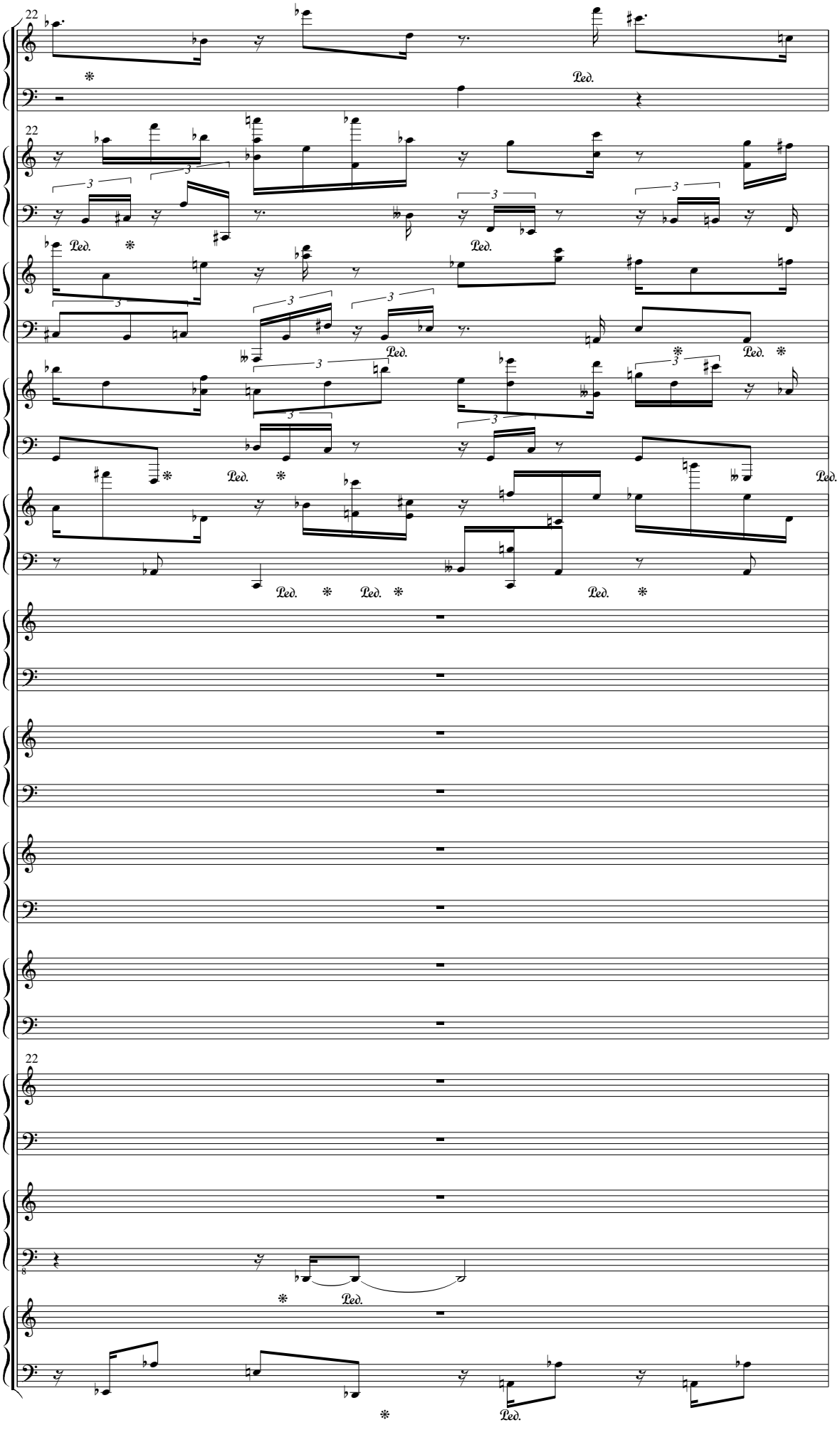

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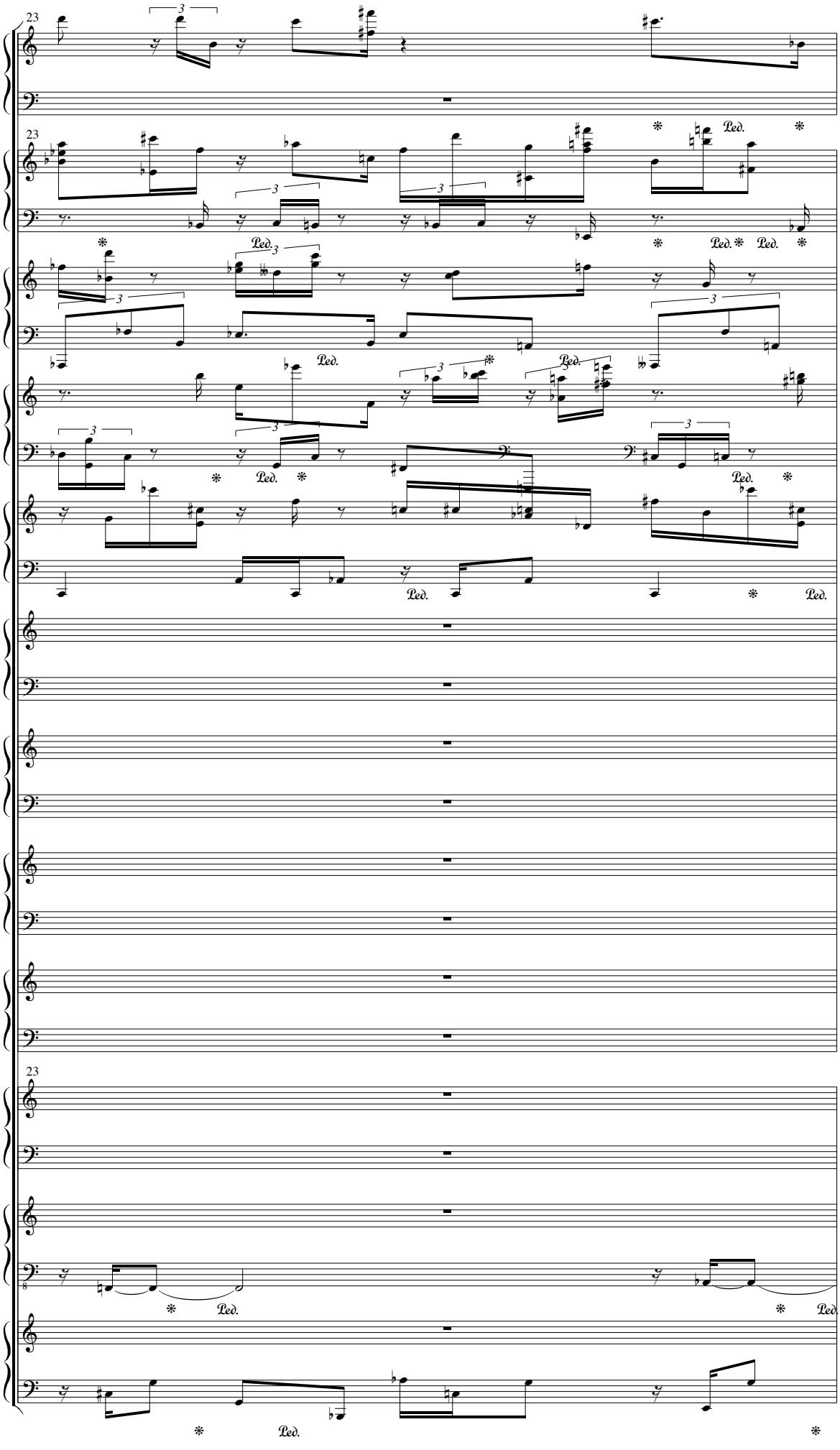

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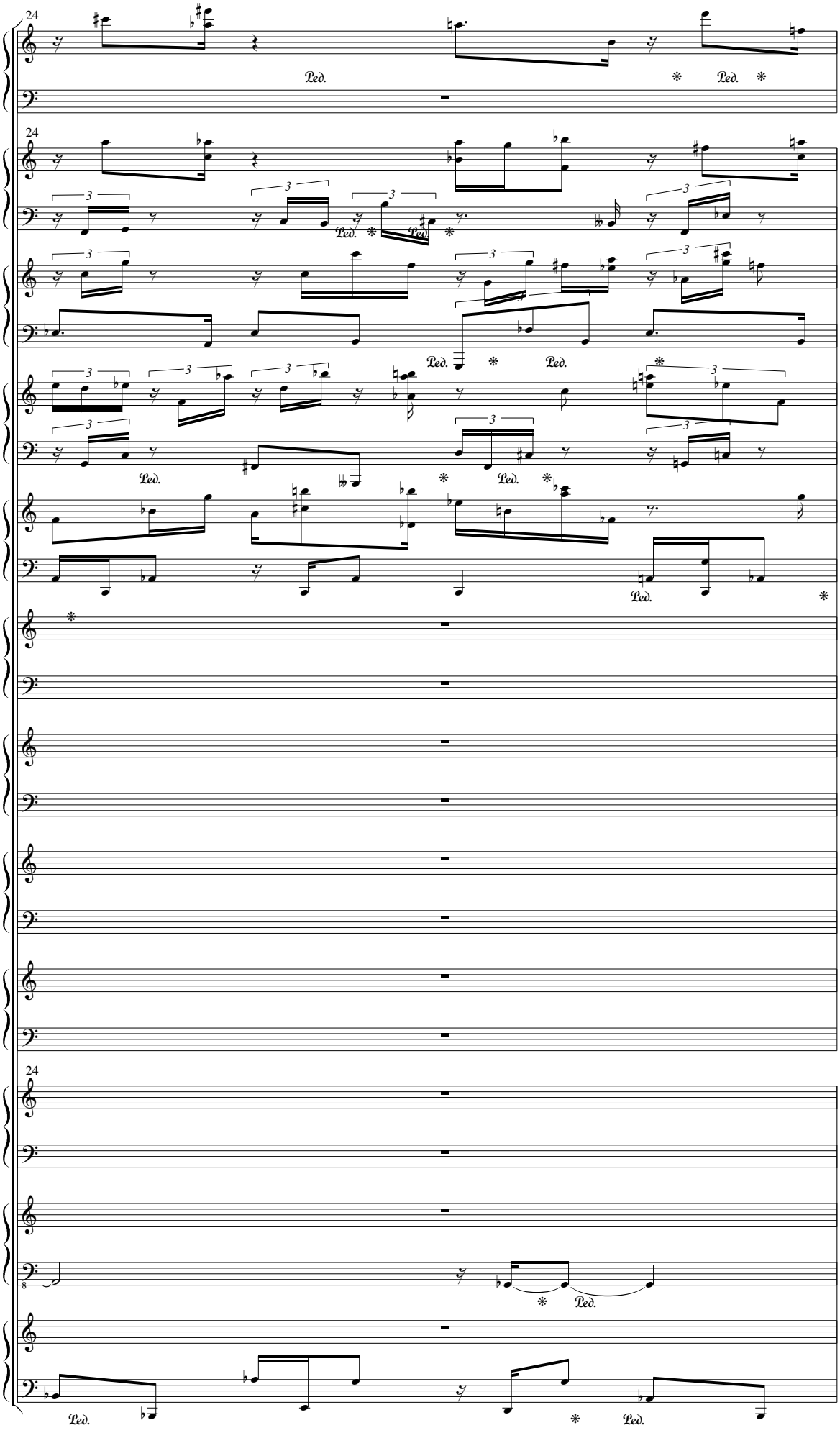

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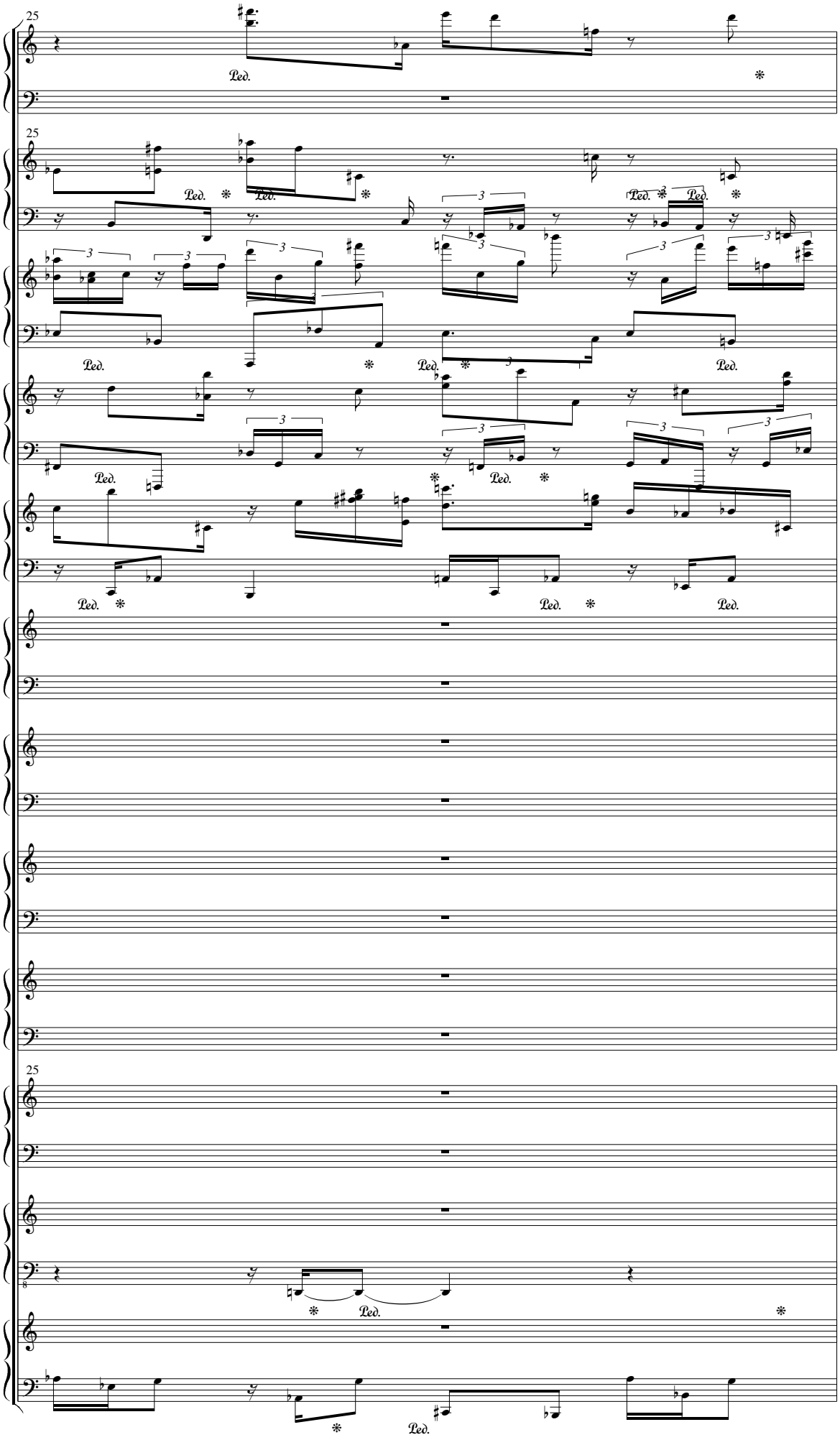

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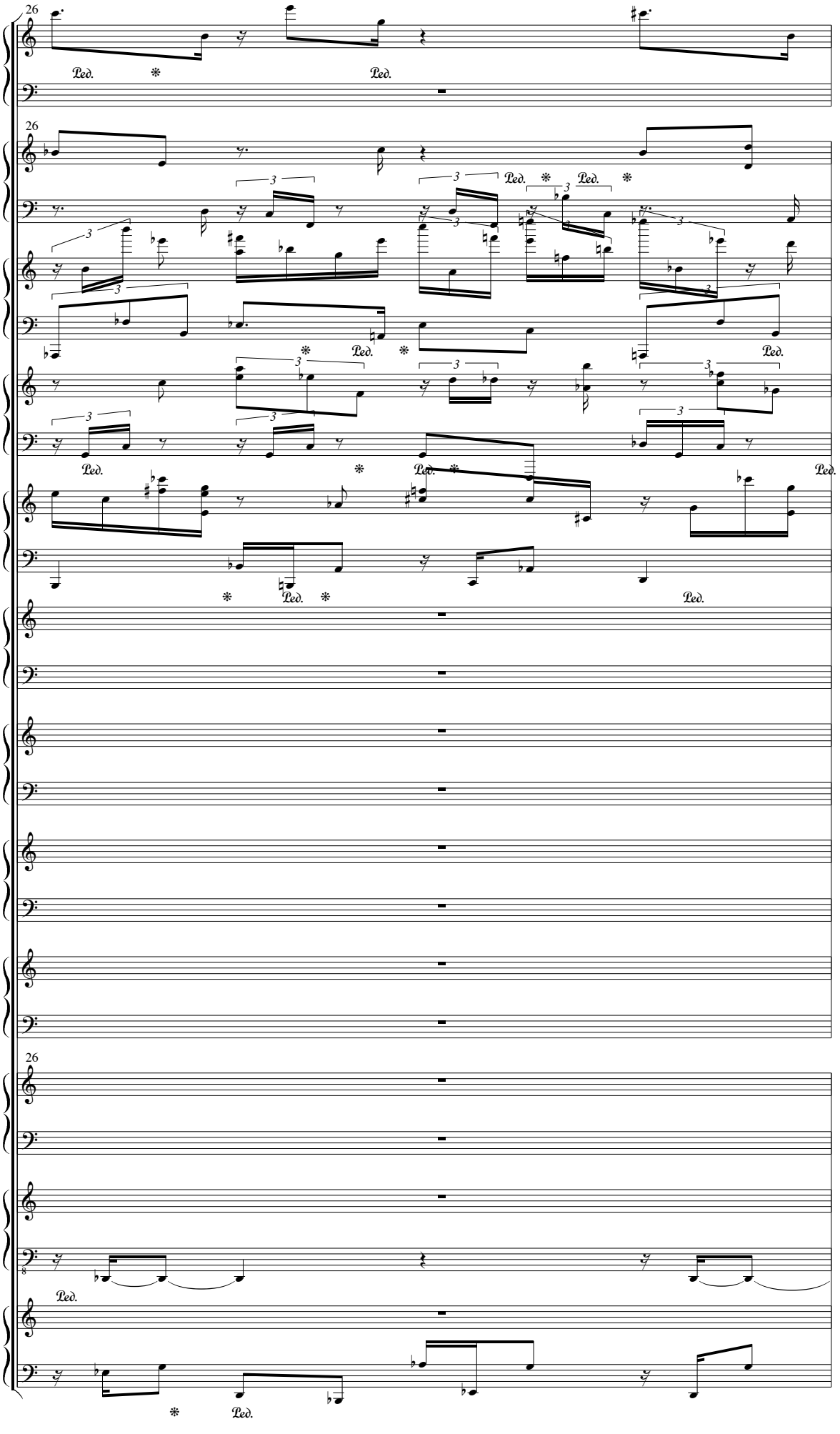

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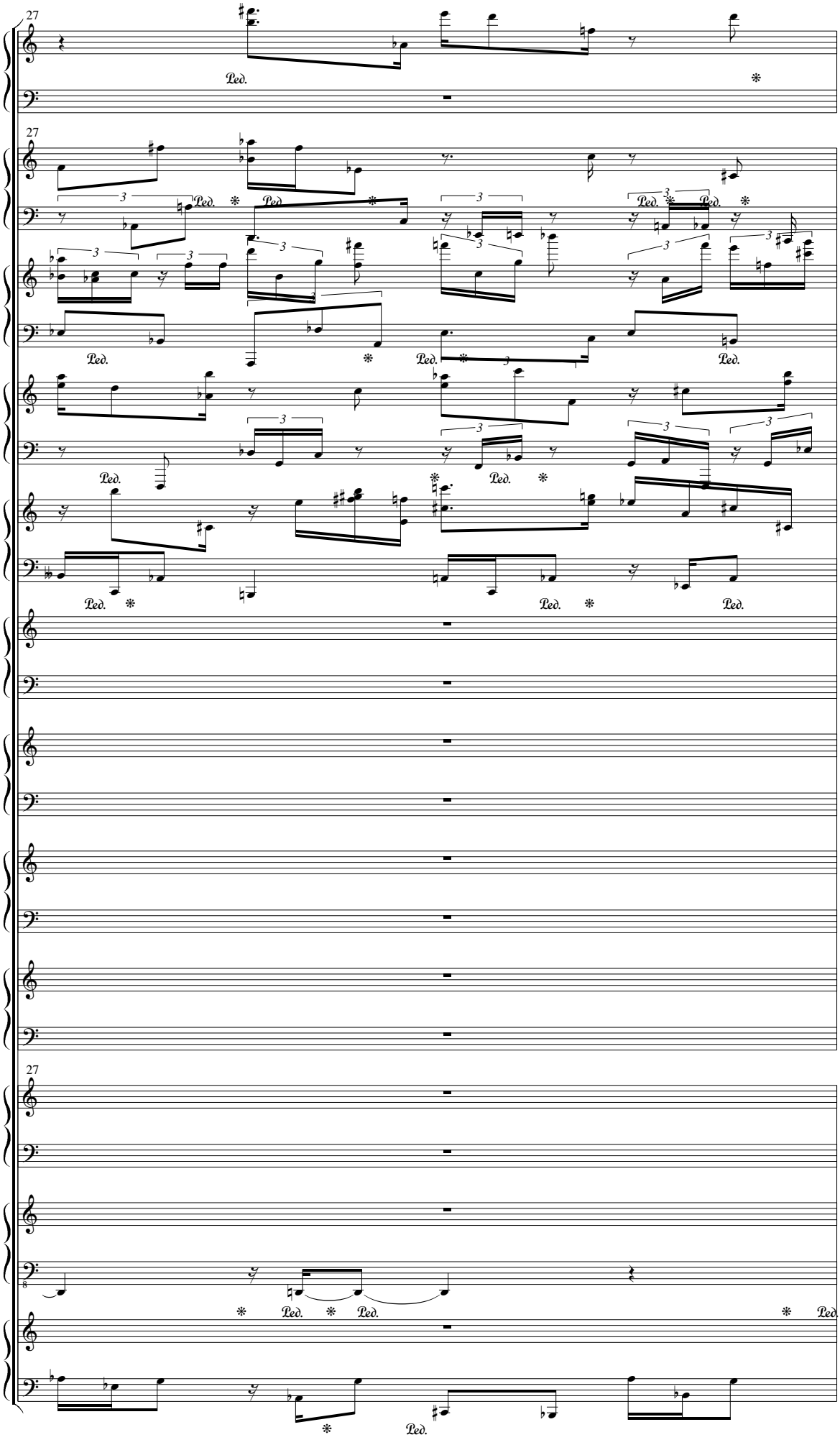

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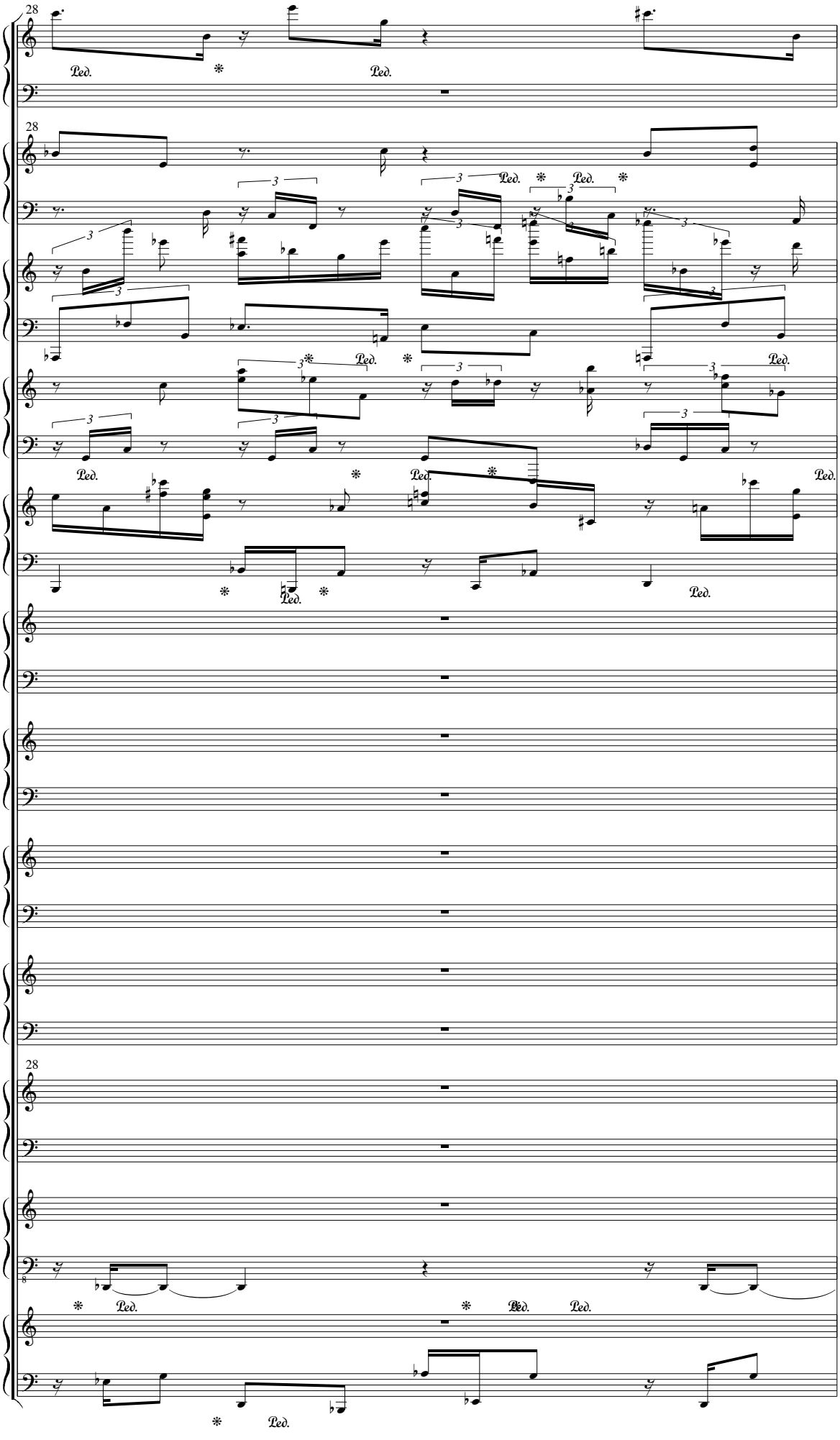

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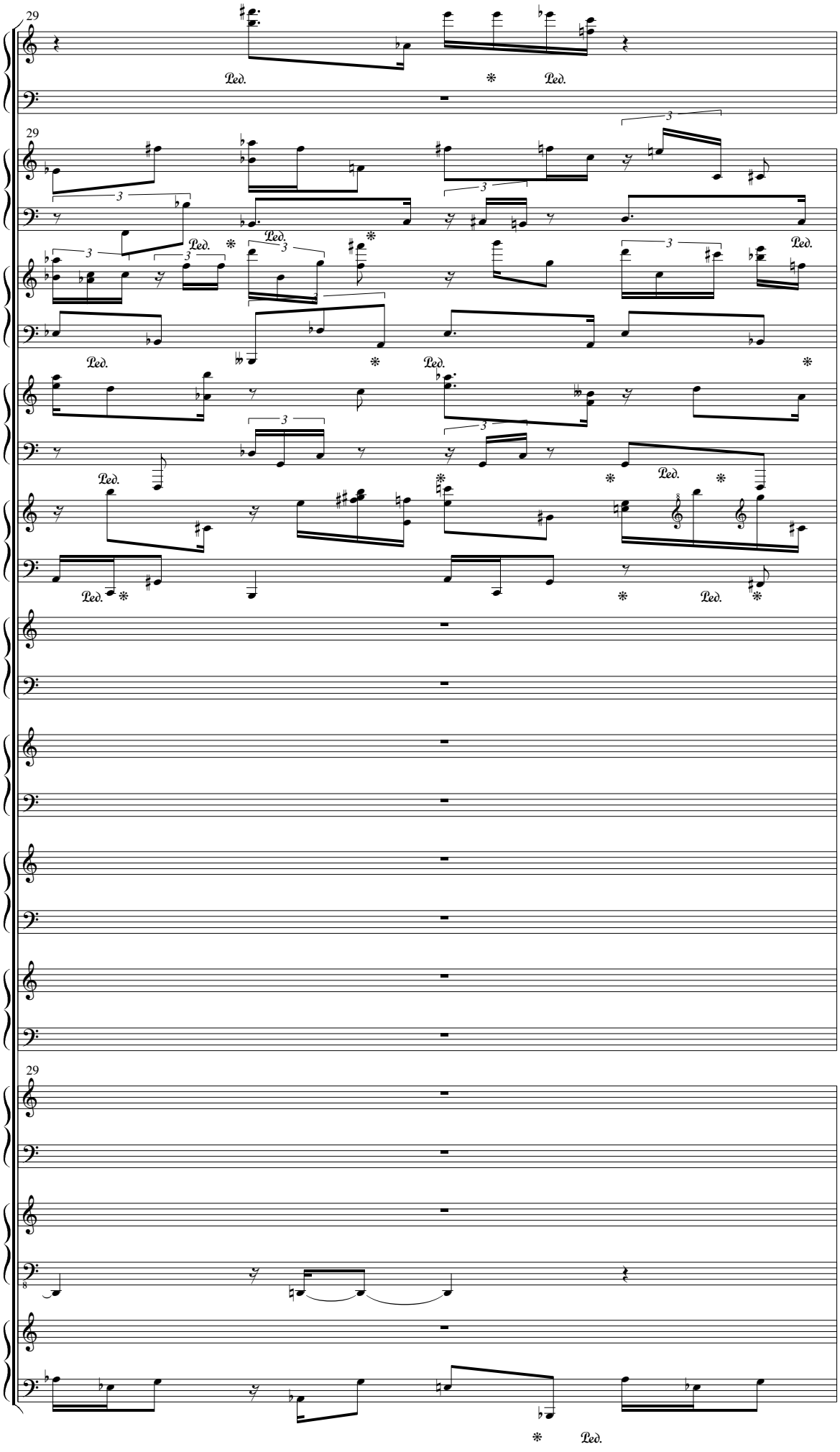

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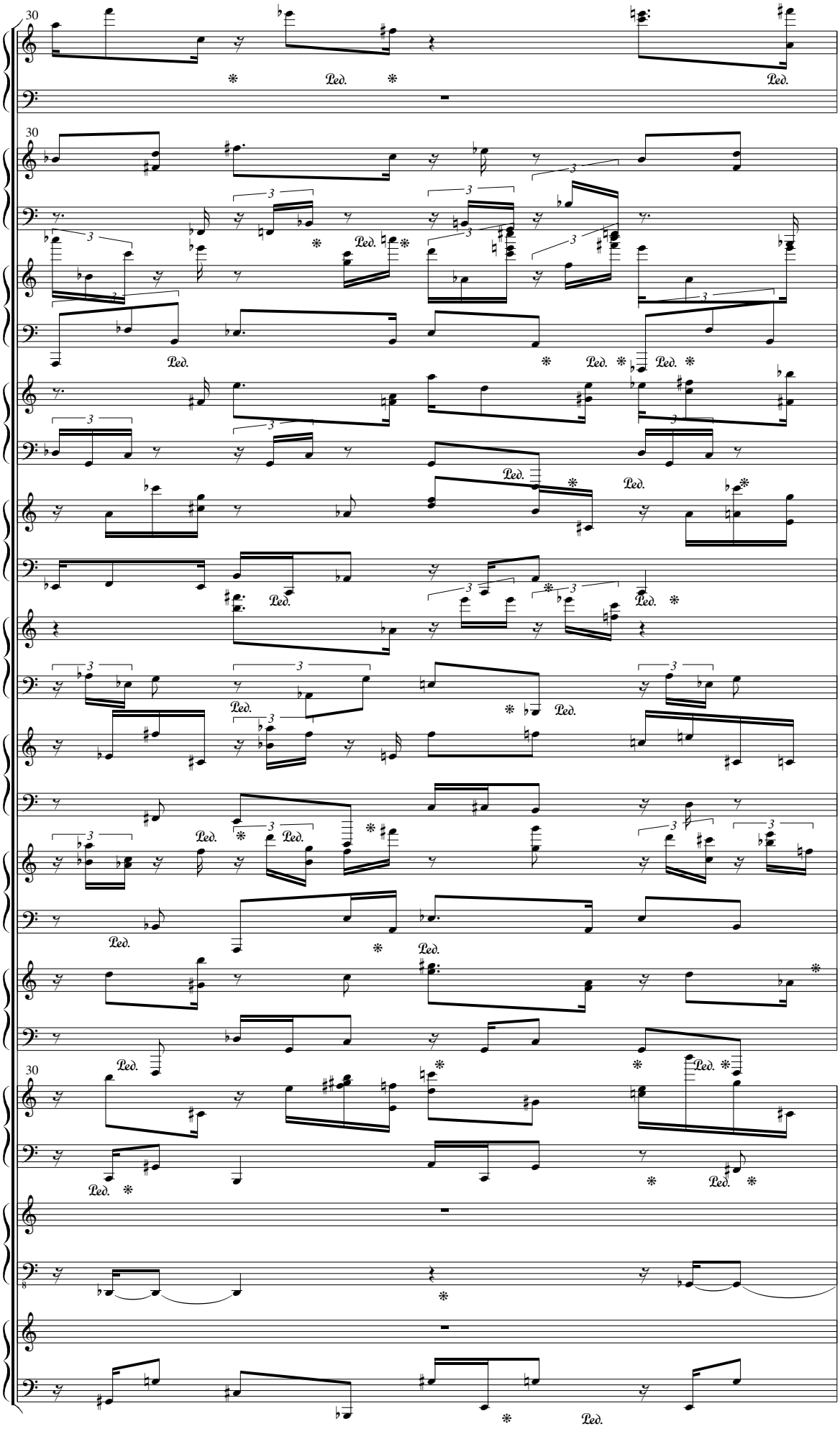

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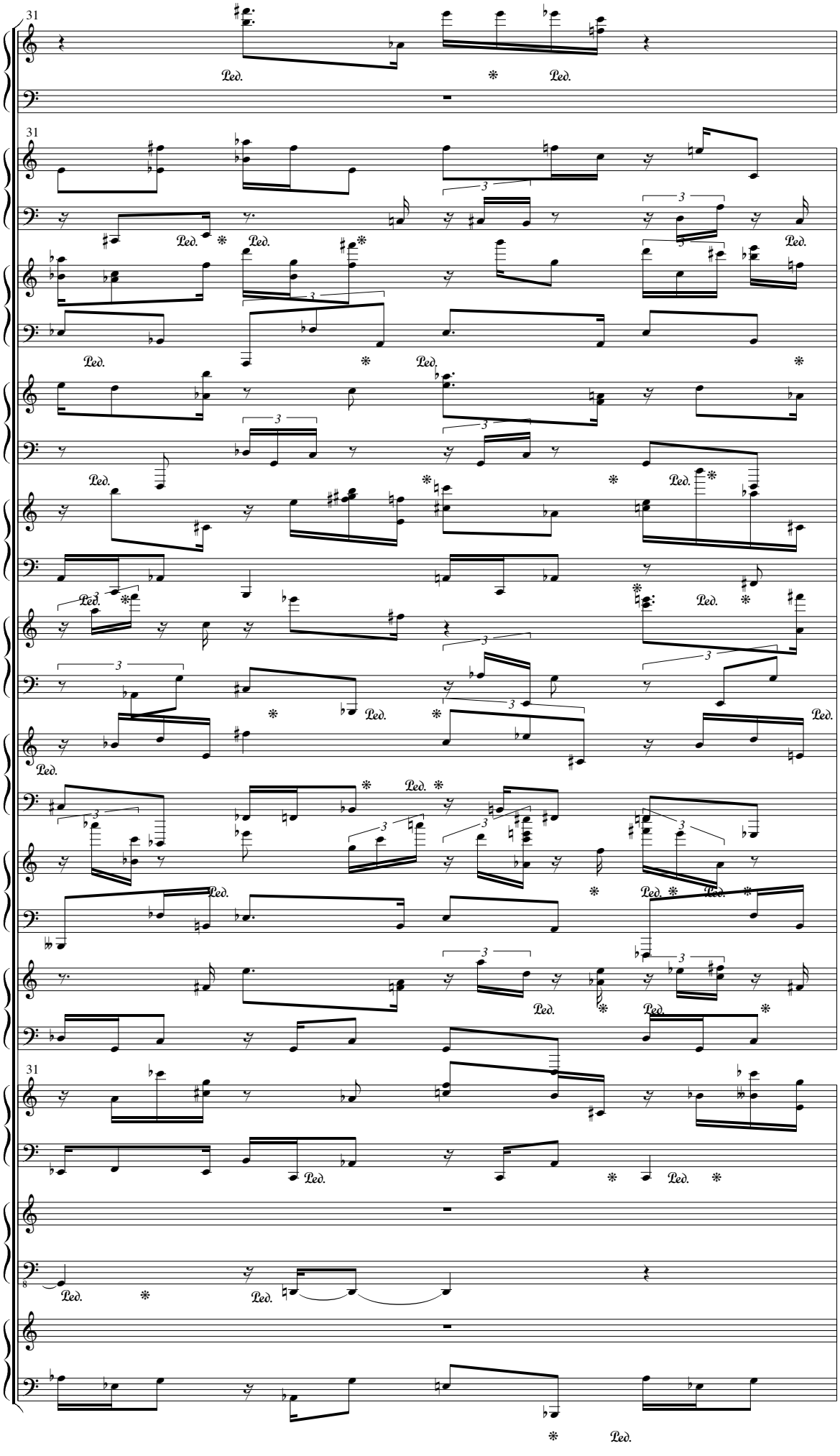

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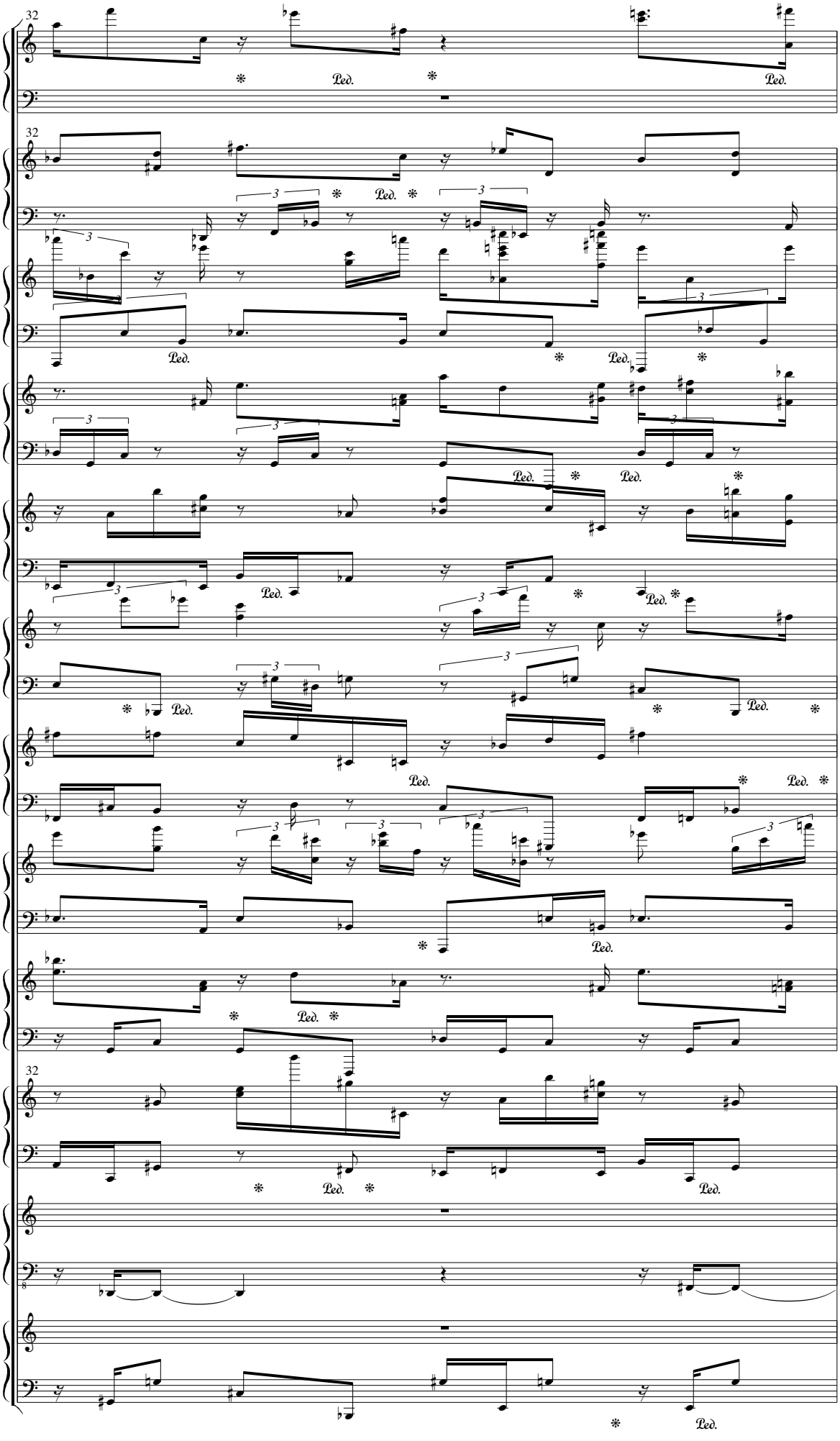

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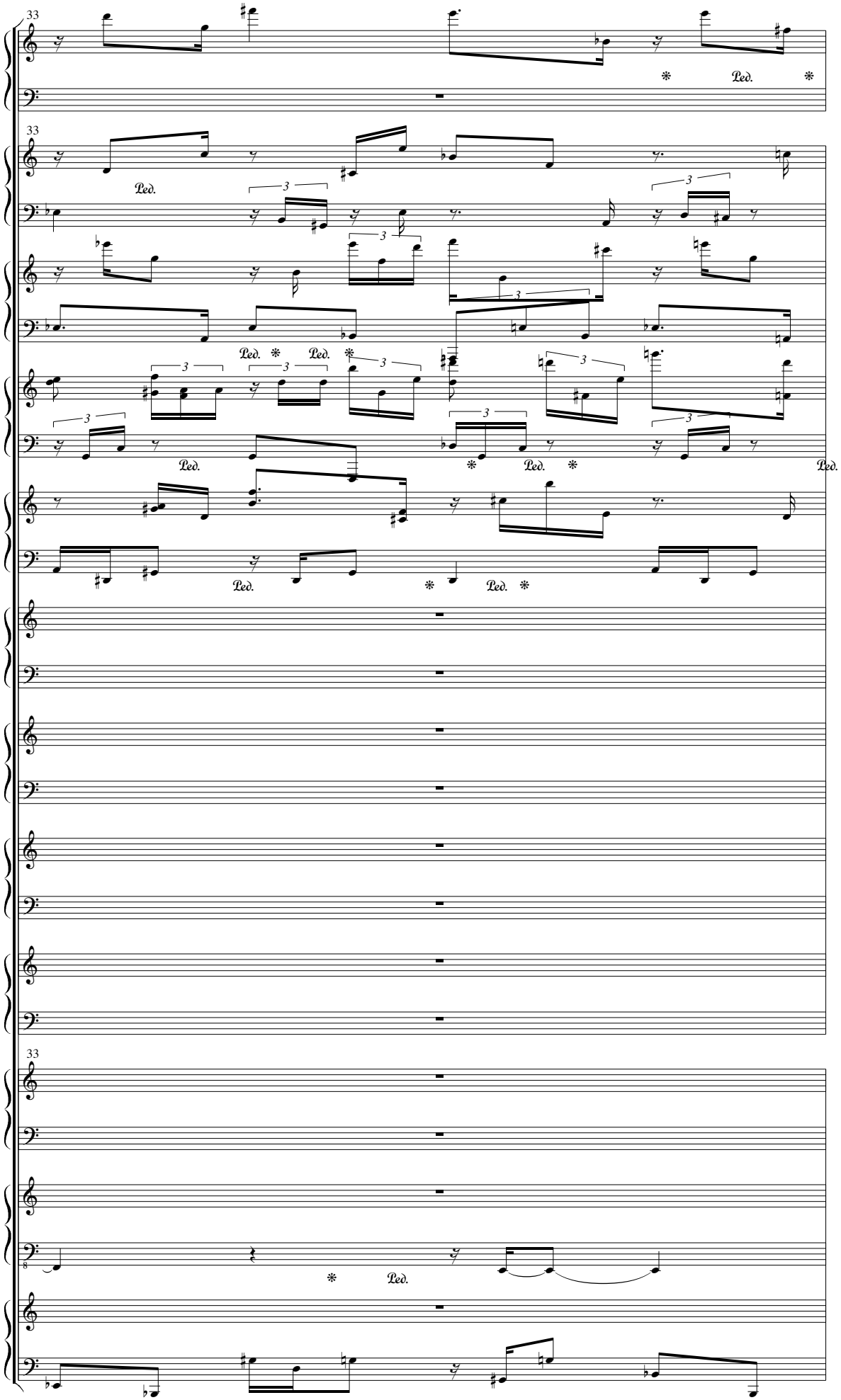

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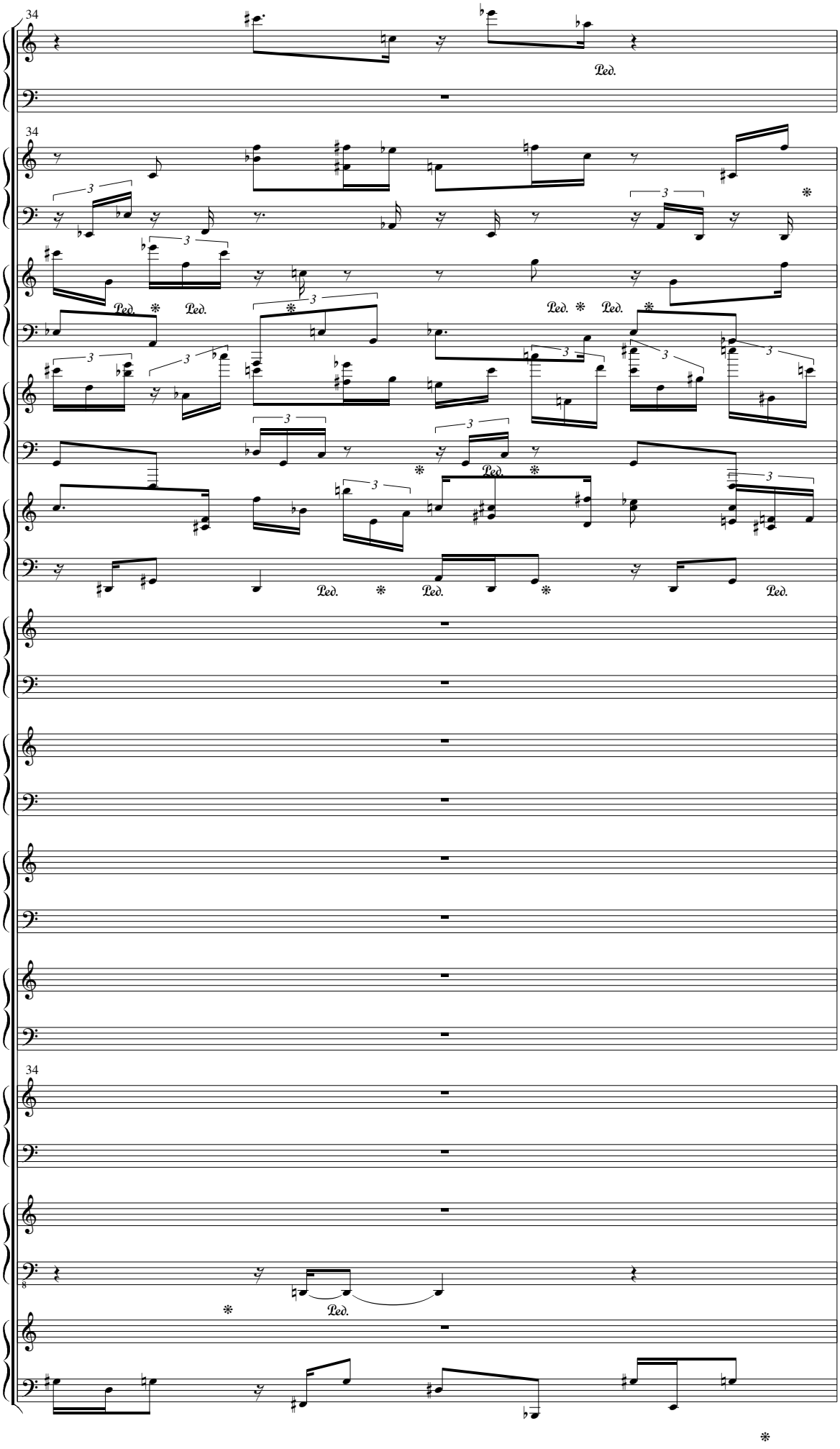

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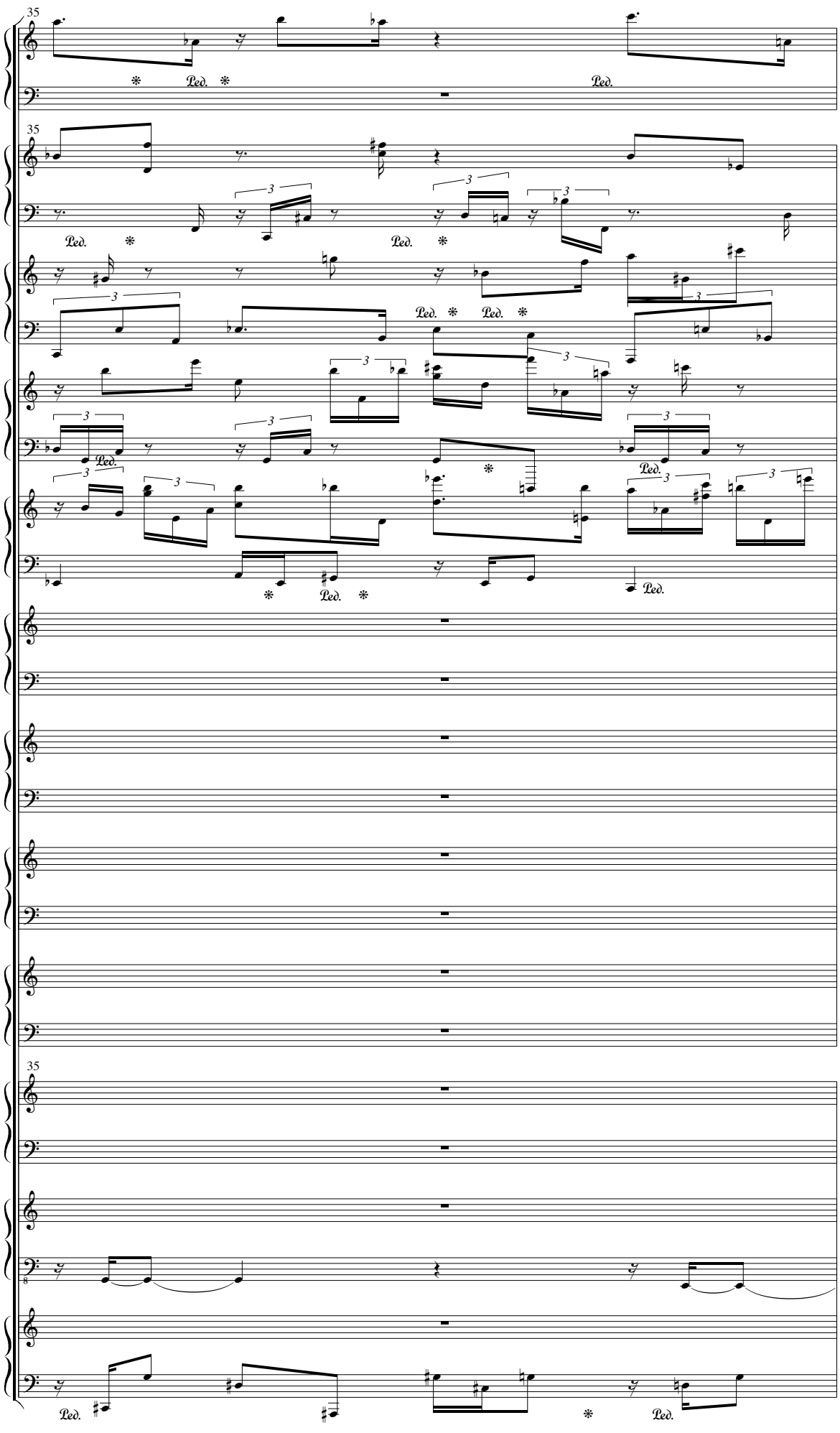

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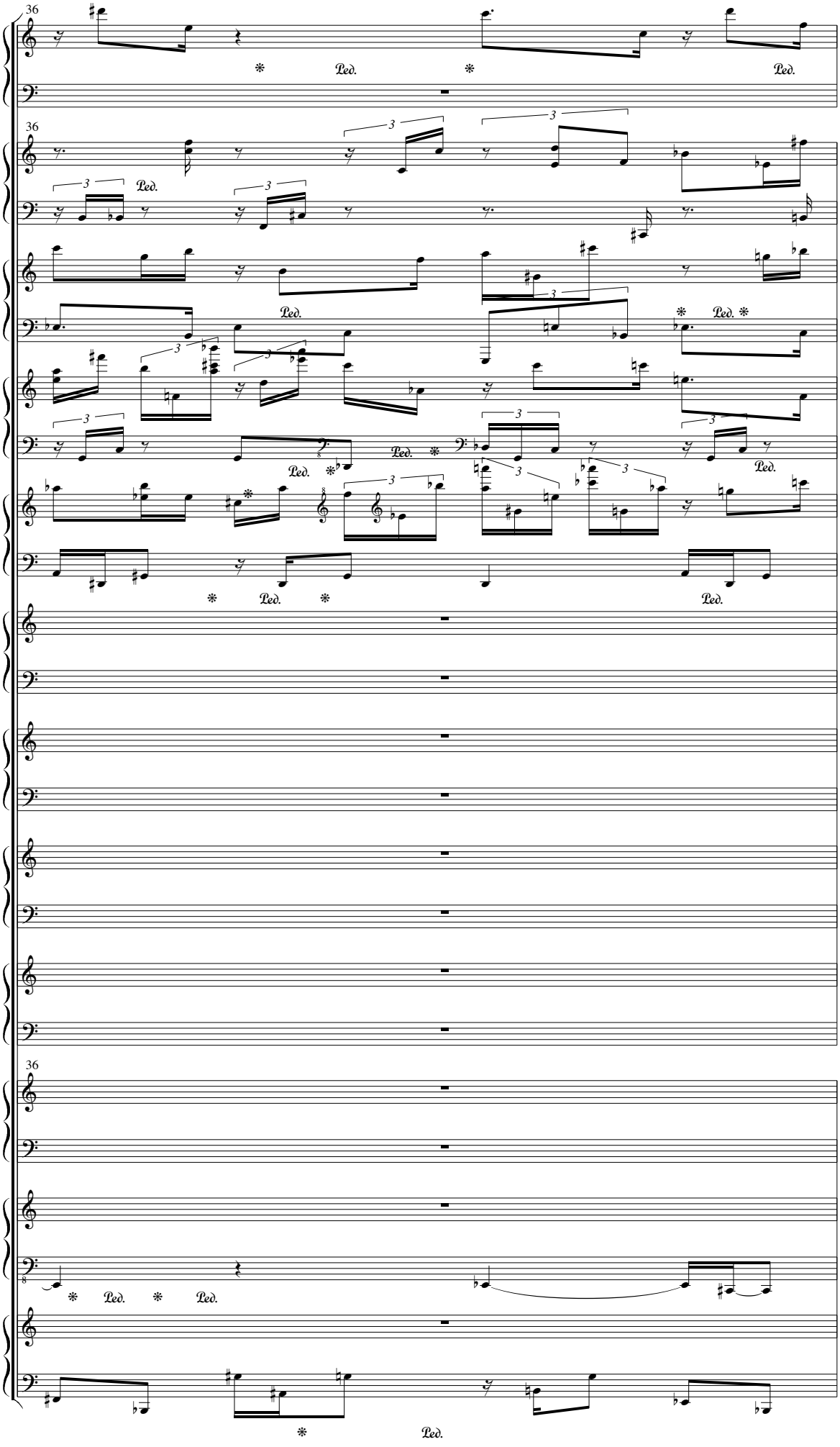

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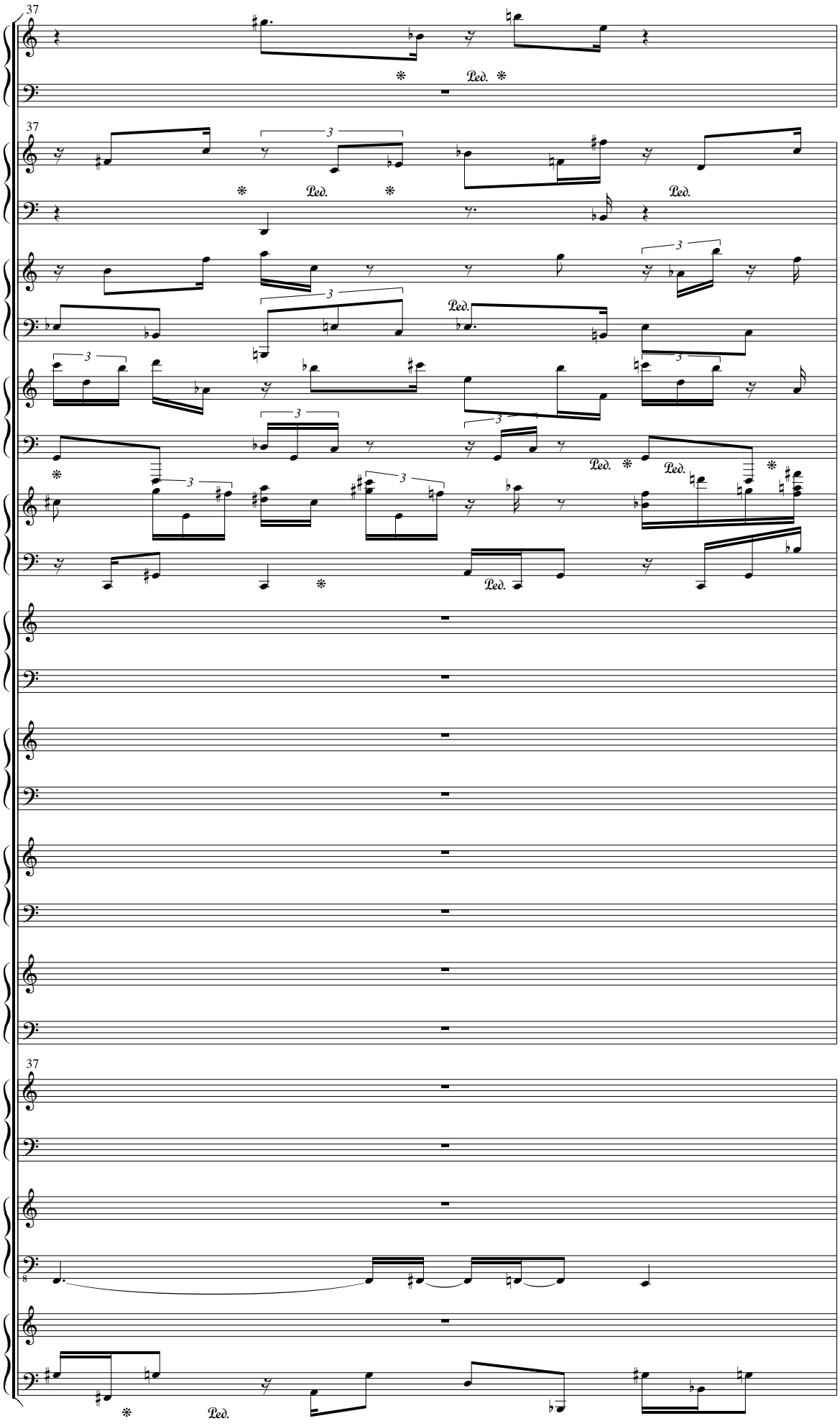

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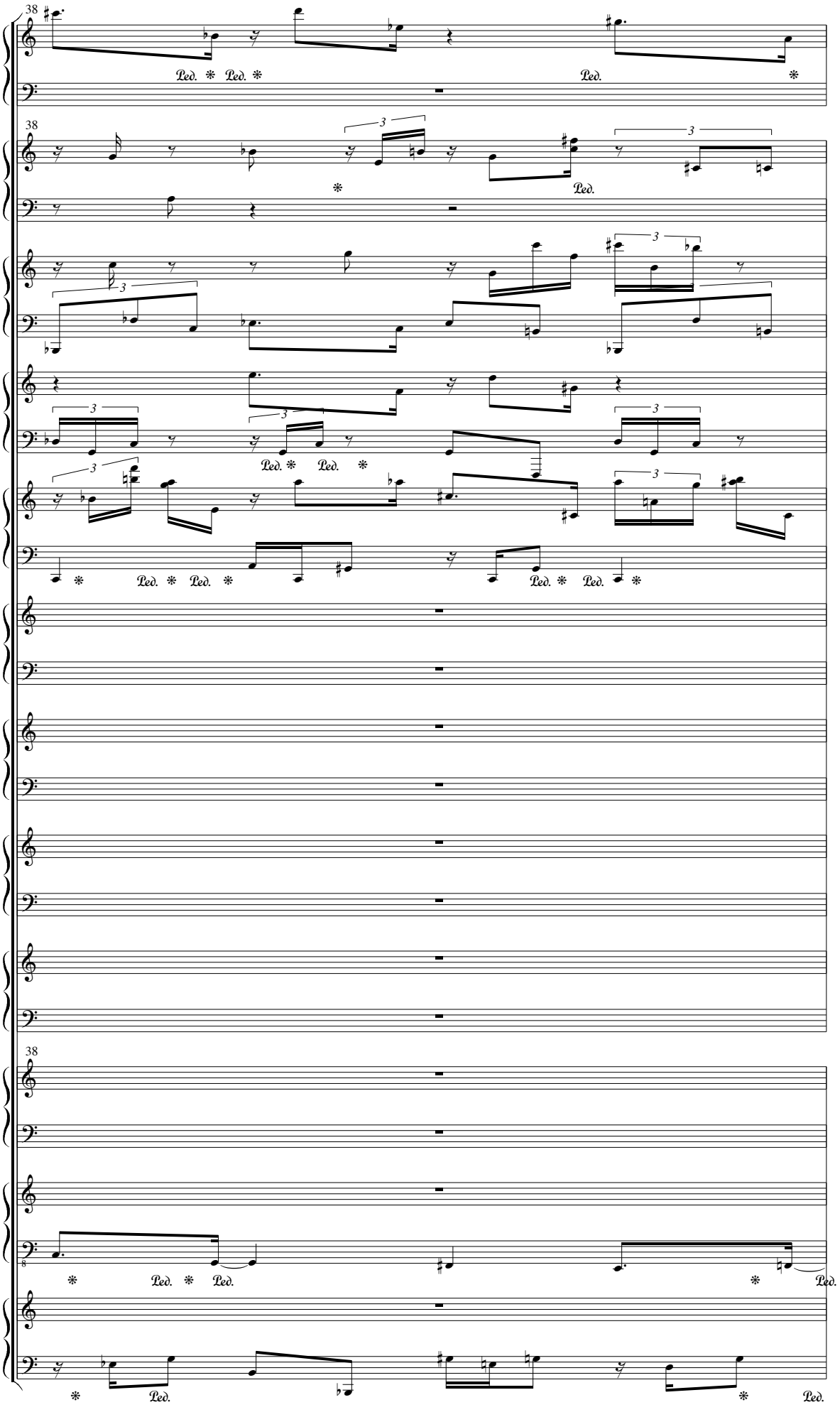

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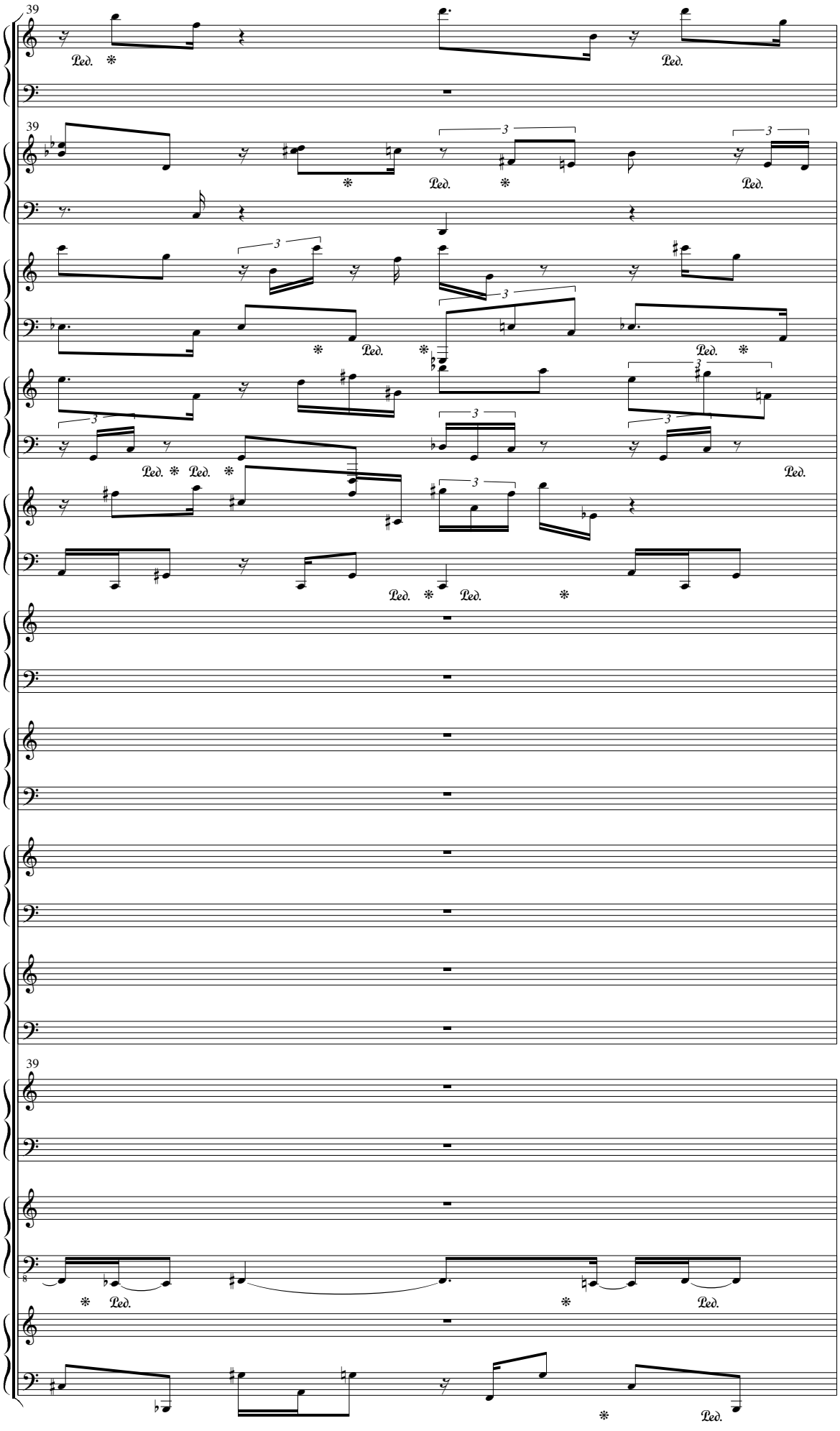

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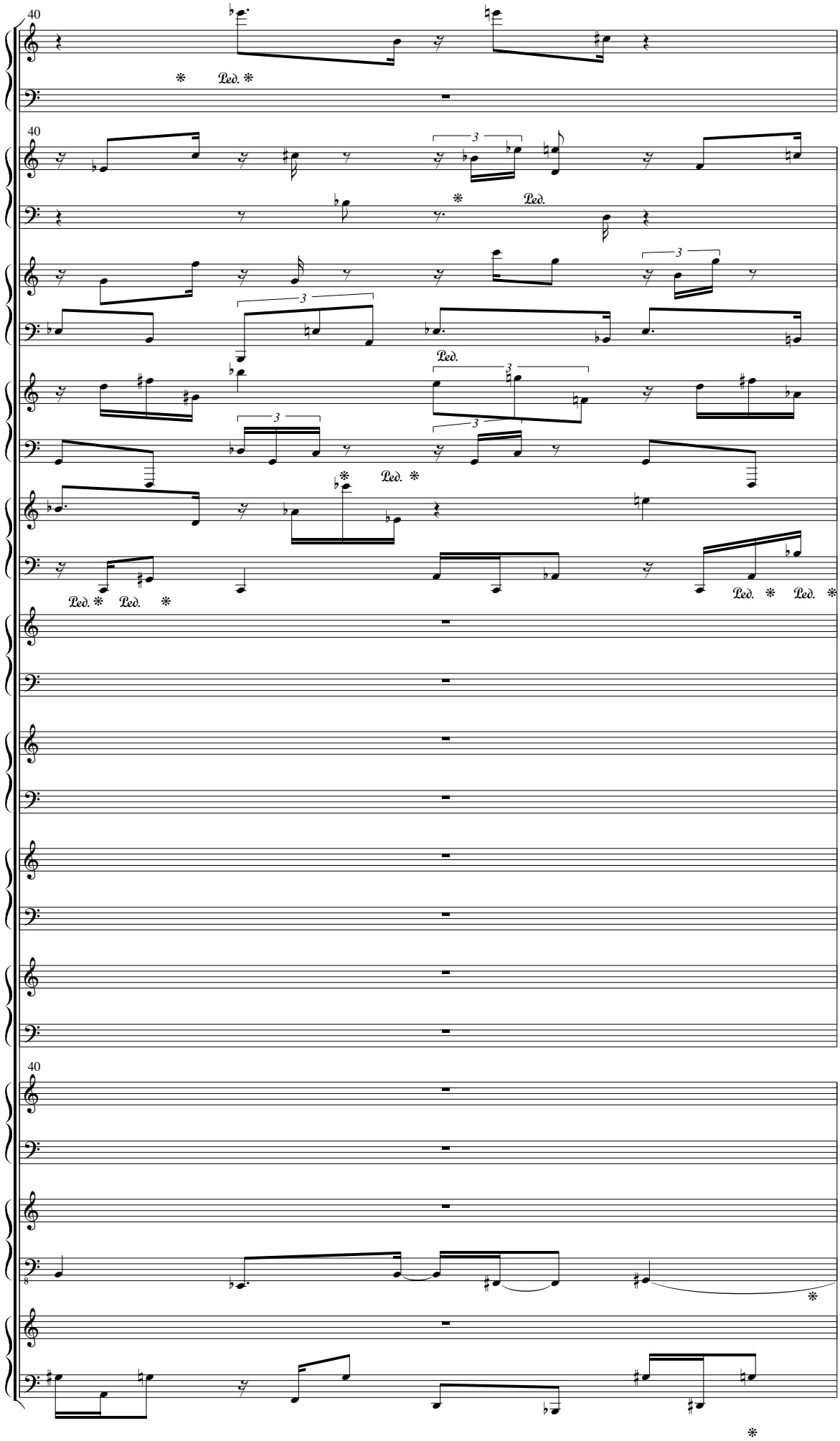

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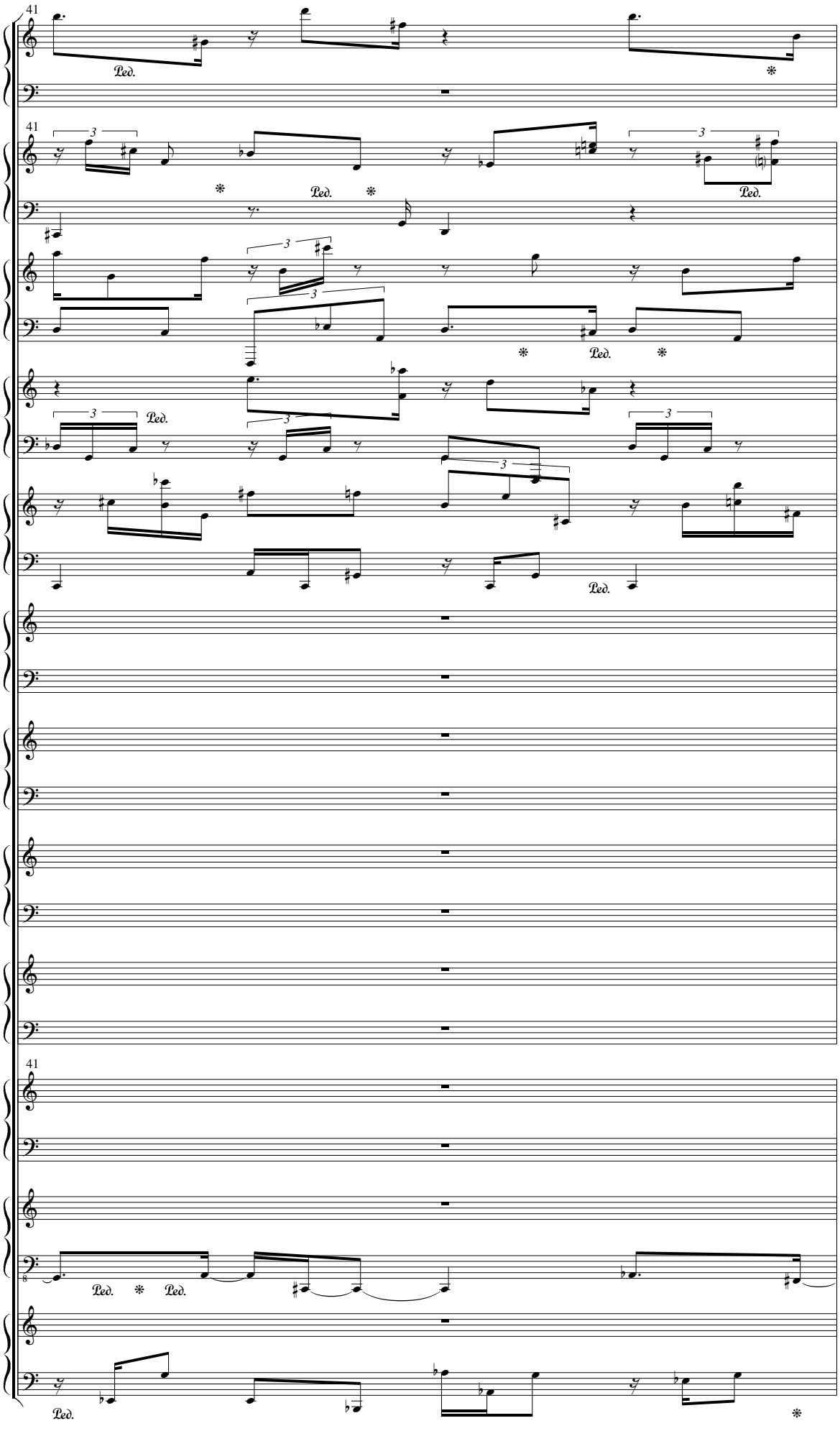

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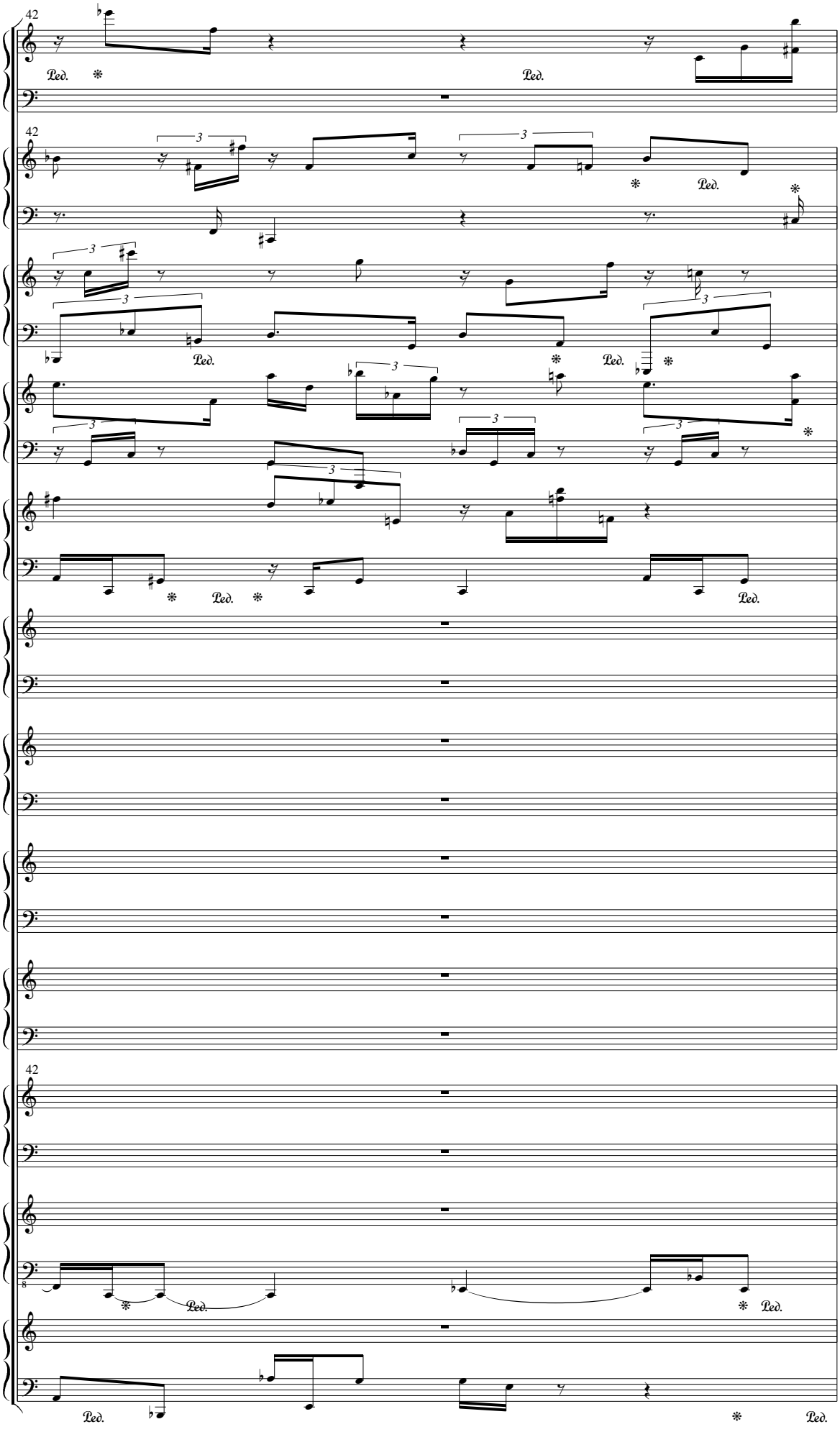

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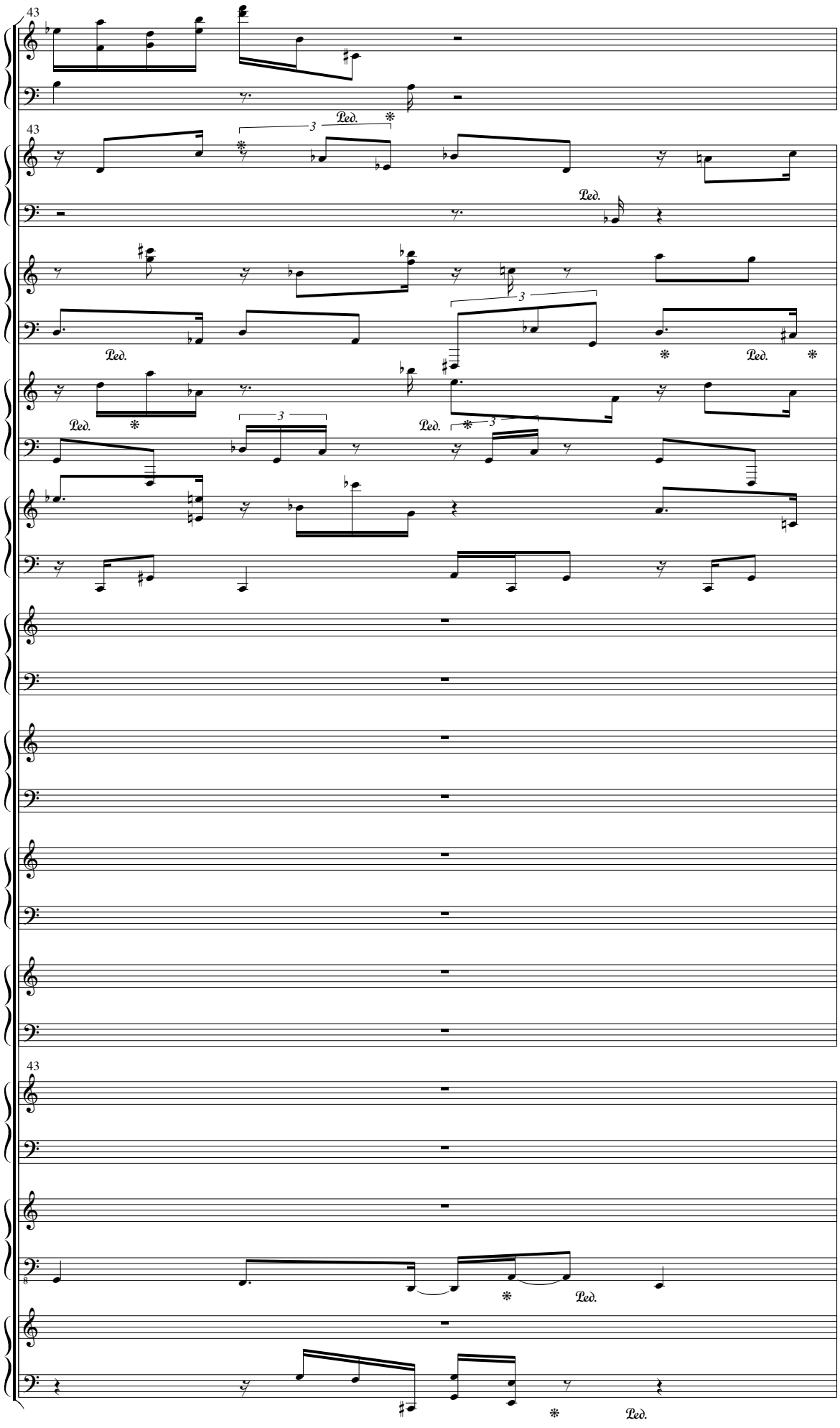

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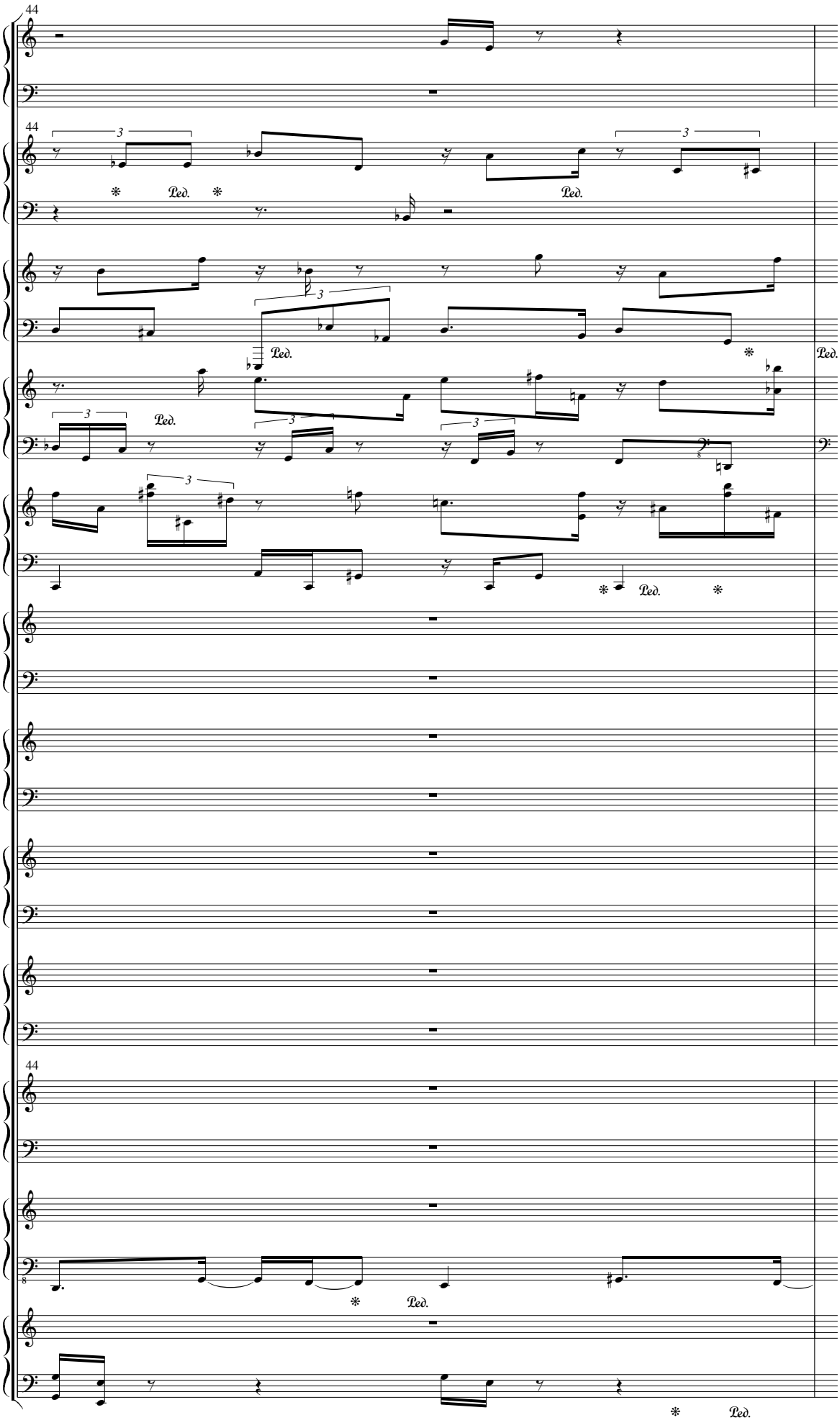

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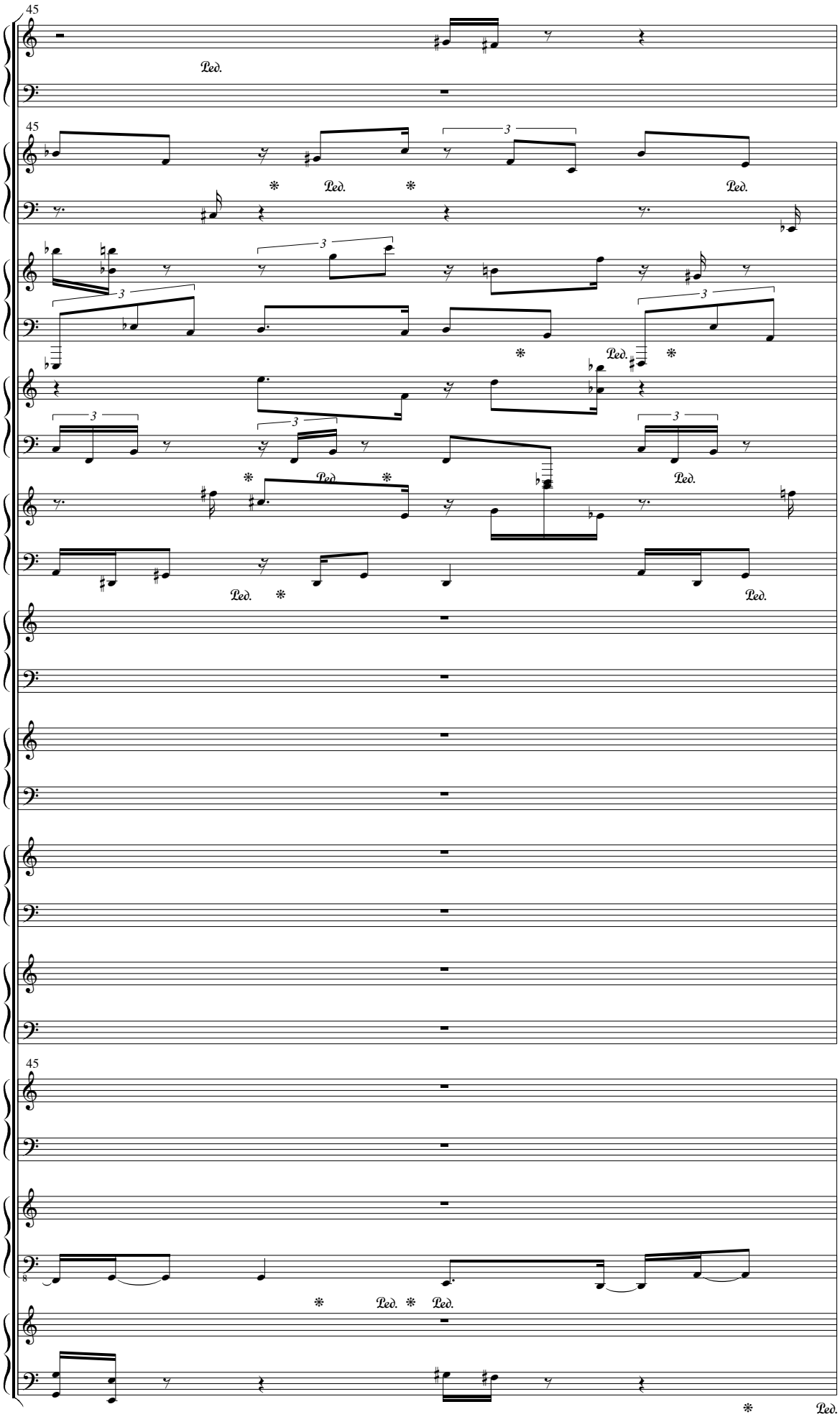

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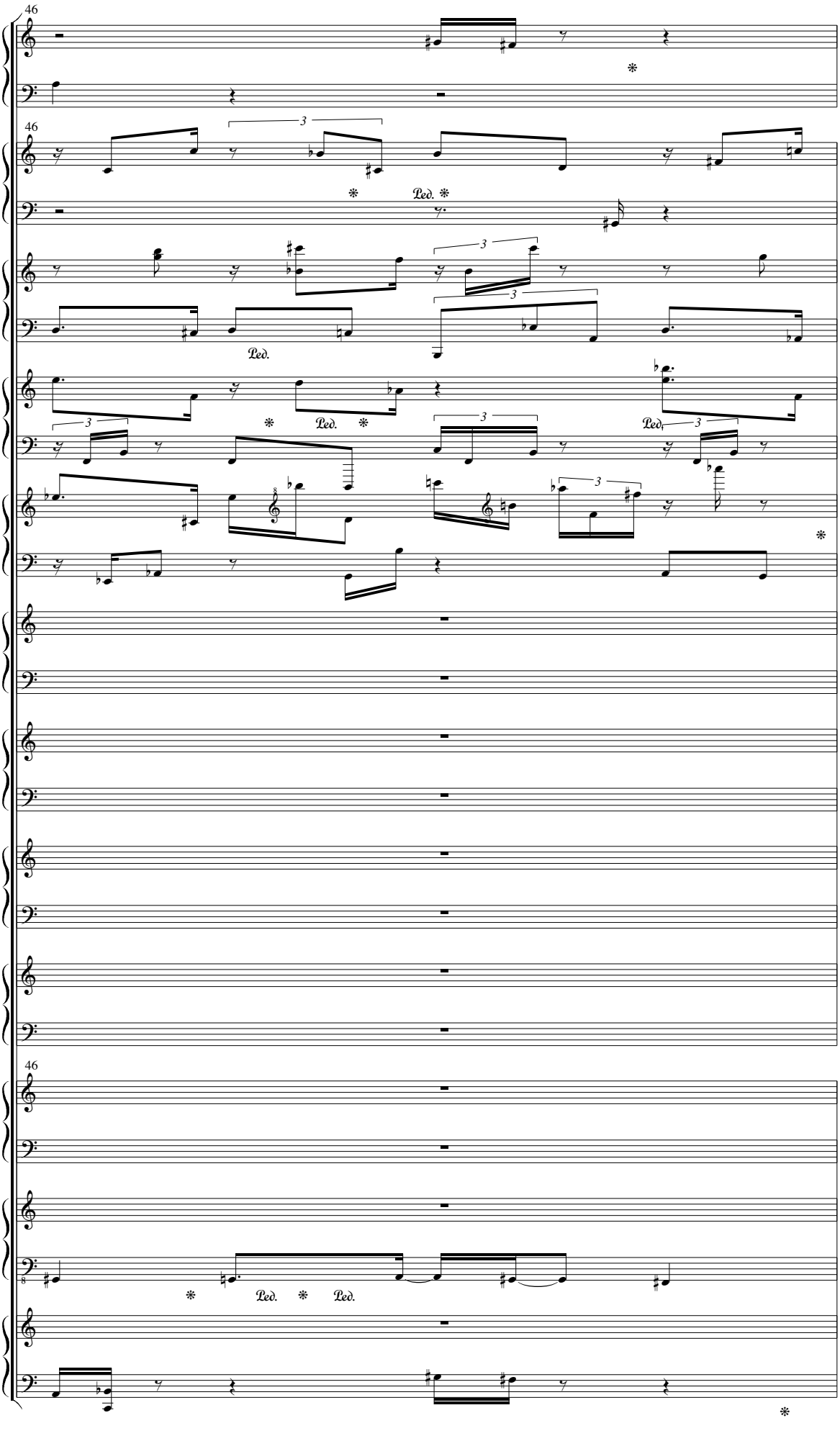

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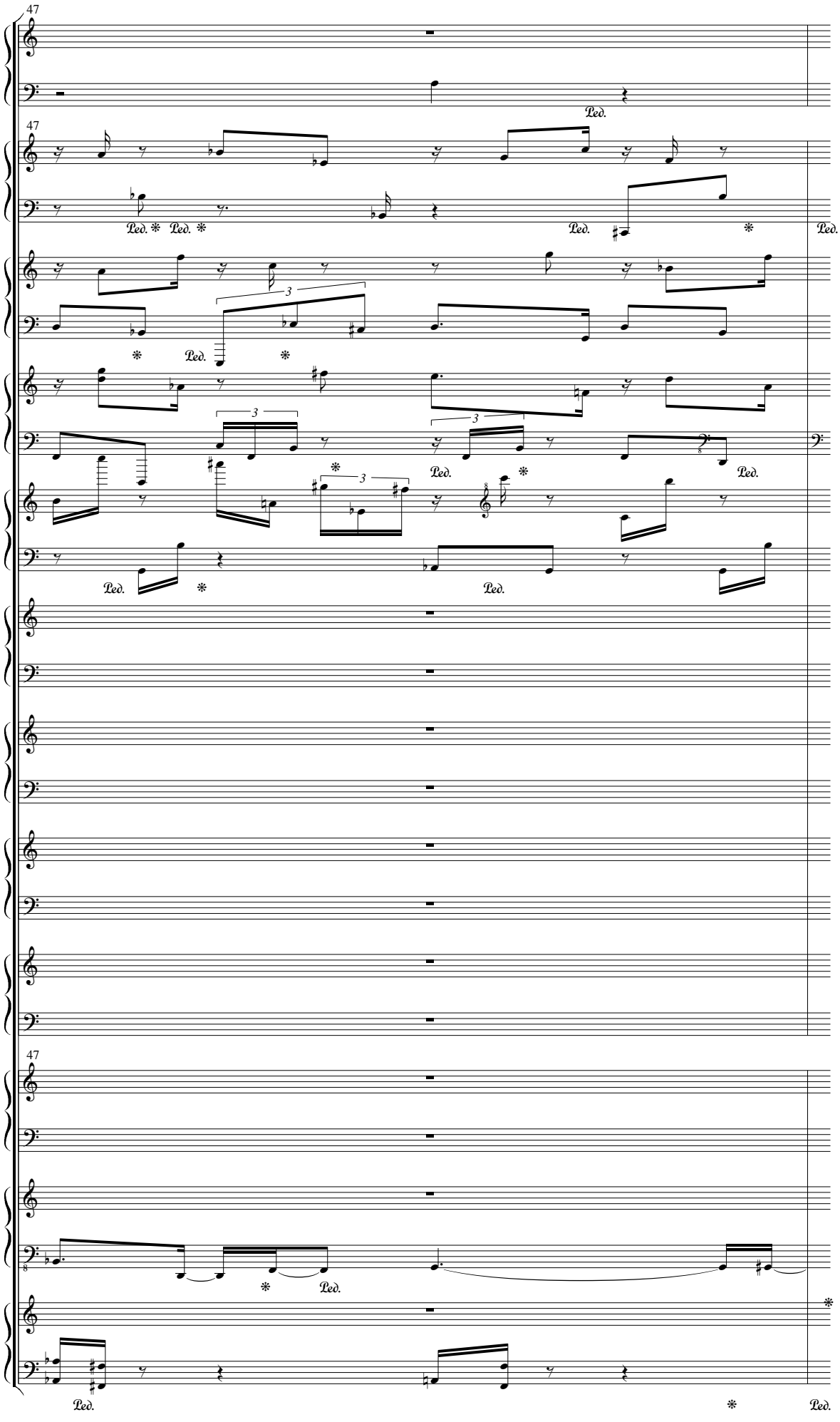

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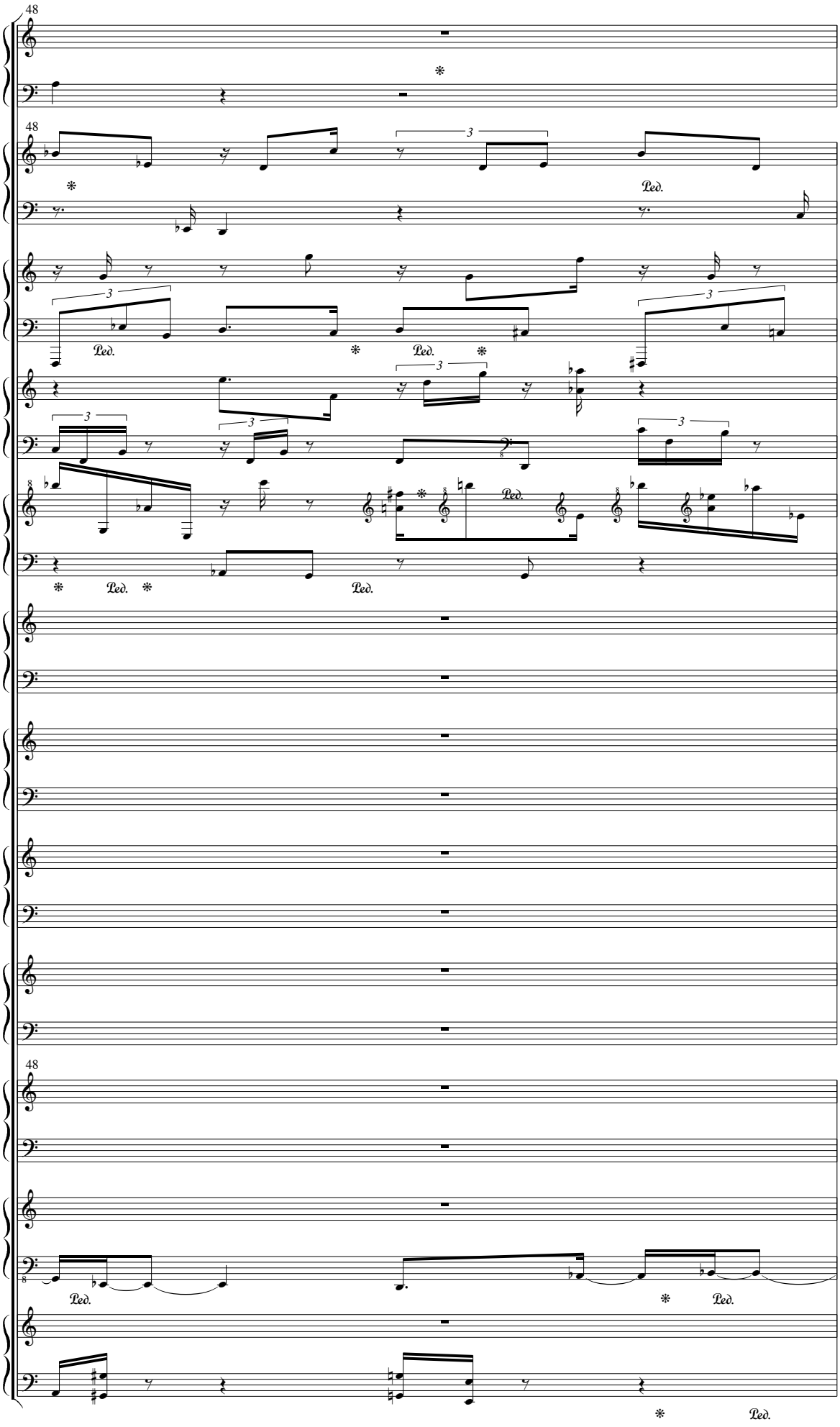

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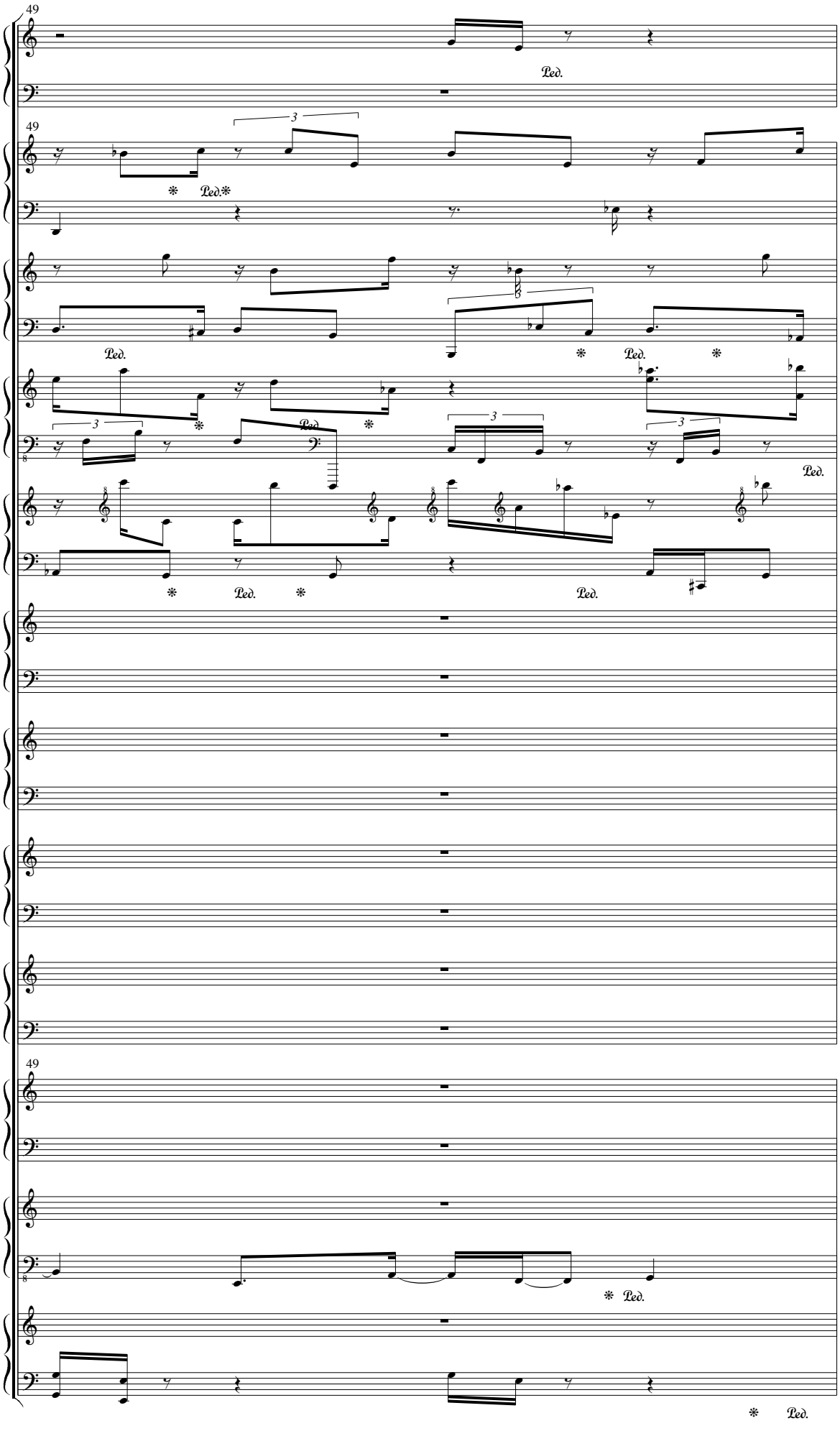

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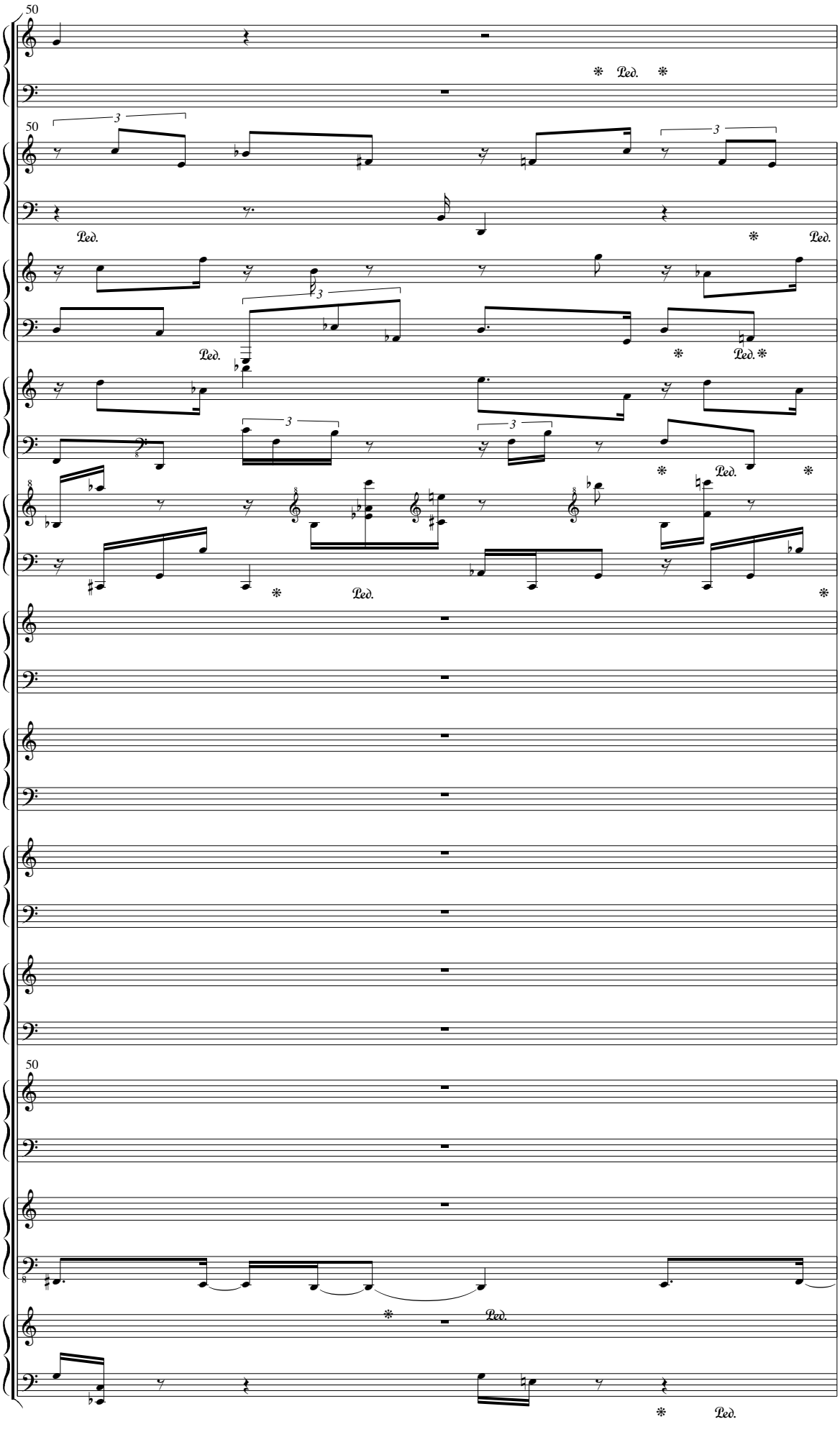

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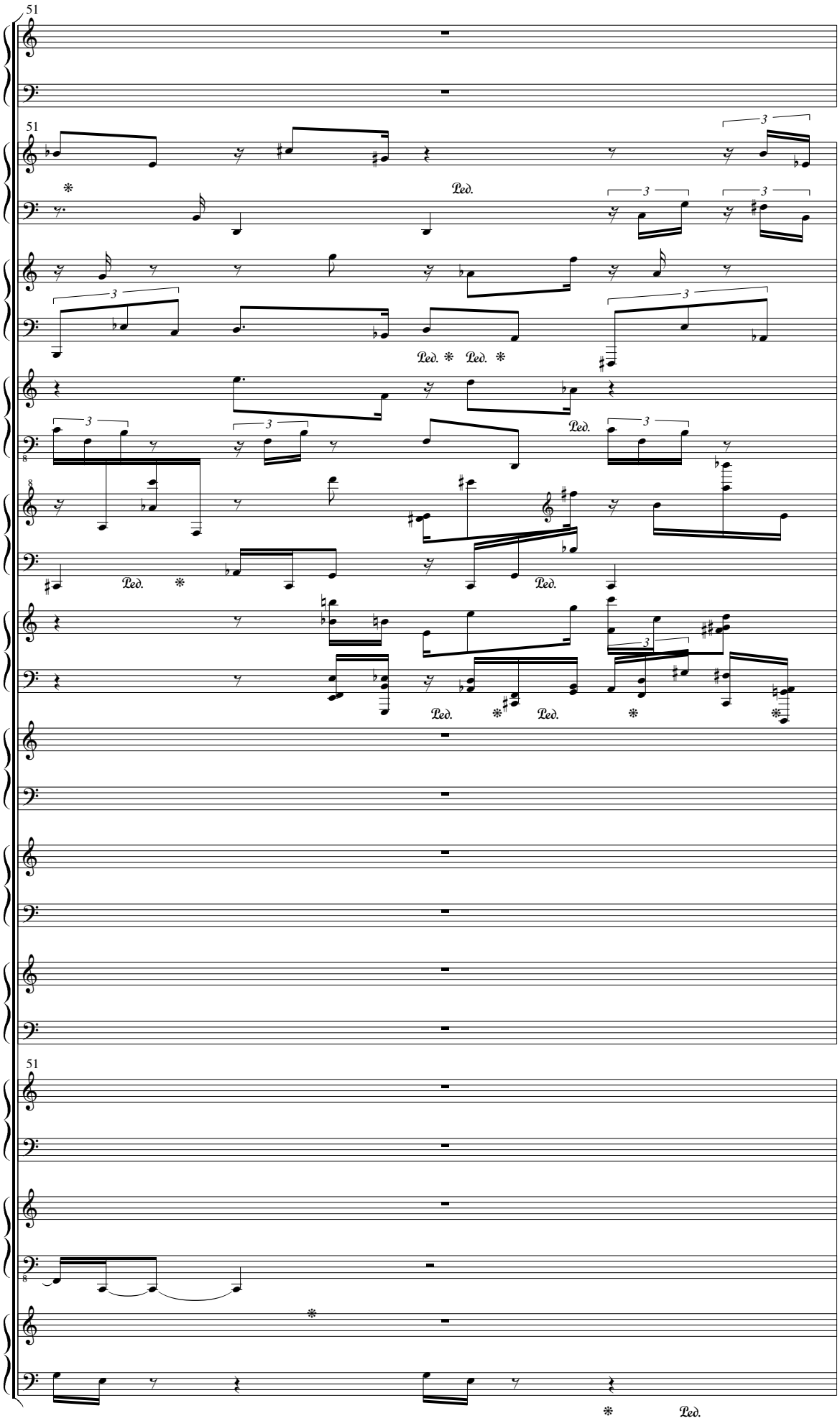

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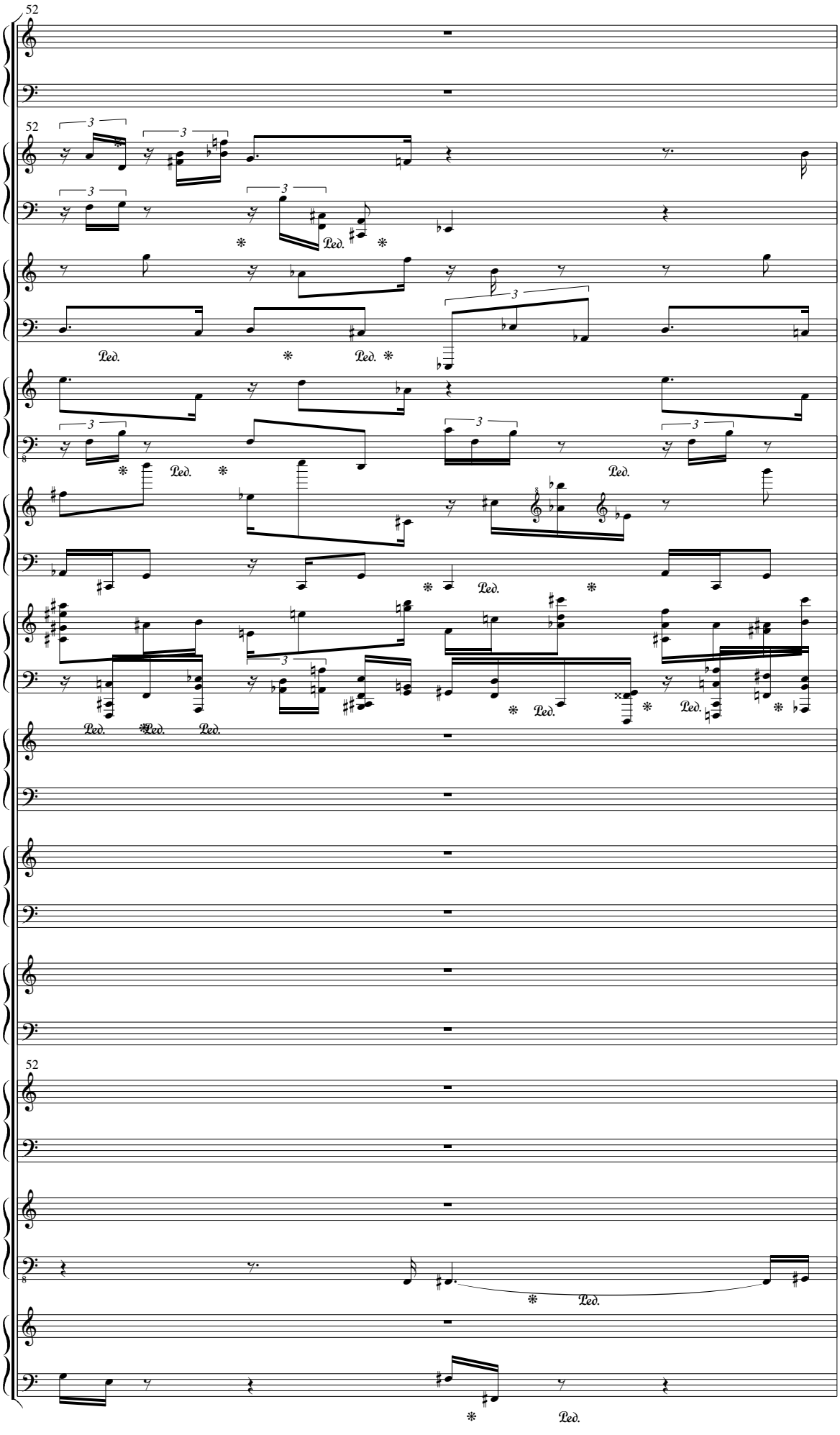

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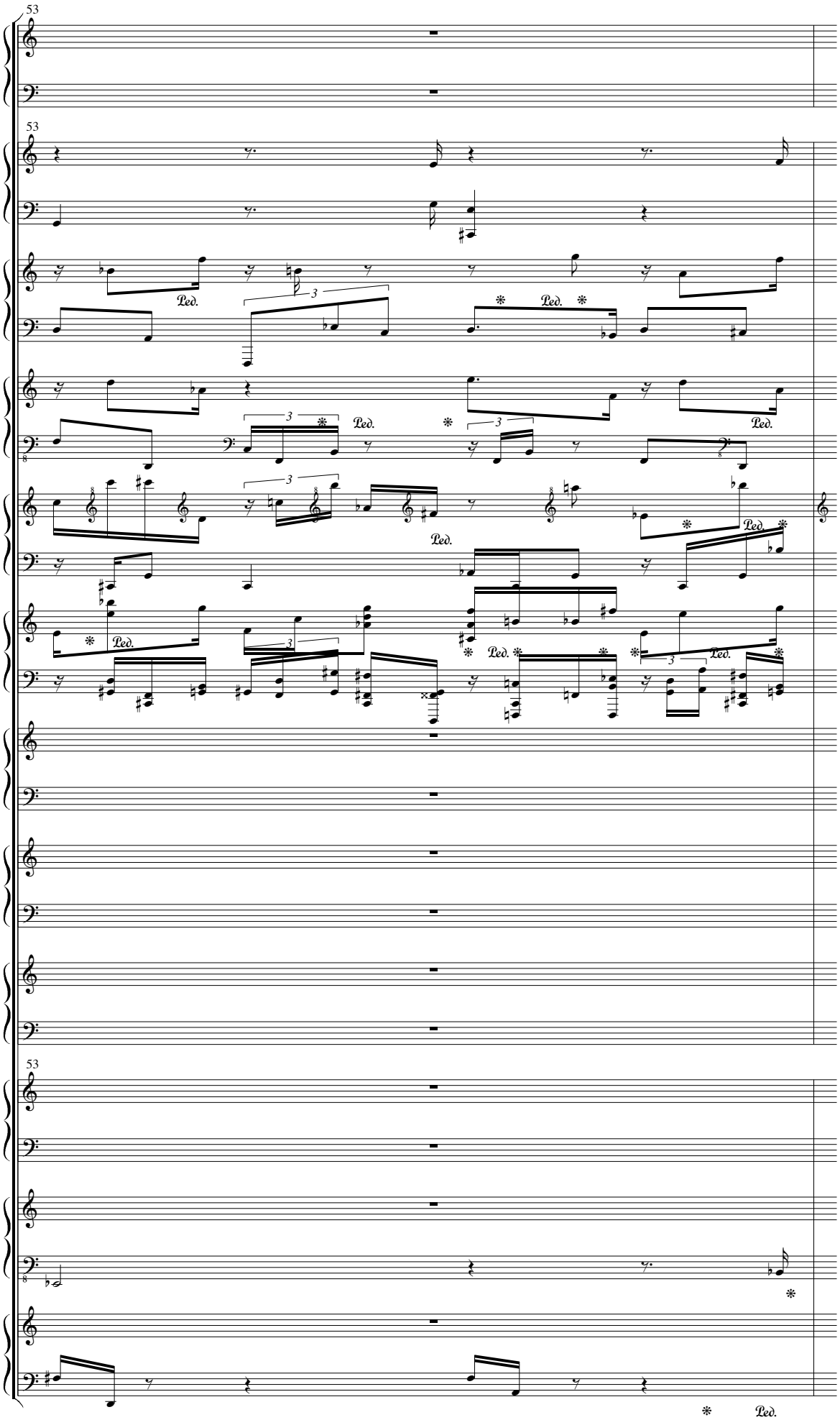

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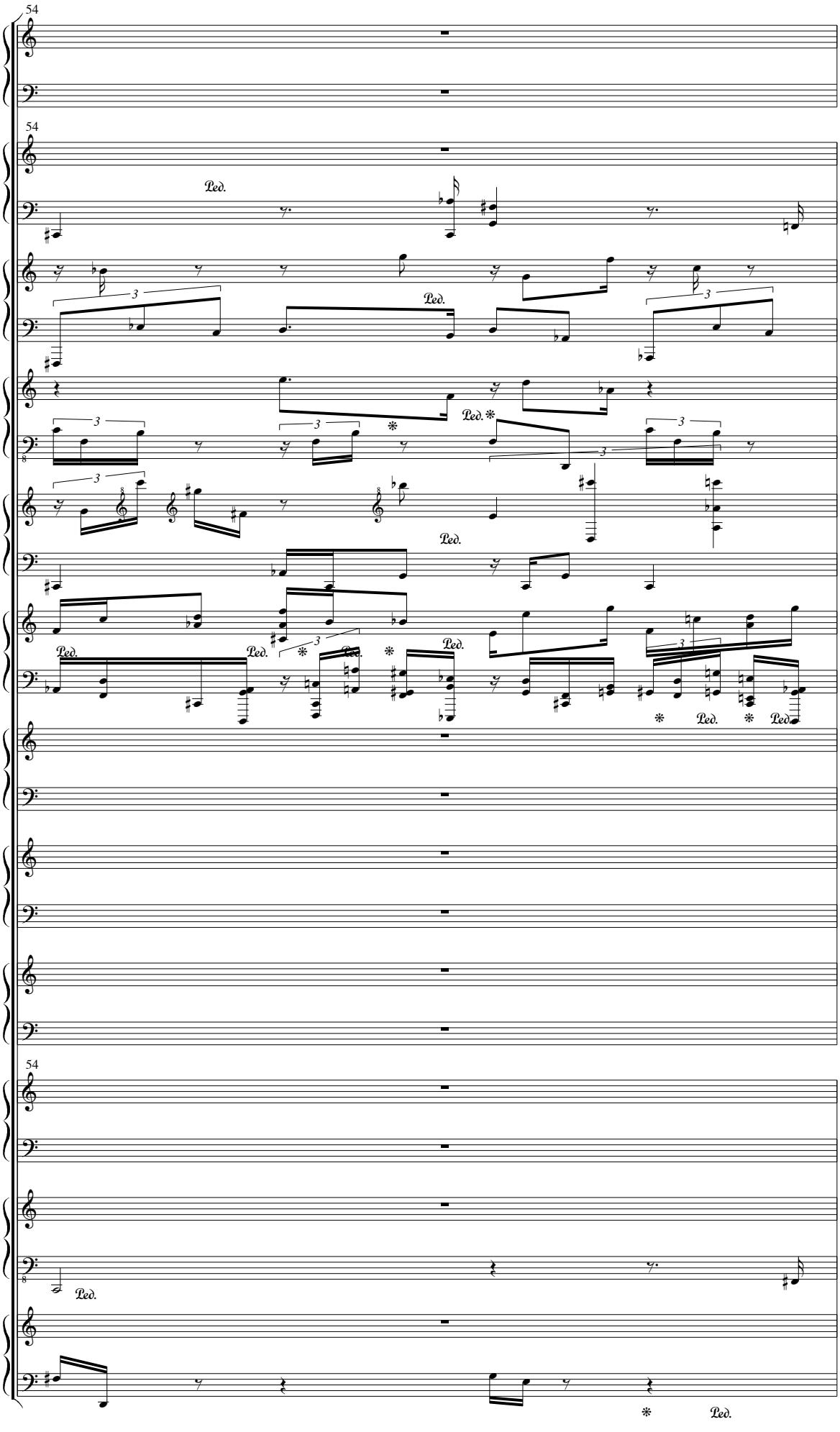

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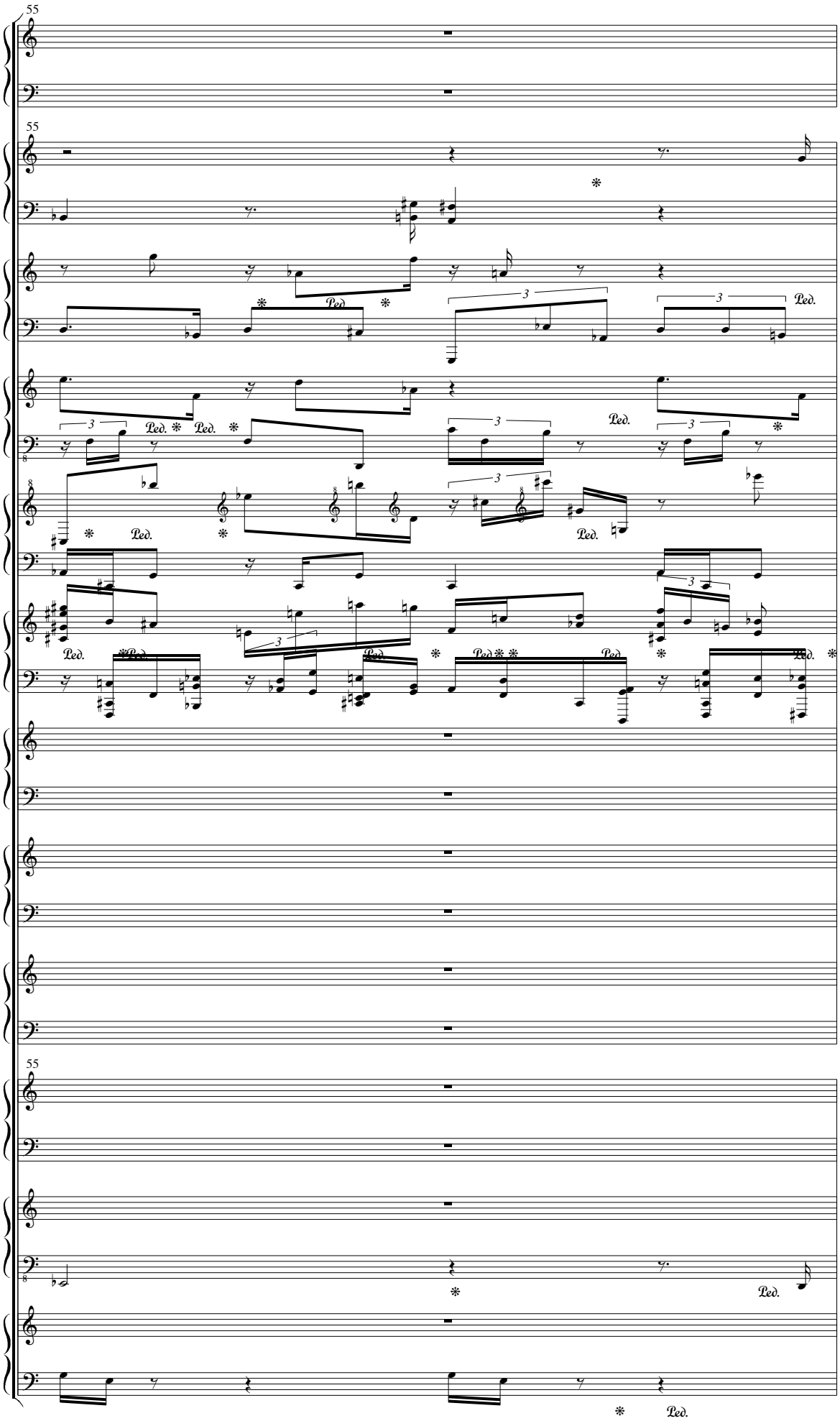

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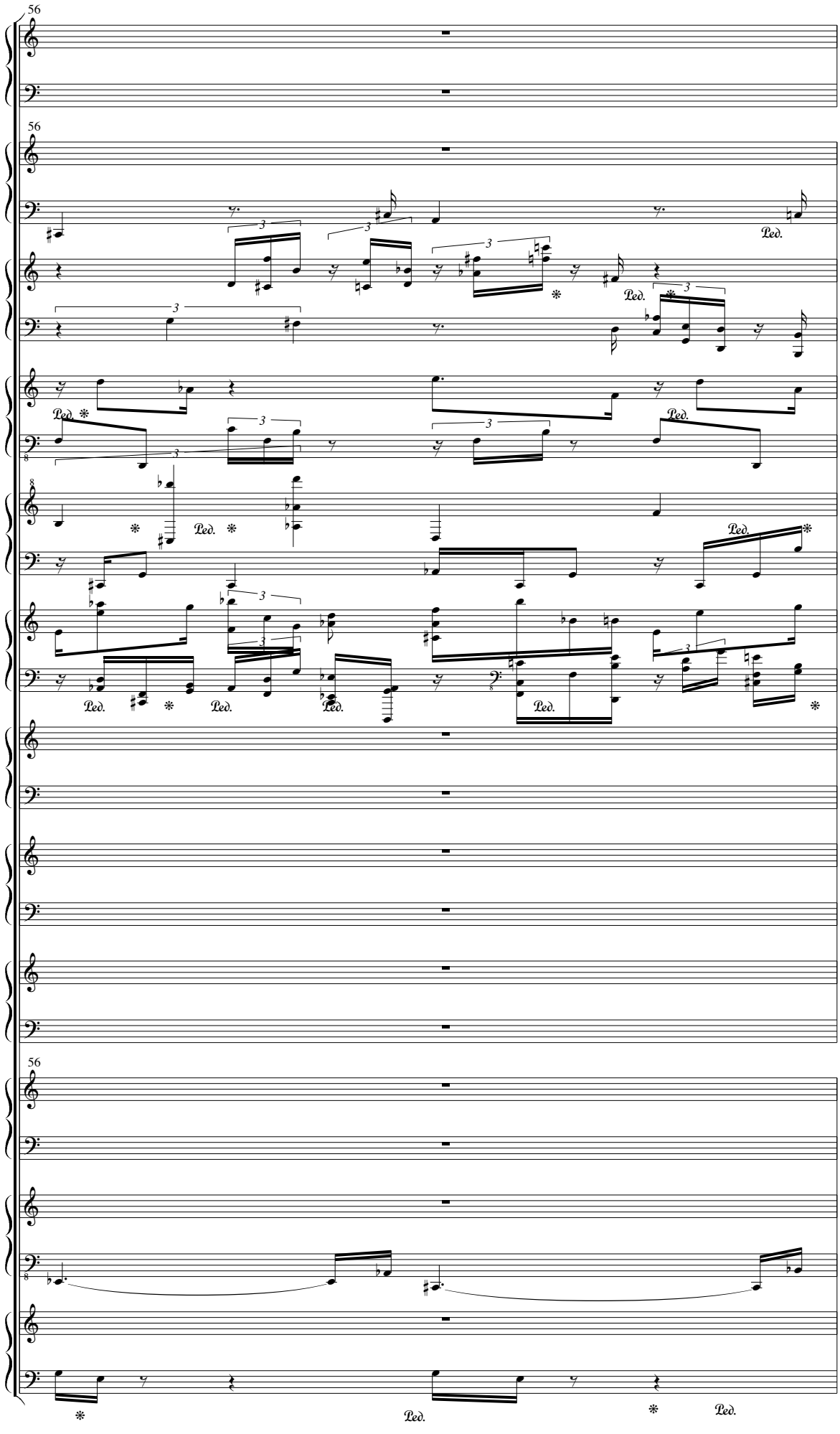

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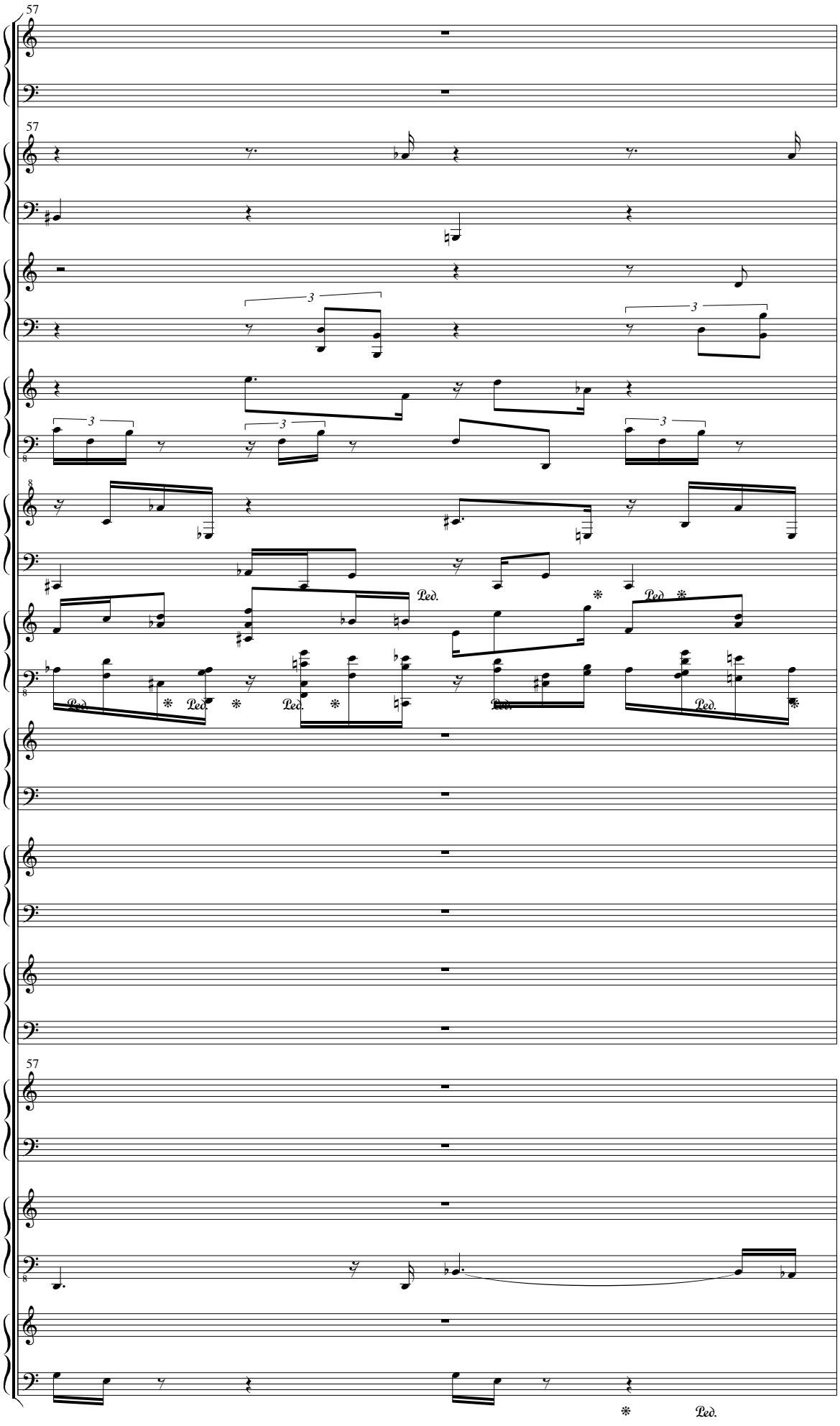

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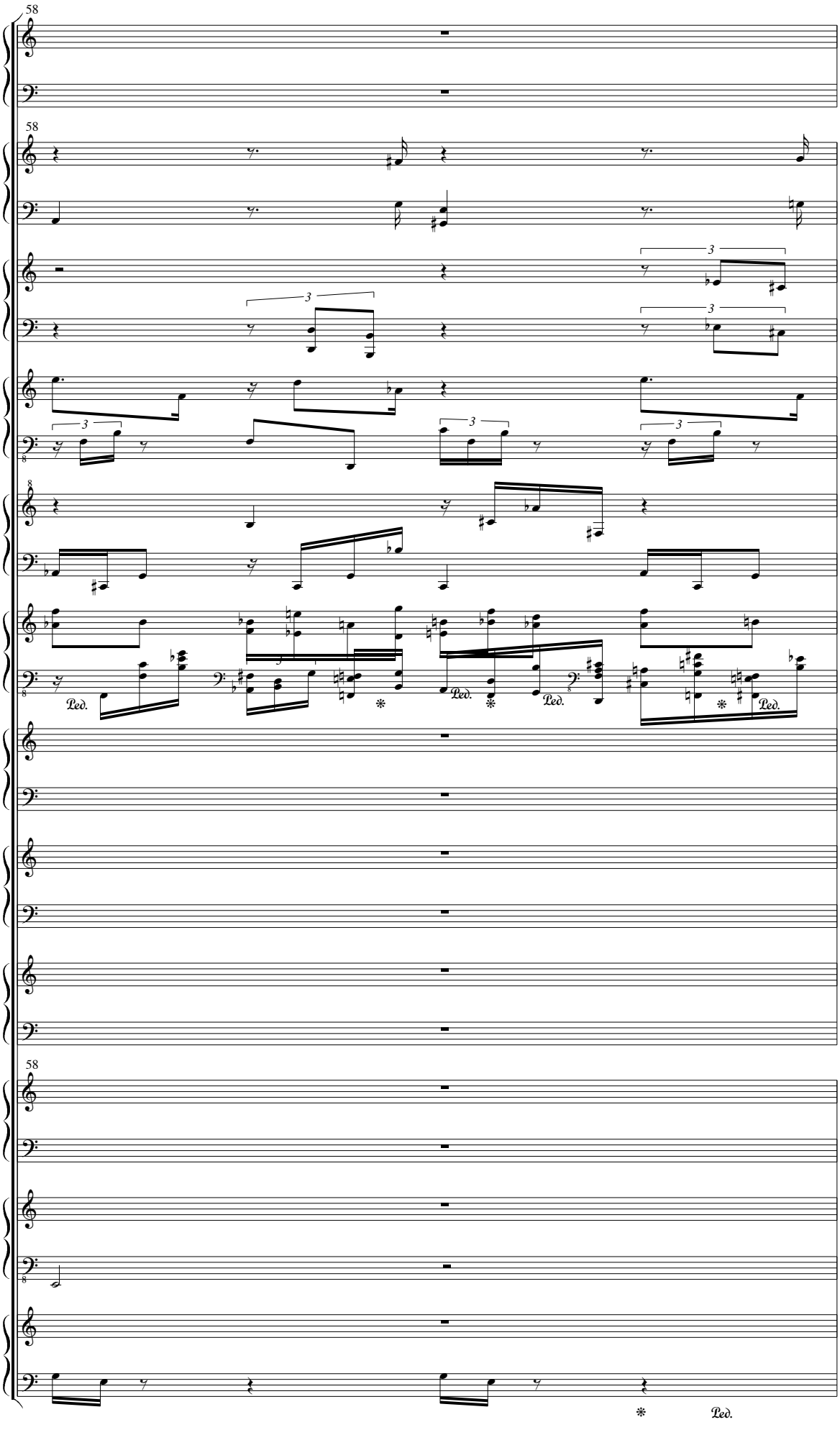

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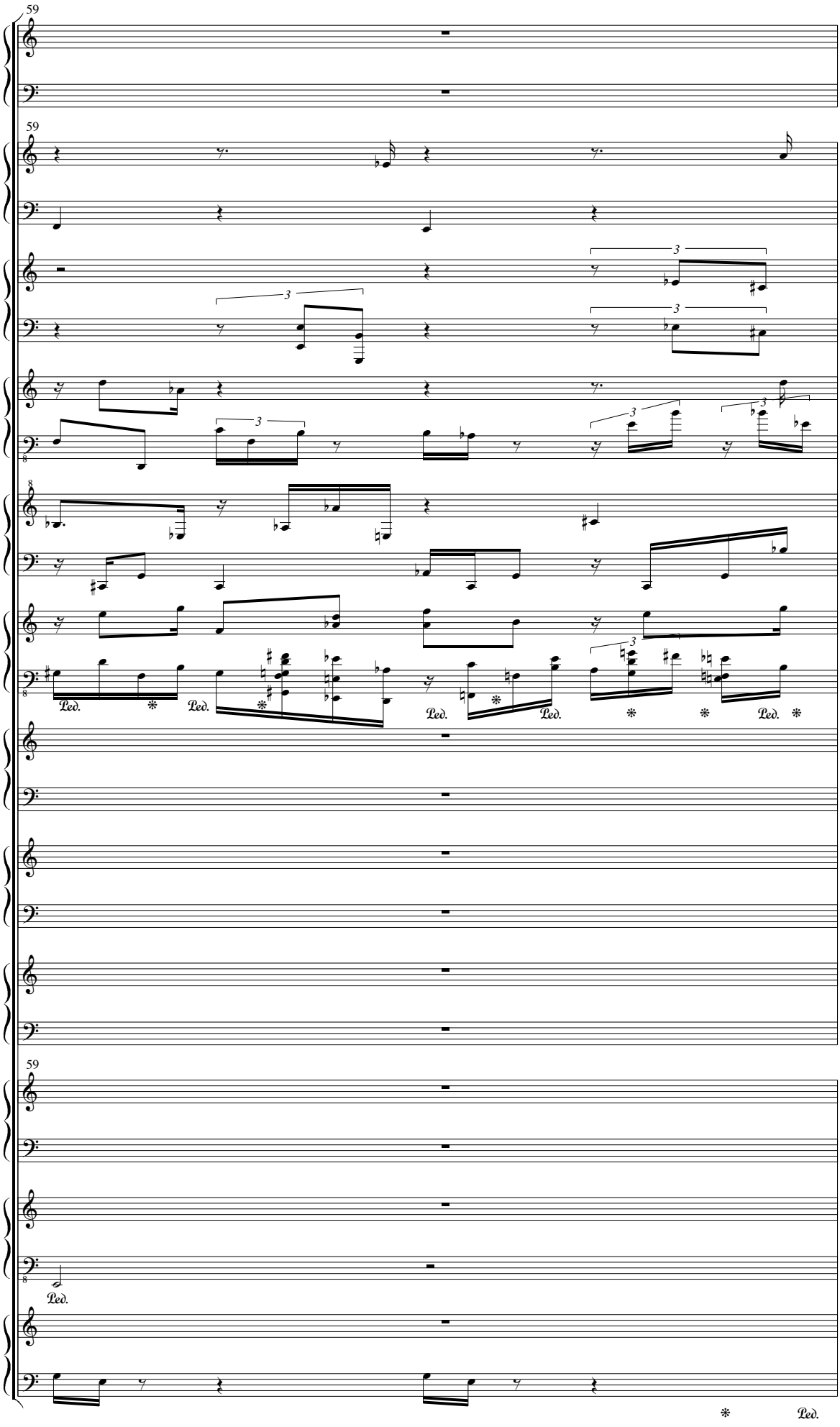

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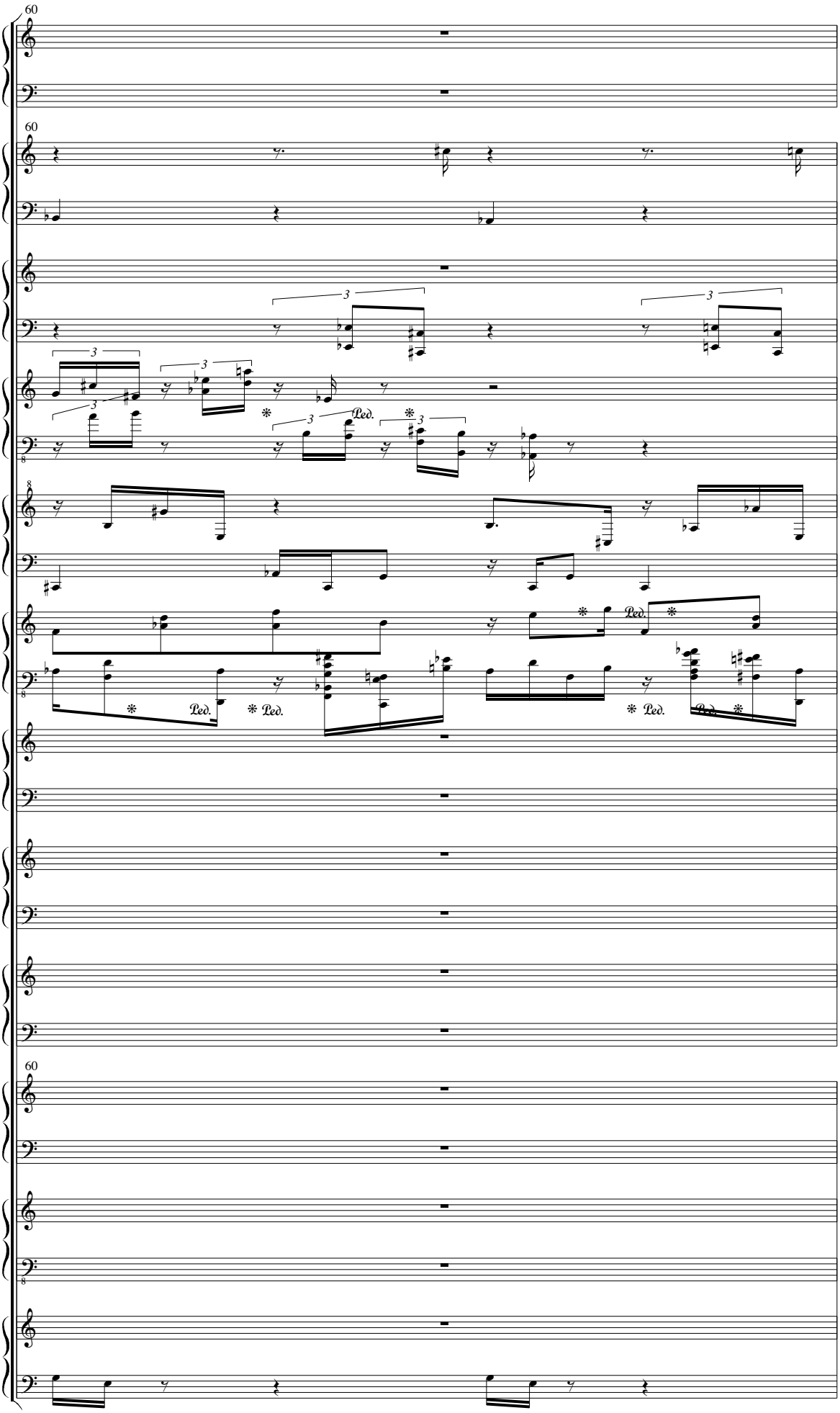

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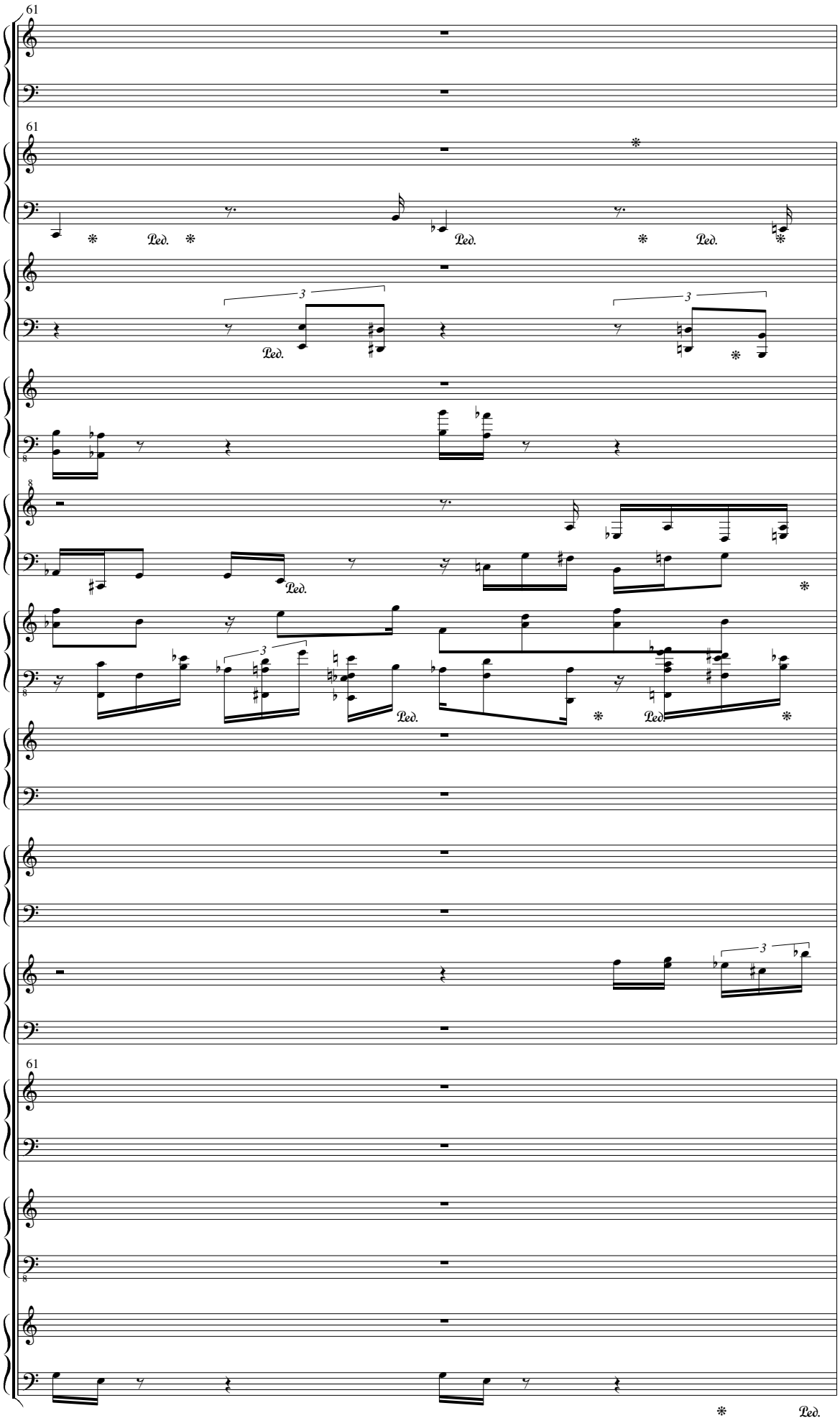

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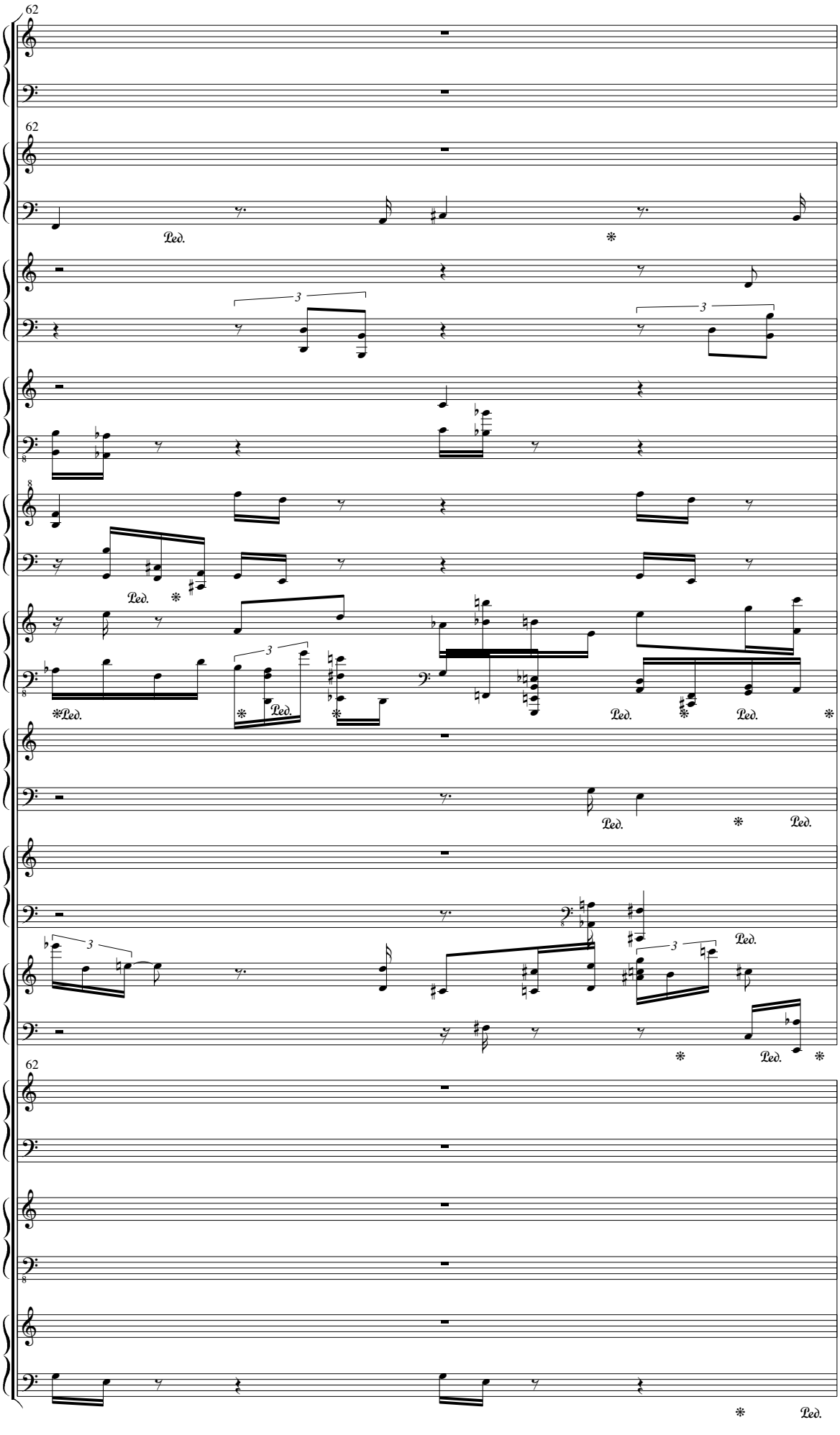

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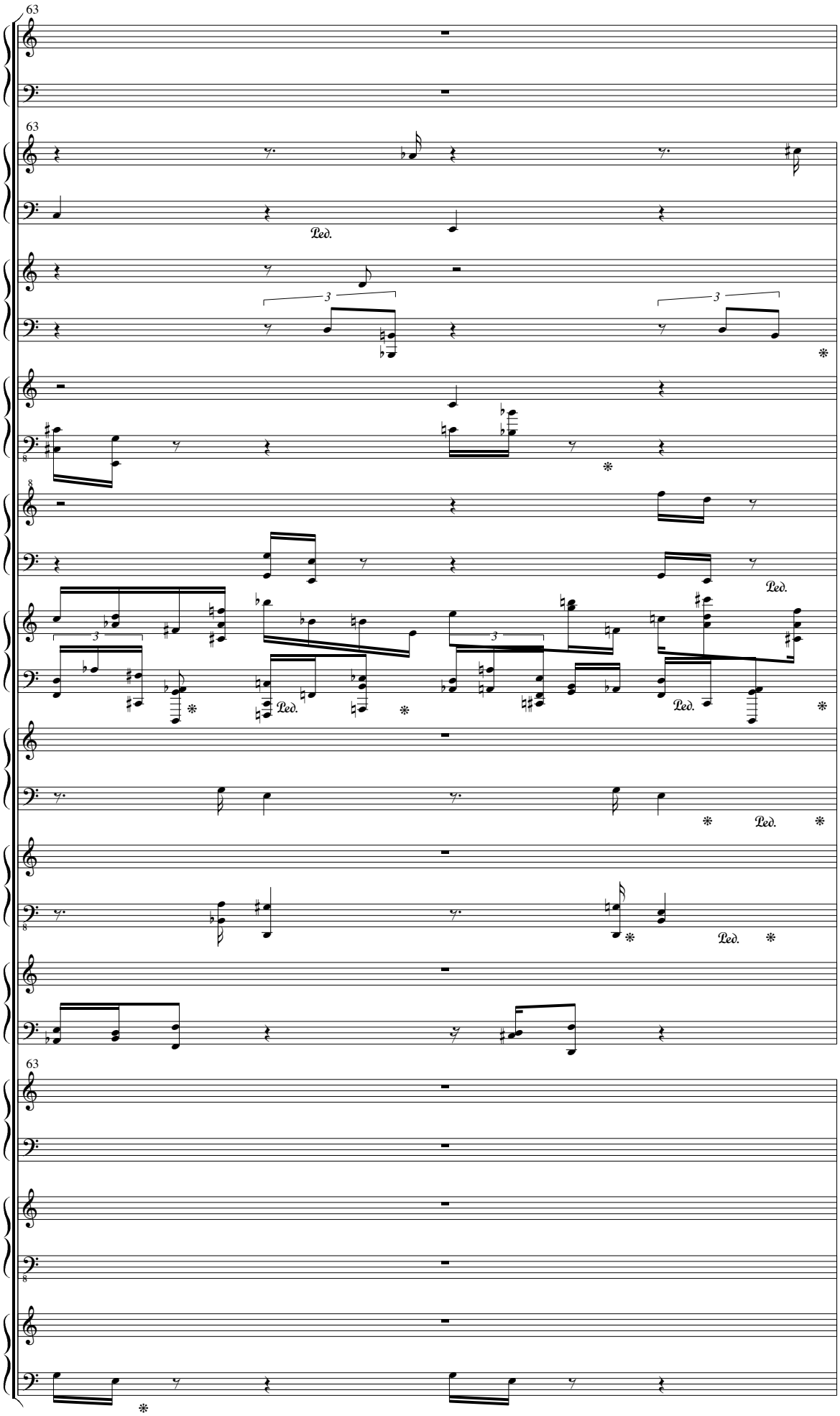

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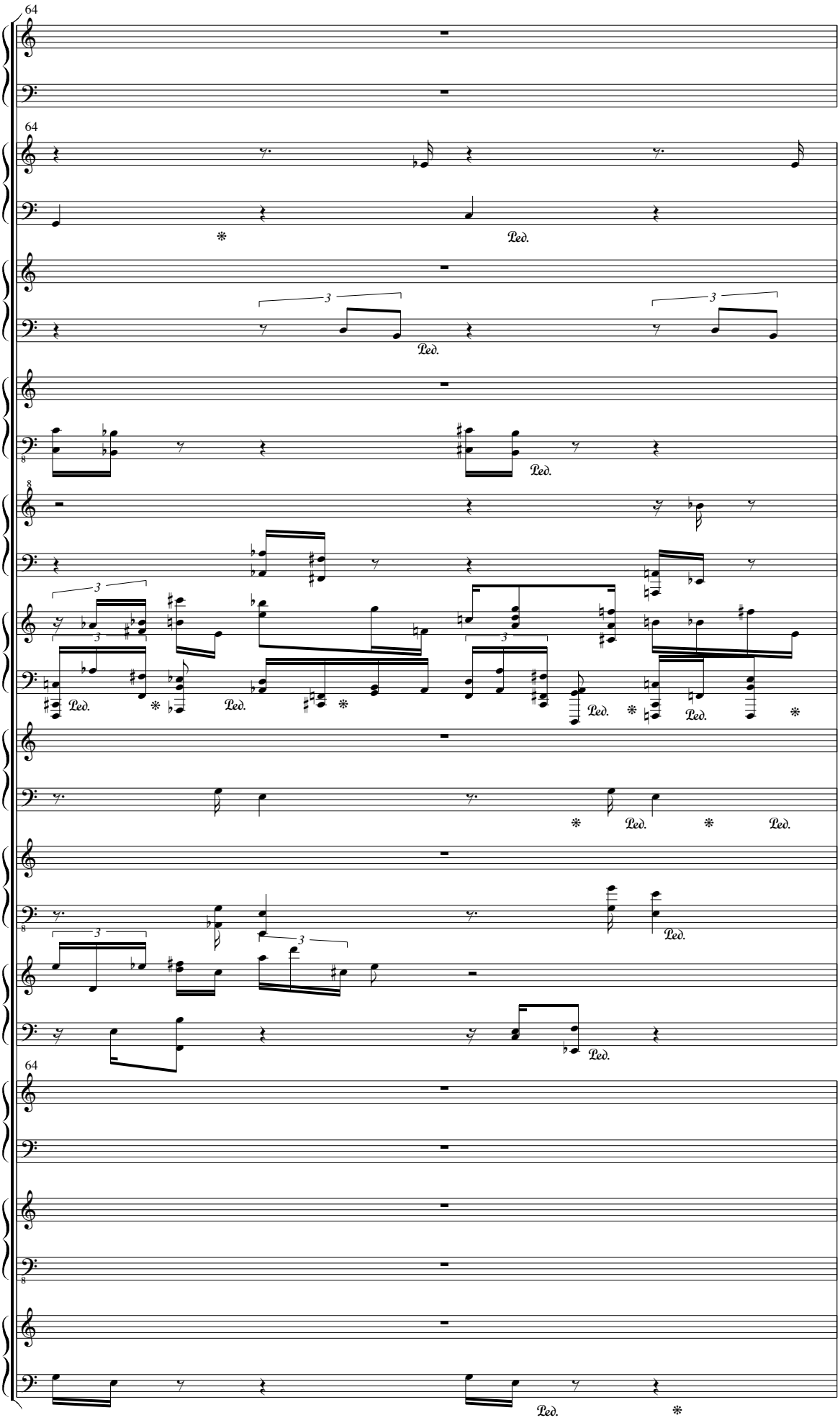

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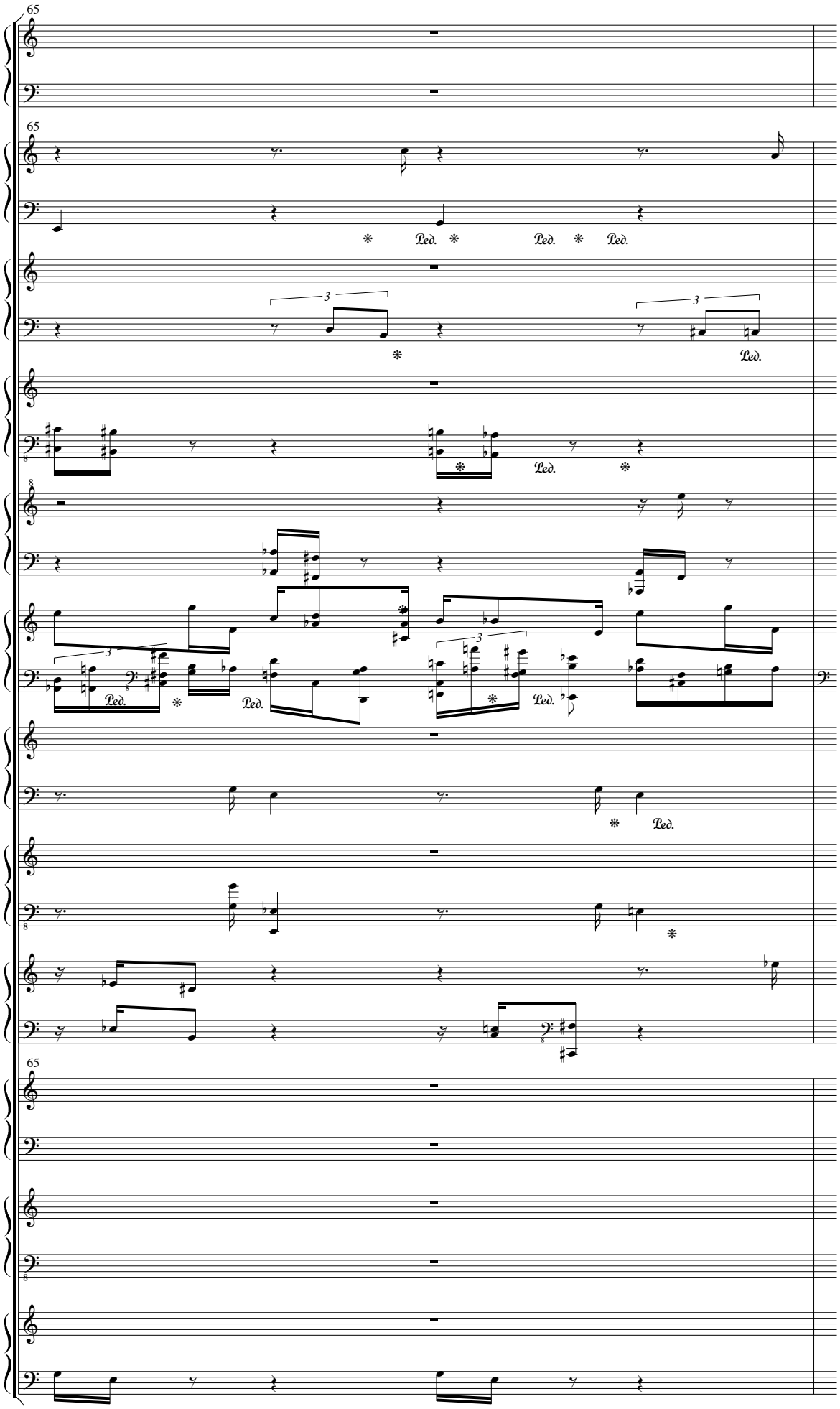

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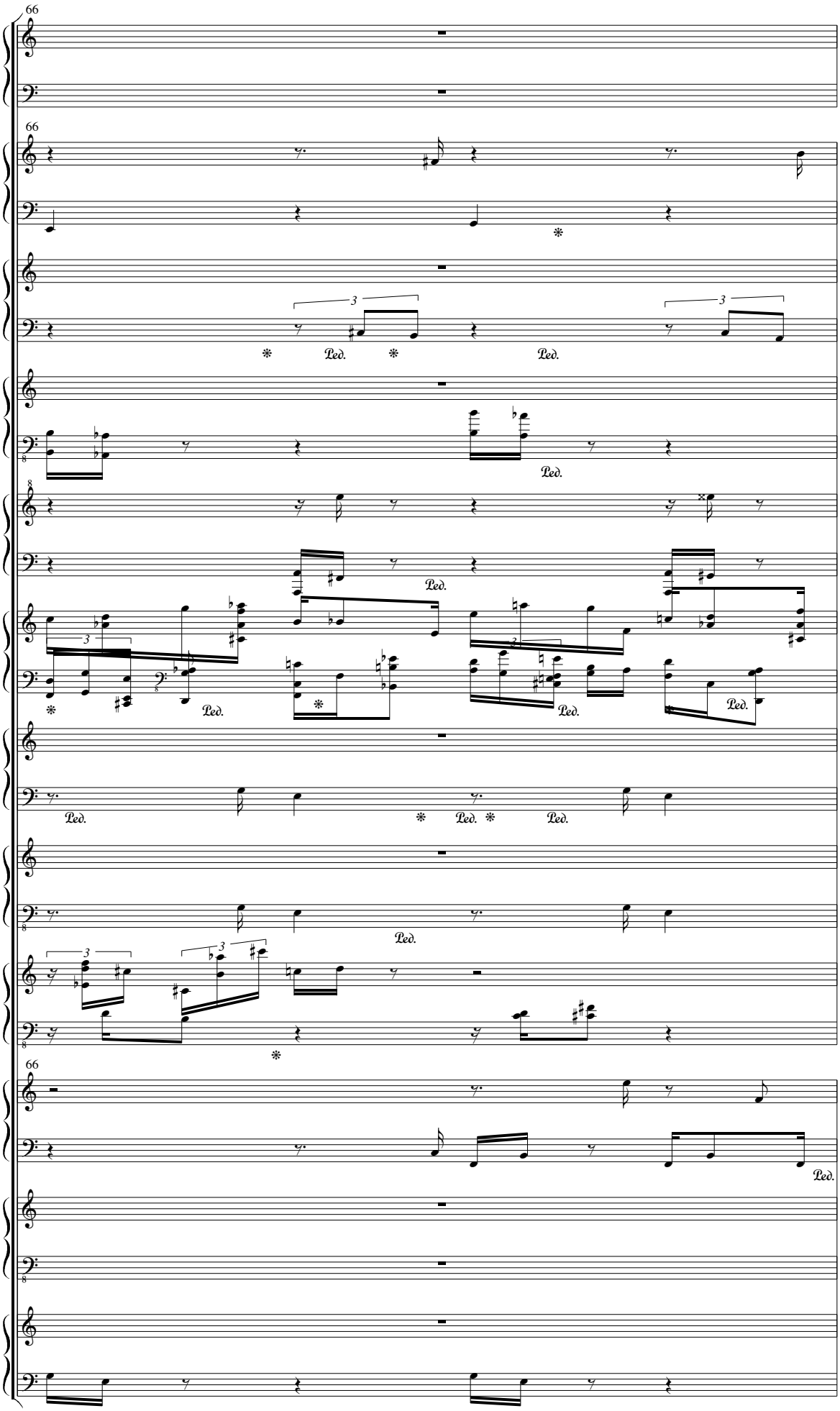

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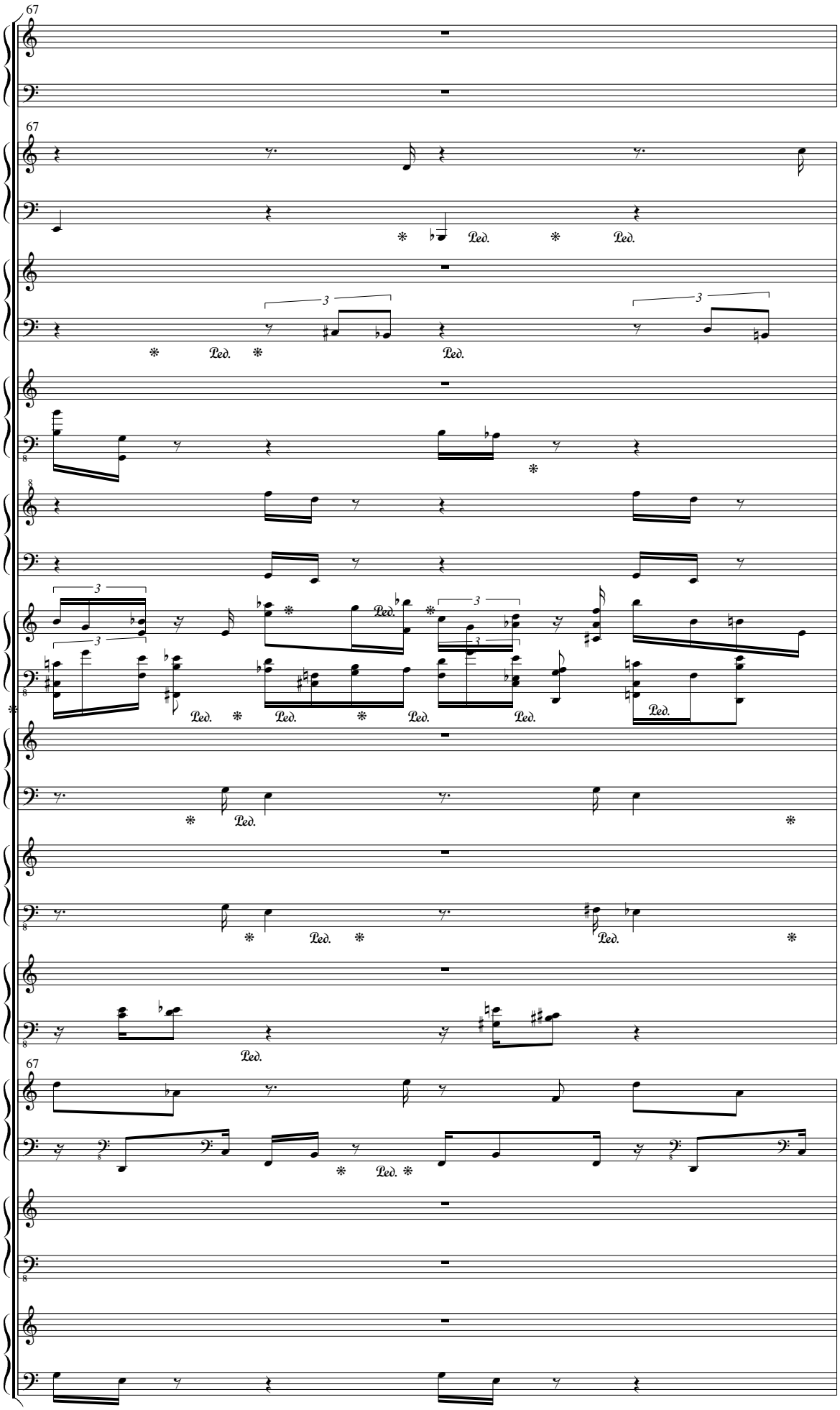

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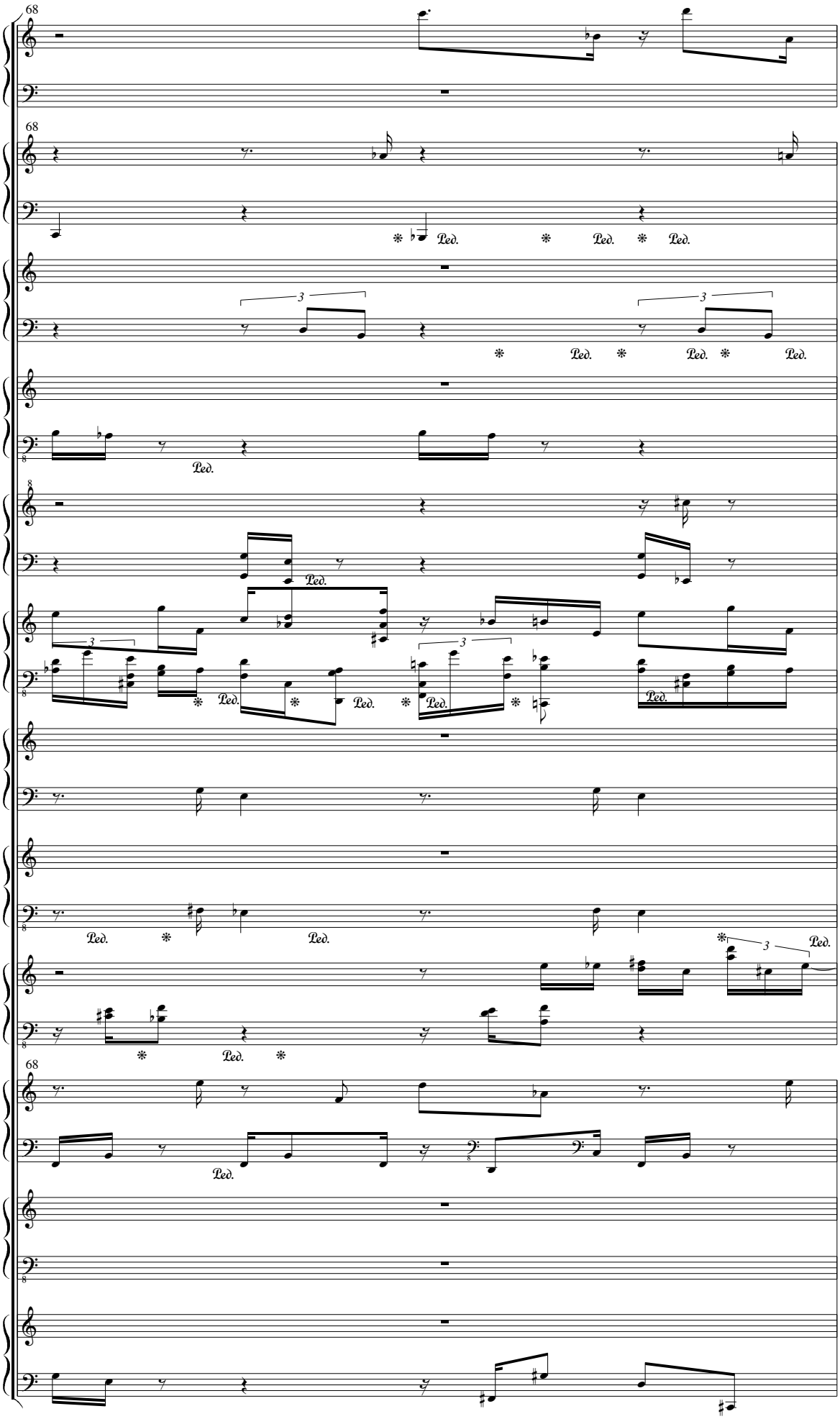

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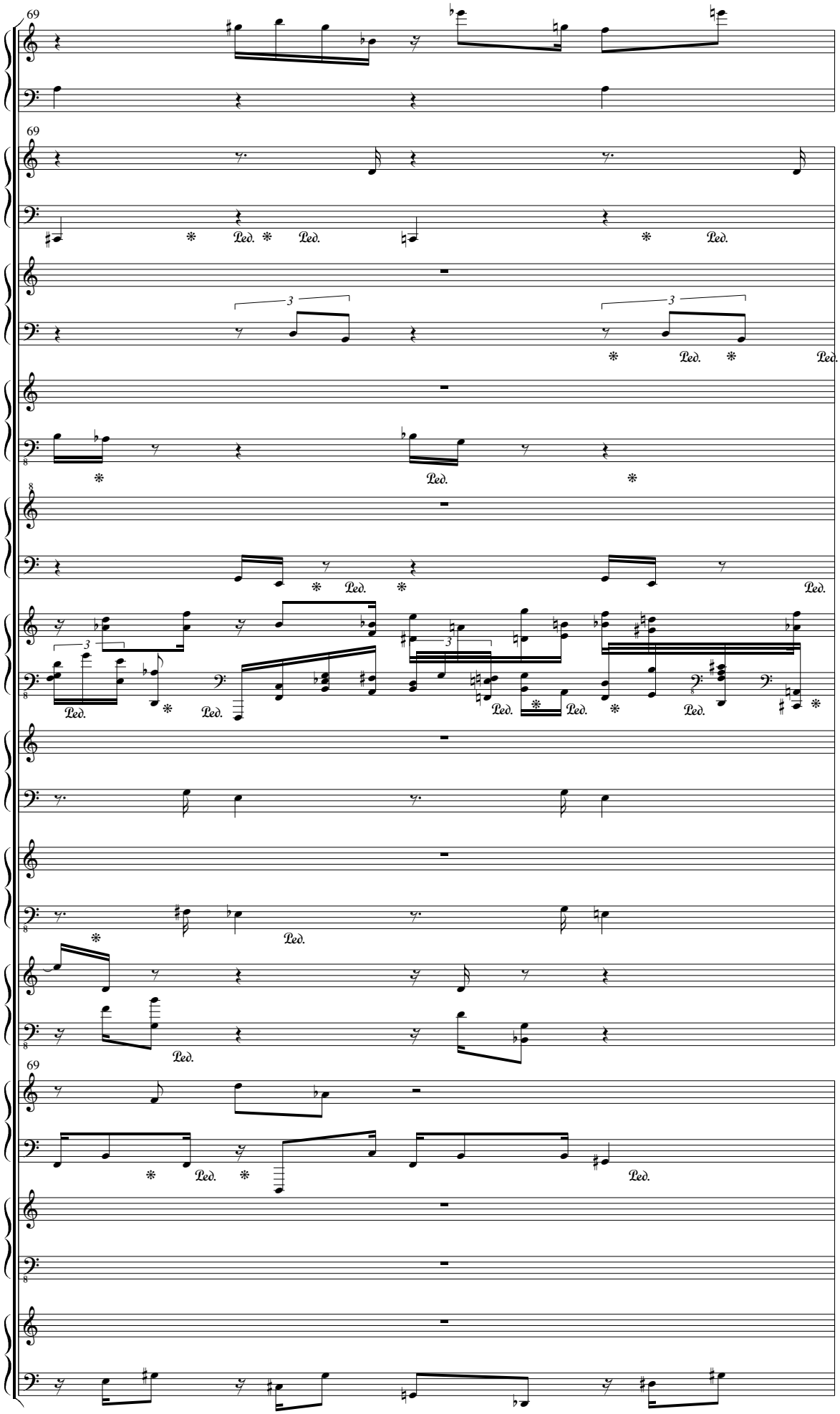

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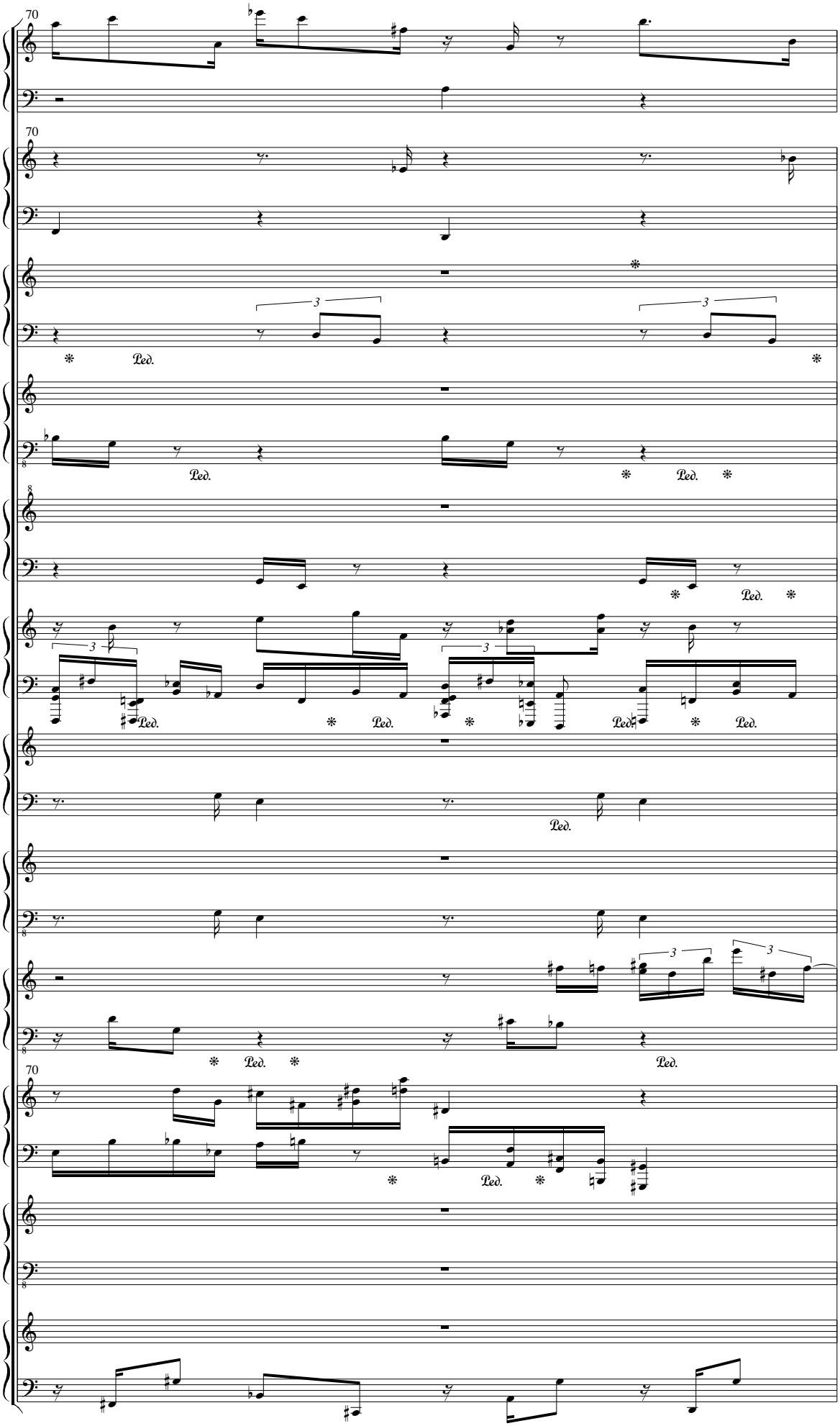

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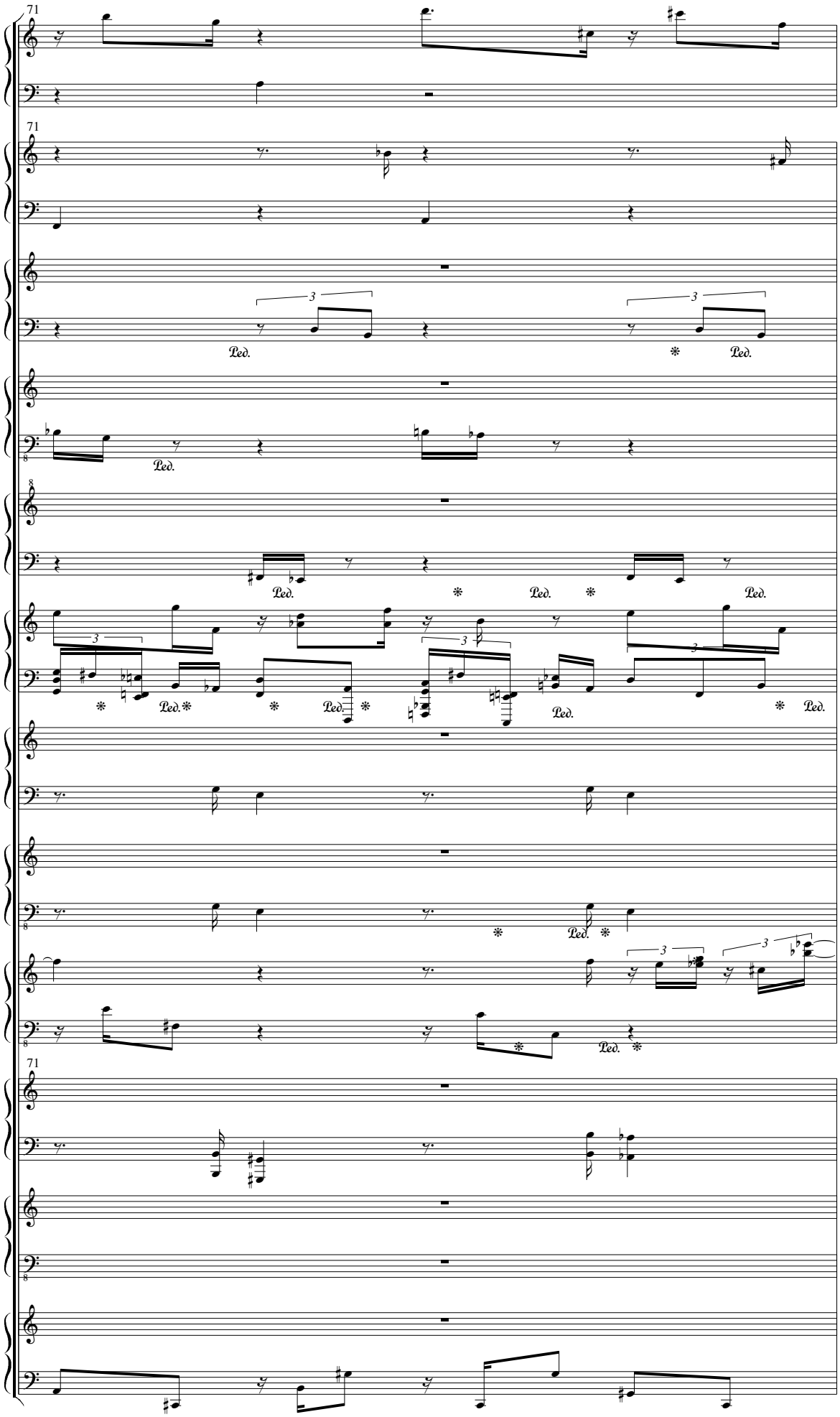

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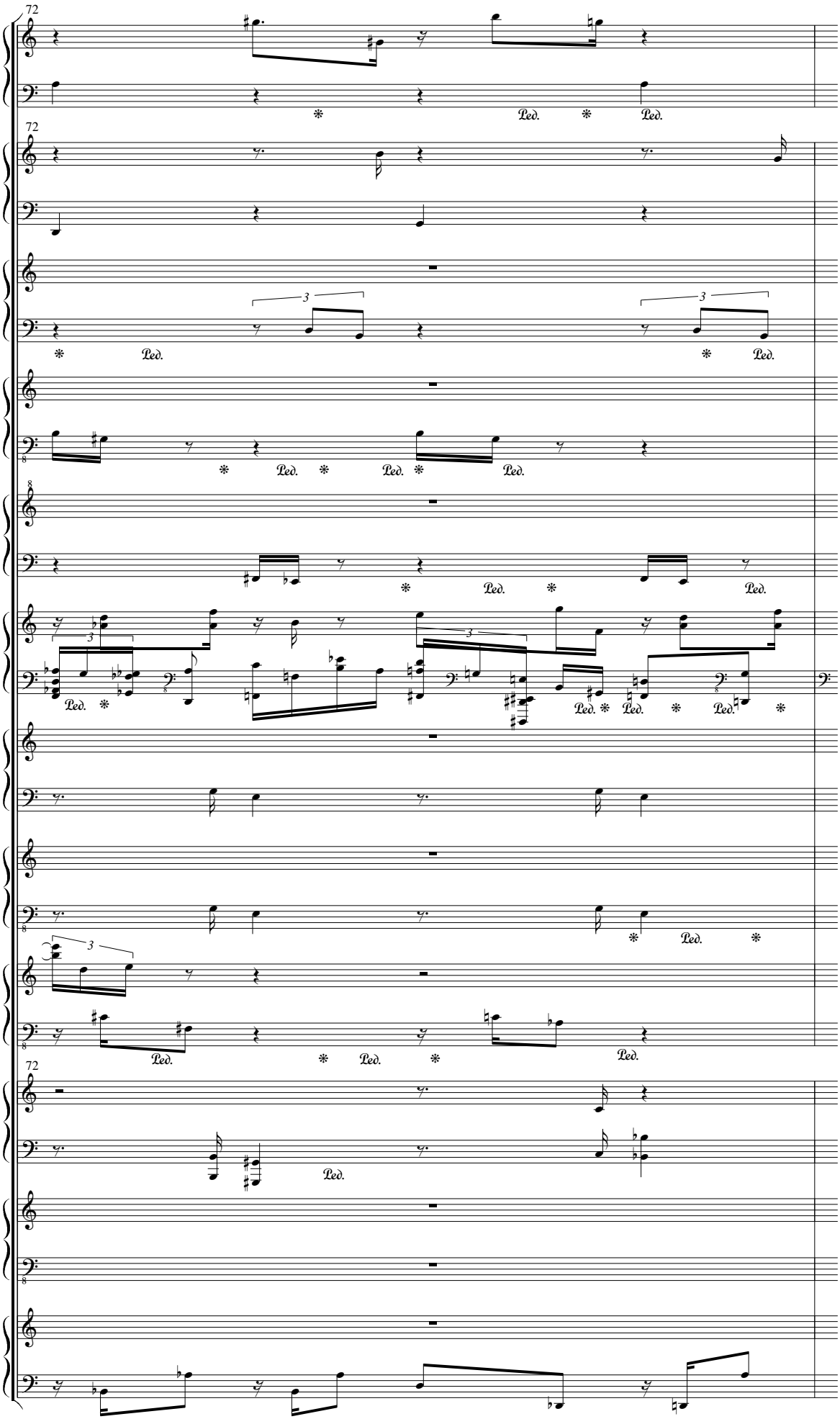

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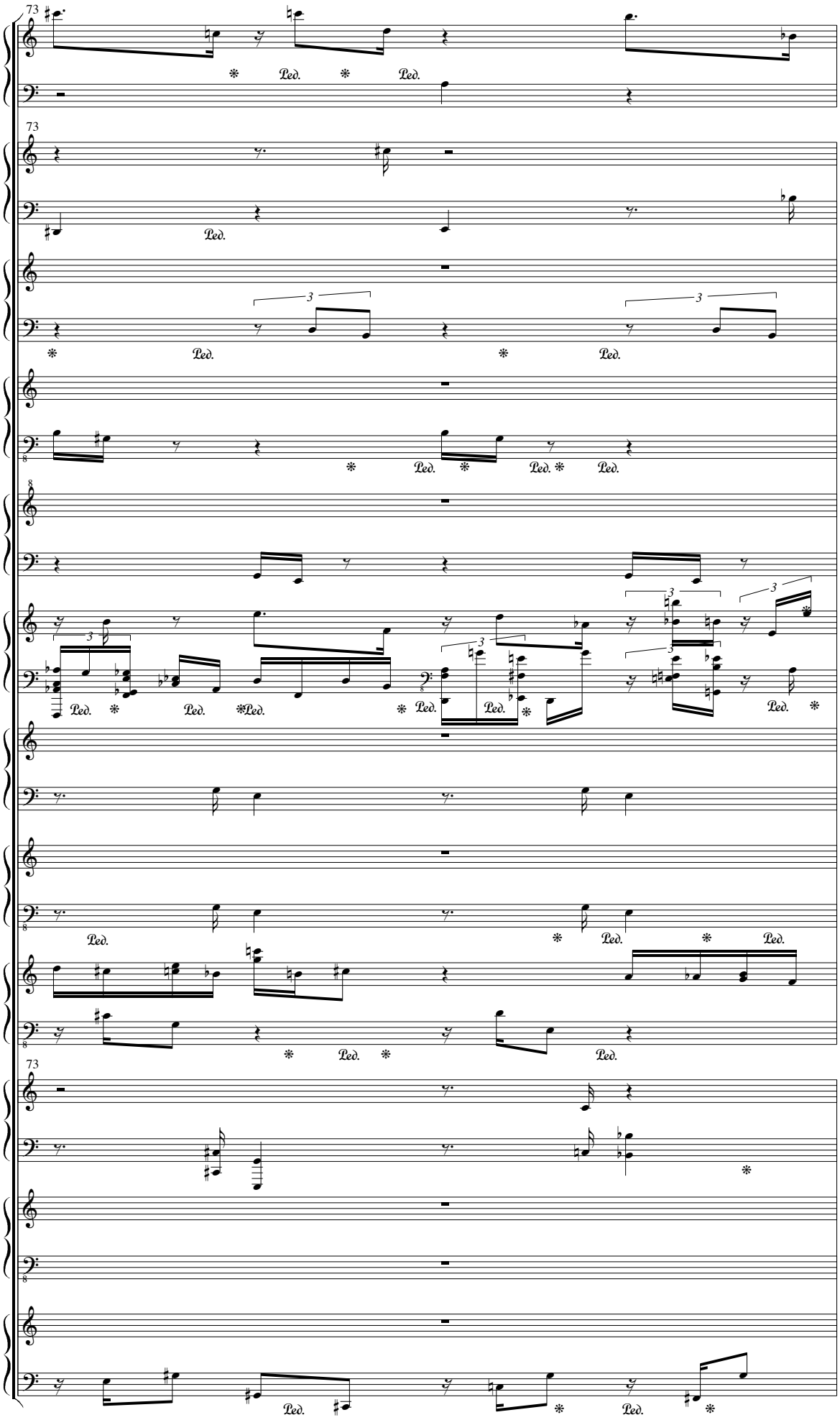

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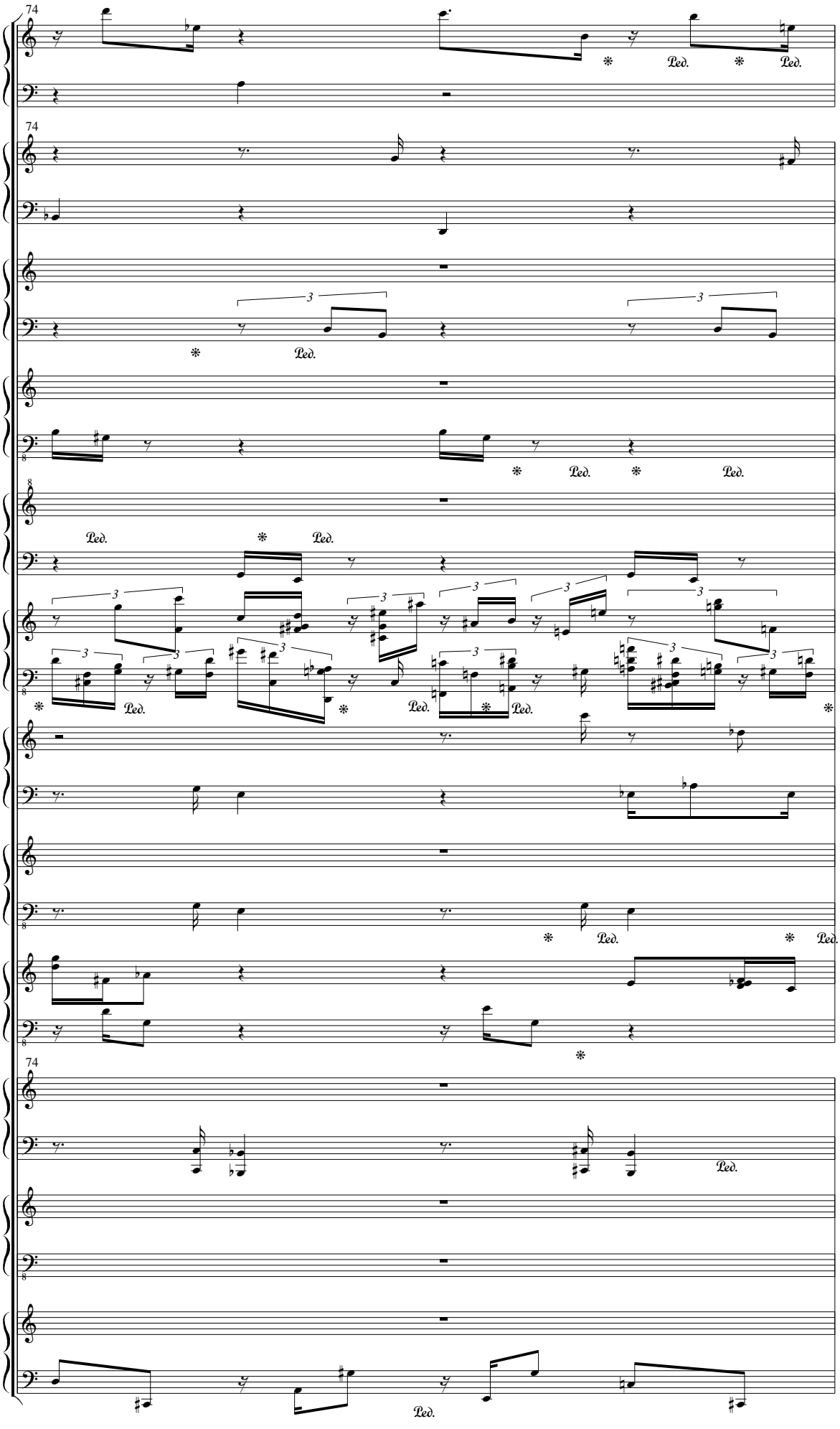

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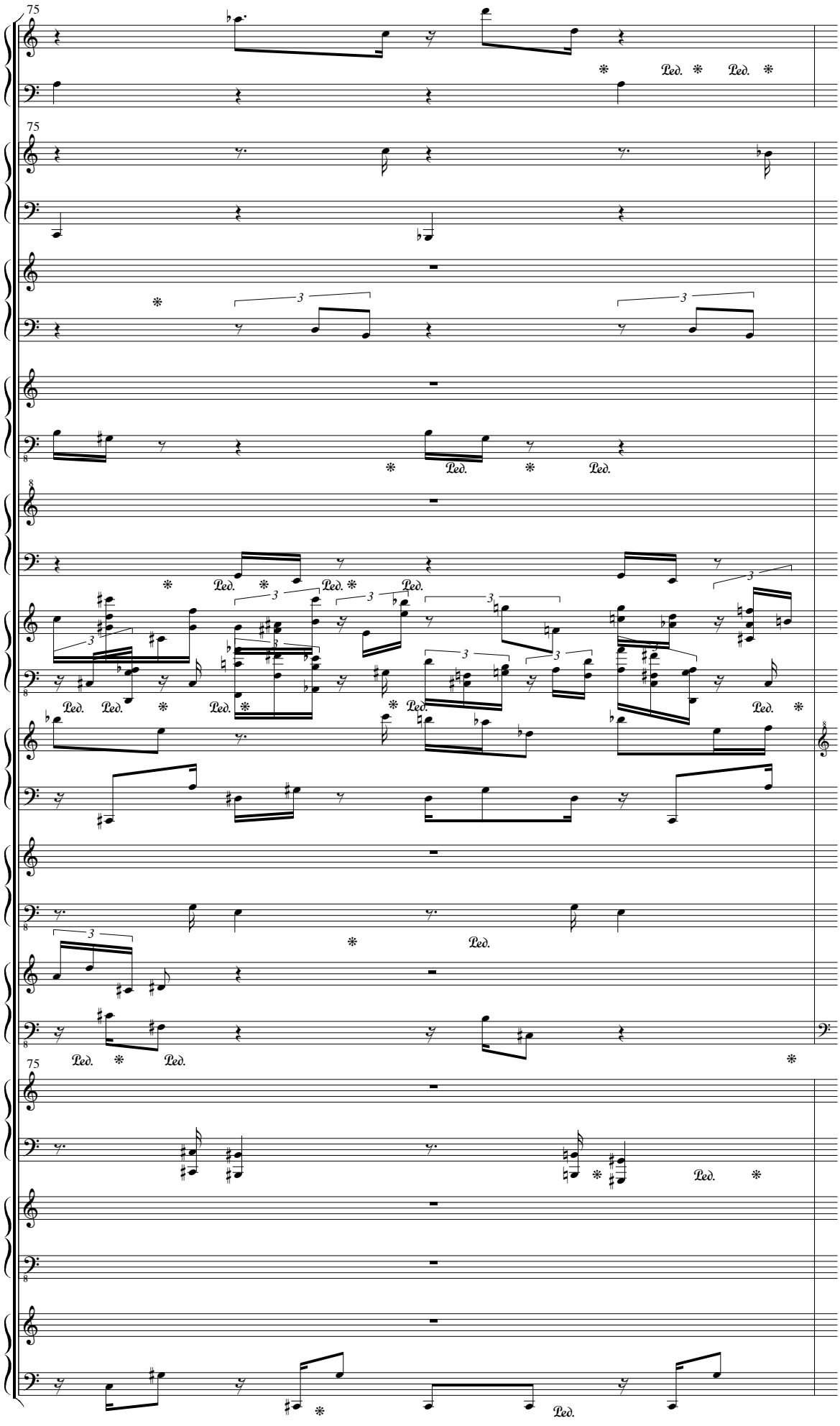

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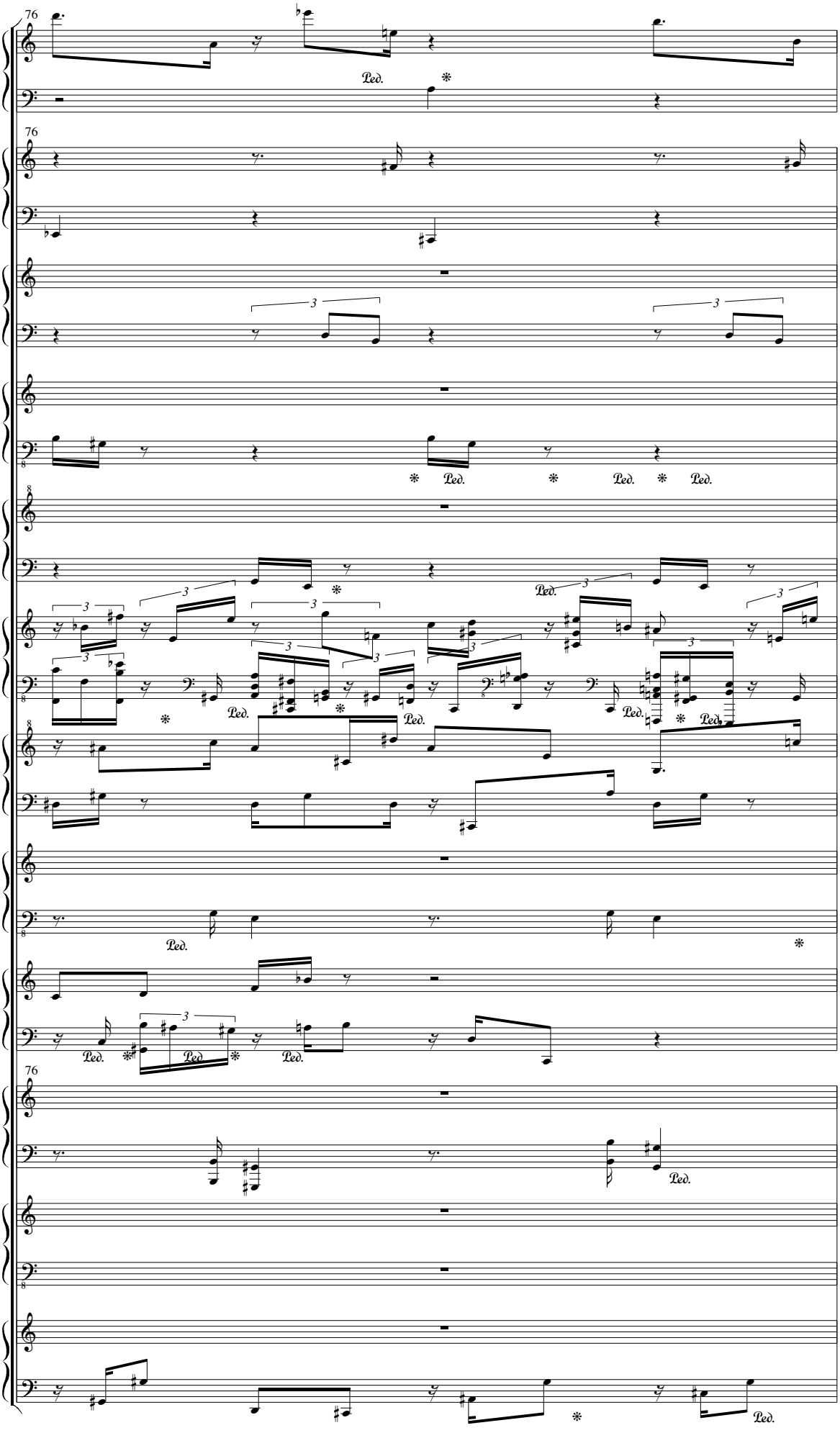

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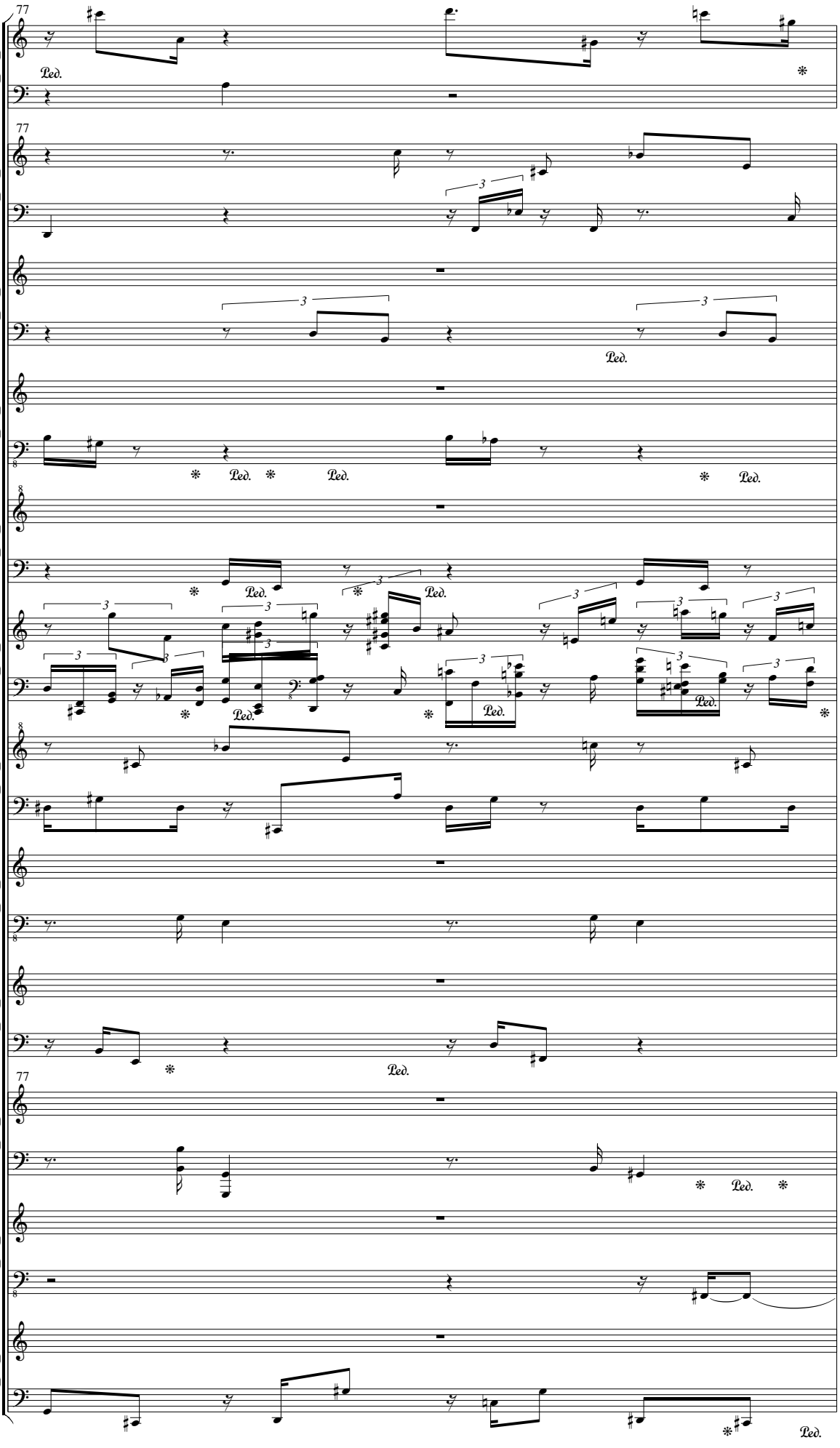

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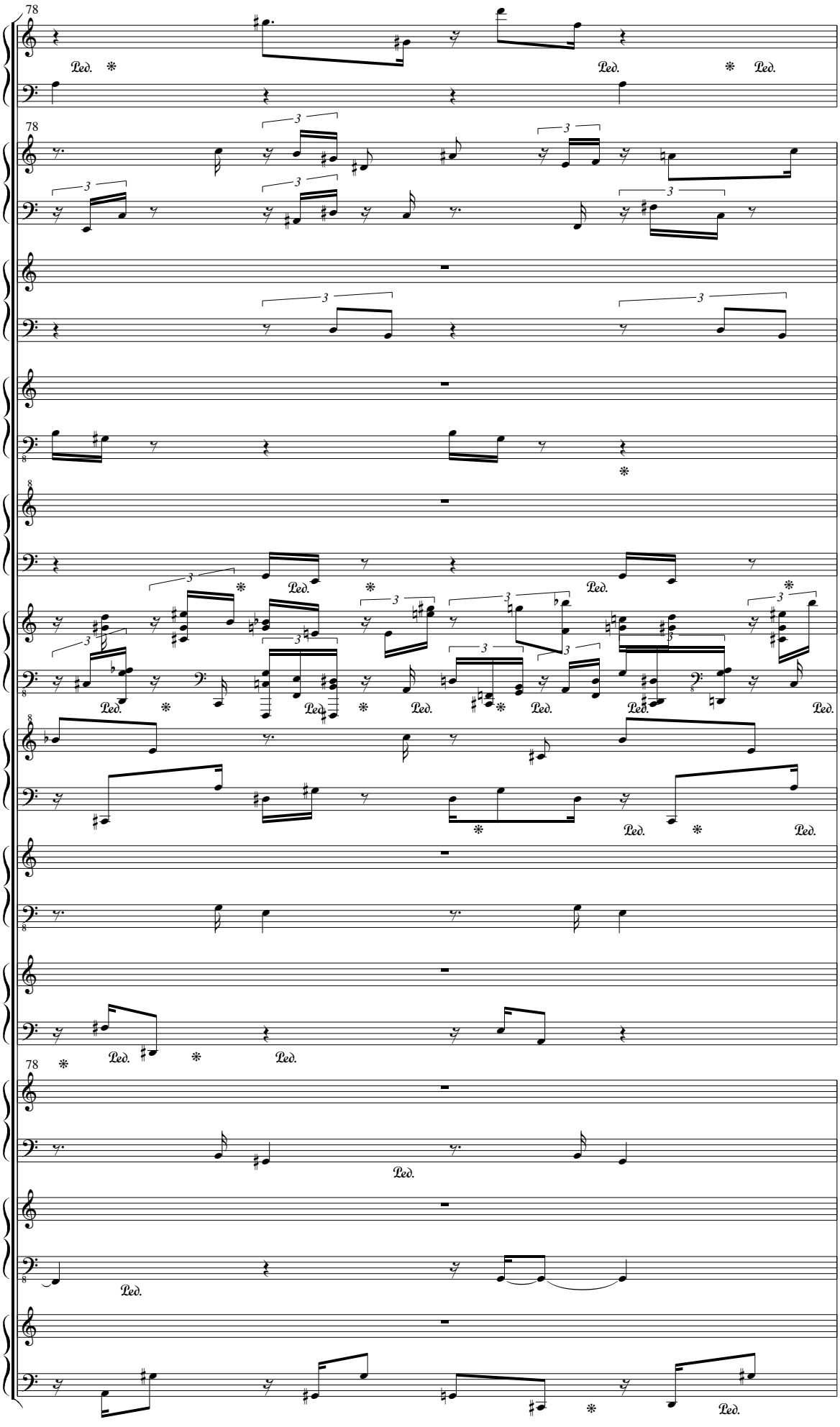

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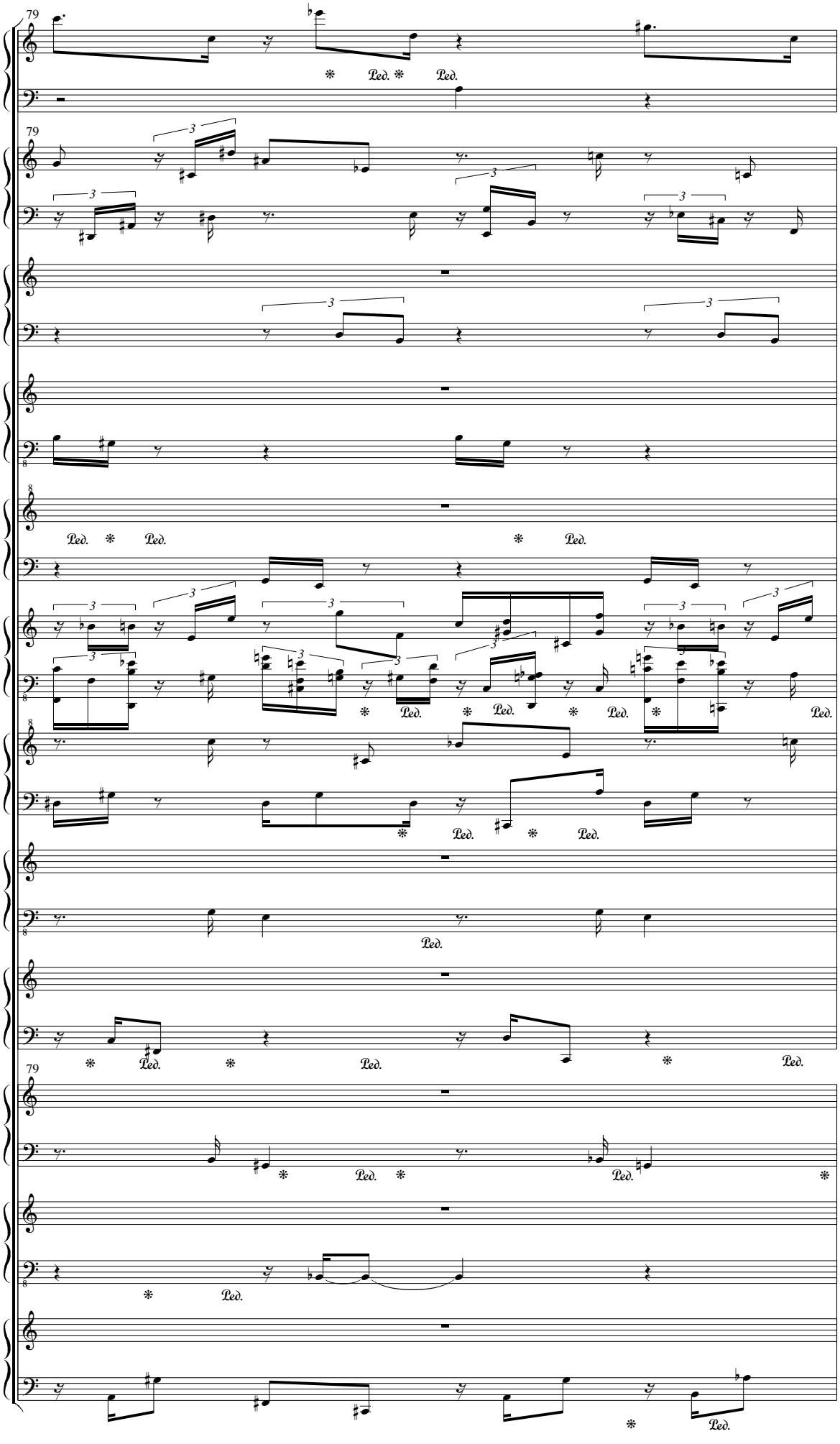

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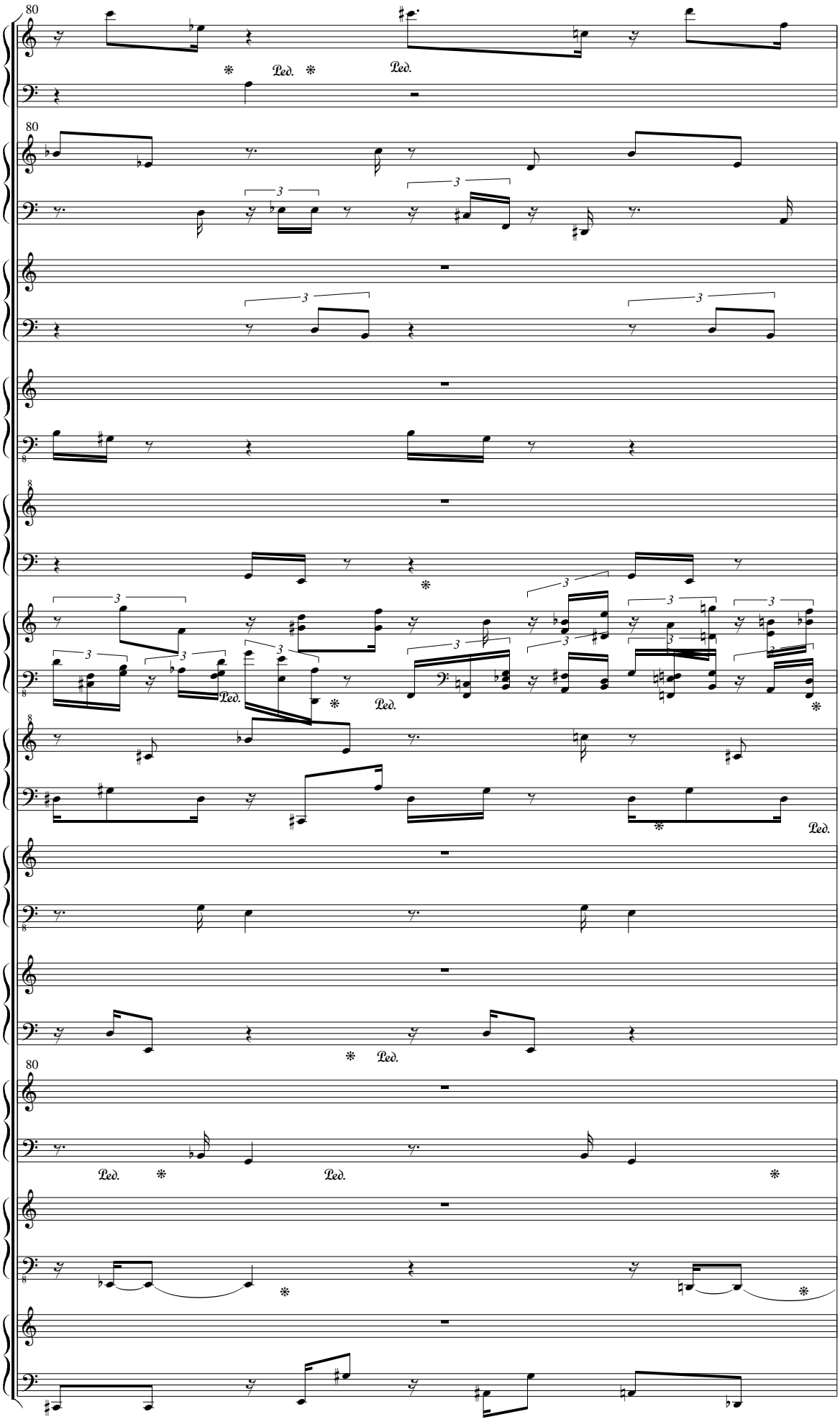

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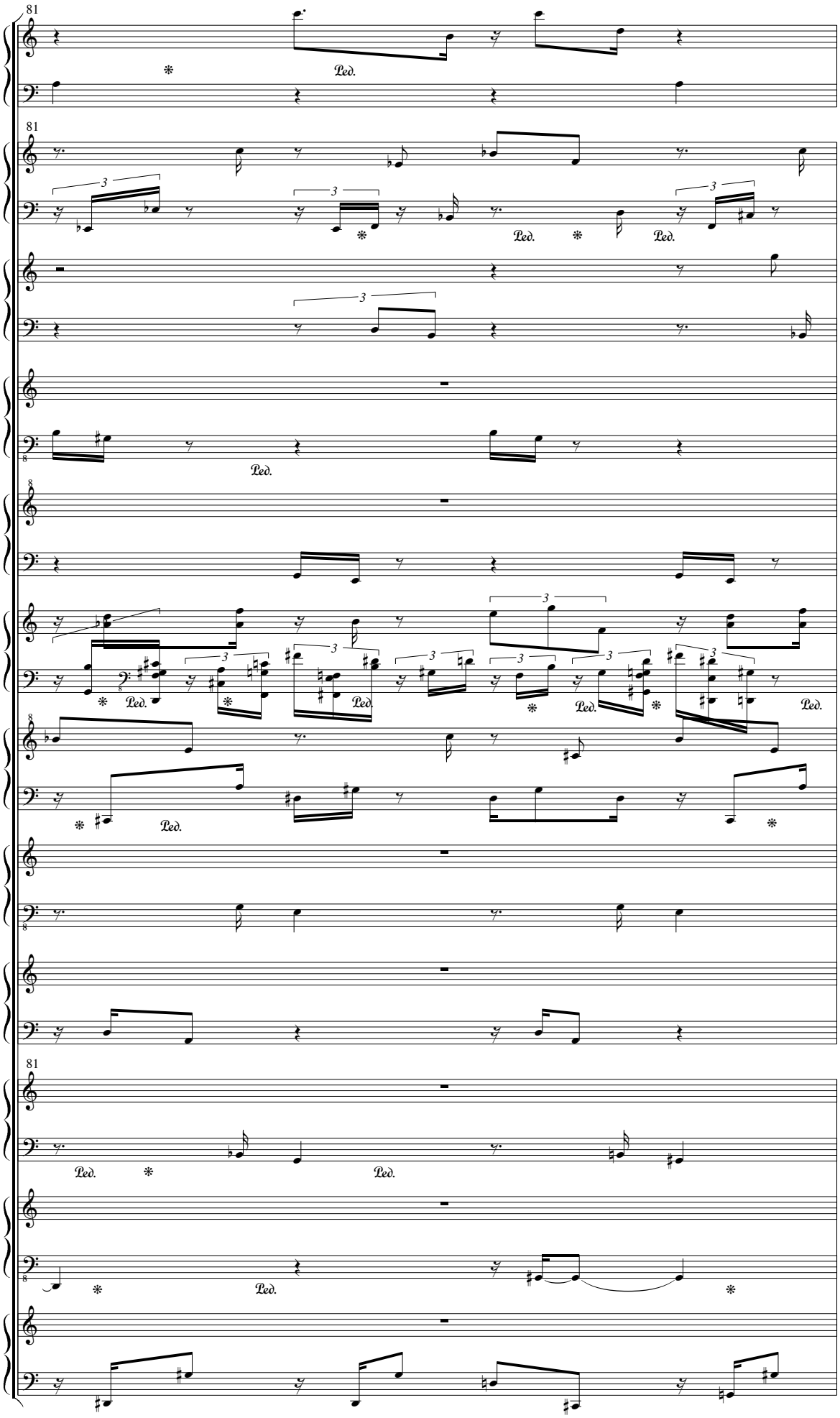

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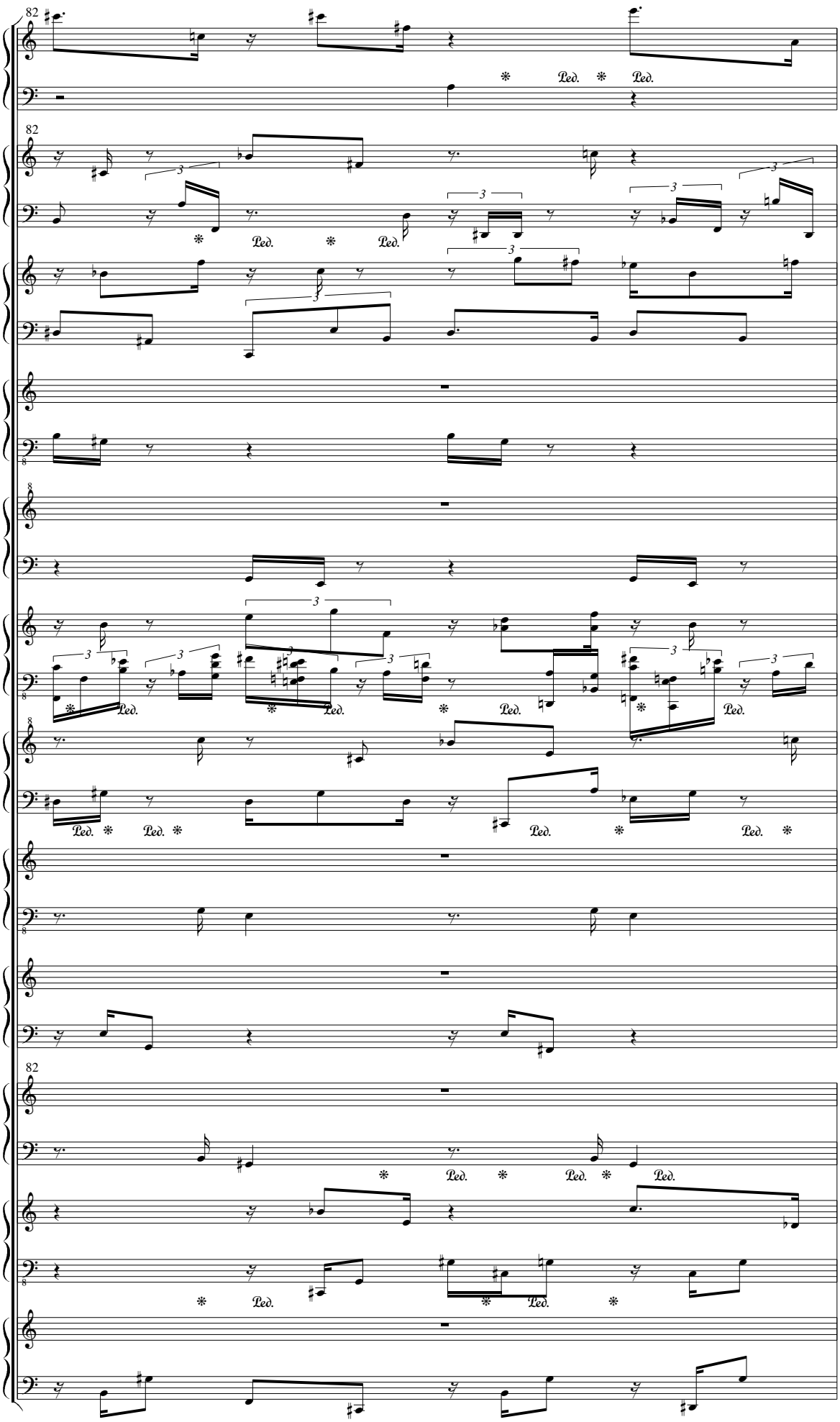

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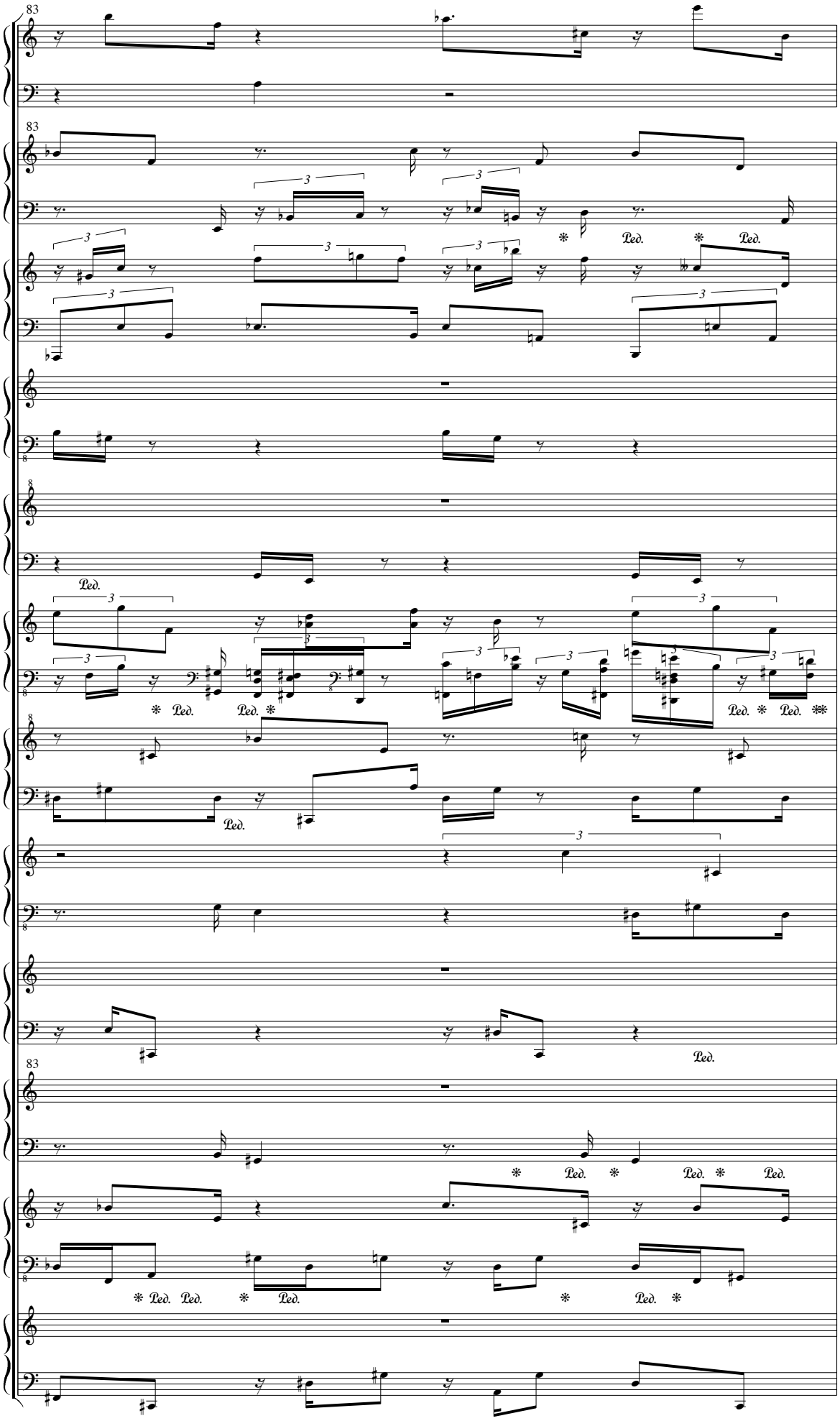

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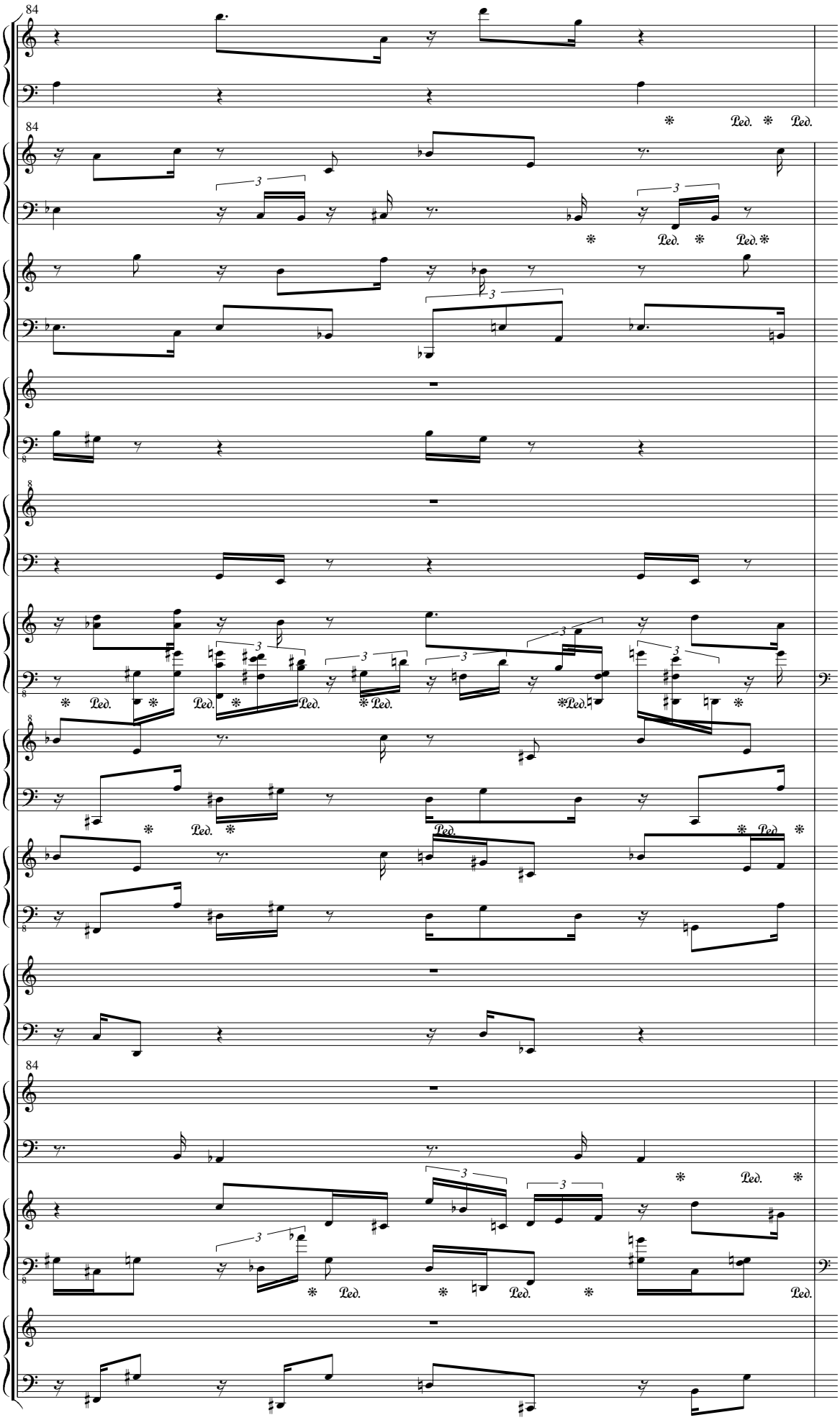

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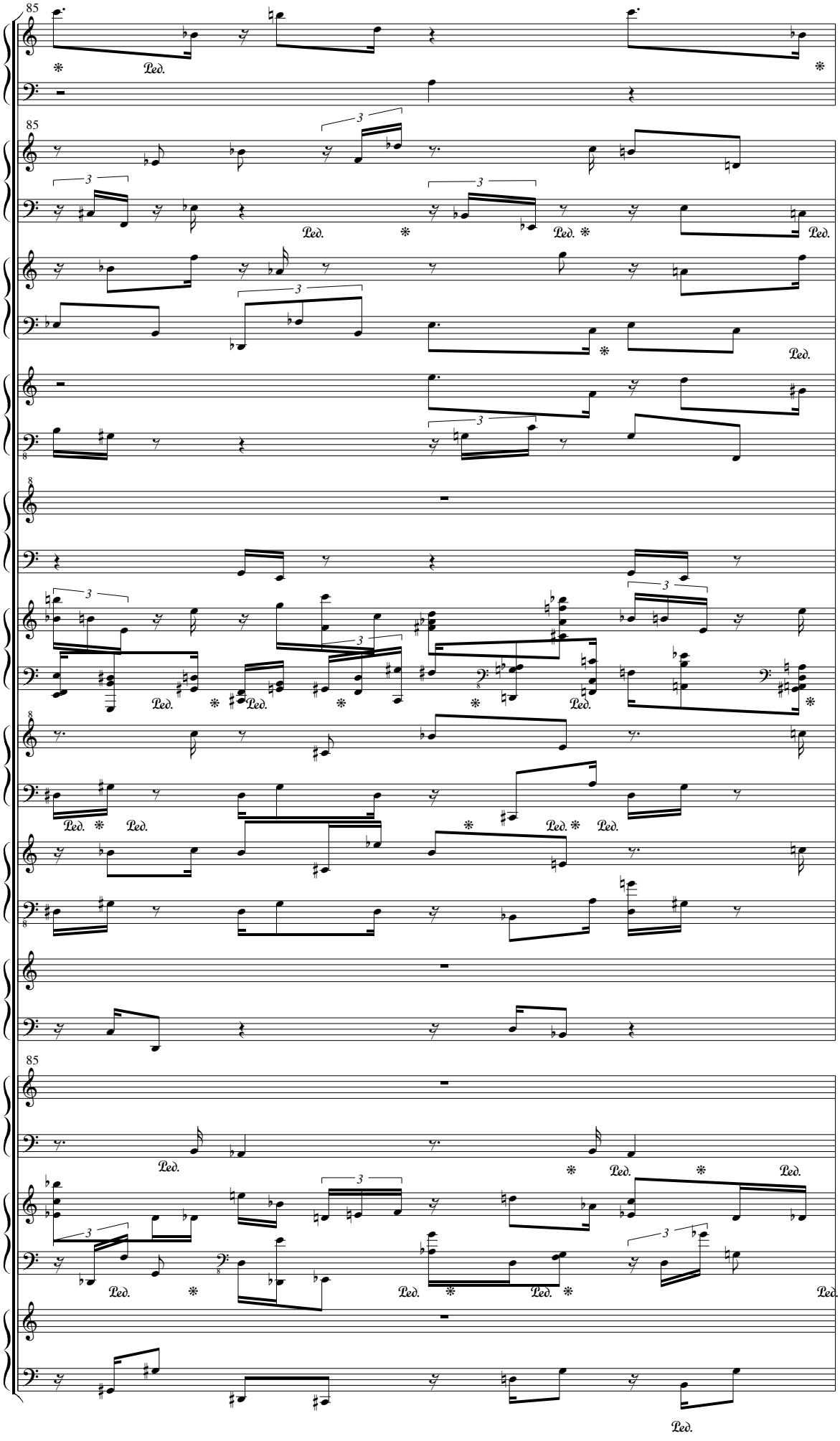

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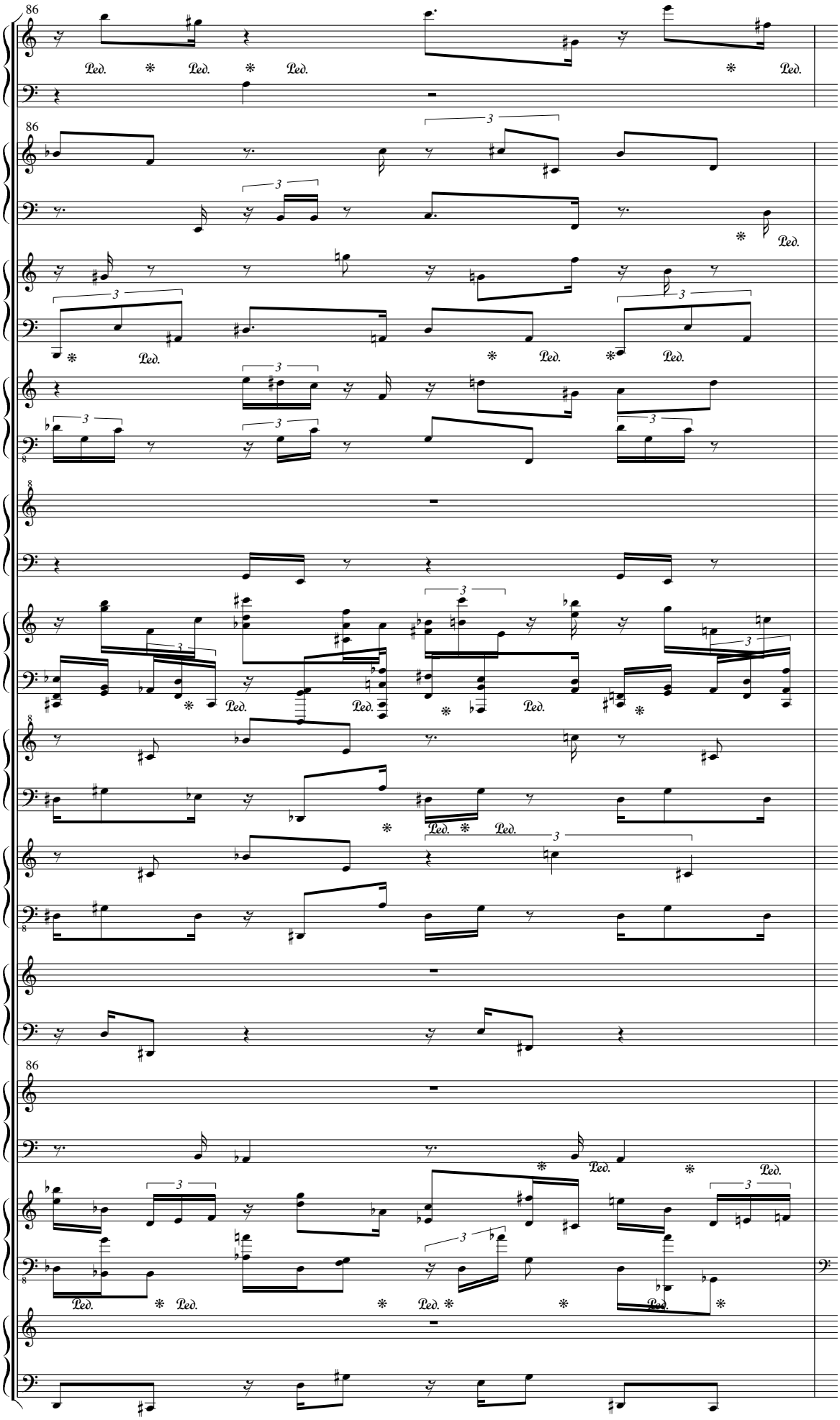

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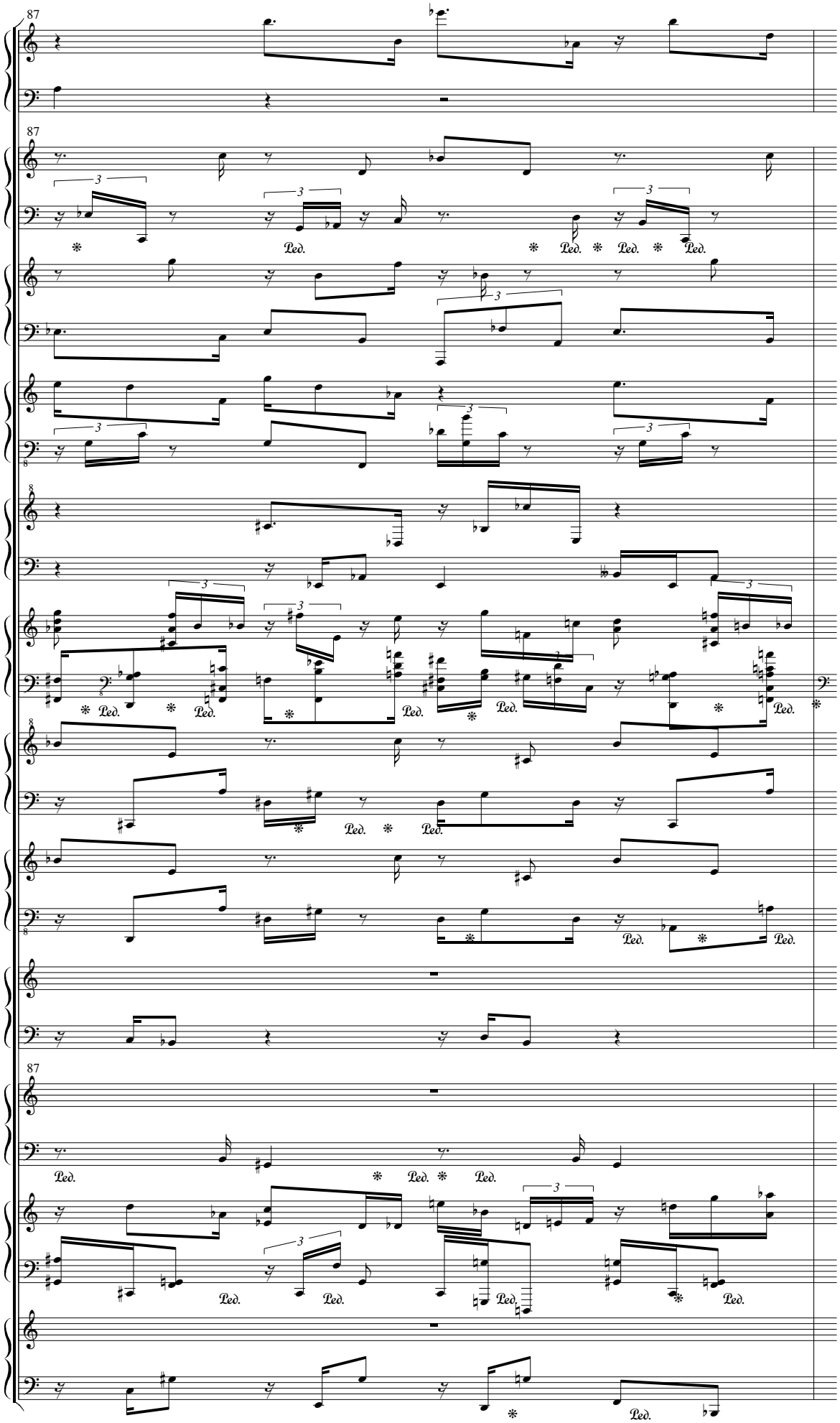

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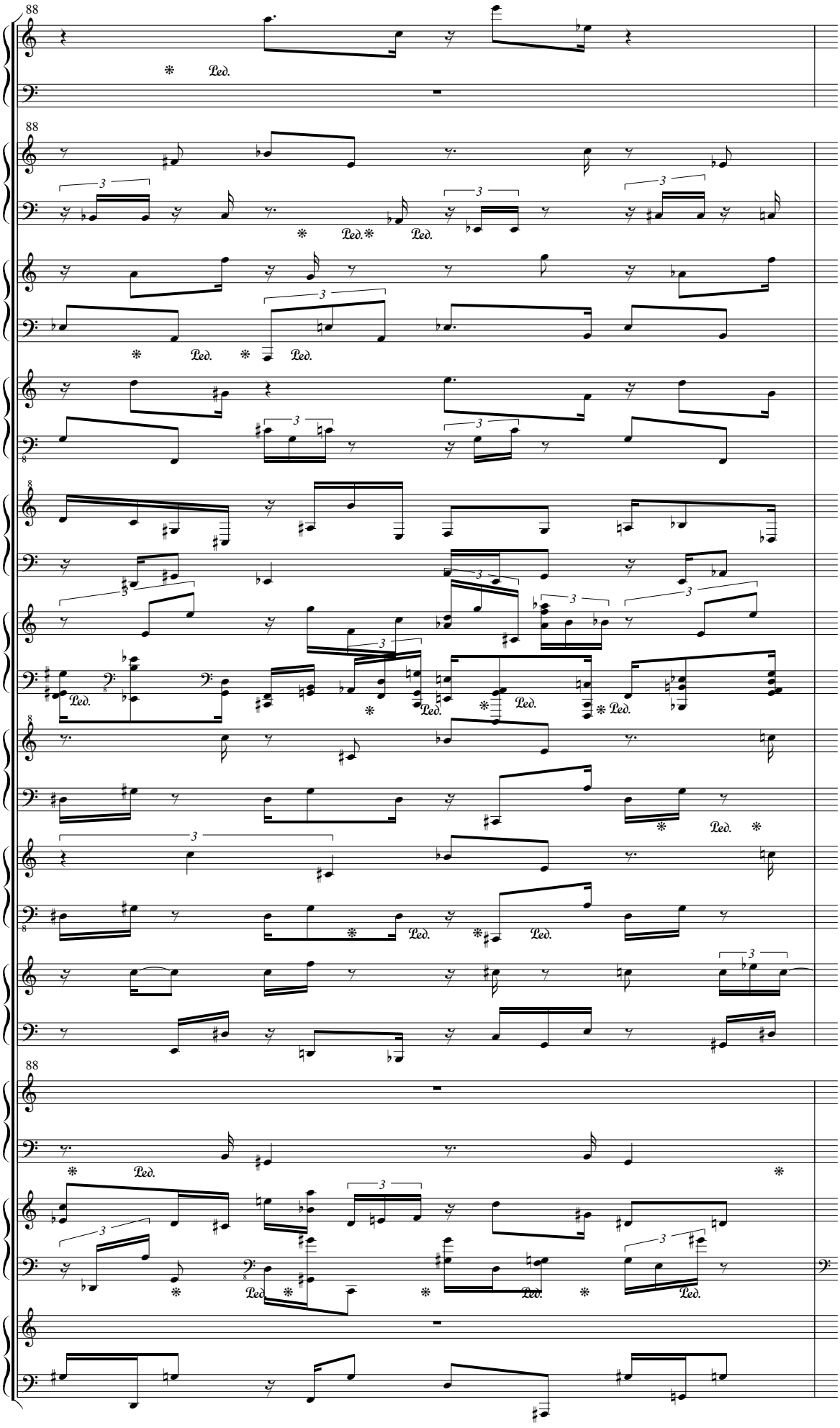

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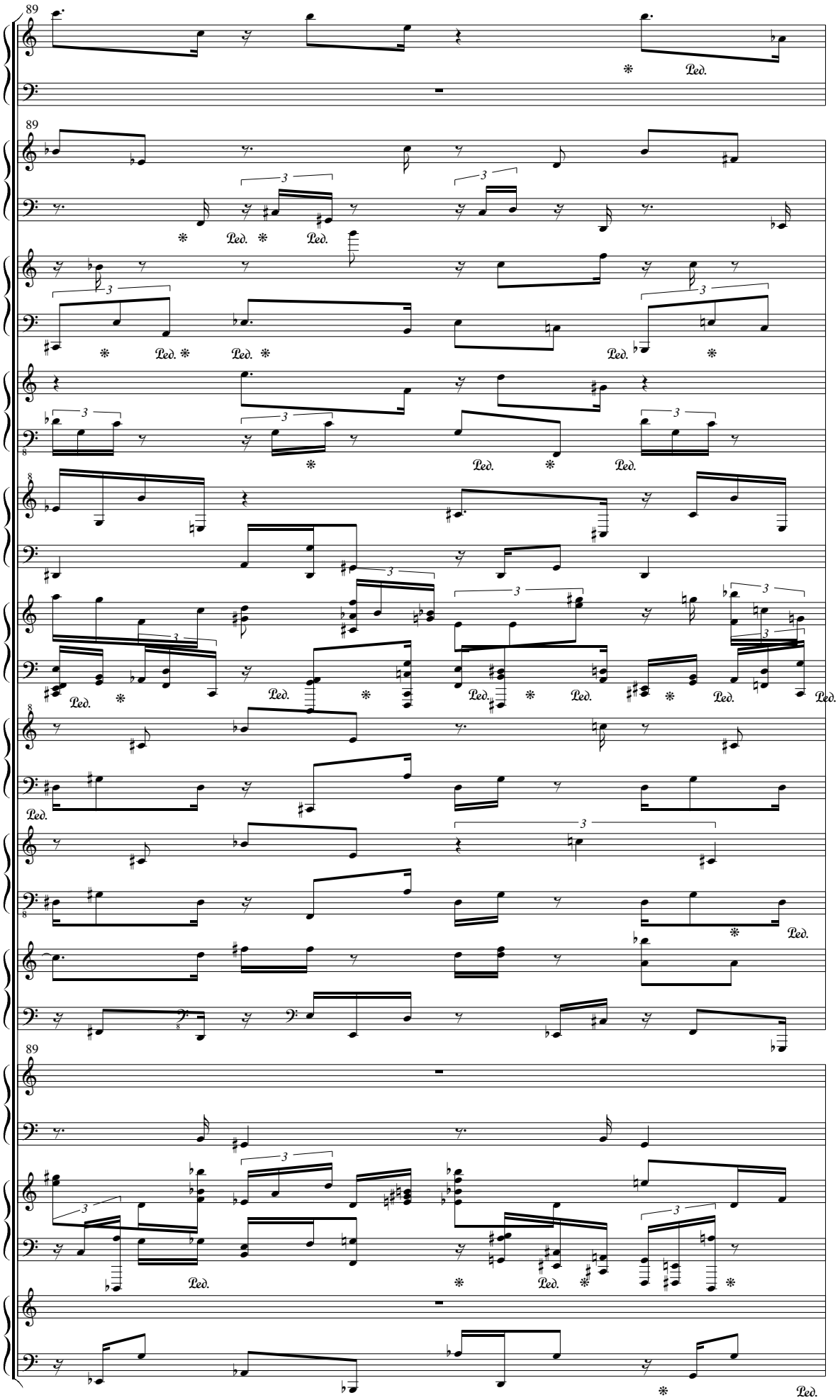

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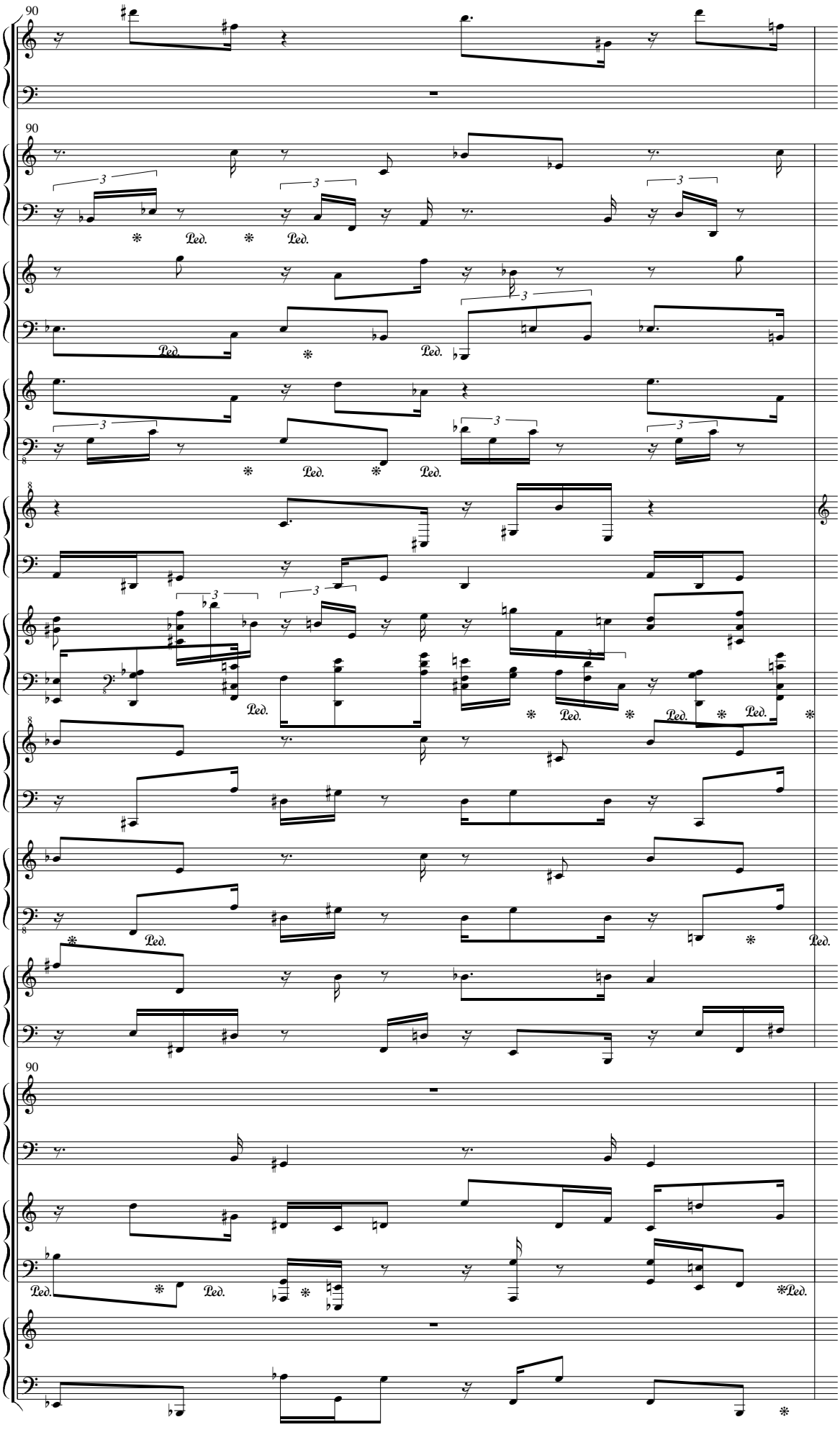

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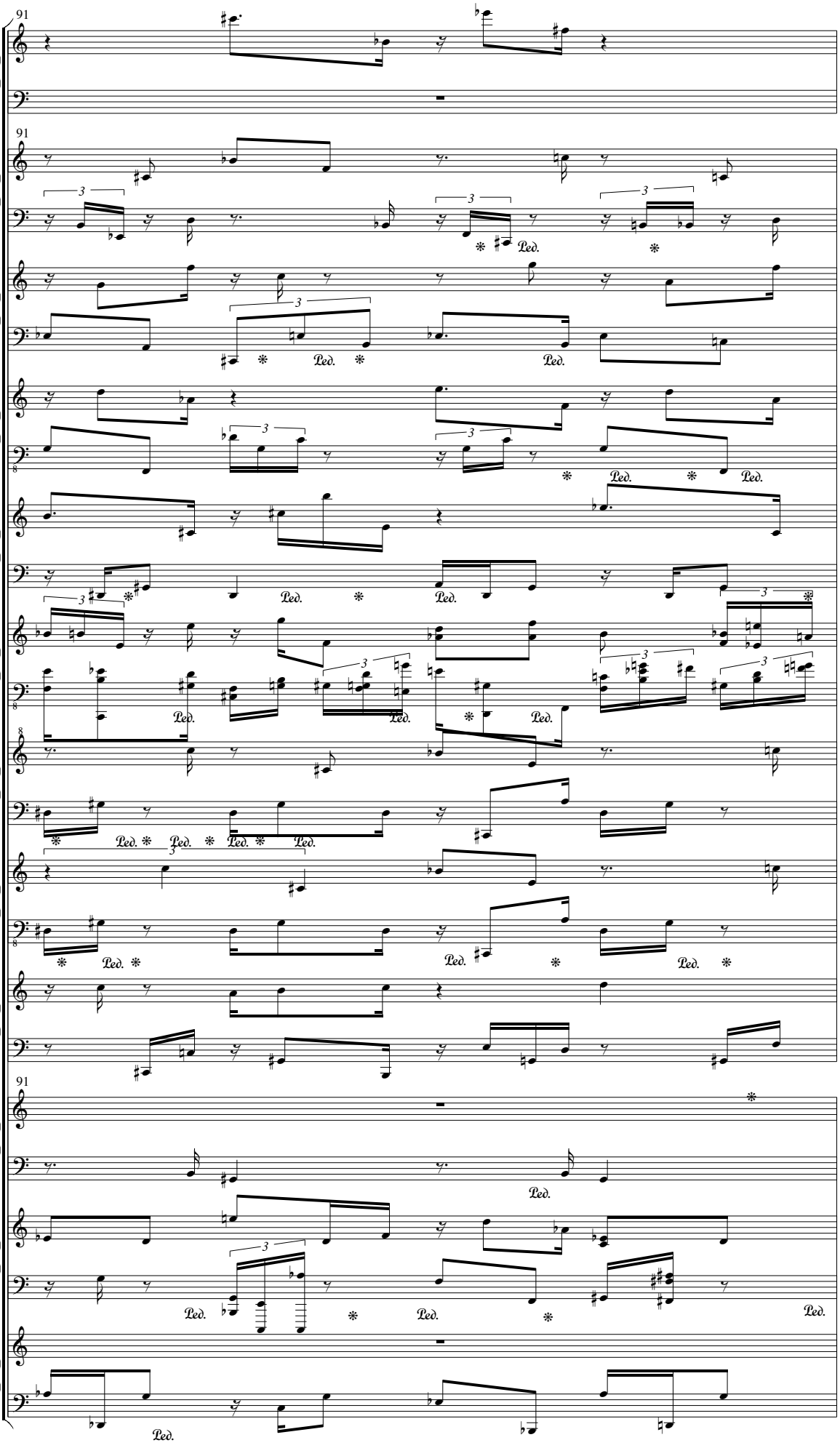

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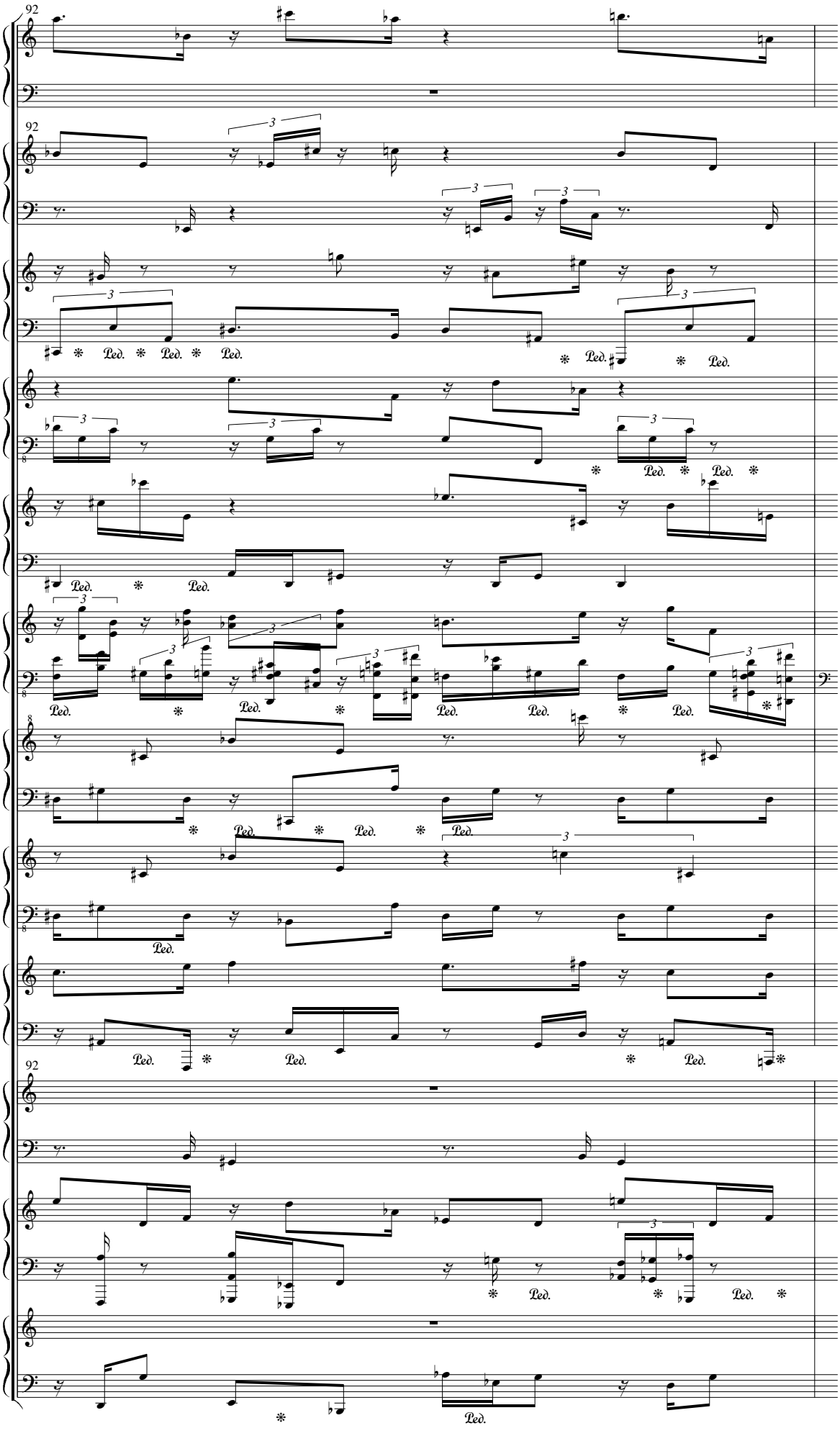

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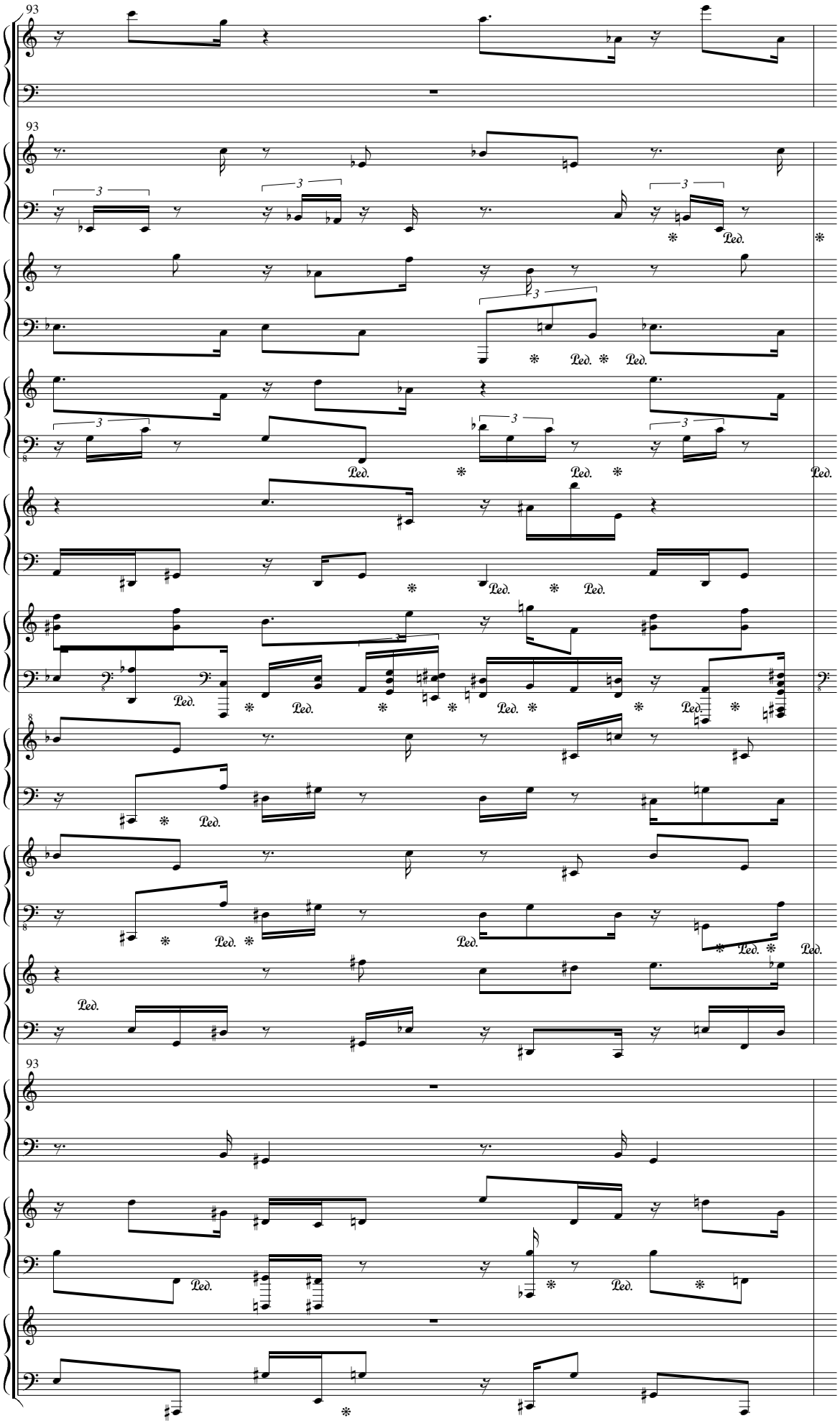

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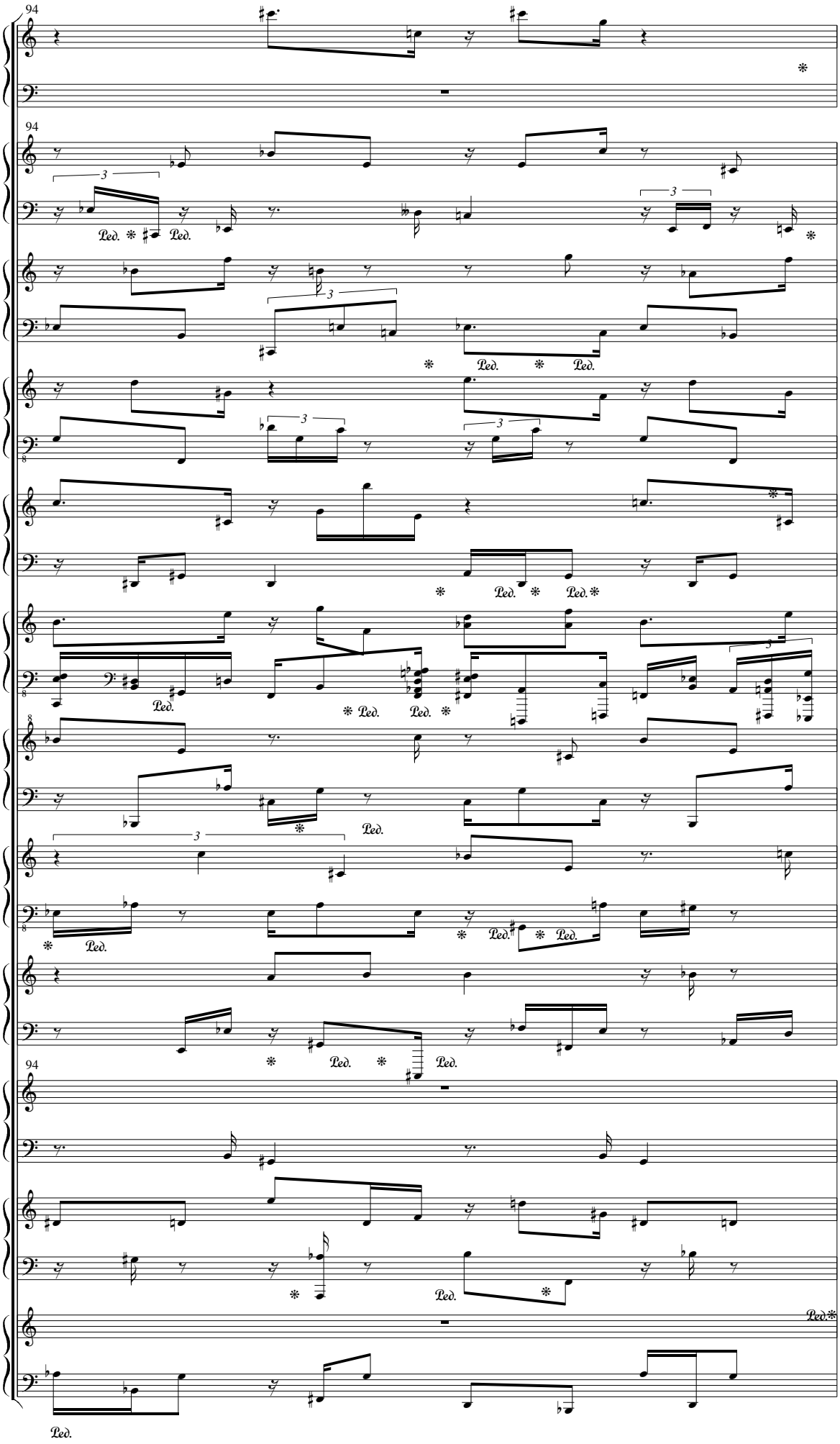

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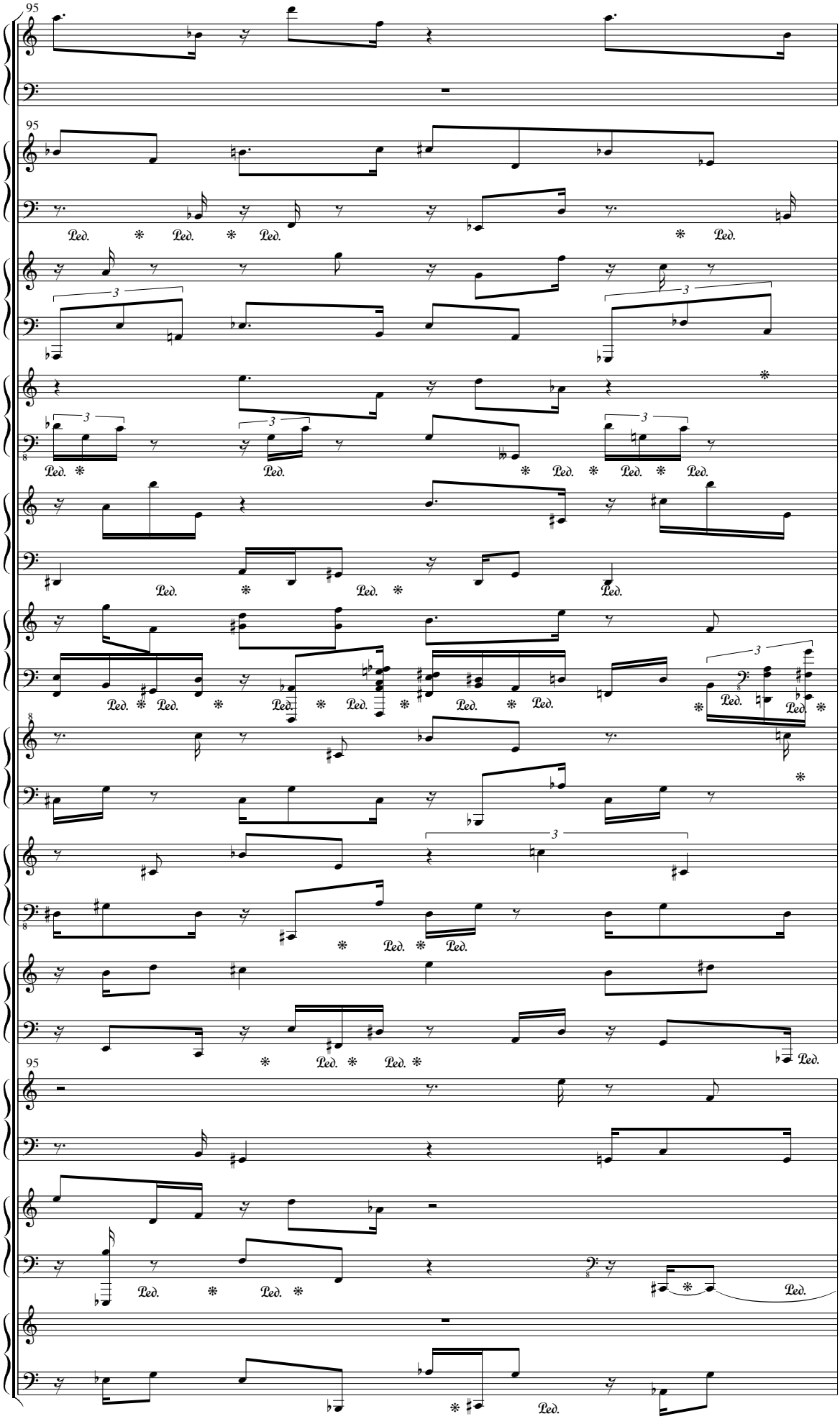

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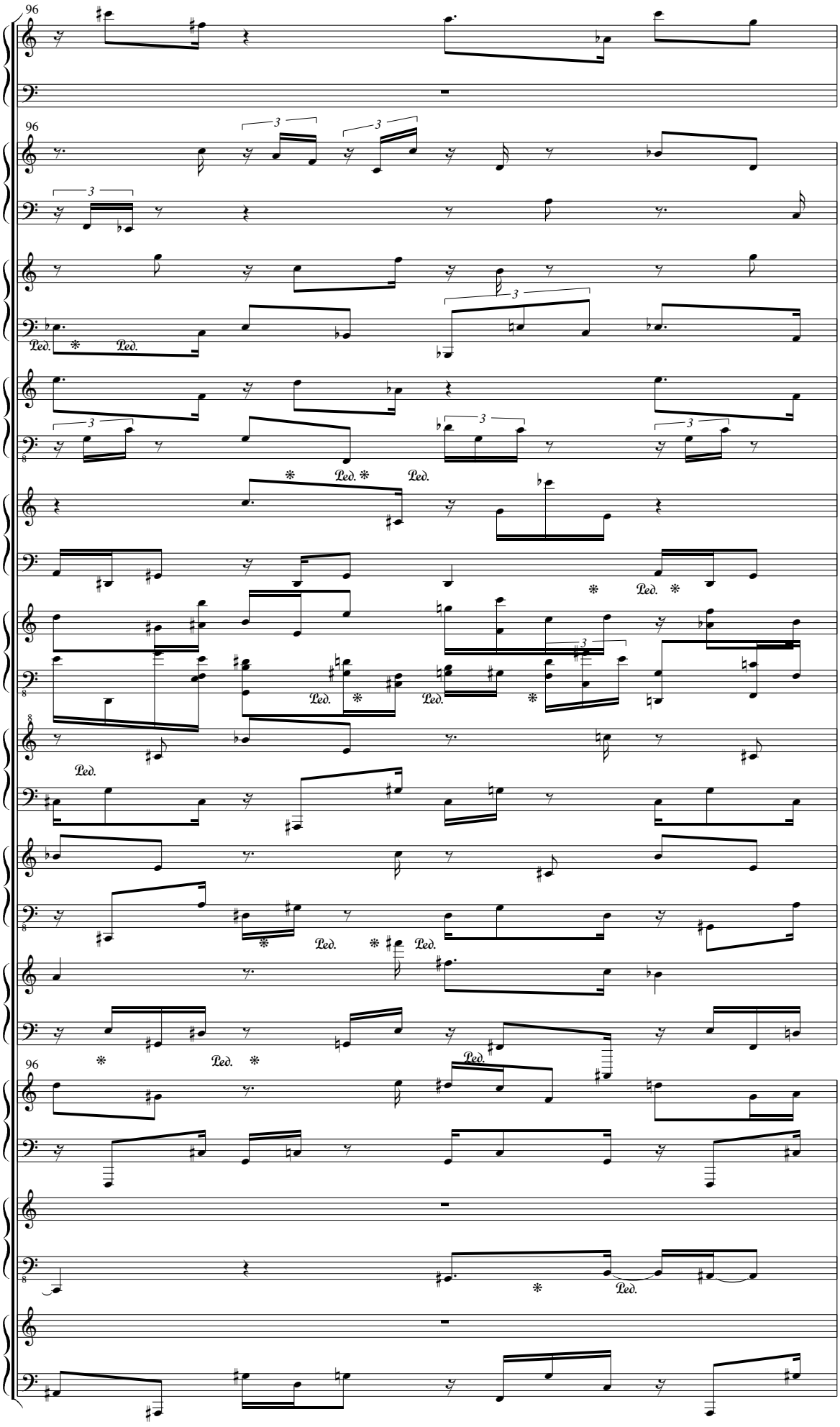

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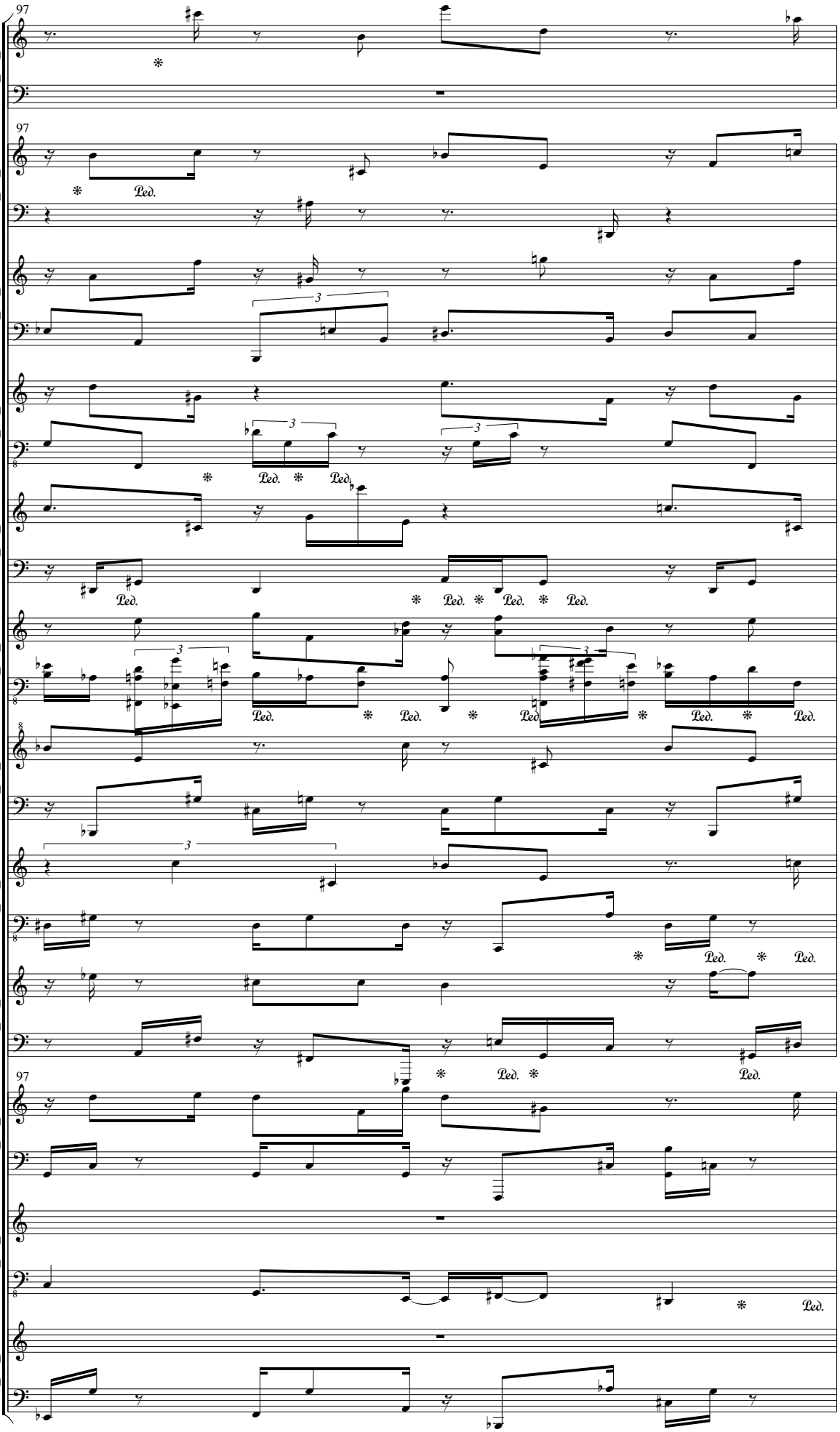

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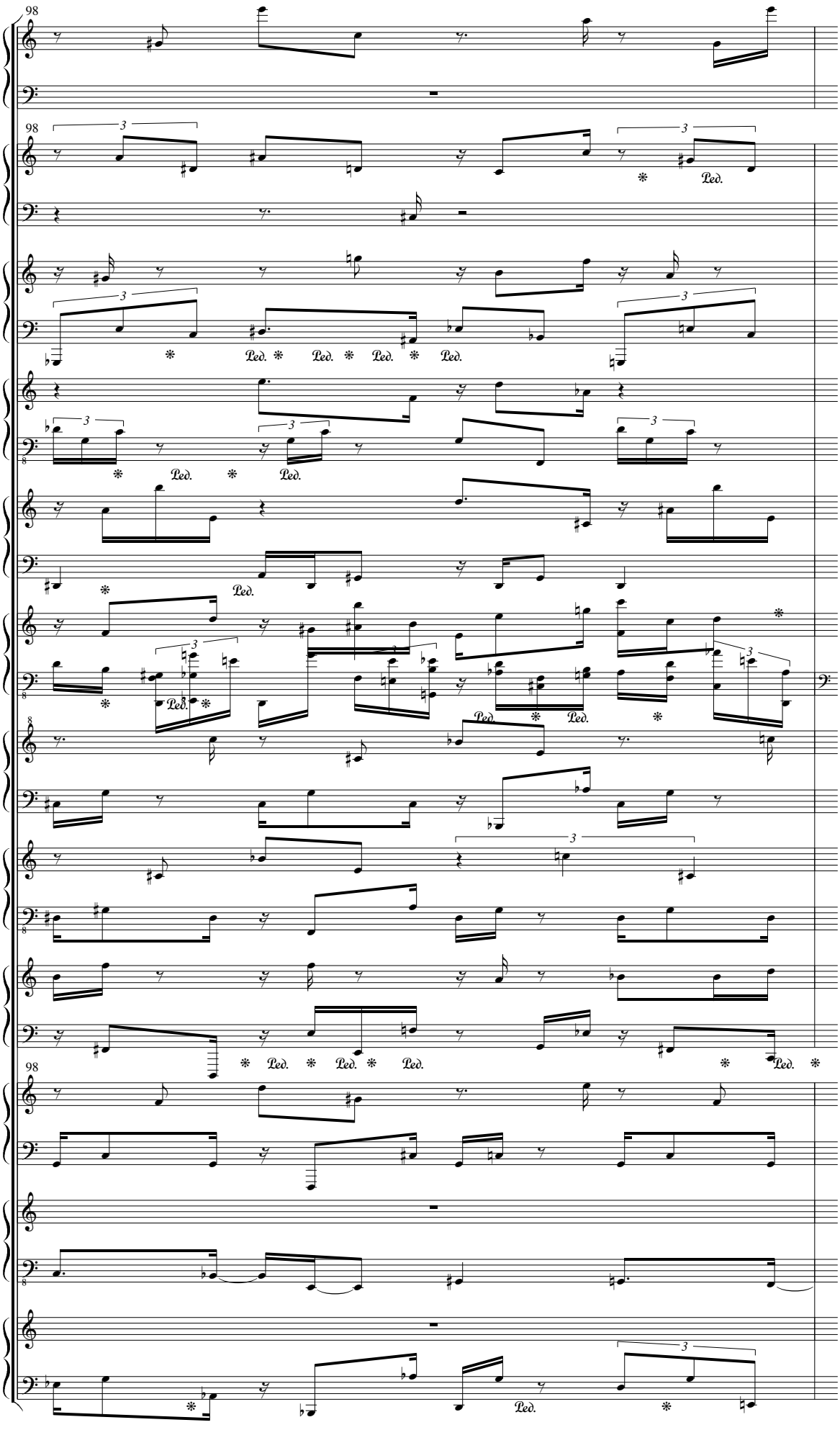

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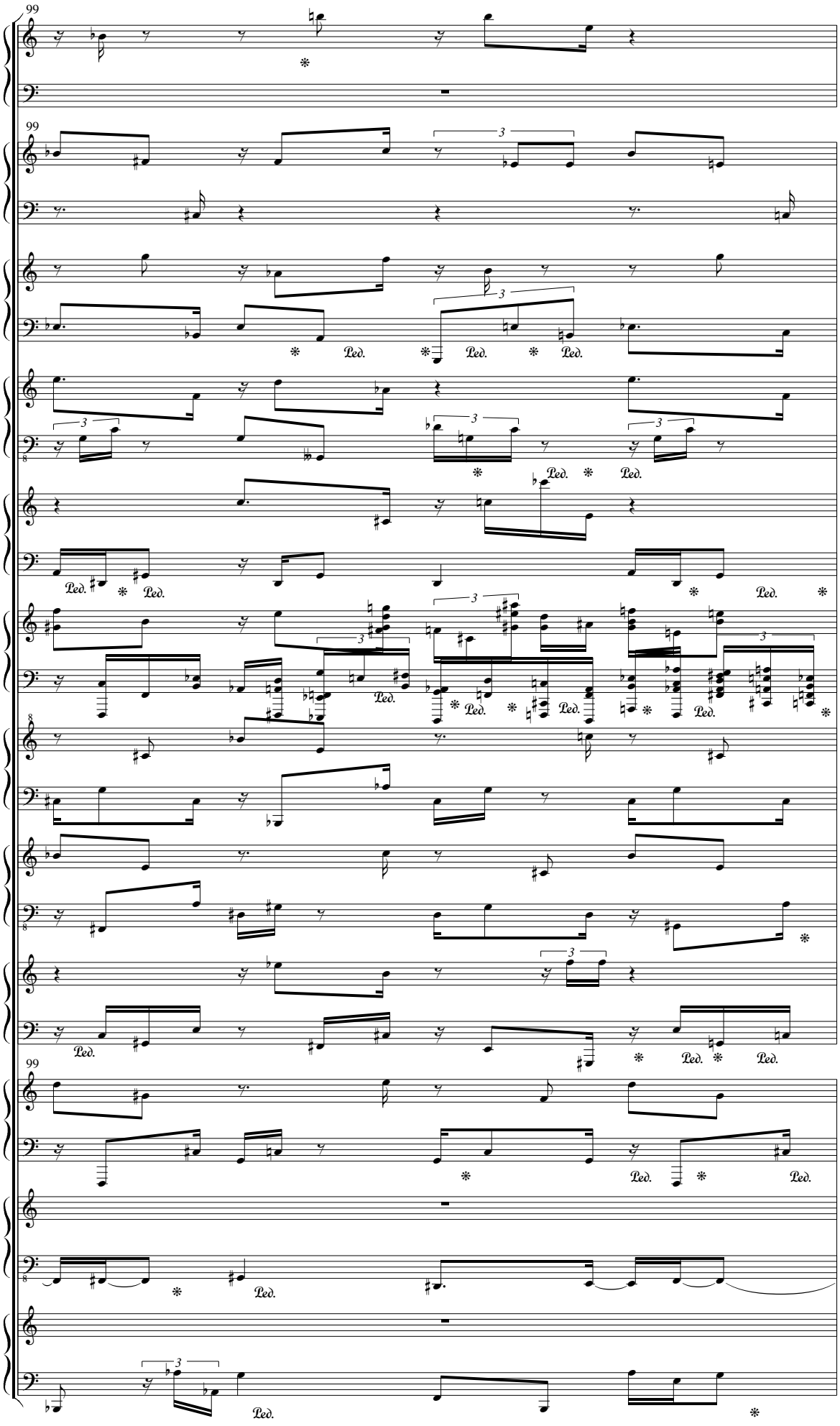

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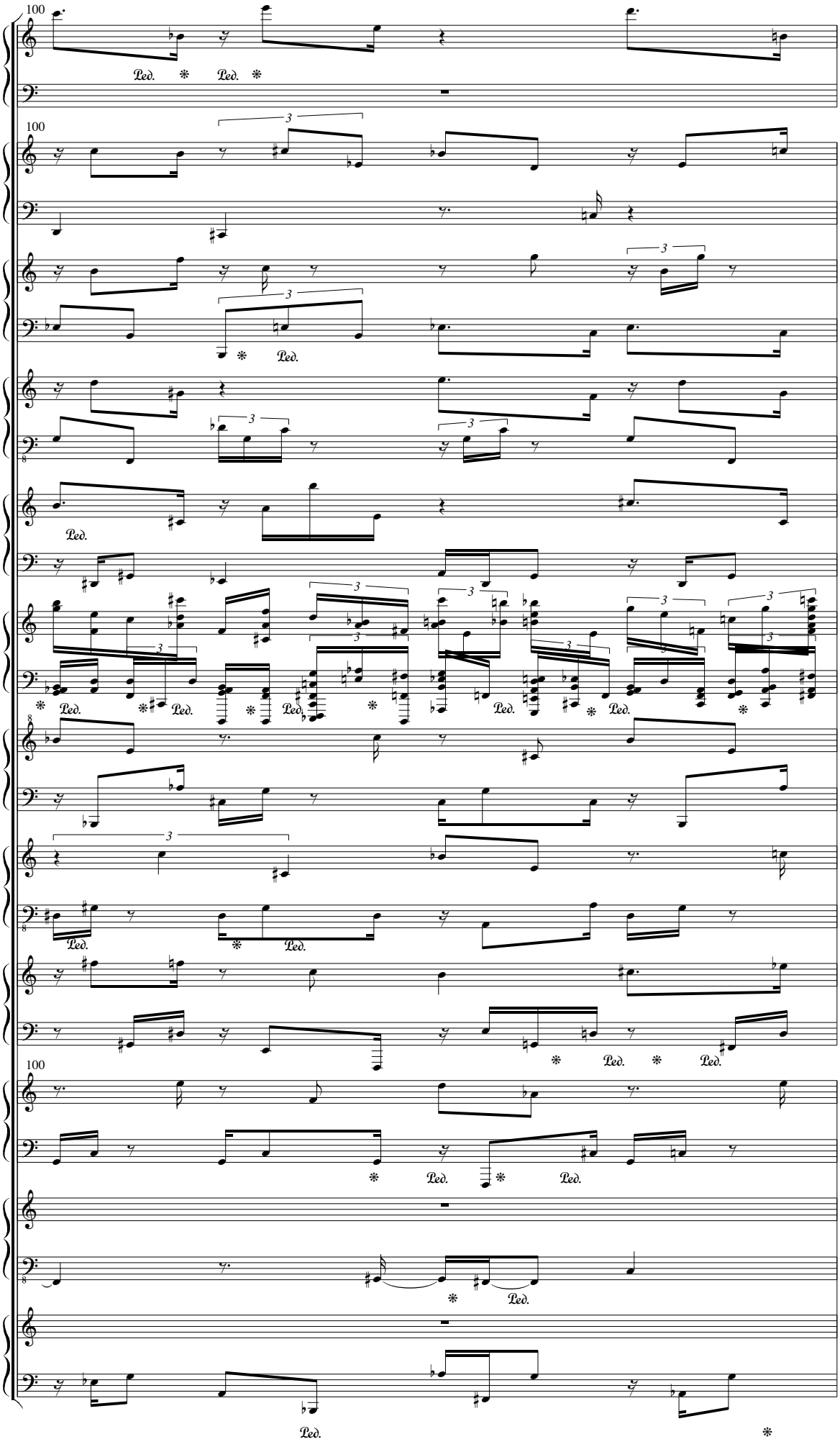

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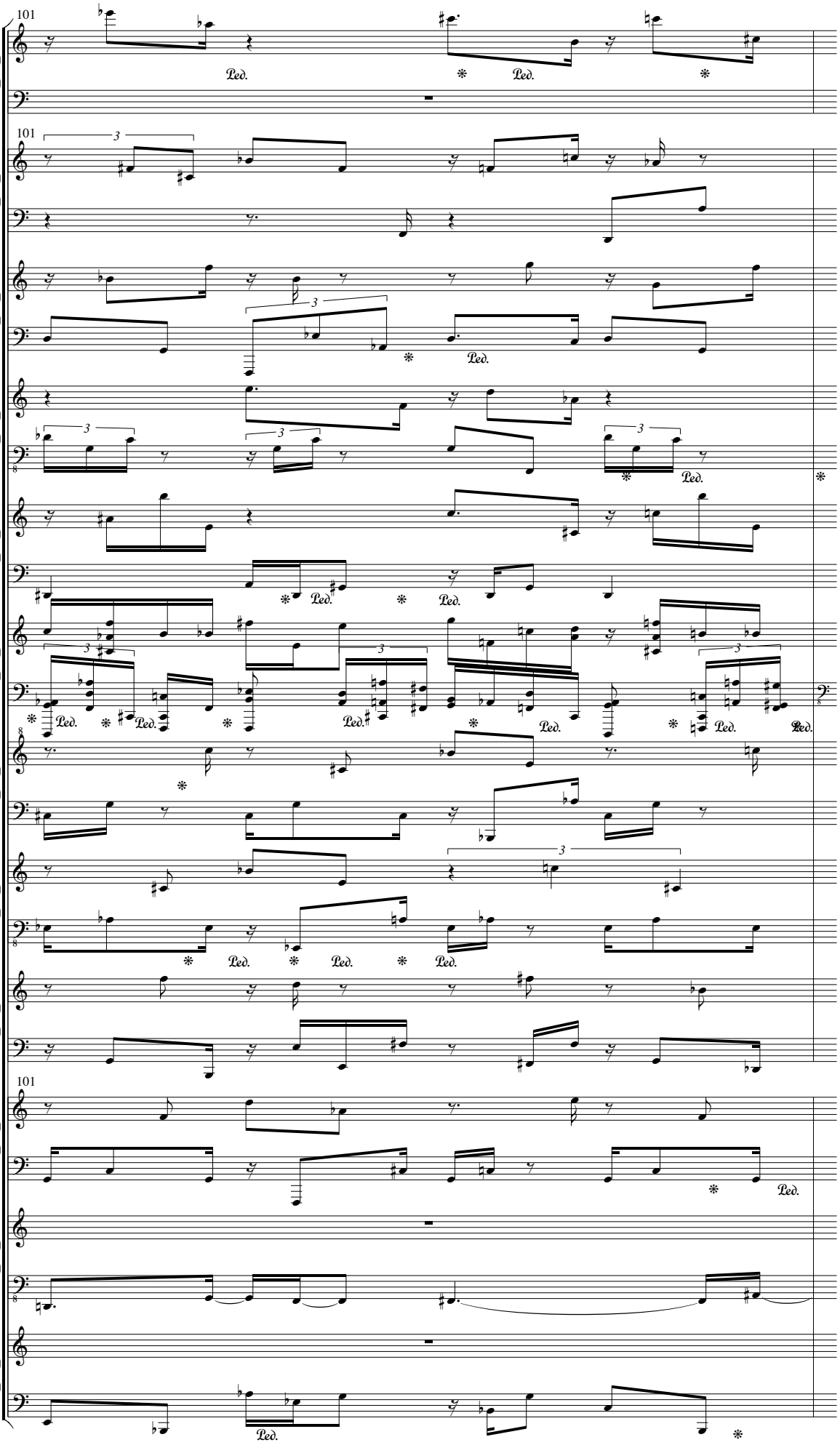

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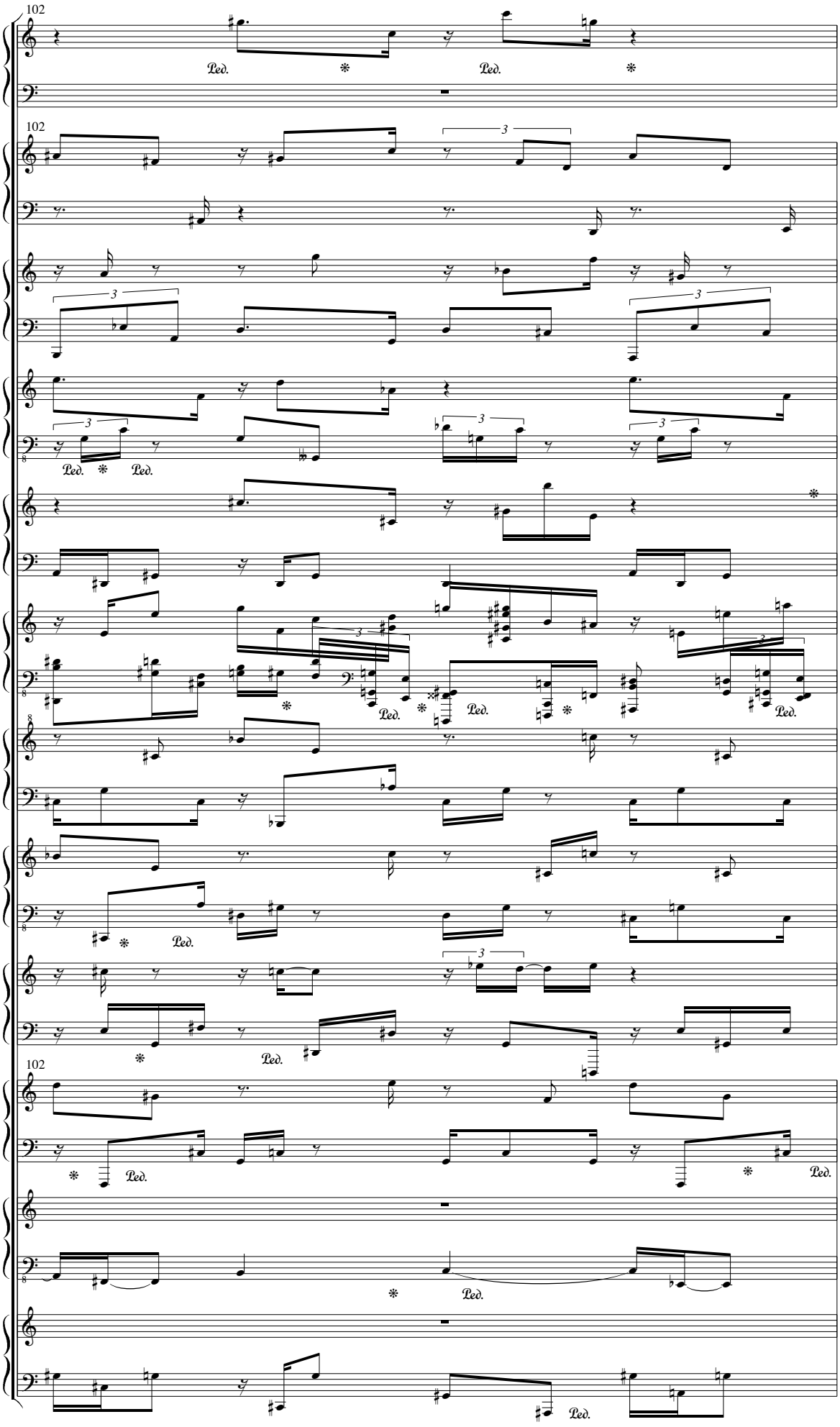

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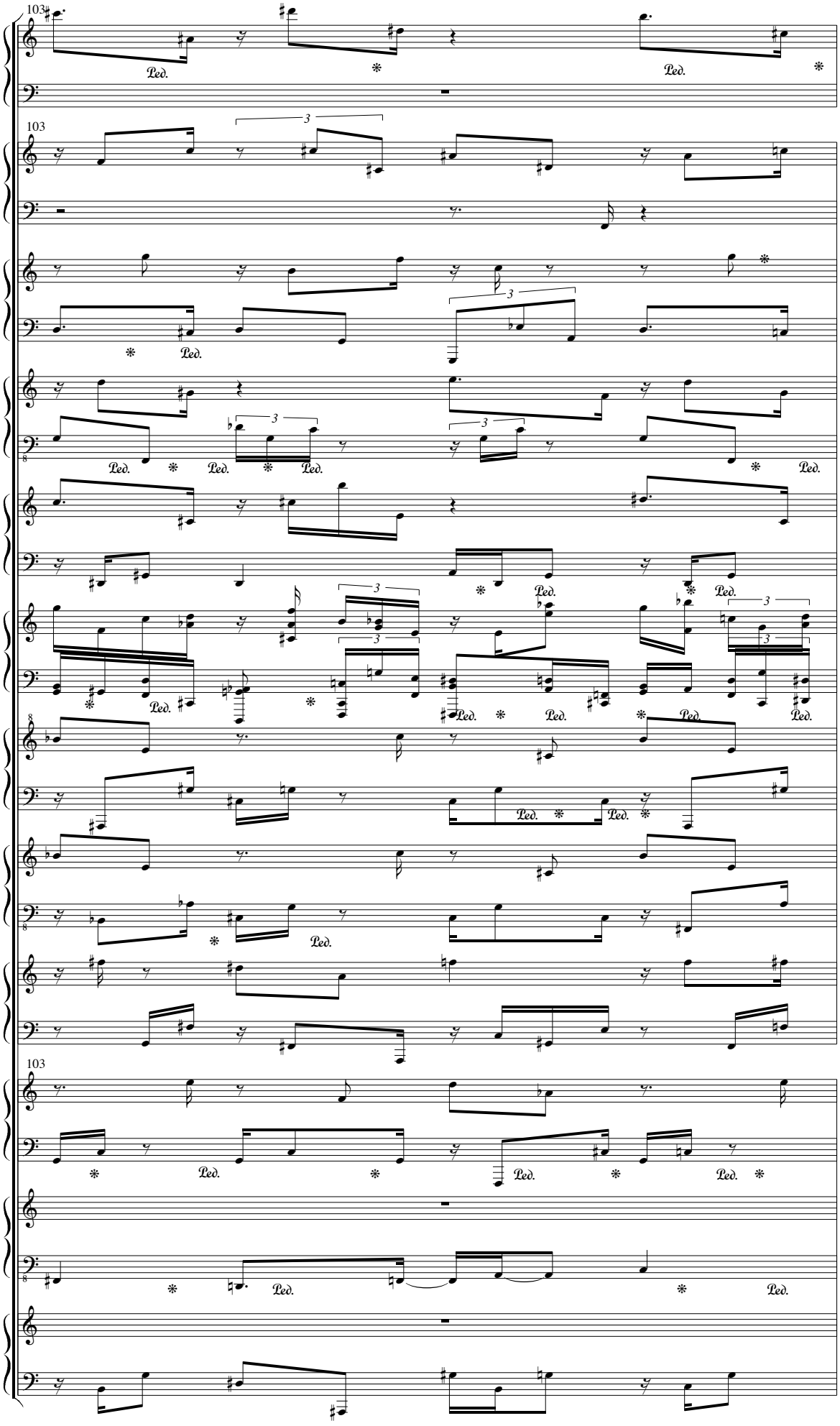

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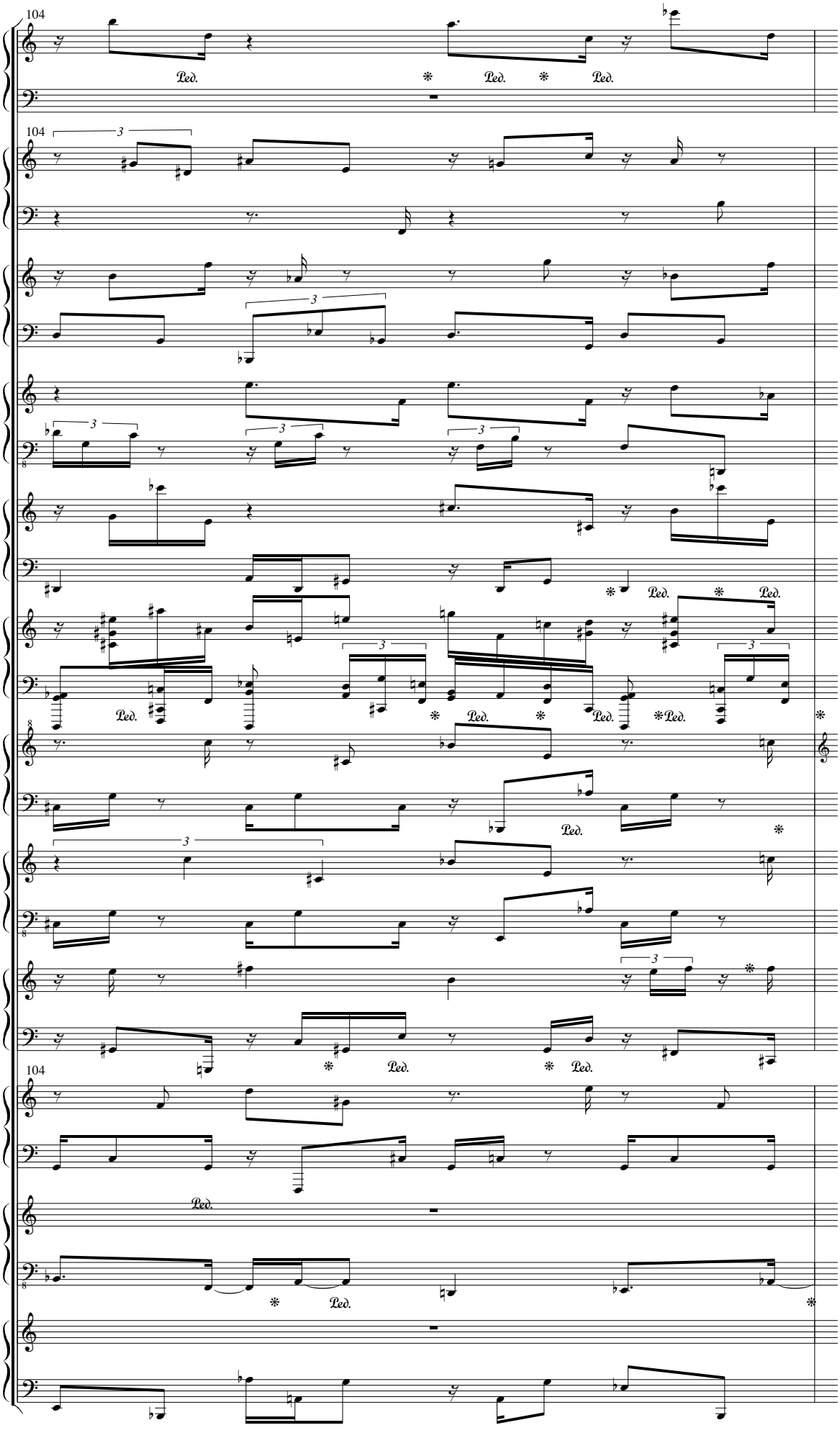

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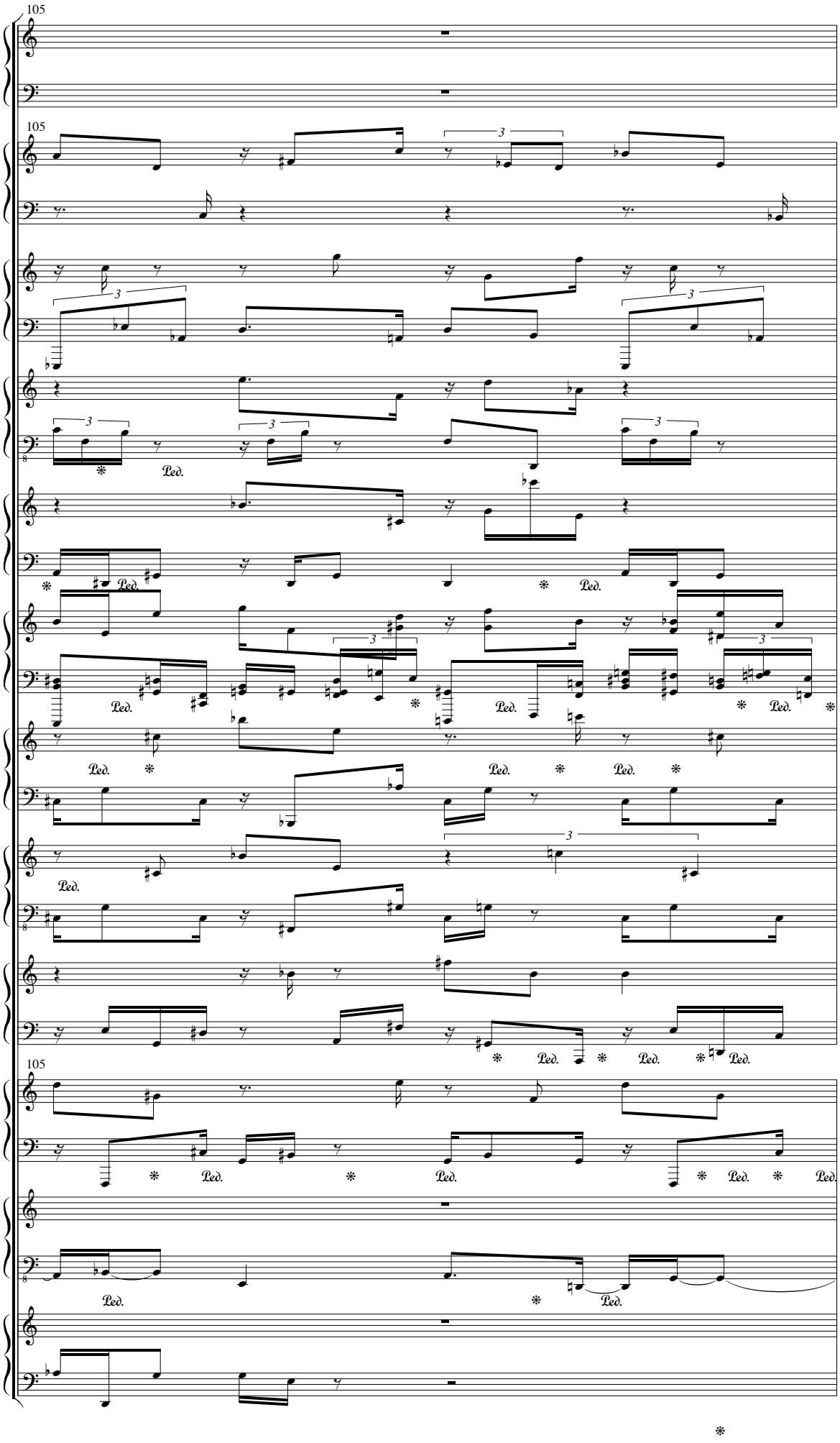

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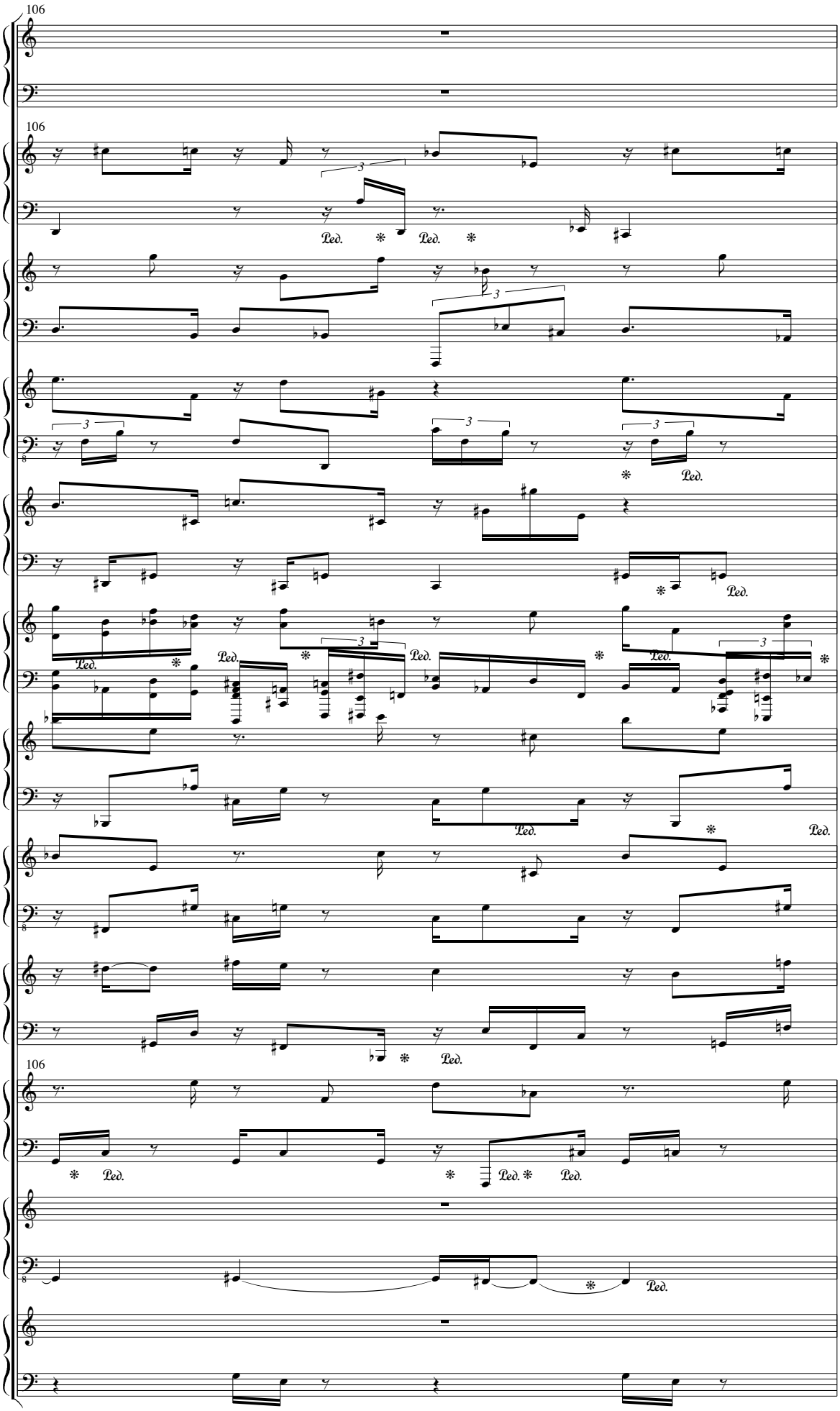

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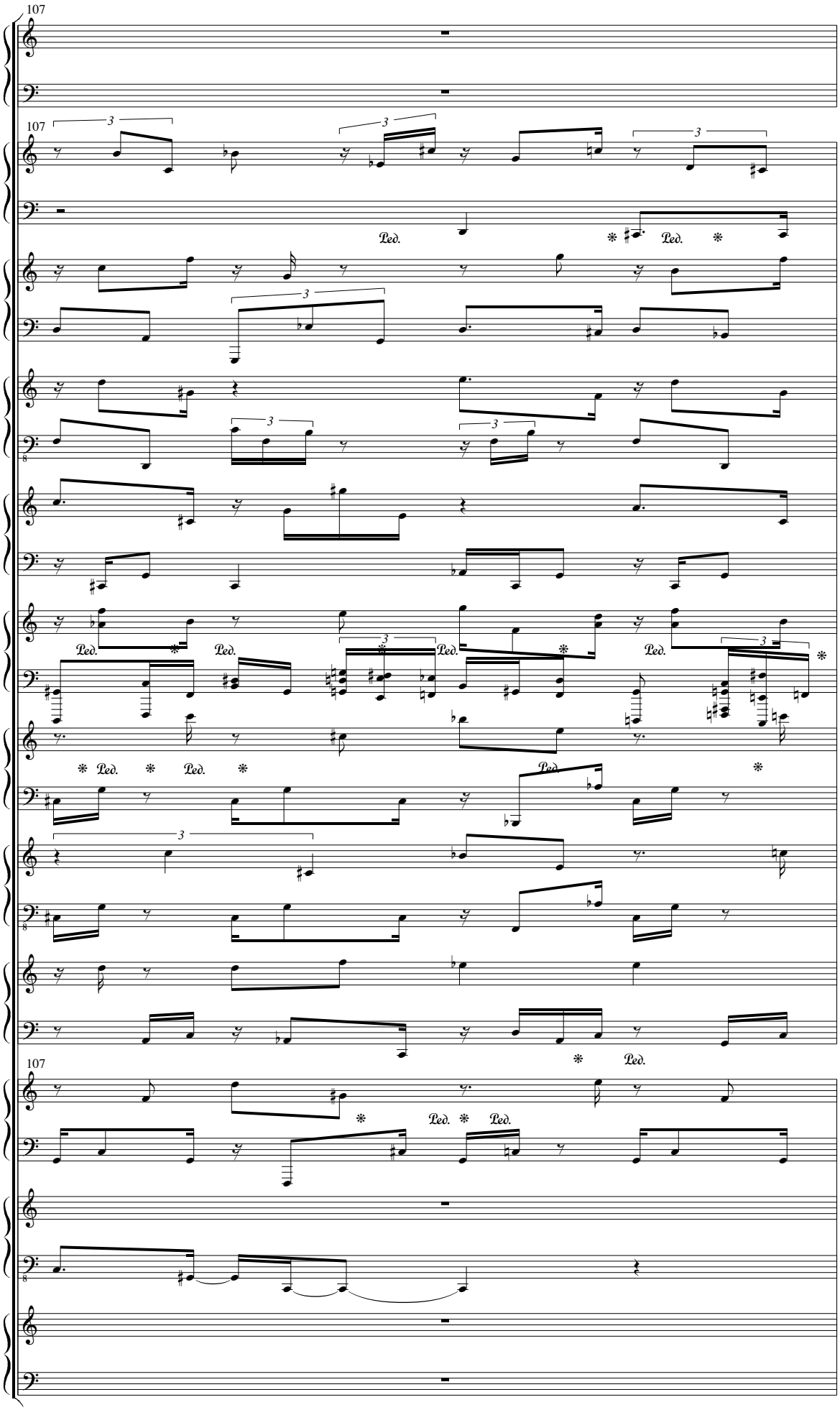

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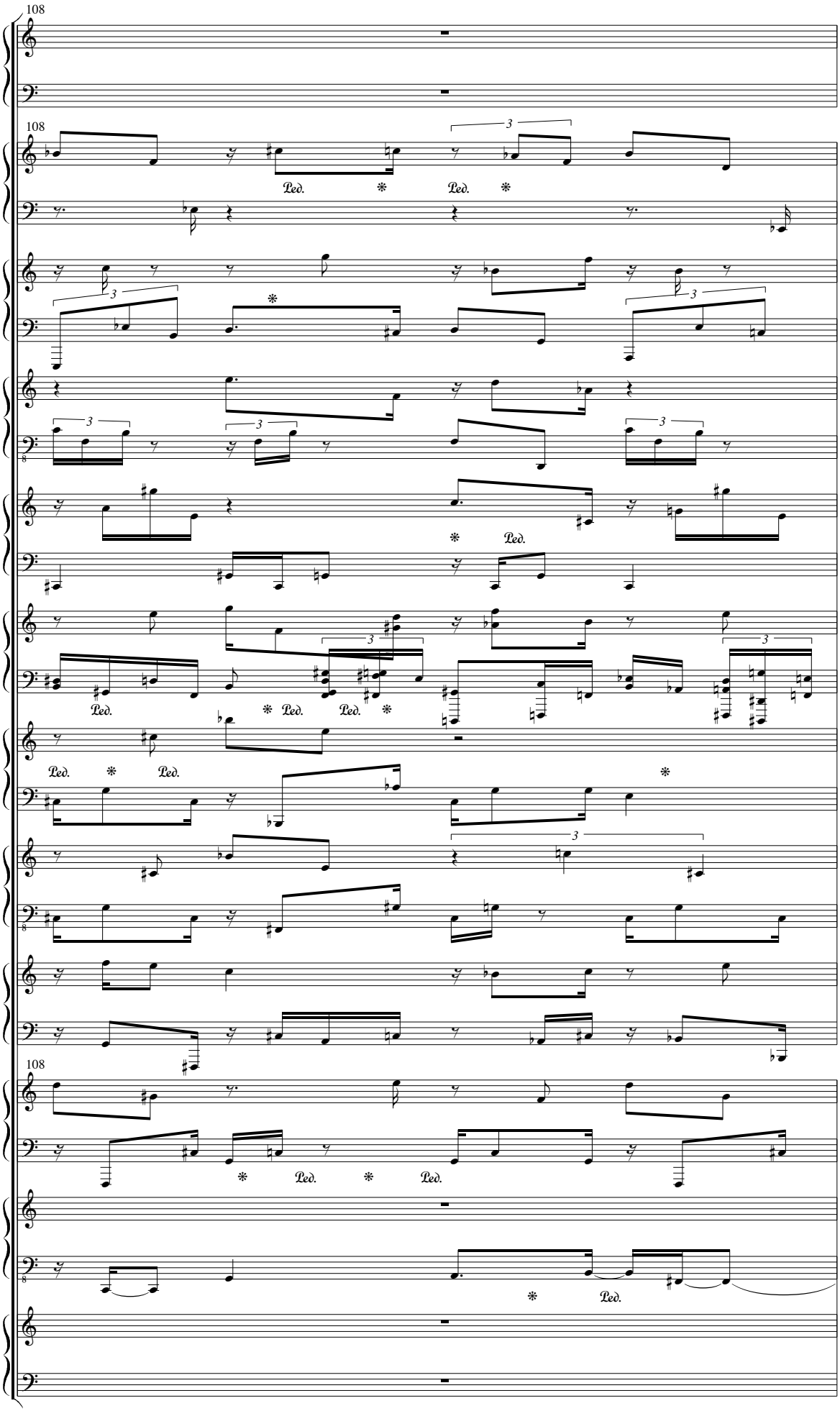

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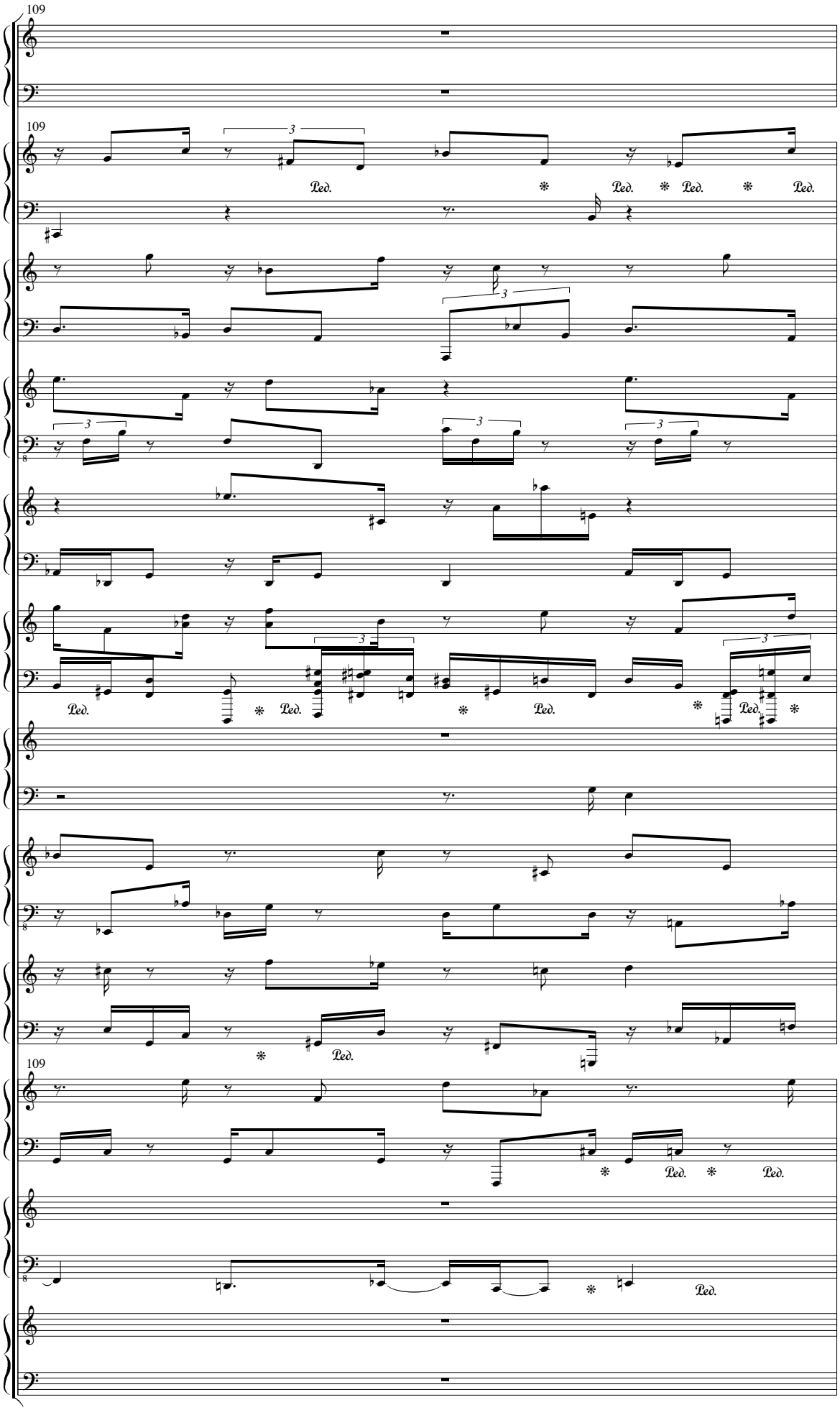

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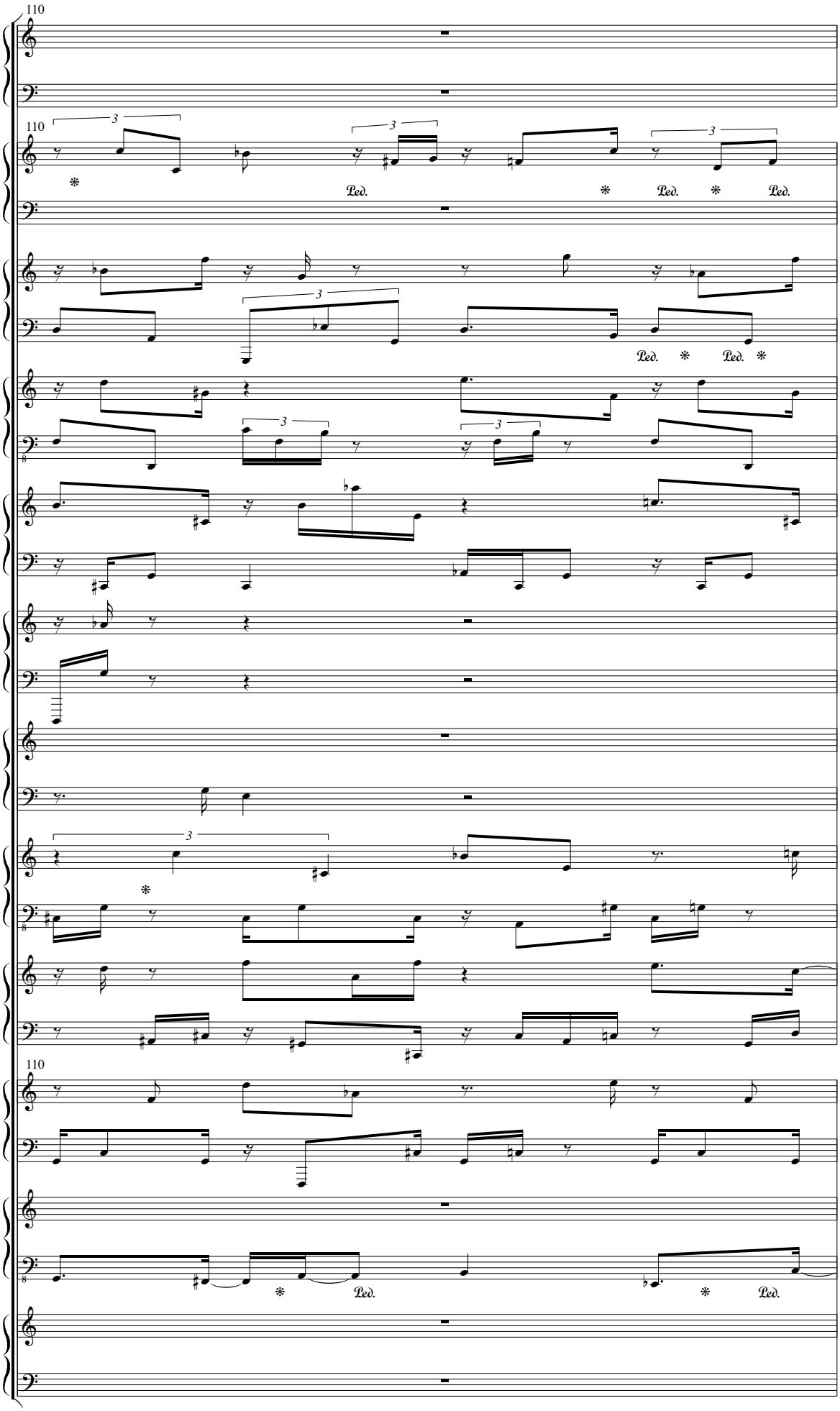

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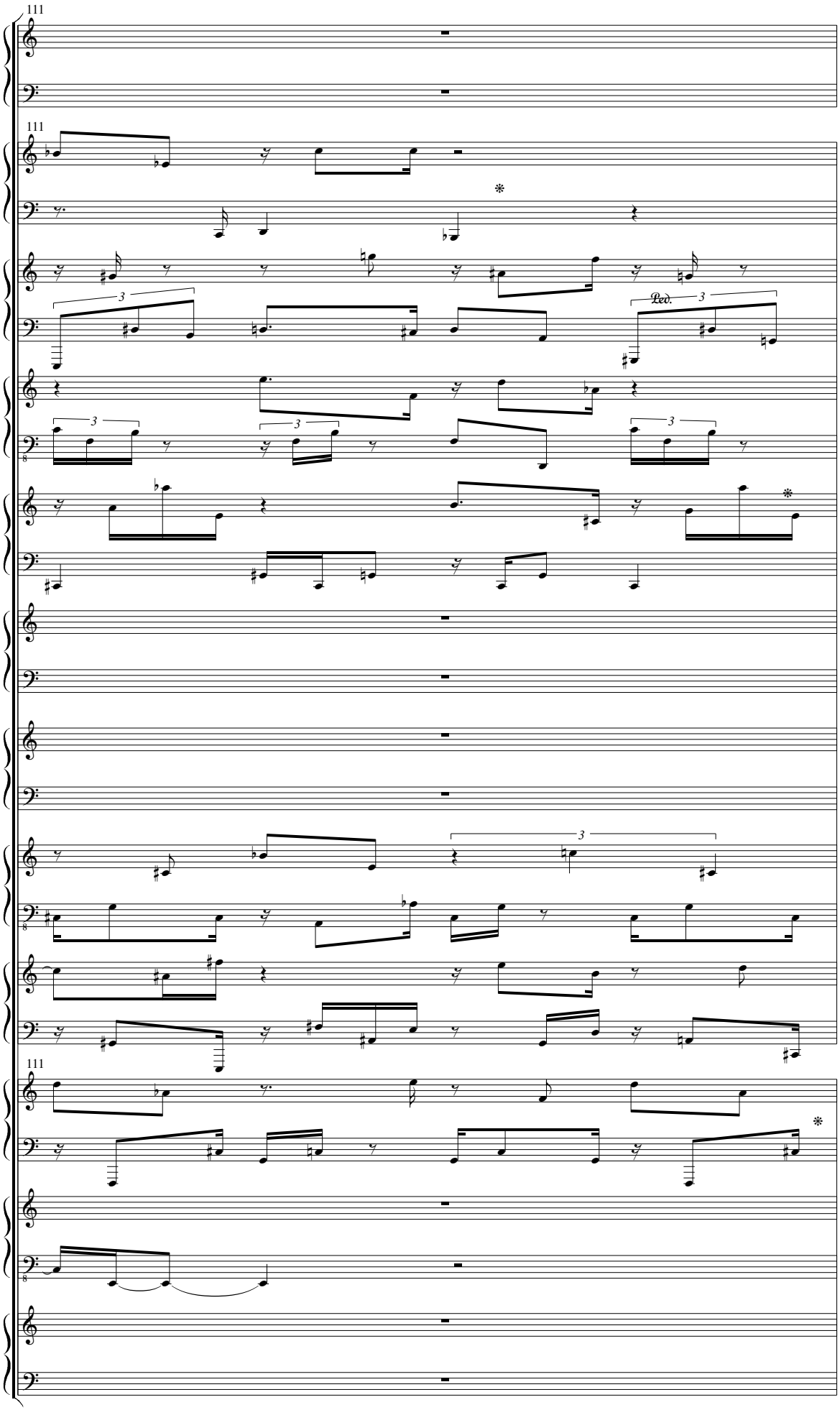

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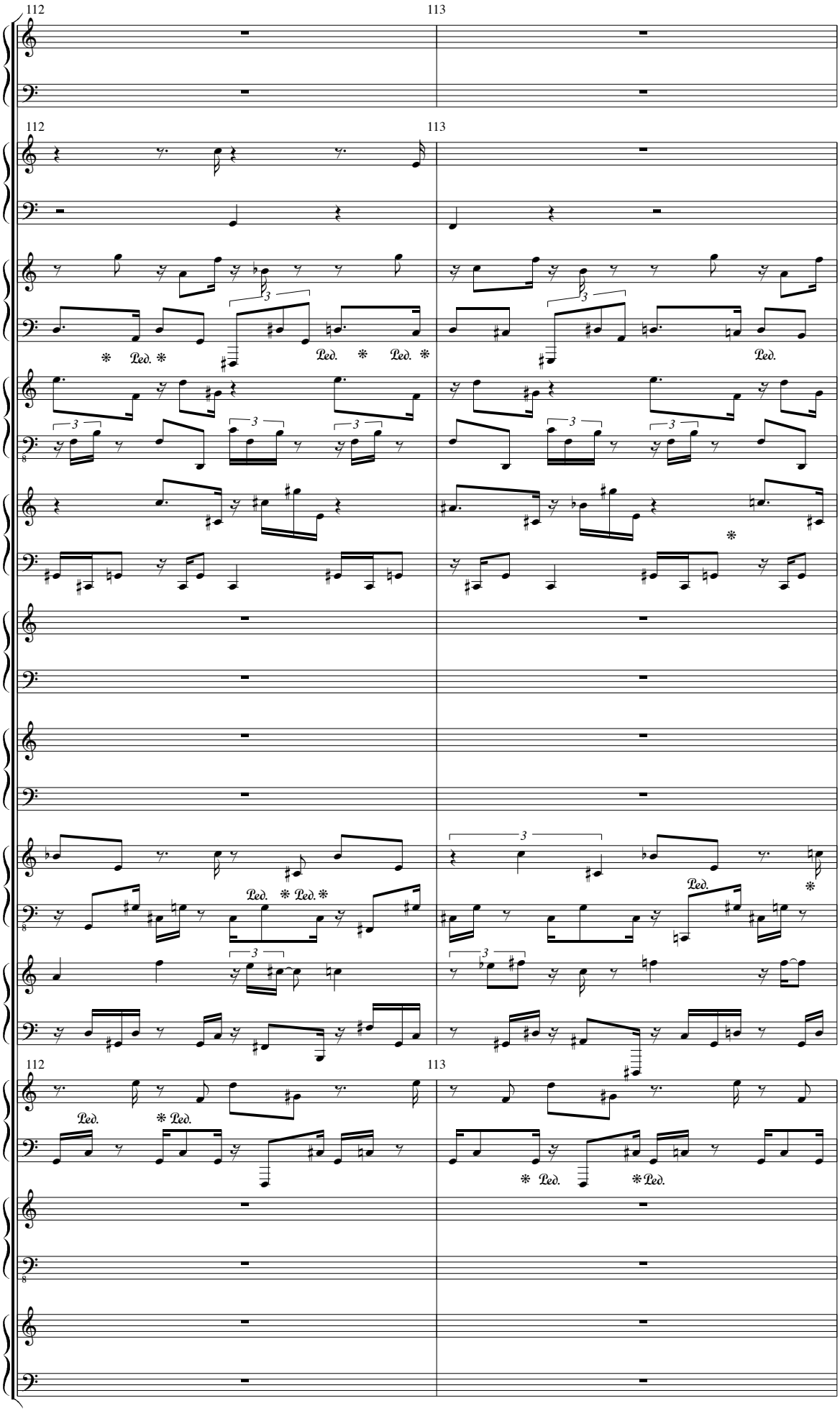

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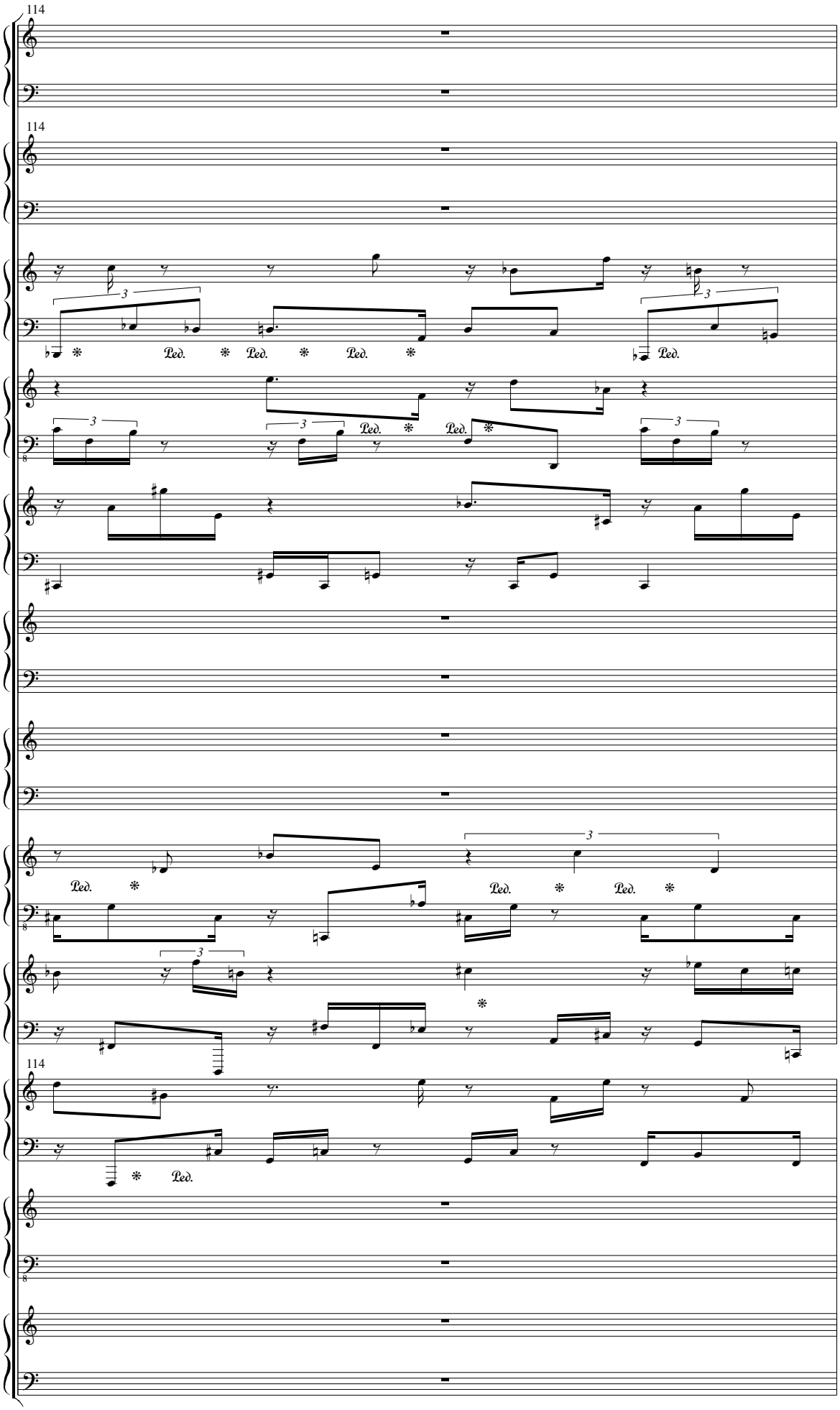

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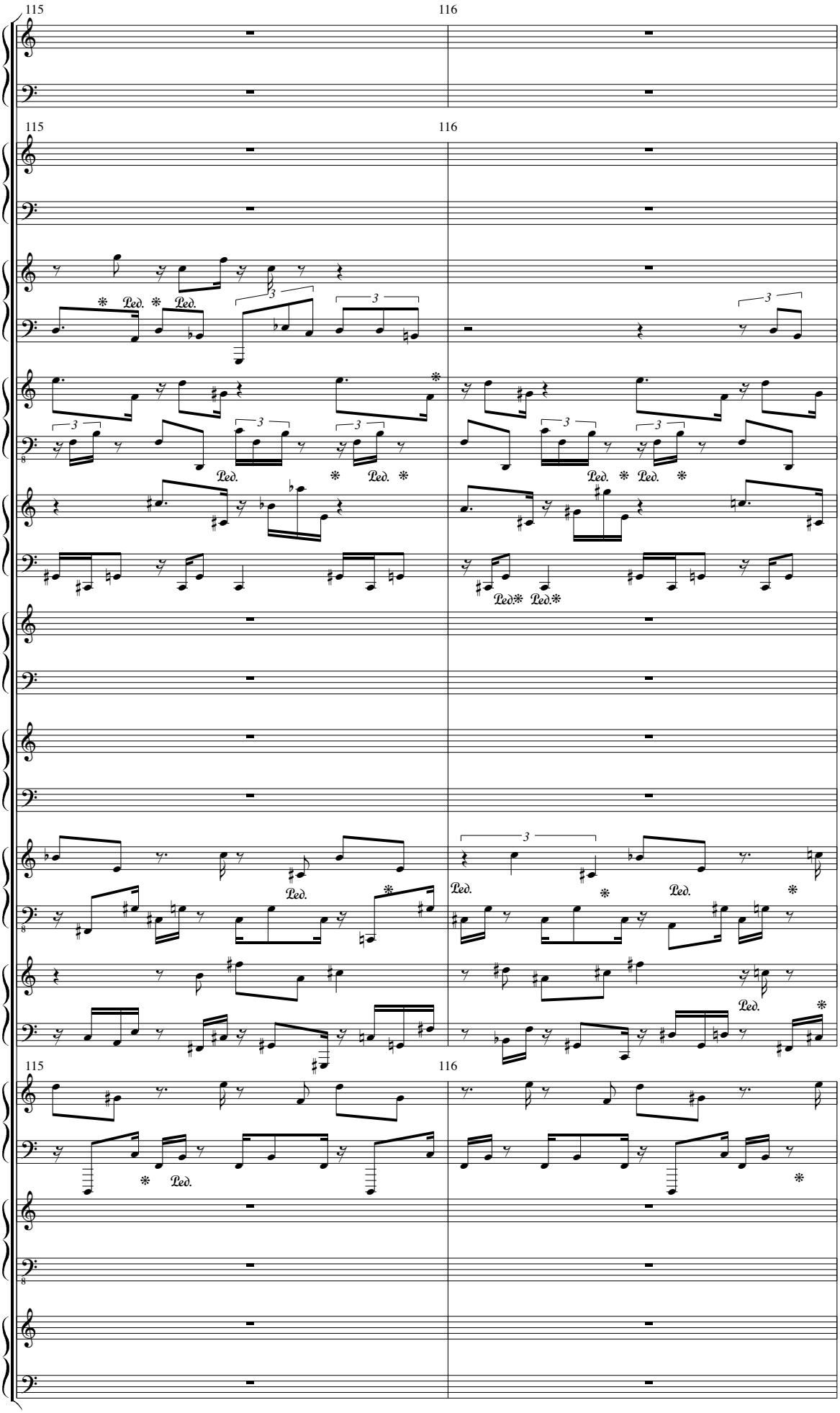

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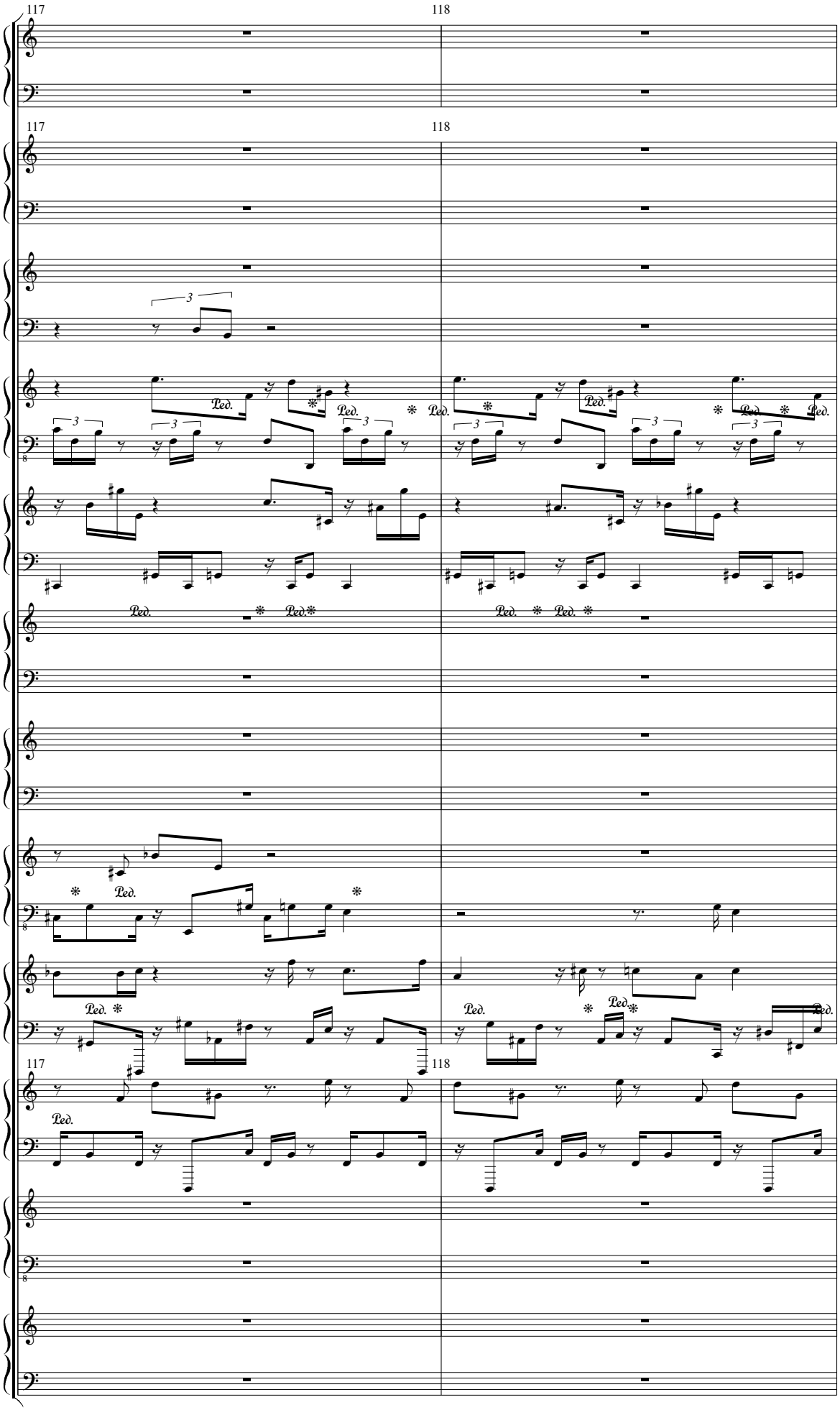

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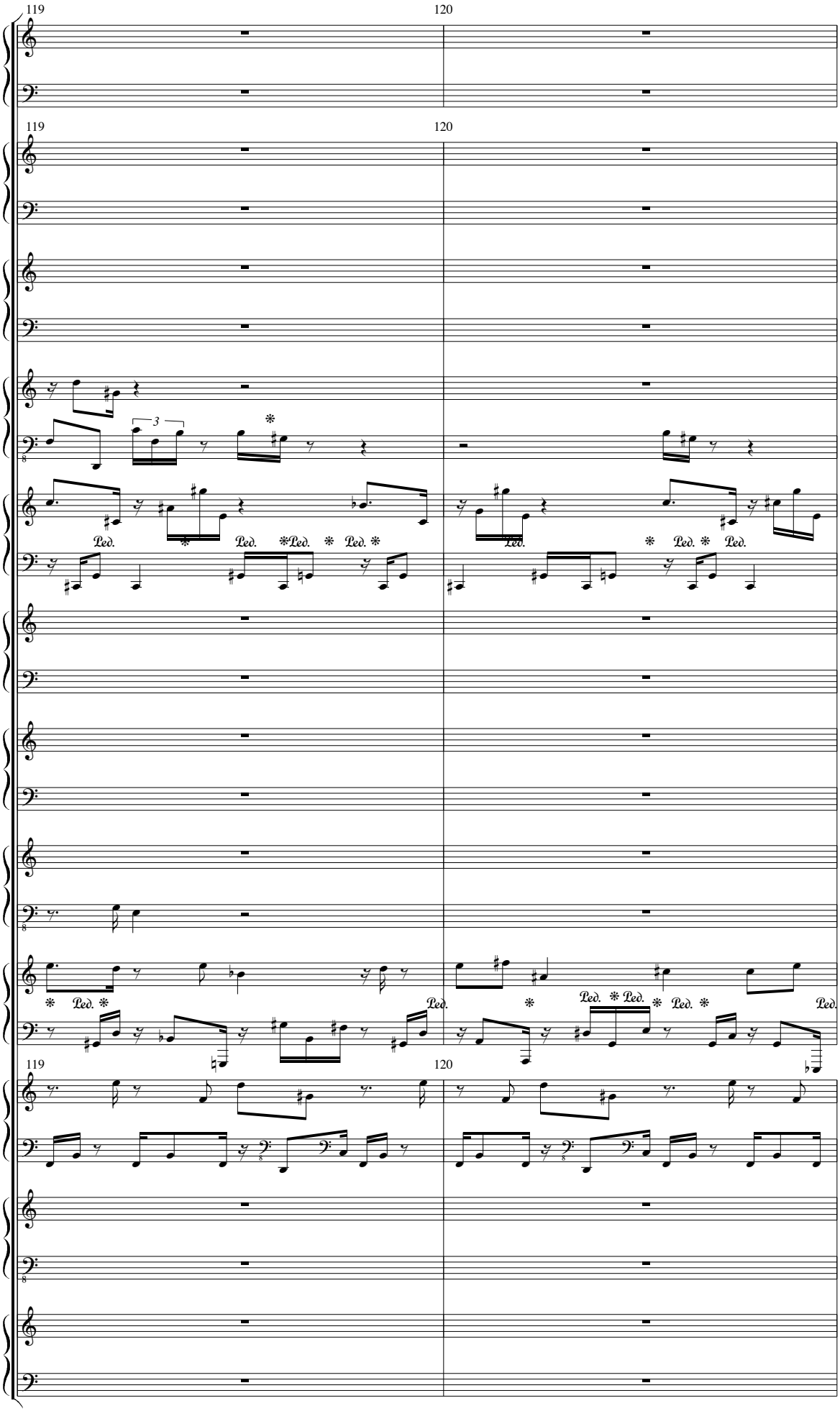

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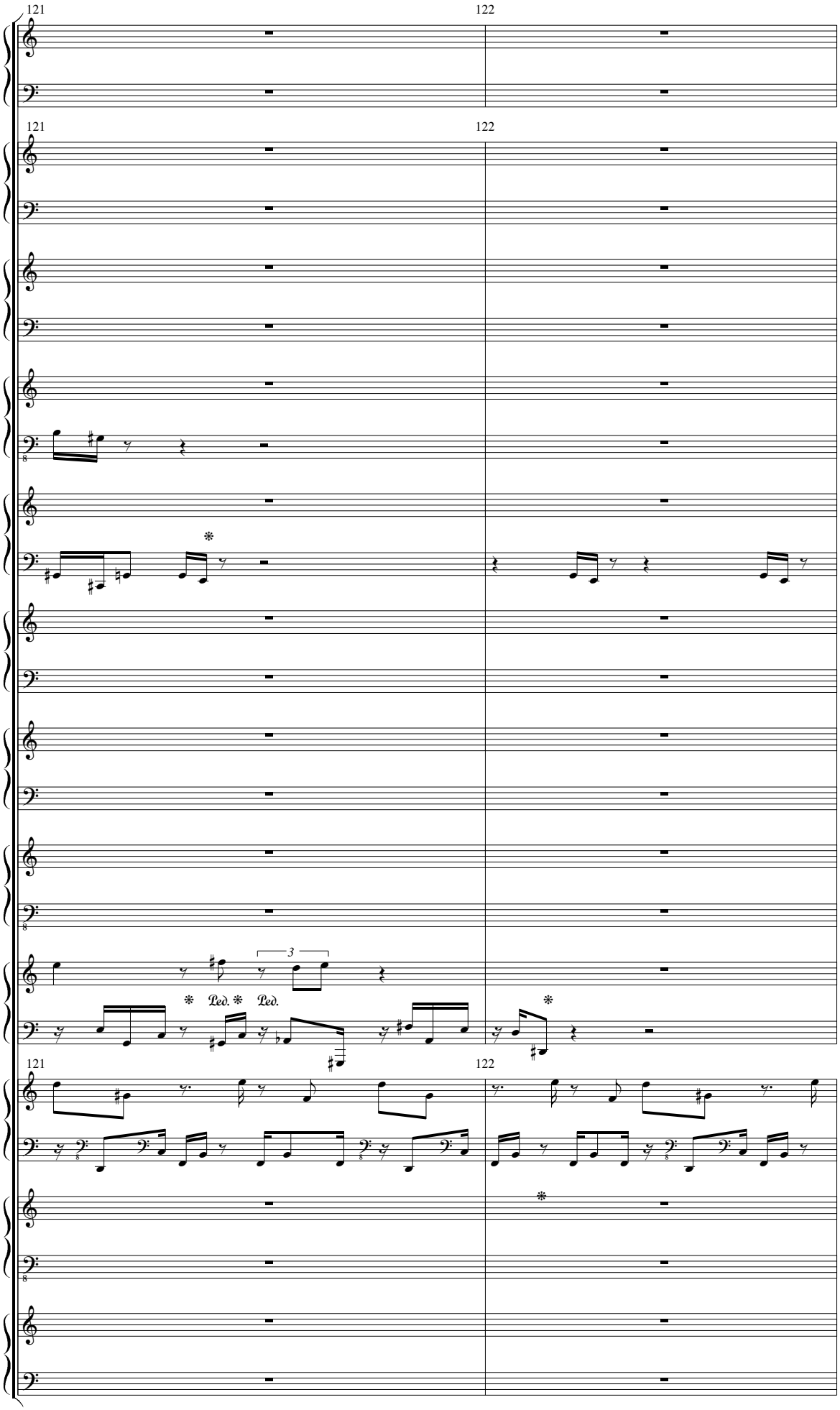

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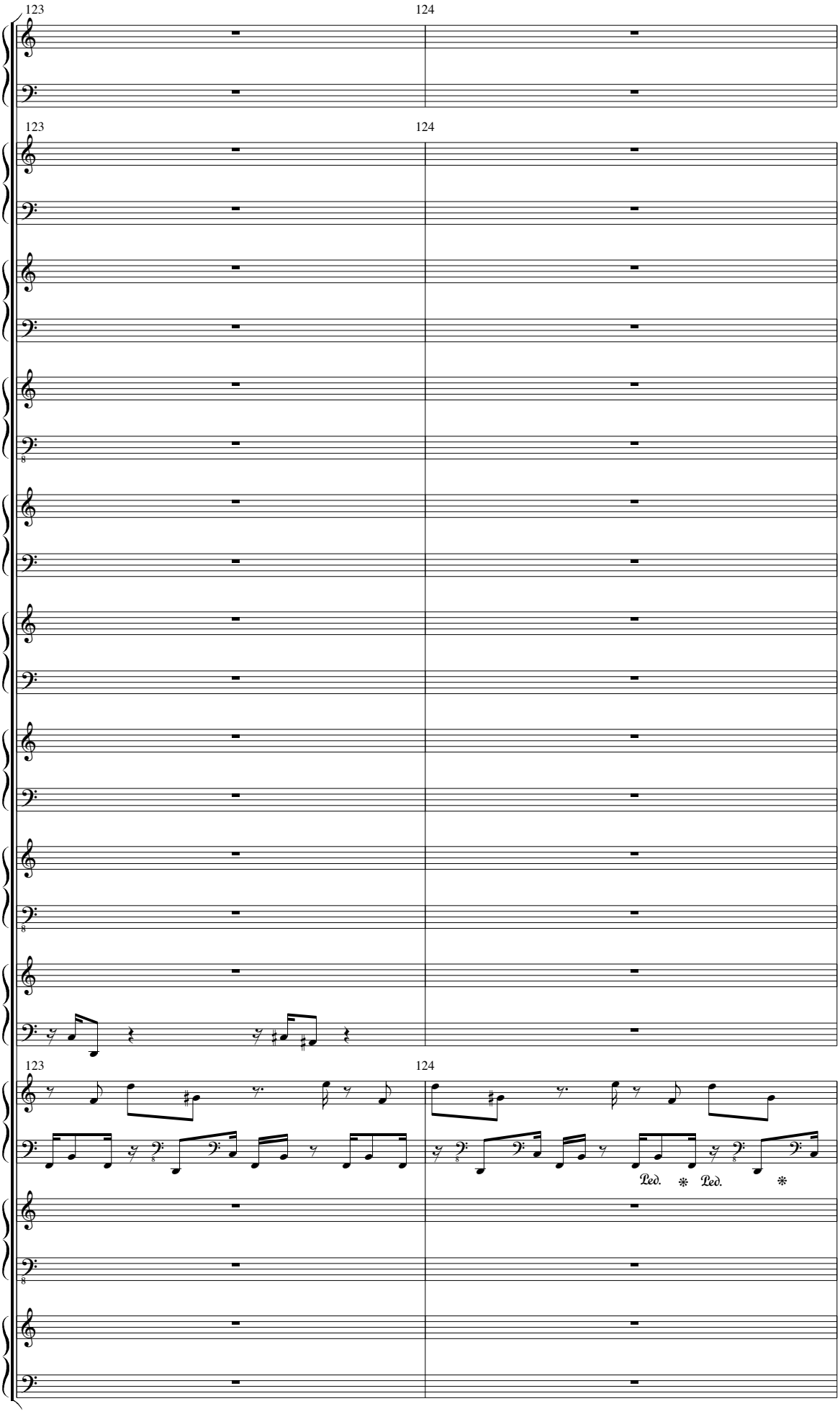

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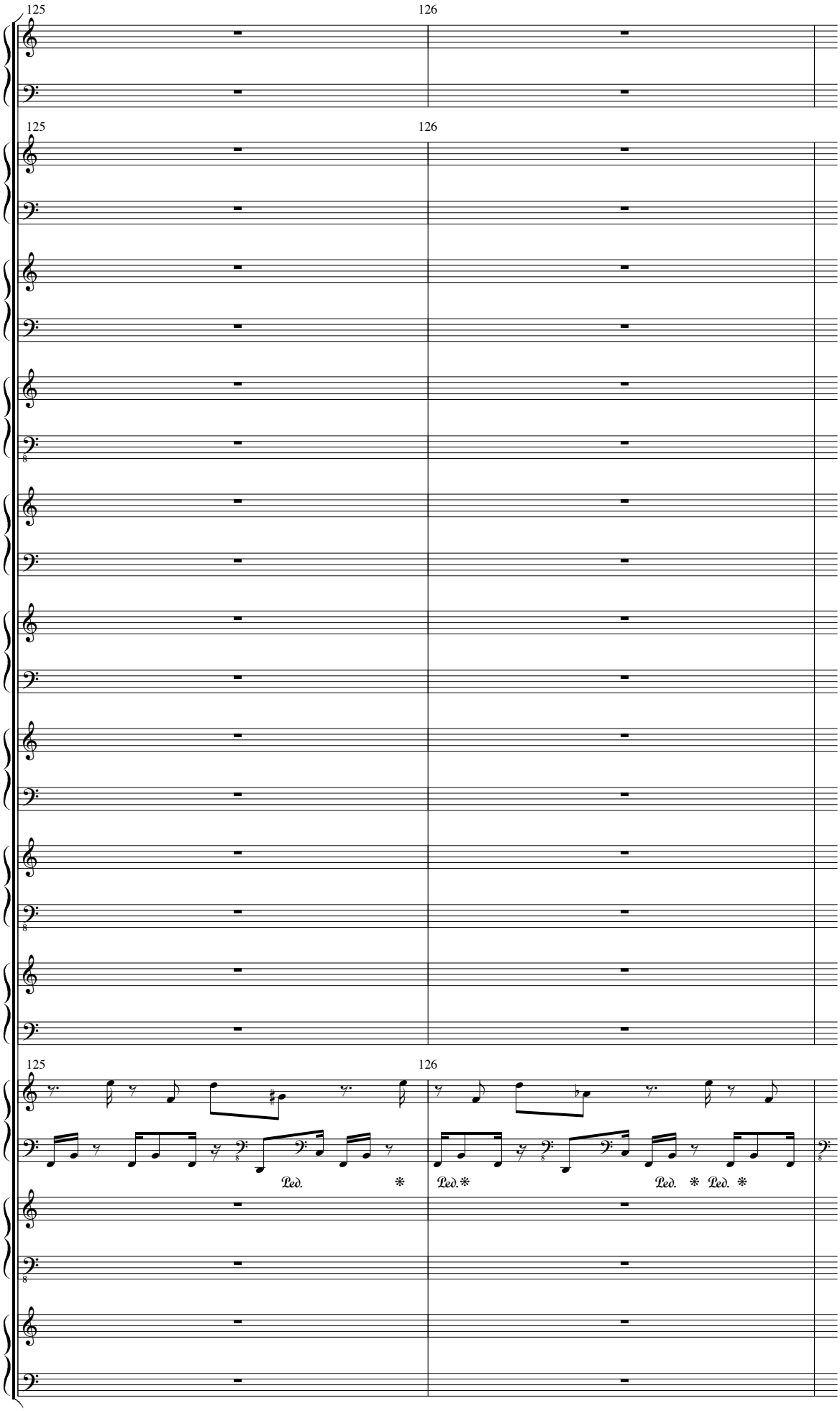

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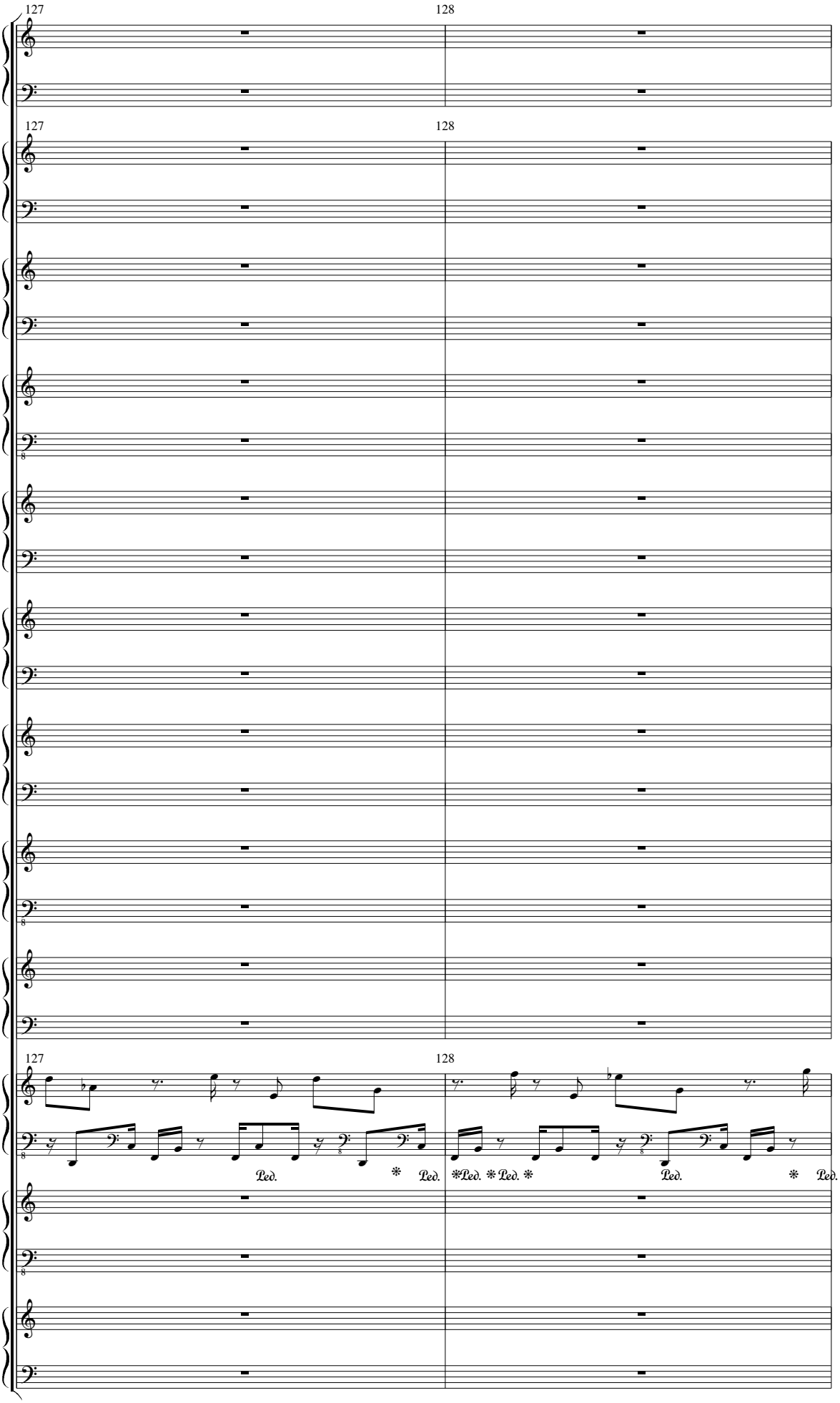

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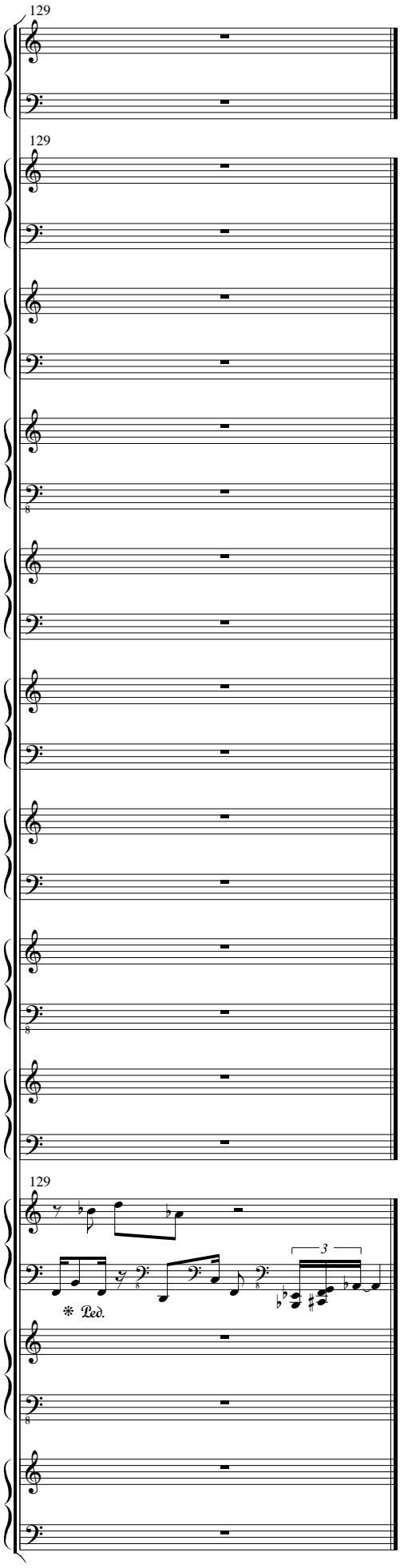

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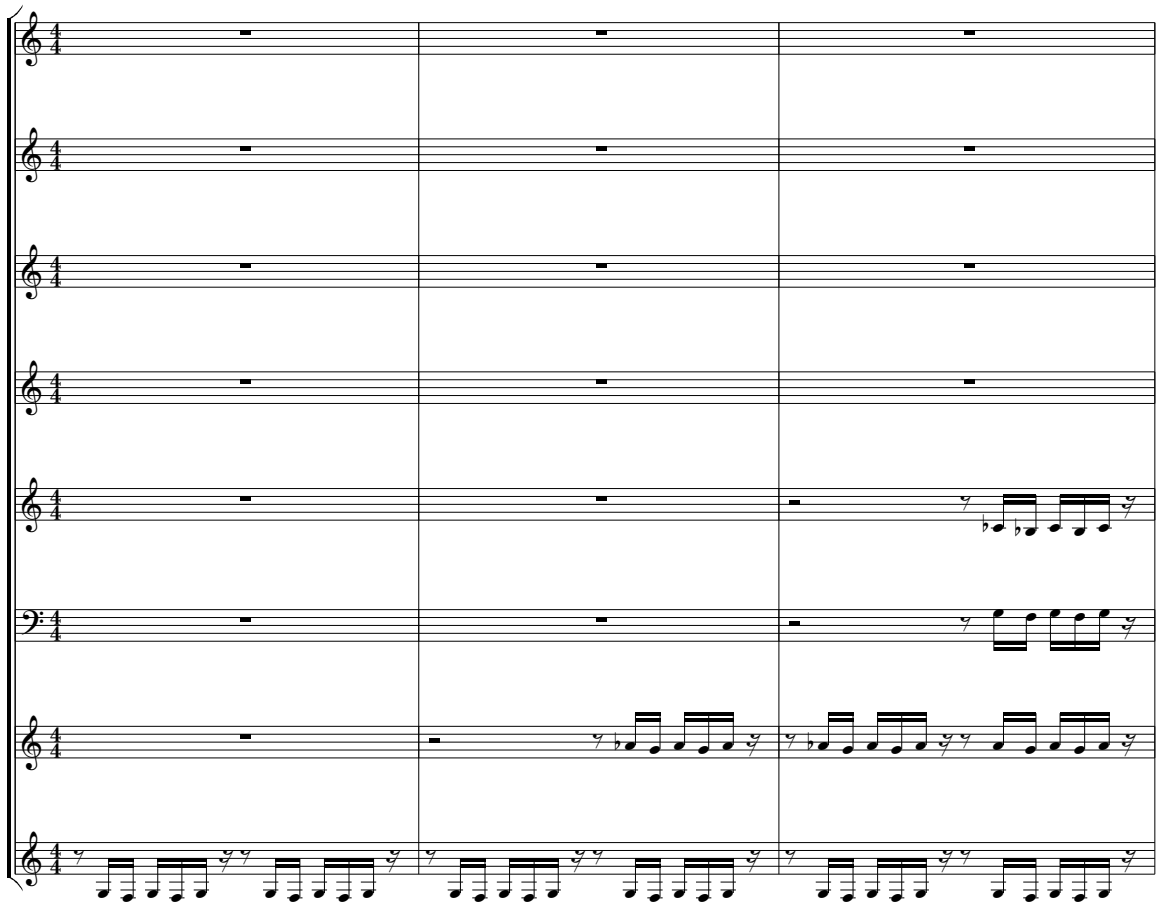

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Dreaming at the Circular Ruins (2)

Dreaming at the Circular Ruins, No.2 2012
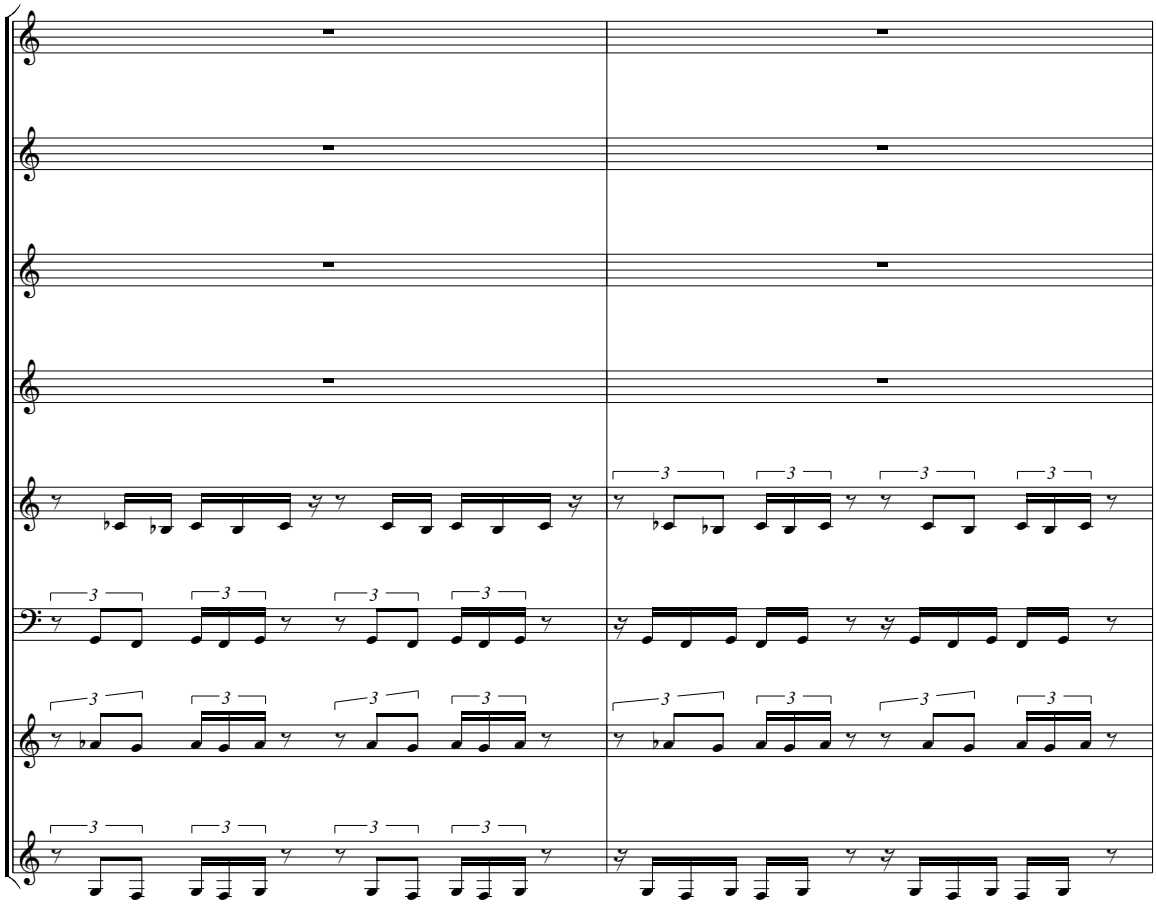
for "Conlon-in-Purple"
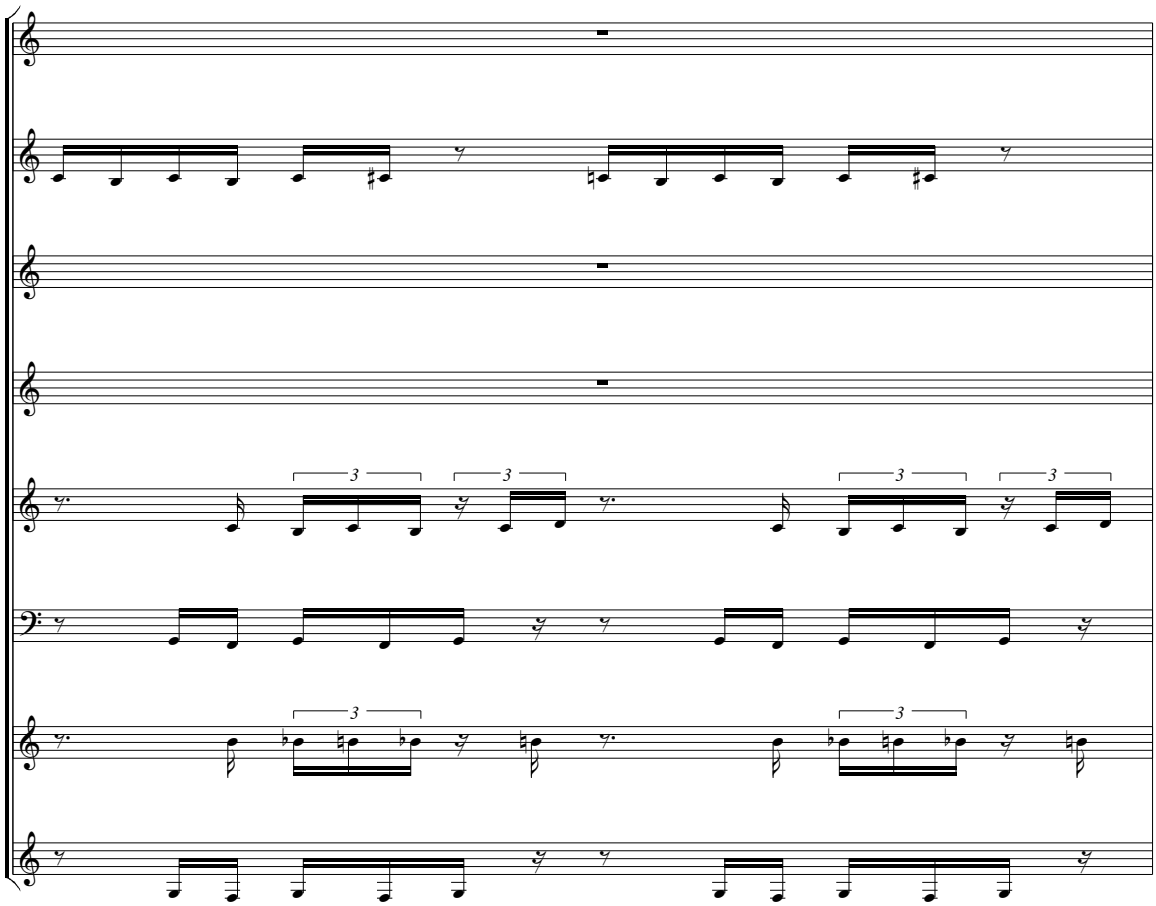
This score quantised to 16/24

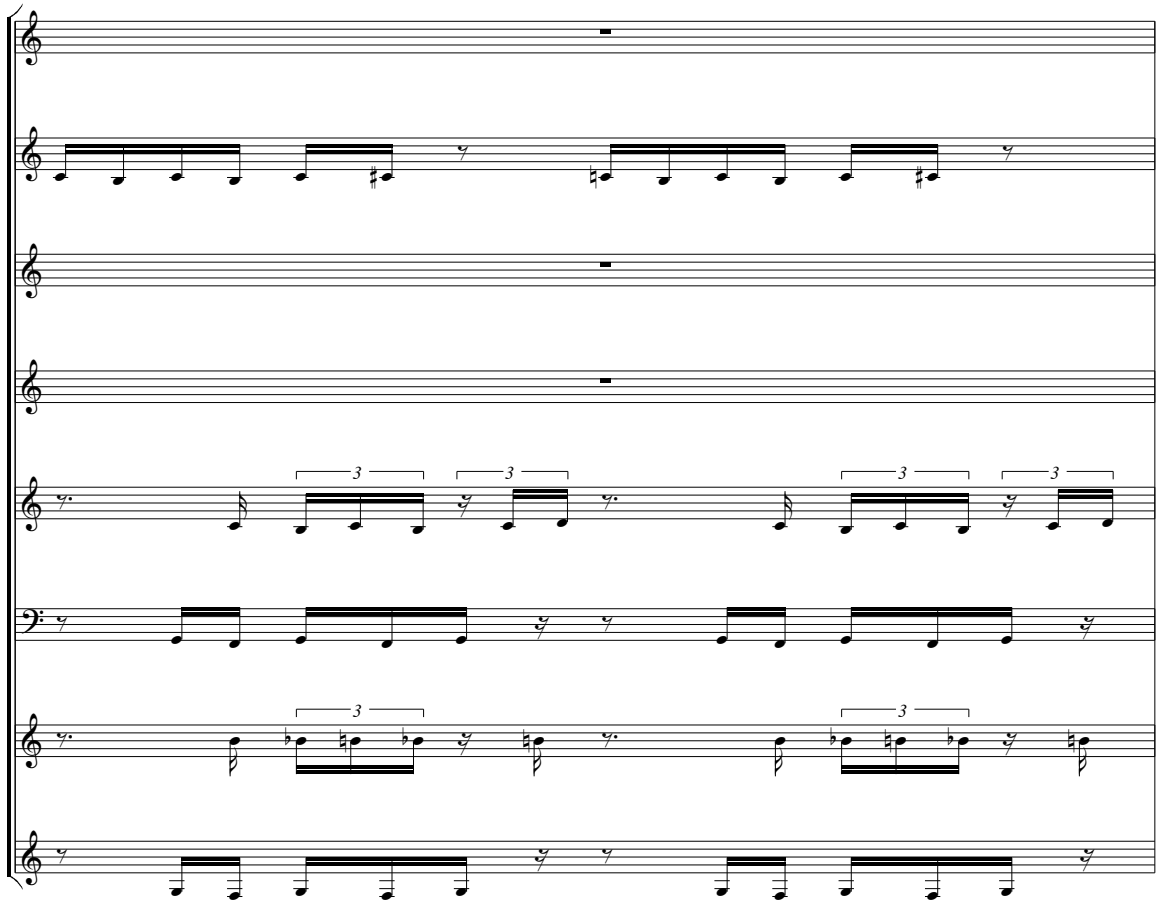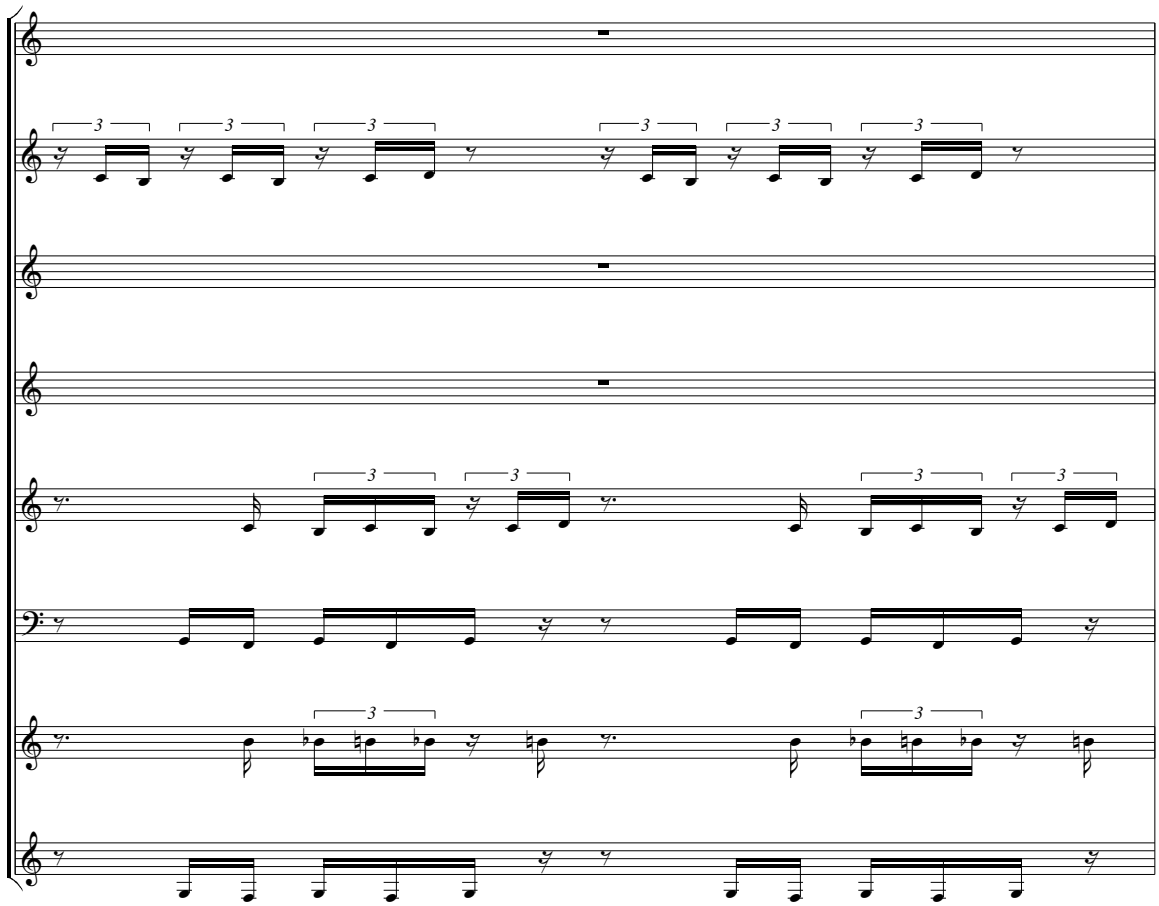


1st performance during the "Impossible Brilliance" Festival, for Conlon Nancarrow's centenary at Queen Elizabeth Hall, "Front Room", April 2012.
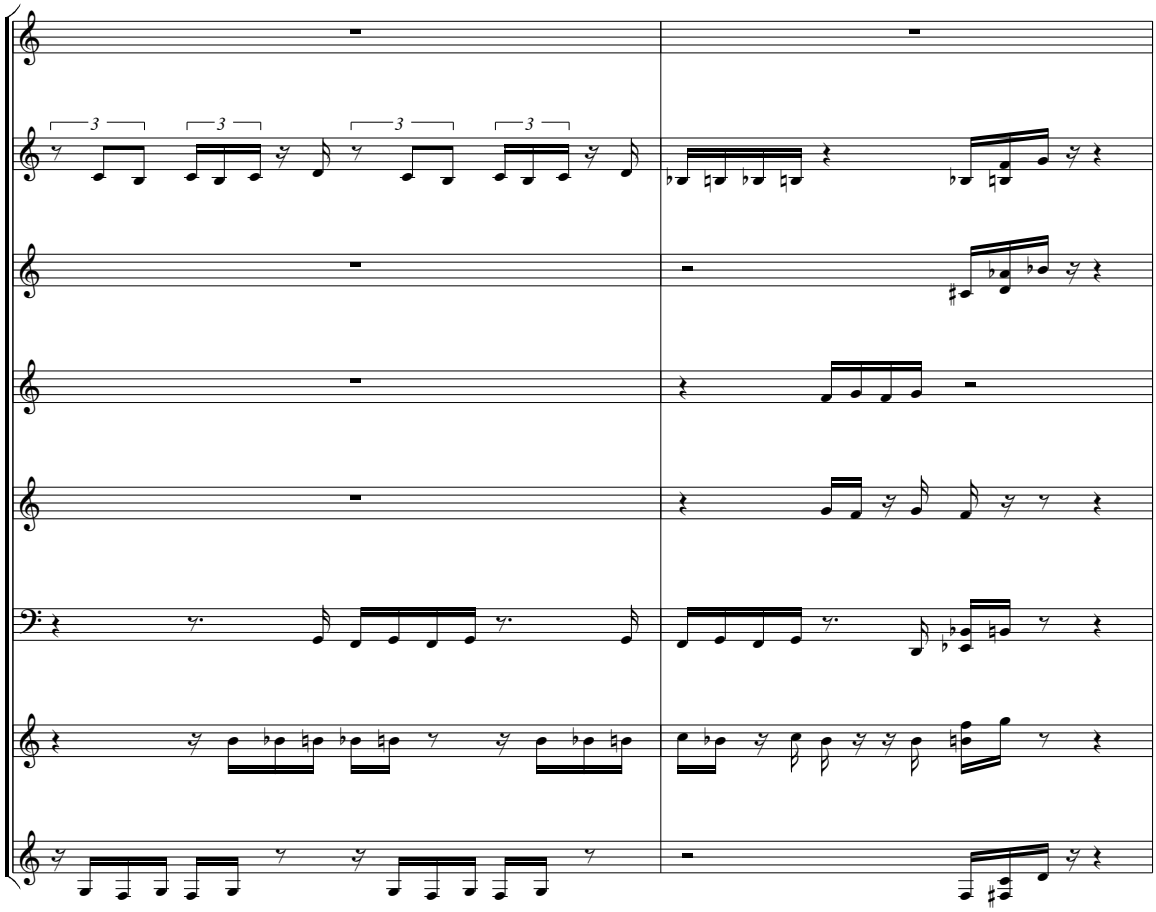
"Conlon-in-Purple" is/was a solenoid-operated MIDI-controlled marimba built by Trimpin
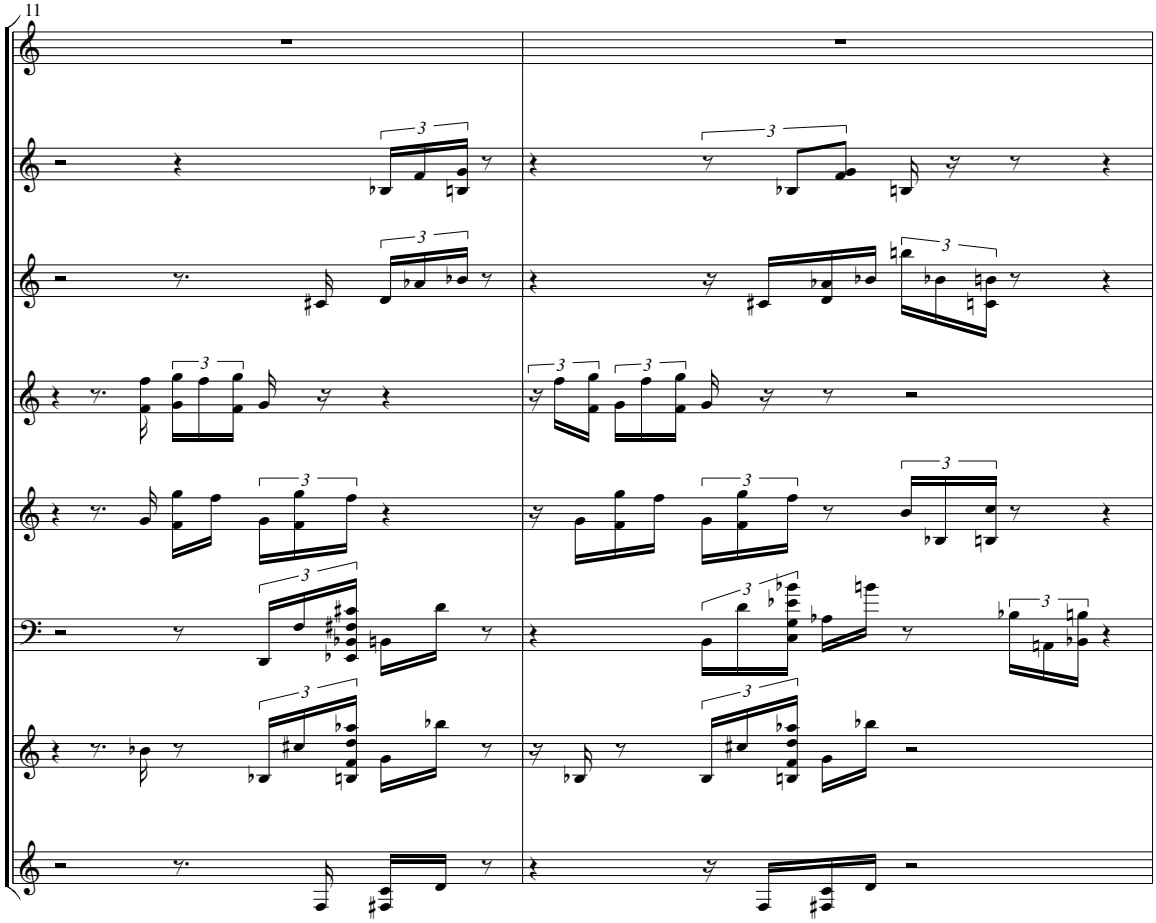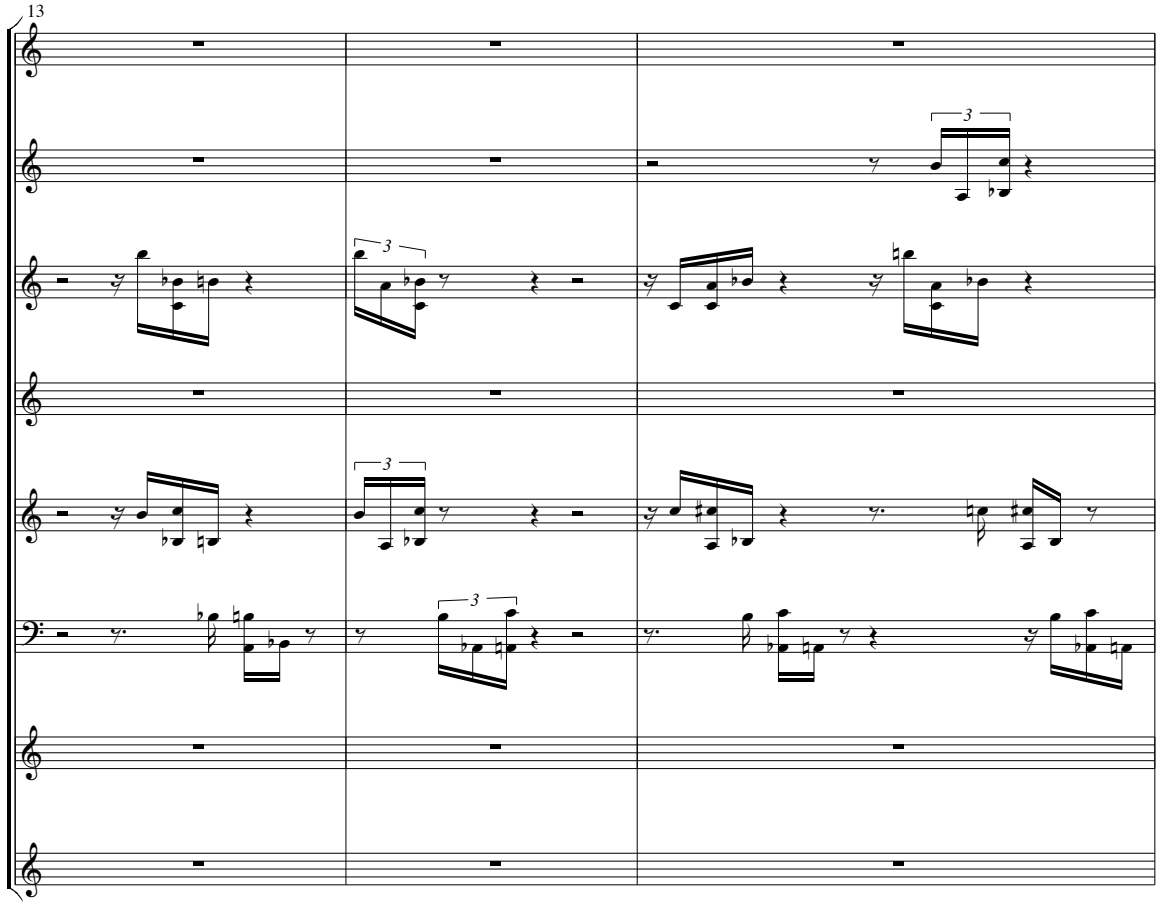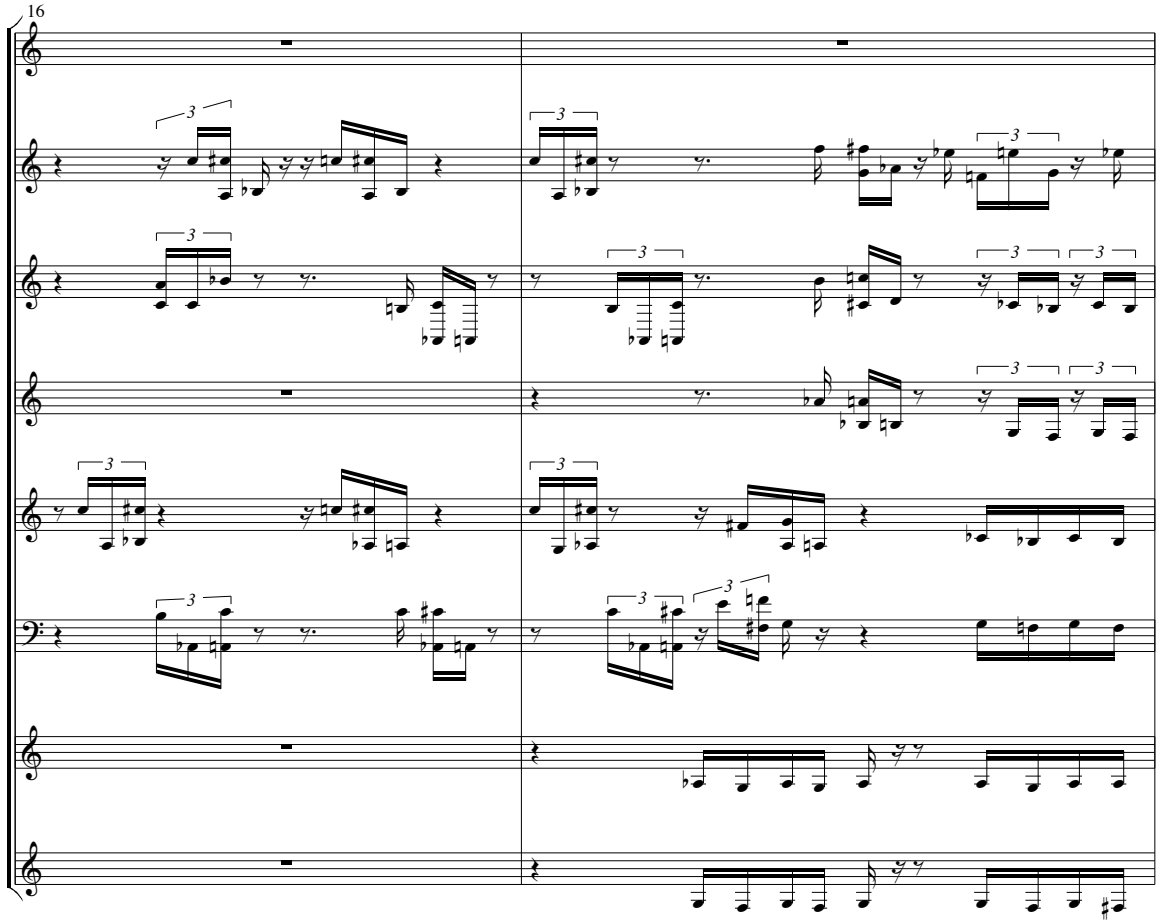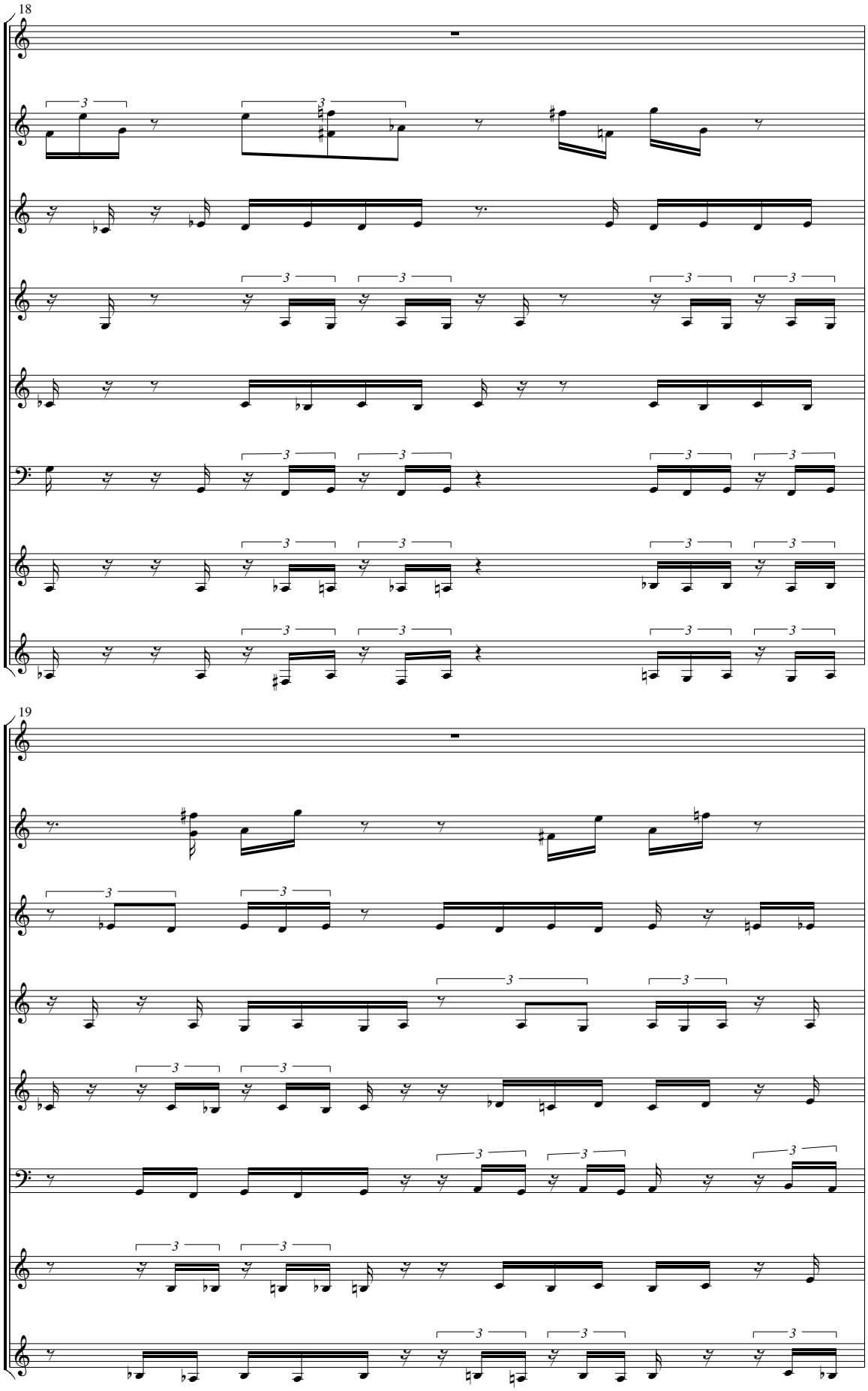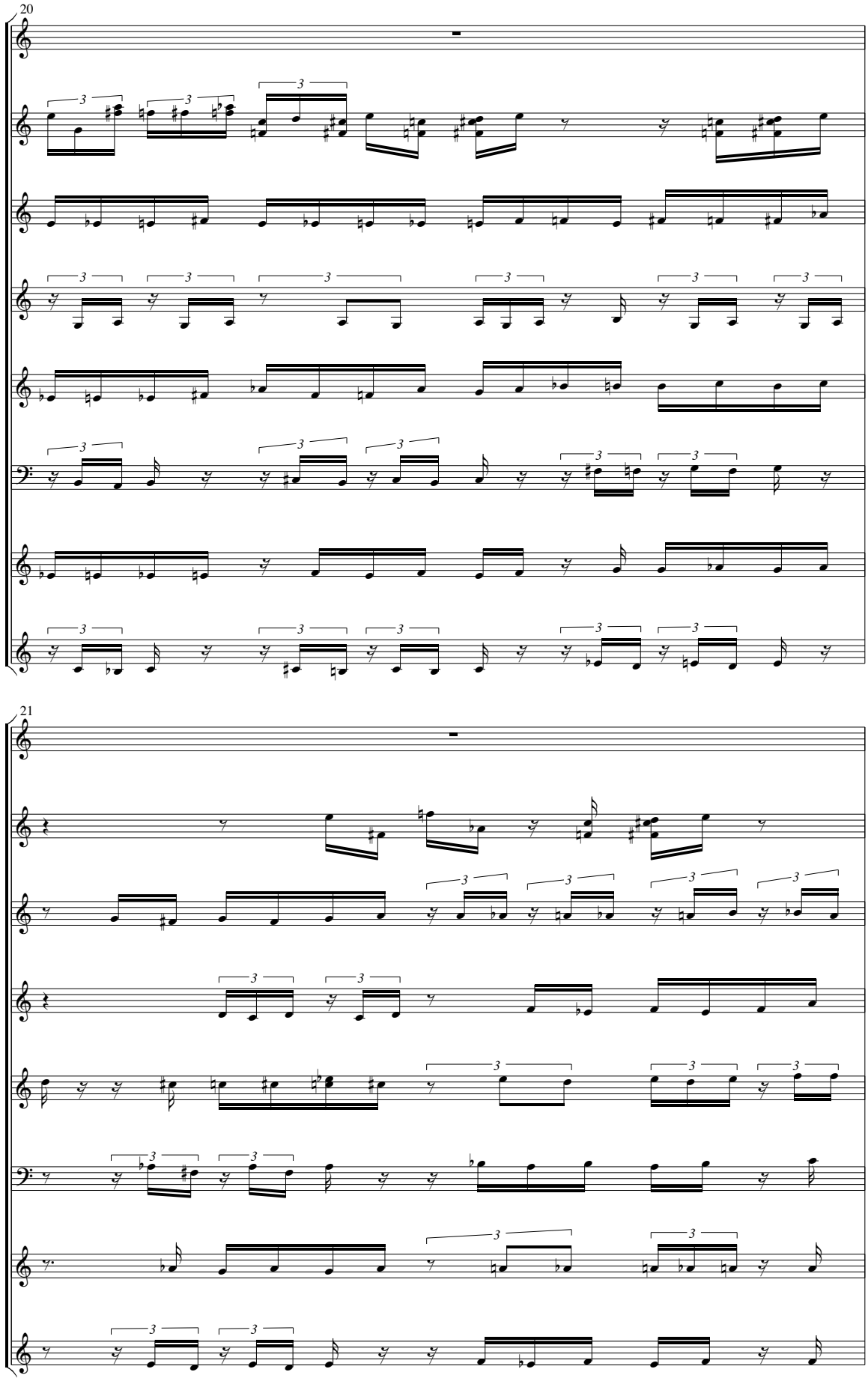










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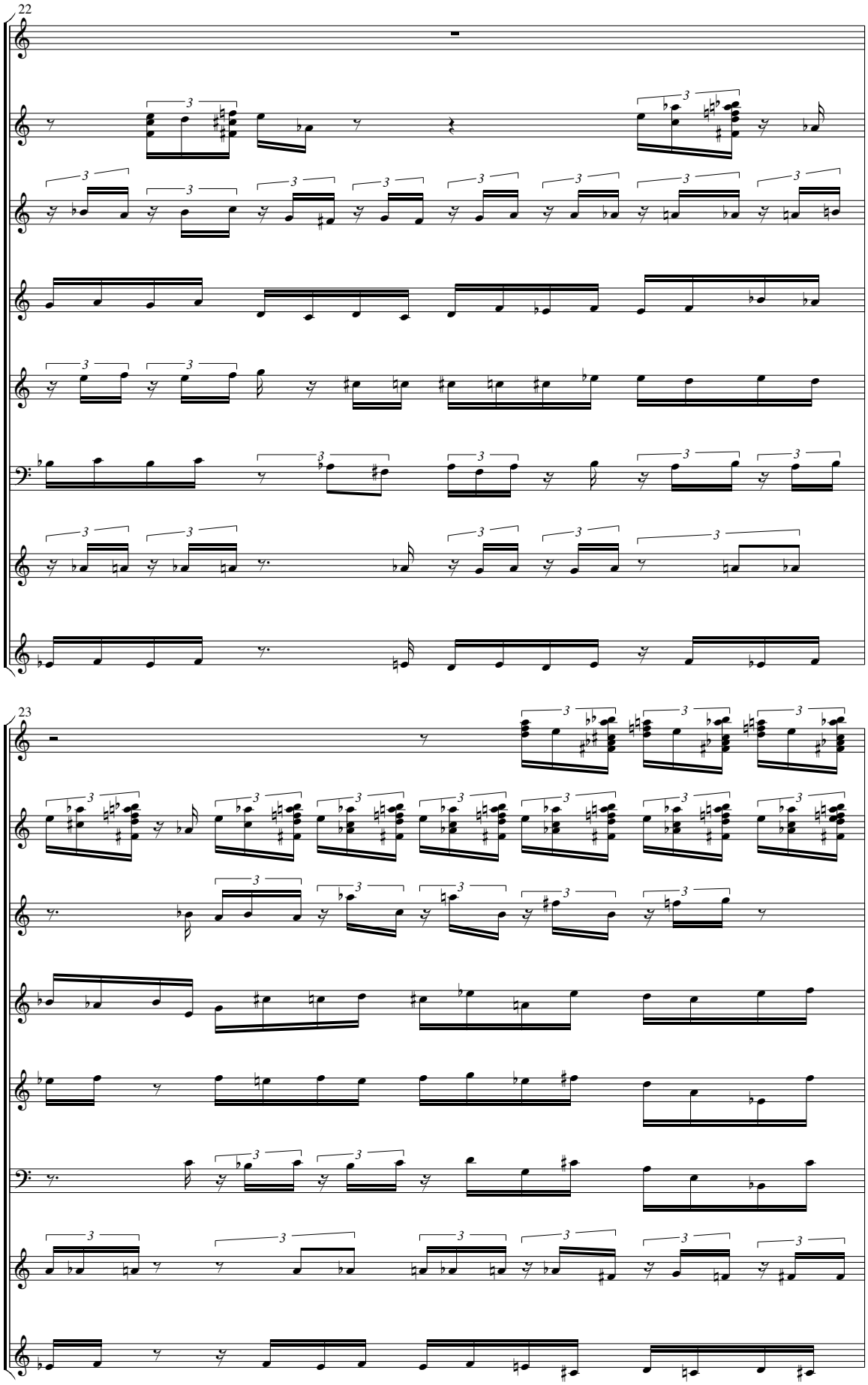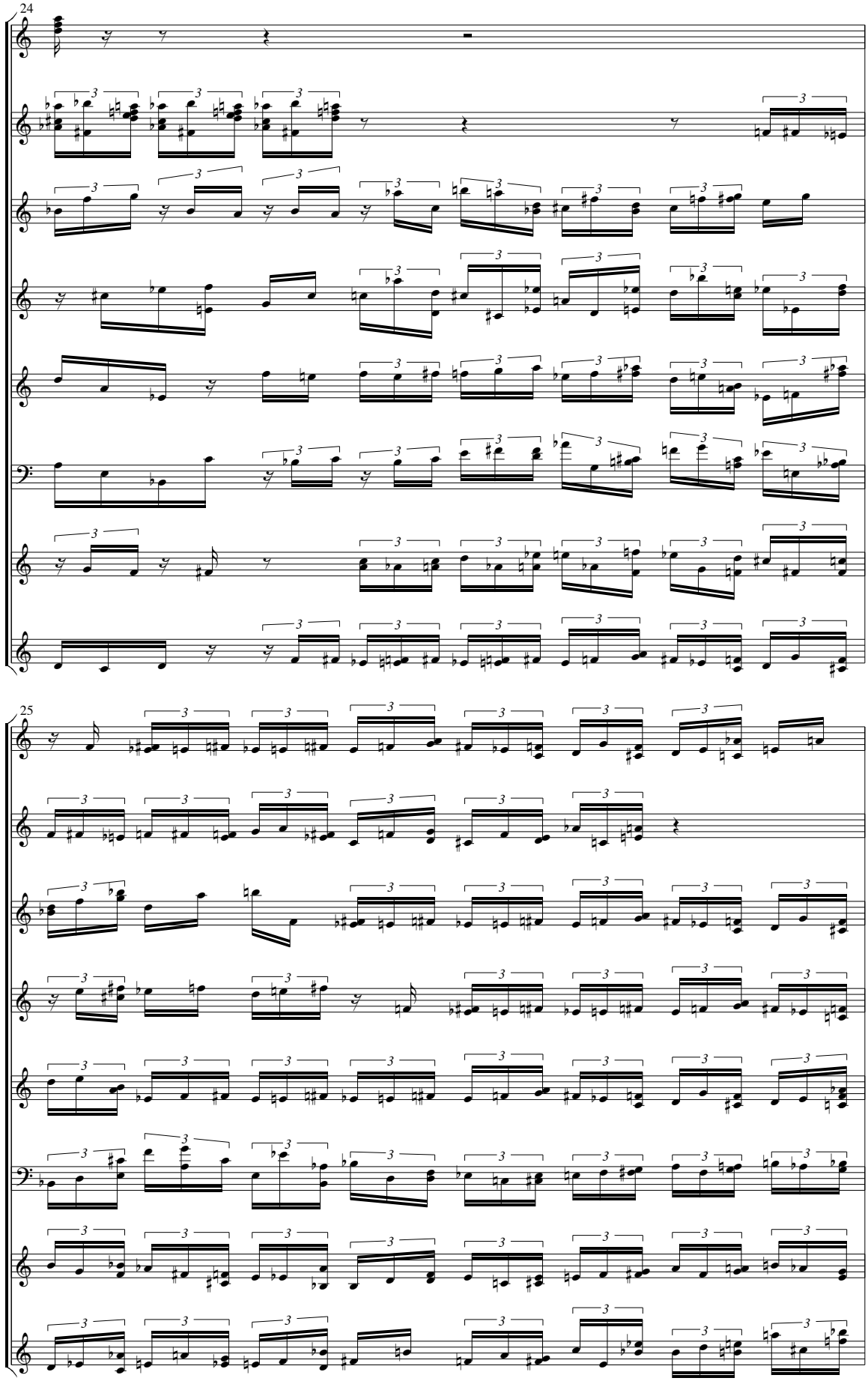



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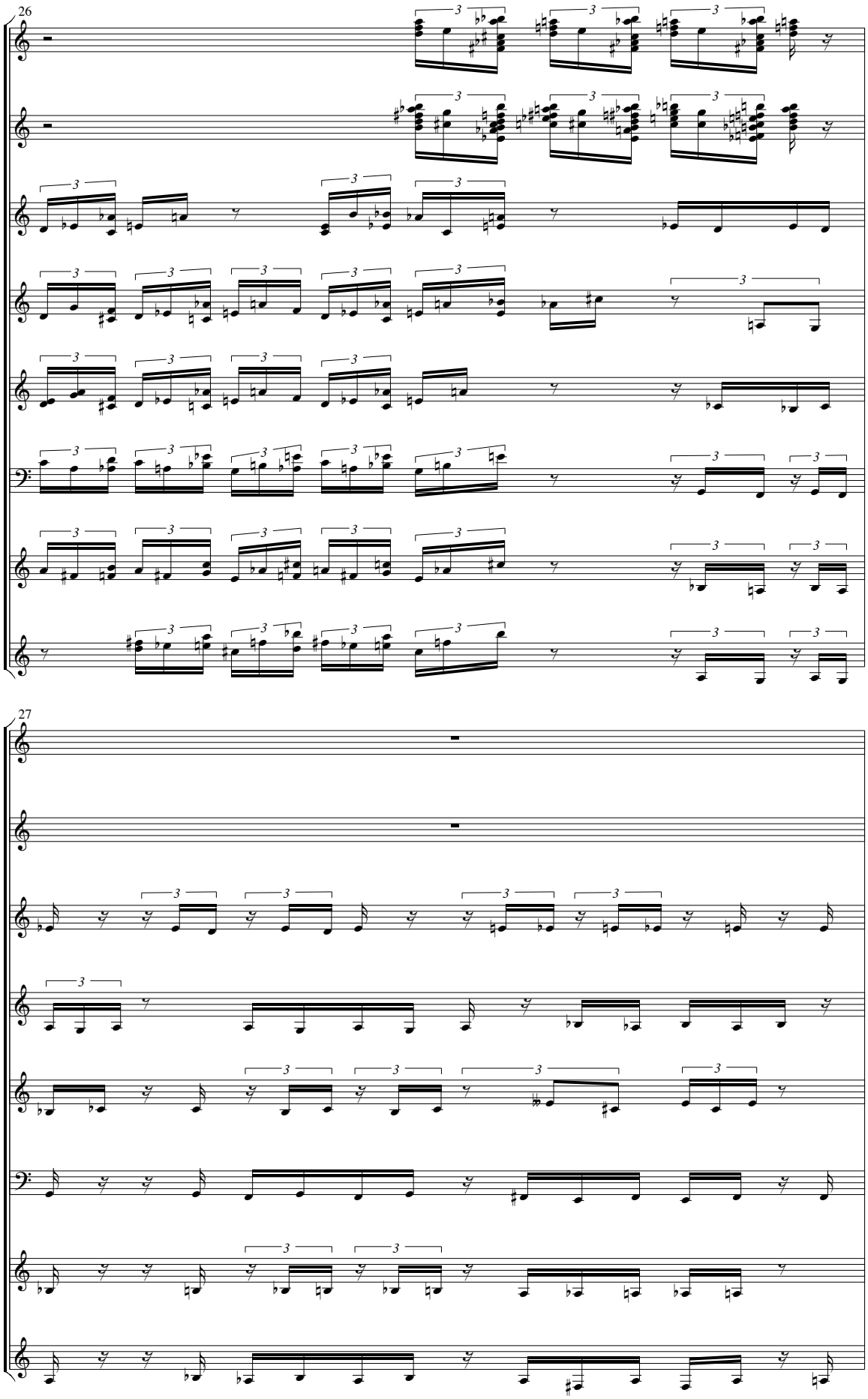

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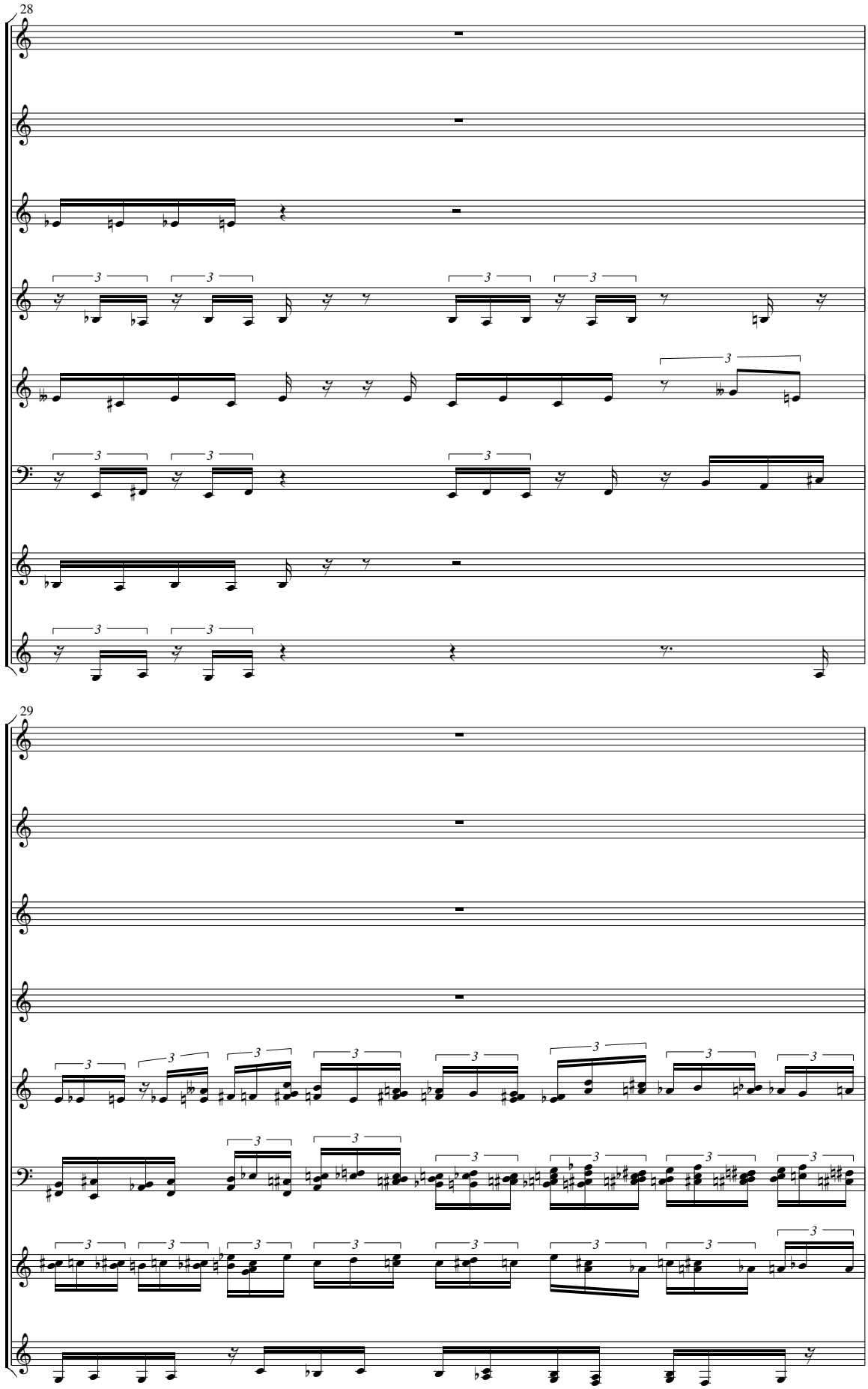

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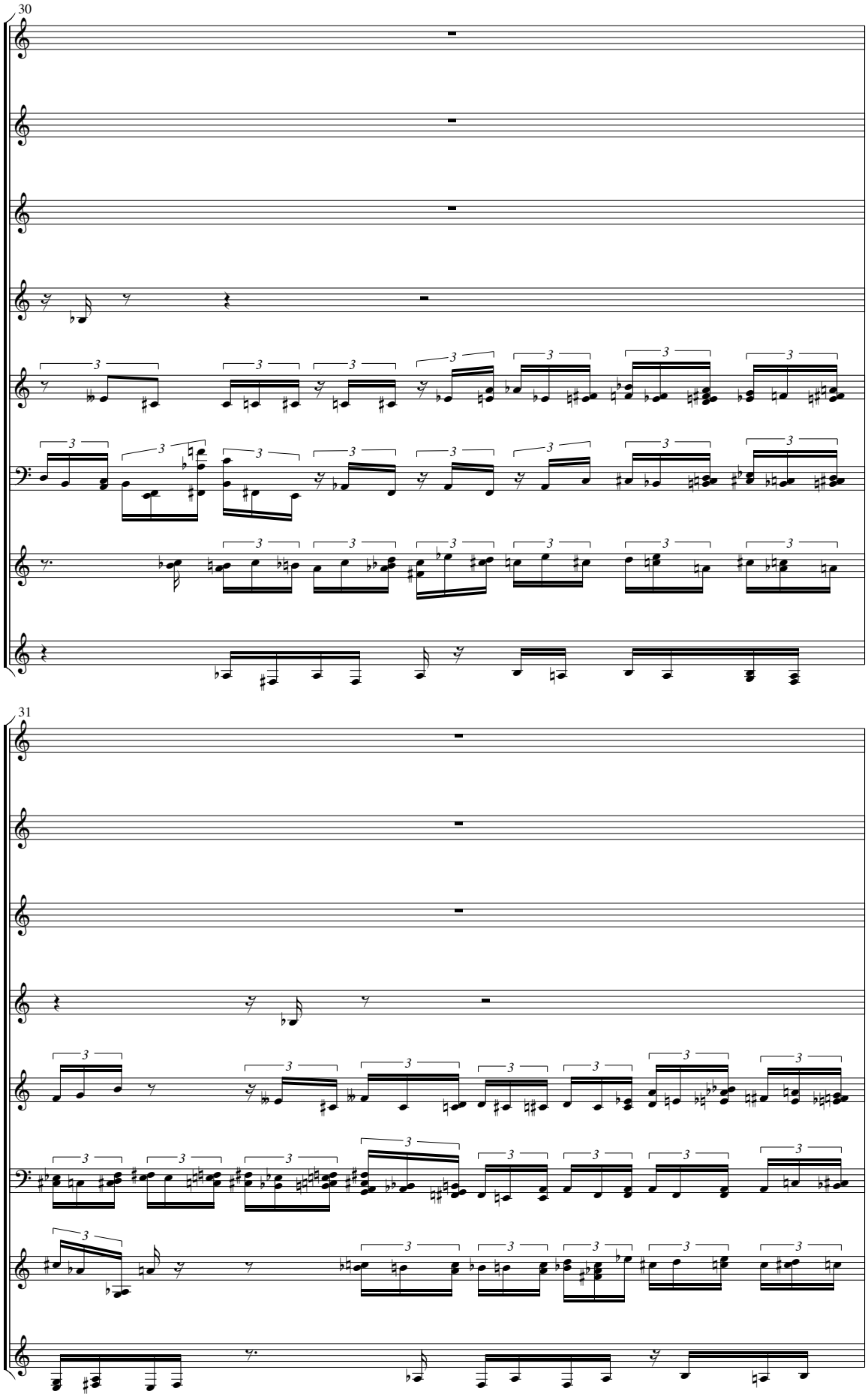

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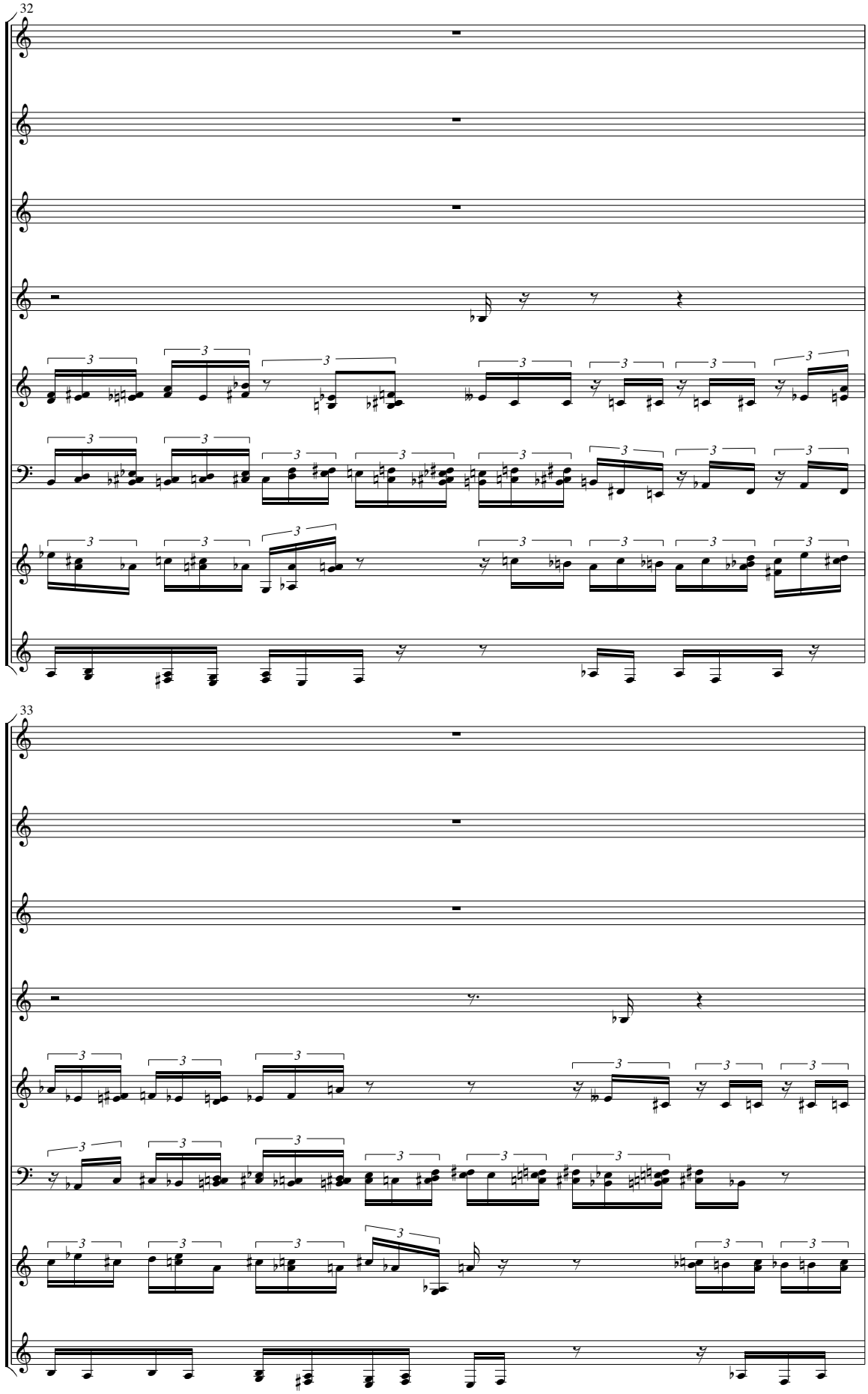

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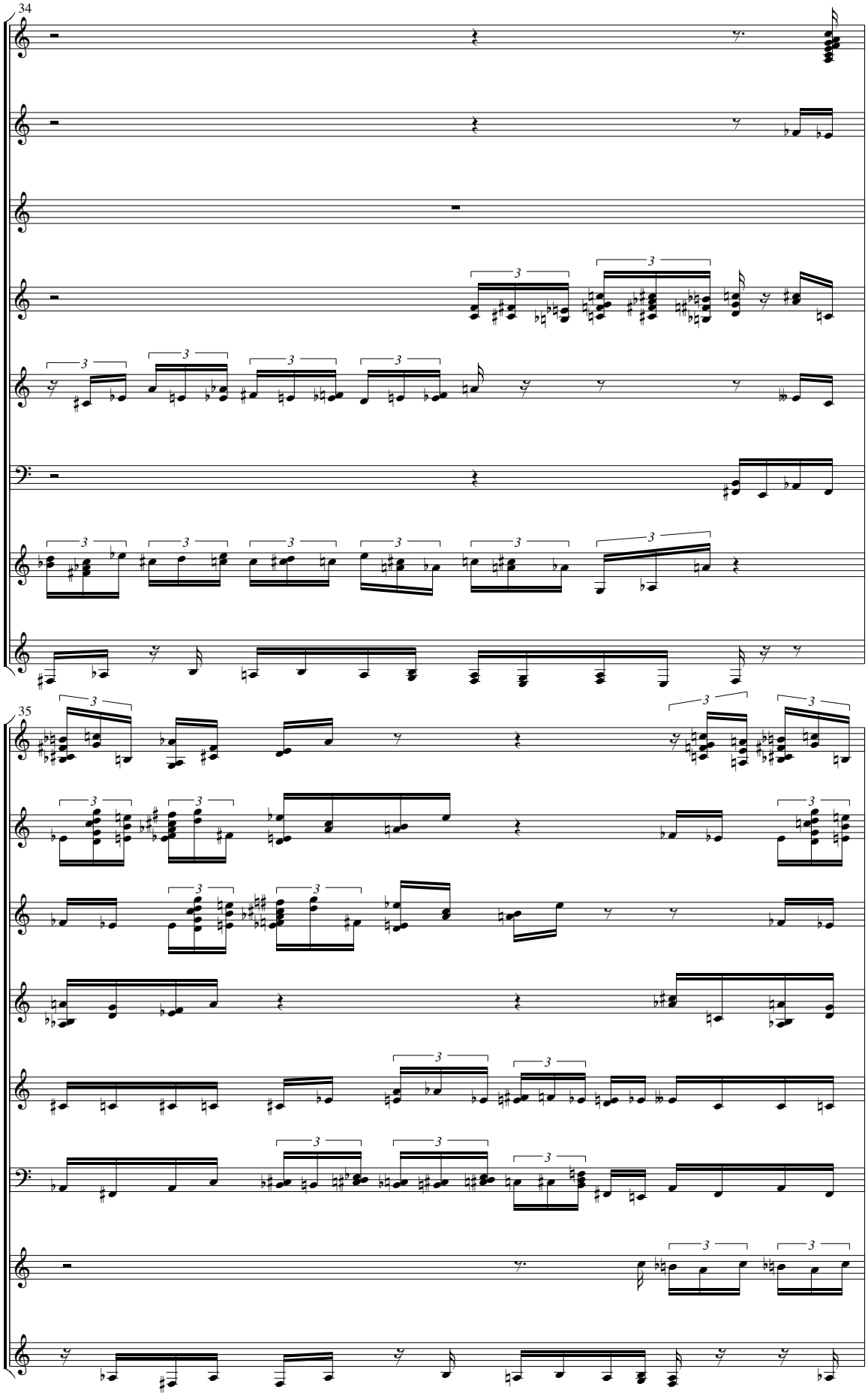

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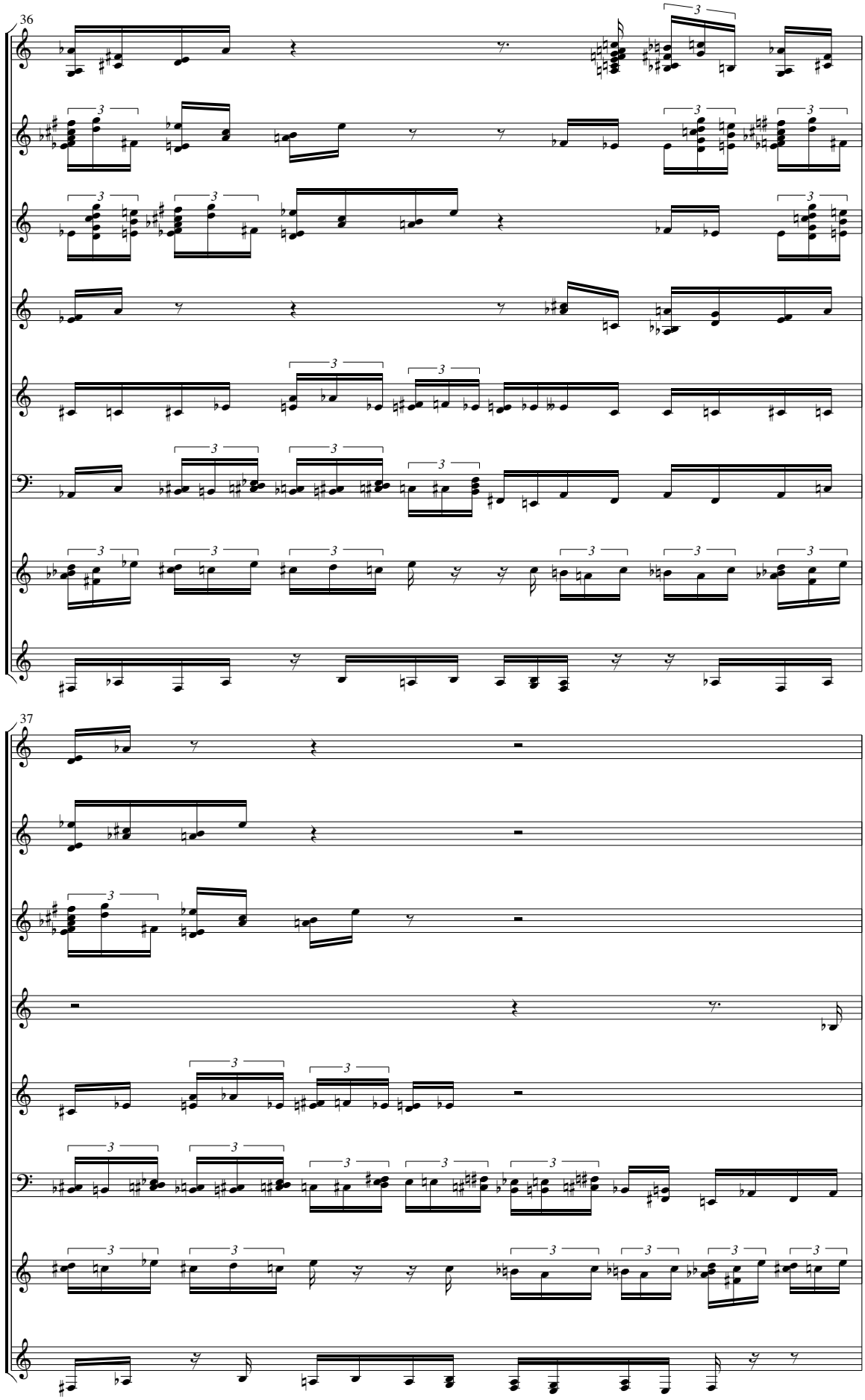

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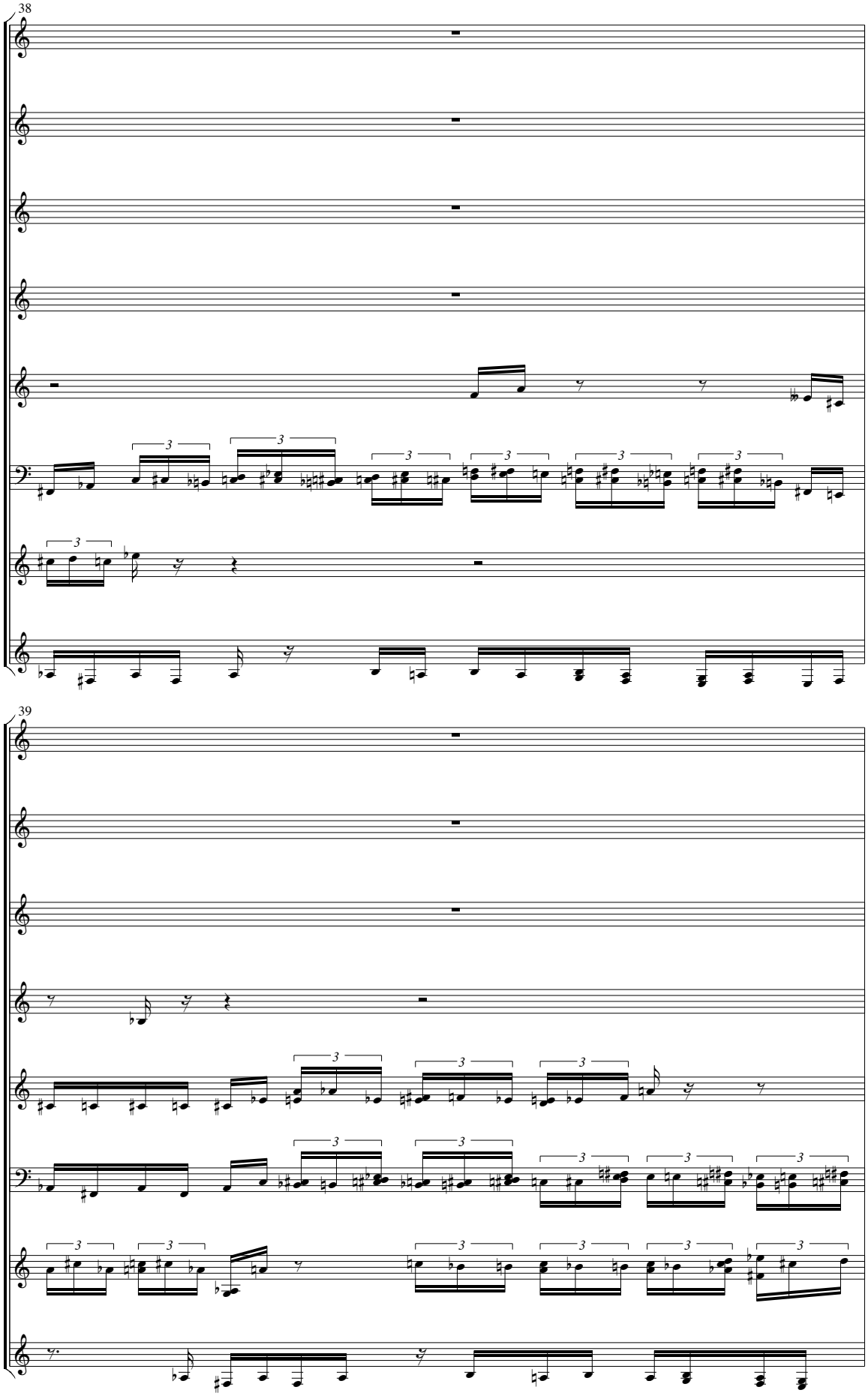

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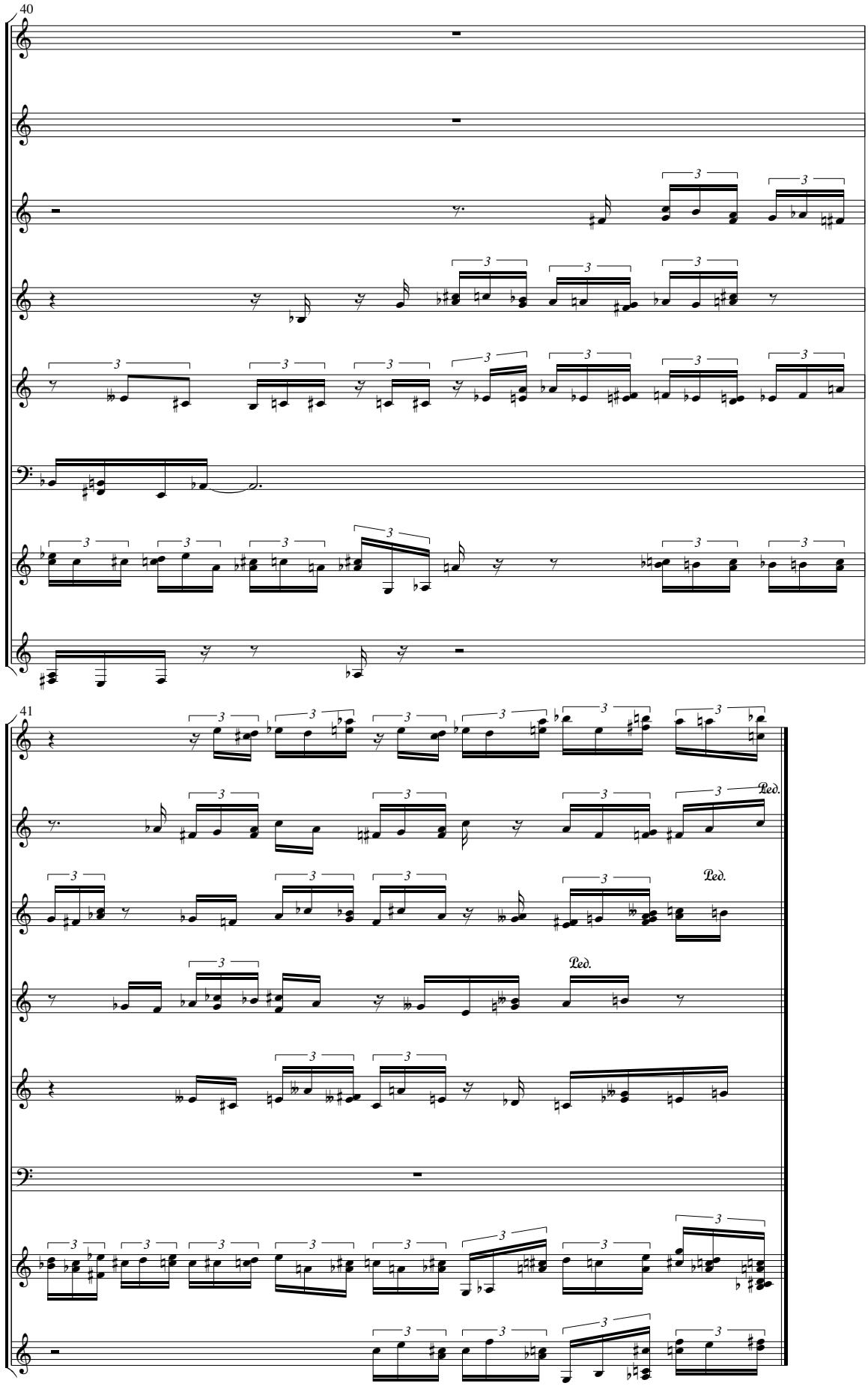

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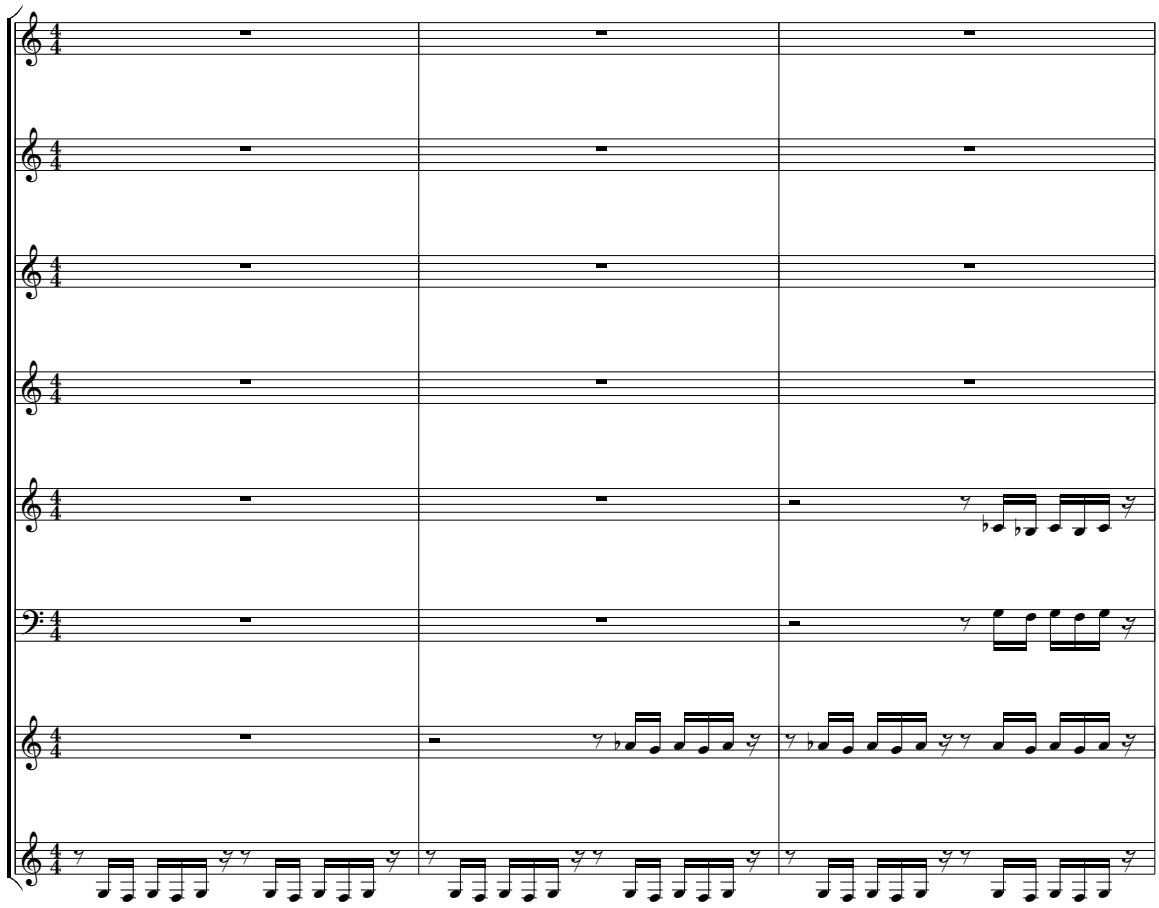

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Ped.
Ped.
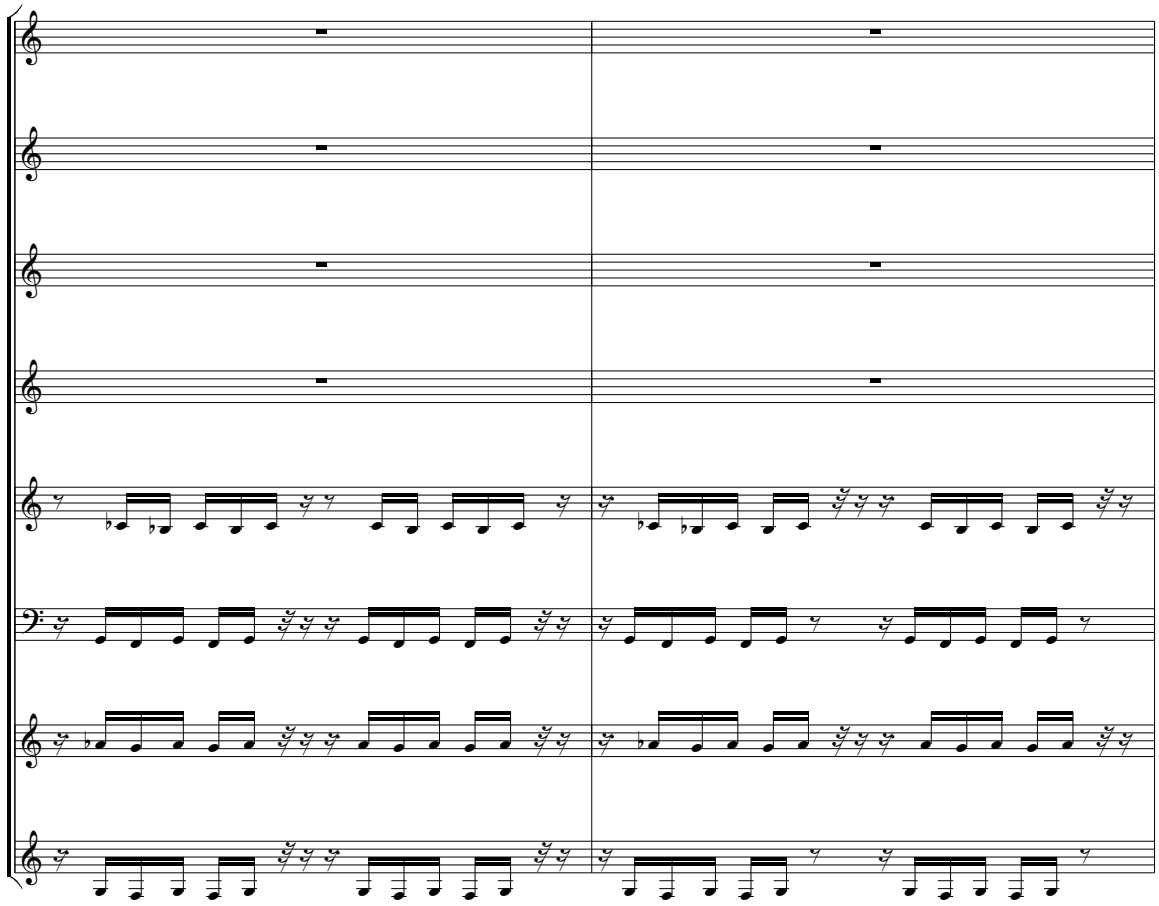
Dreaming at the Circular Ruins, No.2 2012
for "Conlon-in-Purple"
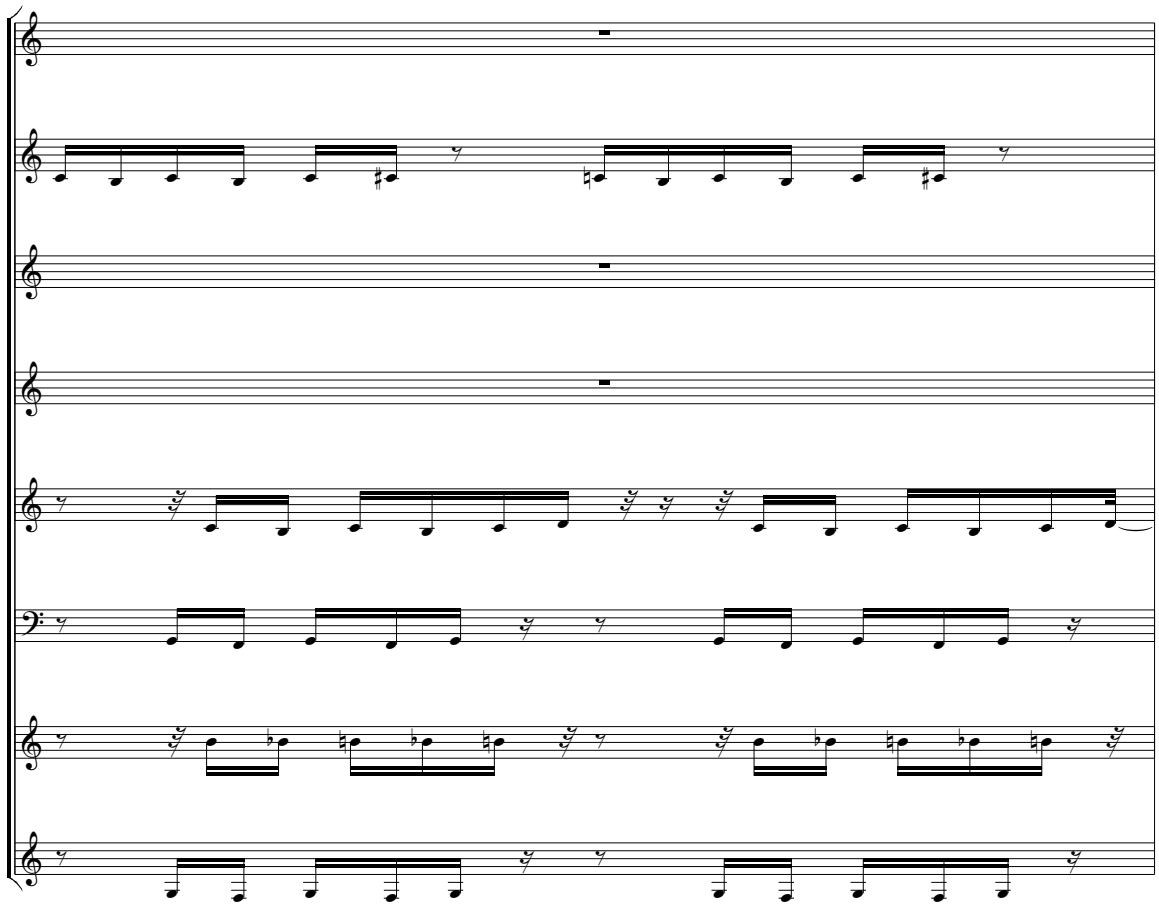
This score quantised to 32/24

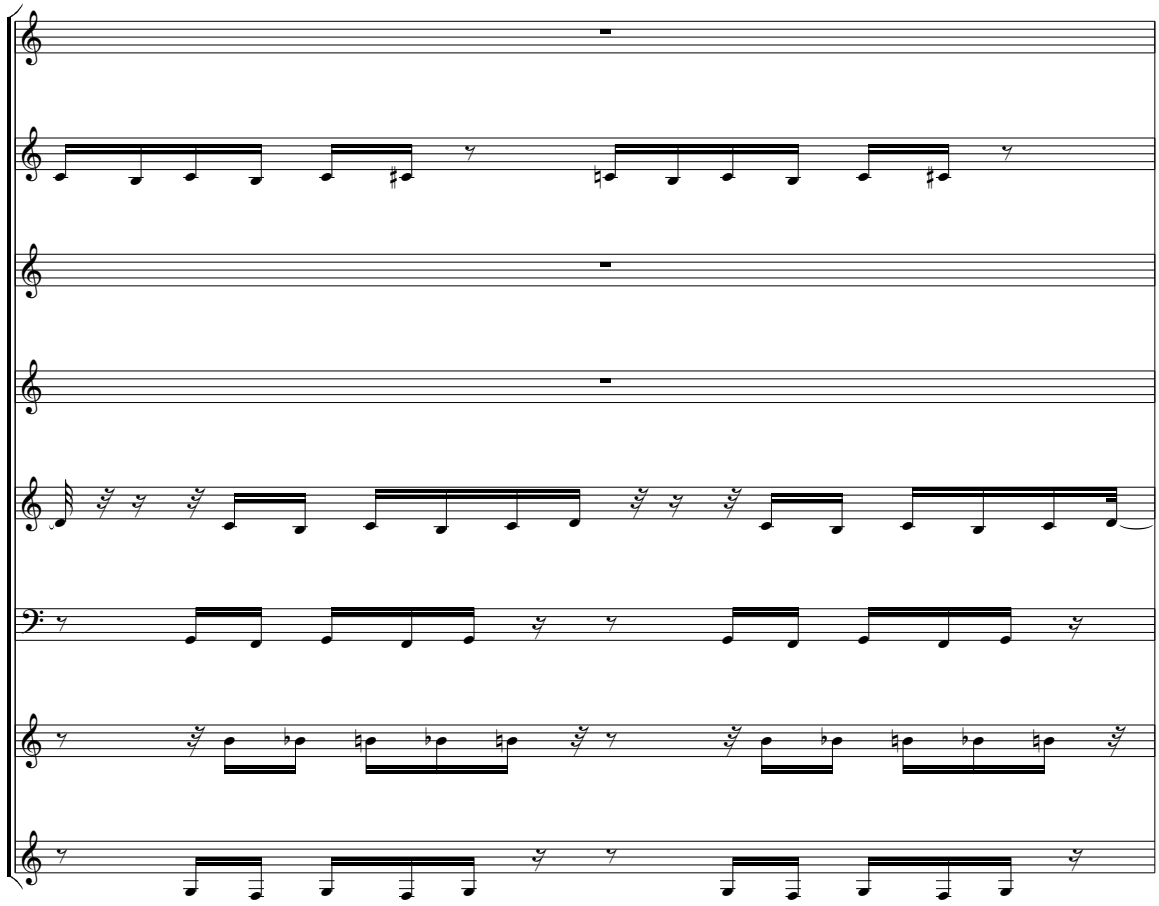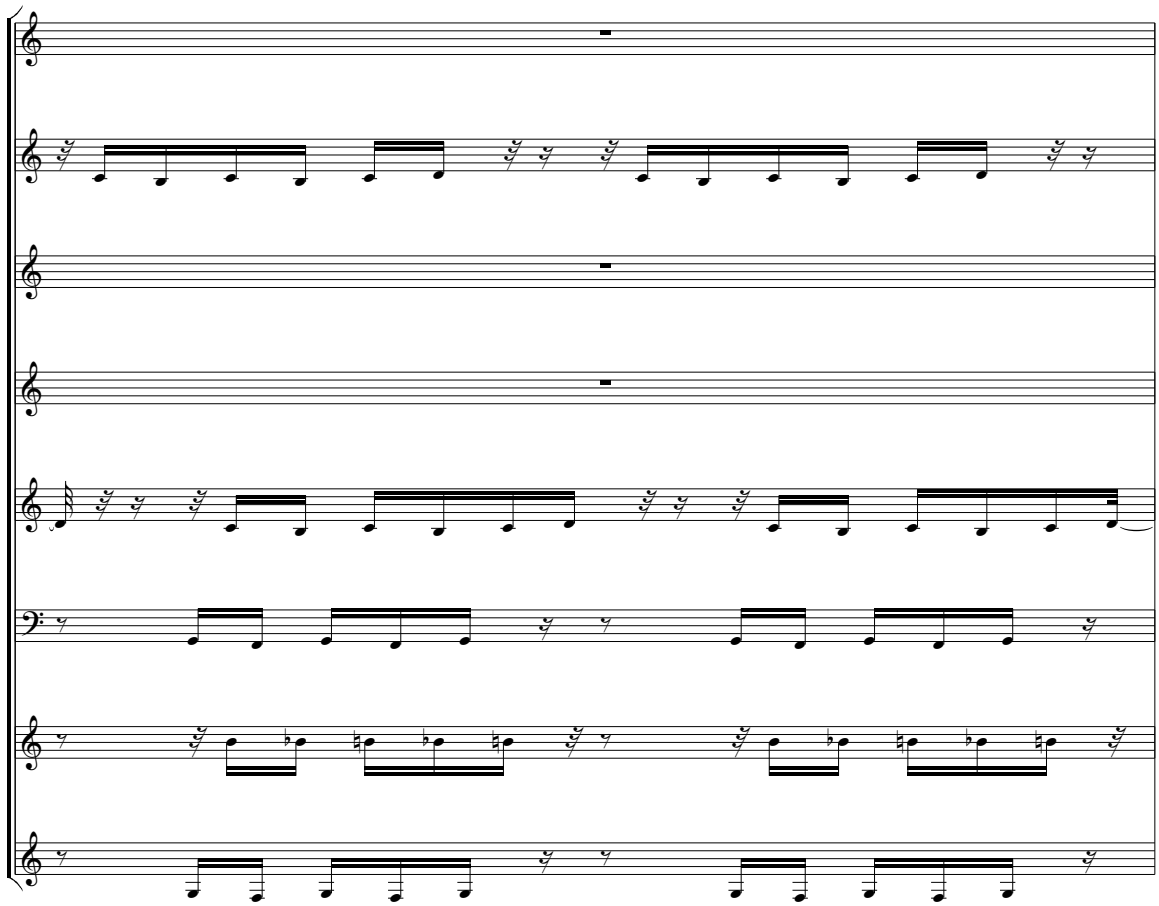


1st performance during the "Impossible Brilliance" Festival, for Conlon Nancarrow's centenary at Queen Elizabeth Hall, "Front Room", April 2012.
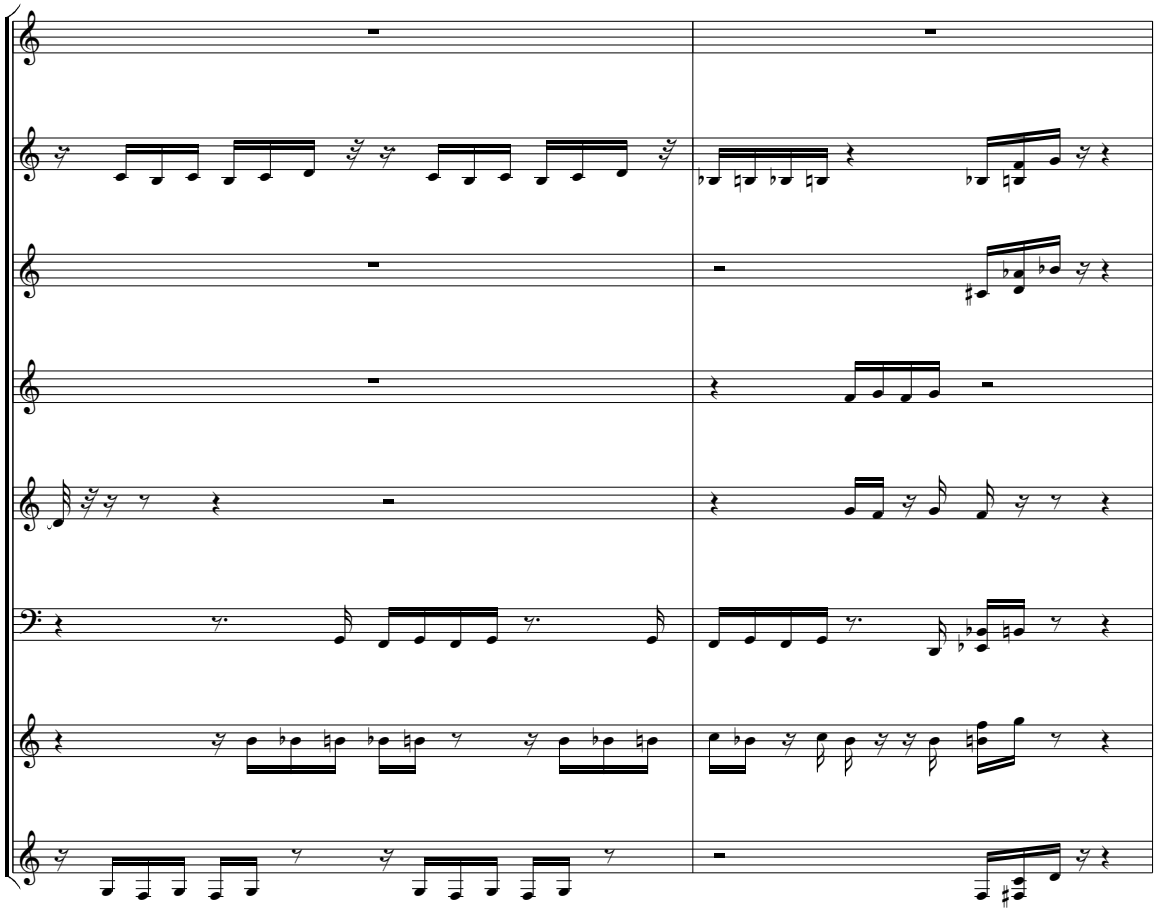
"Conlon-in-Purple" is/was a solenoid-operated MIDI-controlled marimba built by Trimpin



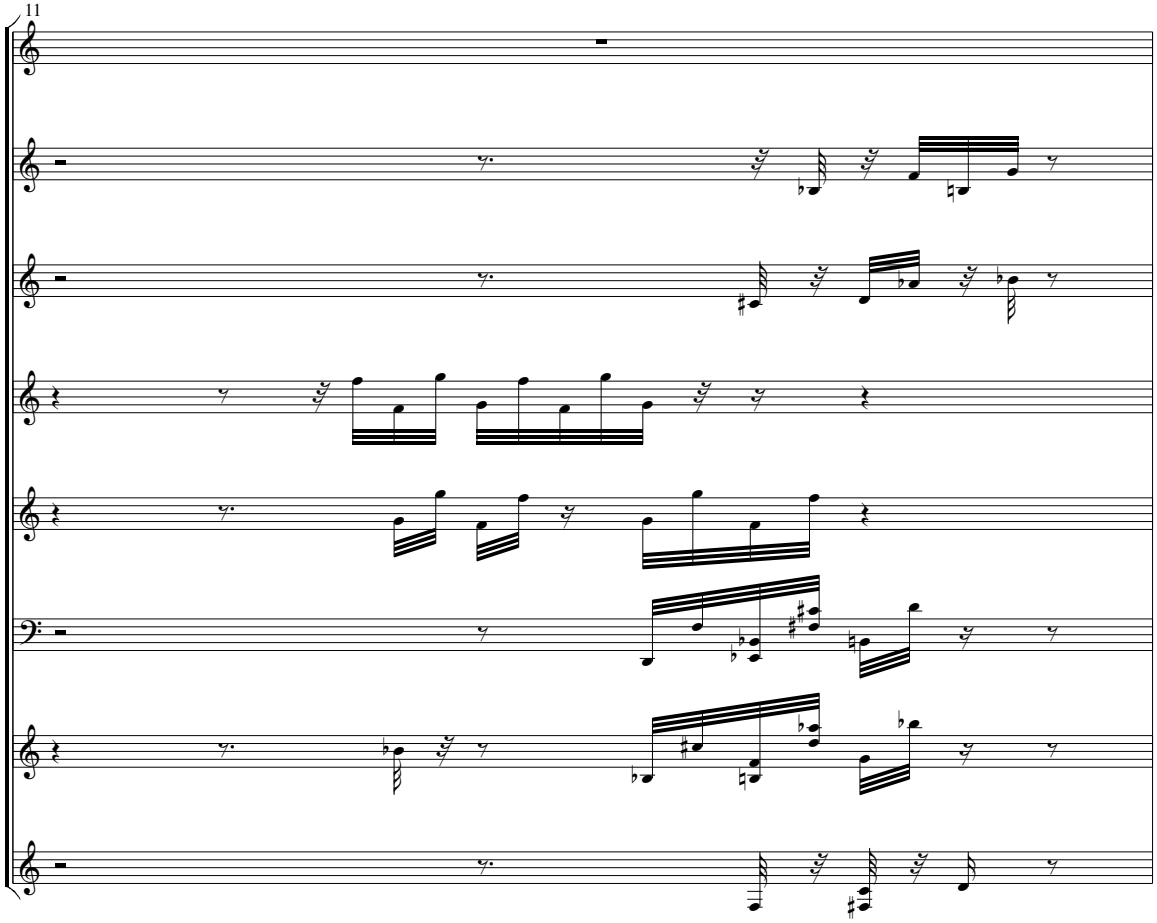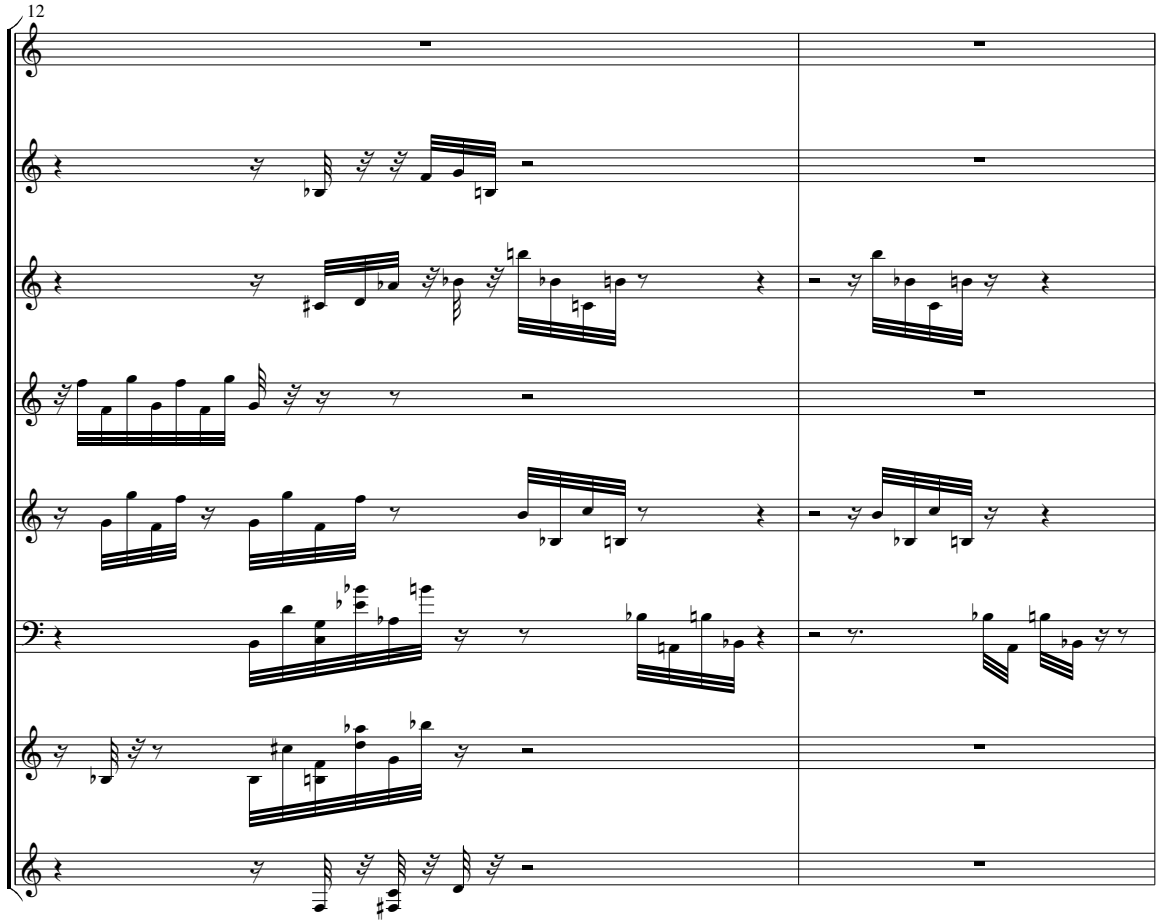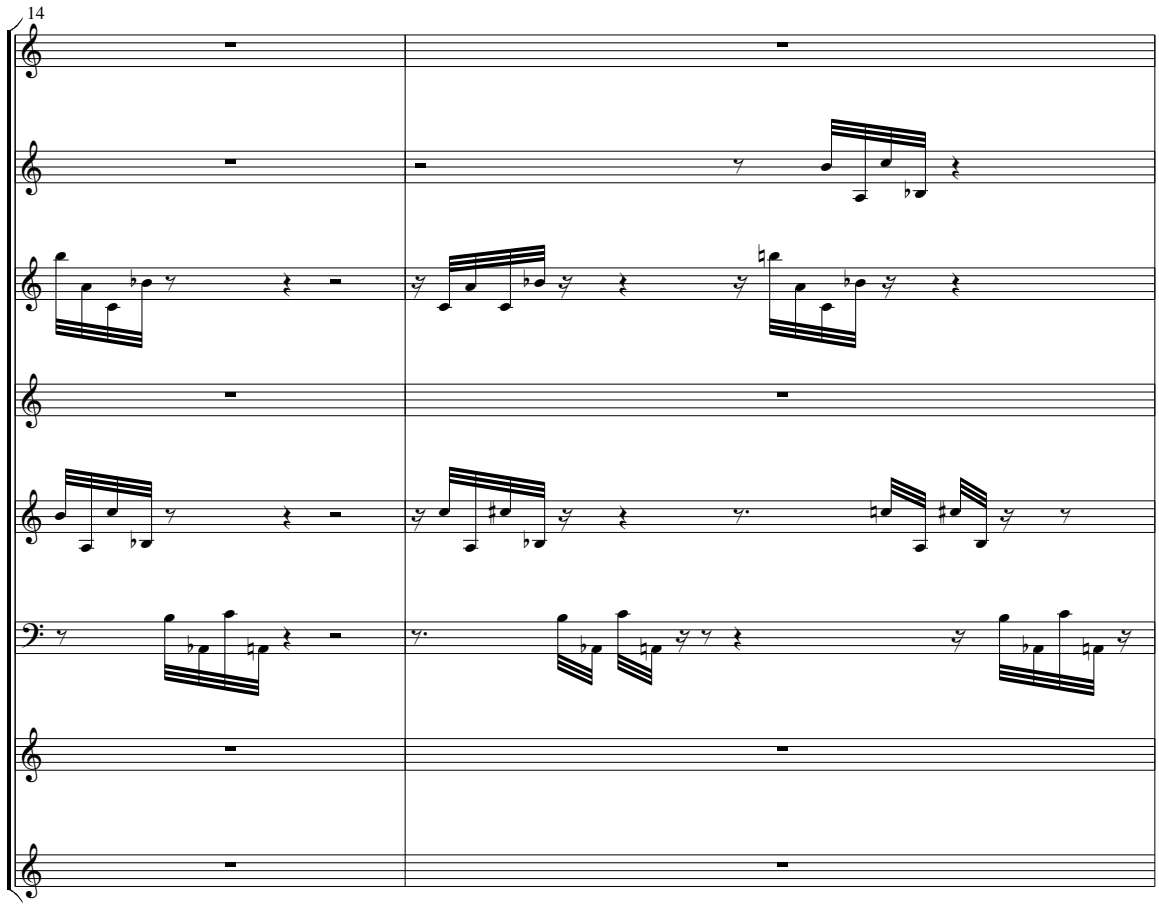








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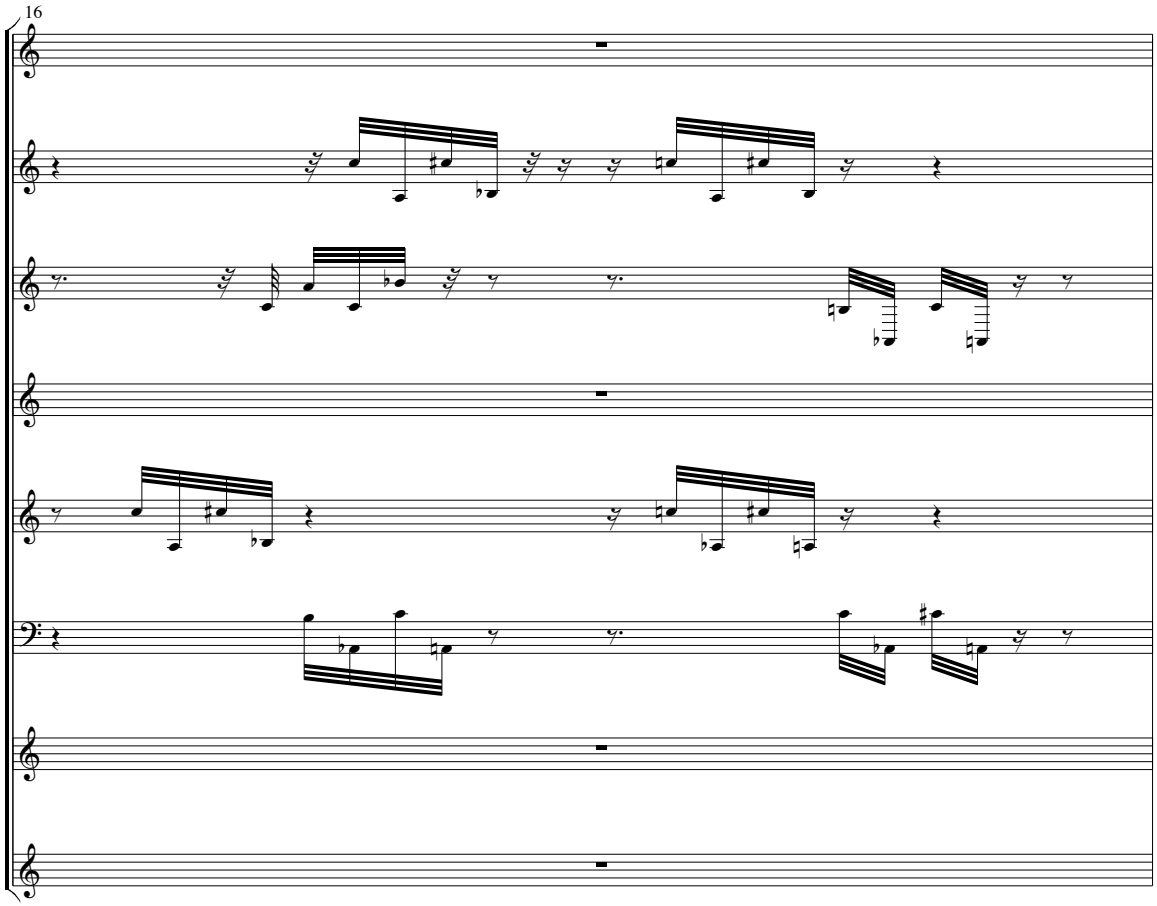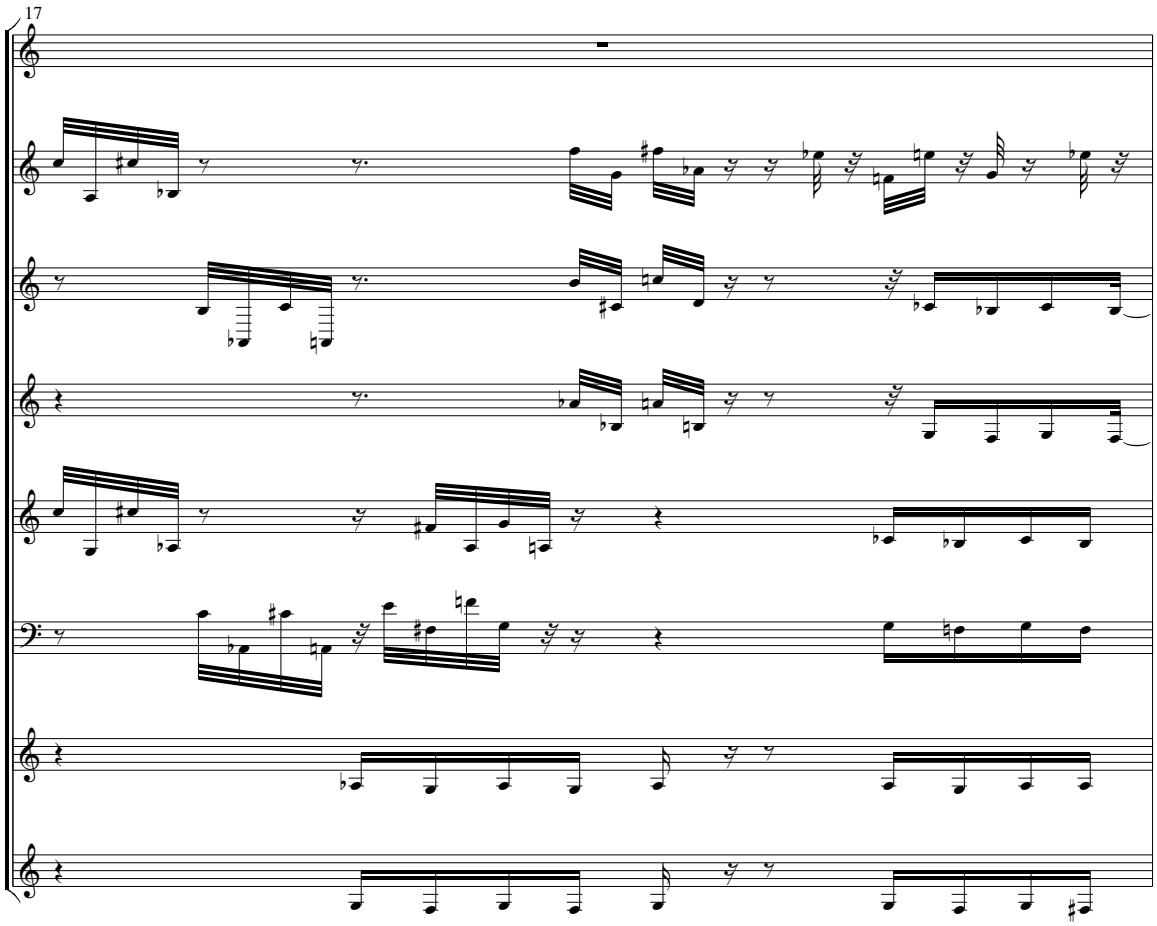


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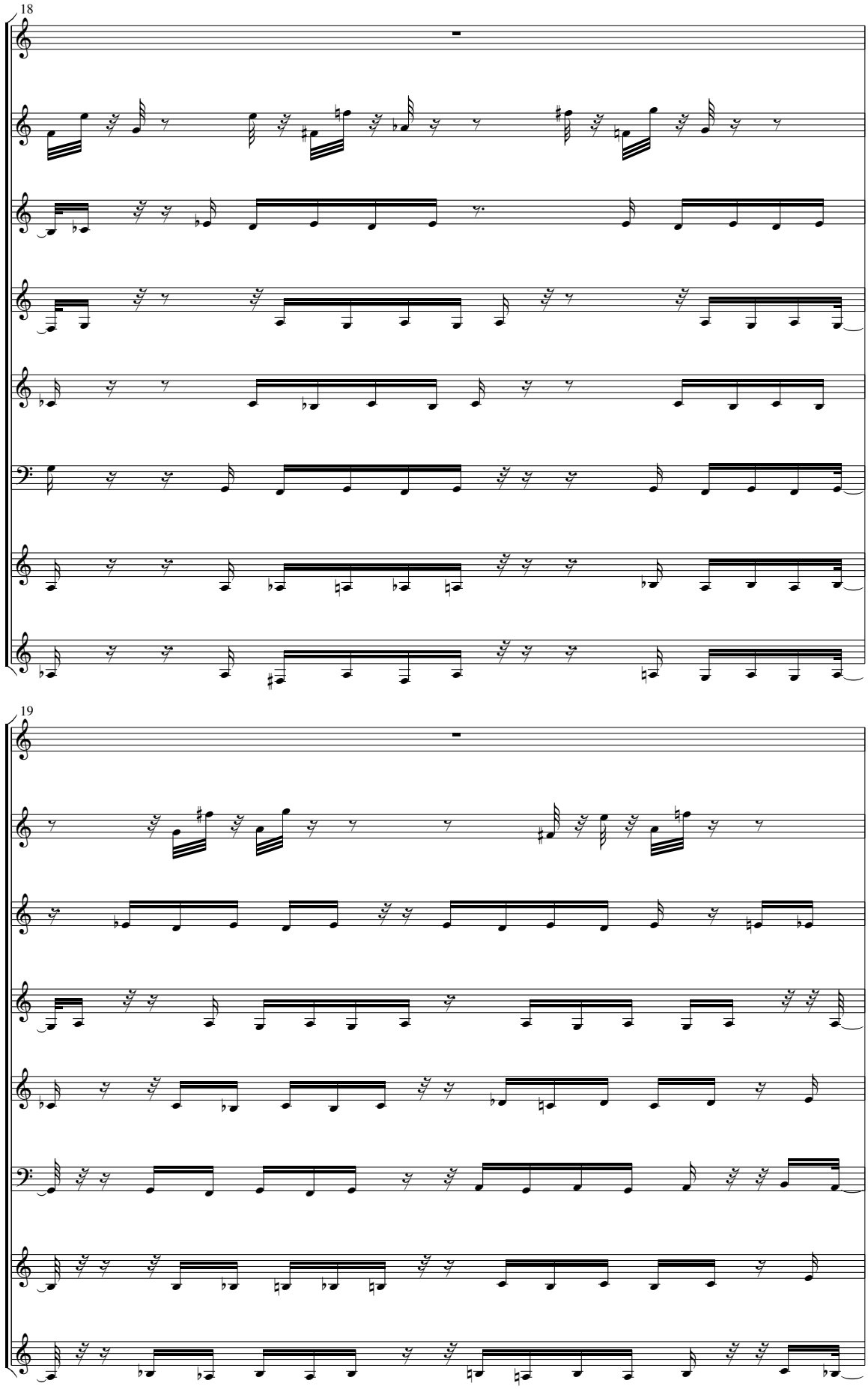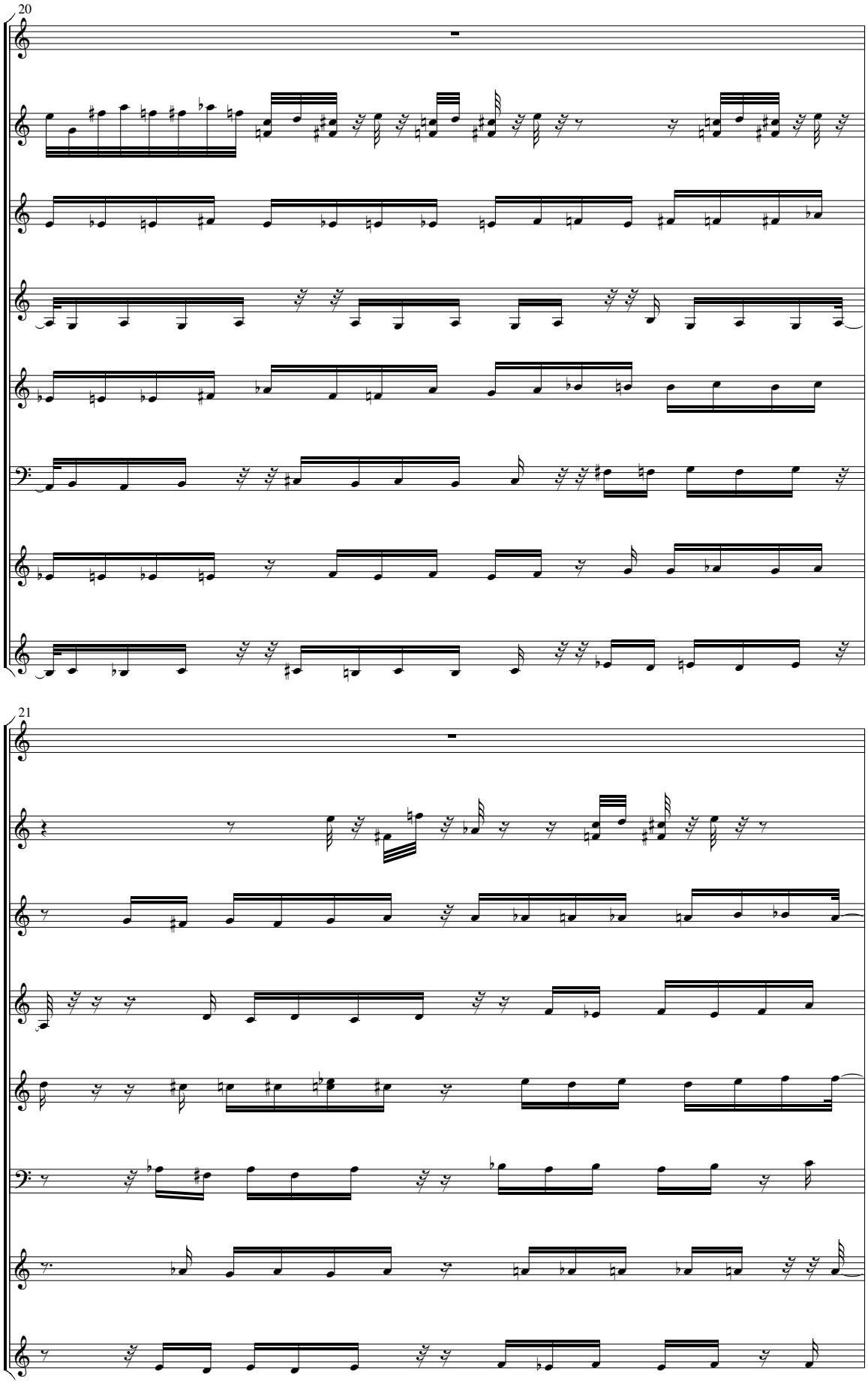


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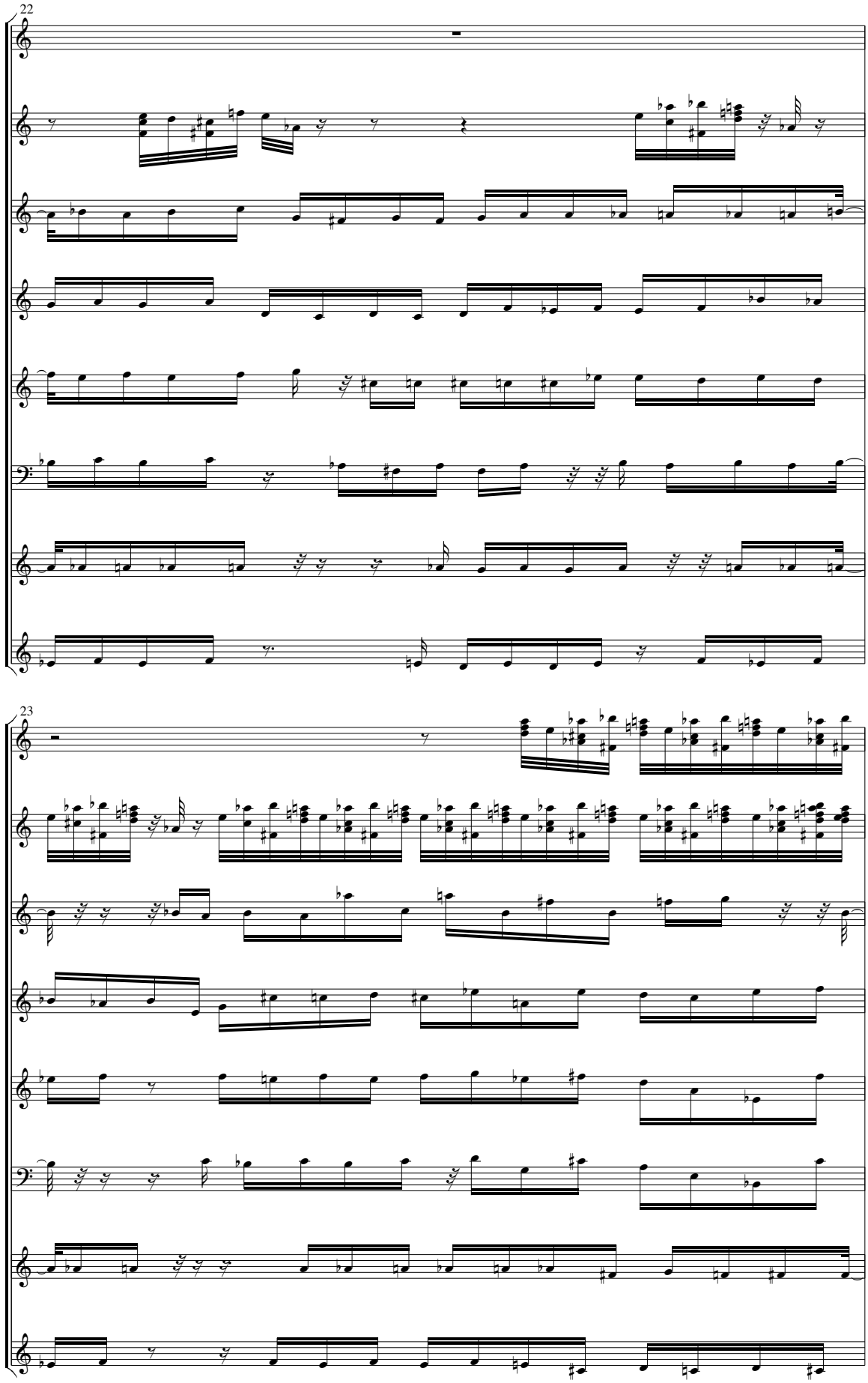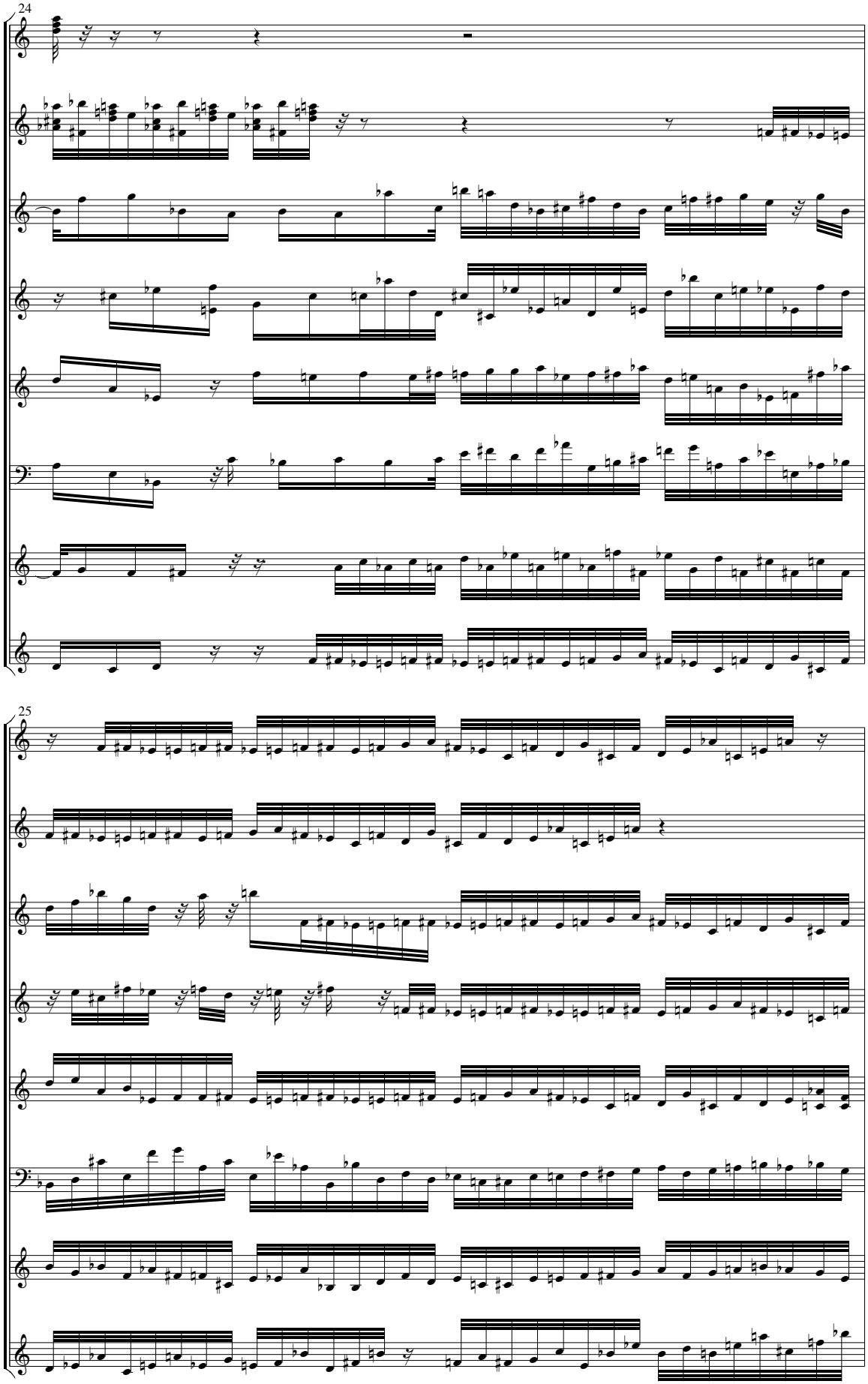



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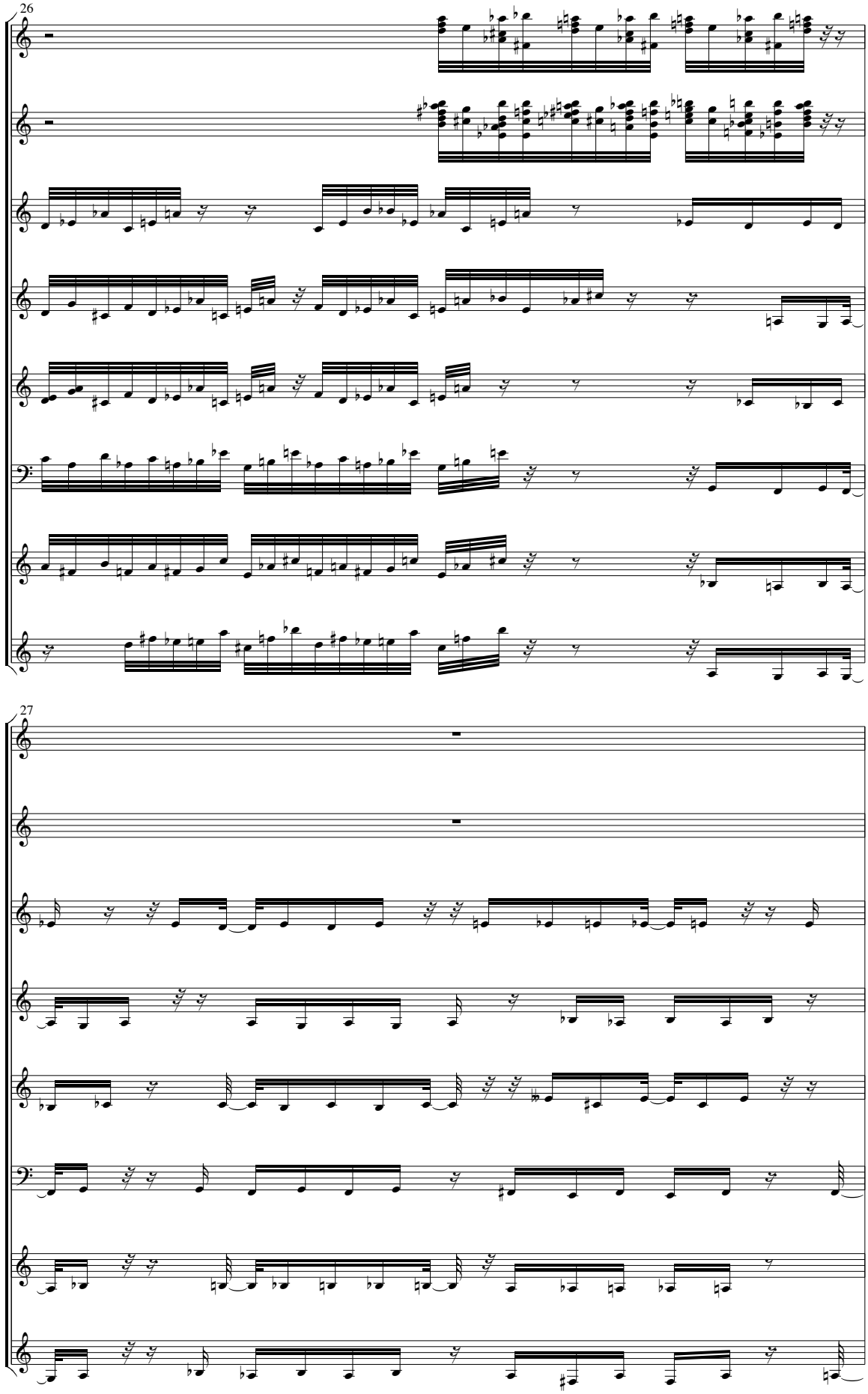

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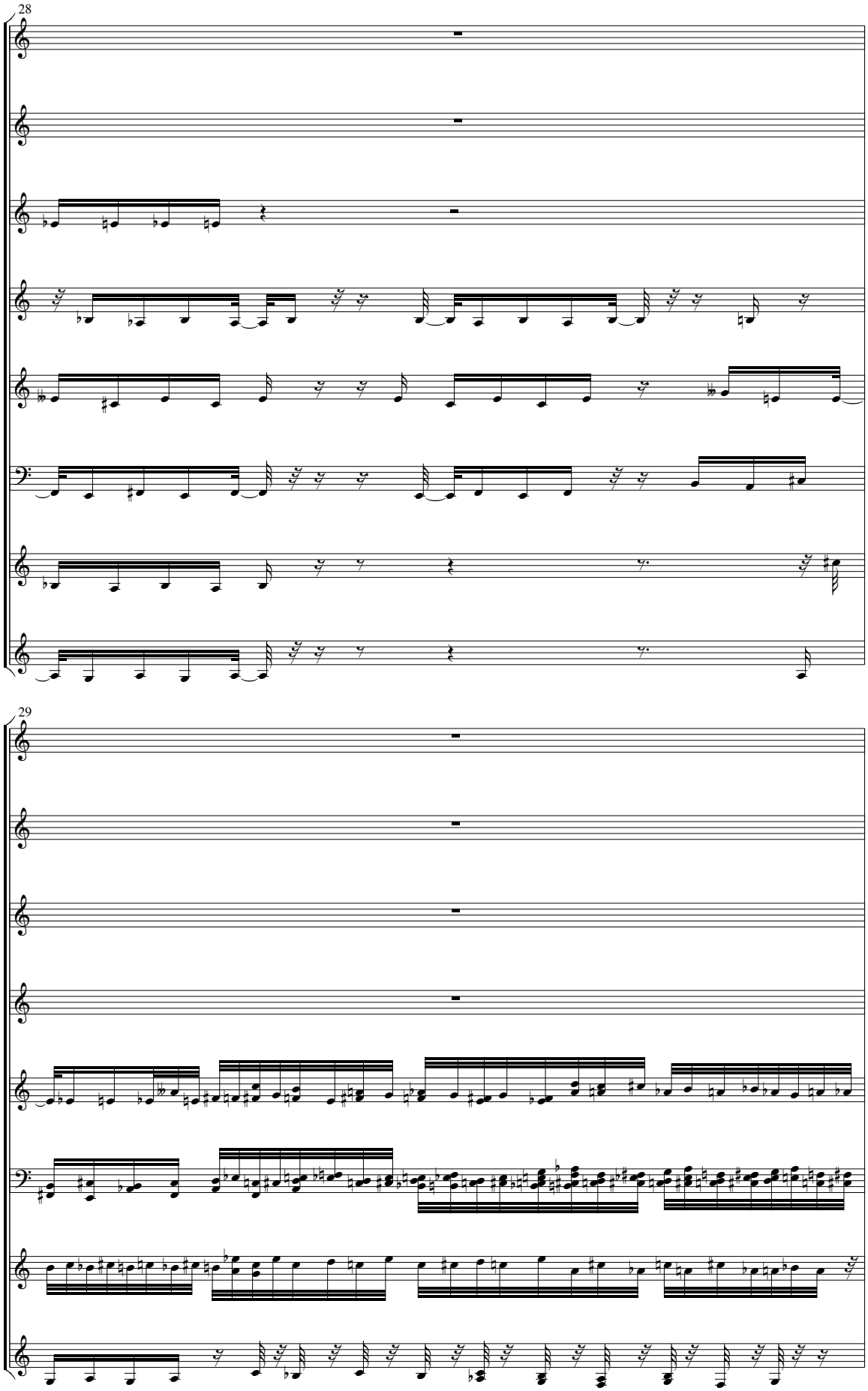

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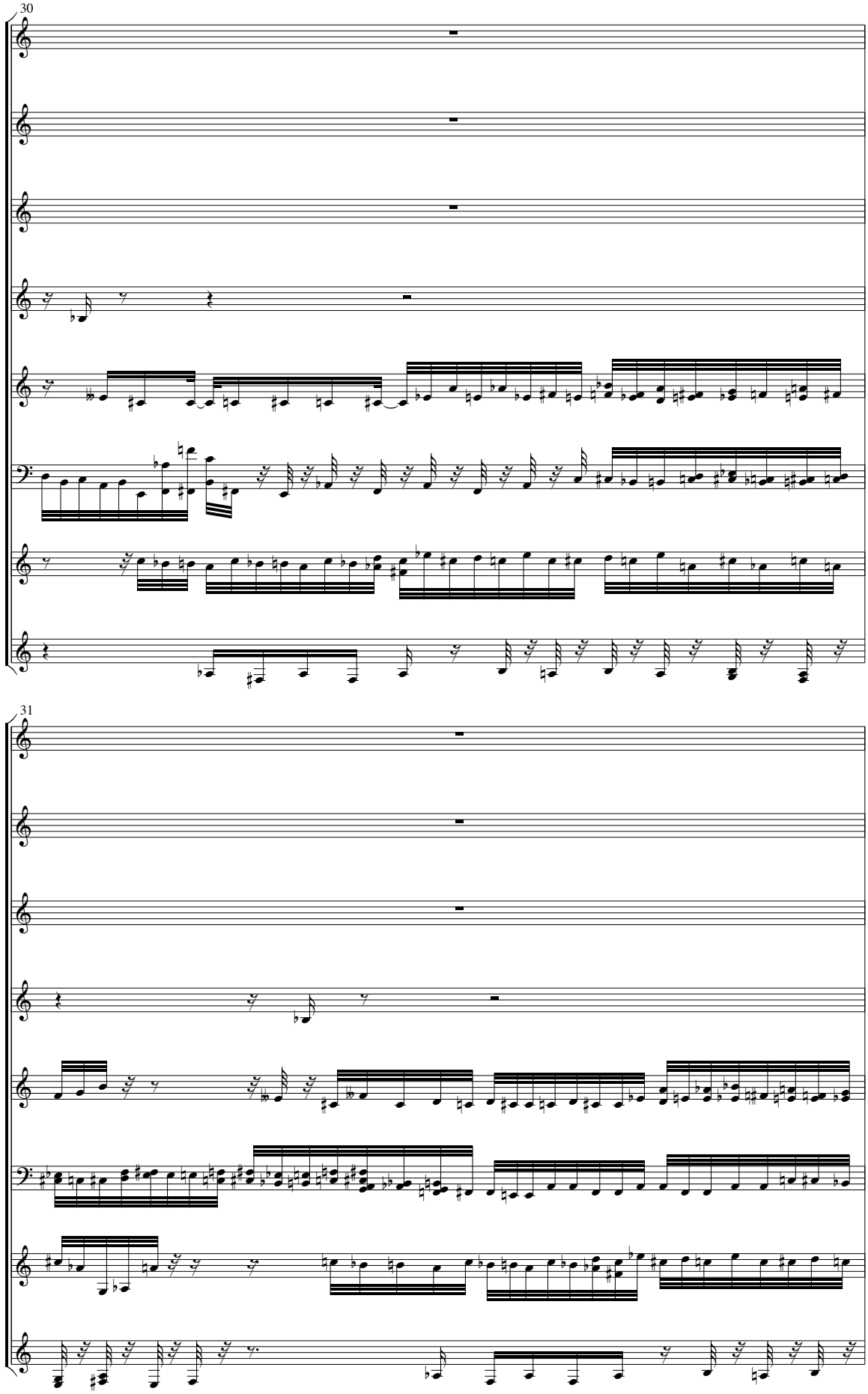

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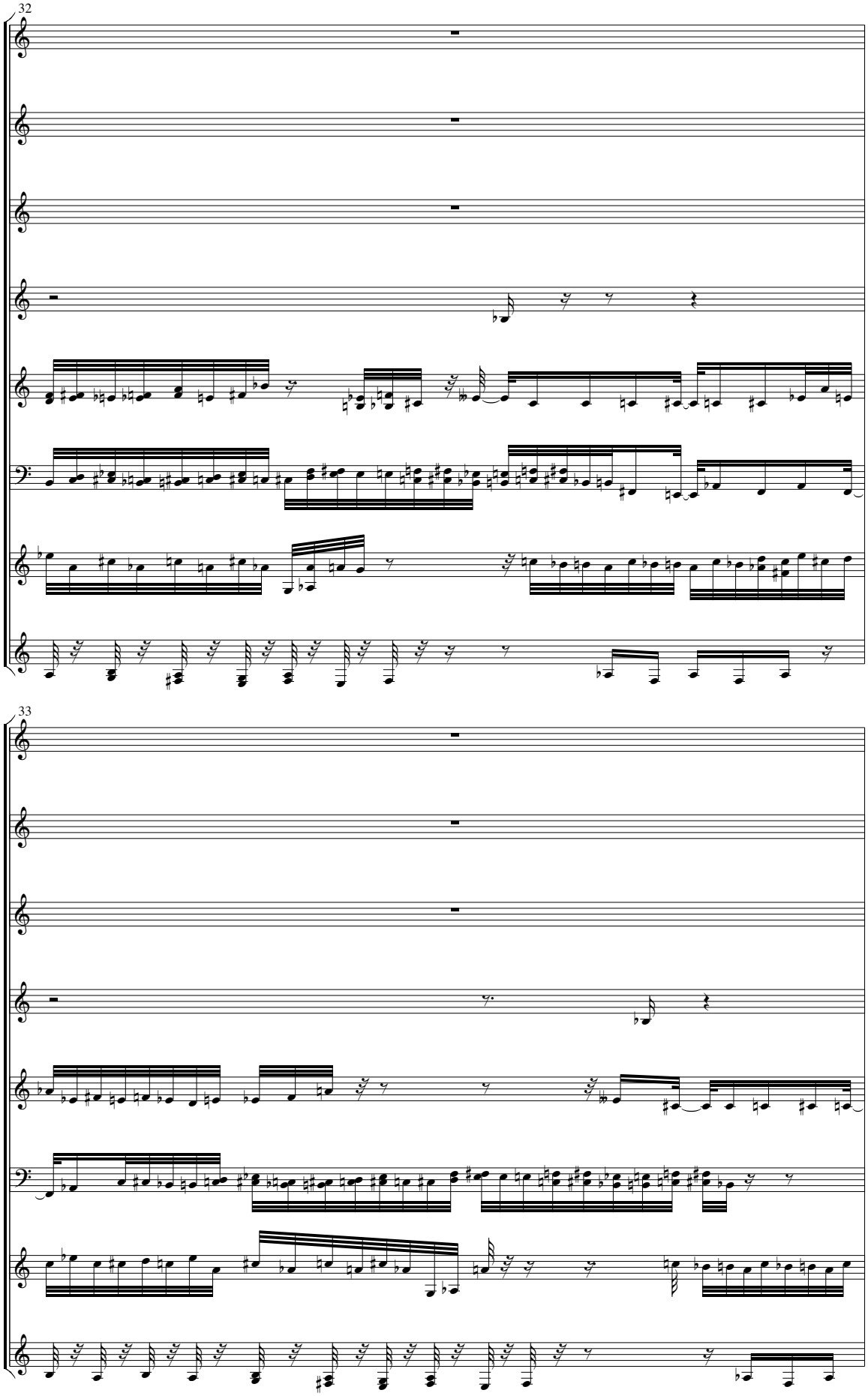

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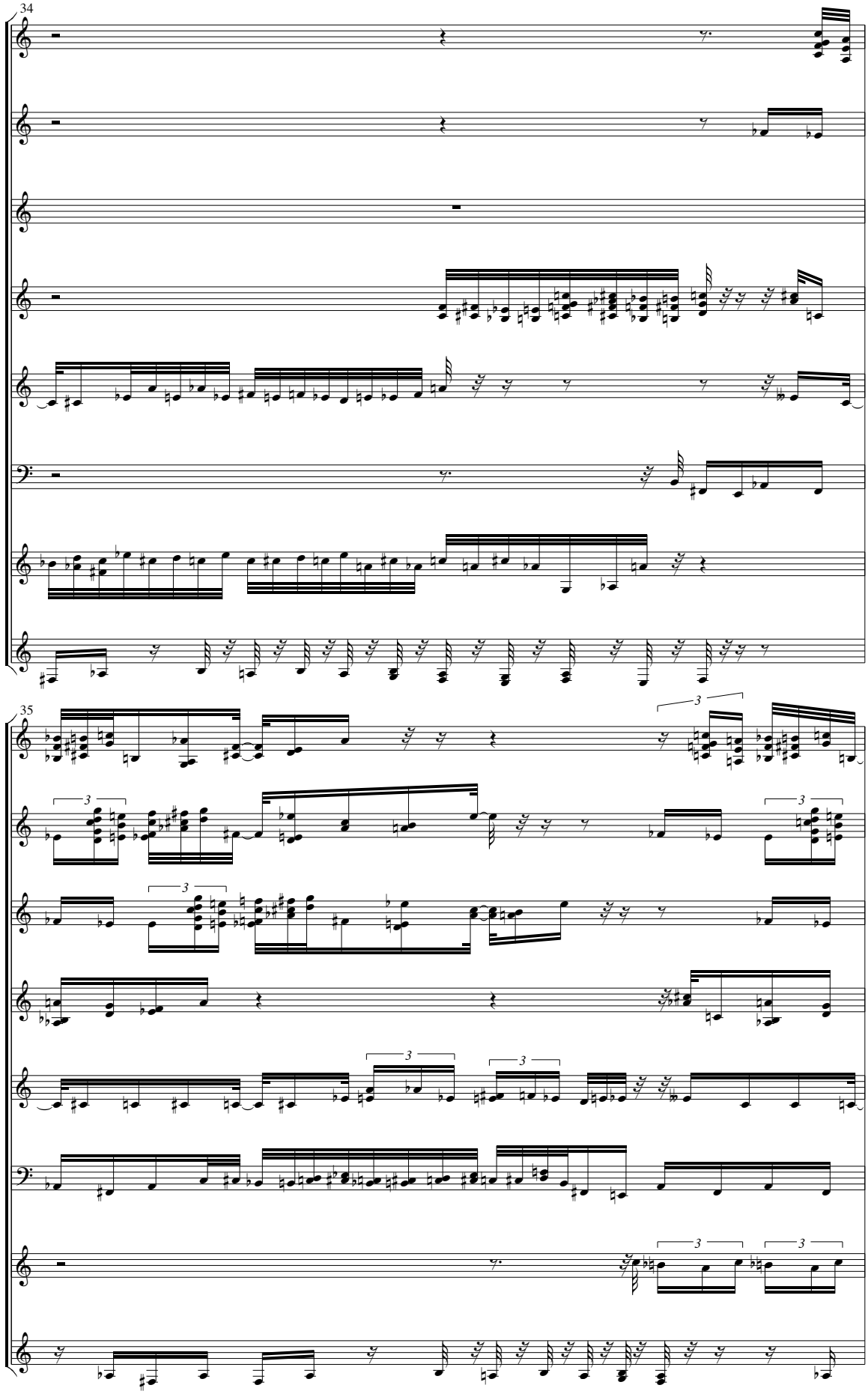

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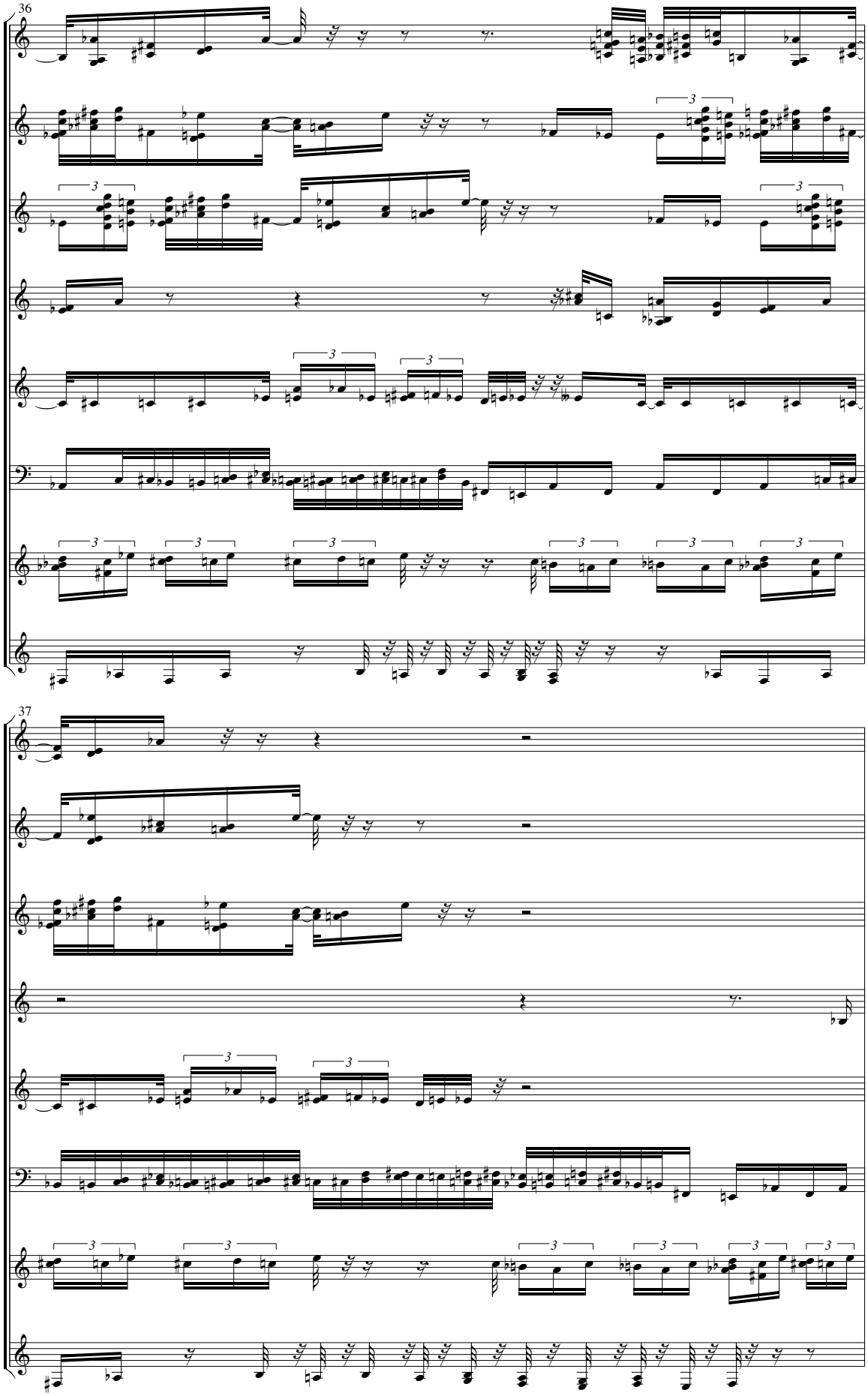

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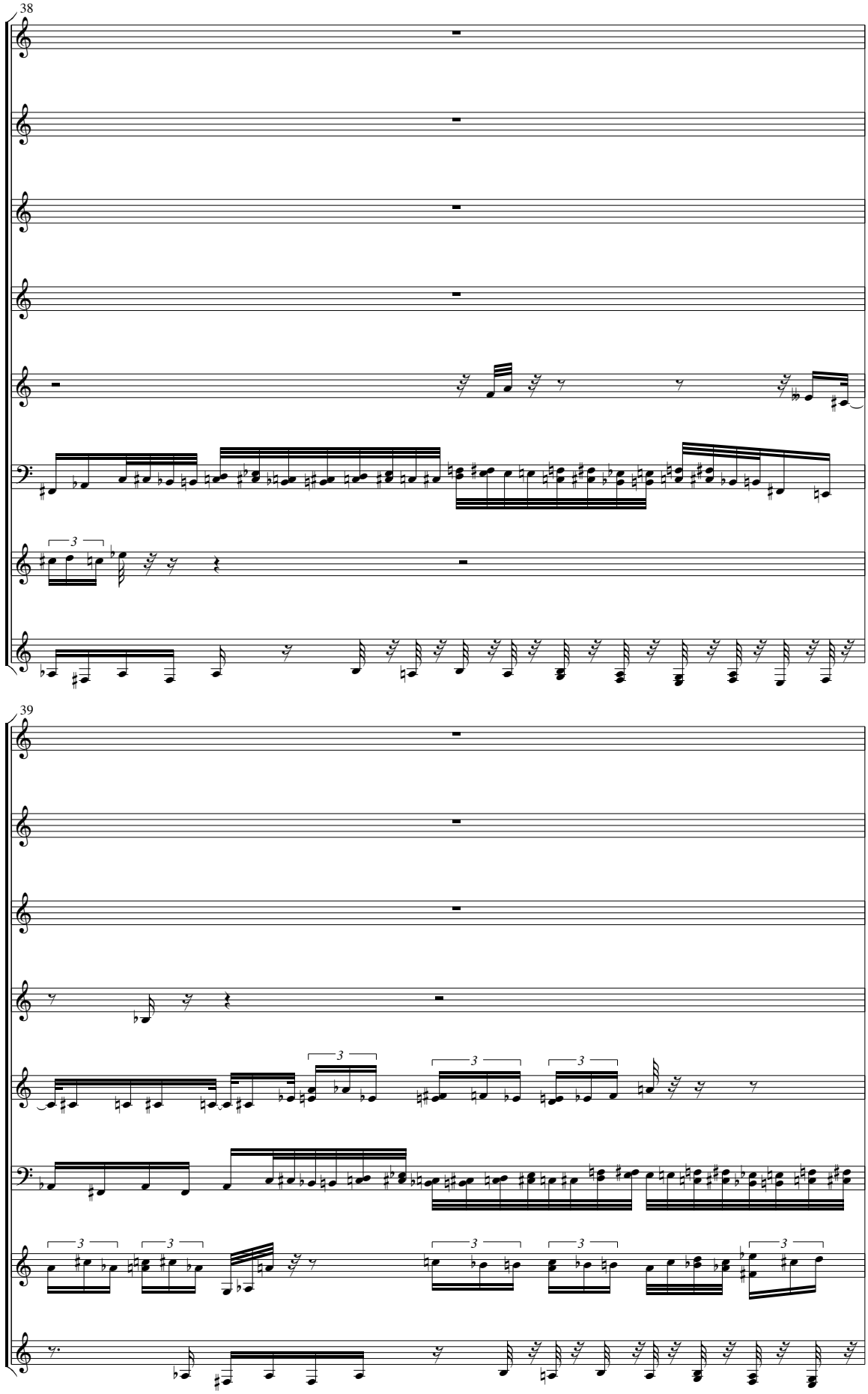

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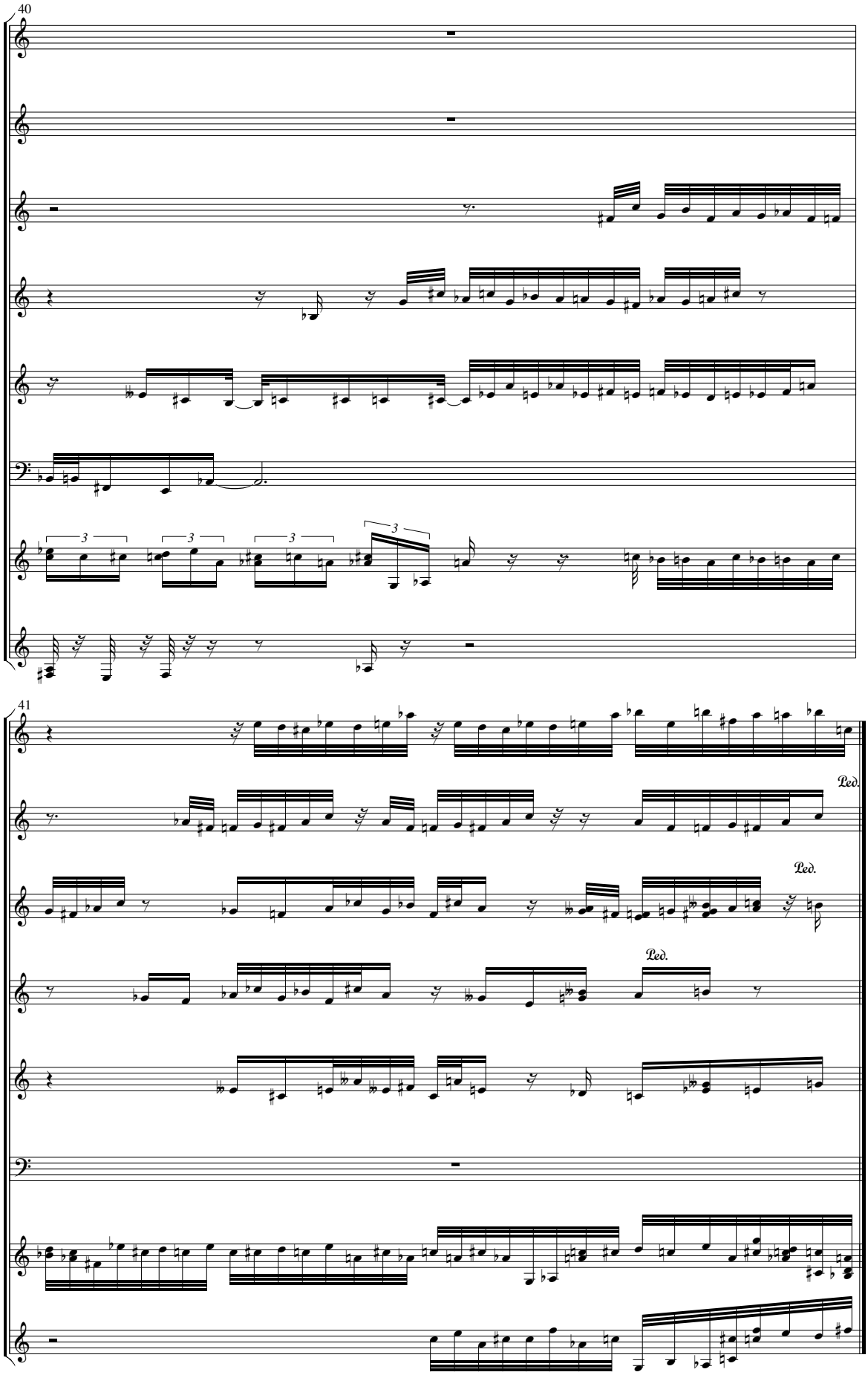

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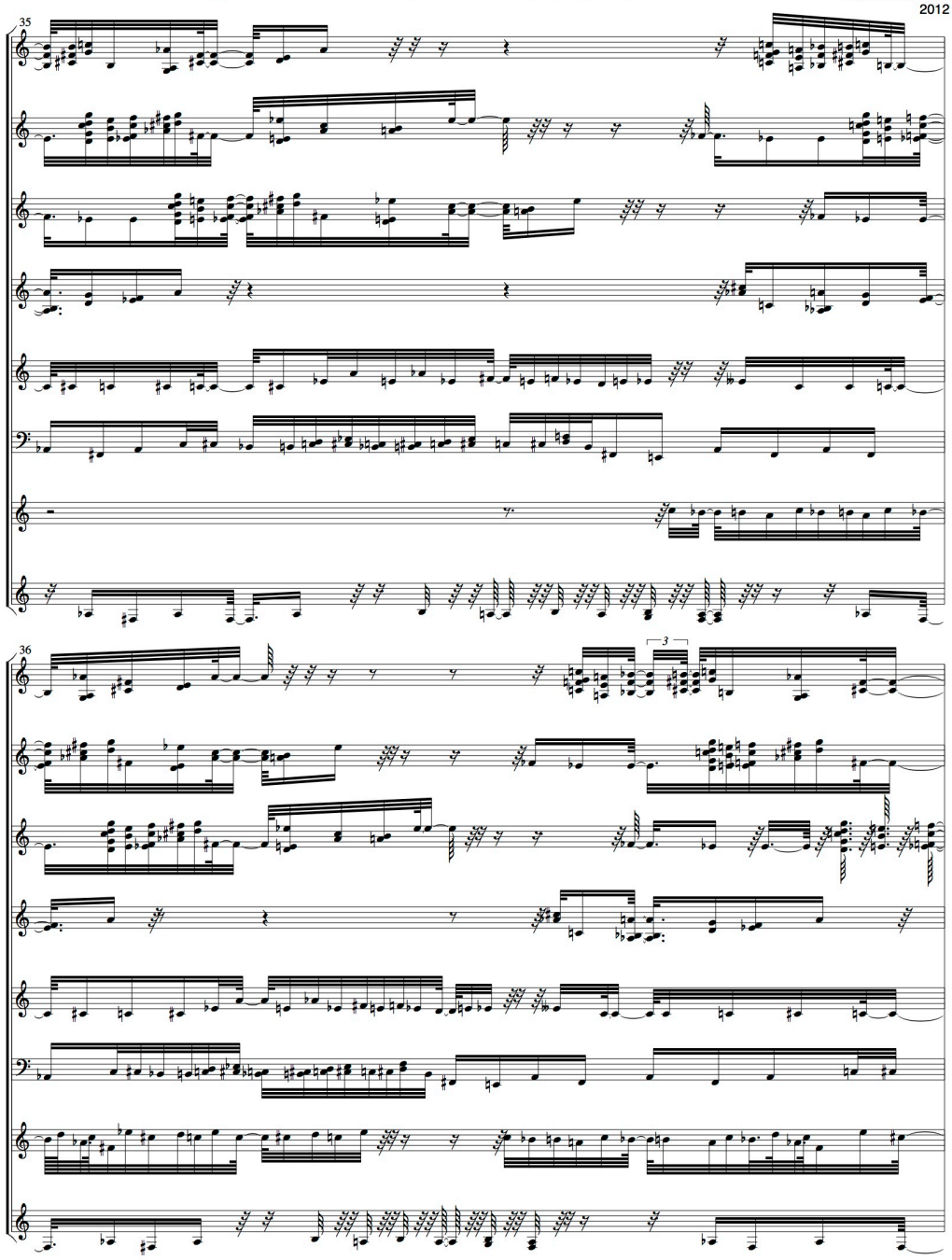

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Ped.
Ped.
Ped.

Dreaming at the Circular Ruins, No.2 Excerpt: page 14, bars 35-36

Benjamin Mawson
2012



Score produced in Logic Pro 9 from MIDI data quantised to resolution 64 / 196
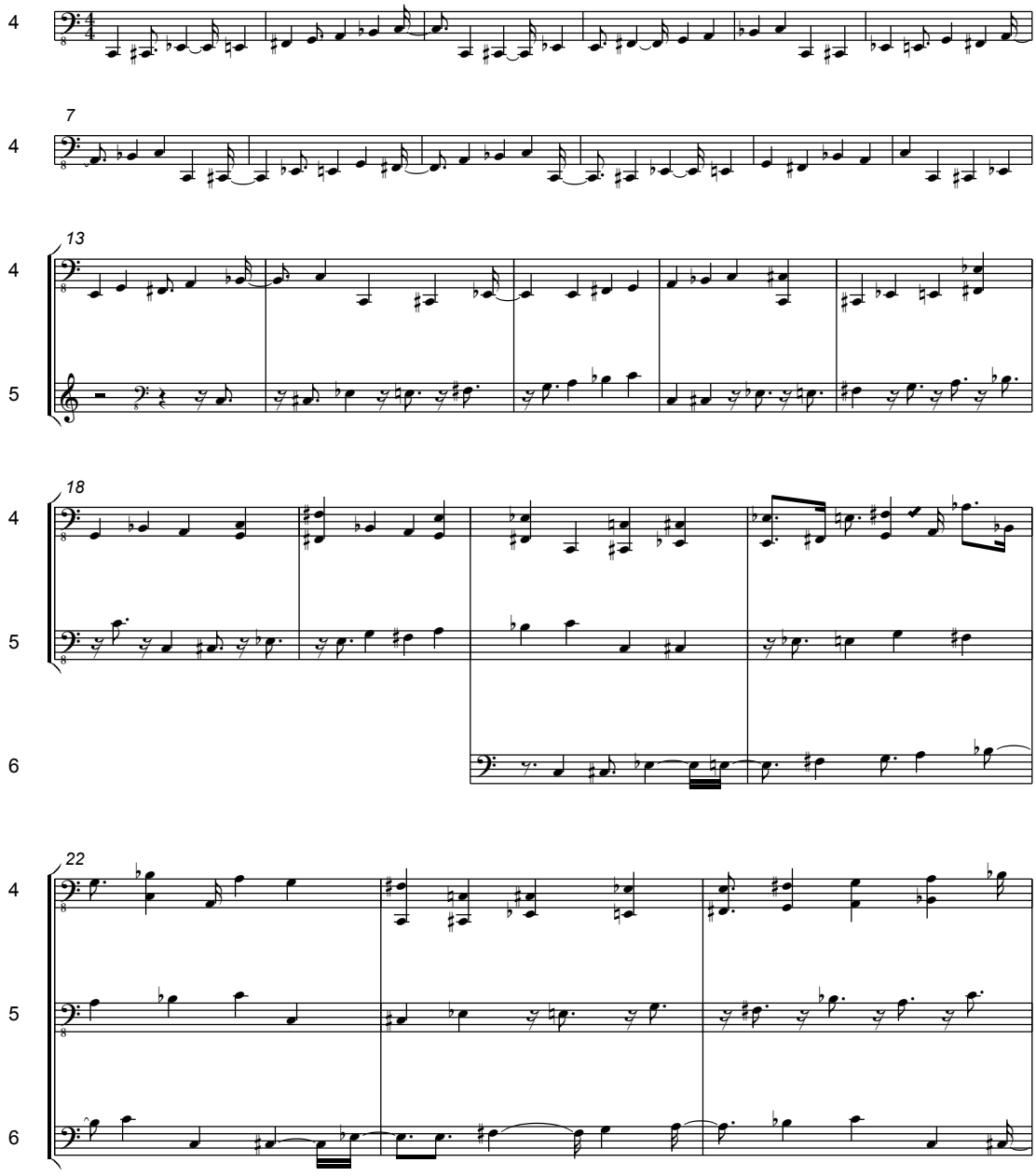
Dreaming at the Circular Ruins (3)
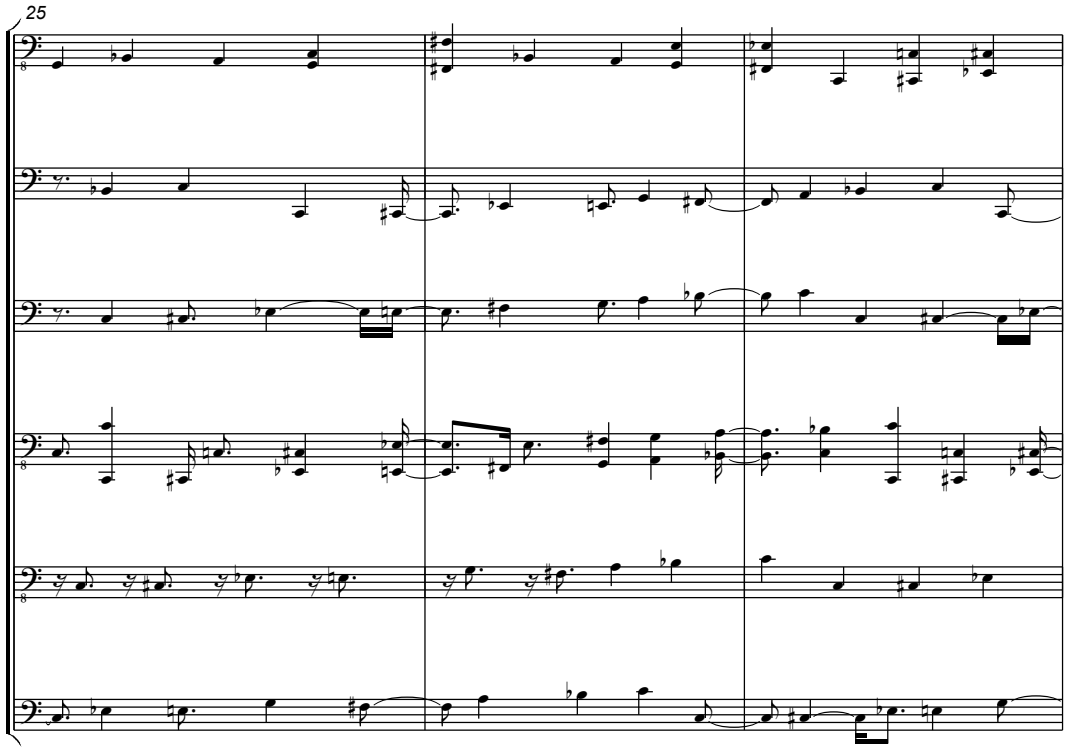
Score quantised to 1/16 : 1/24 resolution
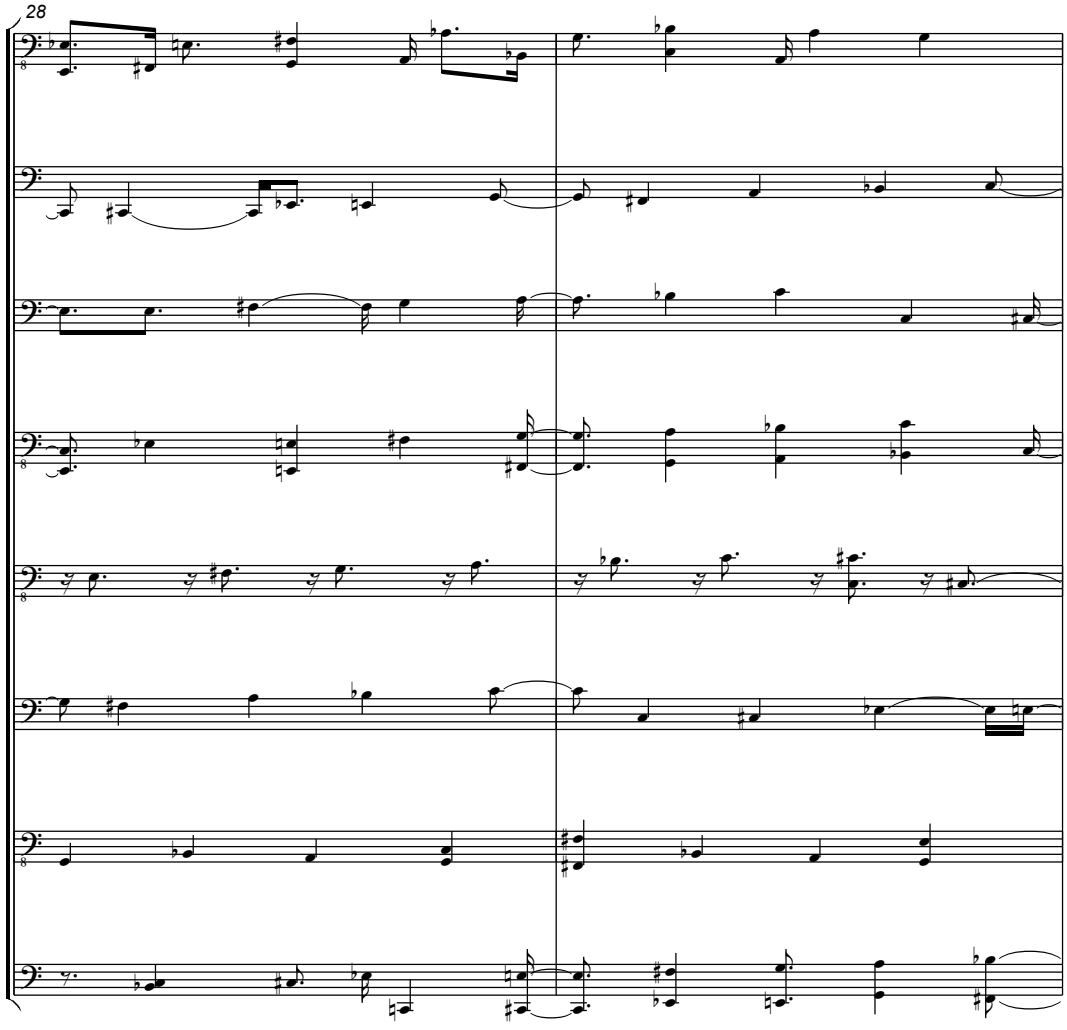
"Dreaming at the Circular Ruins" (Part 3)
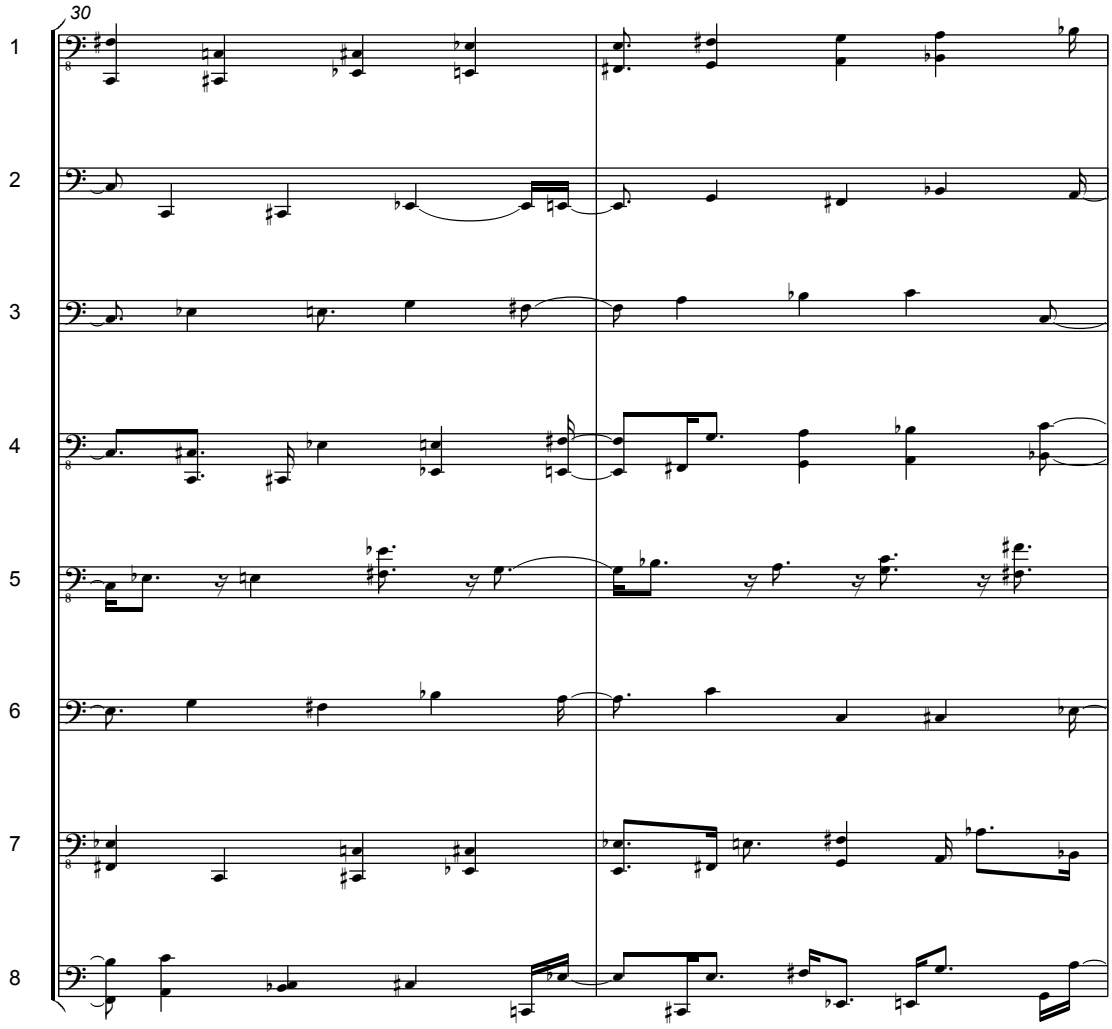
for 12 Digital Player Pianos
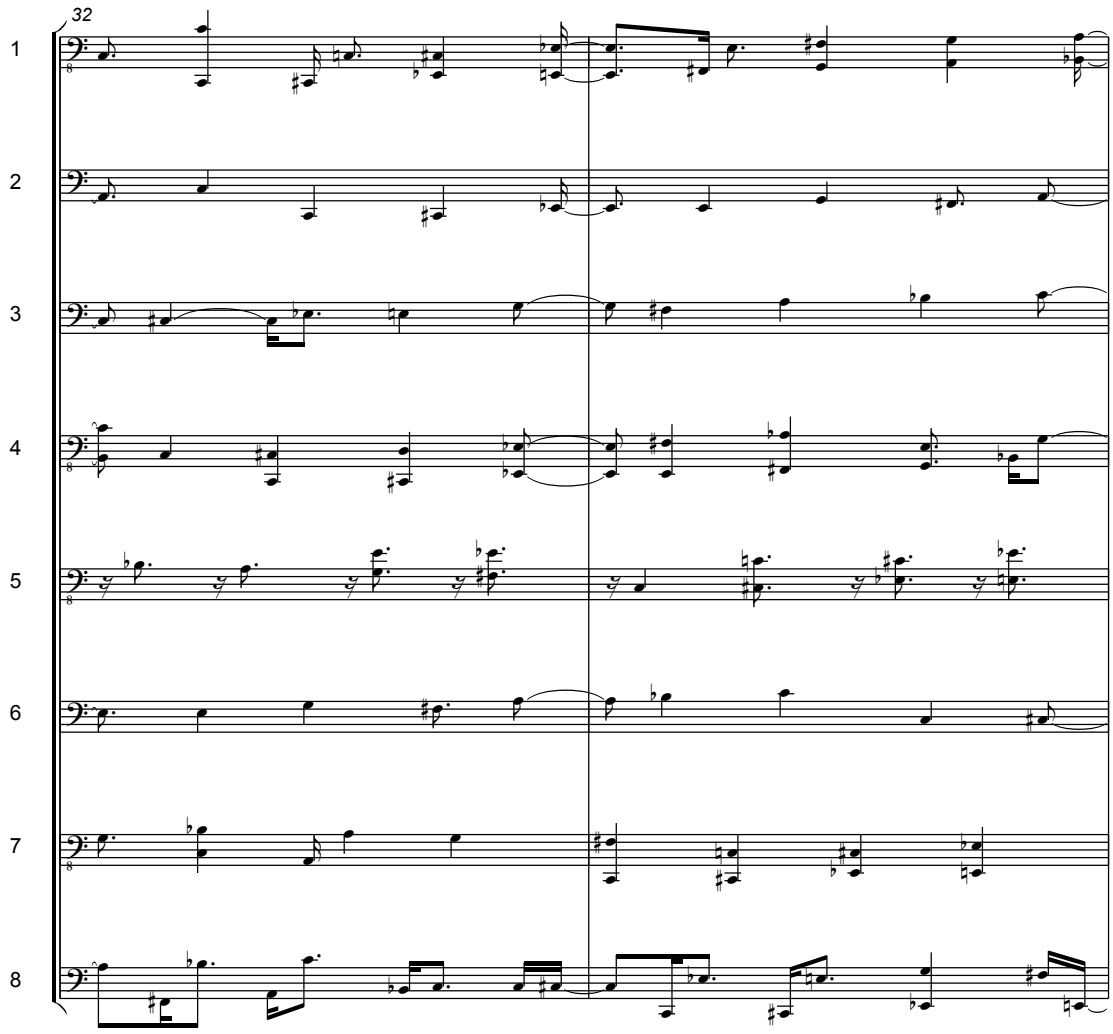
Benjamin Mawson
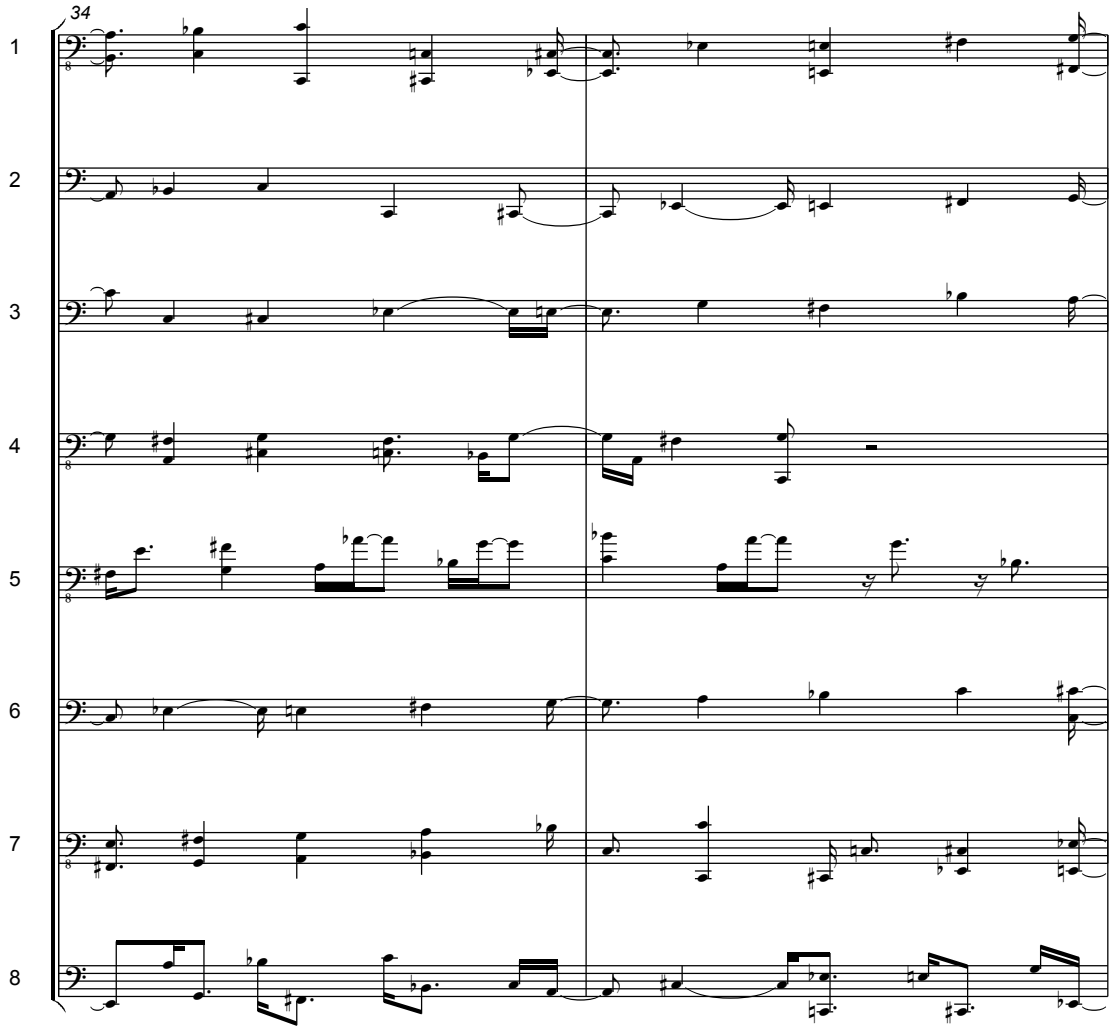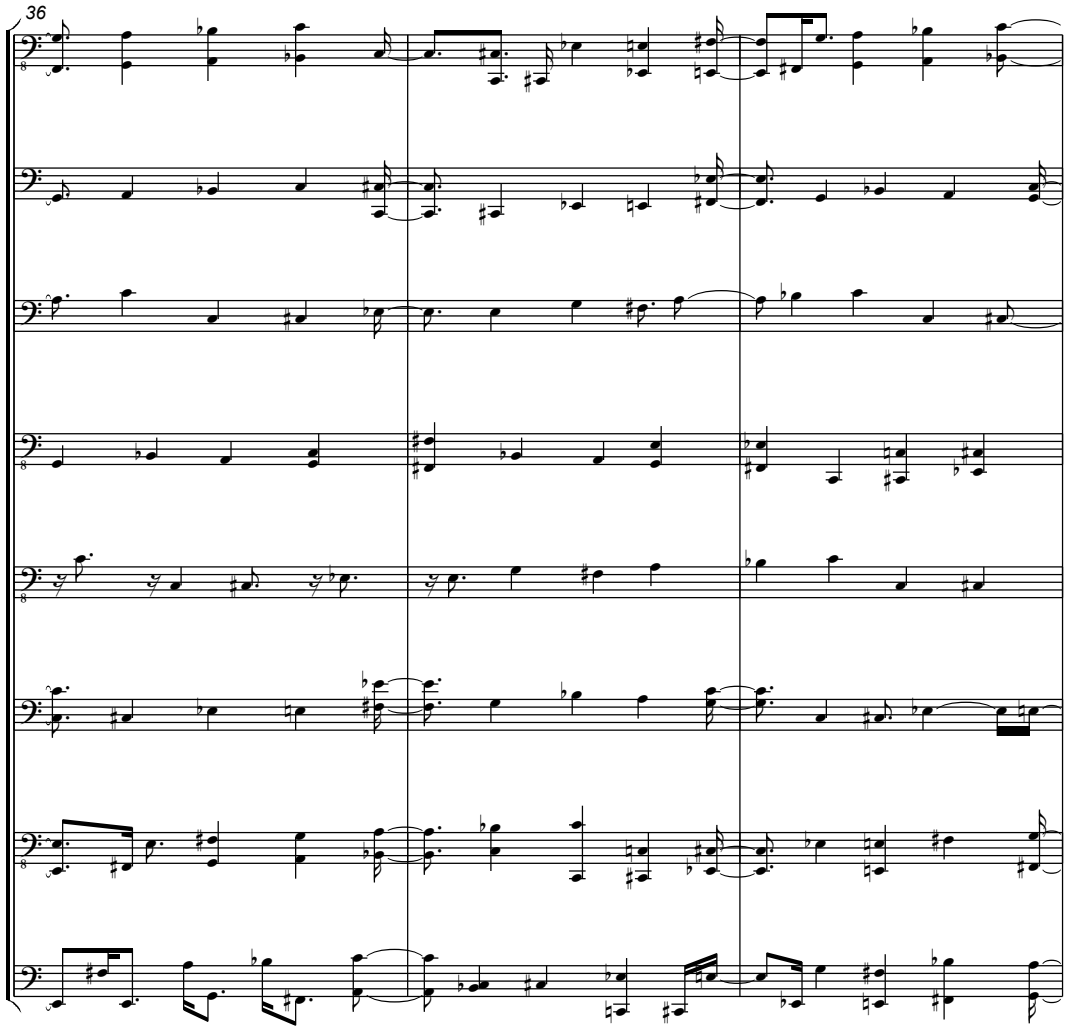



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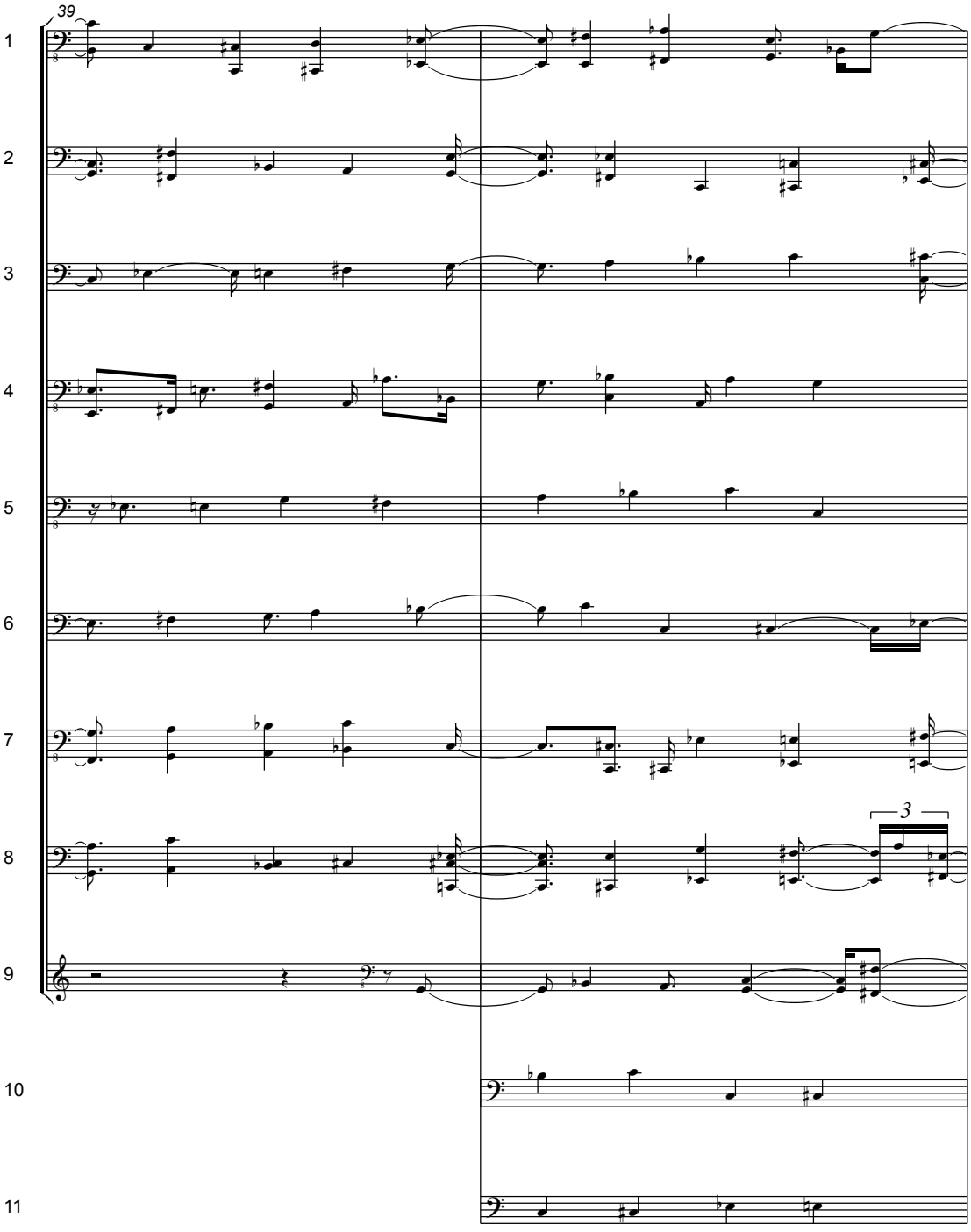

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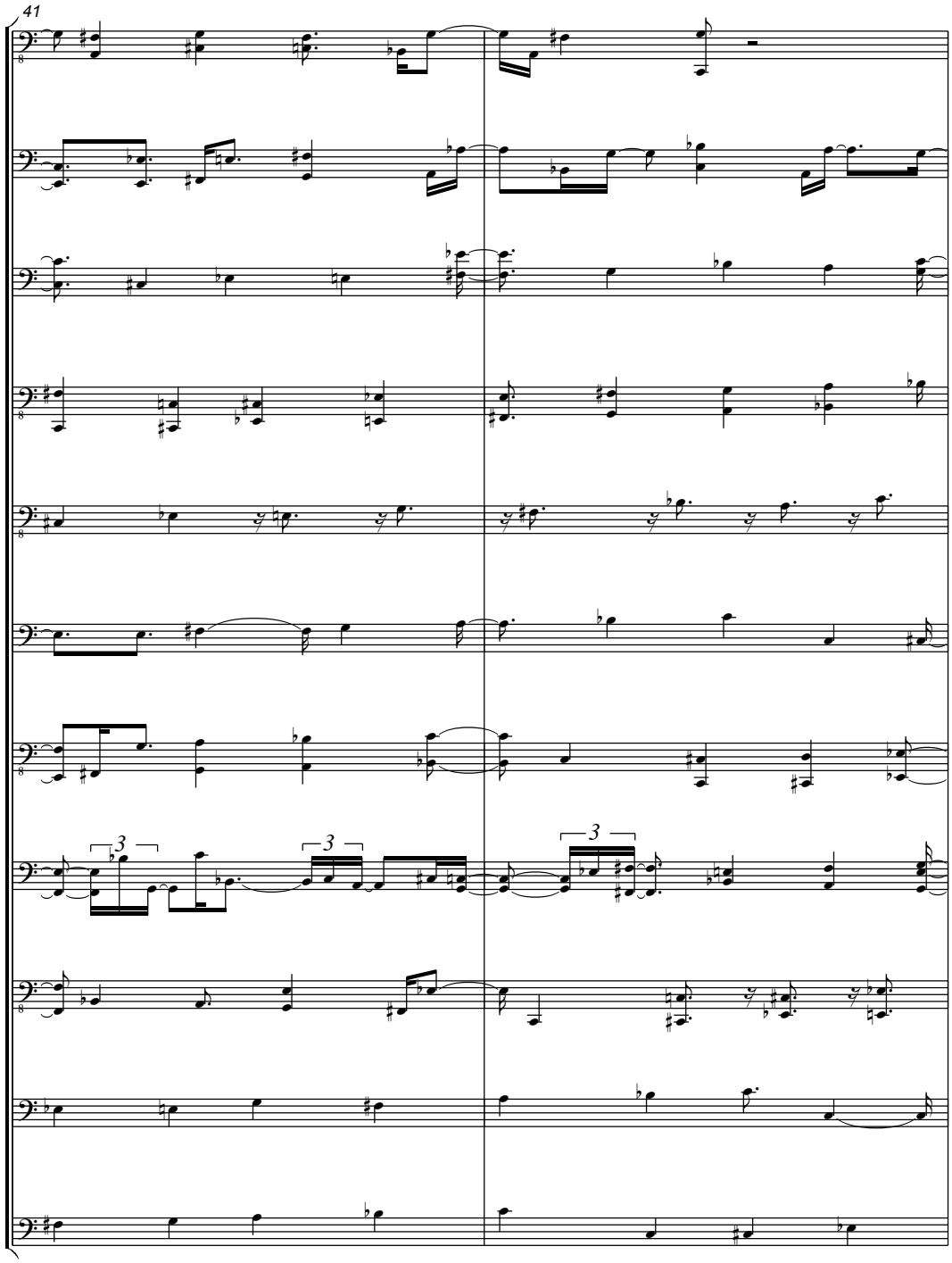

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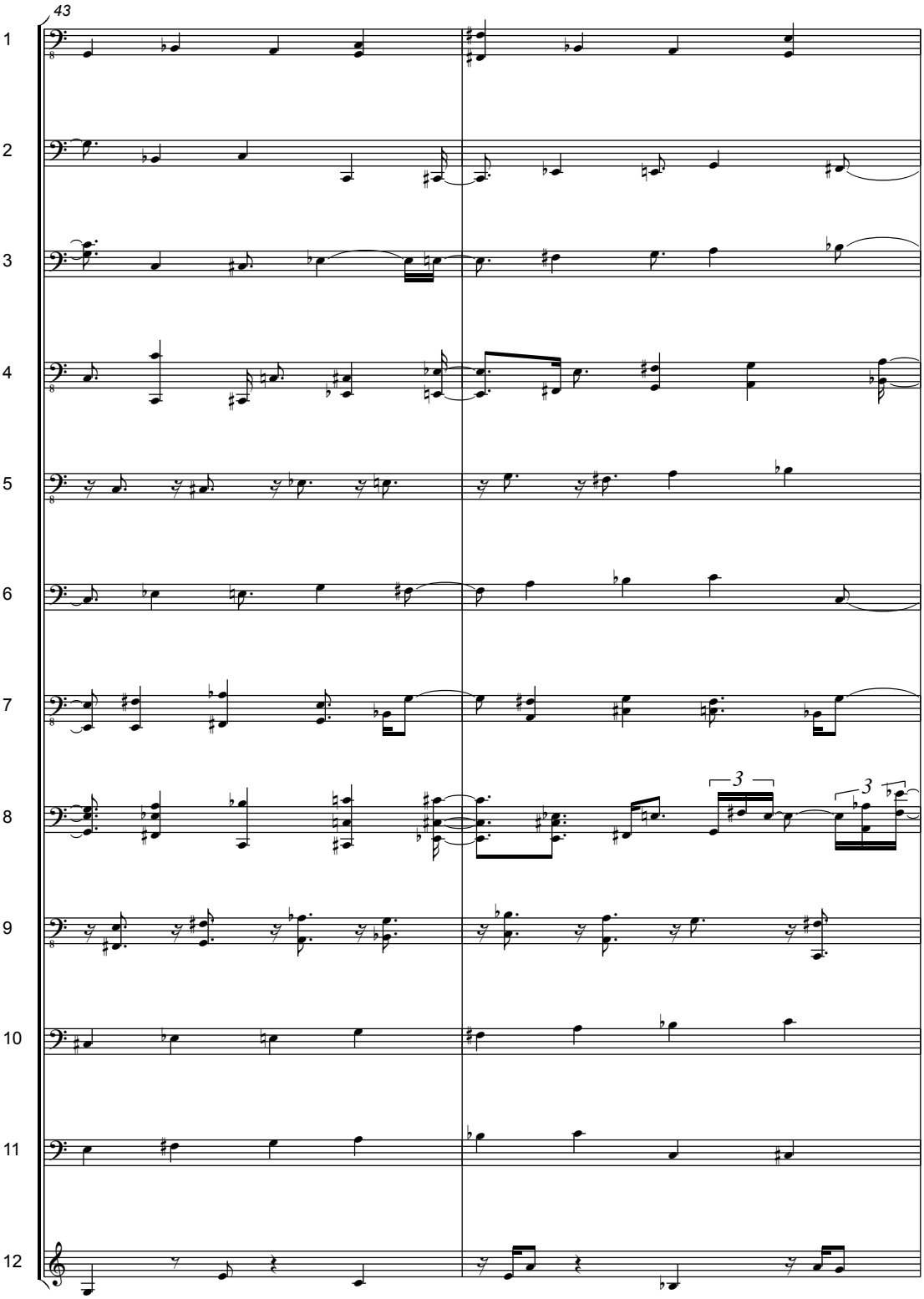

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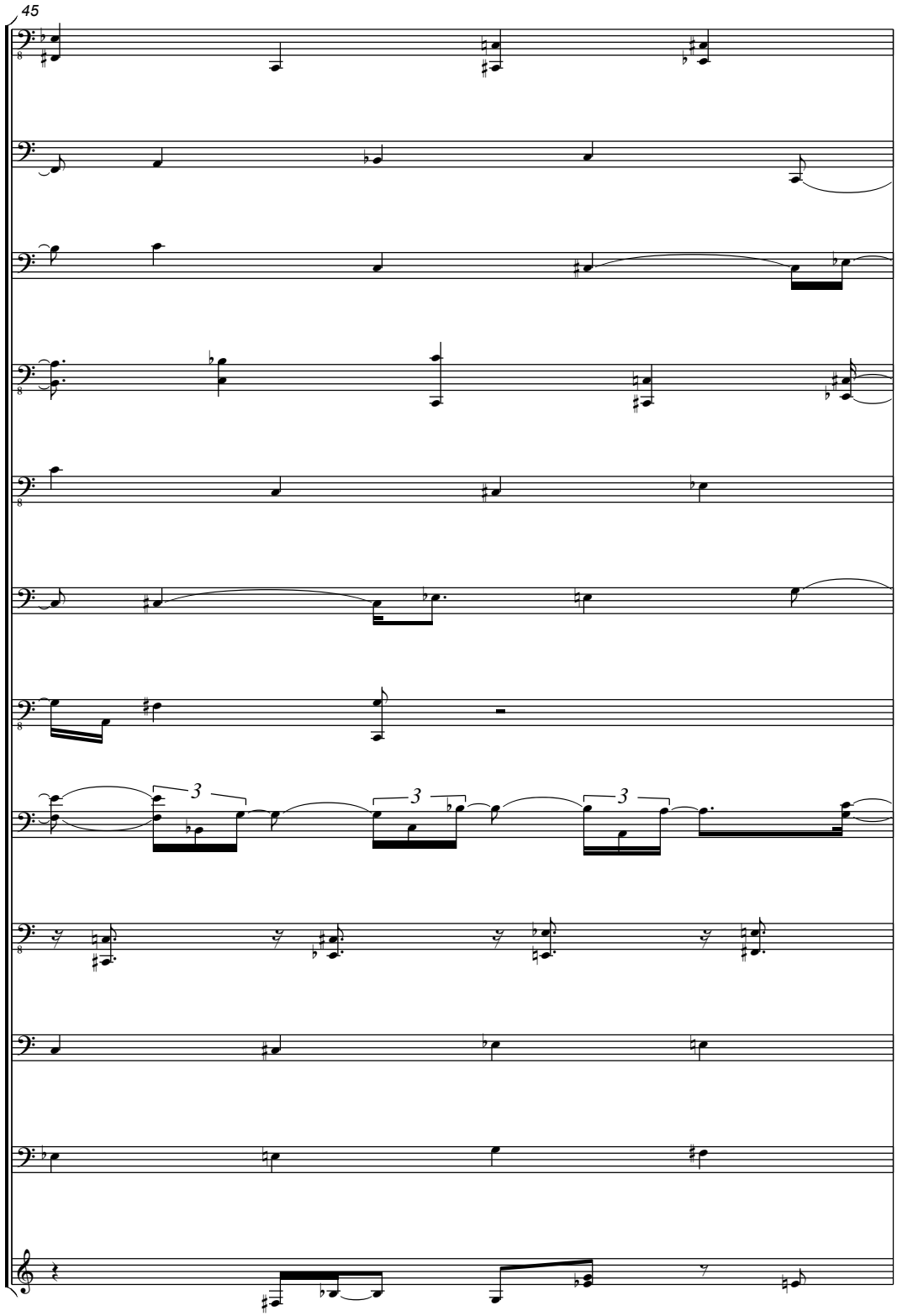

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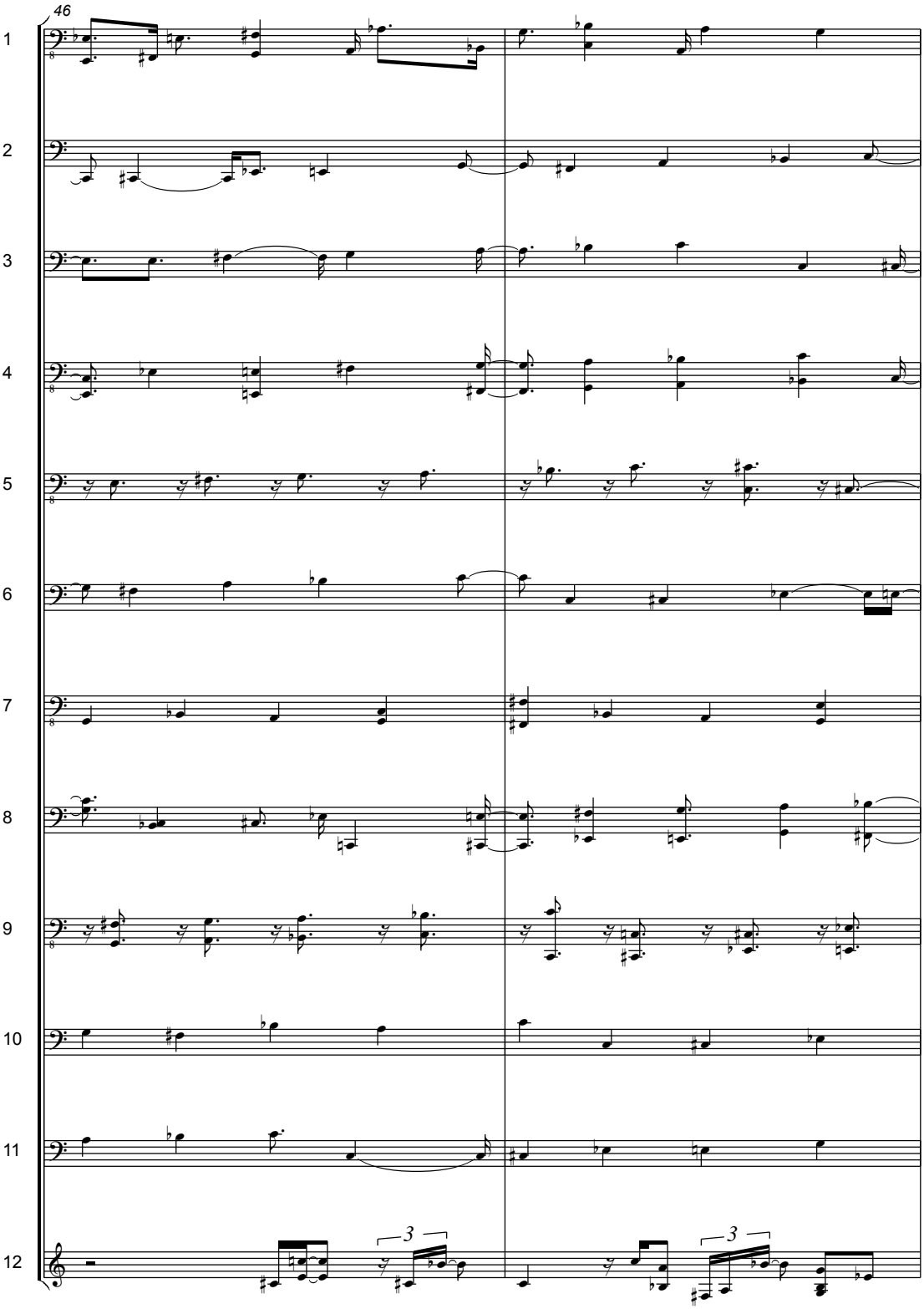

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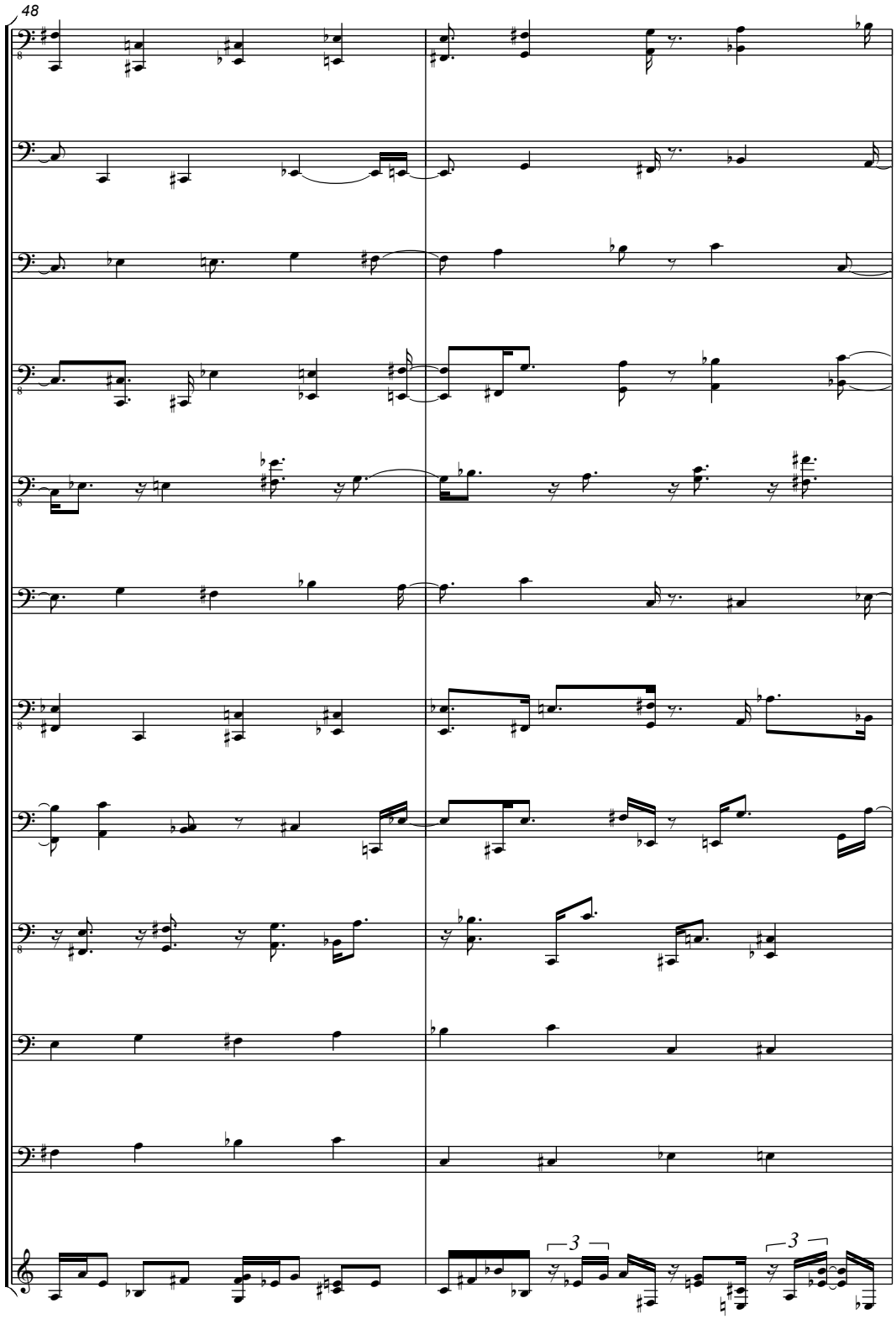

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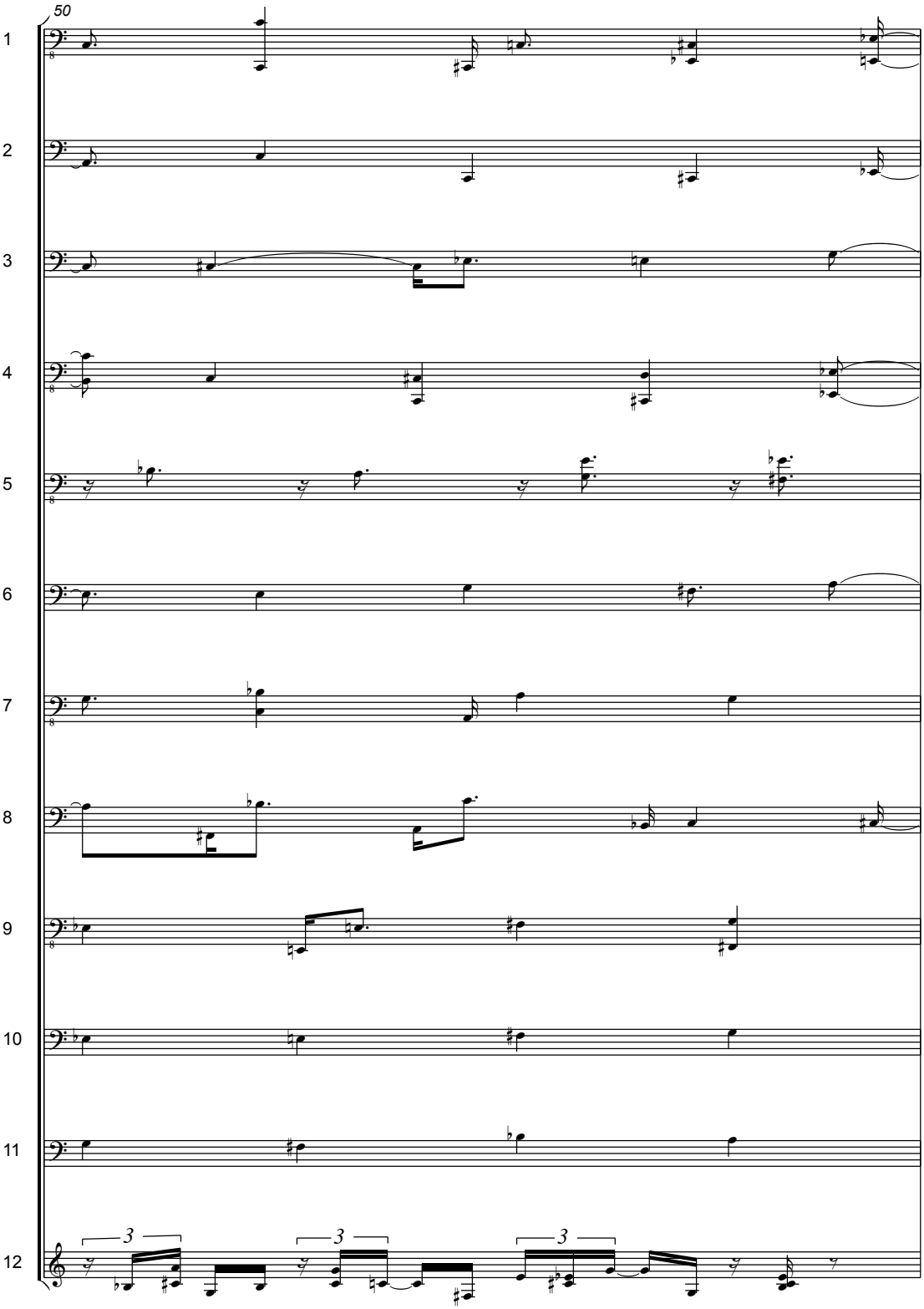

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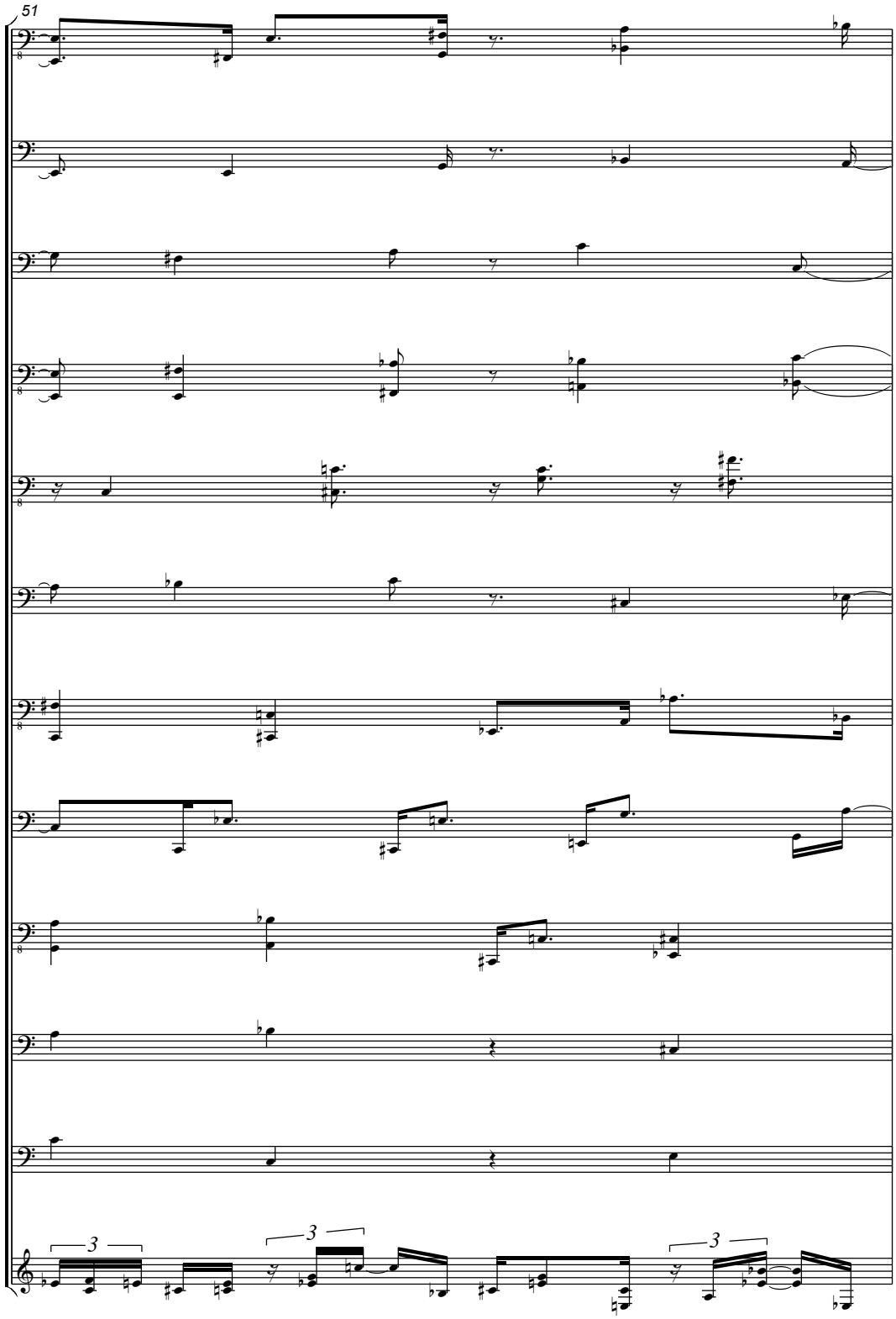

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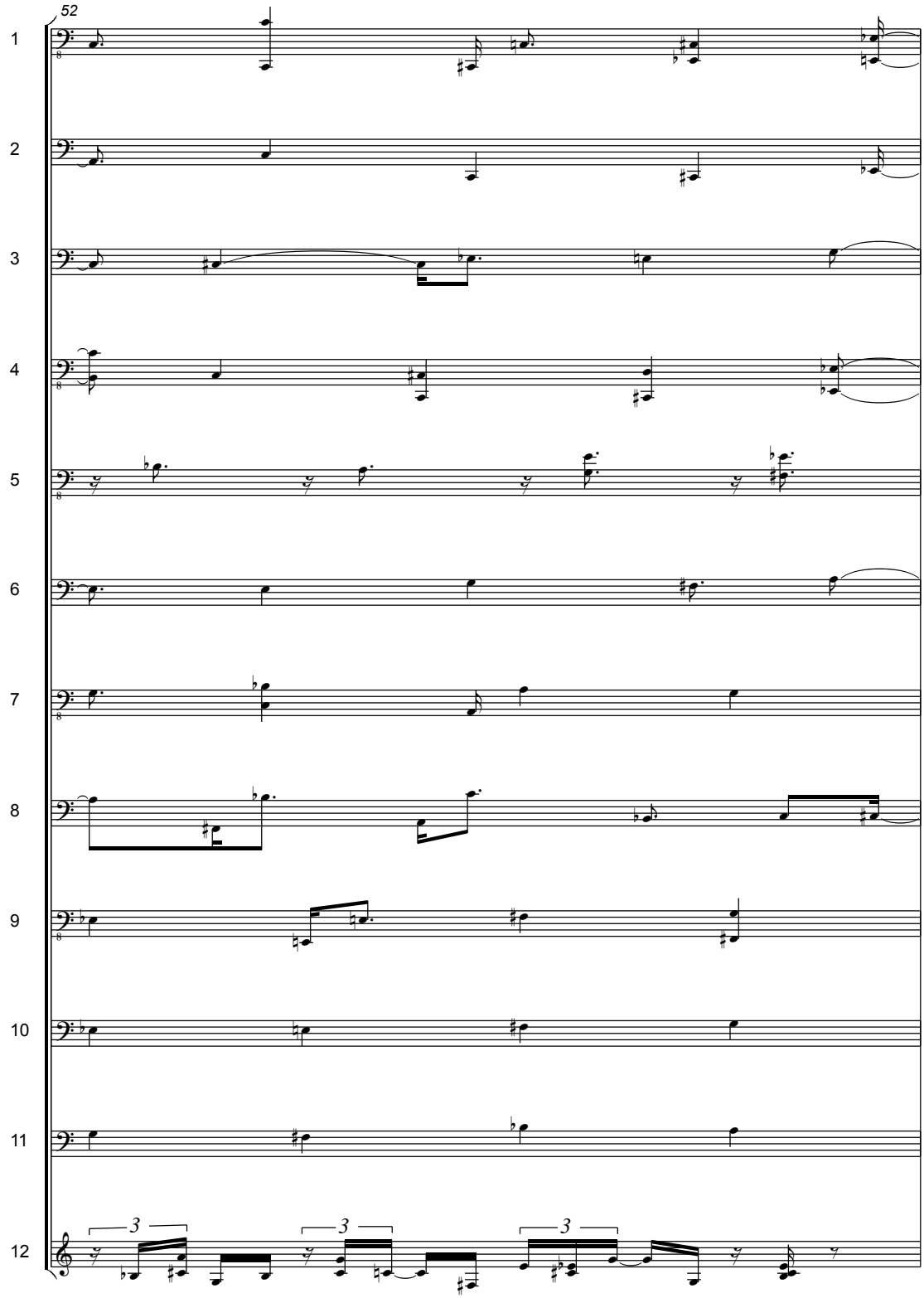

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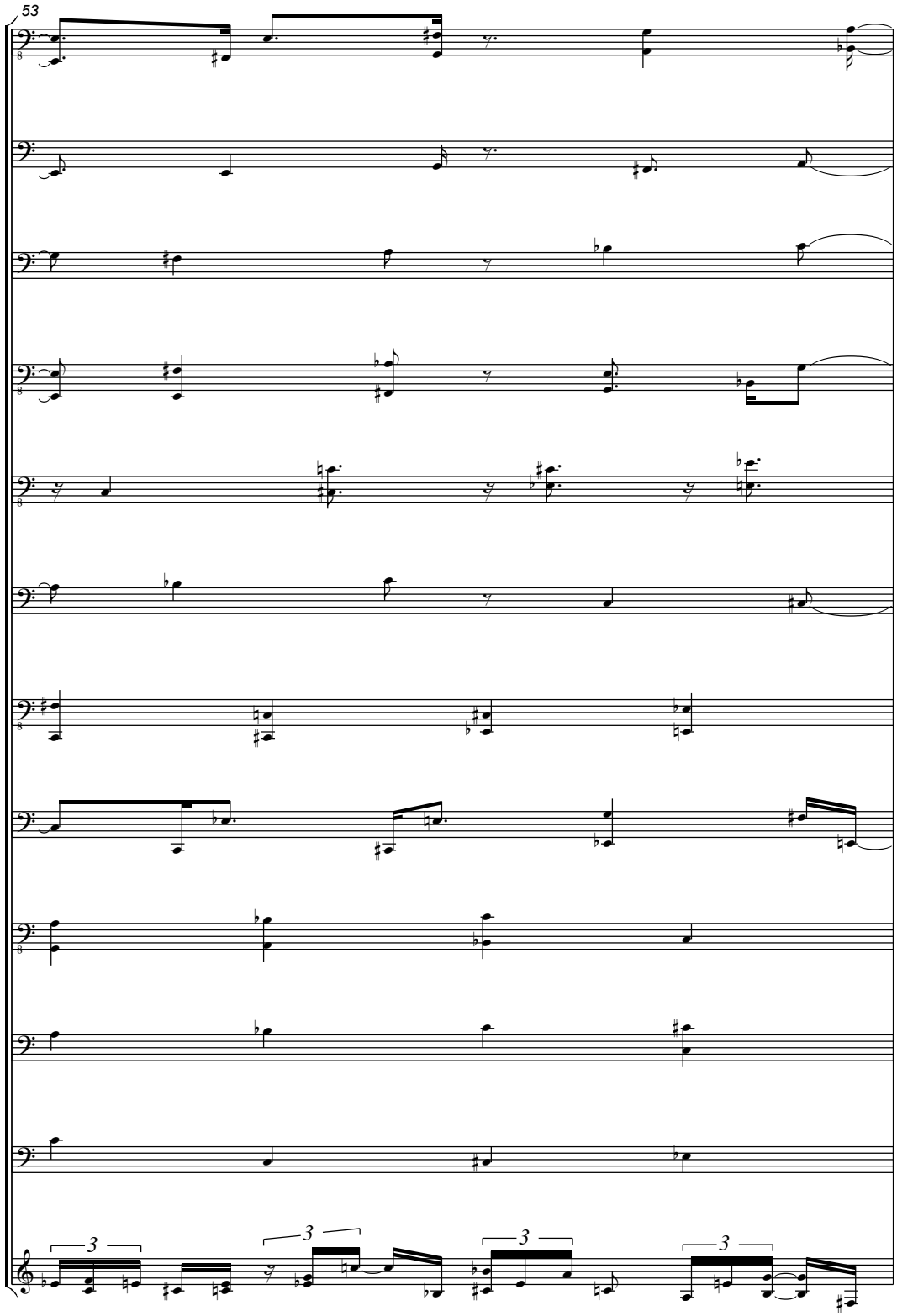

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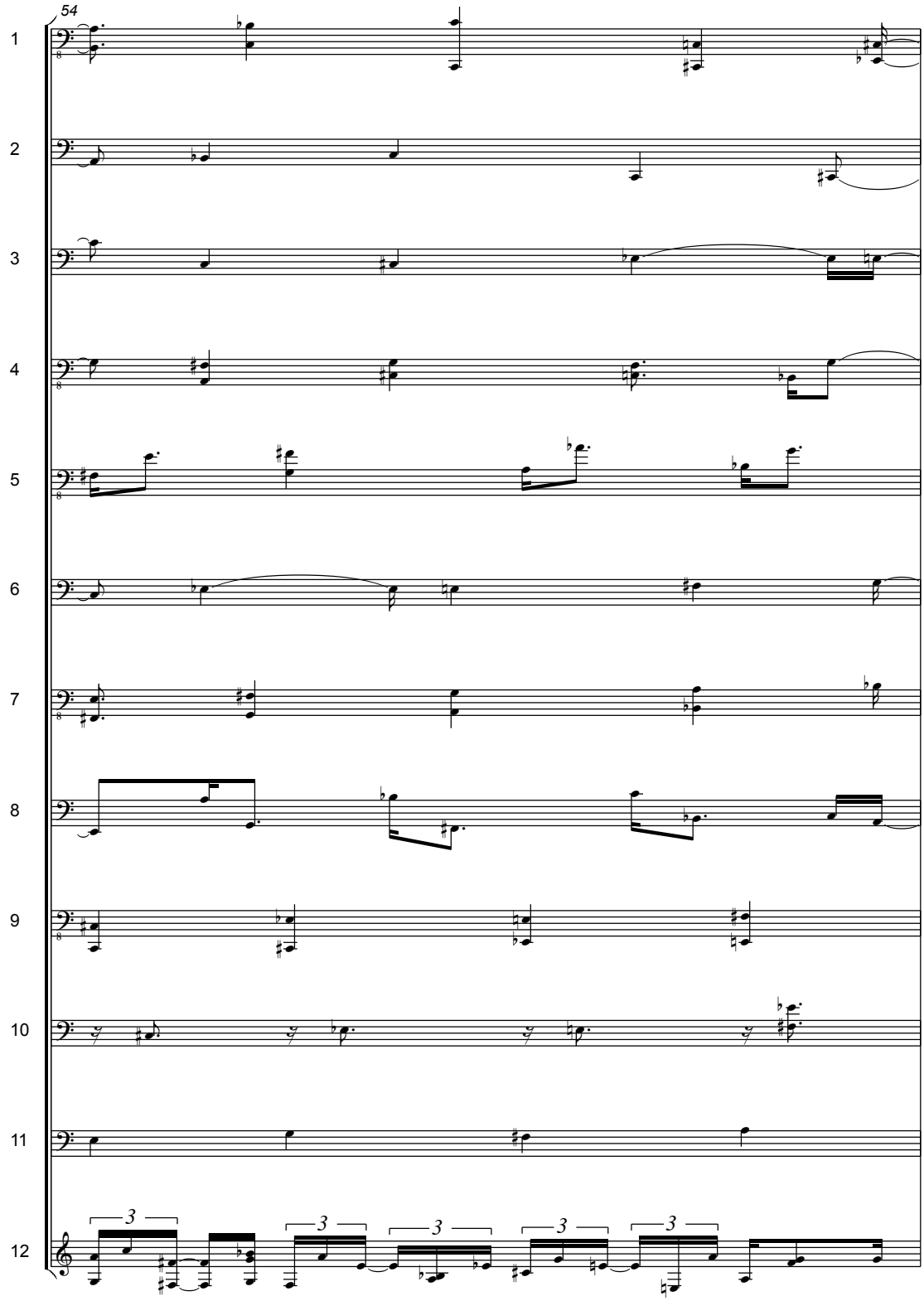

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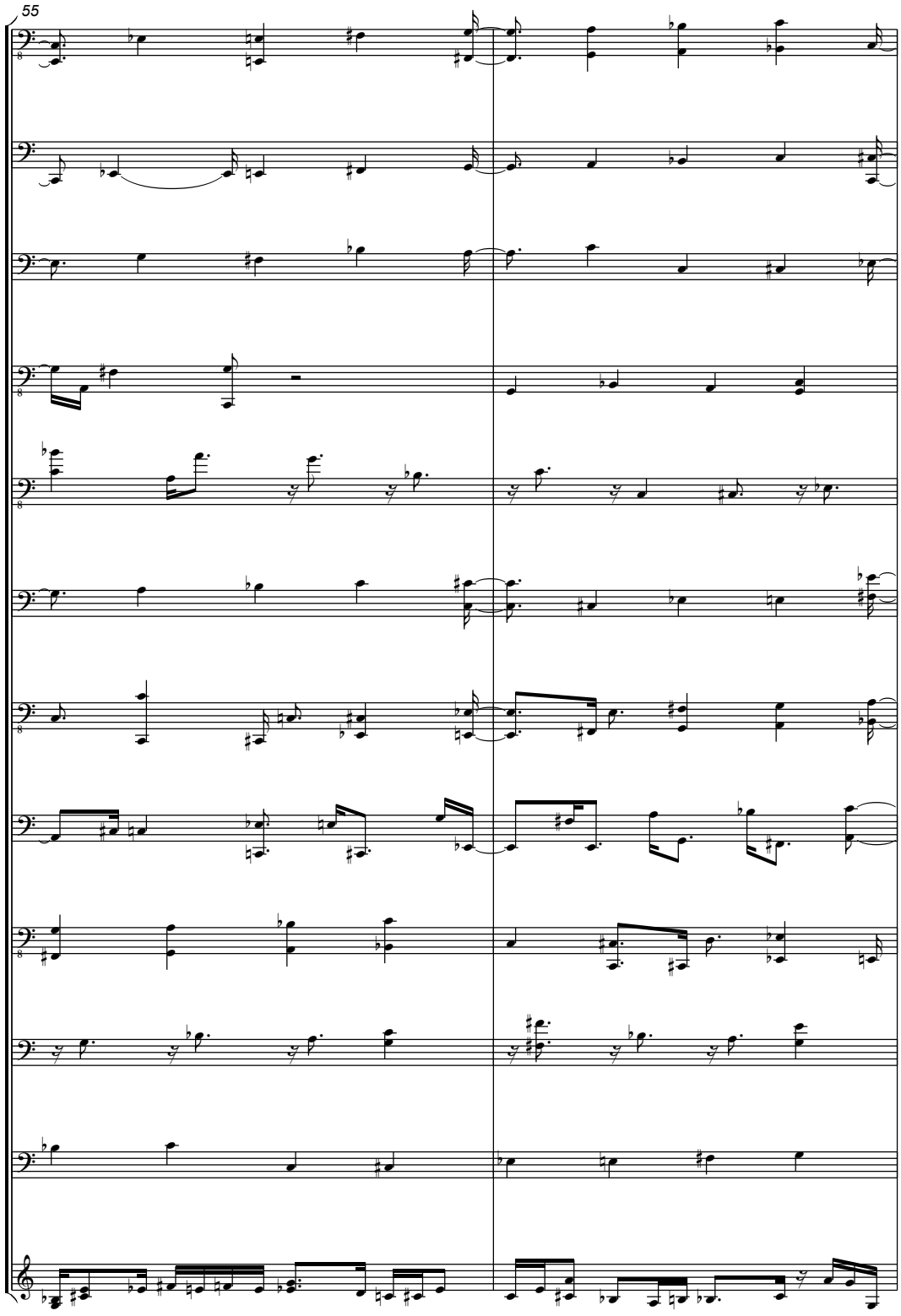

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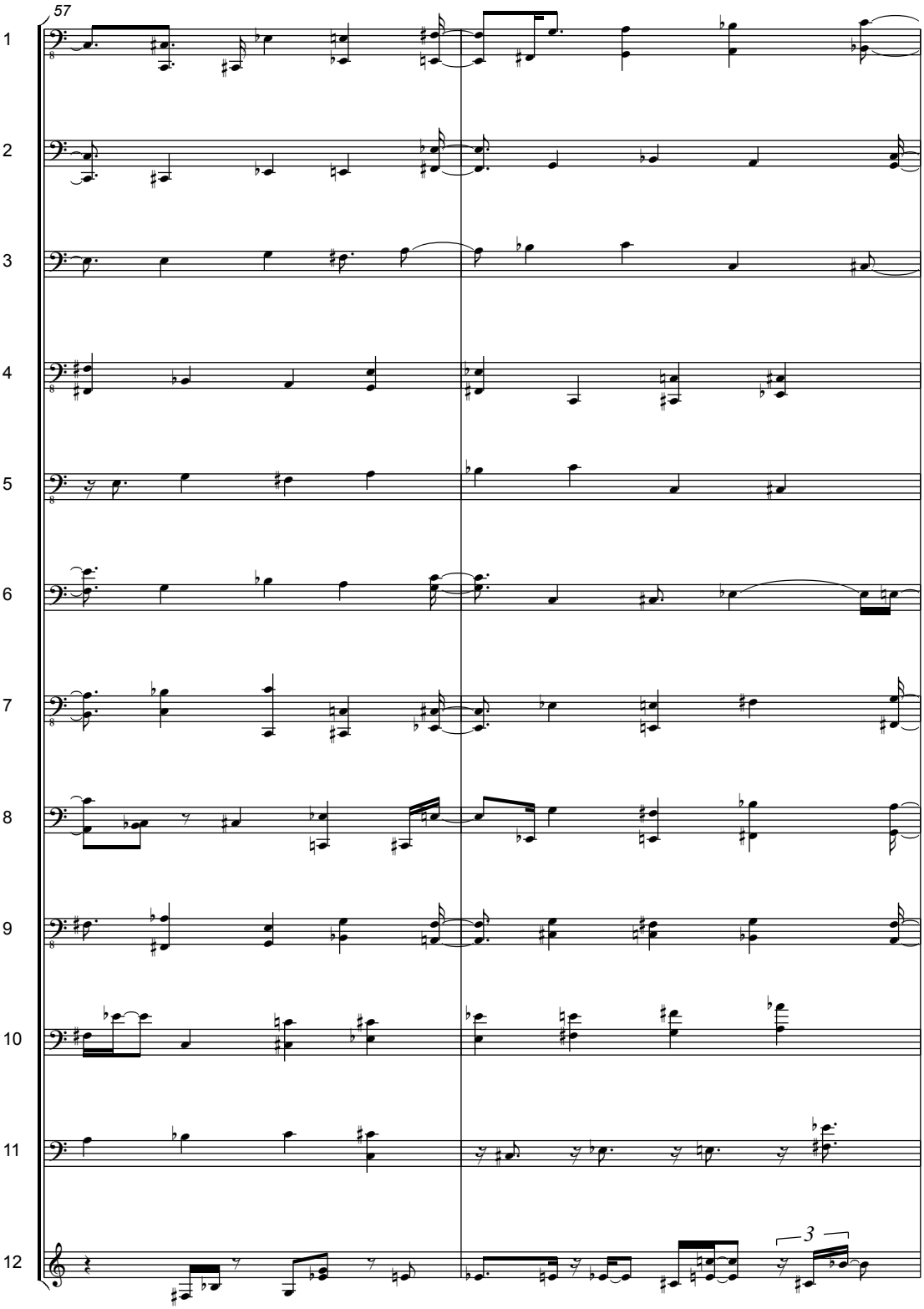

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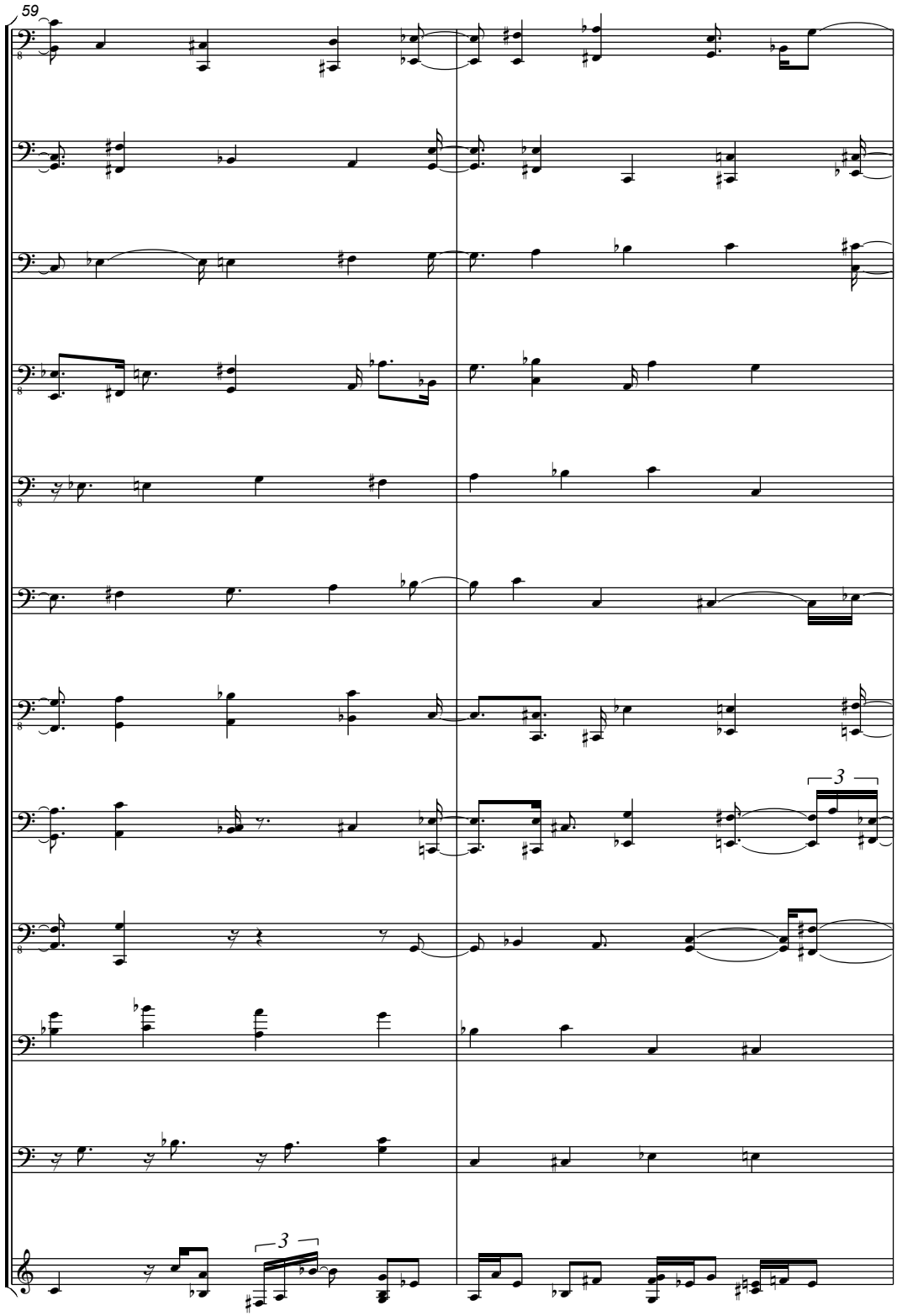

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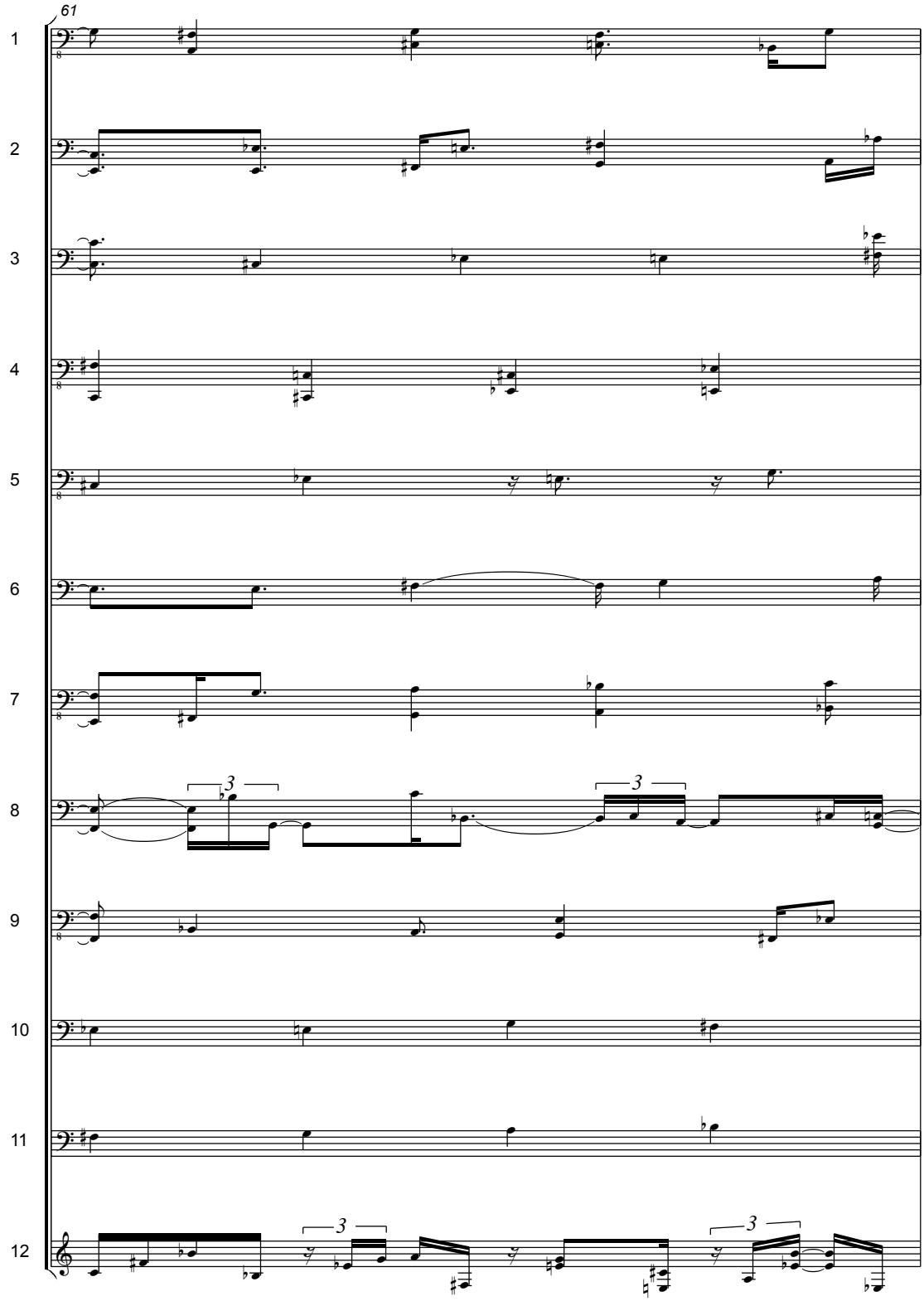

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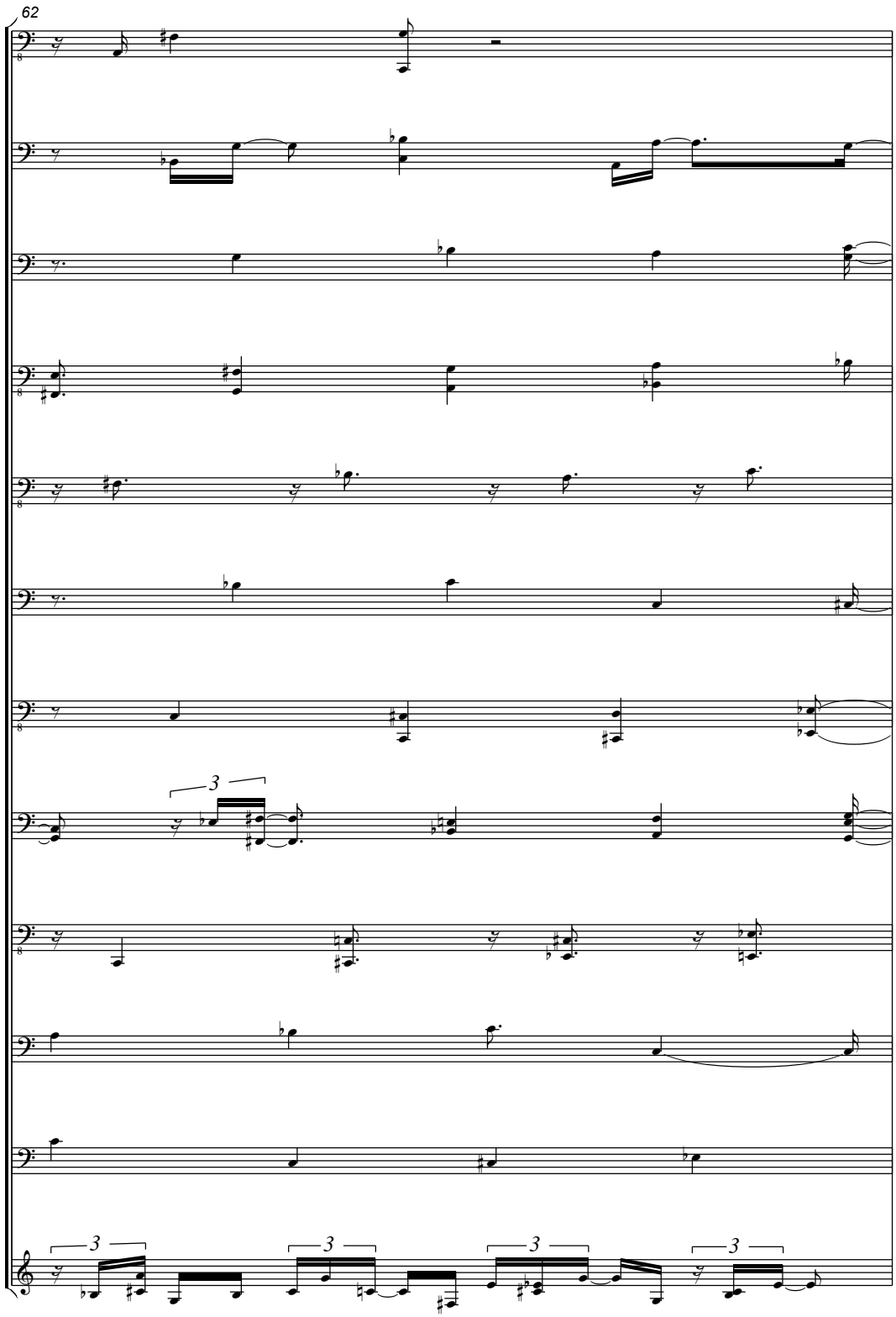

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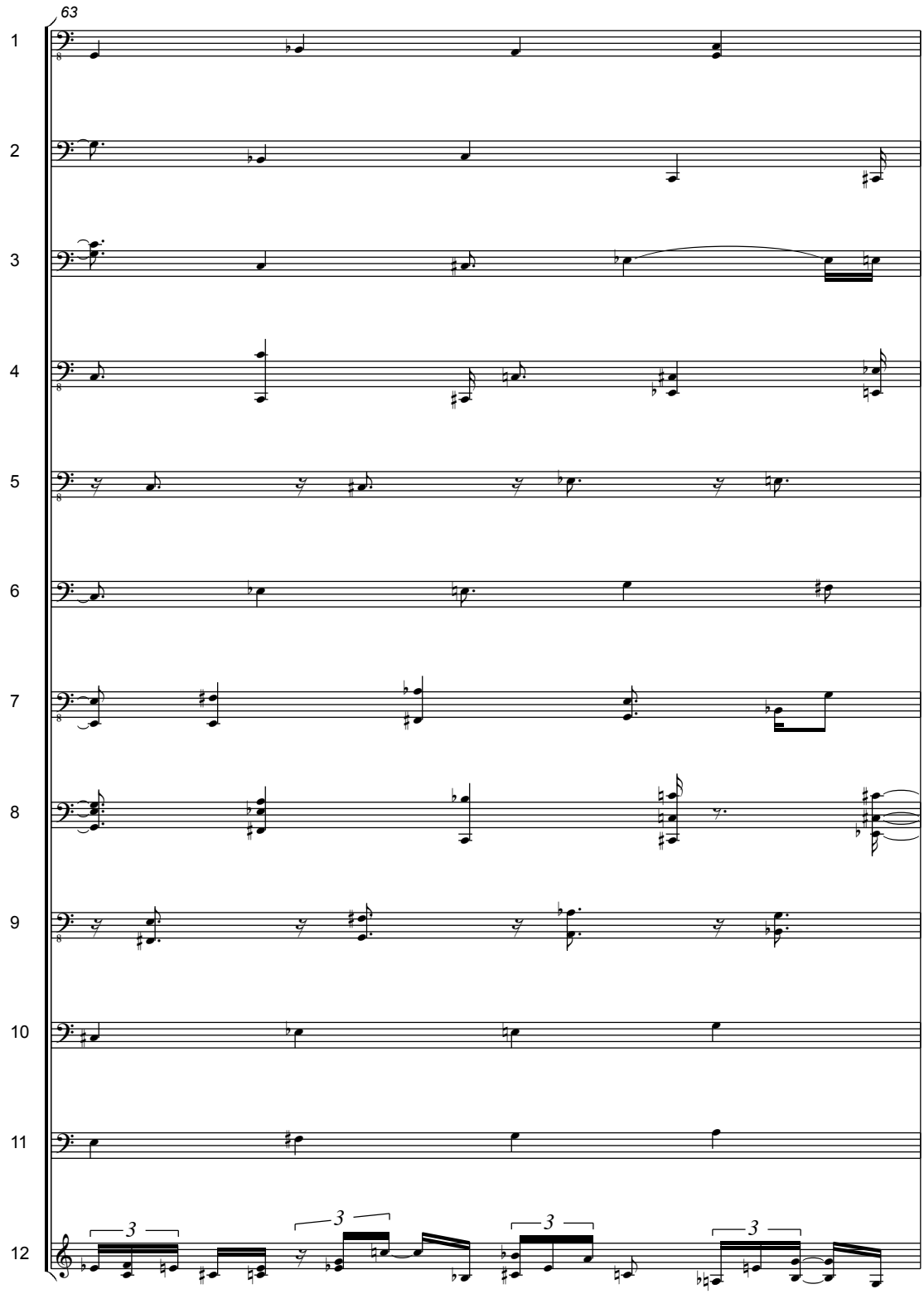

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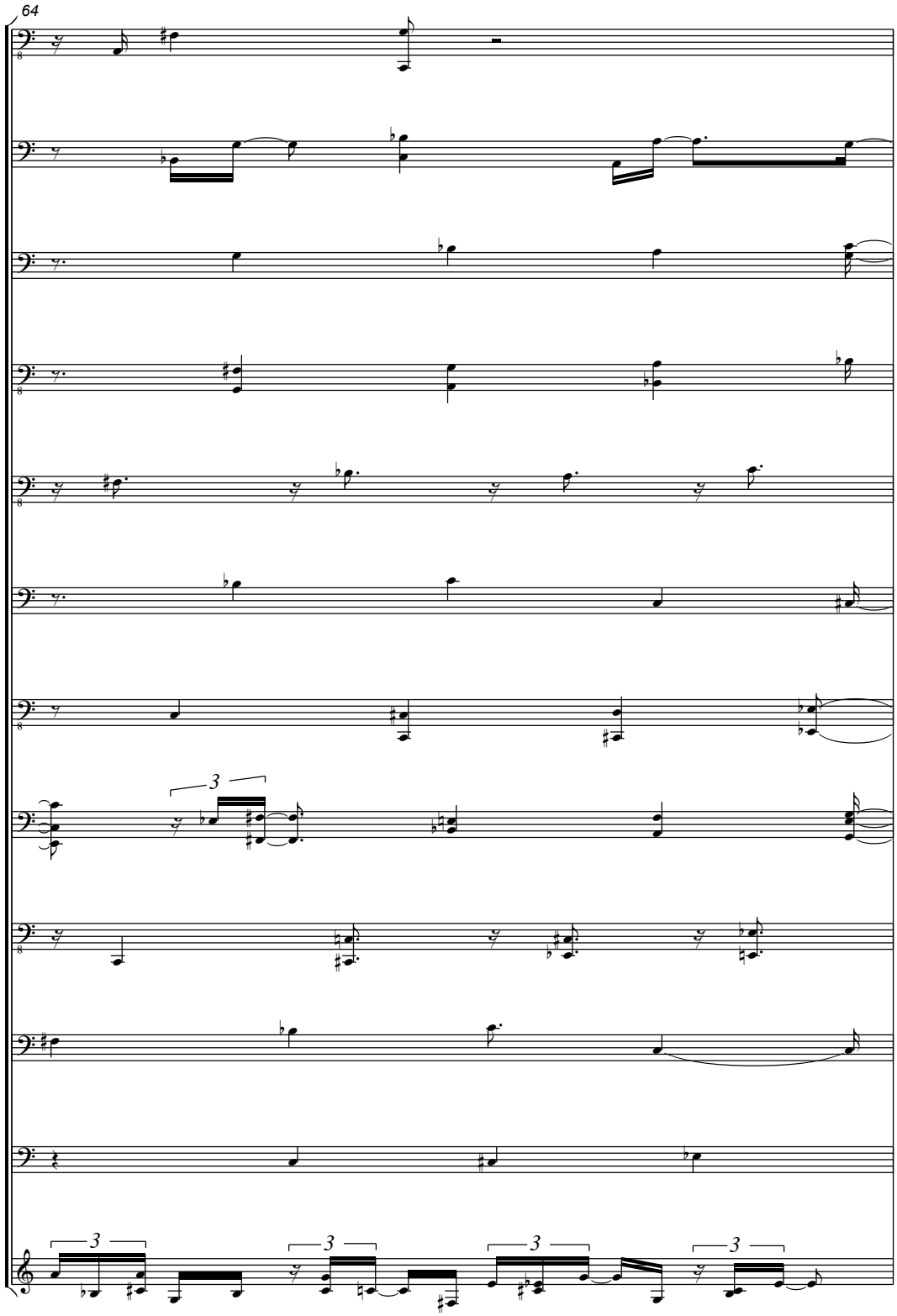

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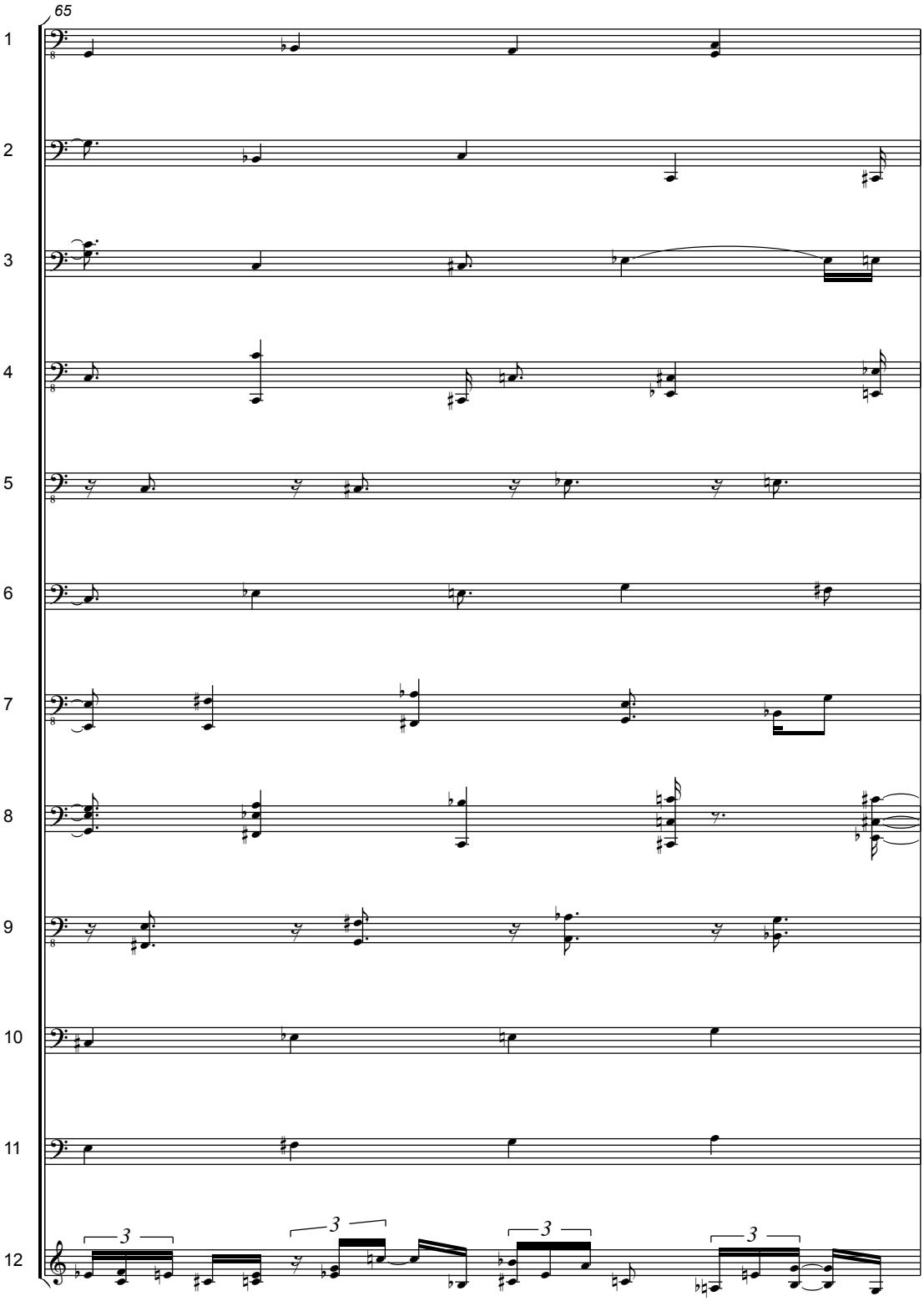

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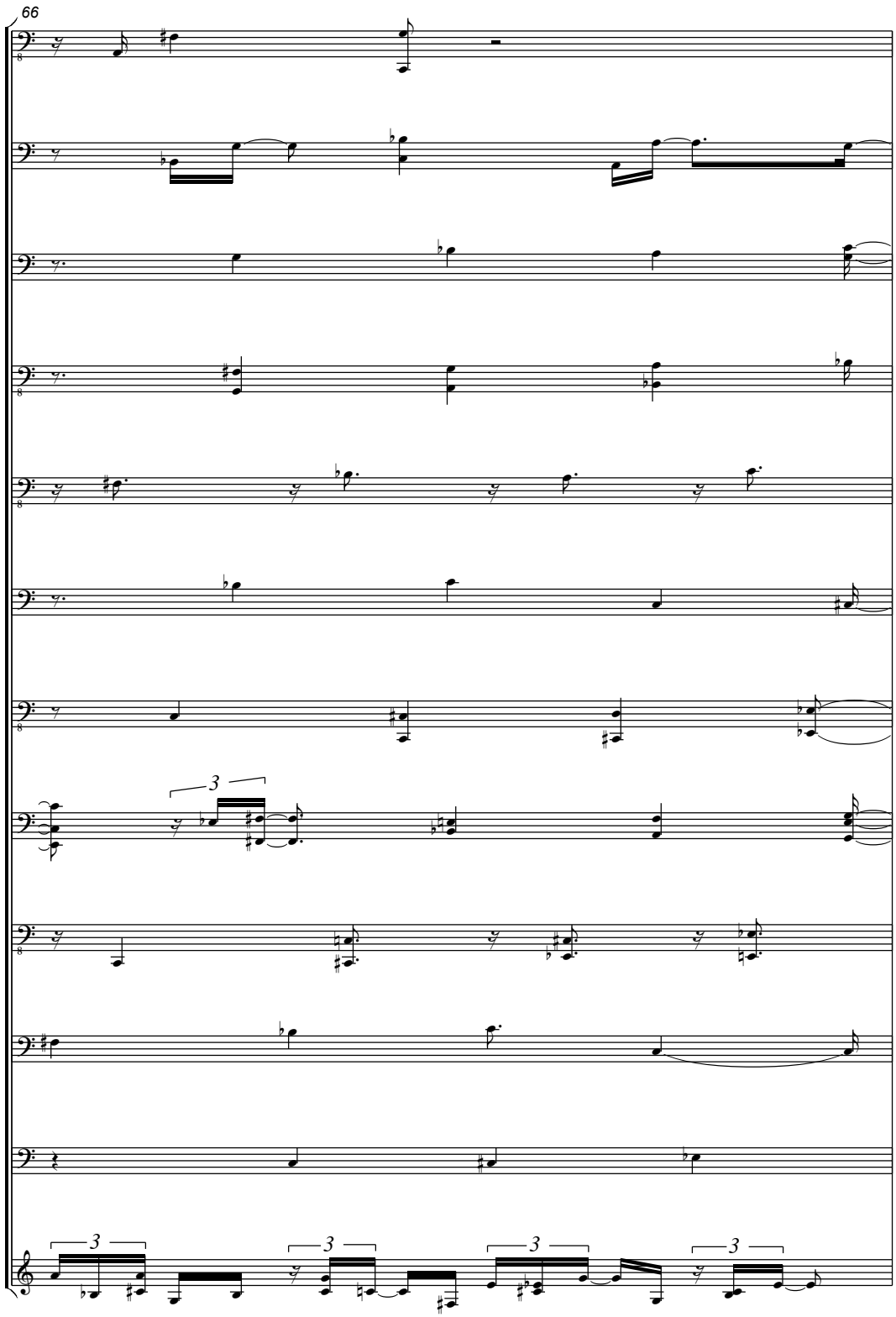

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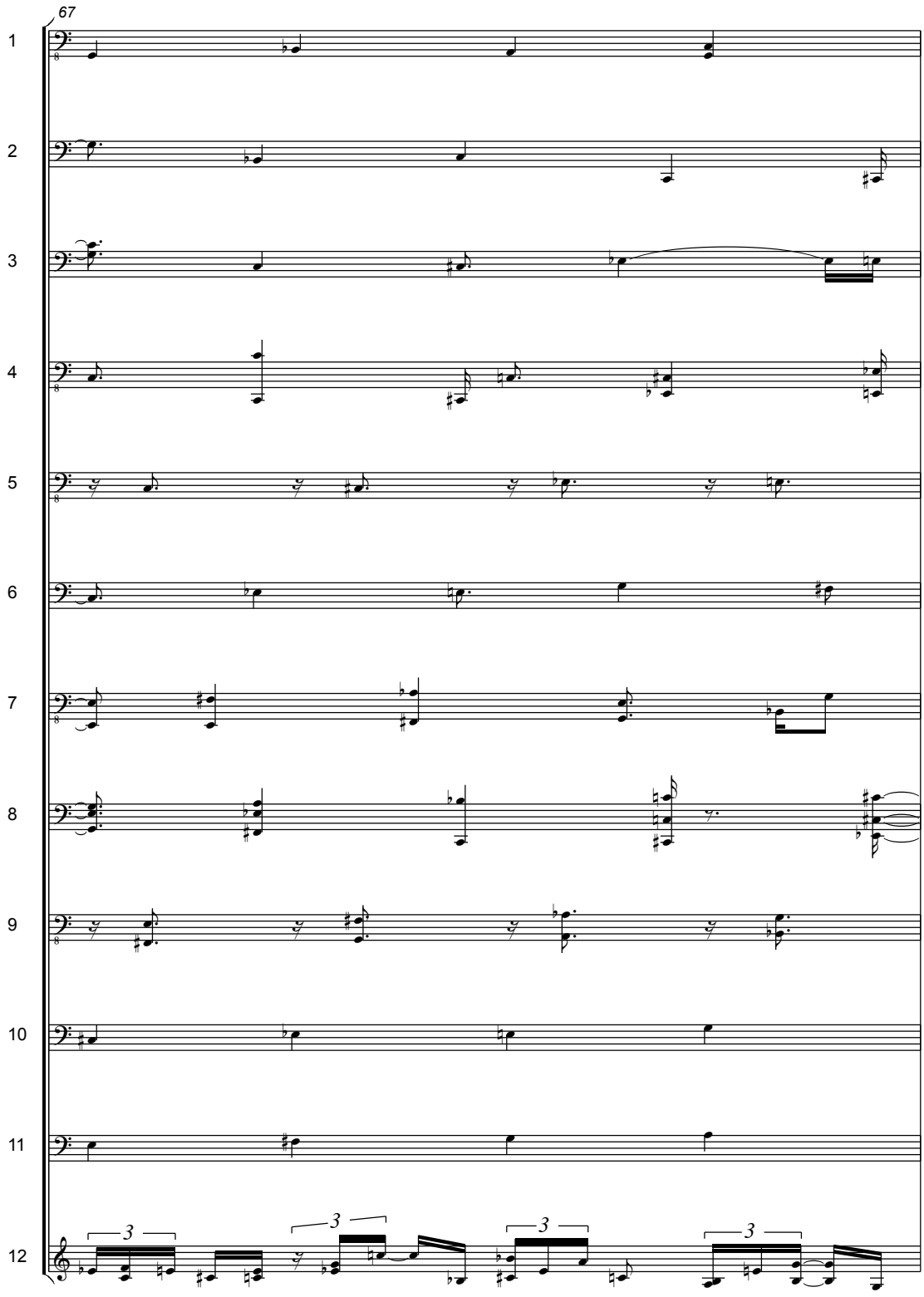

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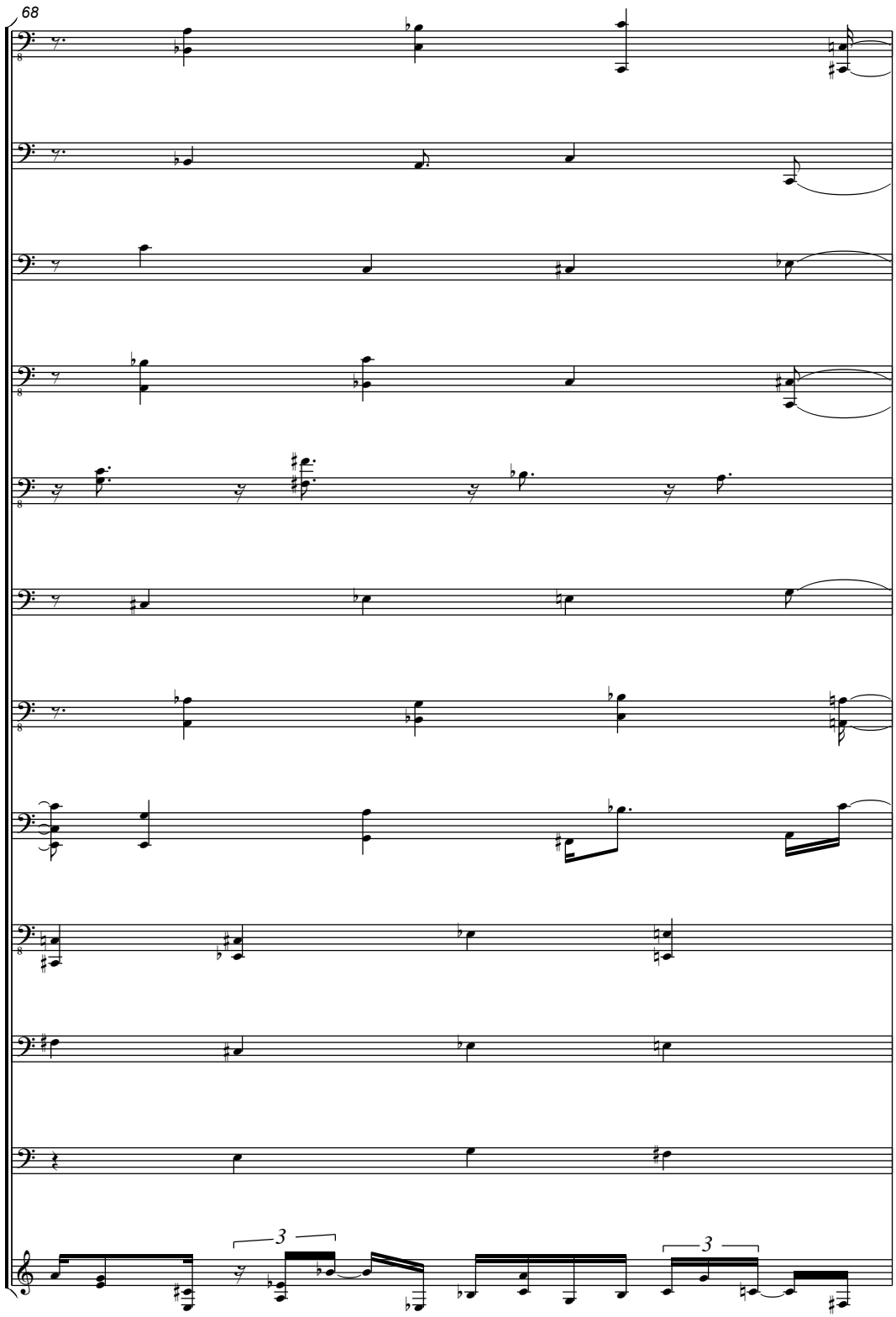

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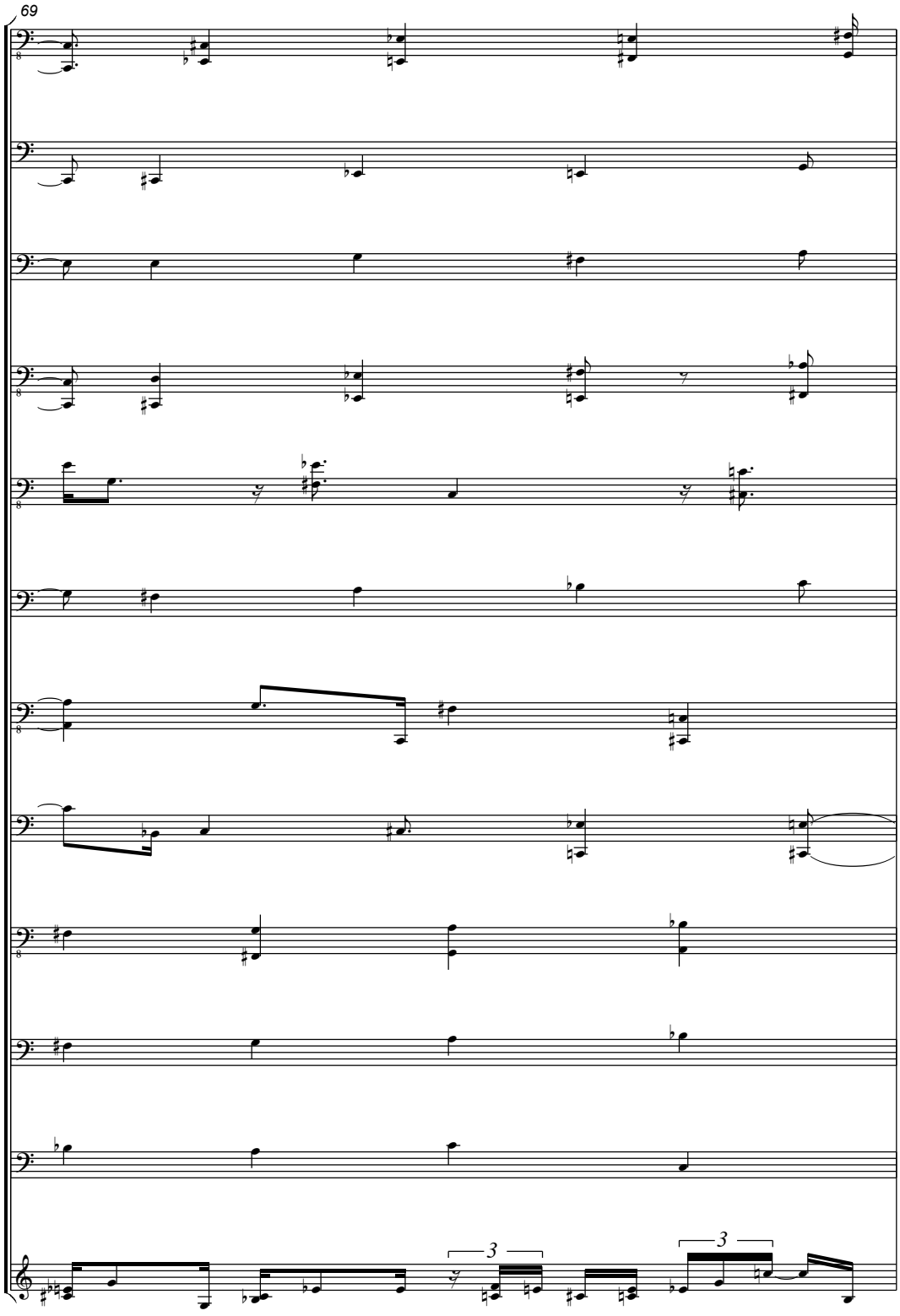

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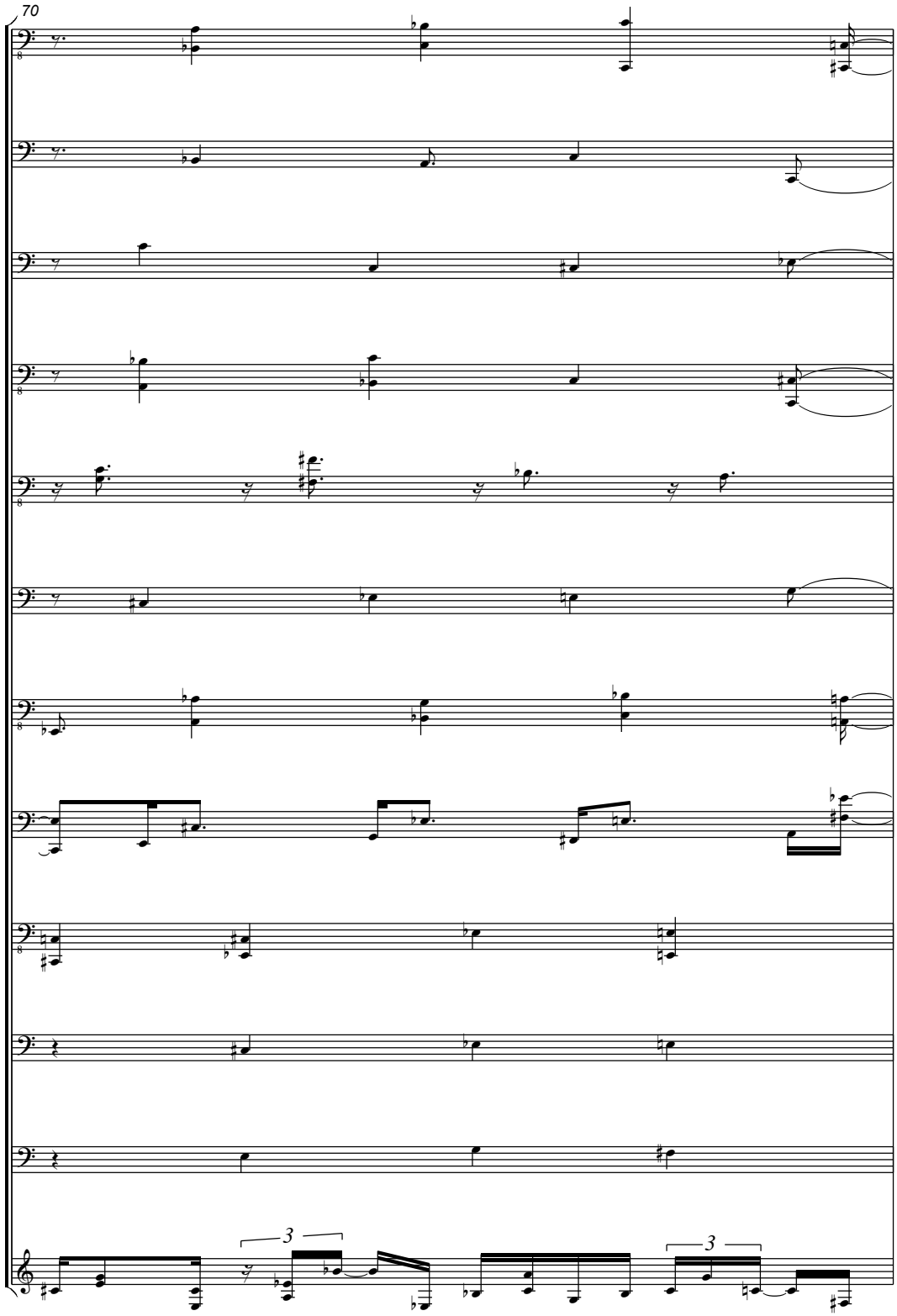

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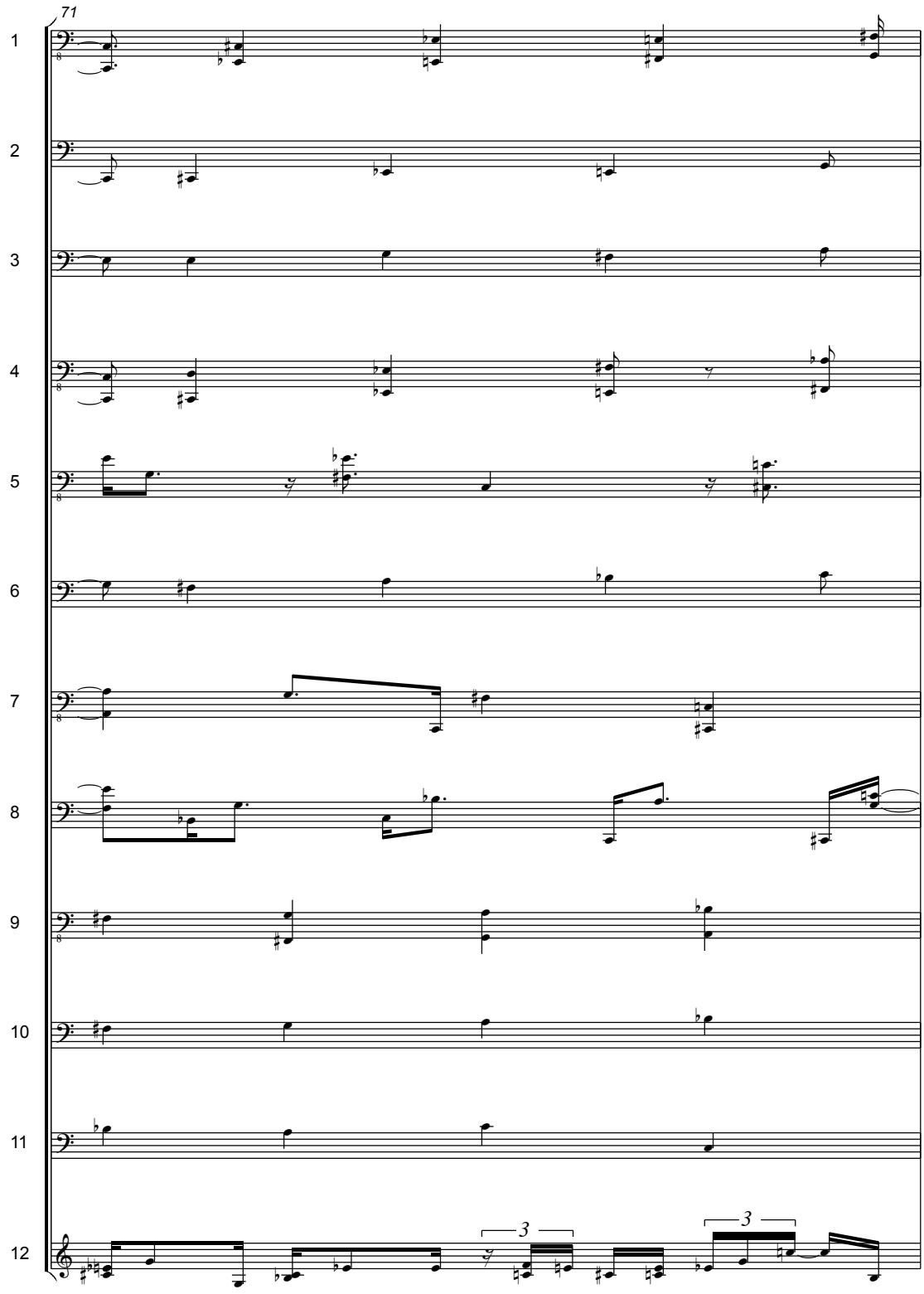

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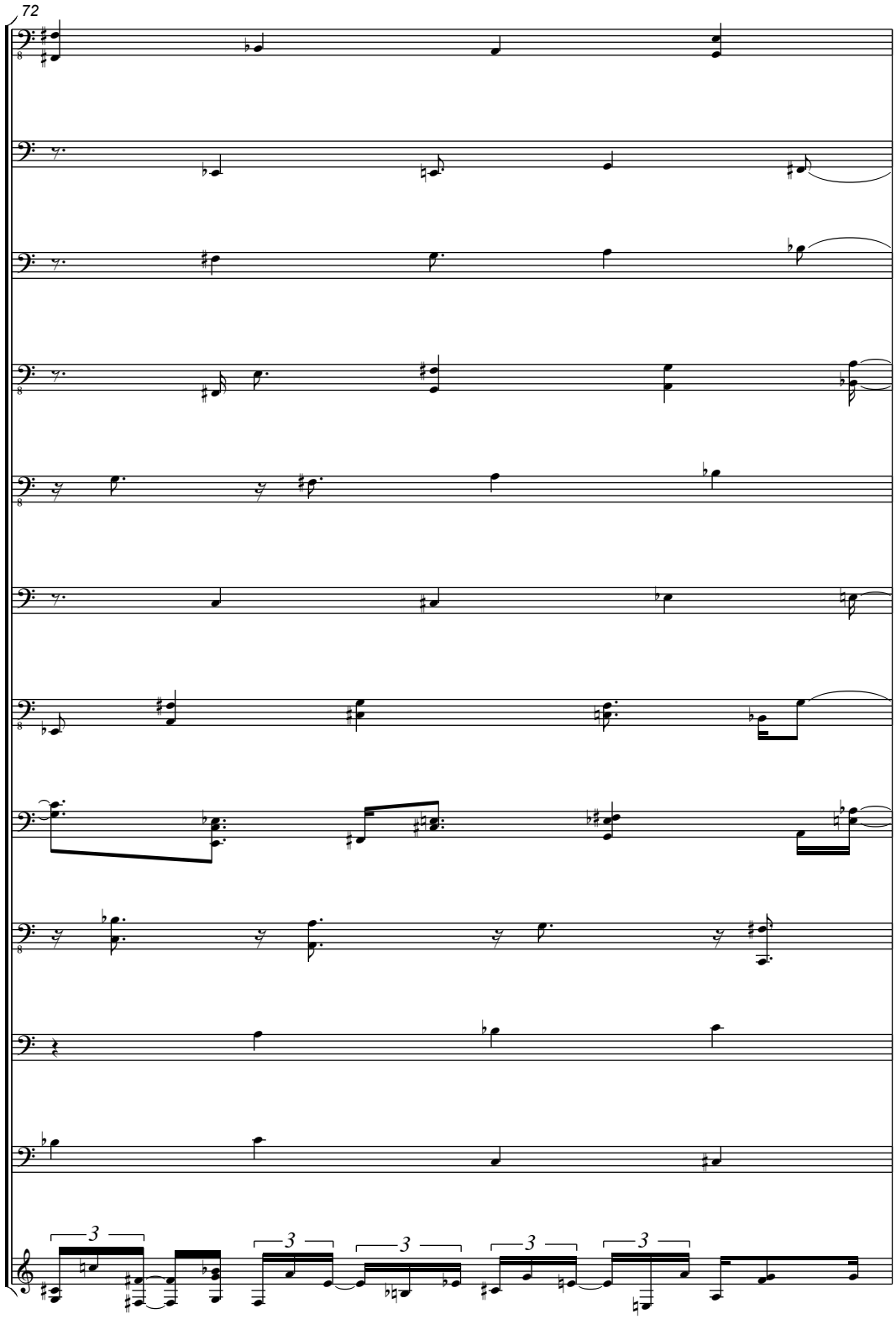

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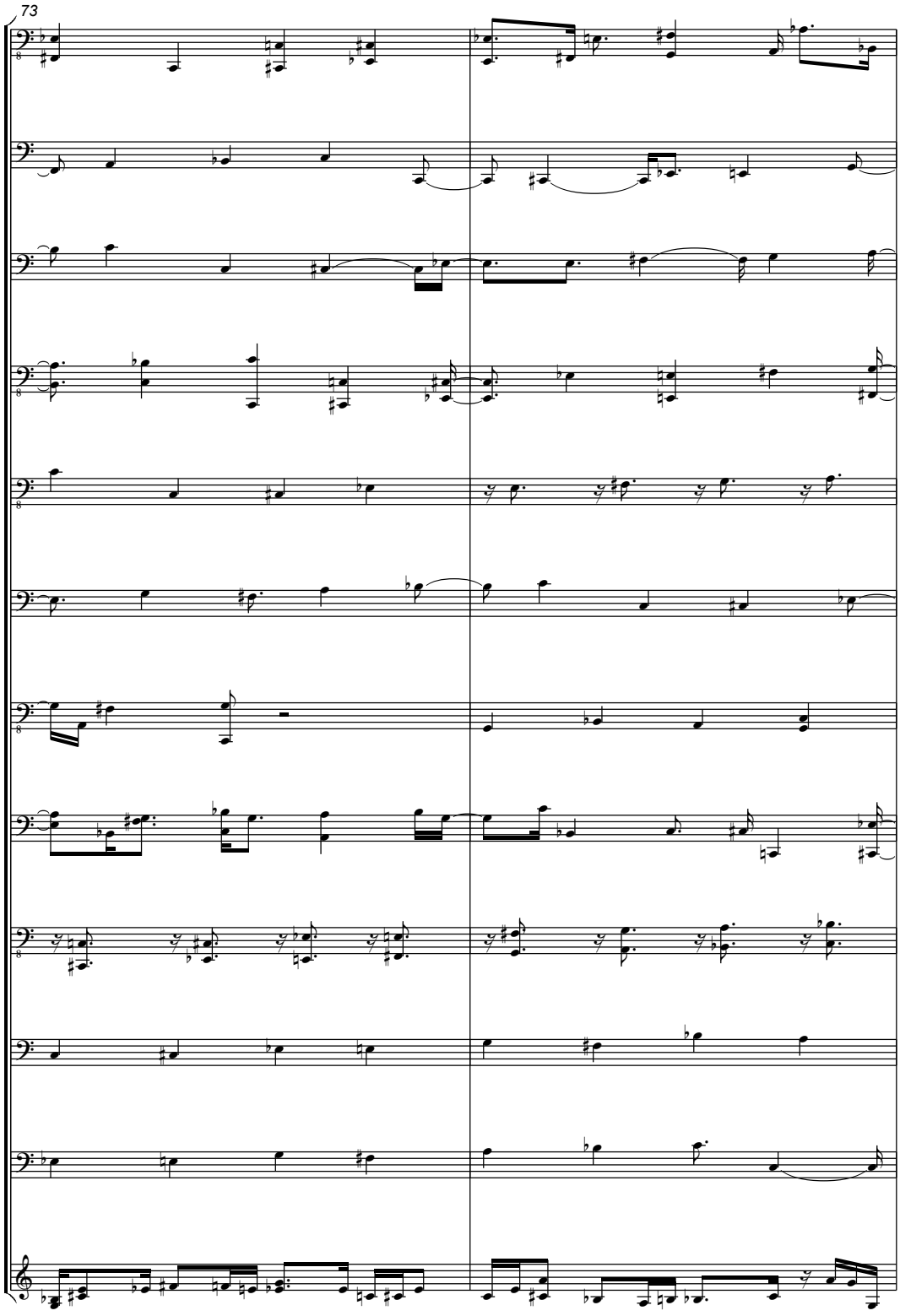

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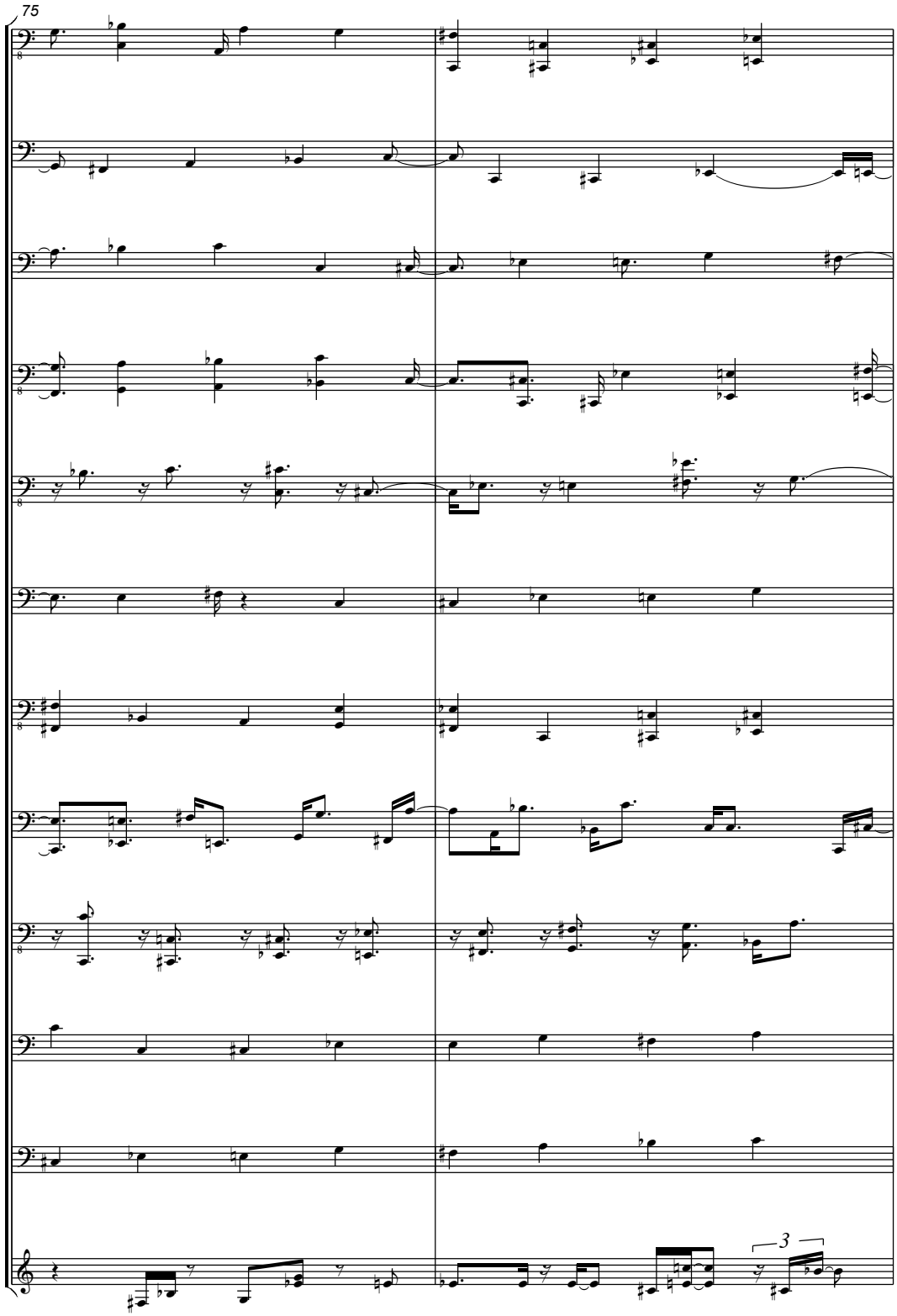

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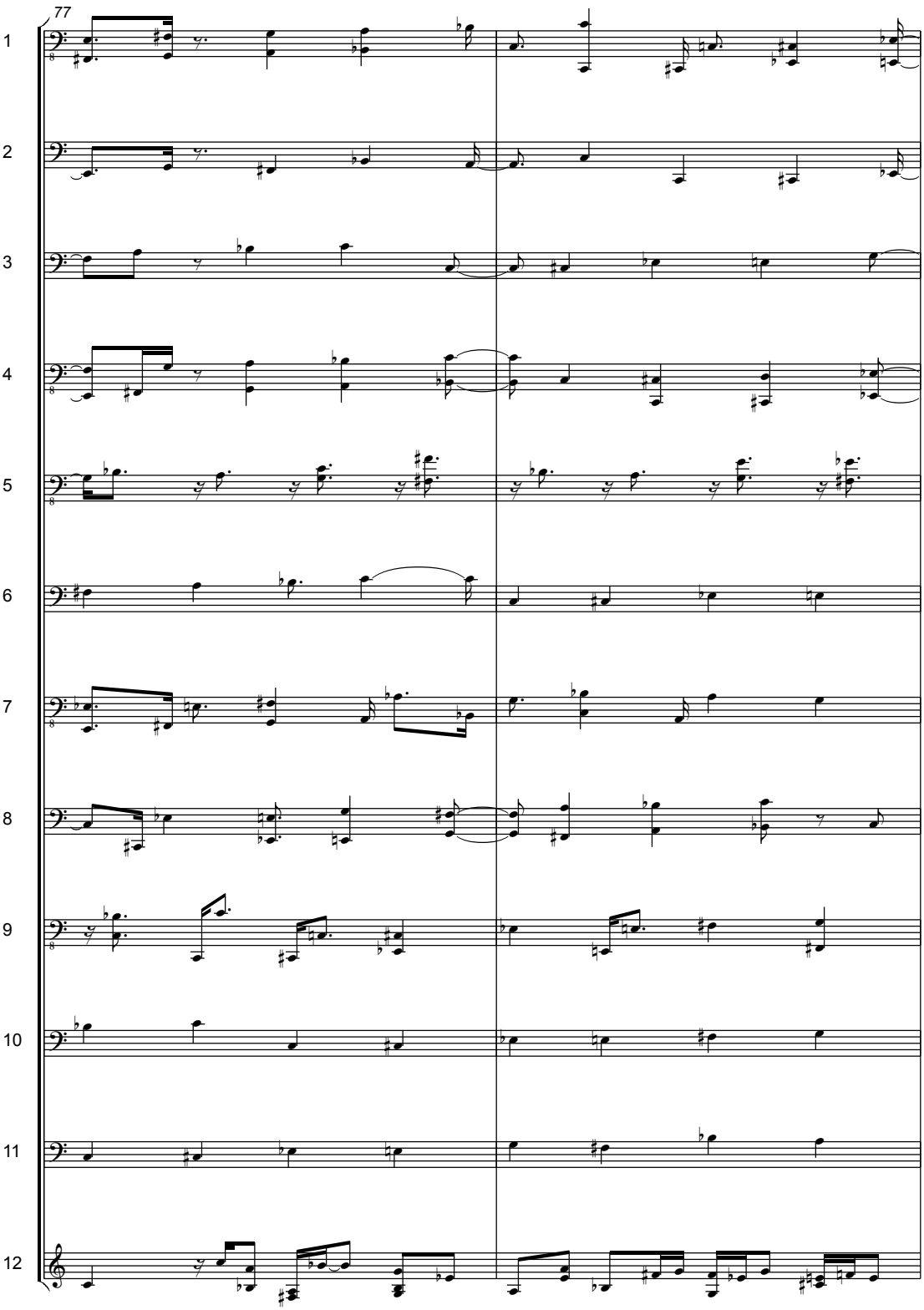

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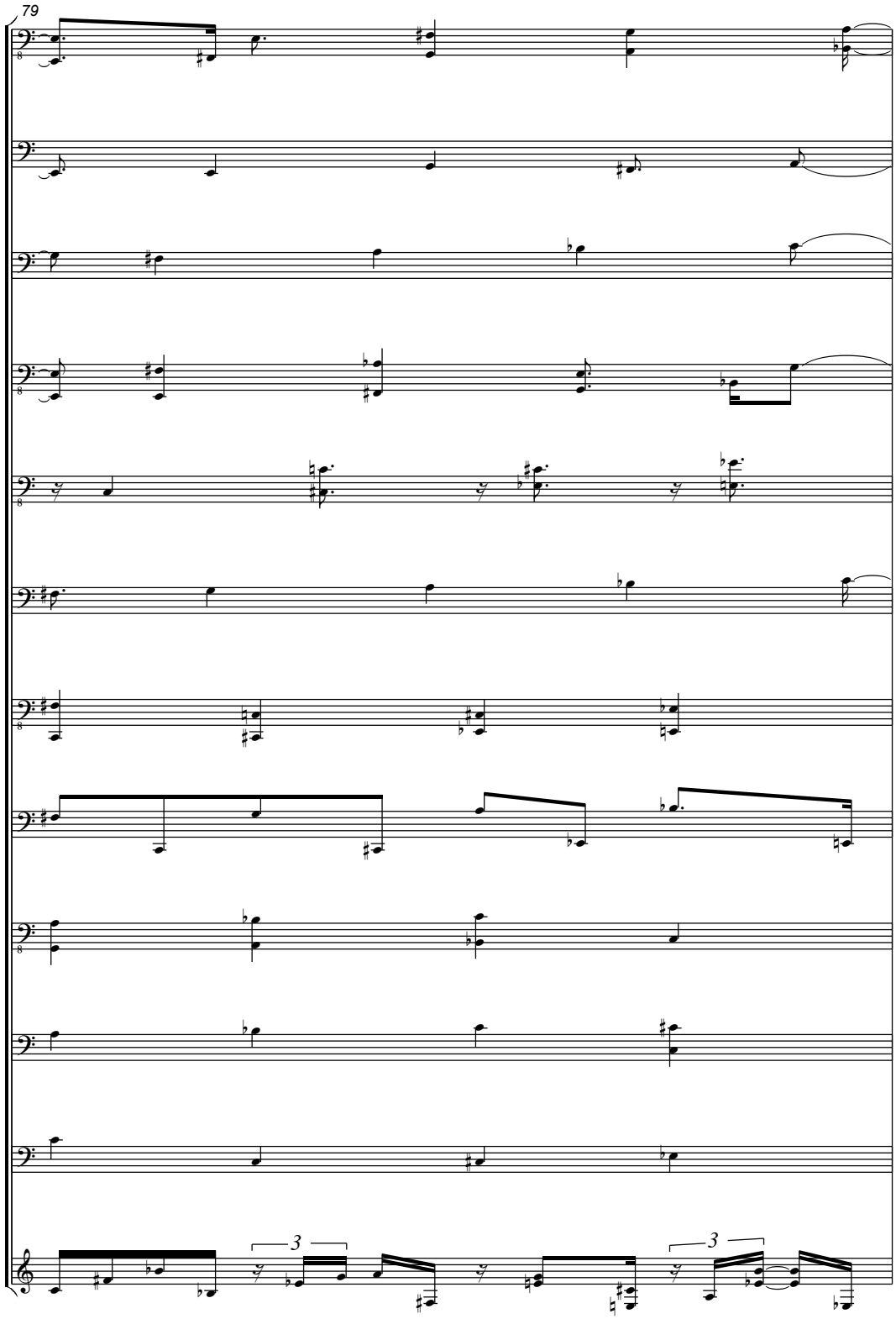

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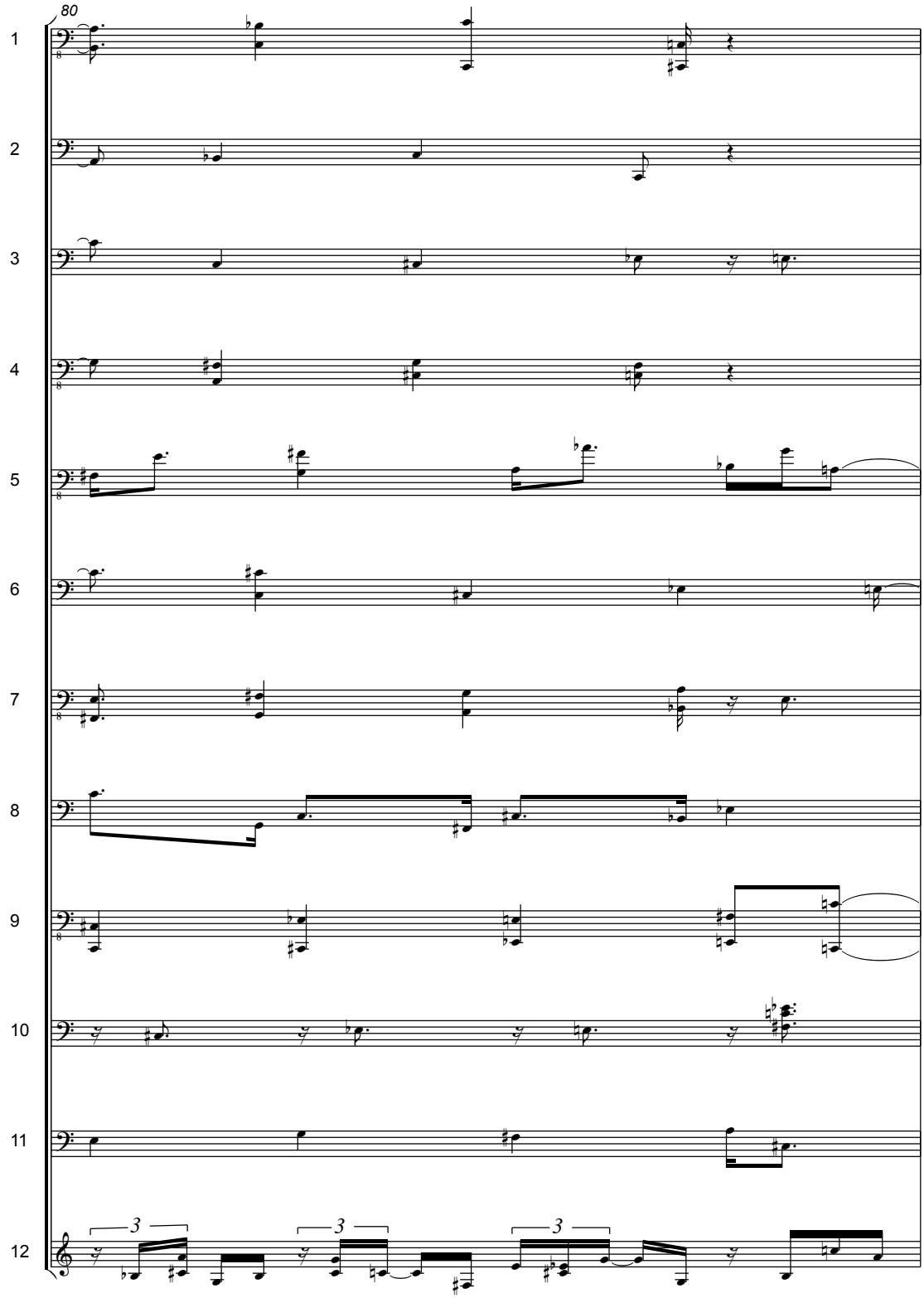

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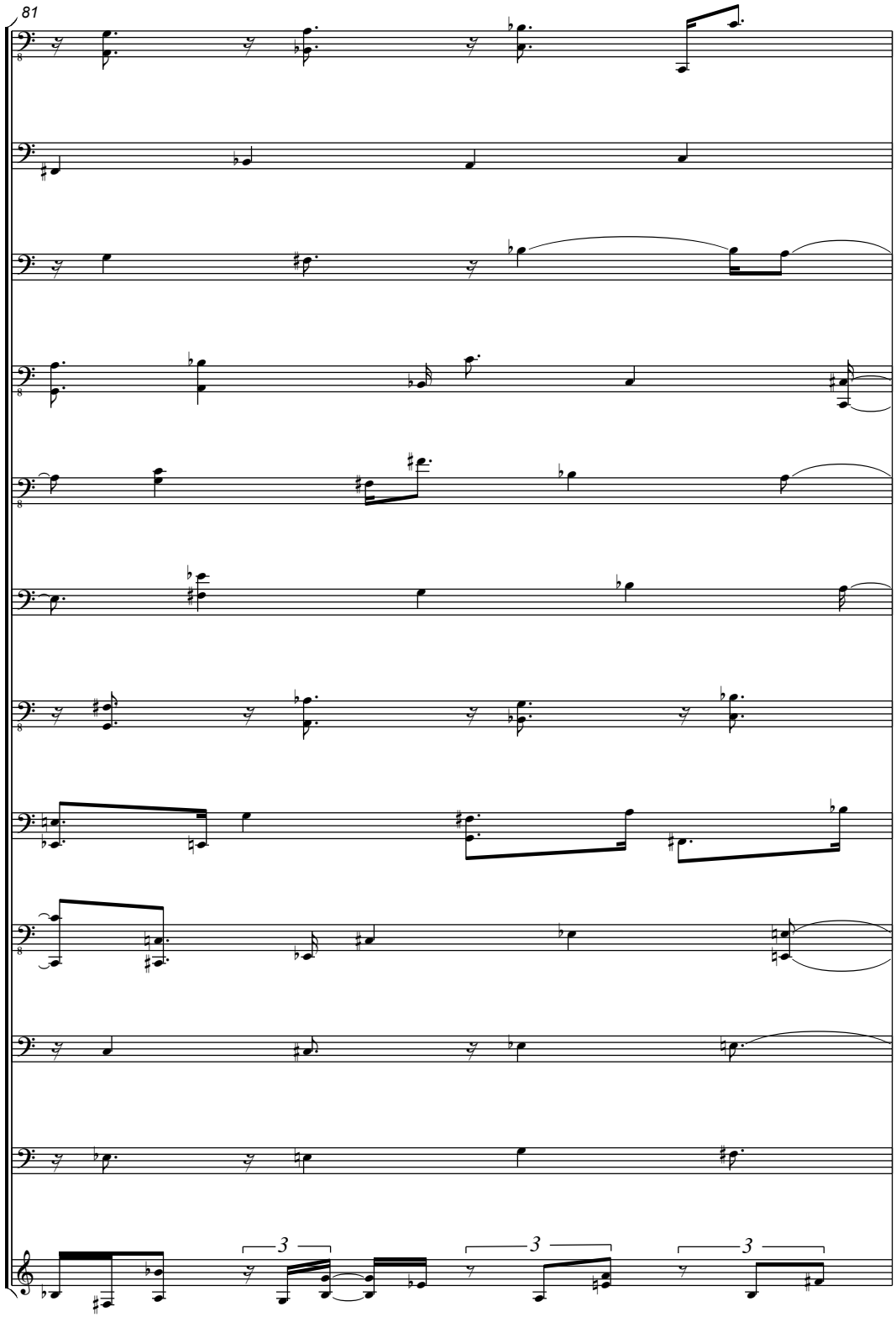

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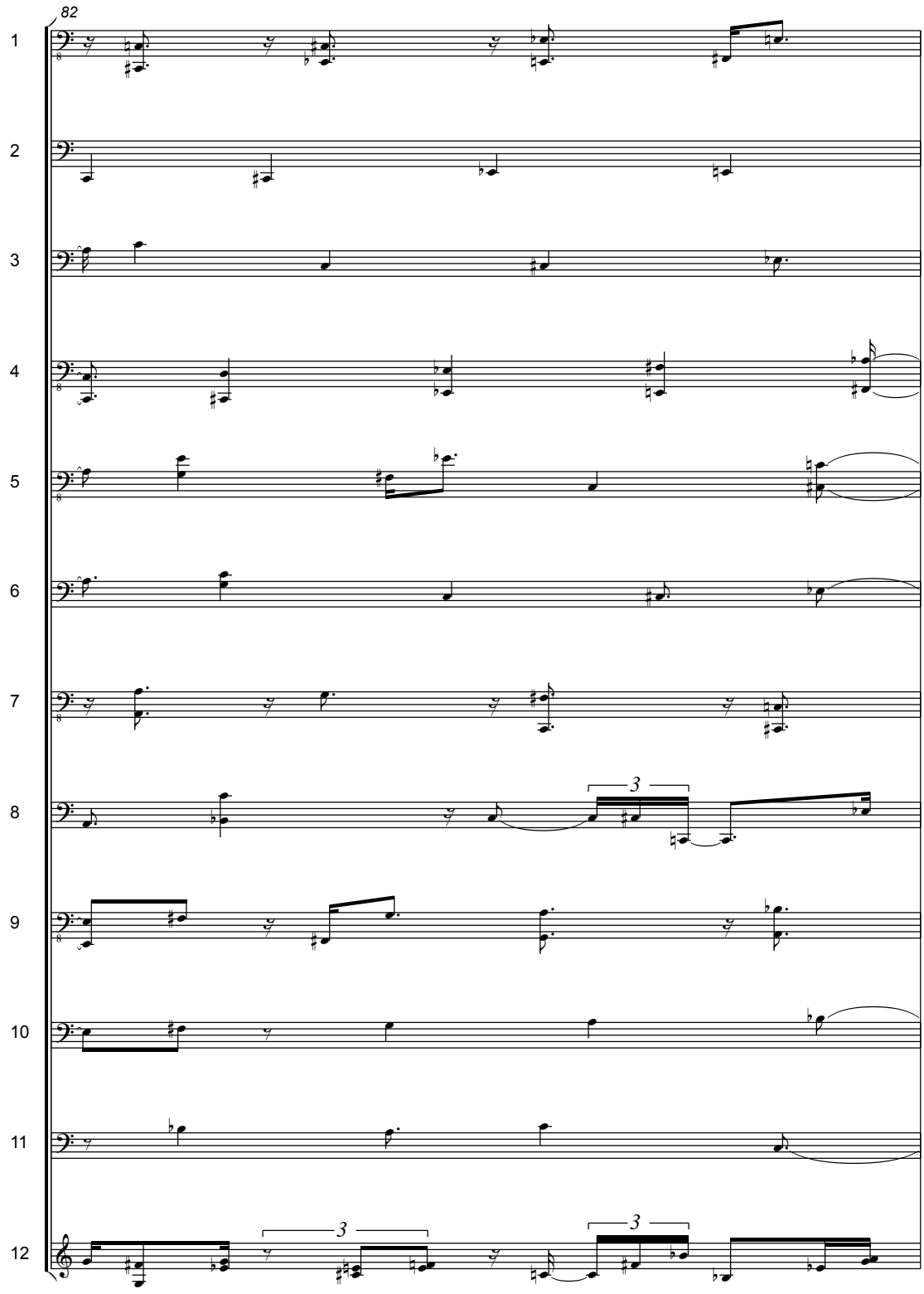

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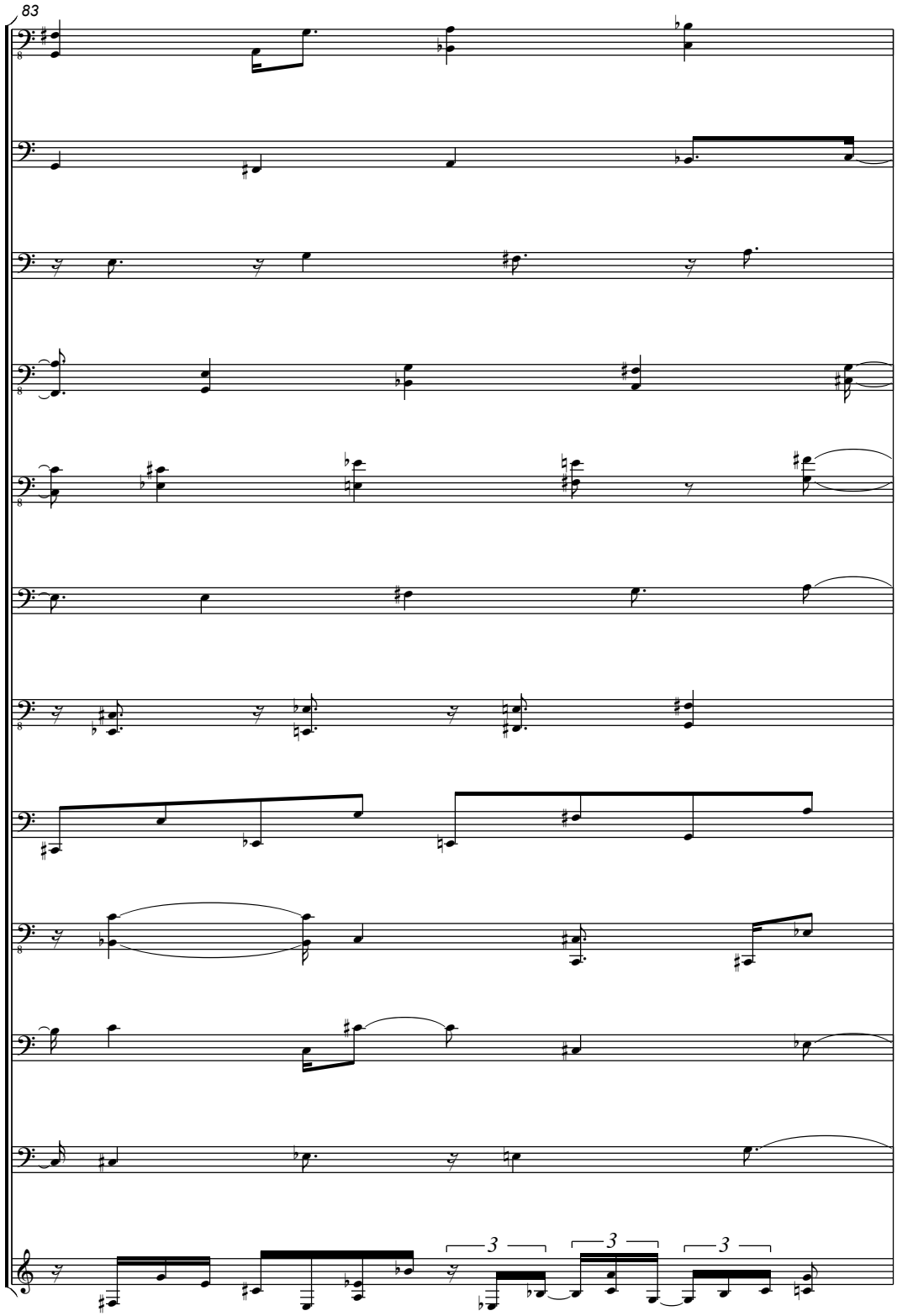

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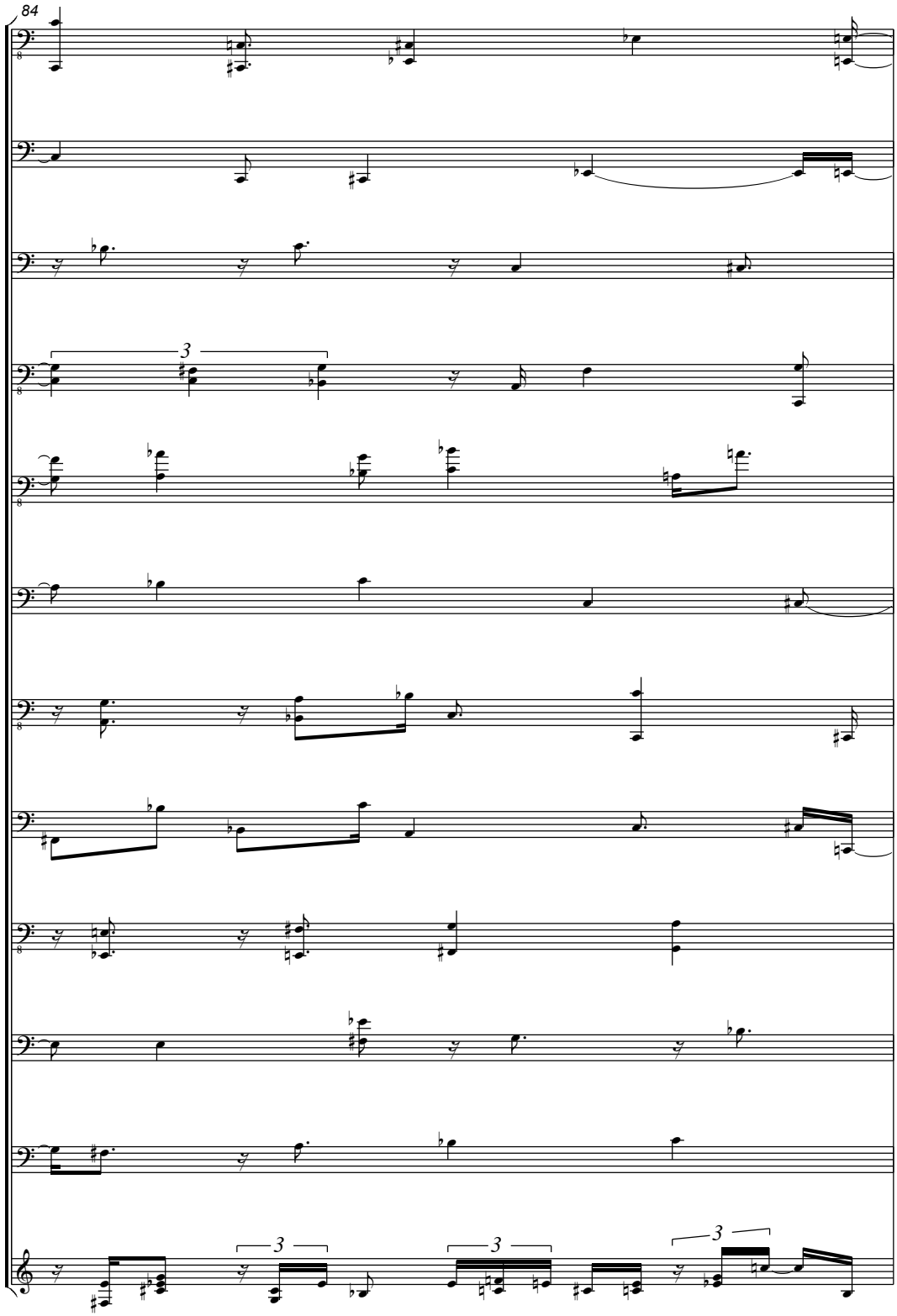

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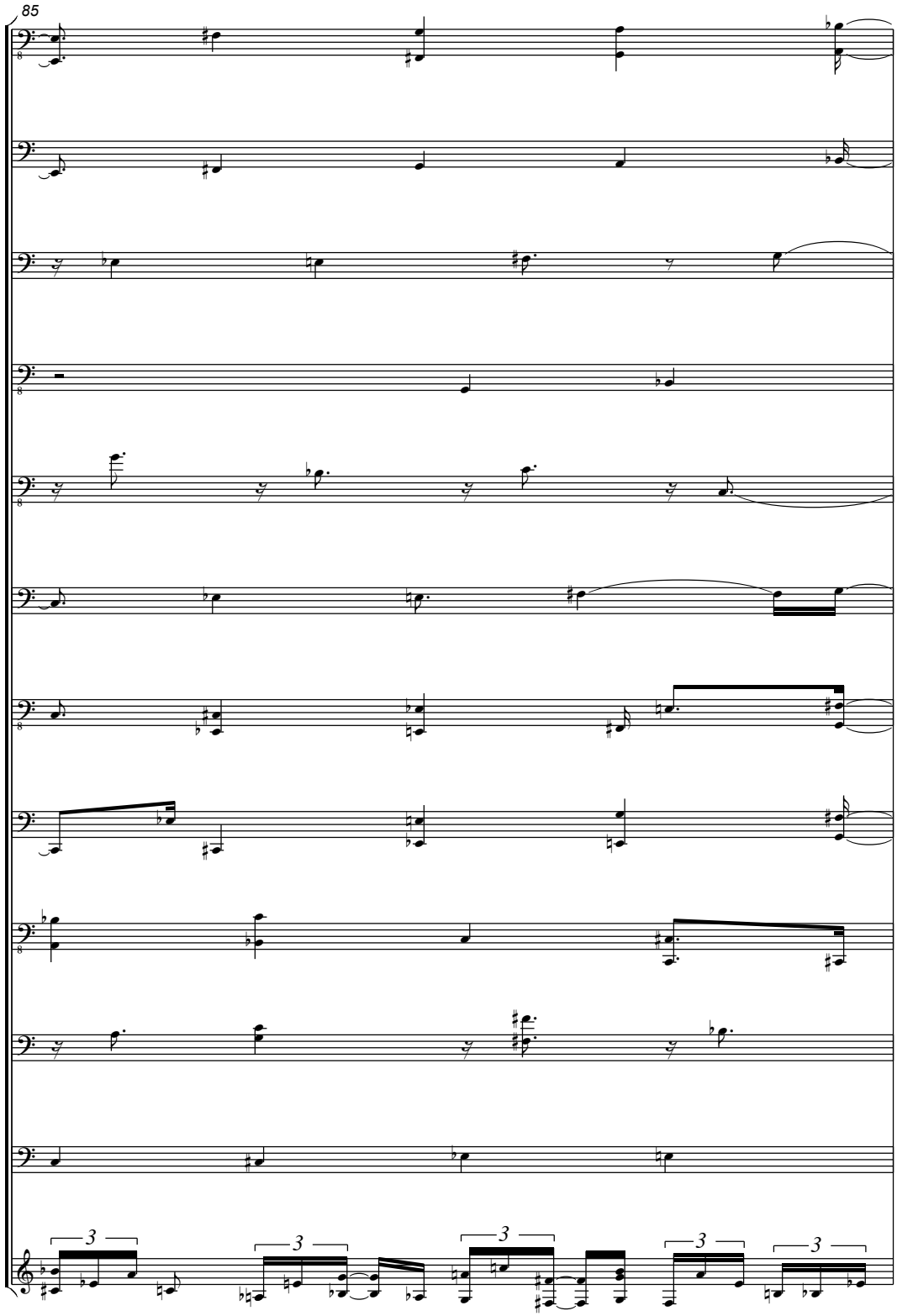

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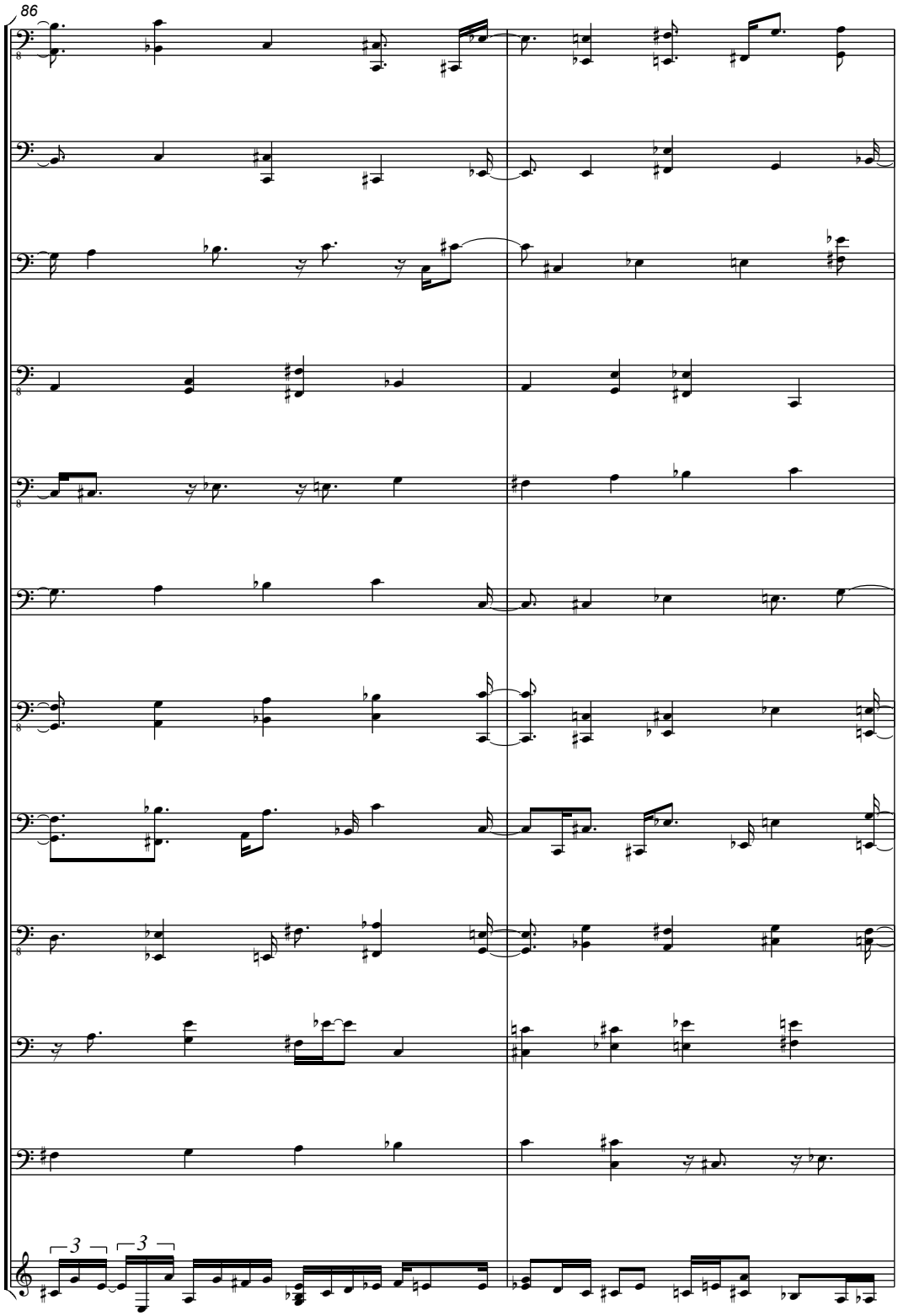

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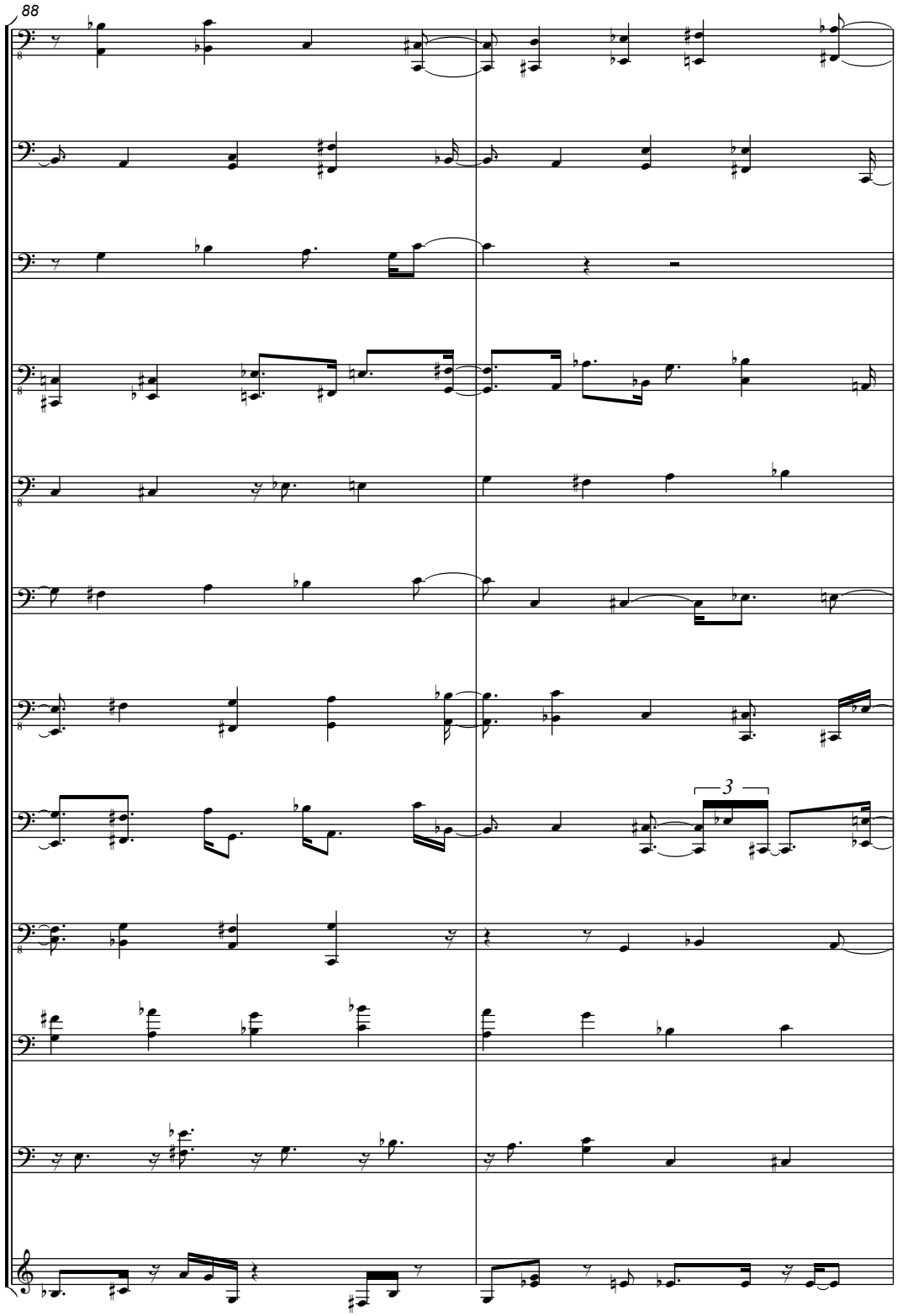

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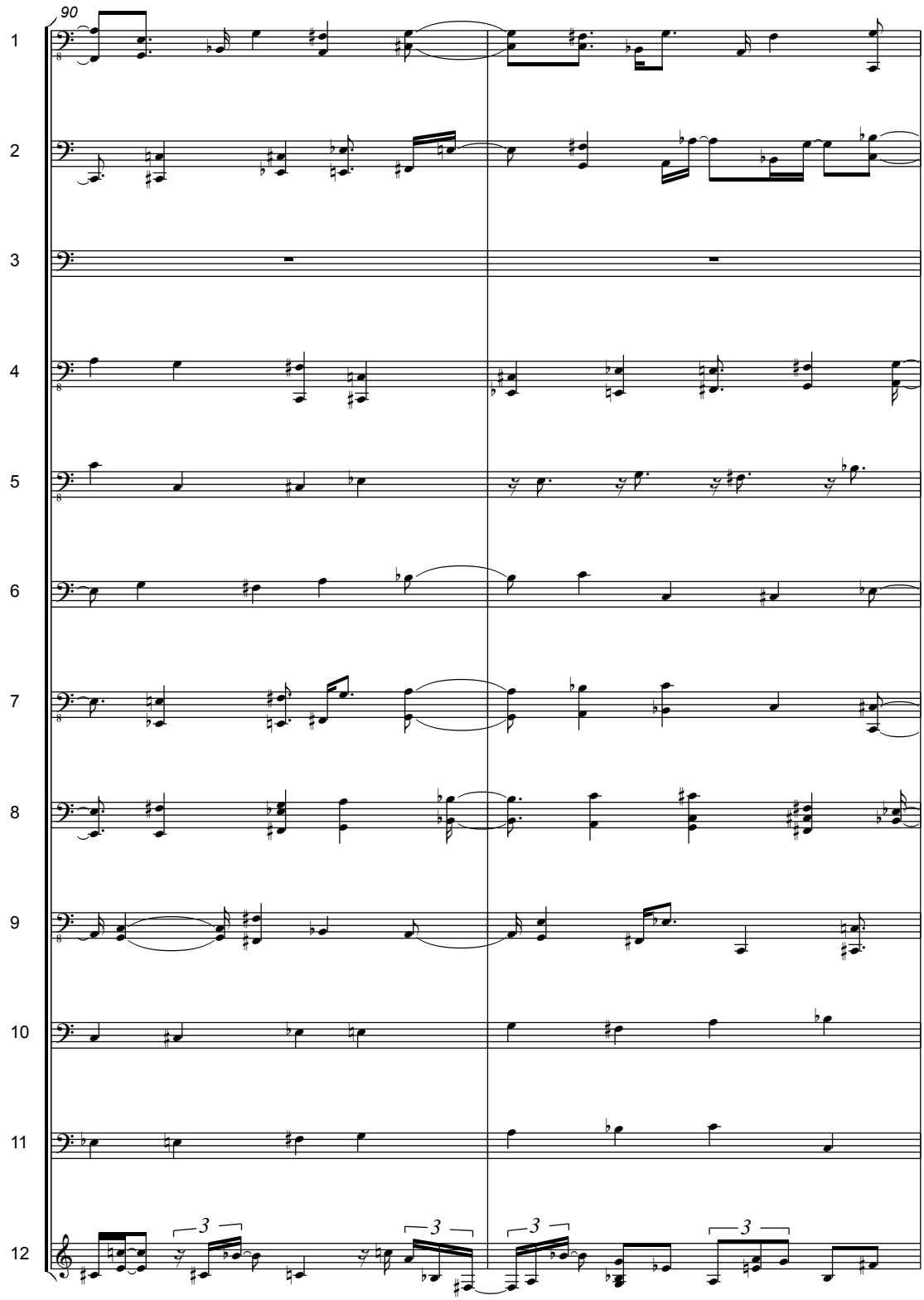

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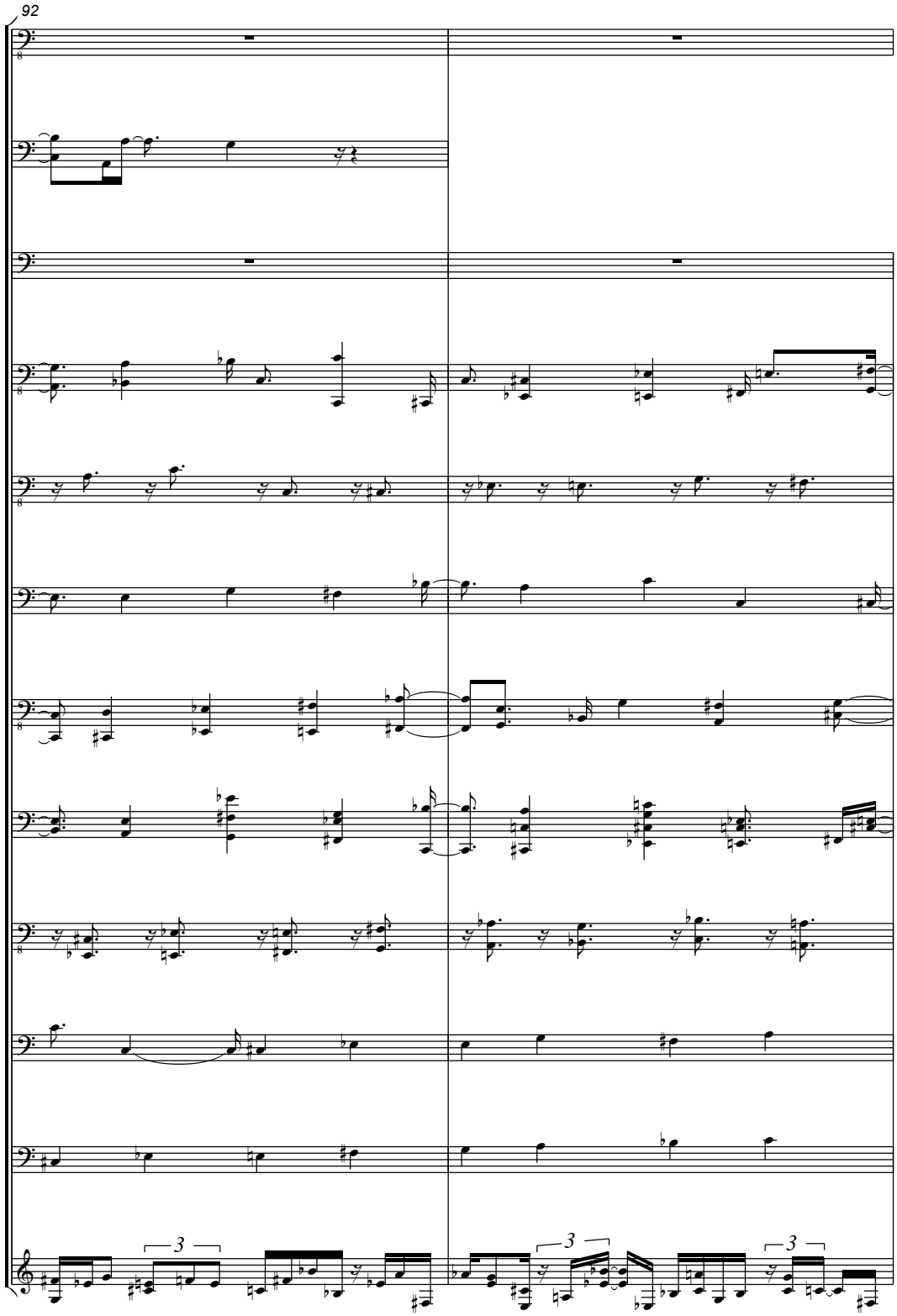

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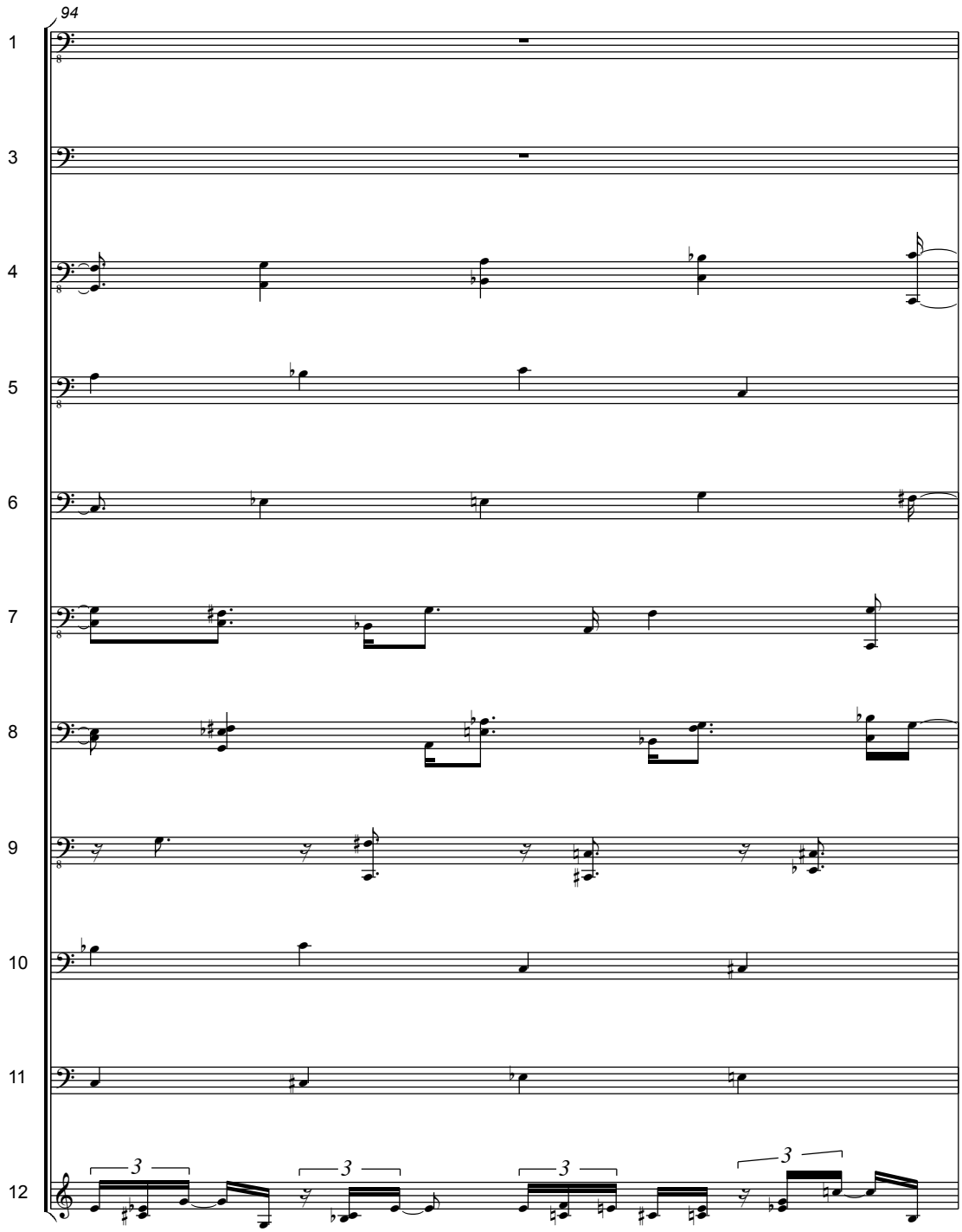

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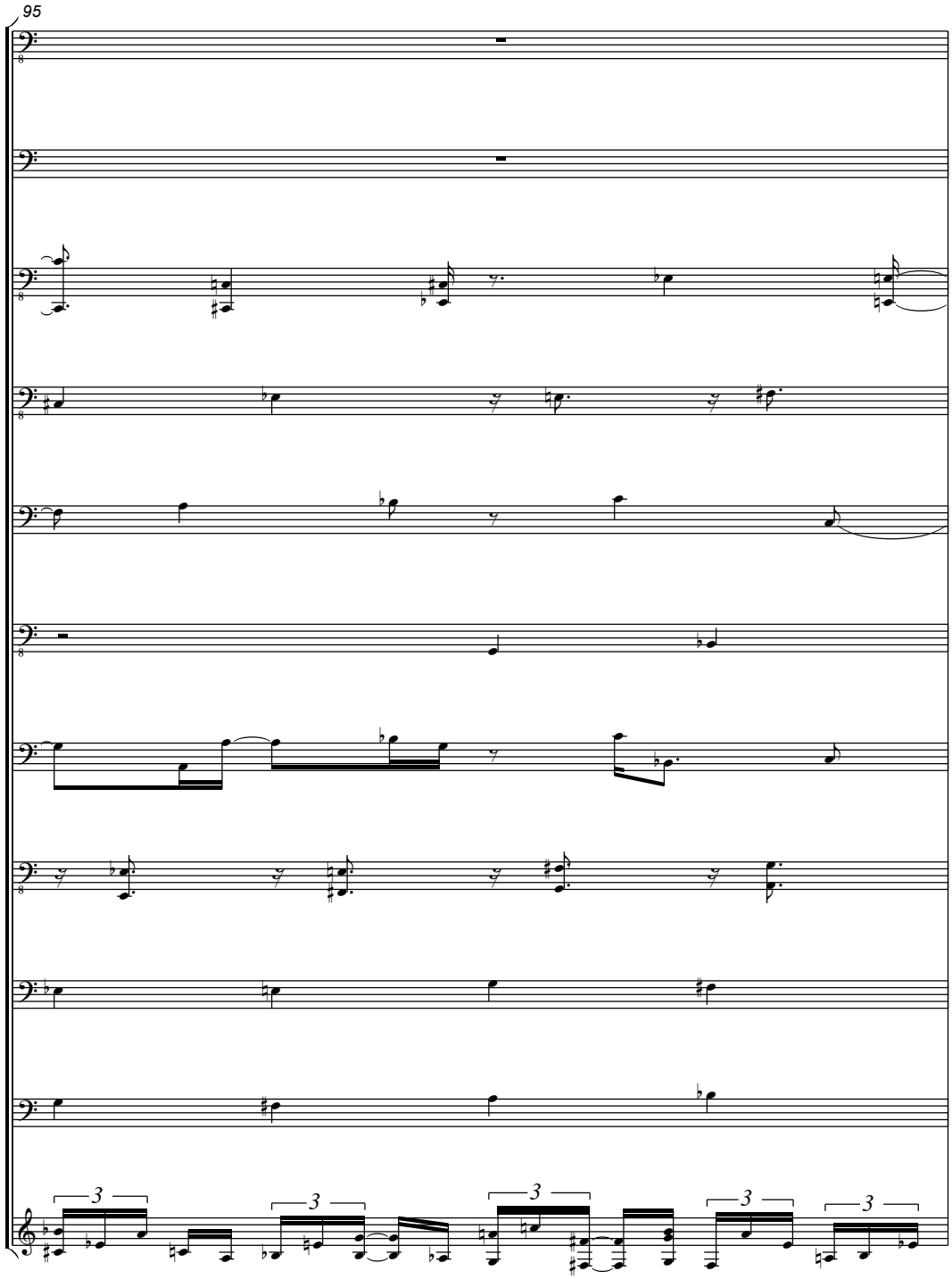

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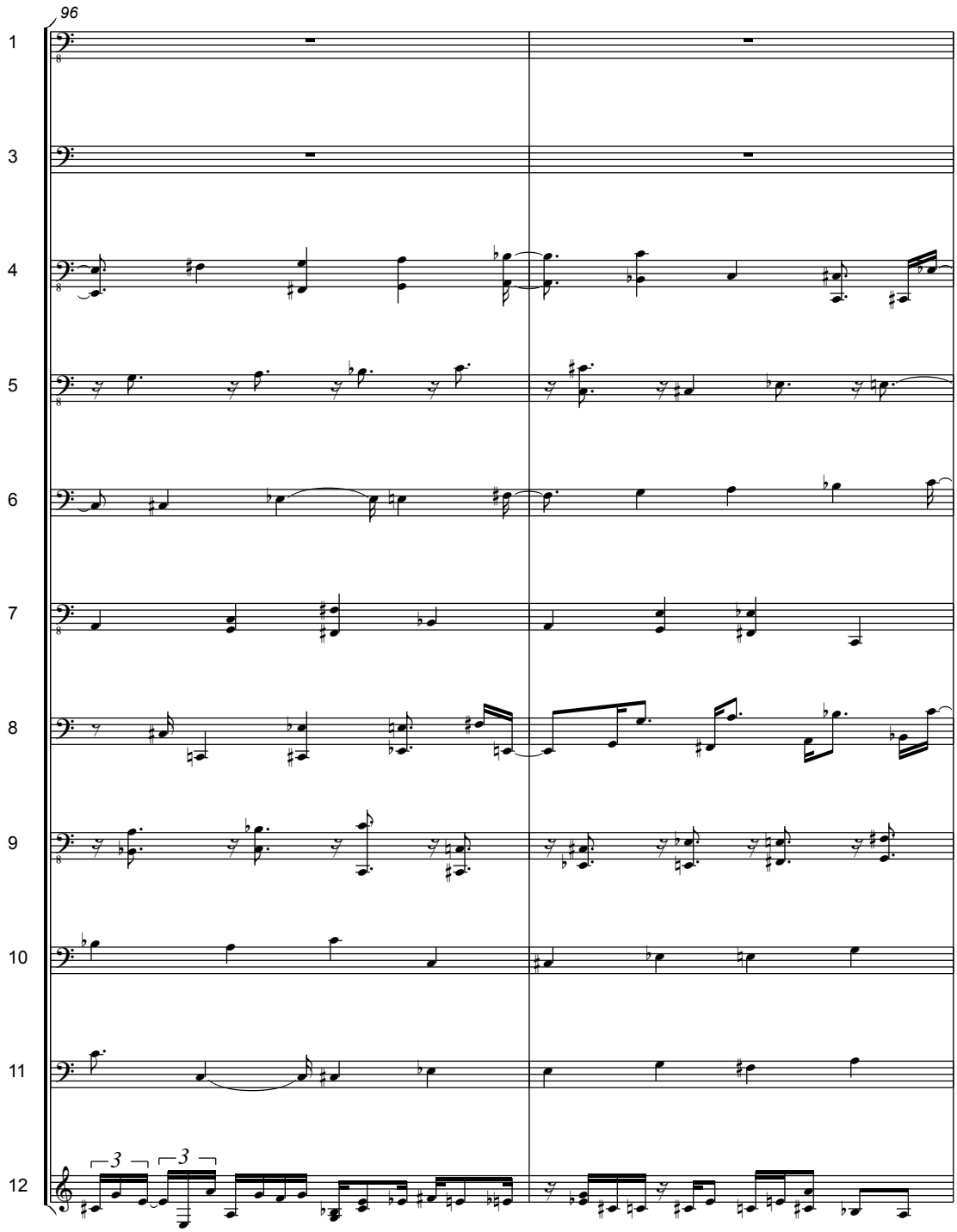

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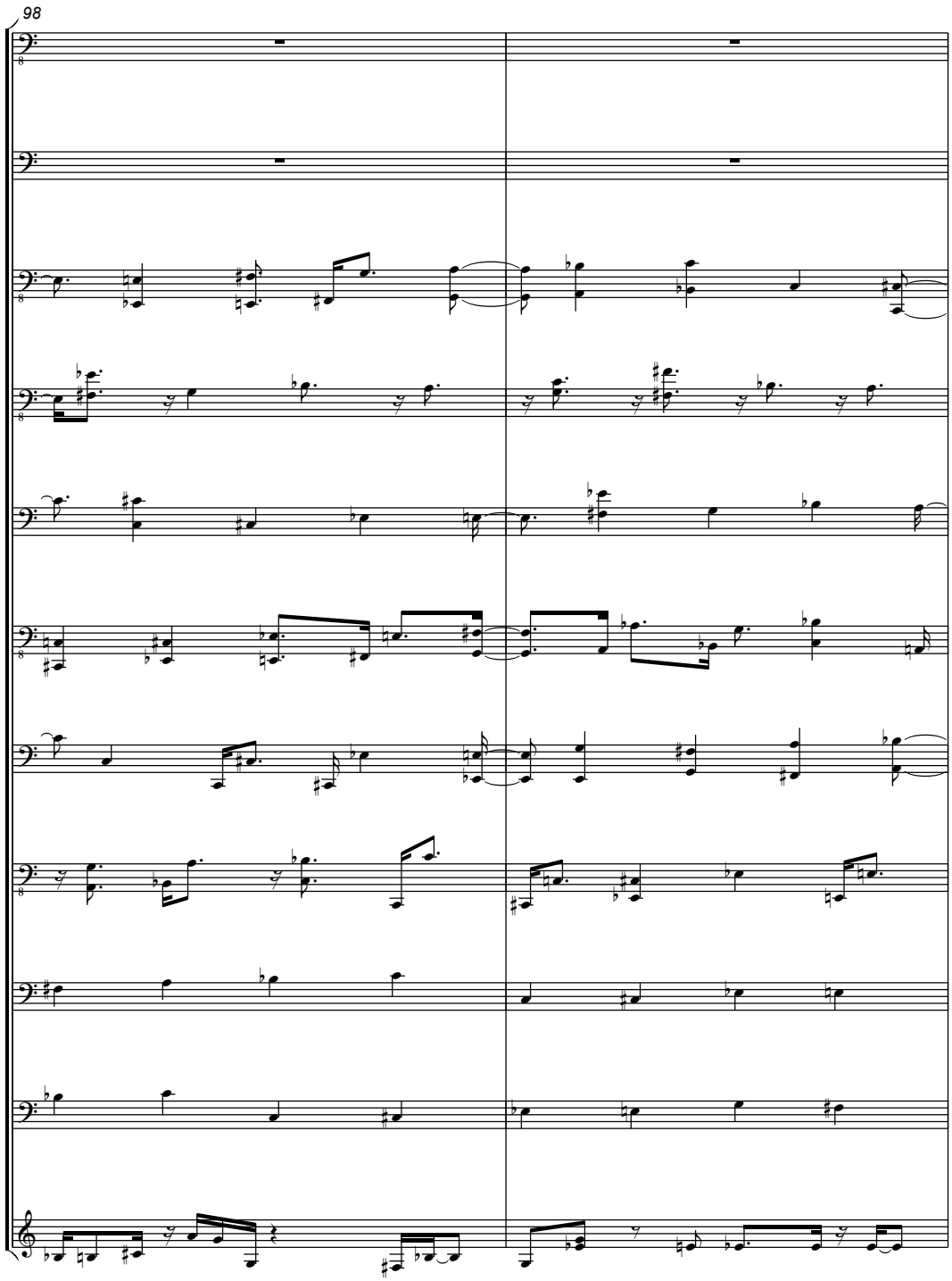

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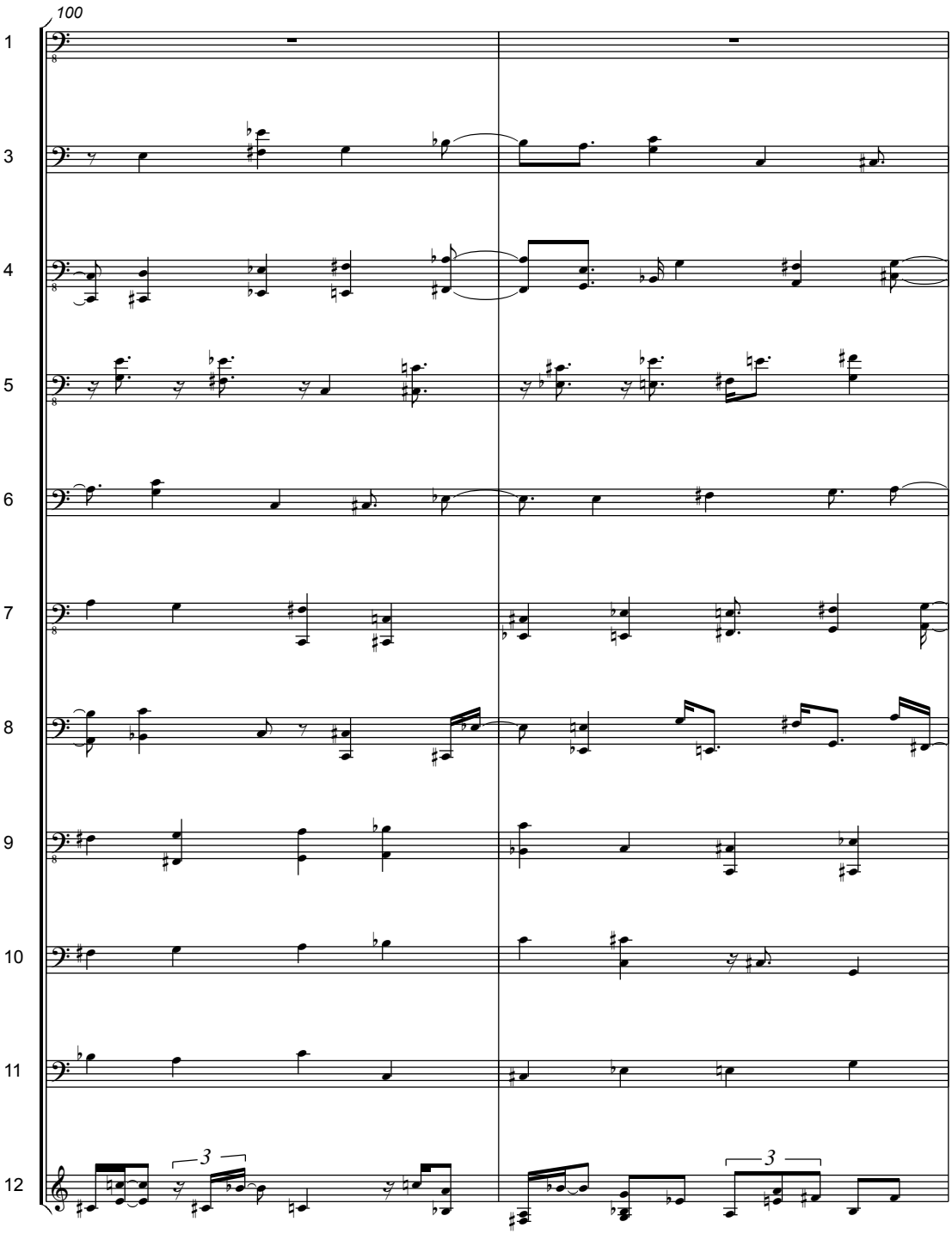

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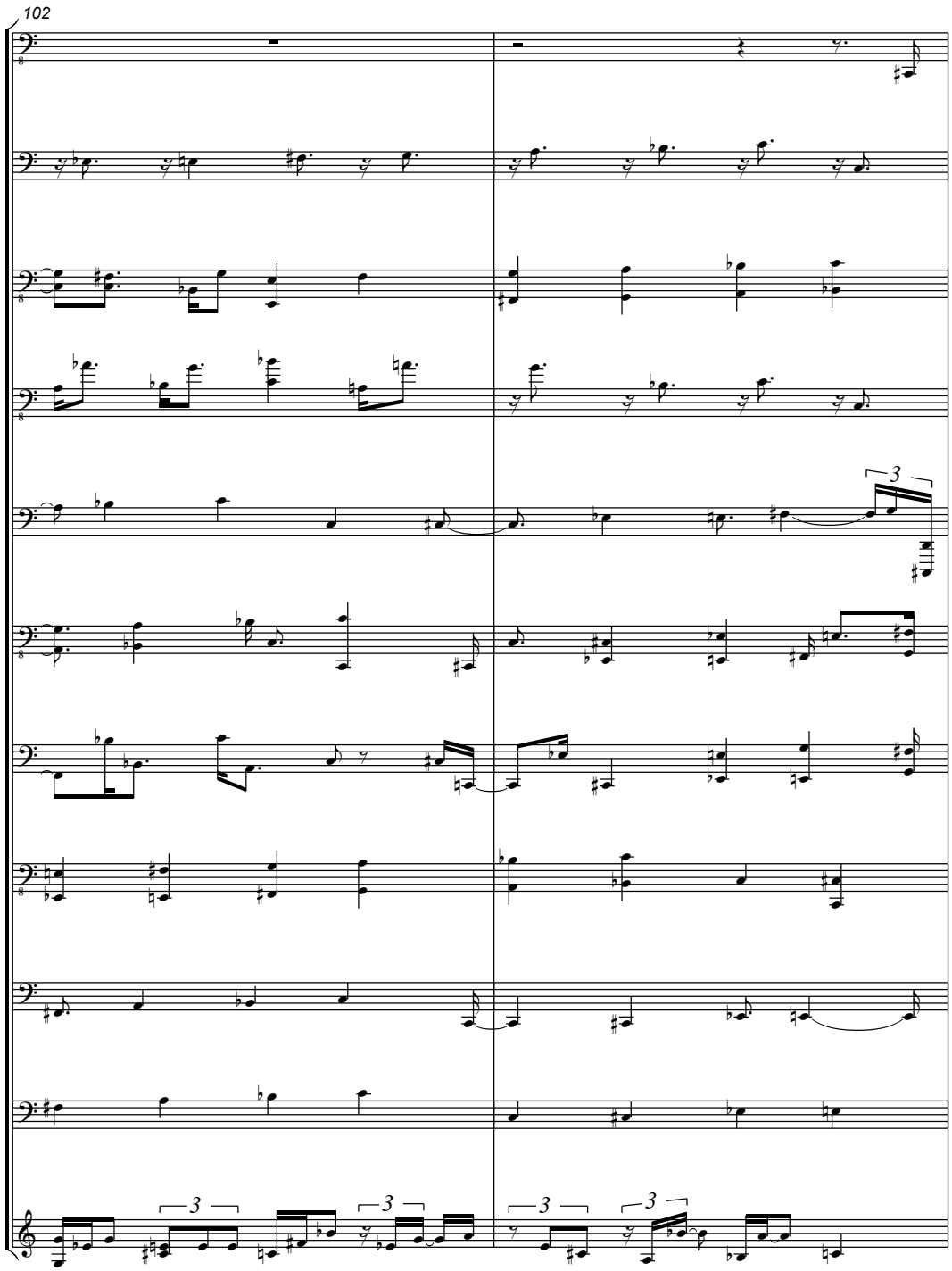

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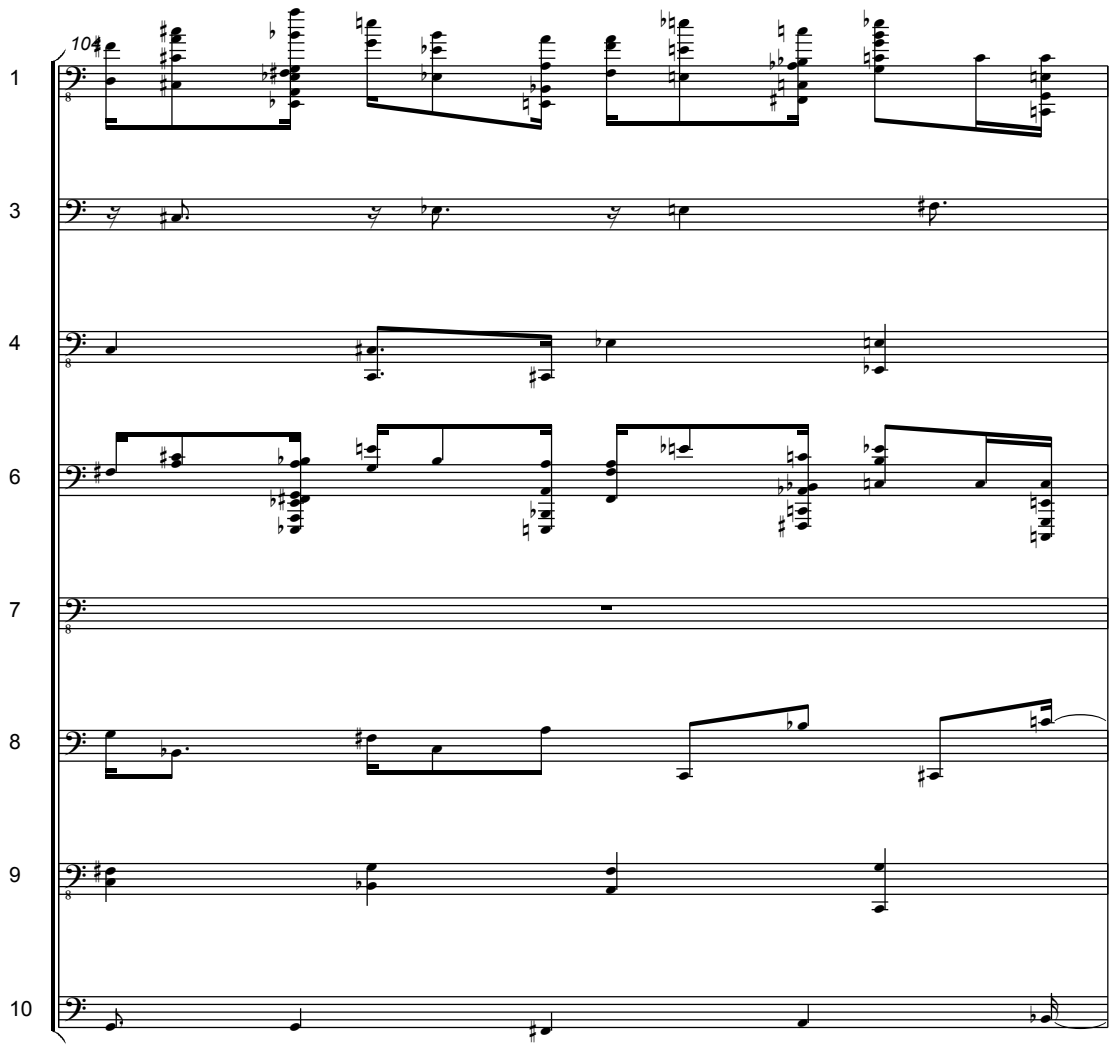

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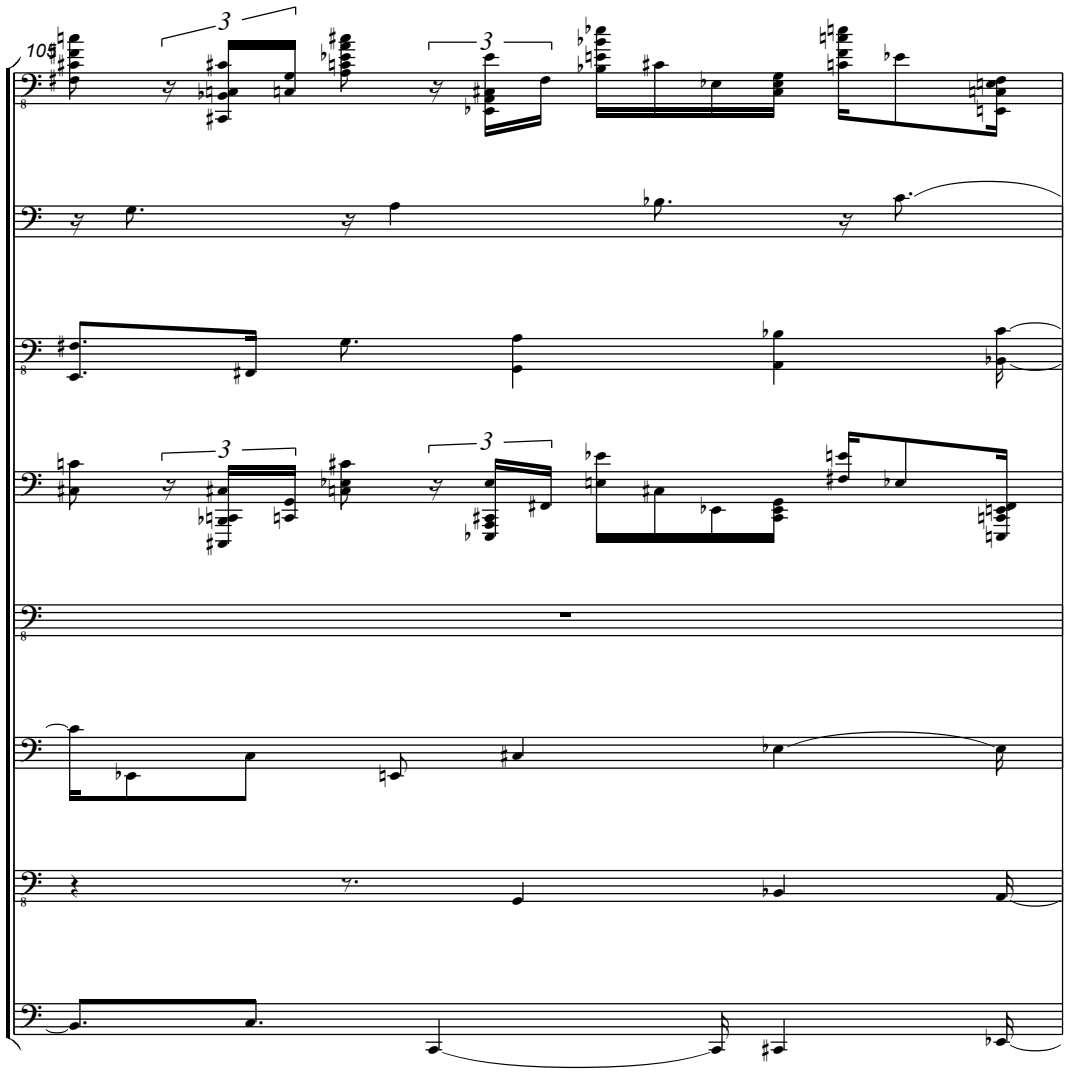

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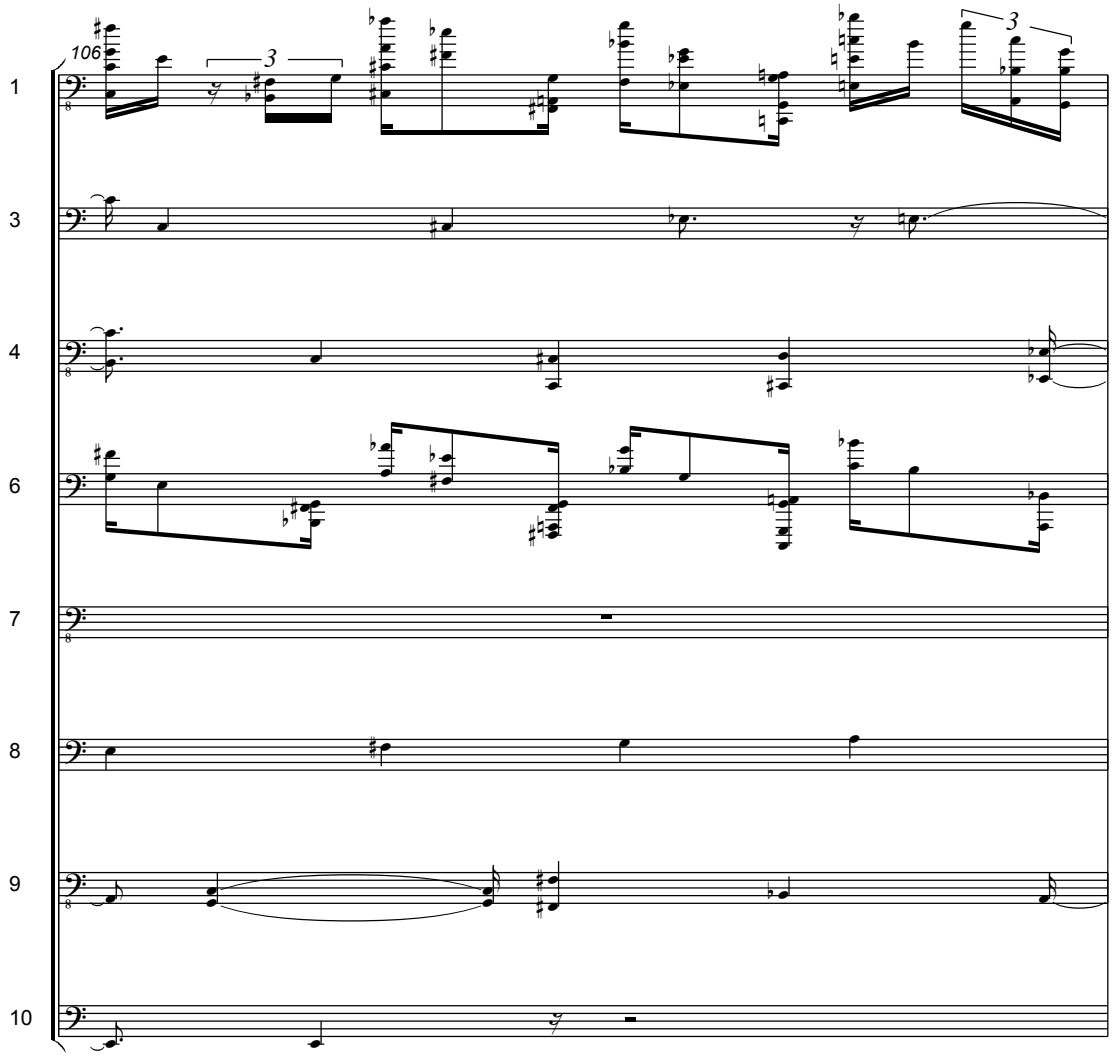

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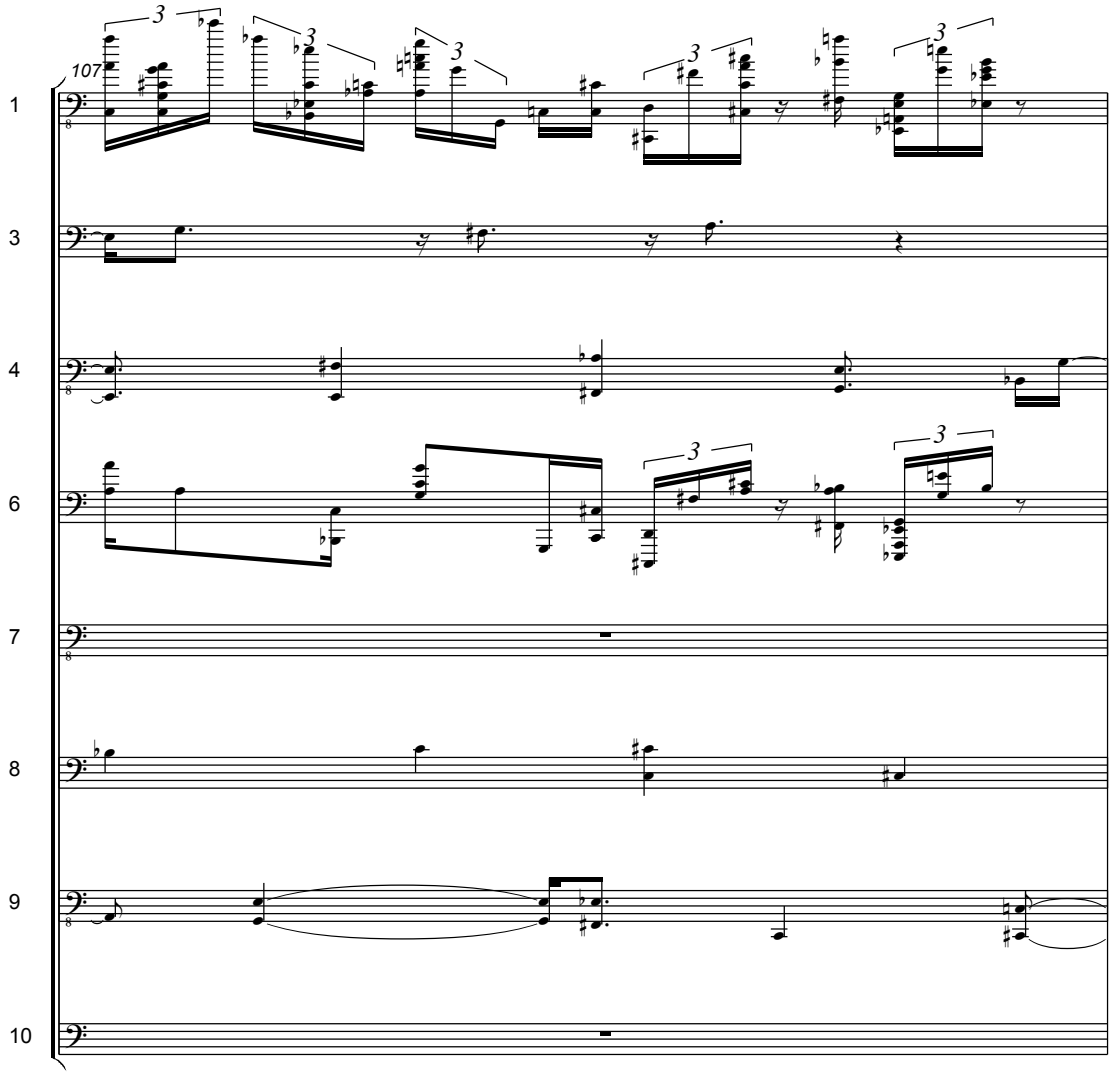

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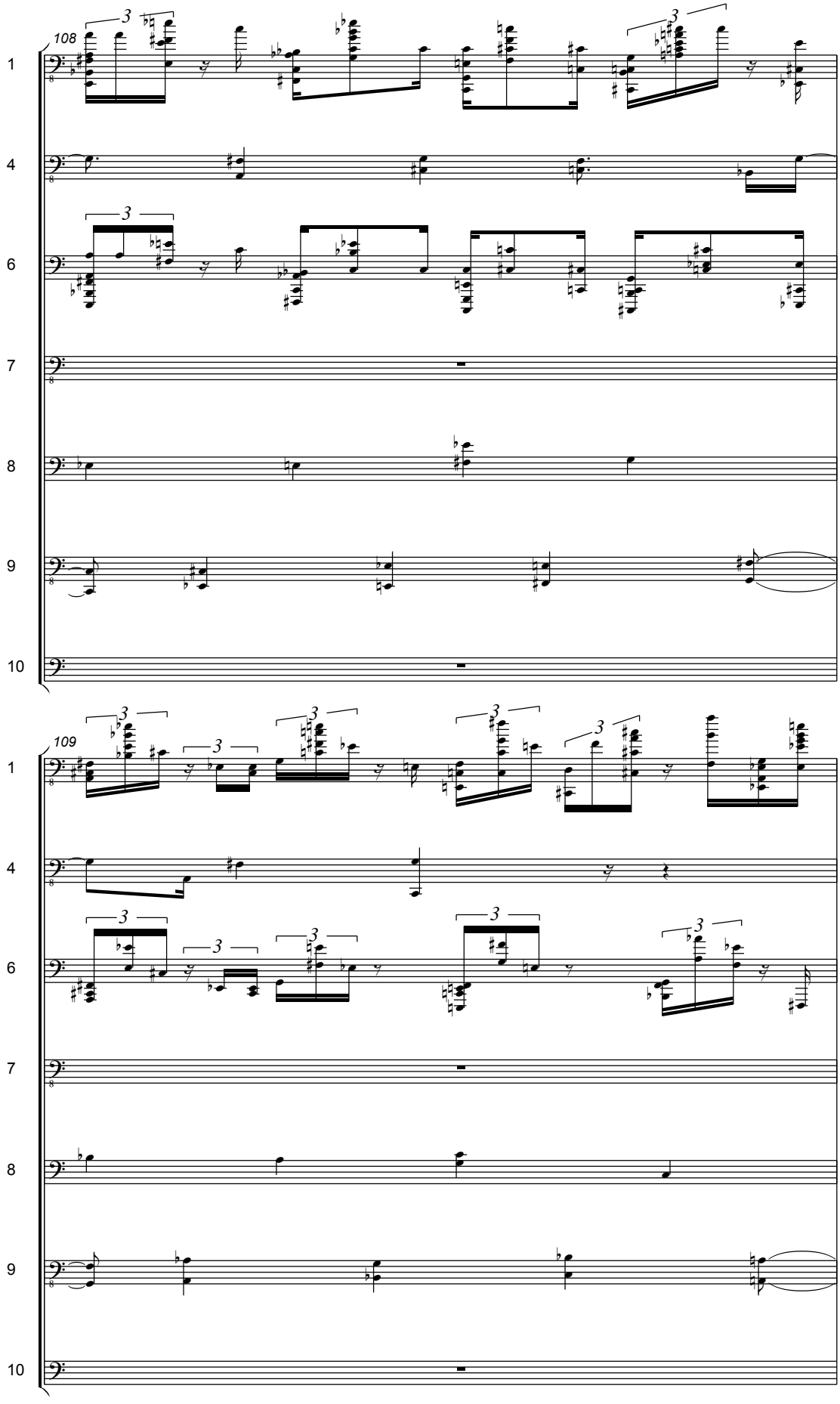

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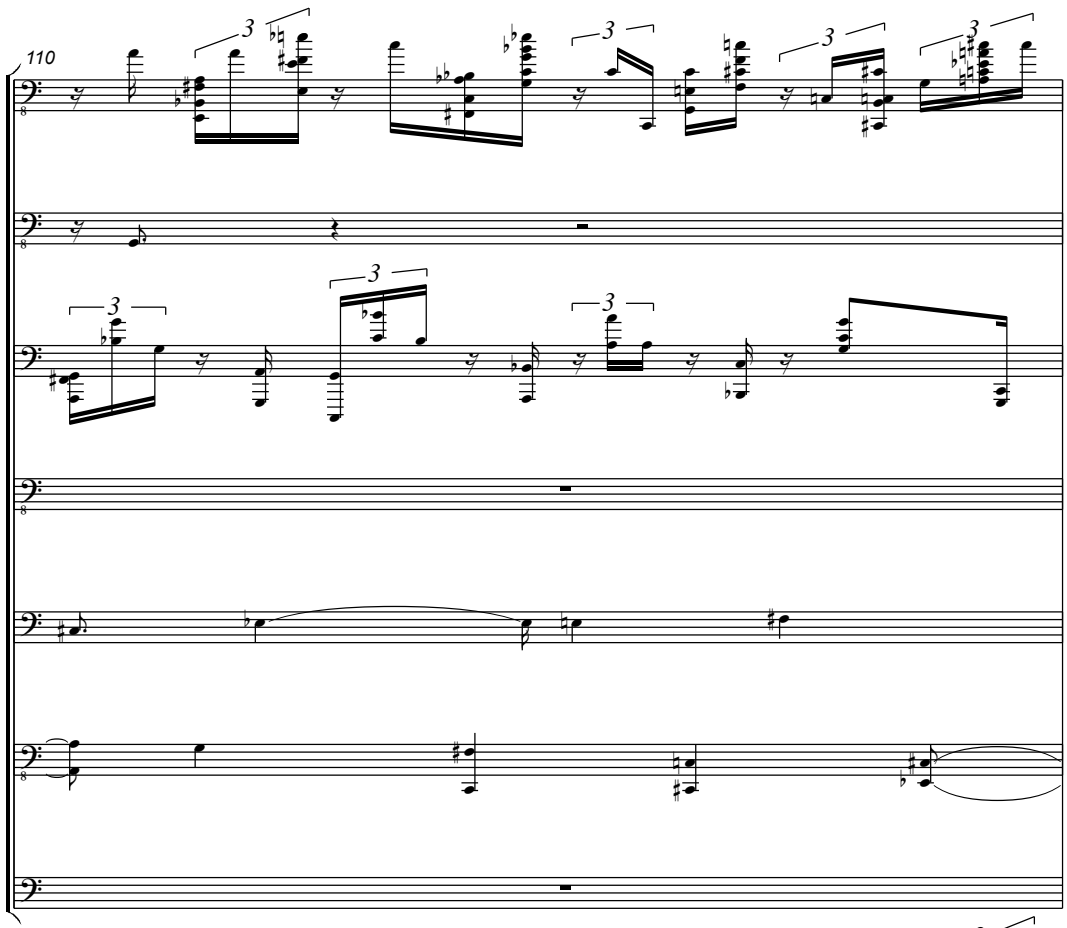

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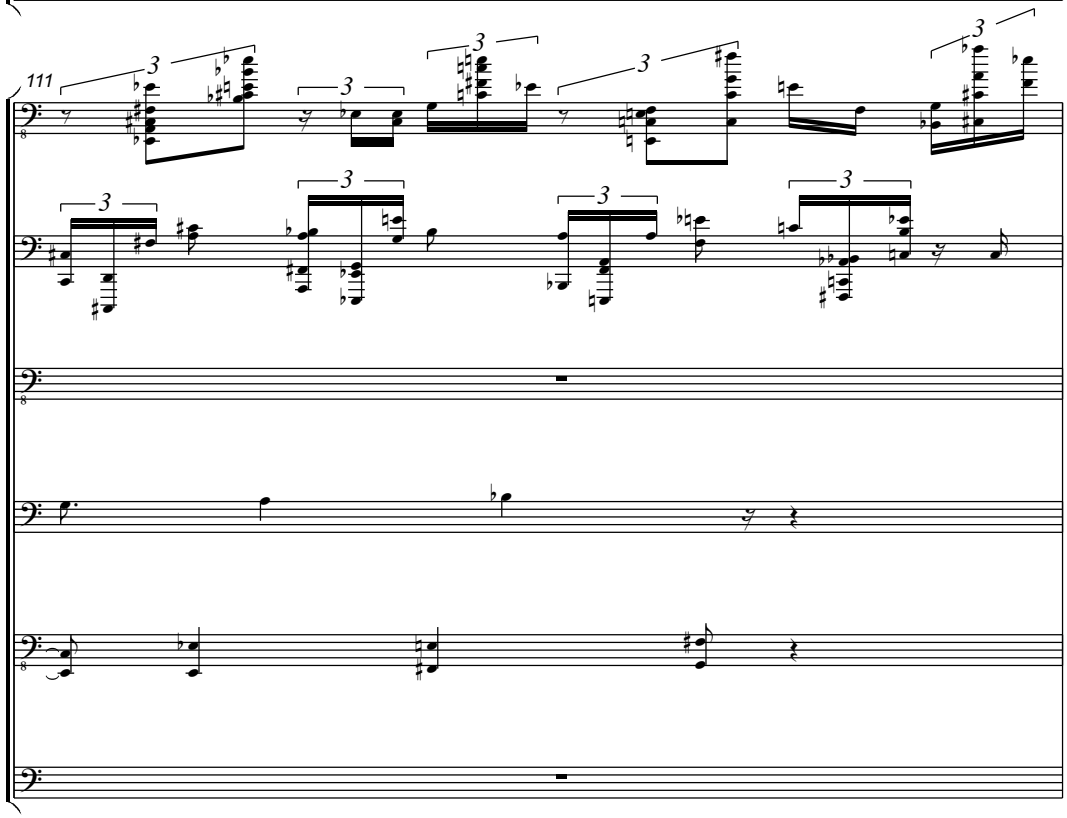

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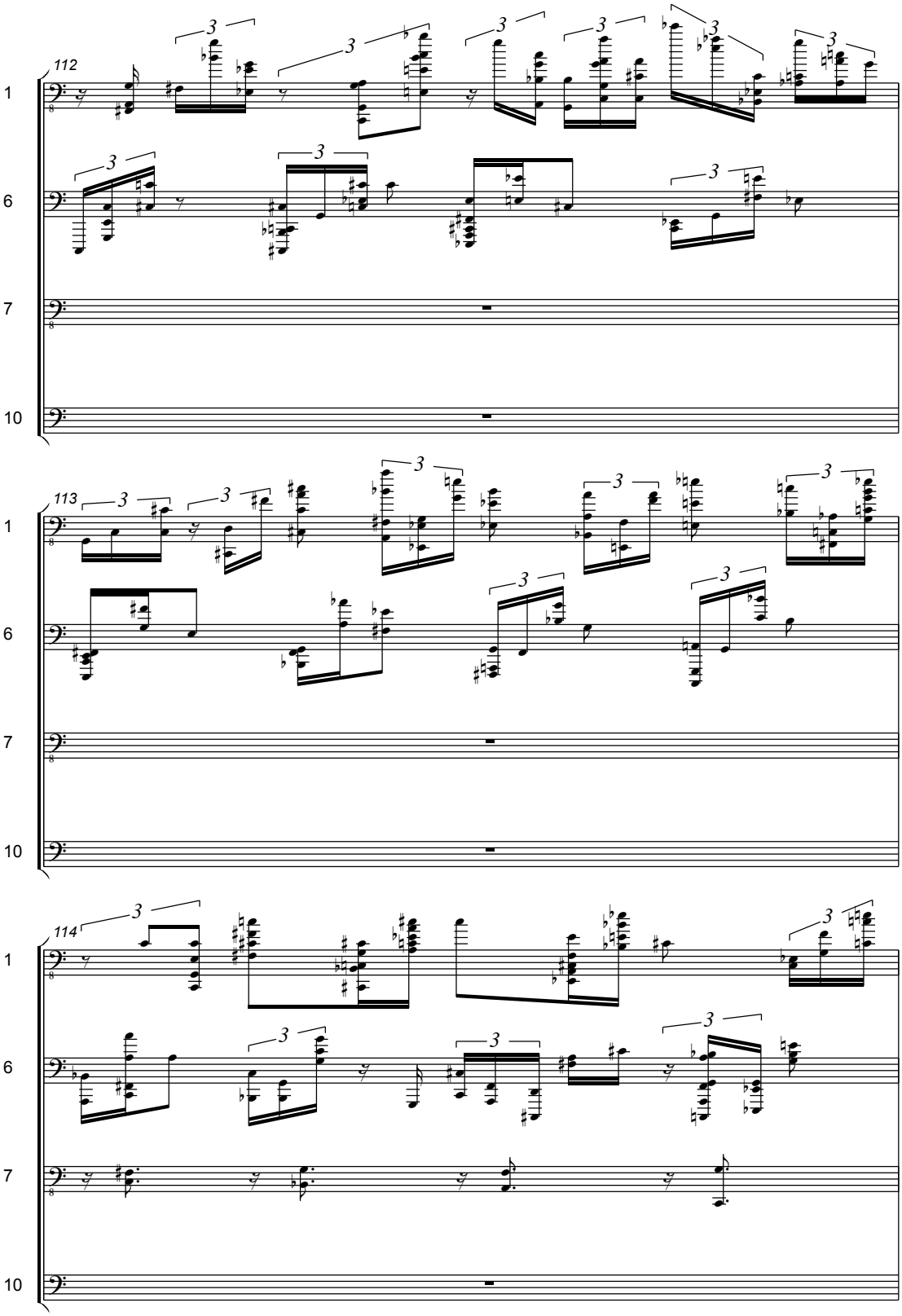

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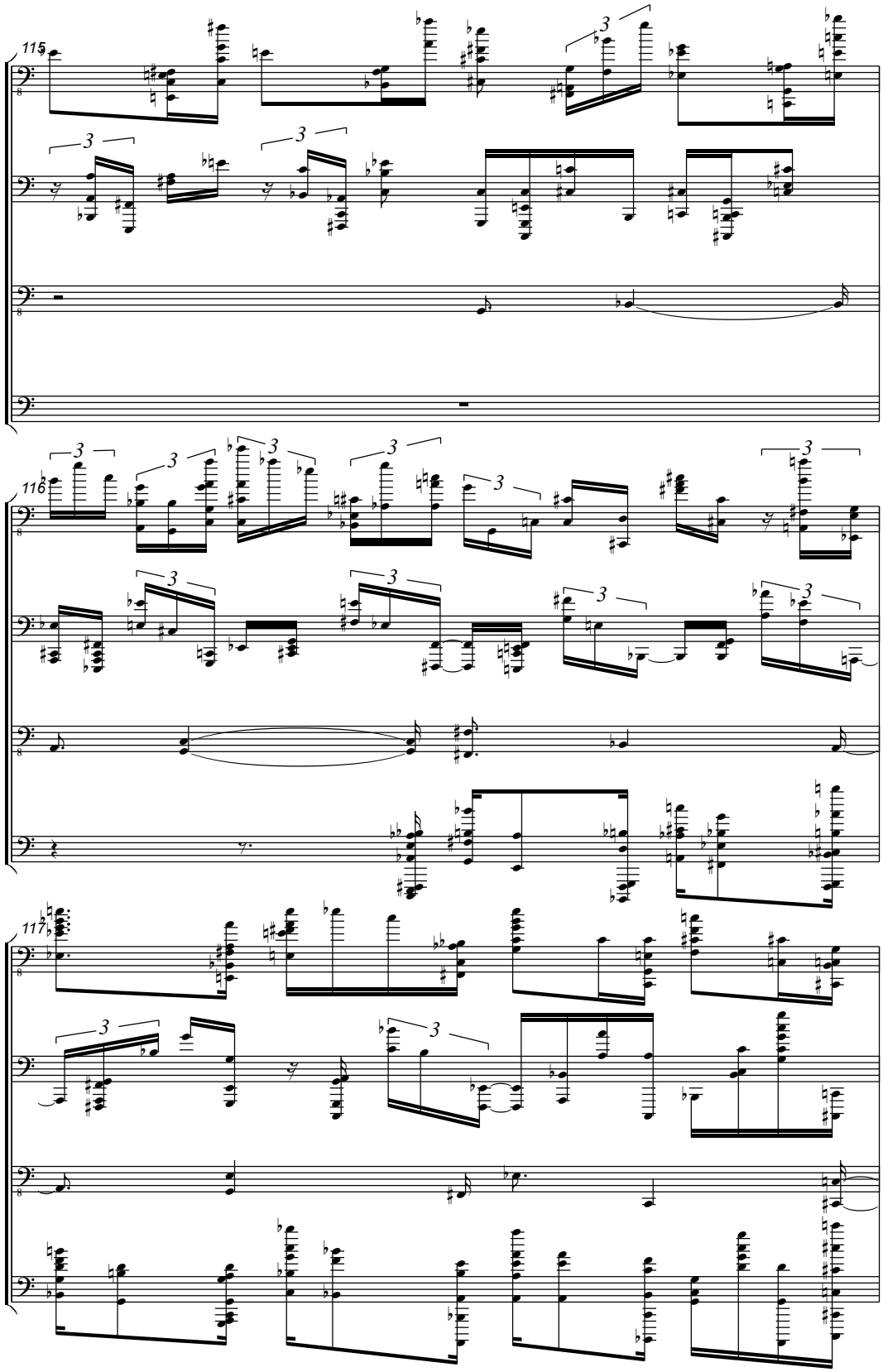

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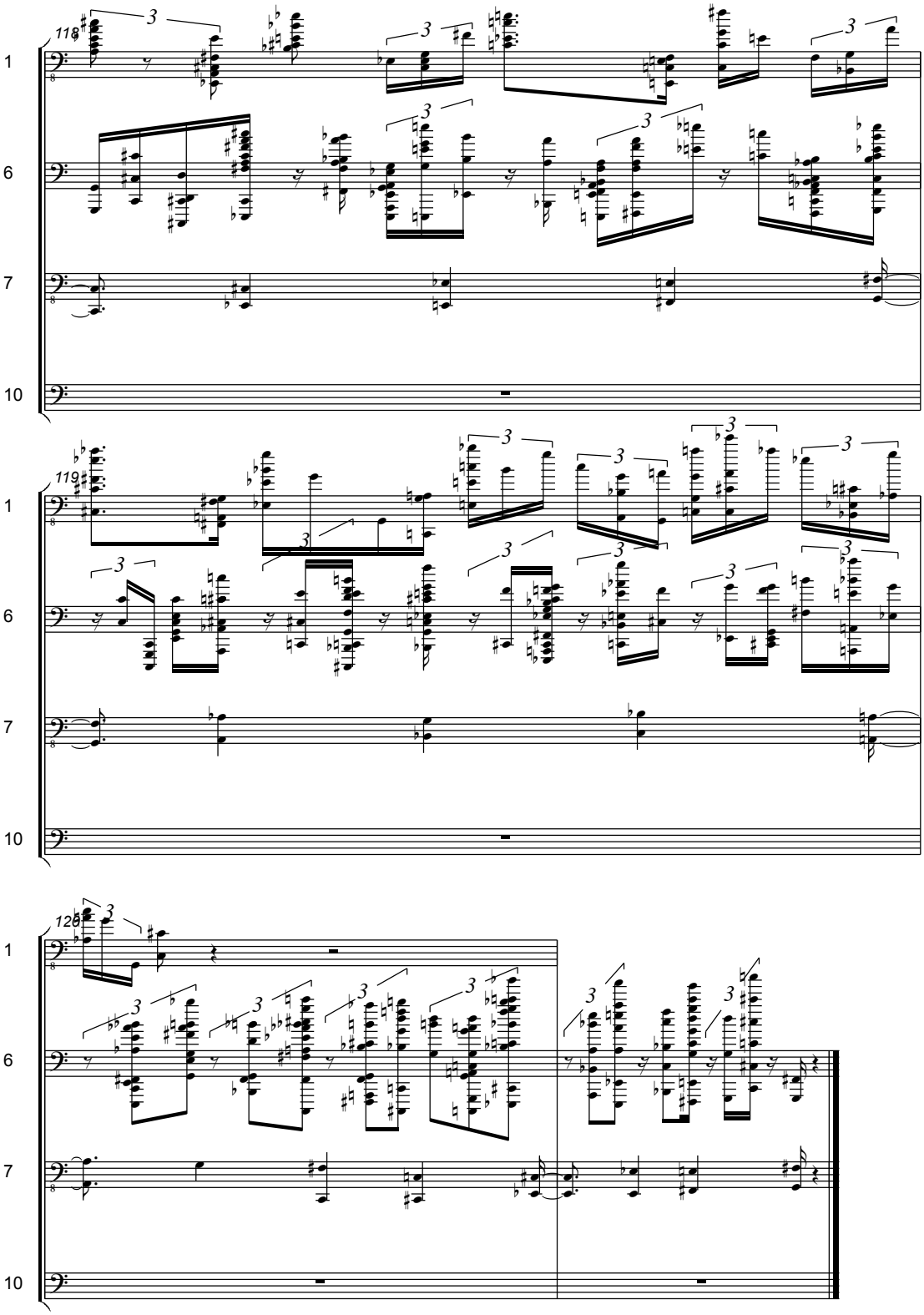

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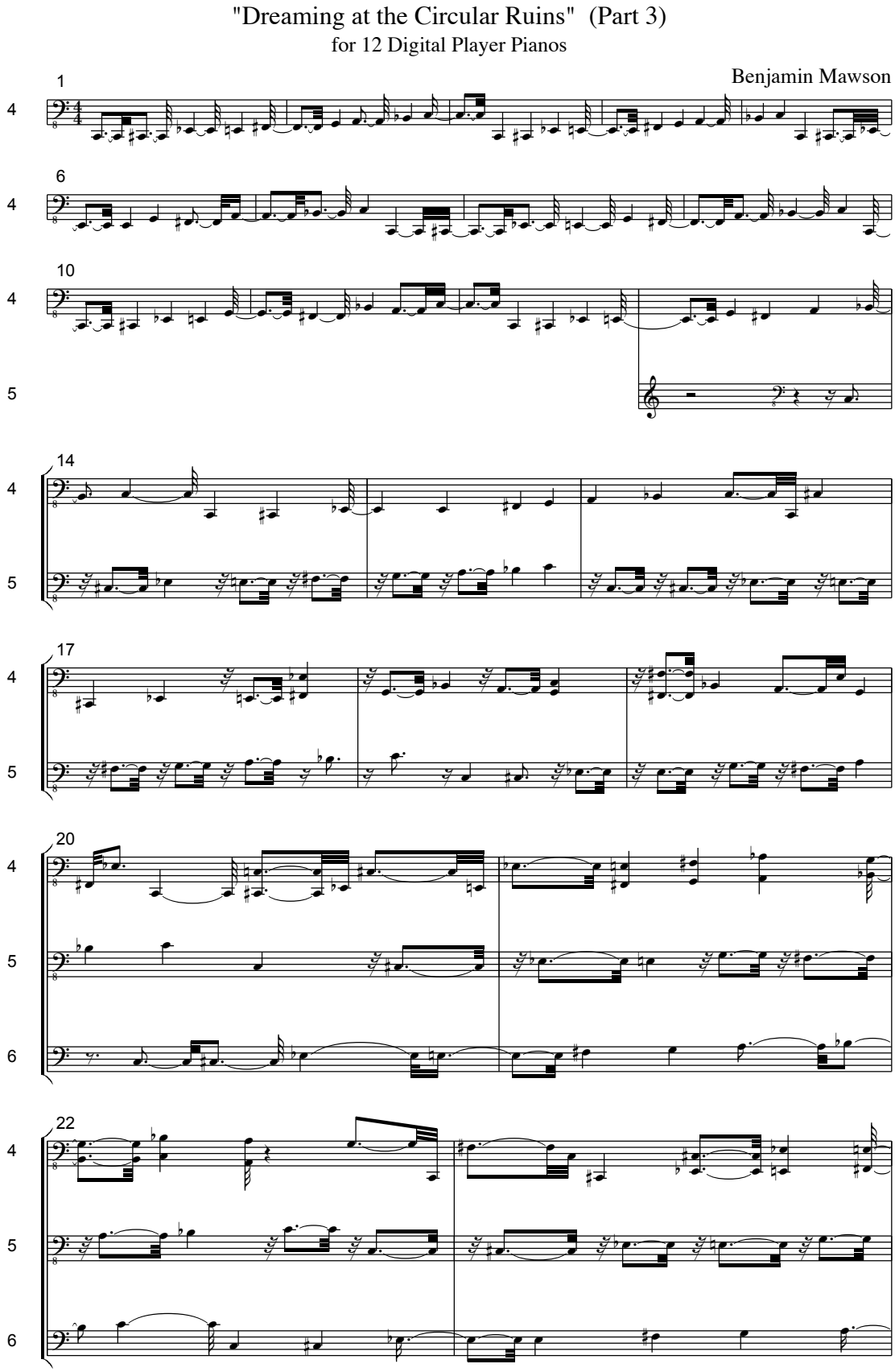

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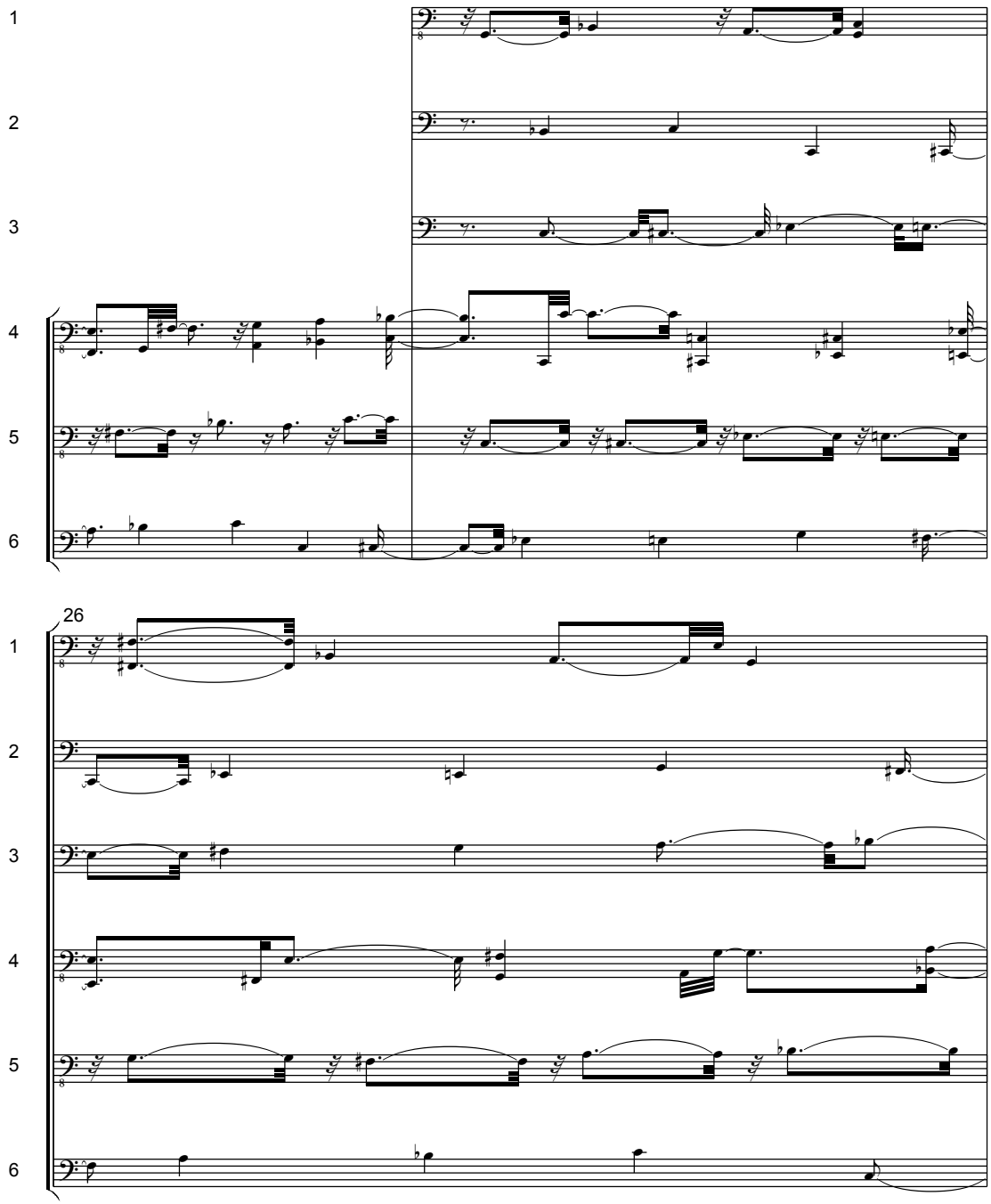

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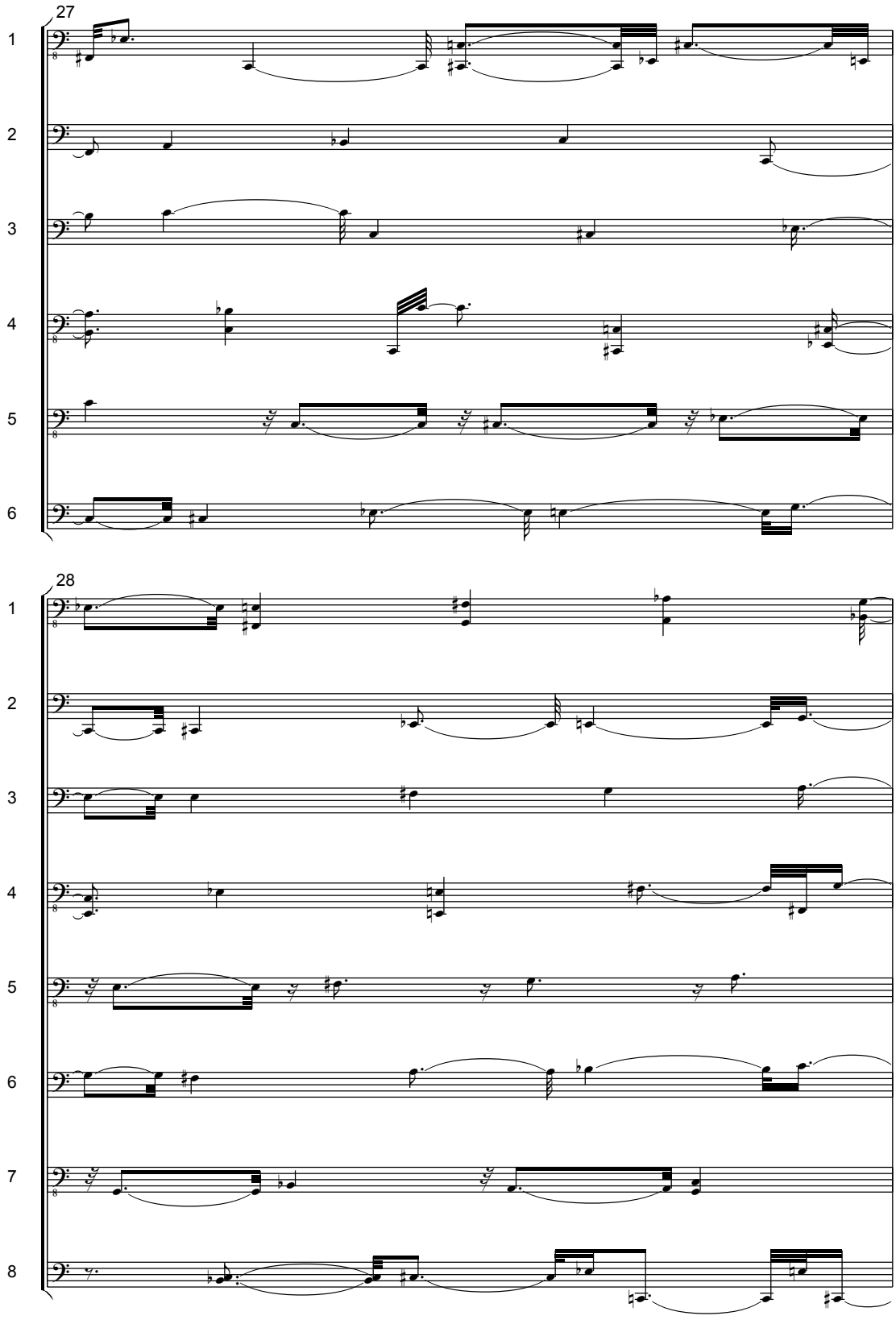

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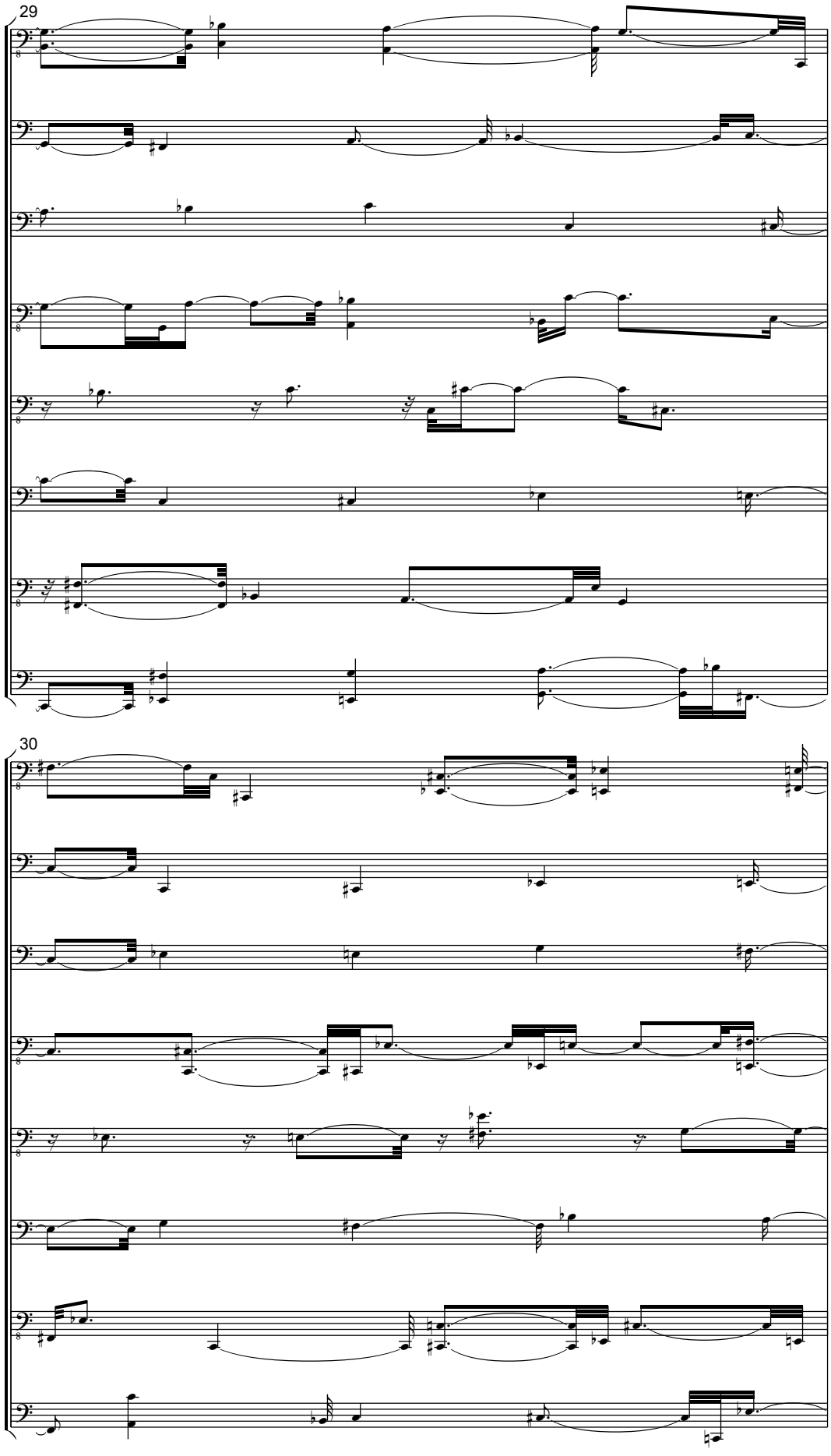

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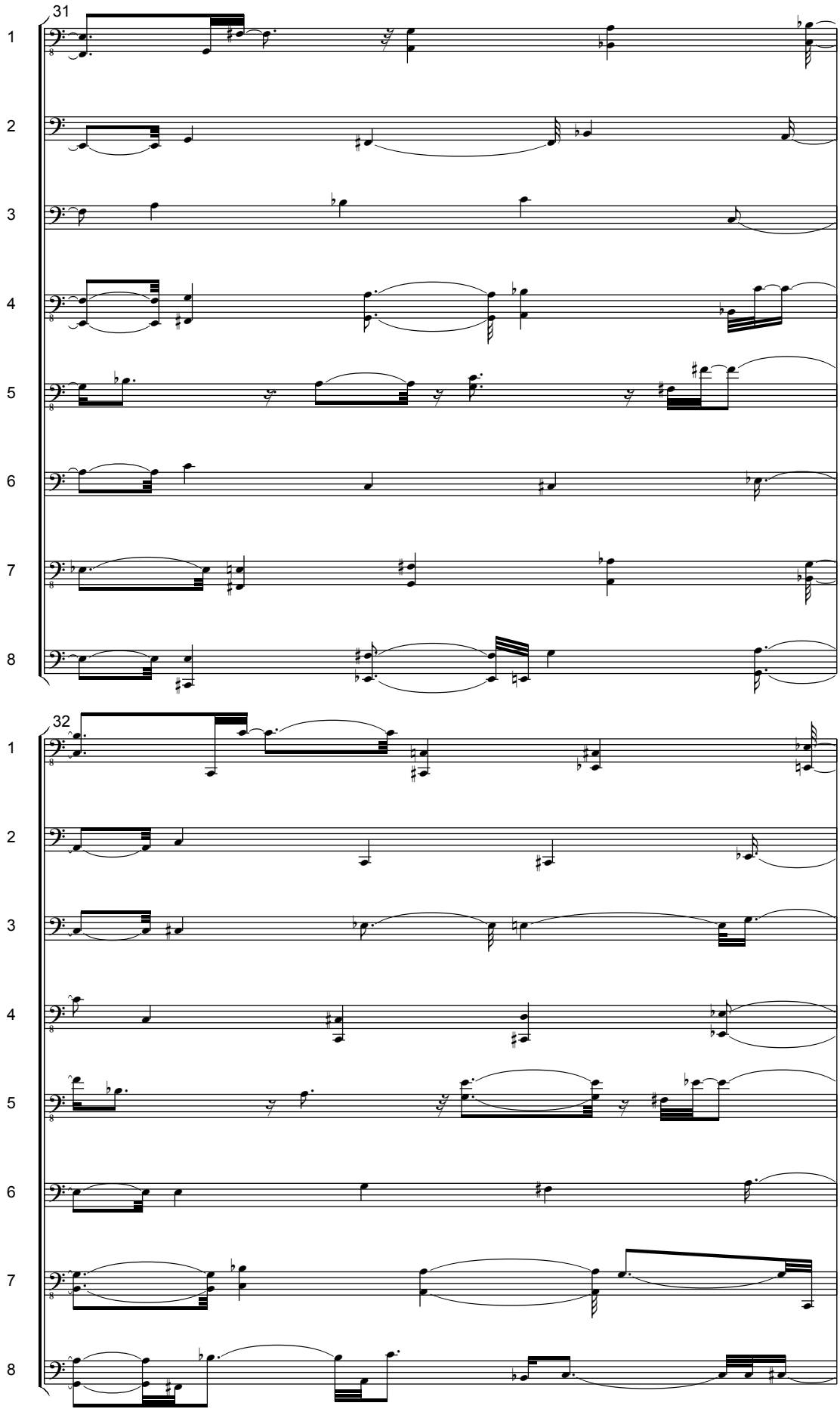
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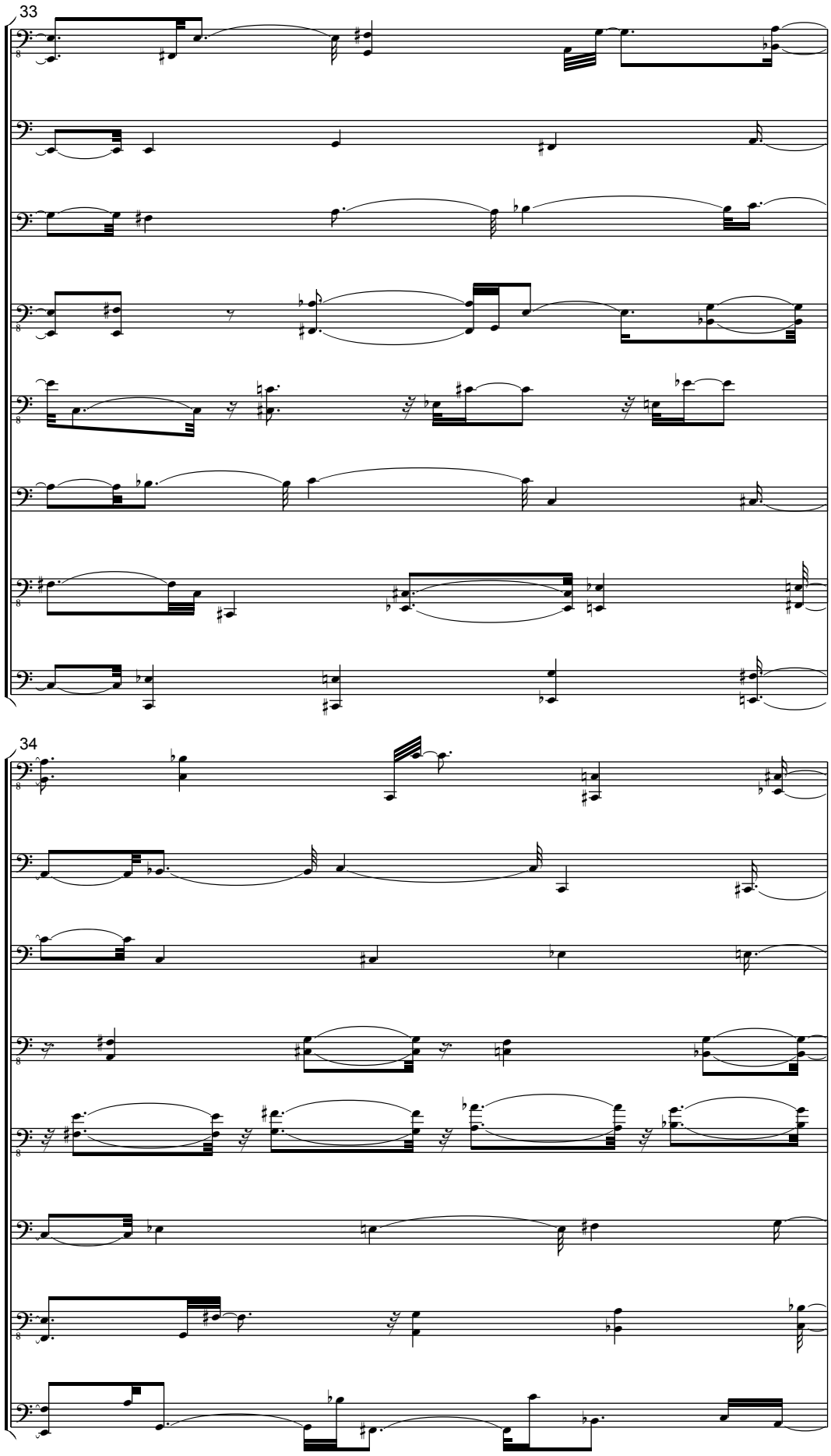


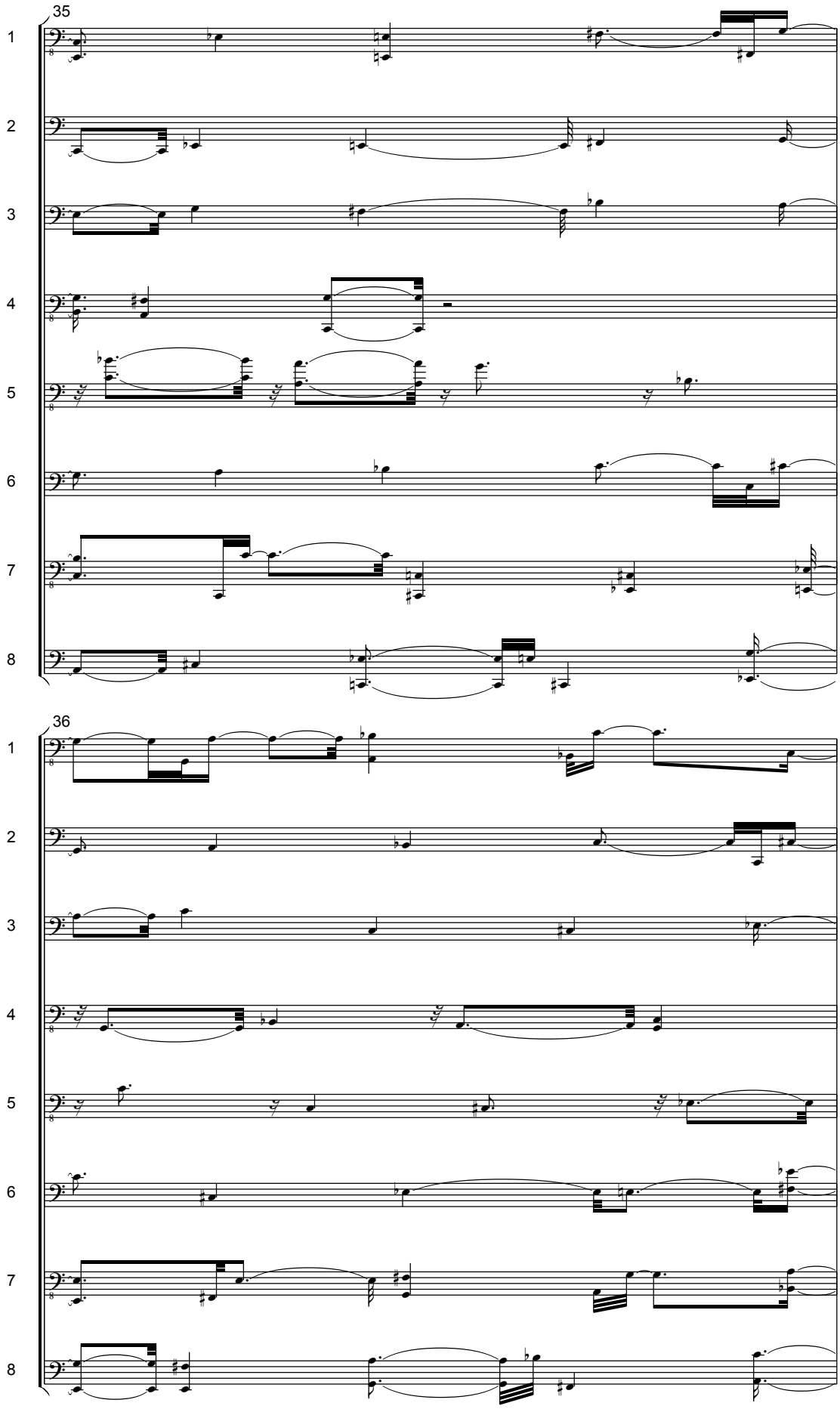

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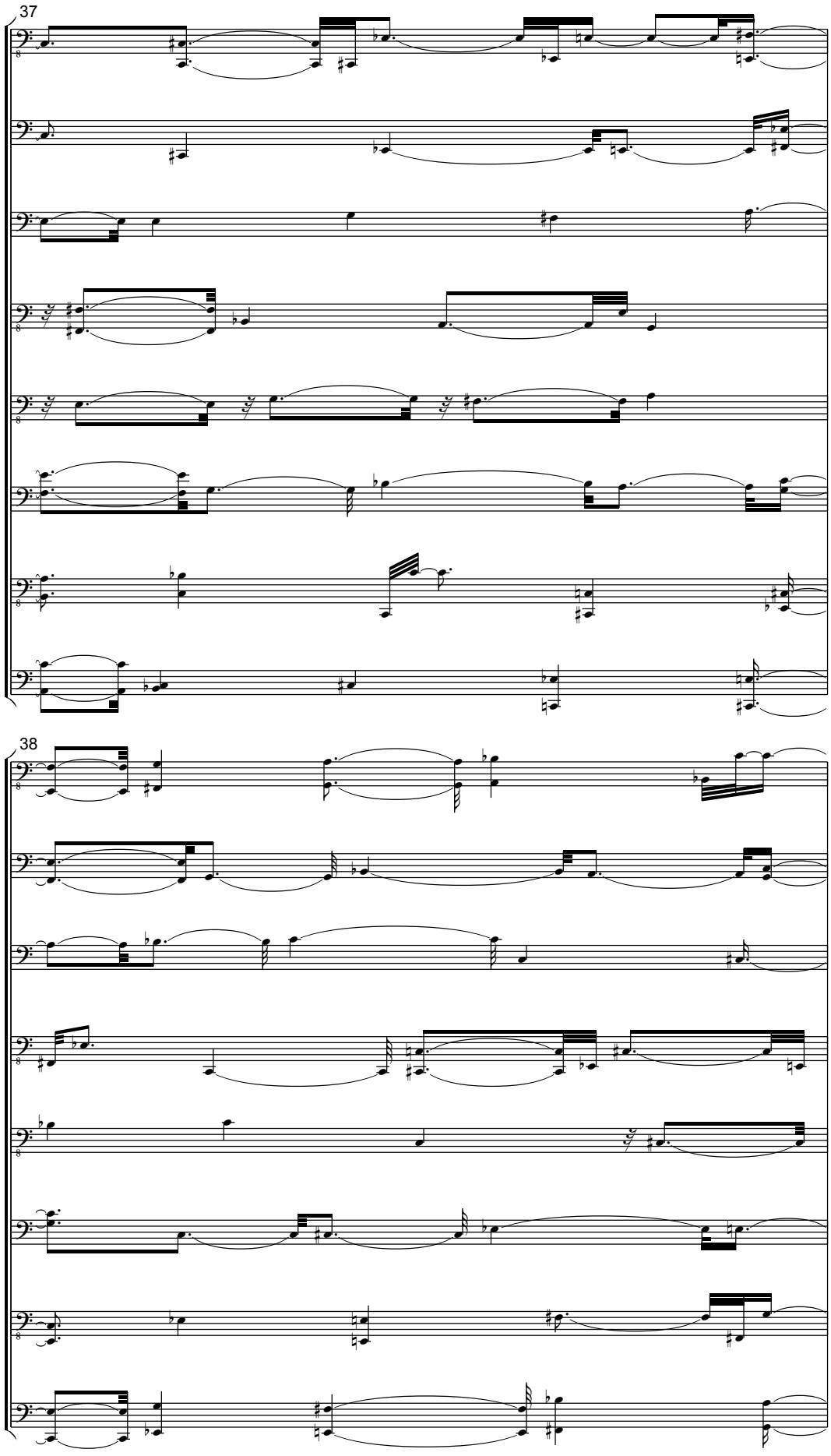

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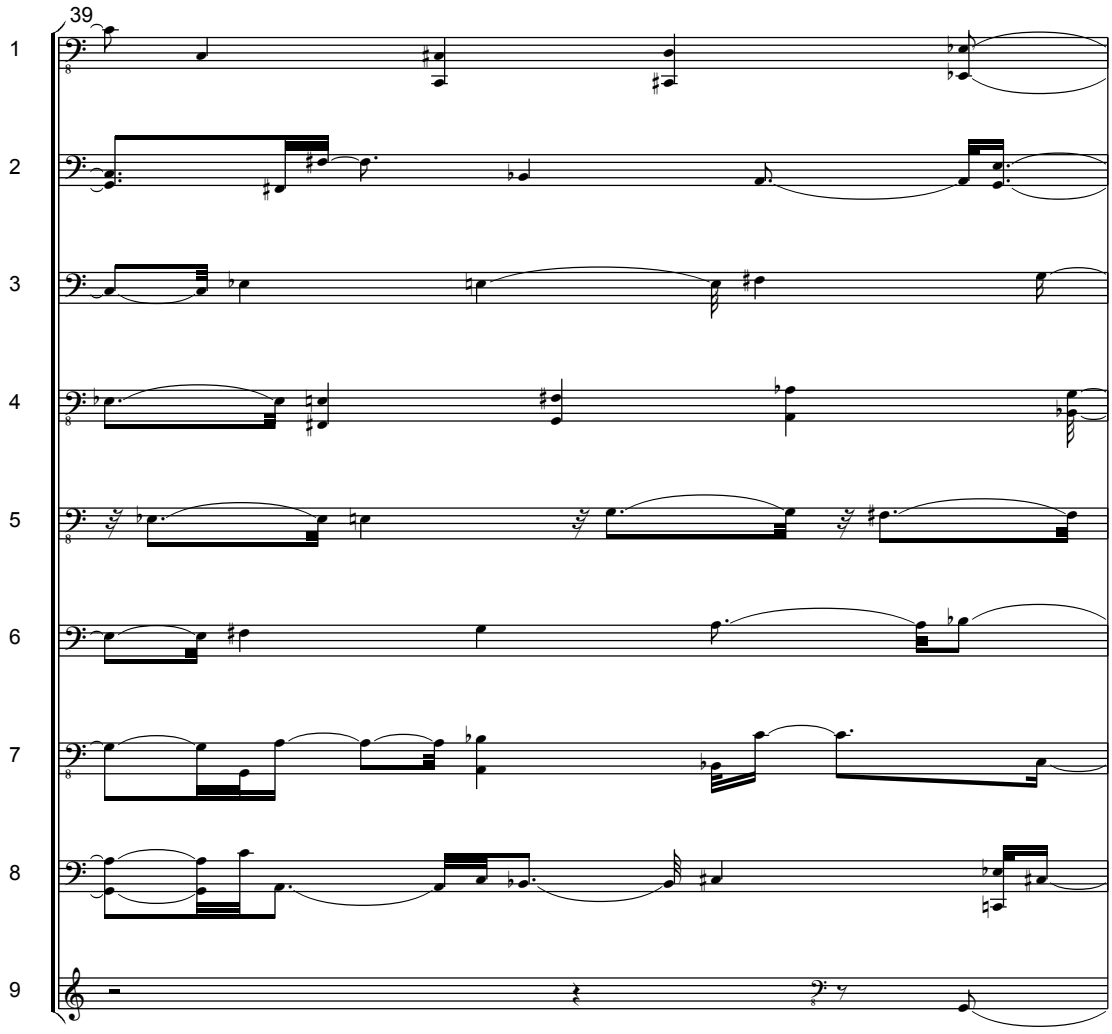

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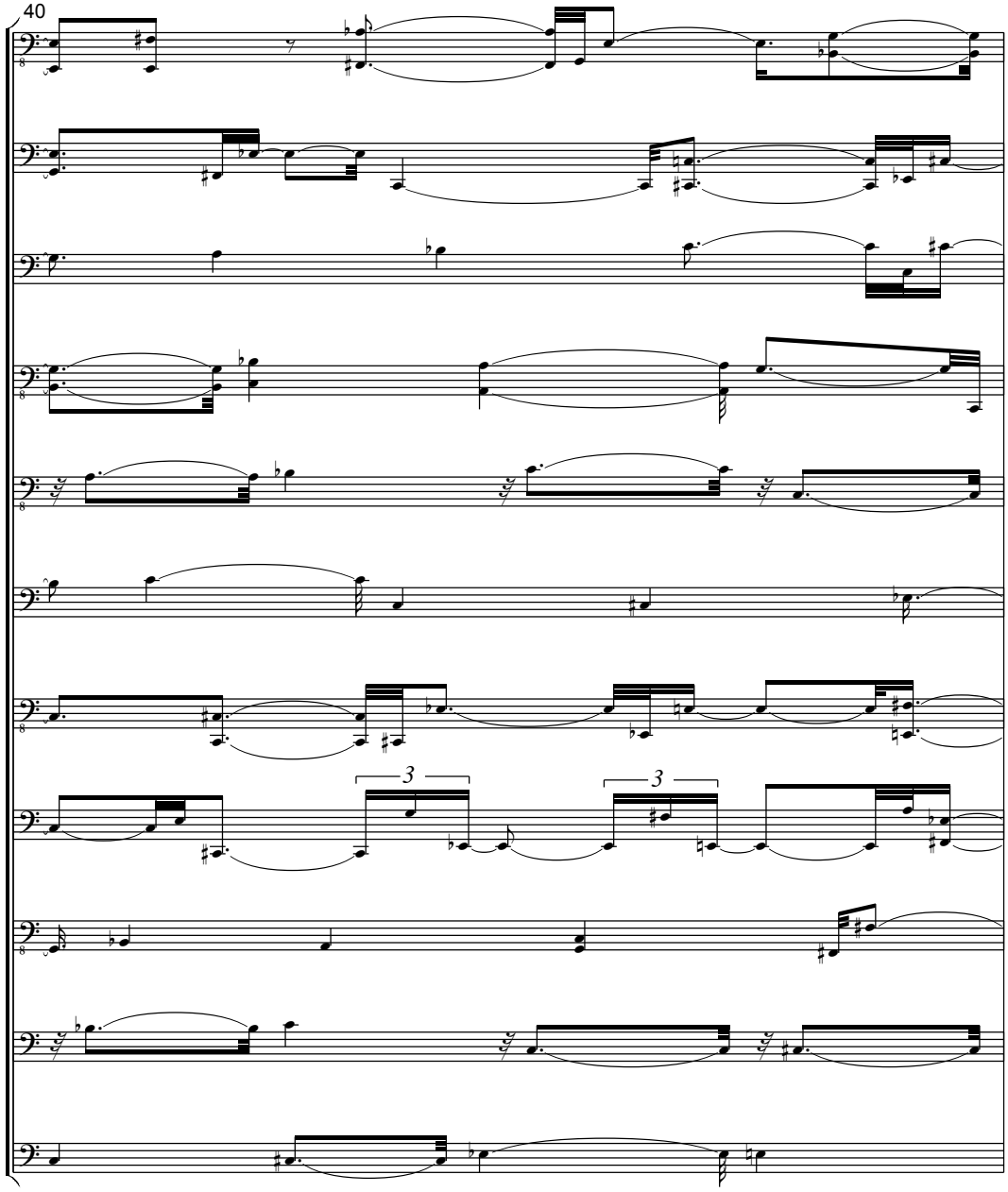

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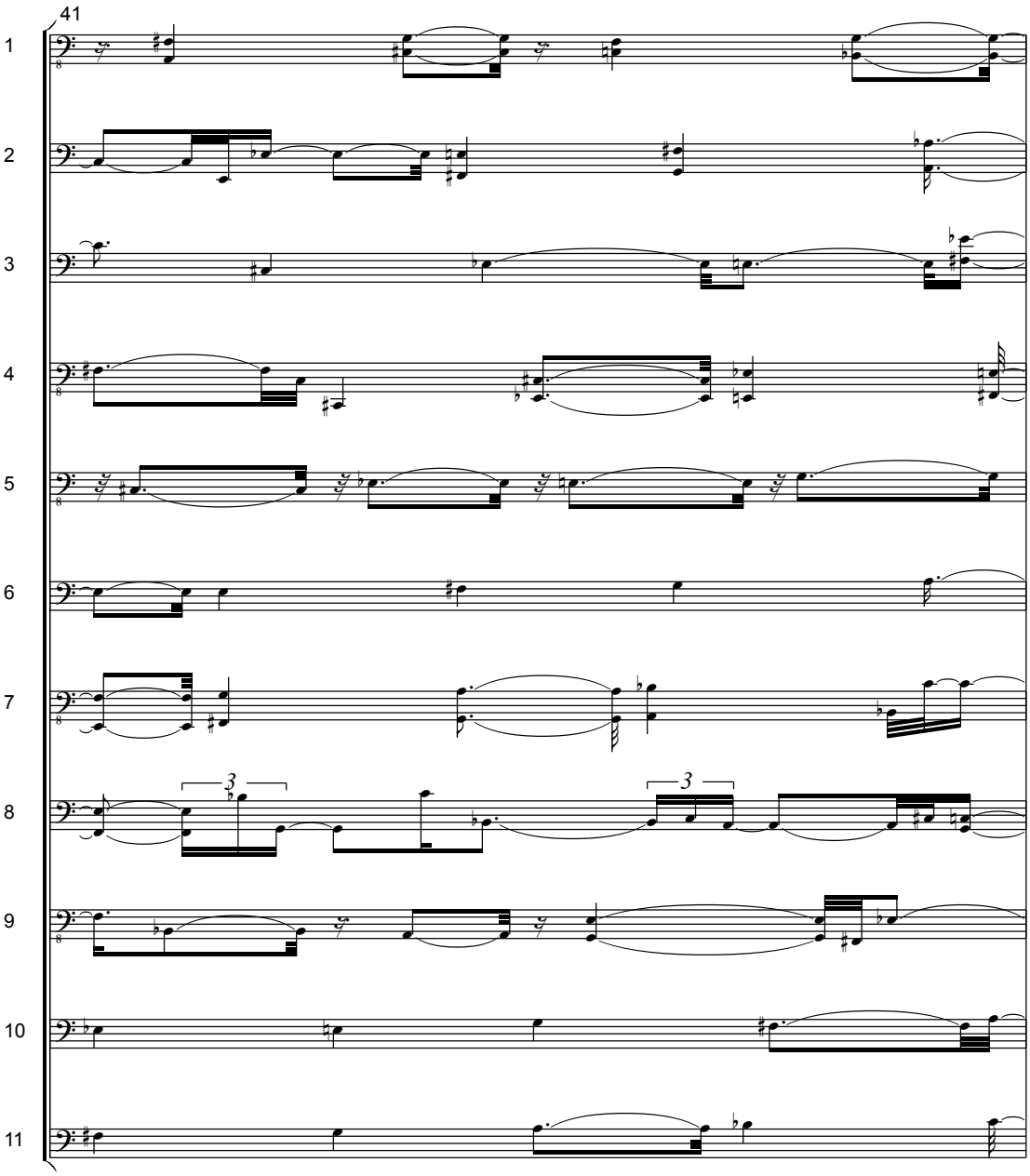

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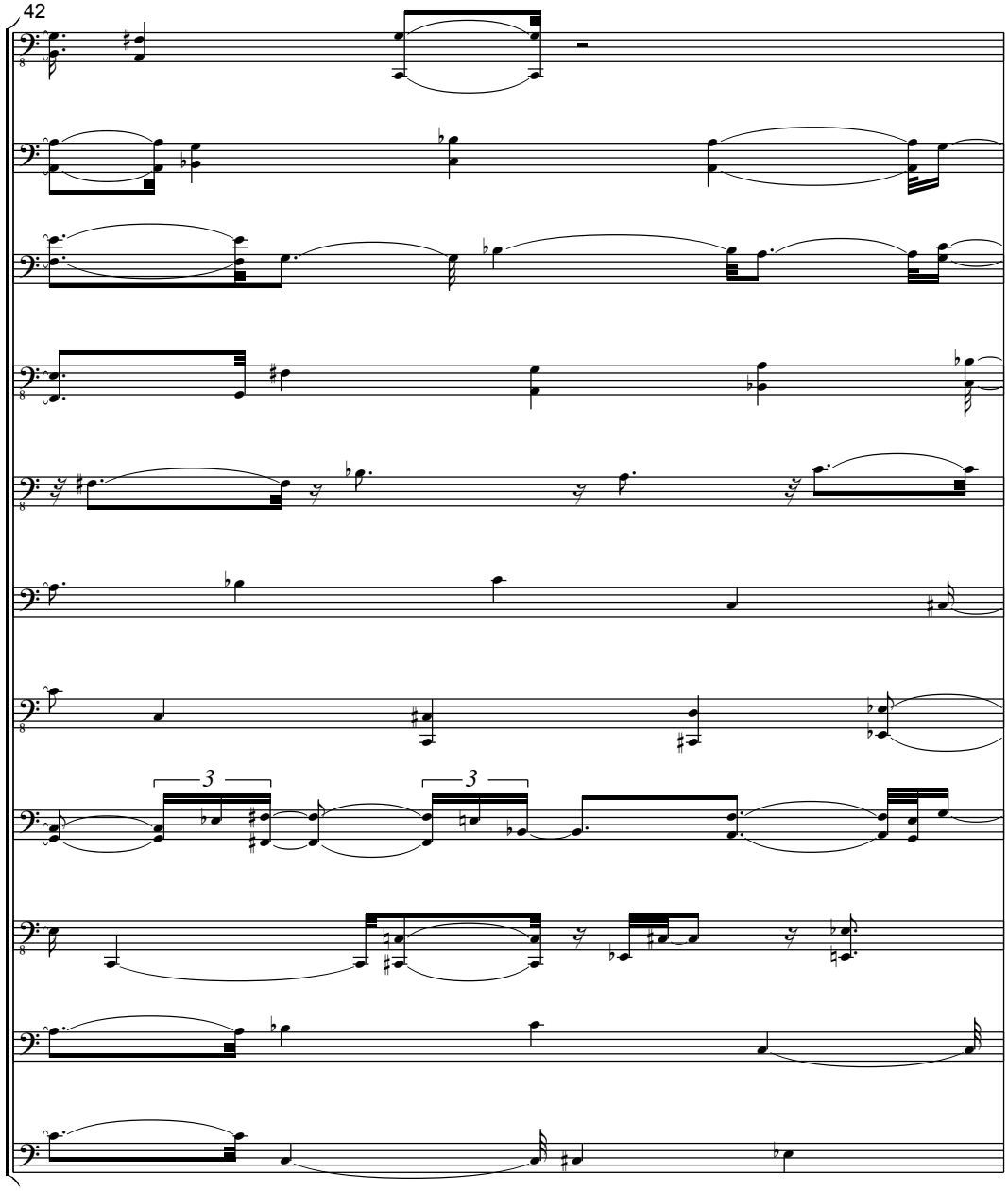

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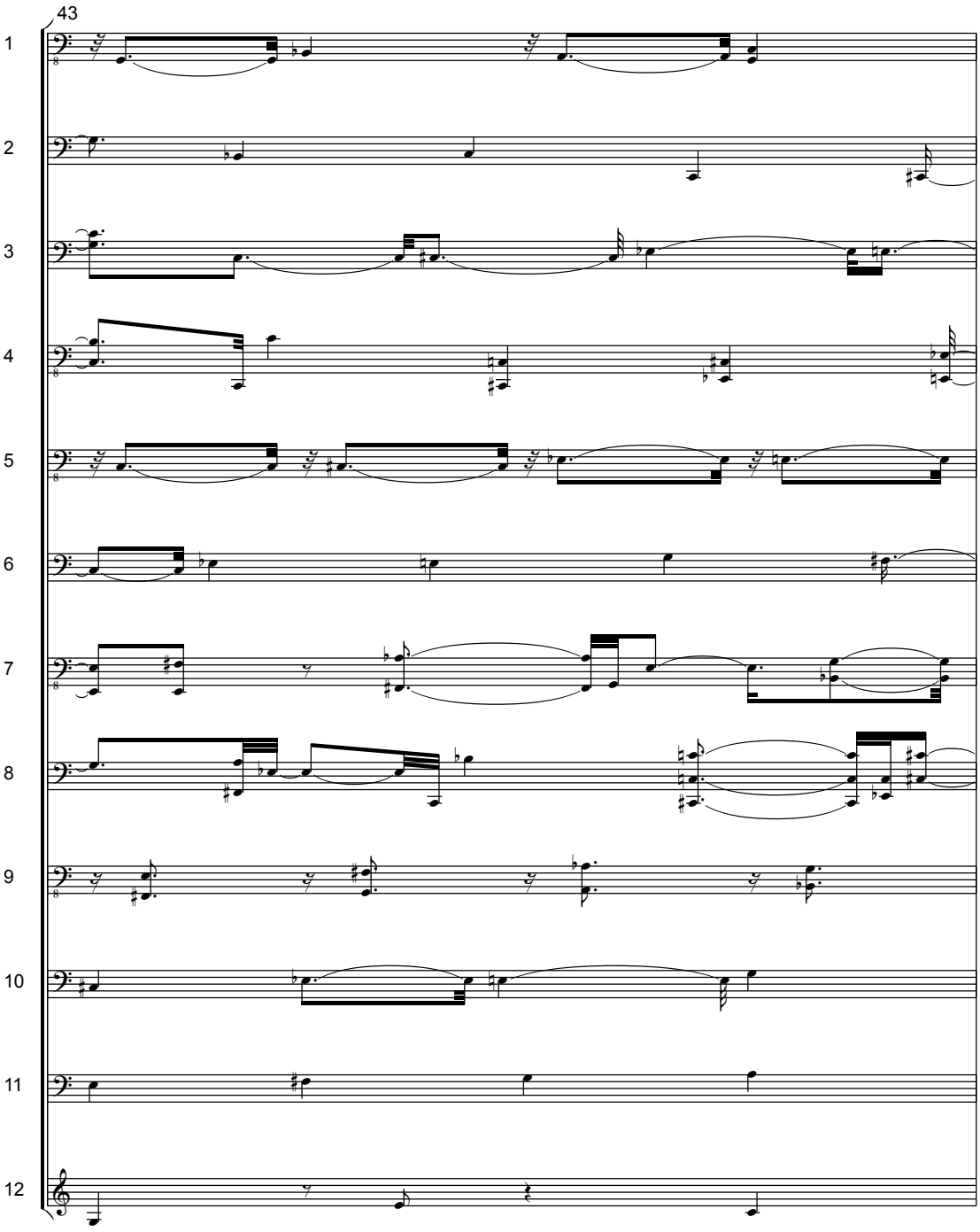

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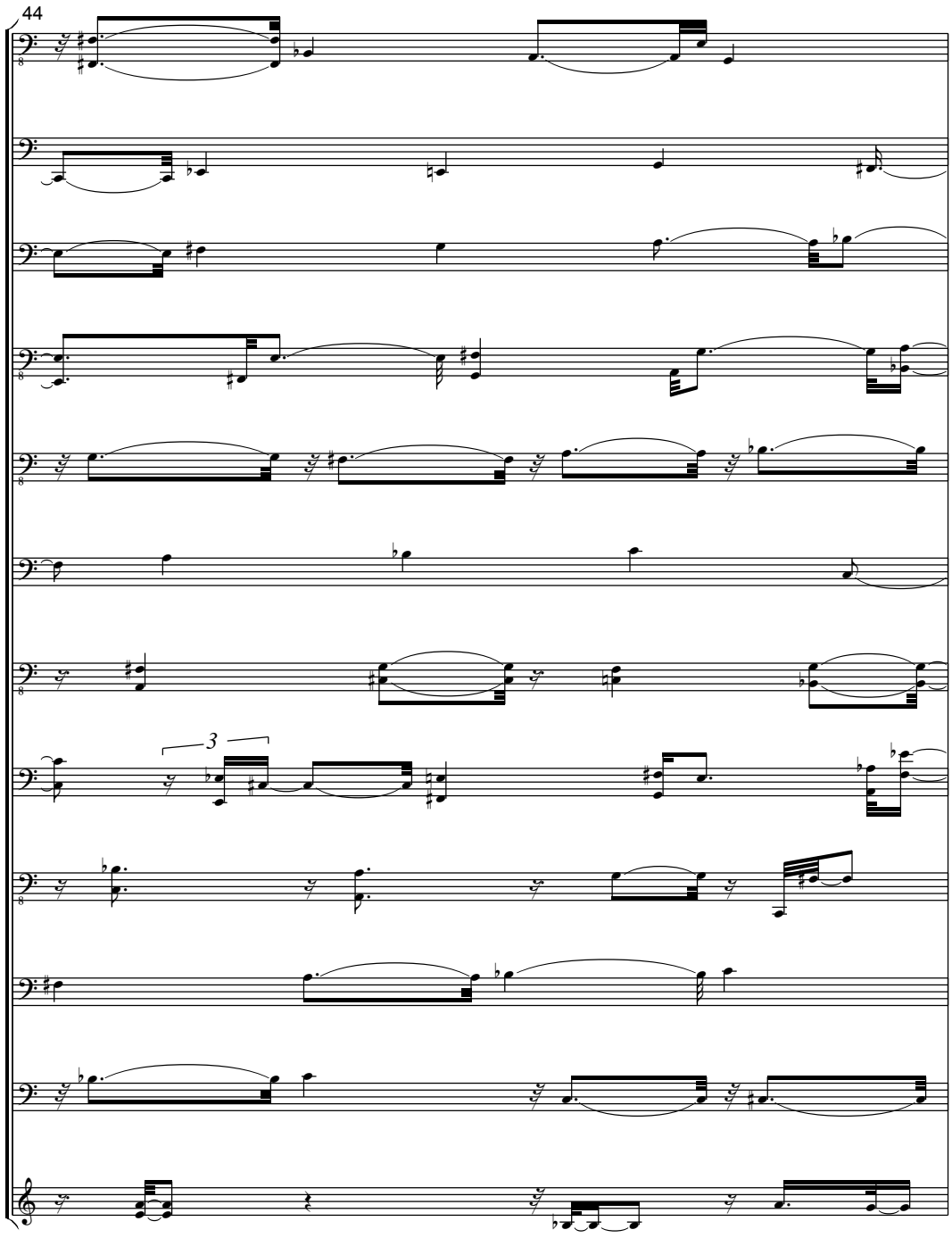

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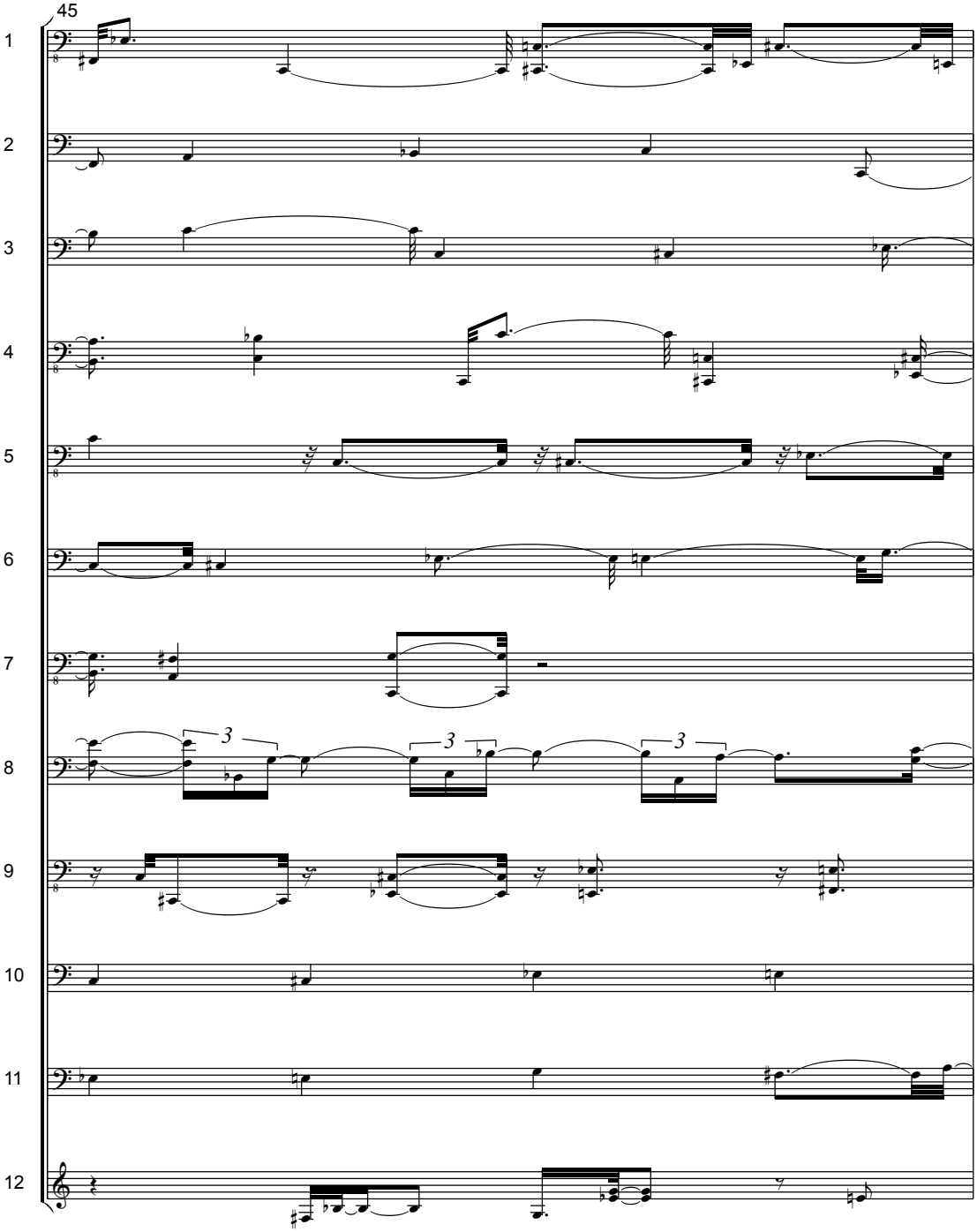

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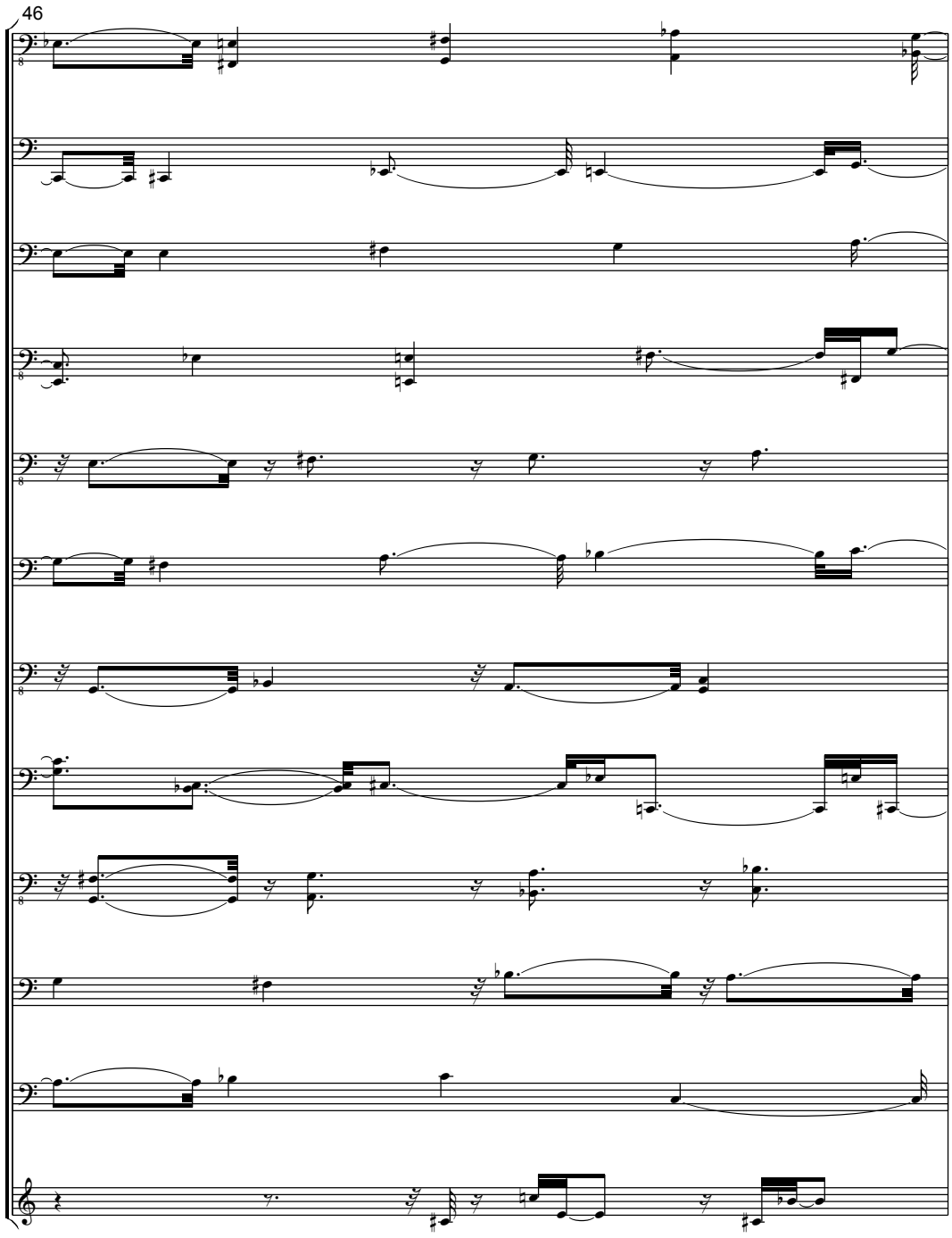

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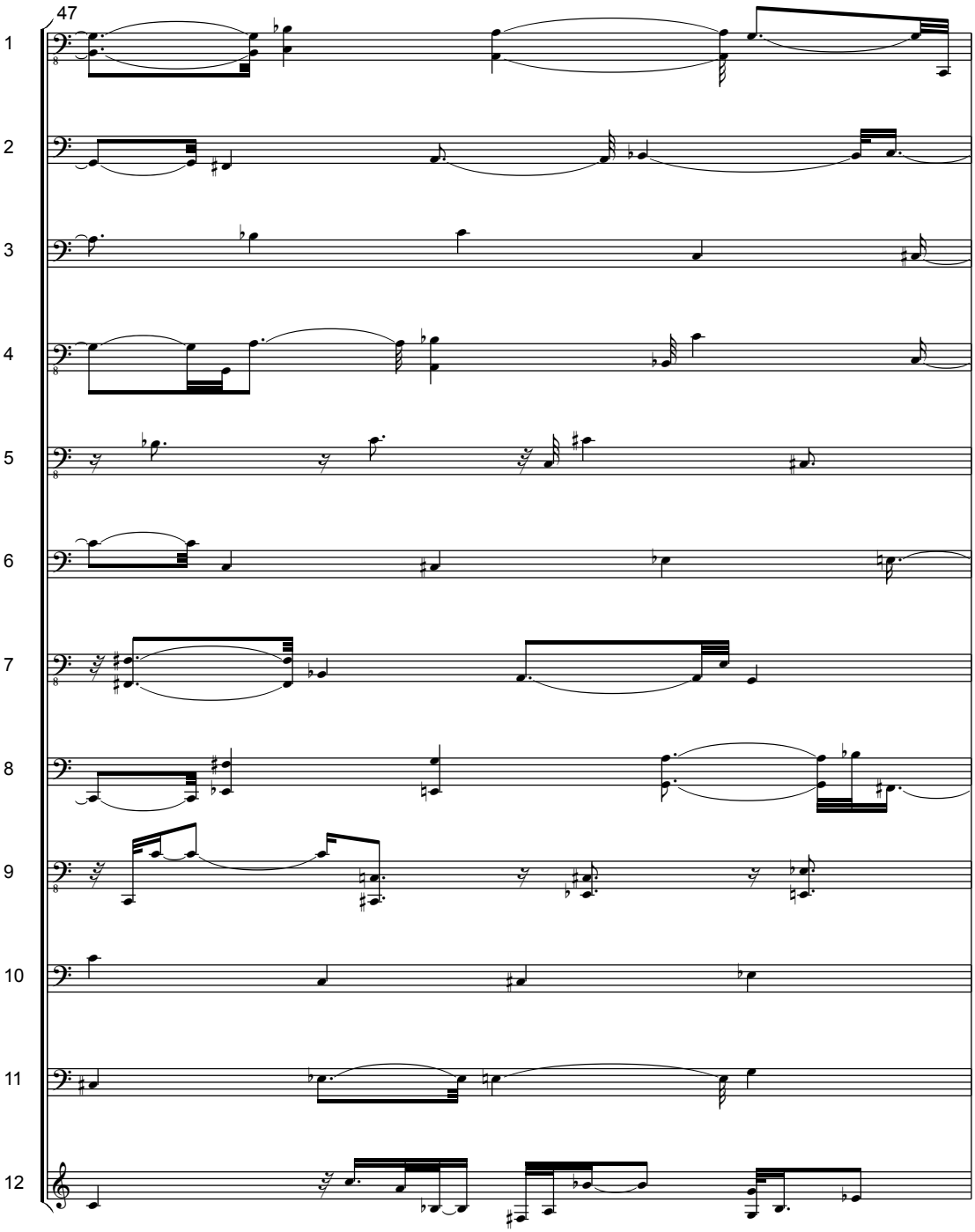

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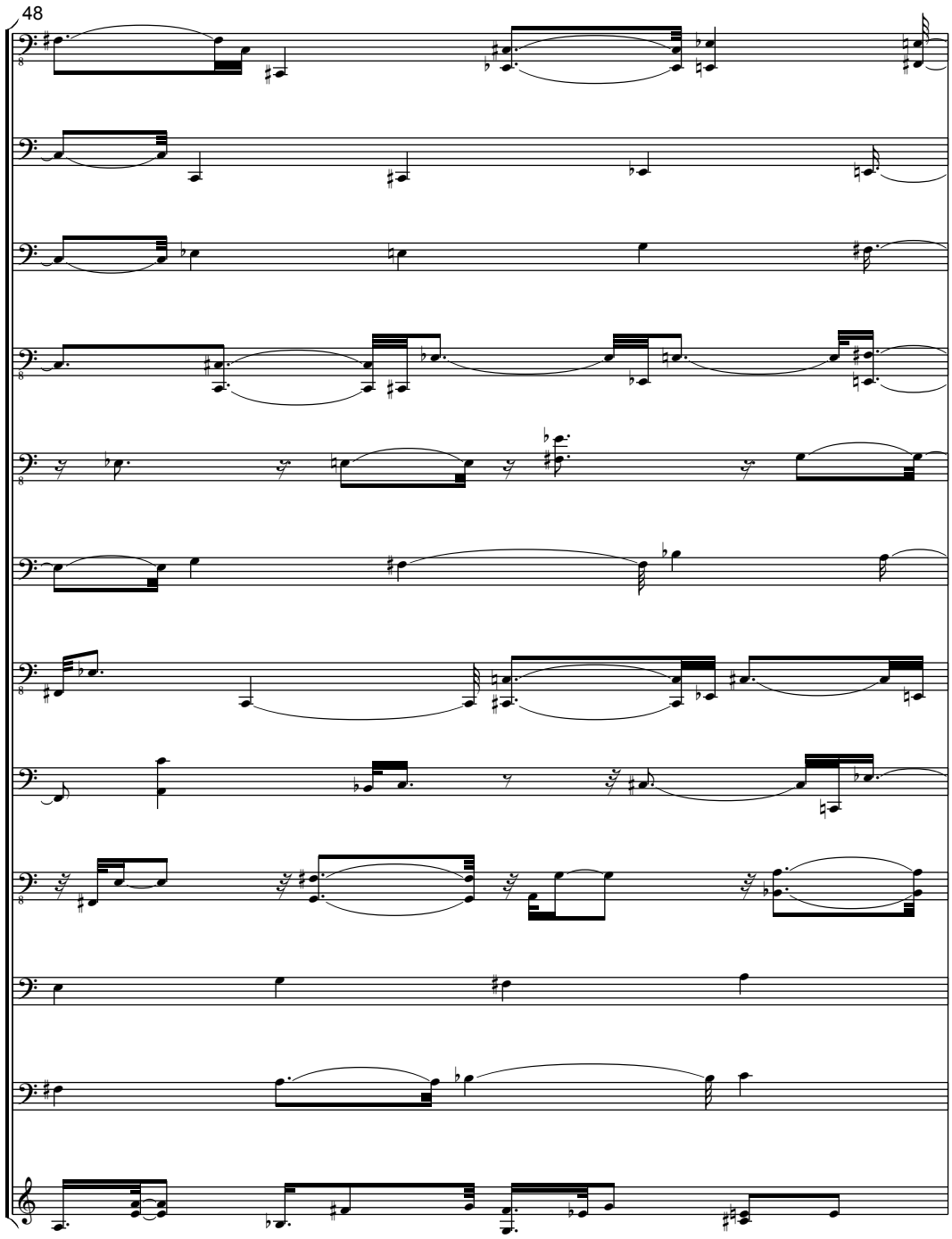

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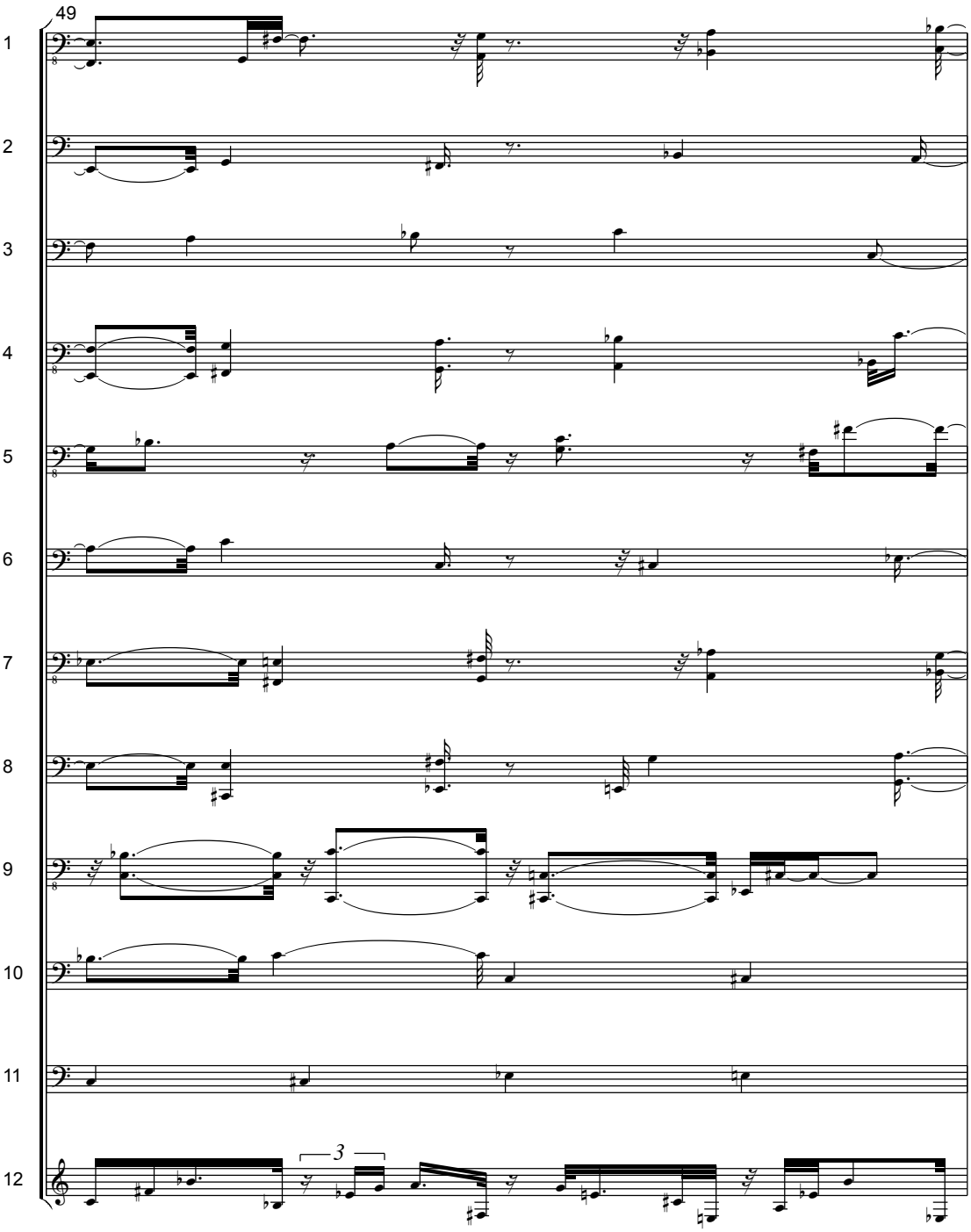

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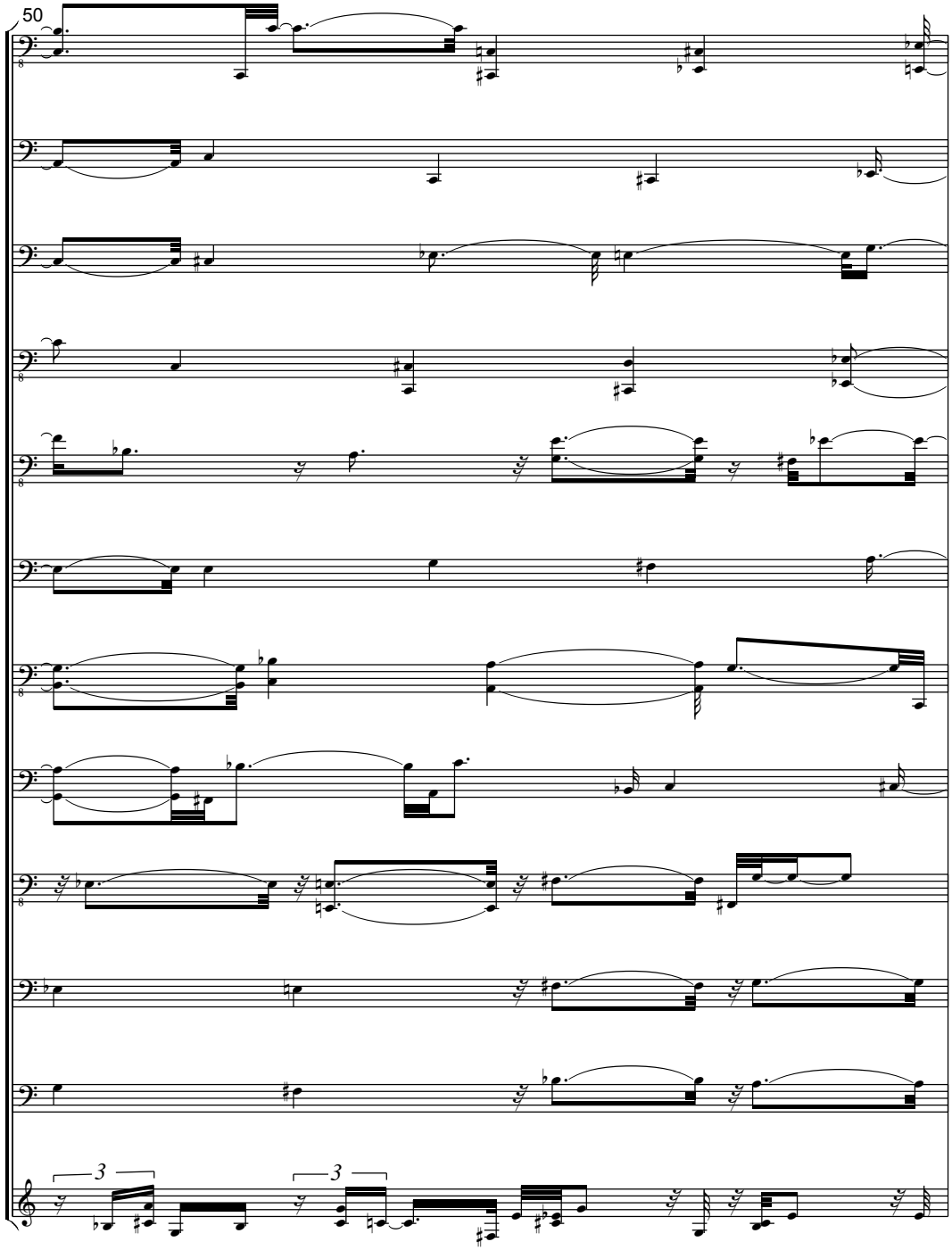

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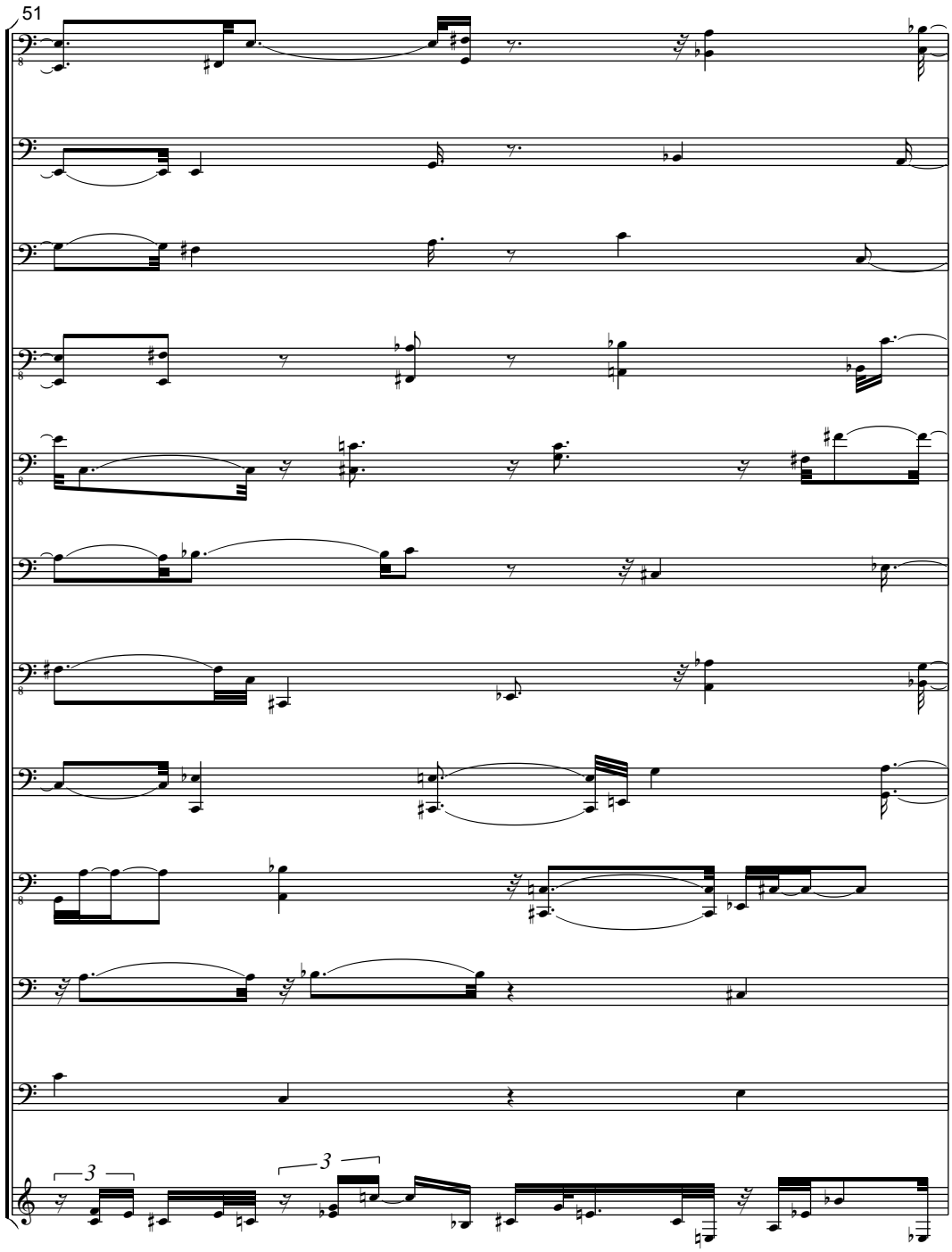

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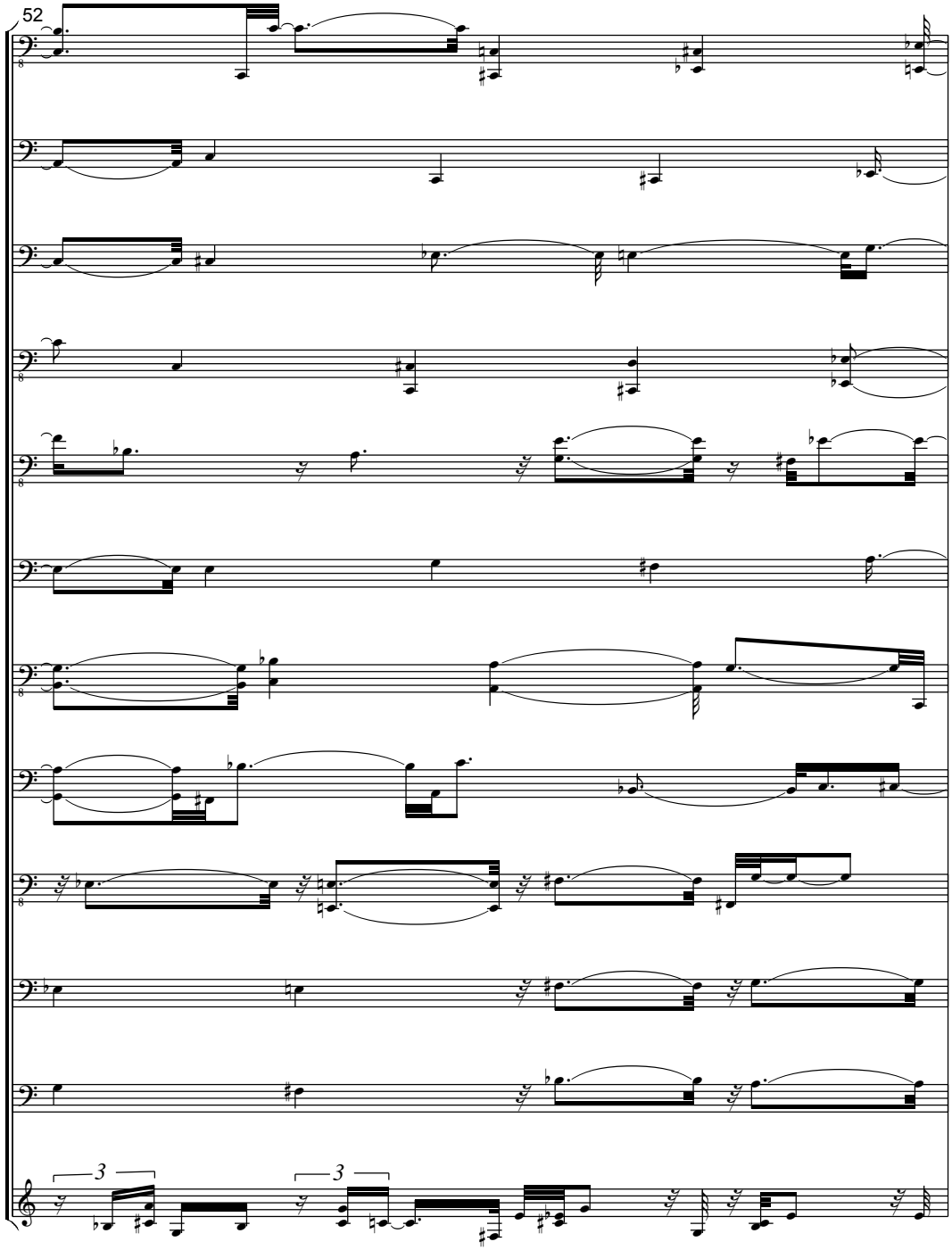

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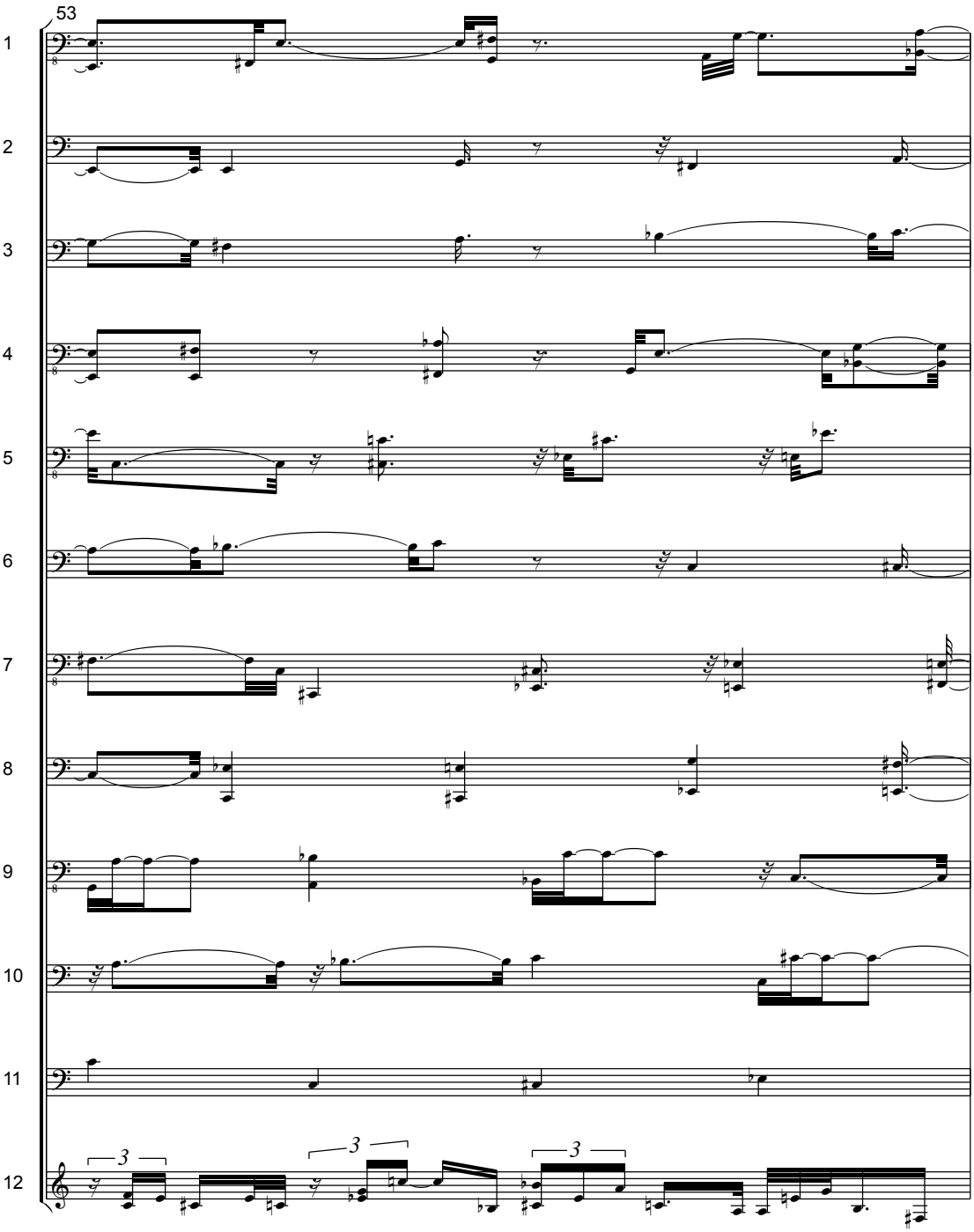

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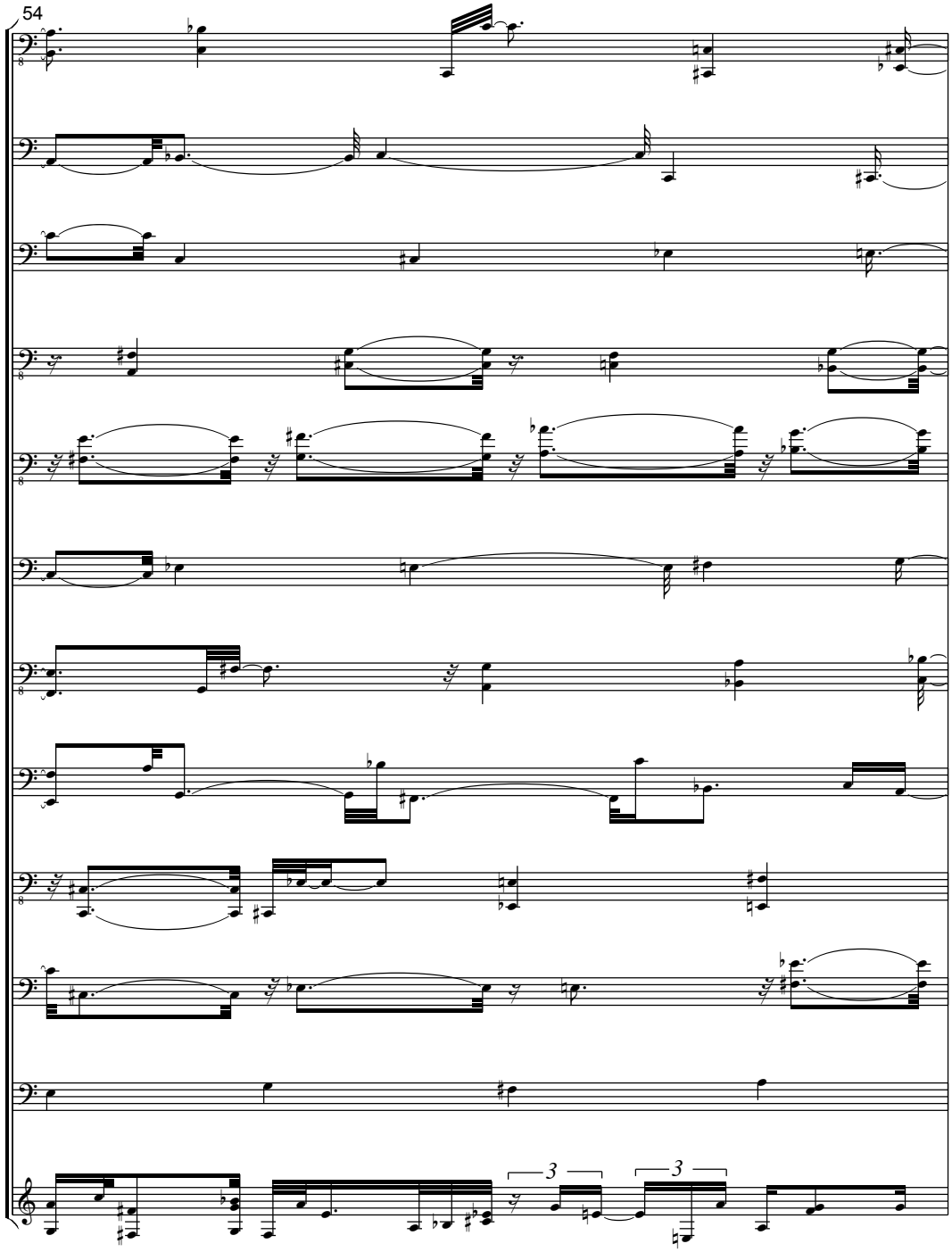

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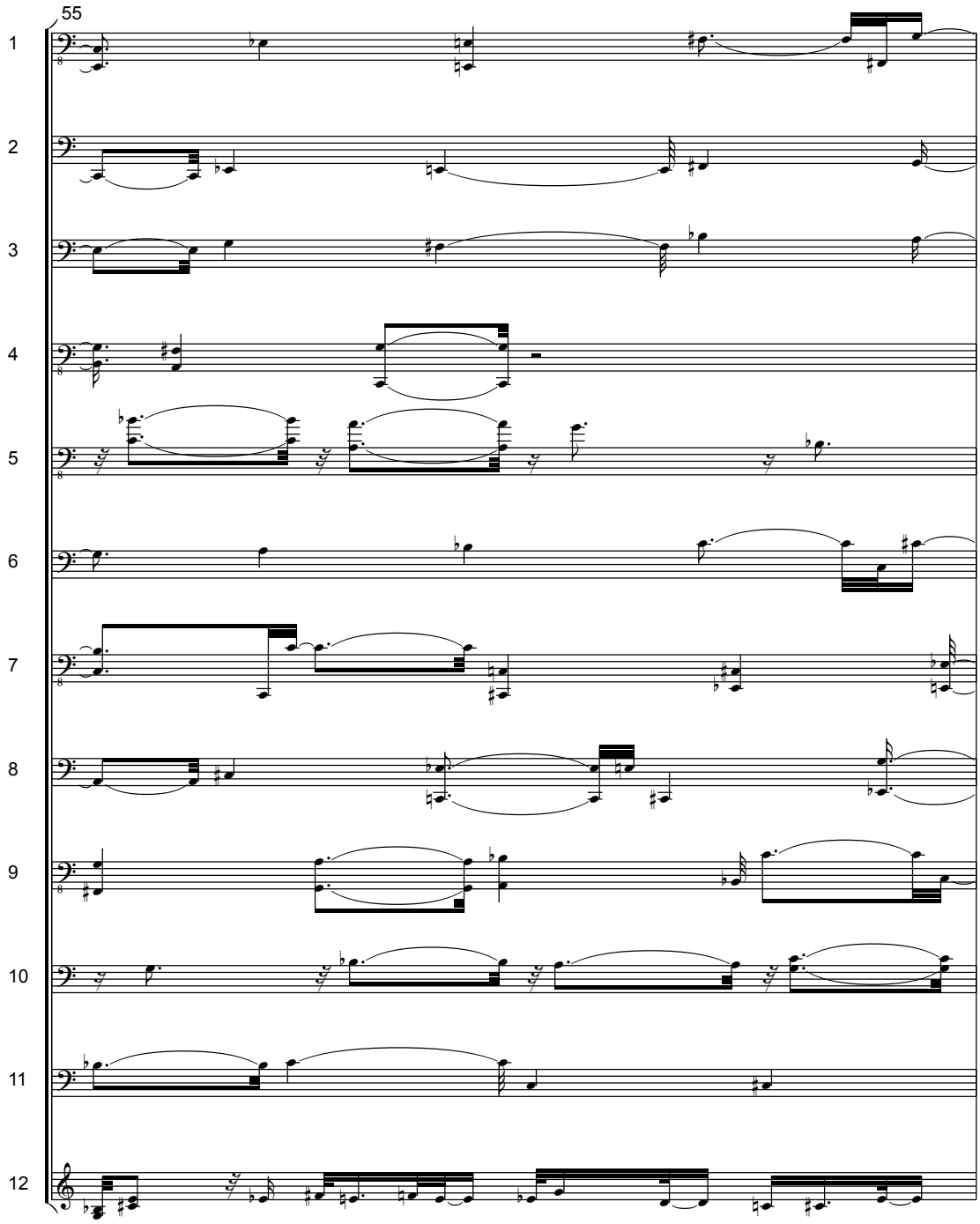

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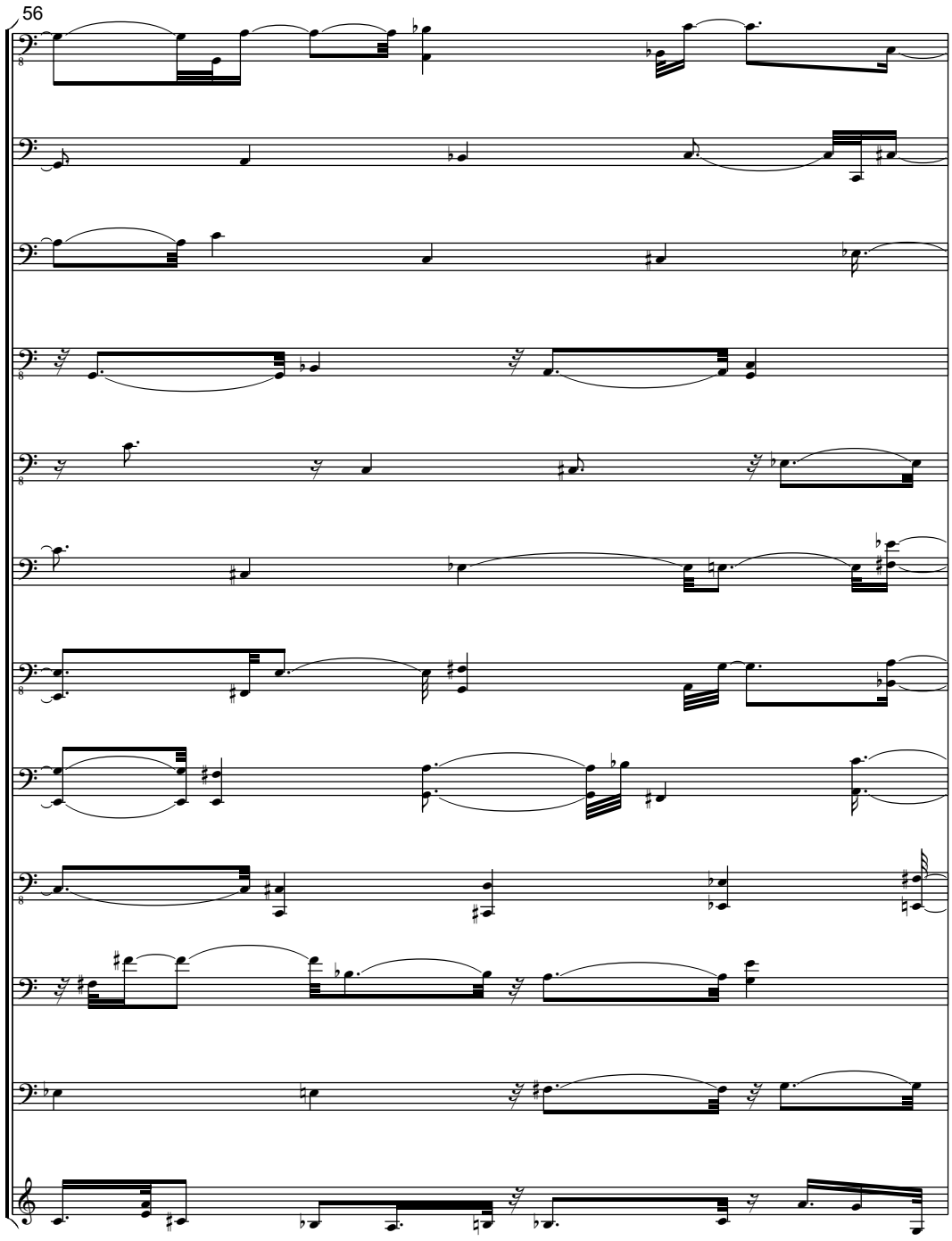

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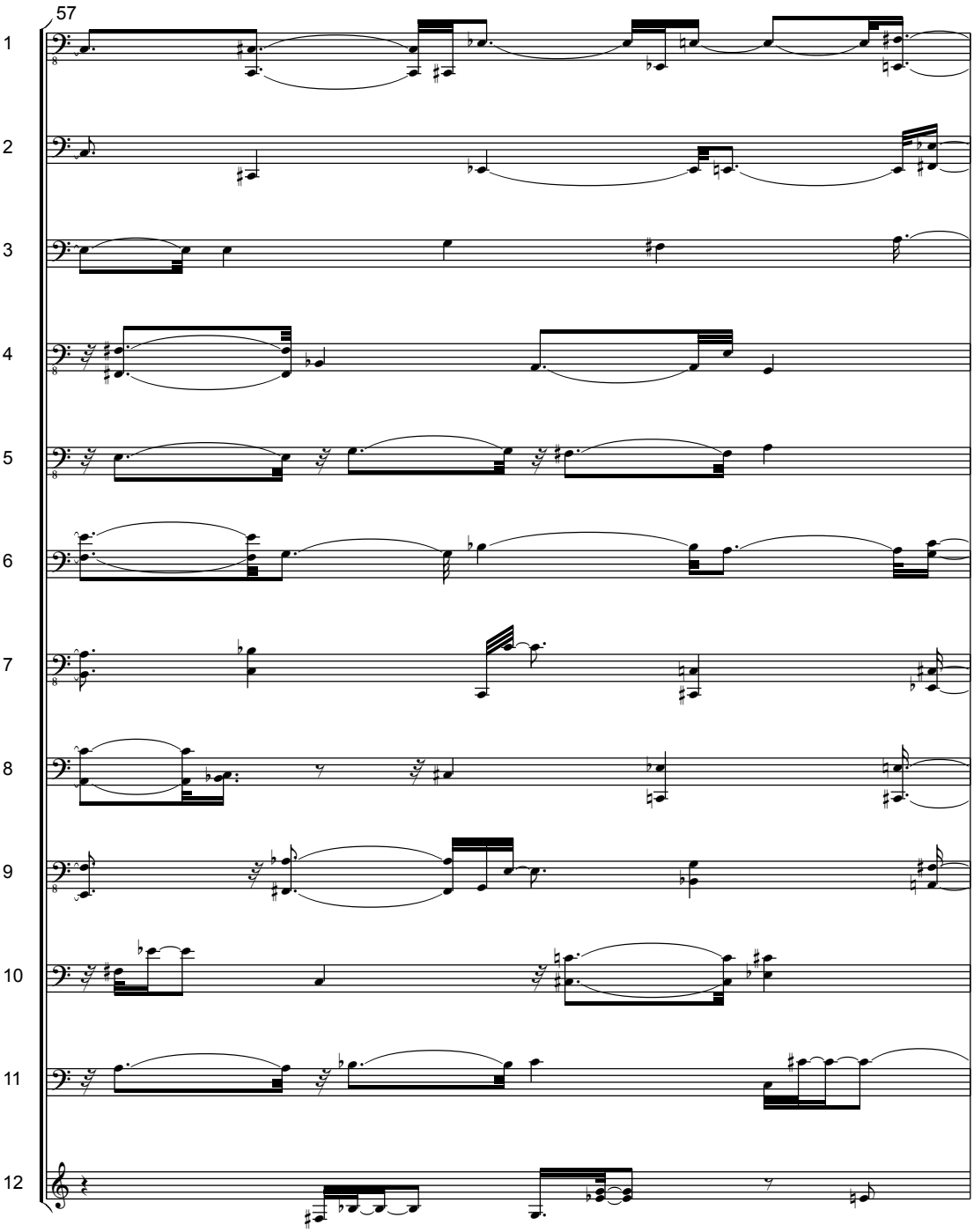

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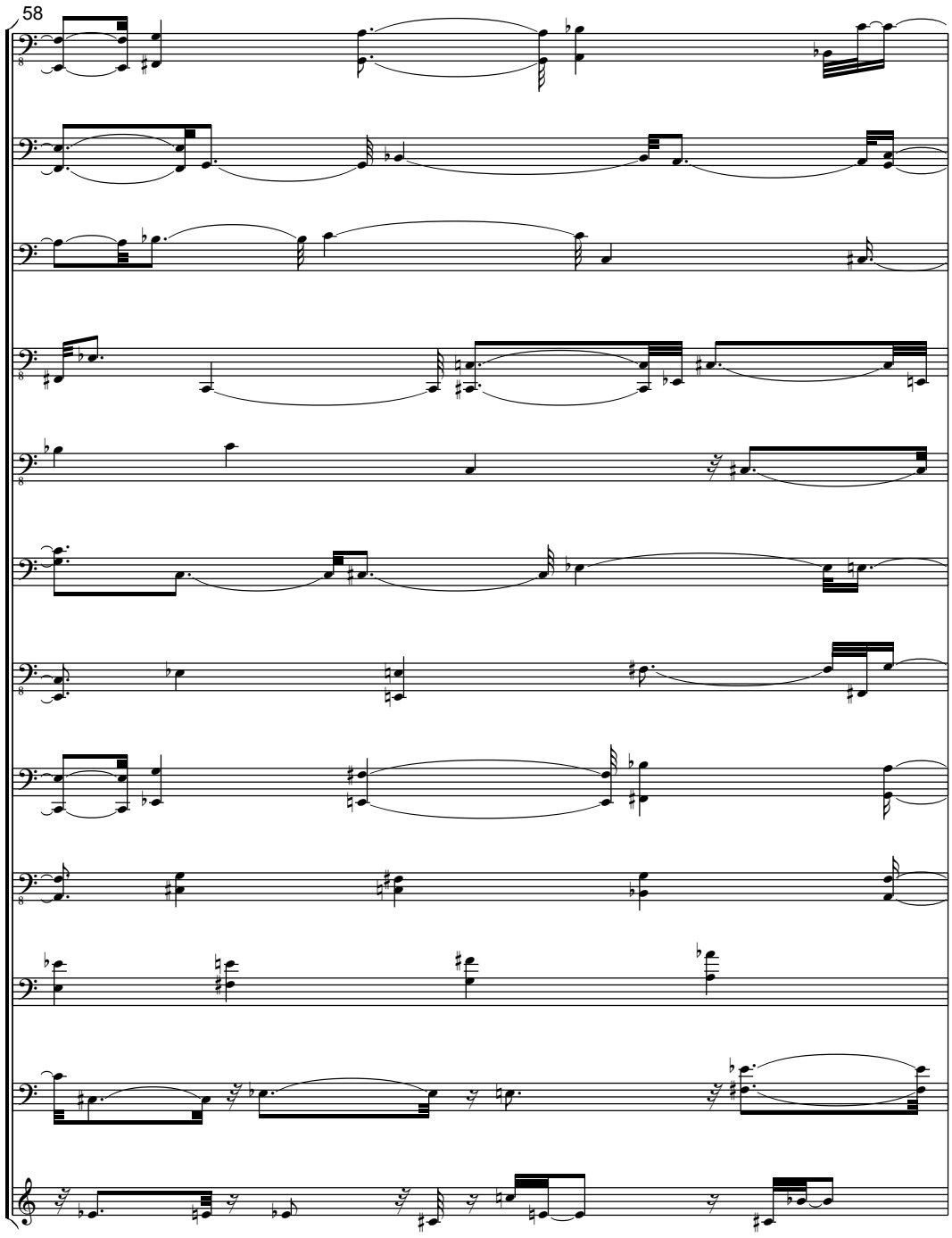

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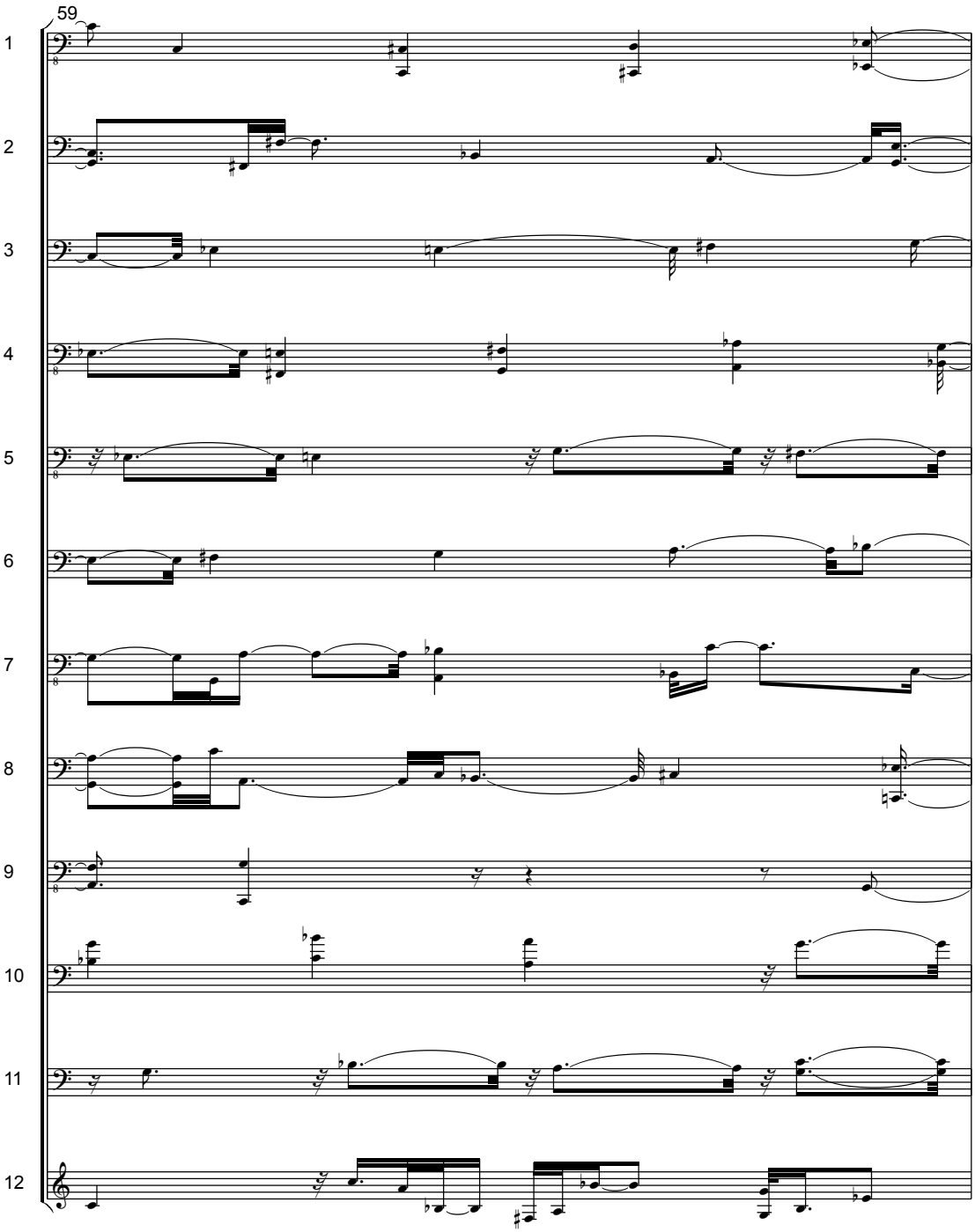

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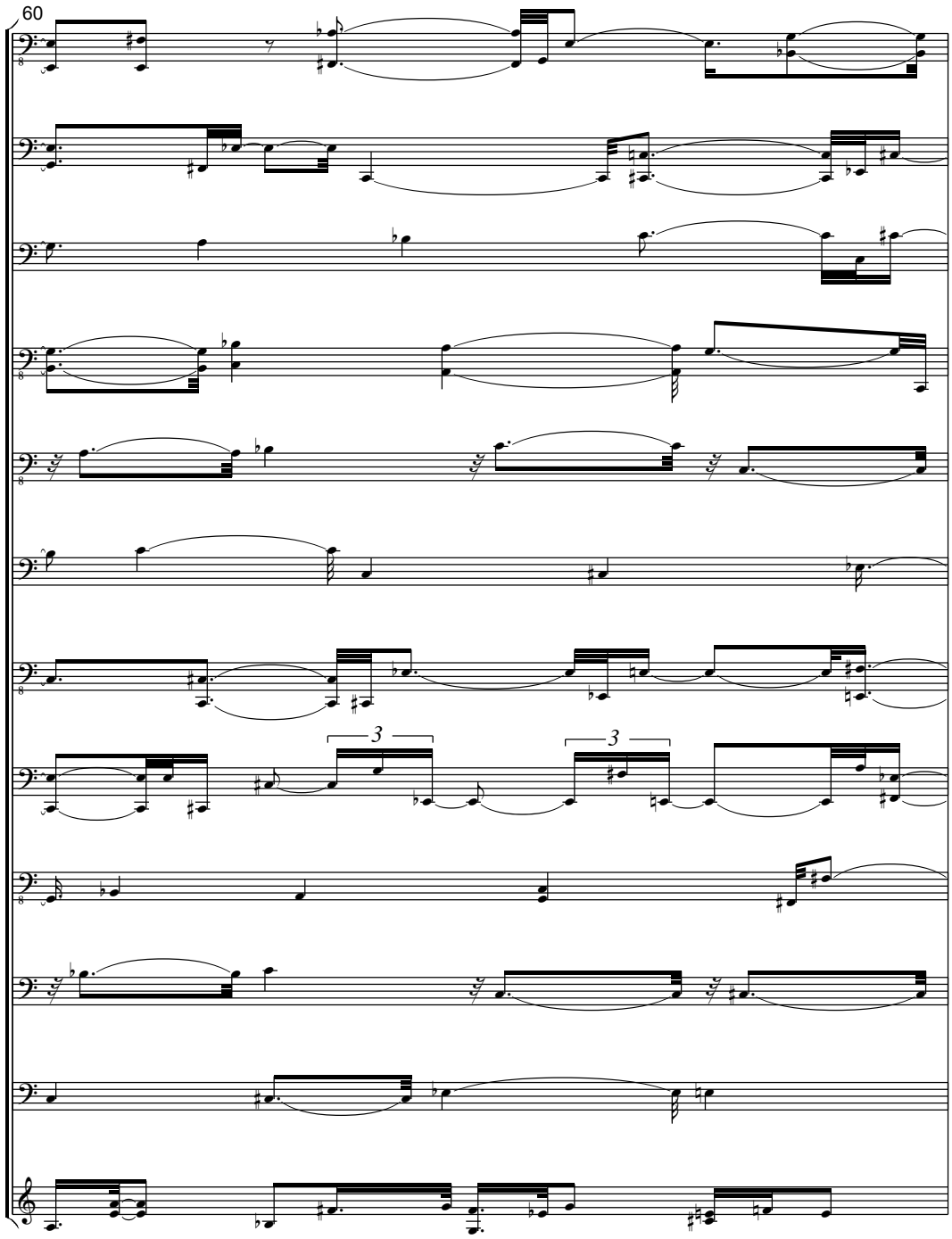

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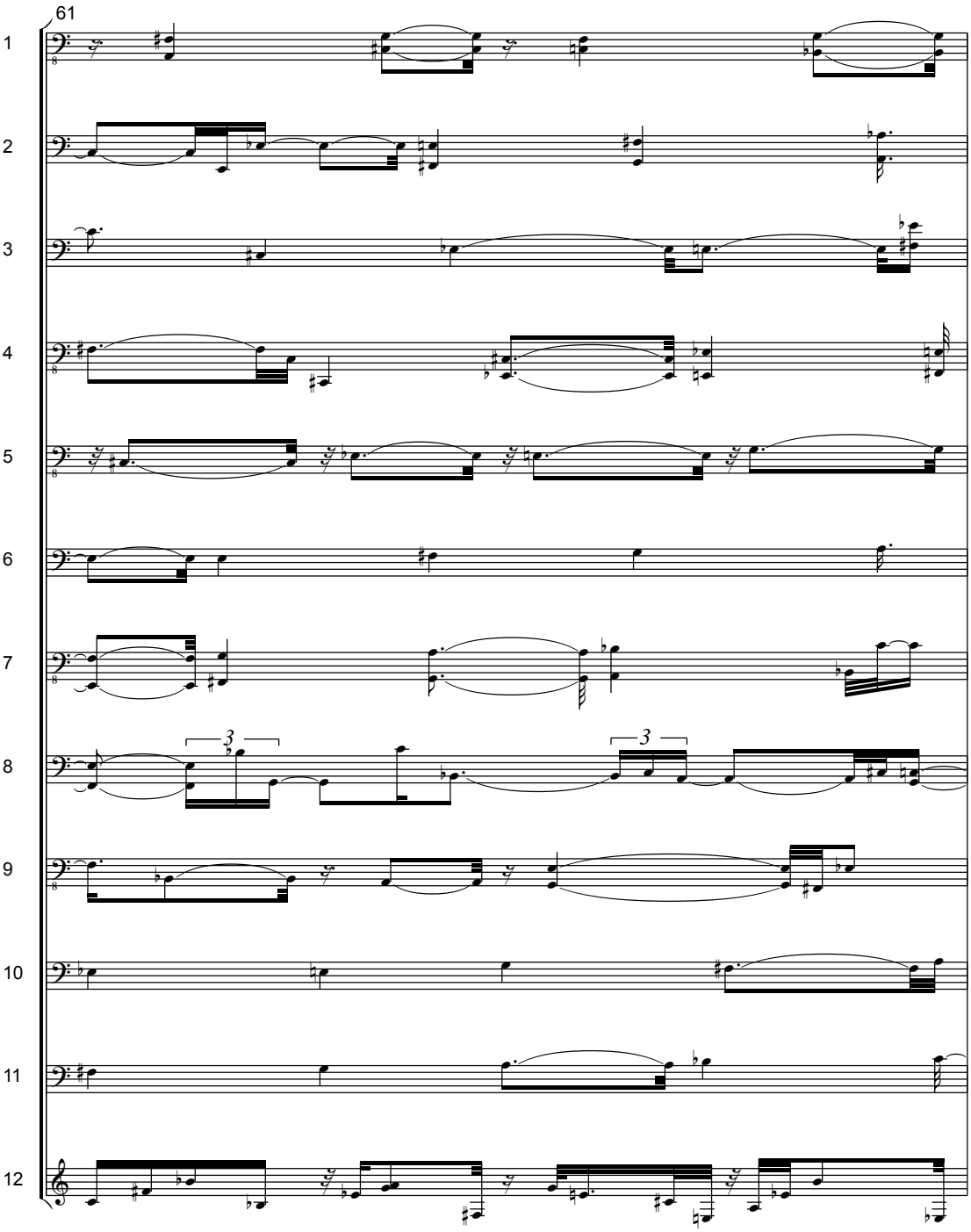

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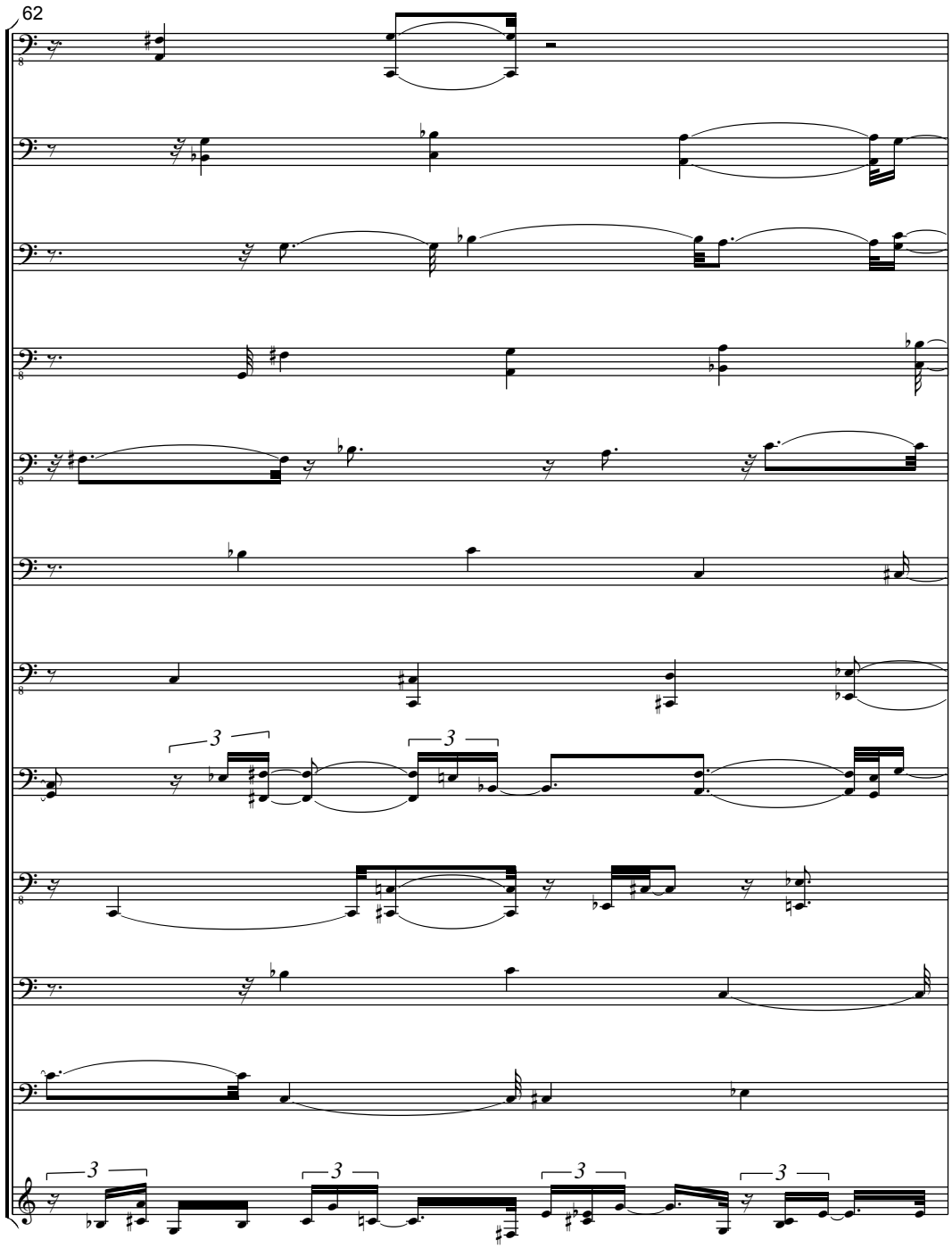

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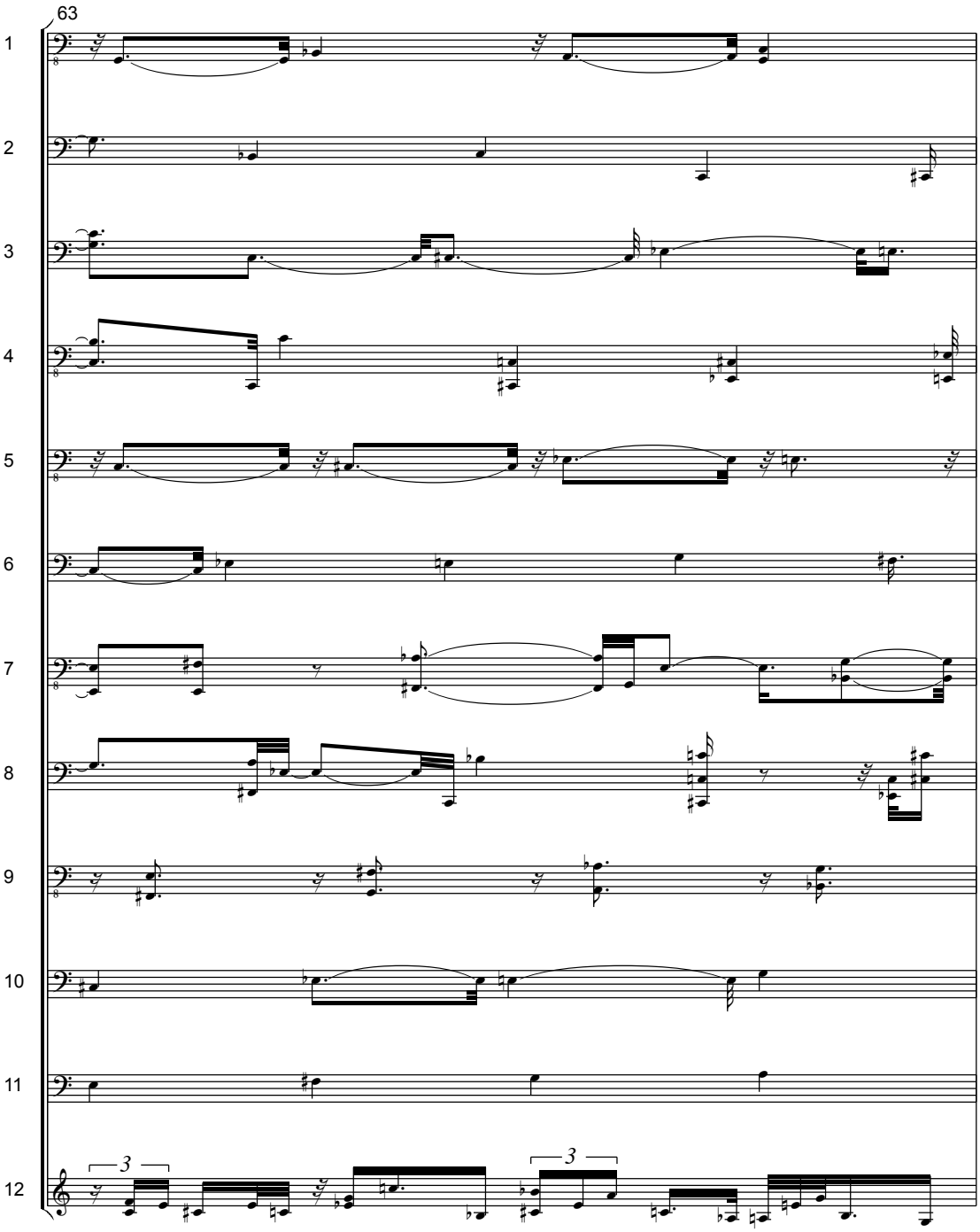

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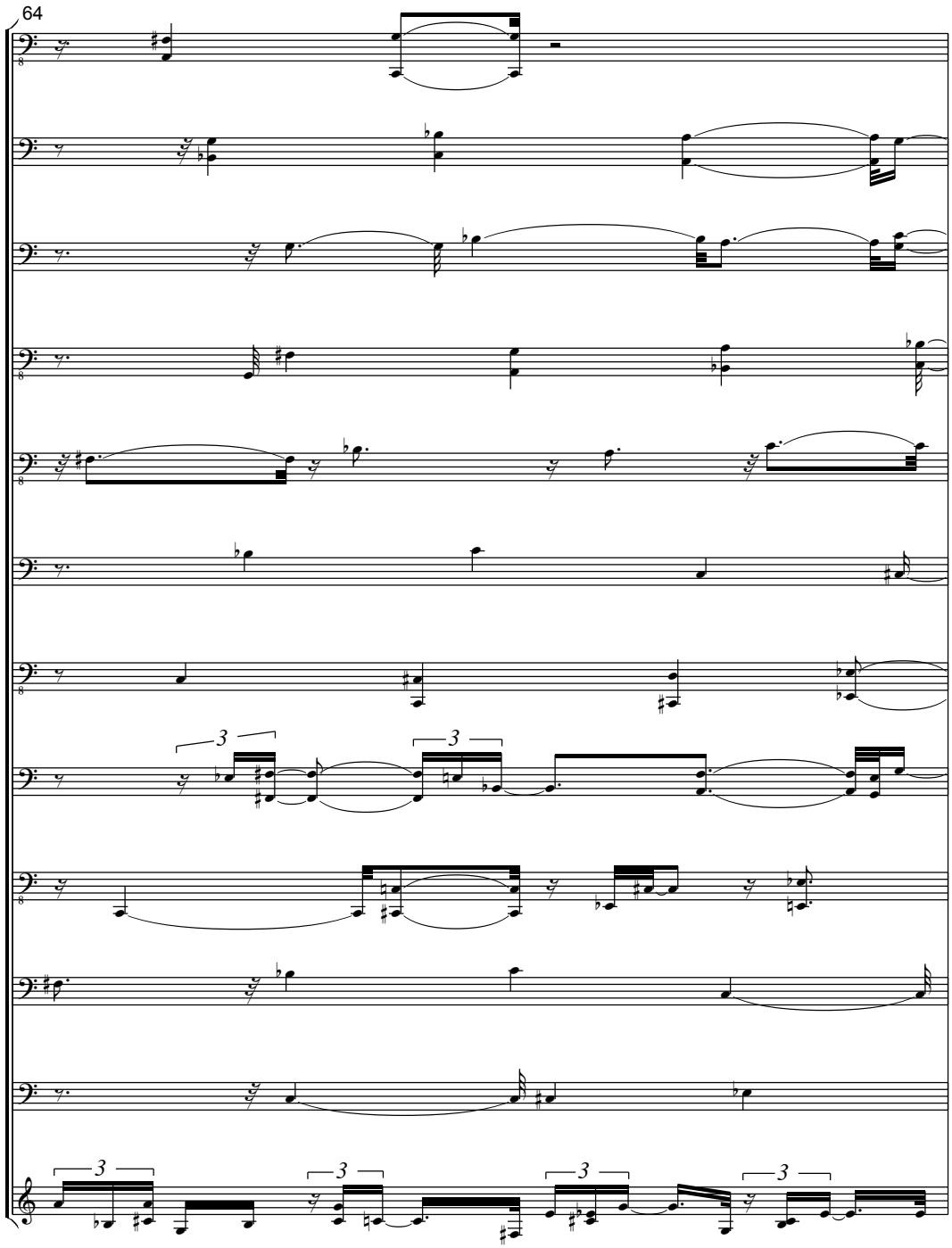

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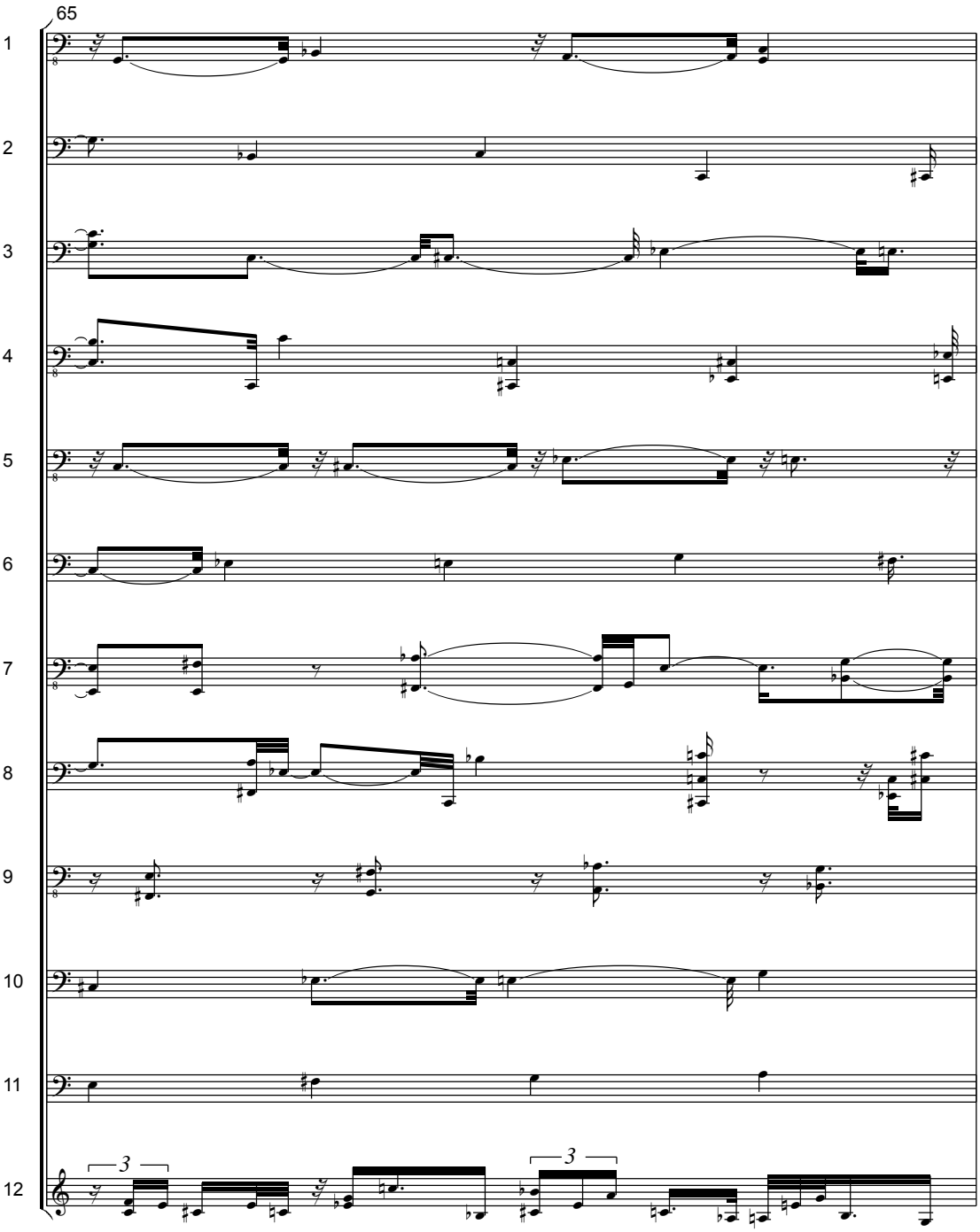

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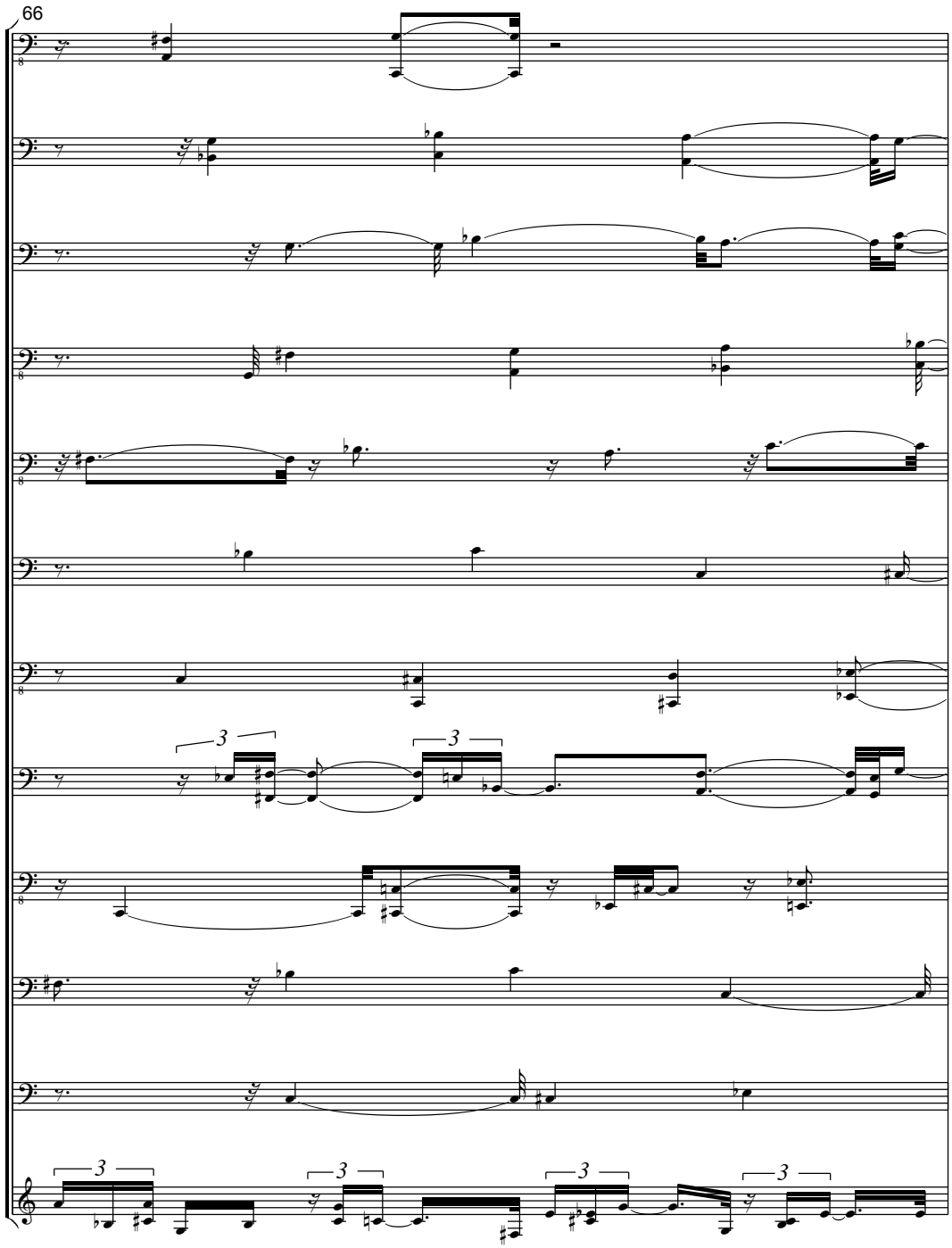

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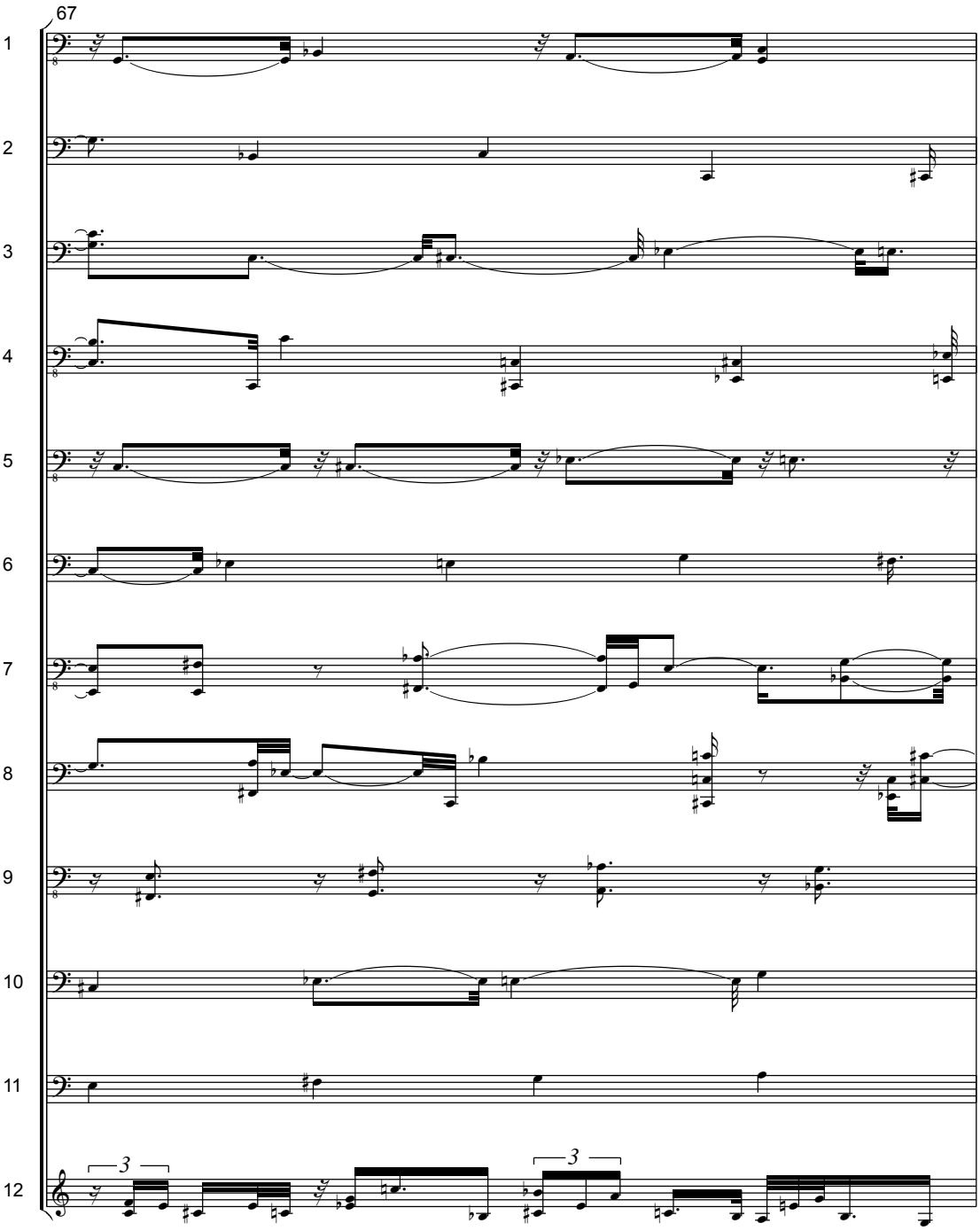

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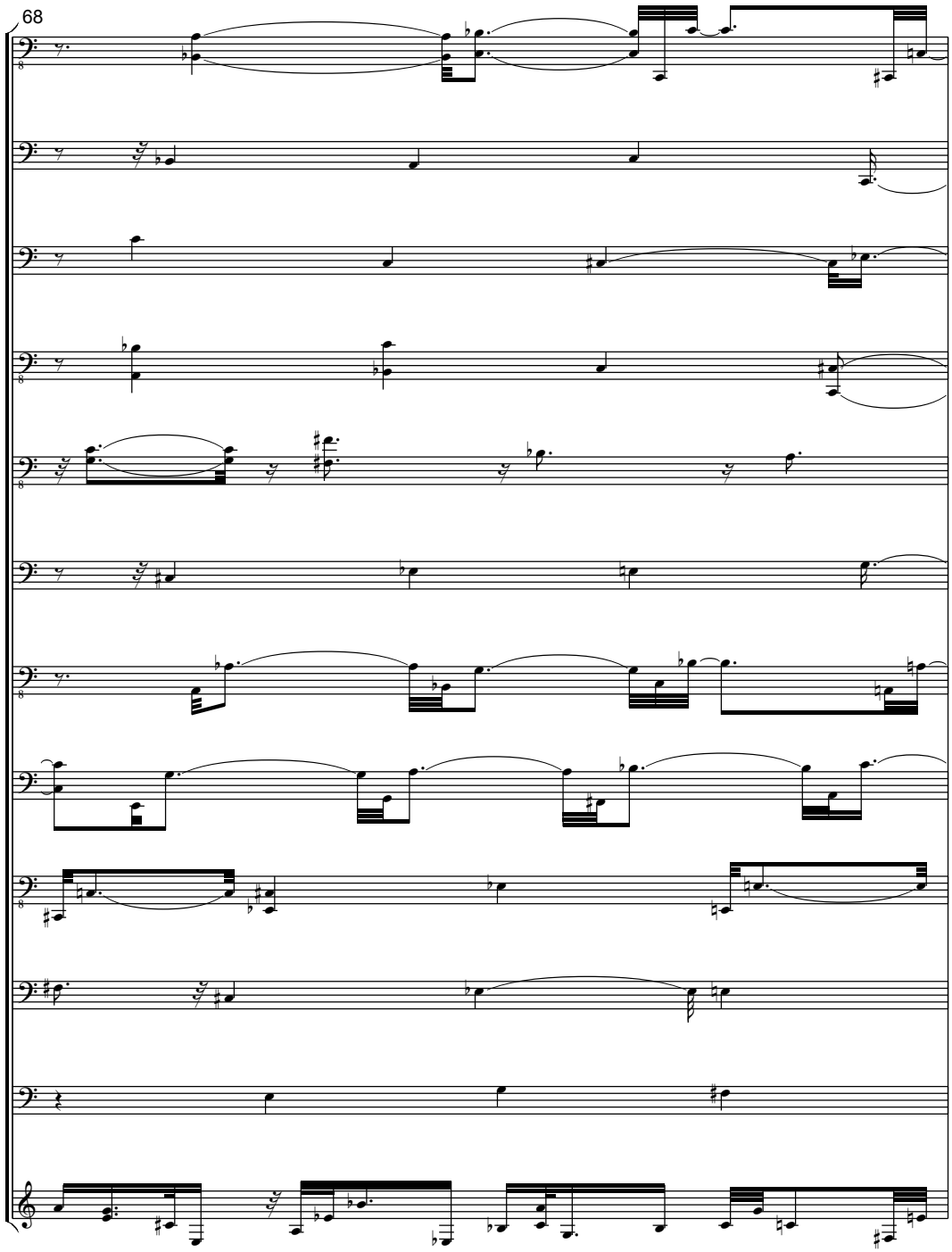

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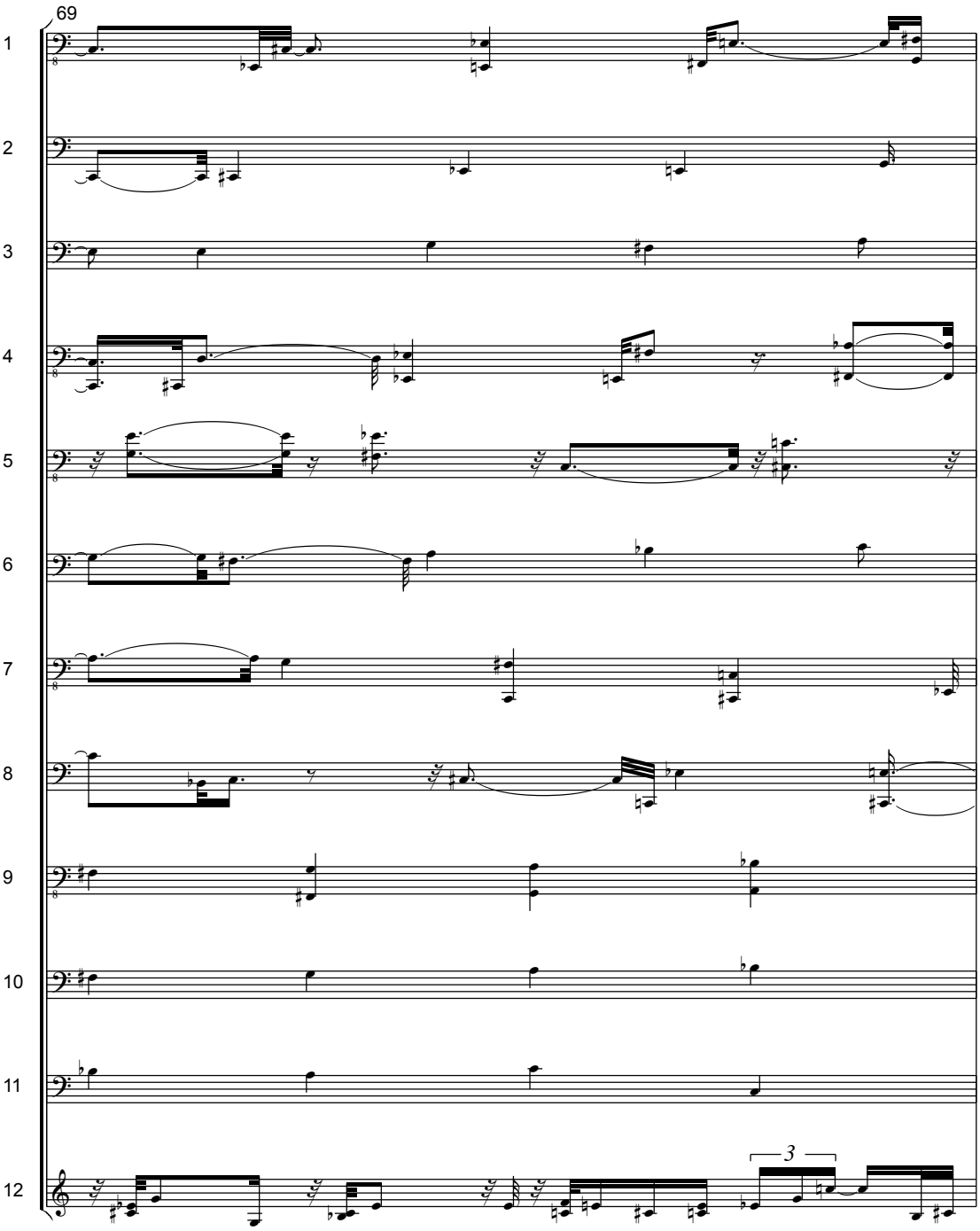

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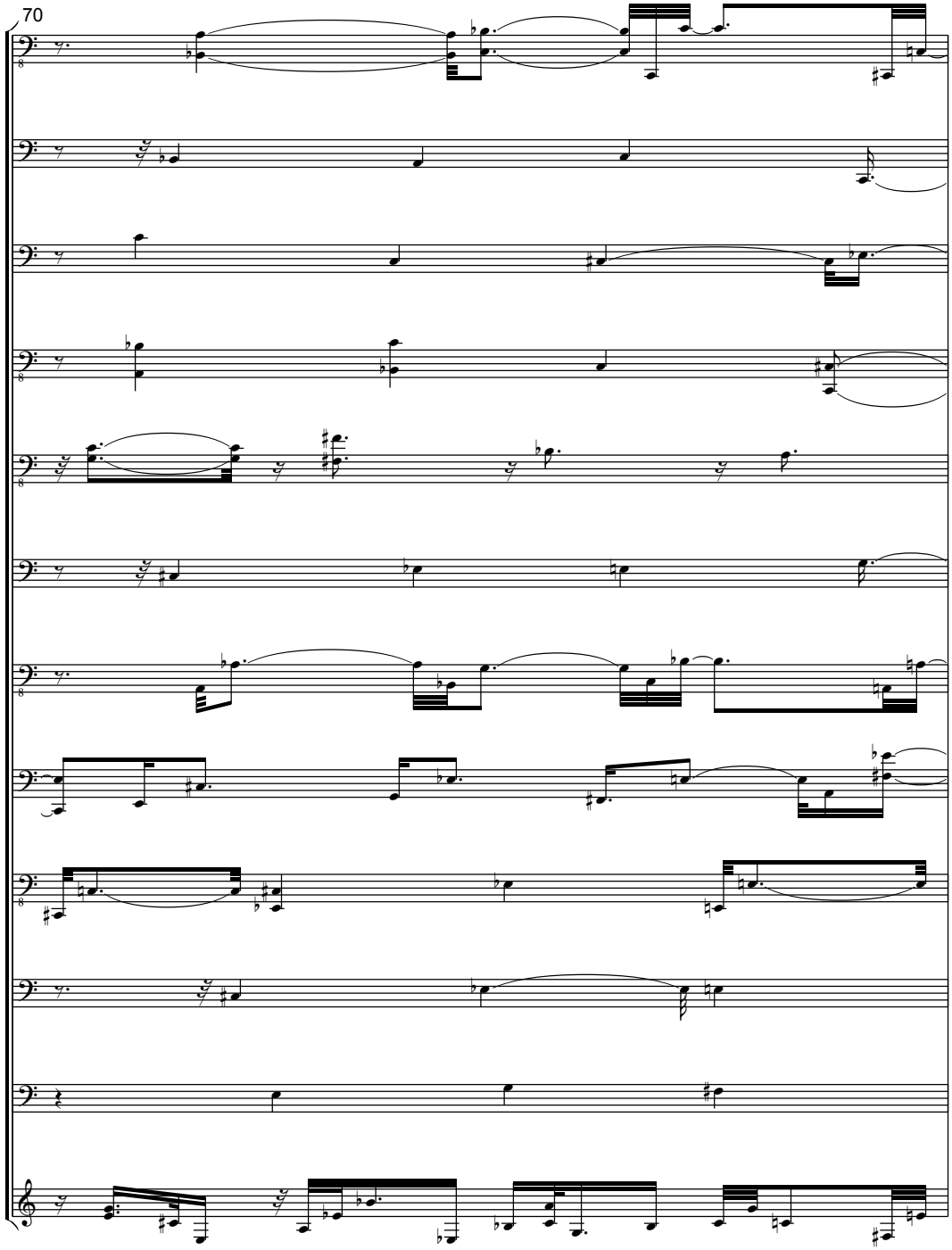

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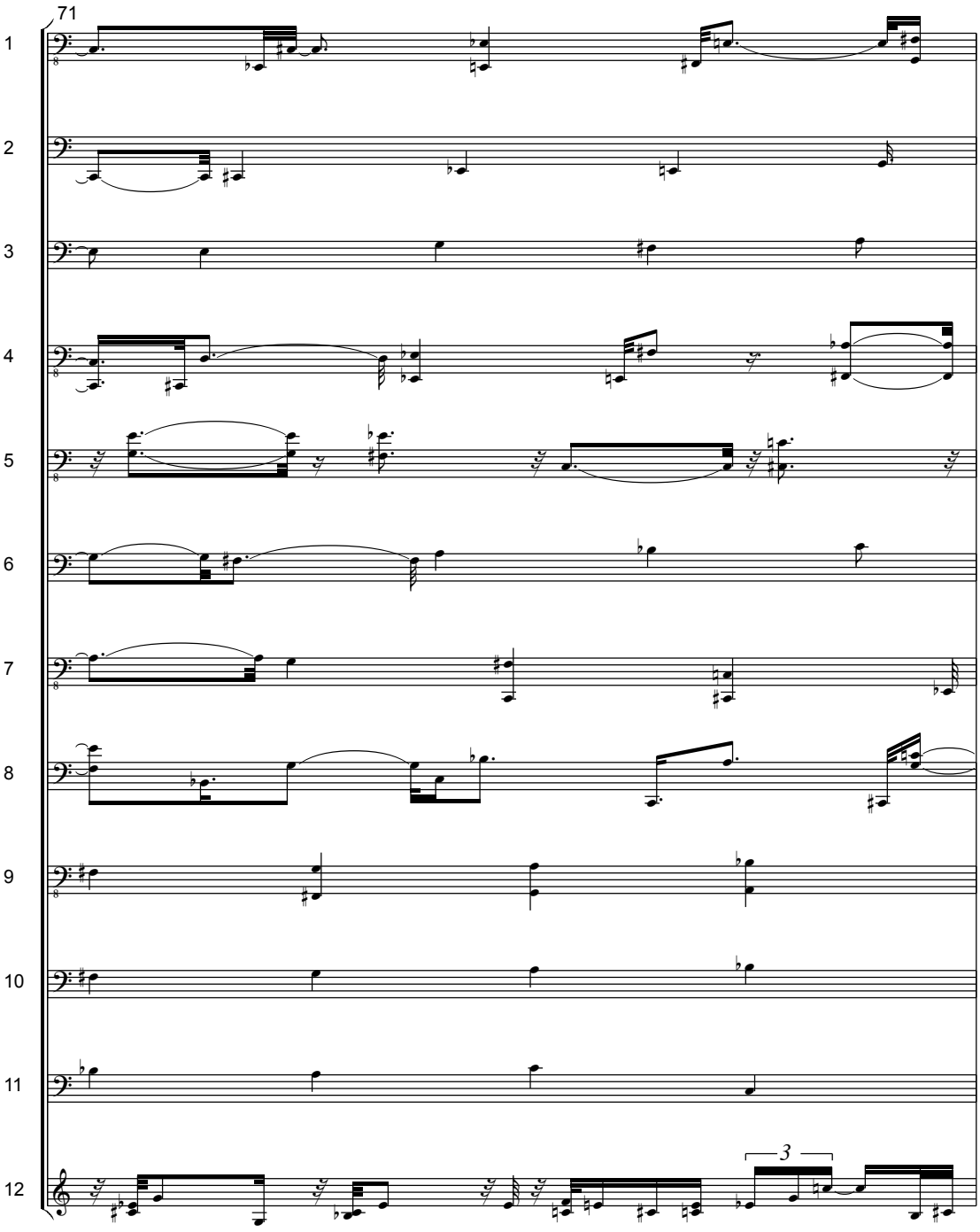

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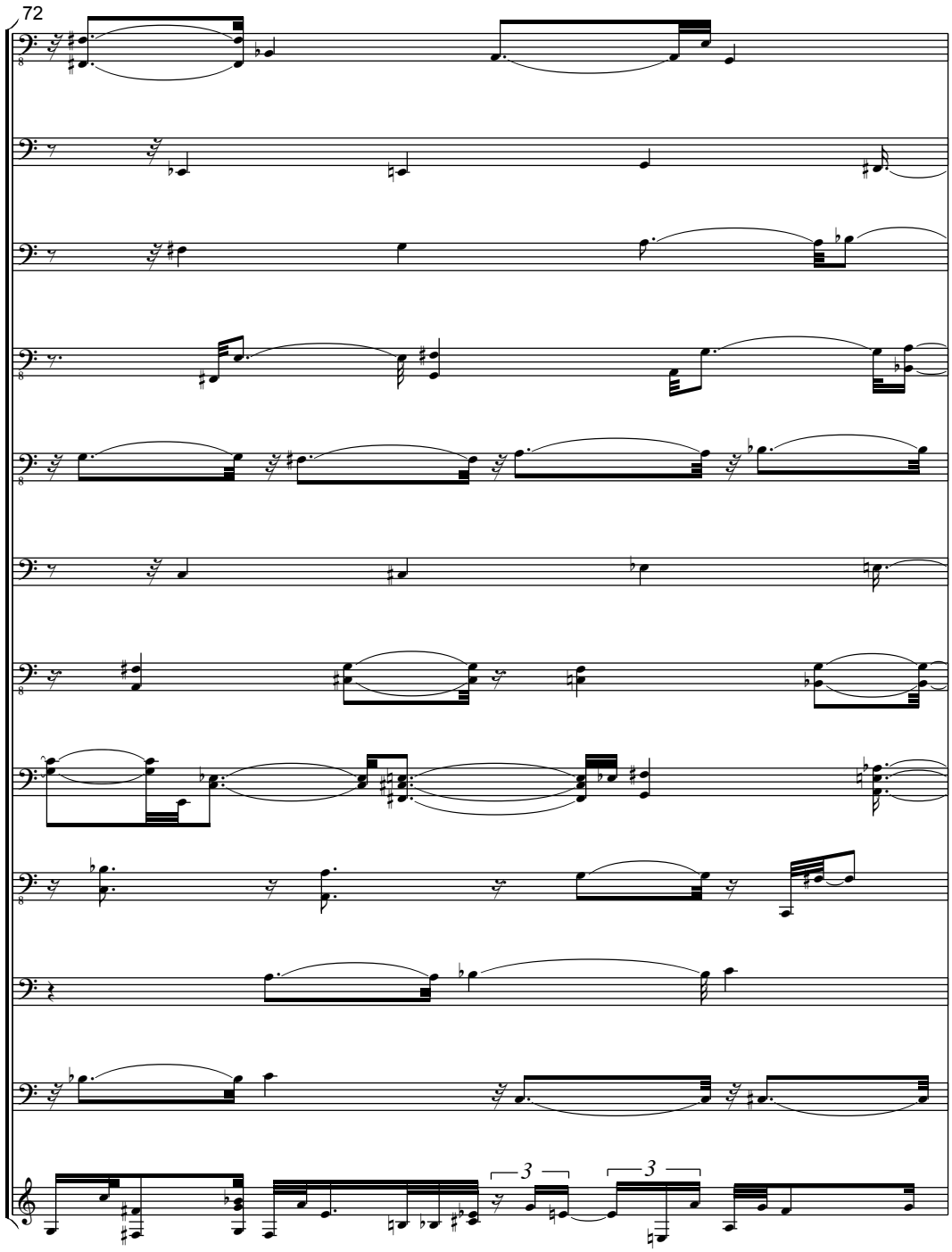

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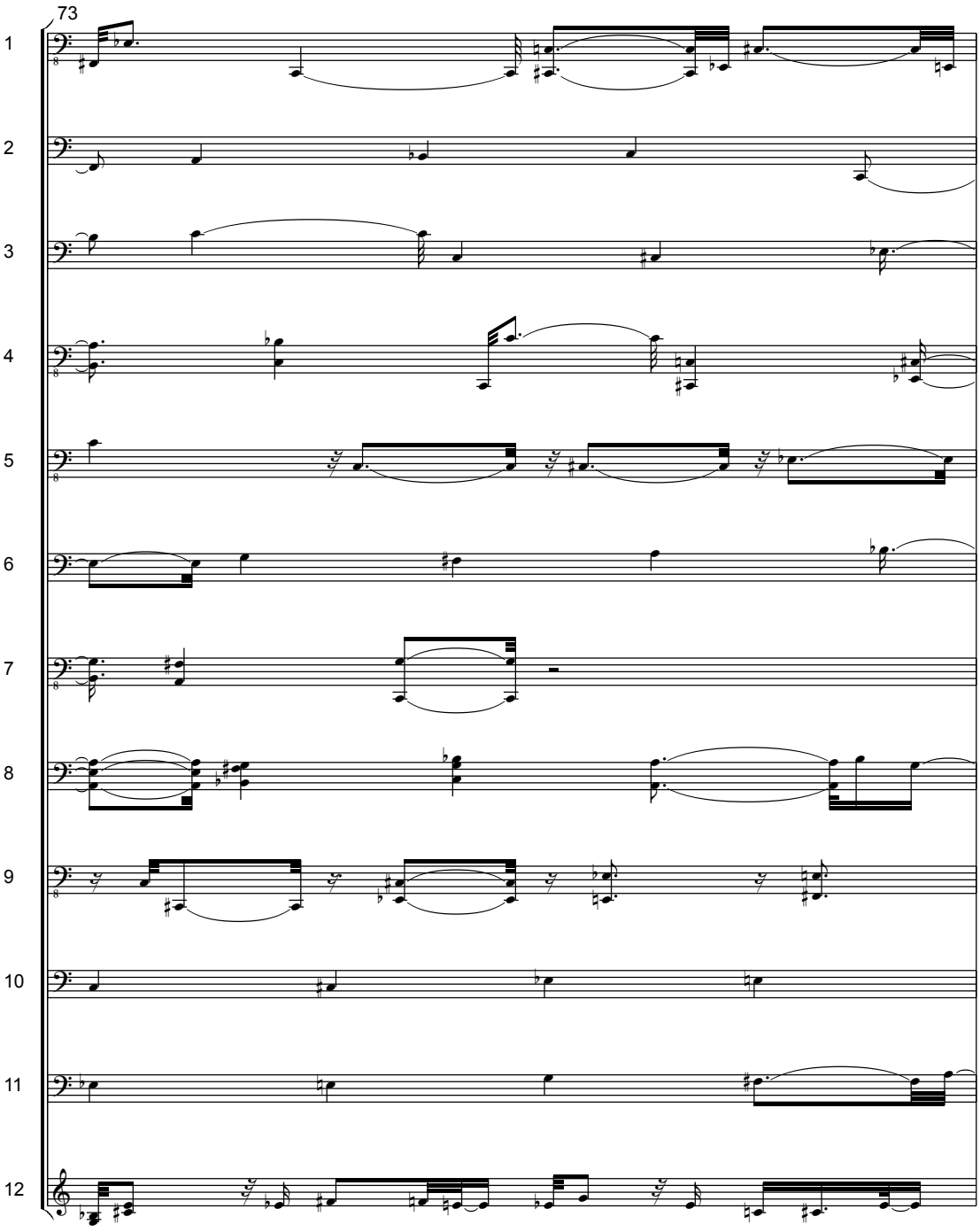

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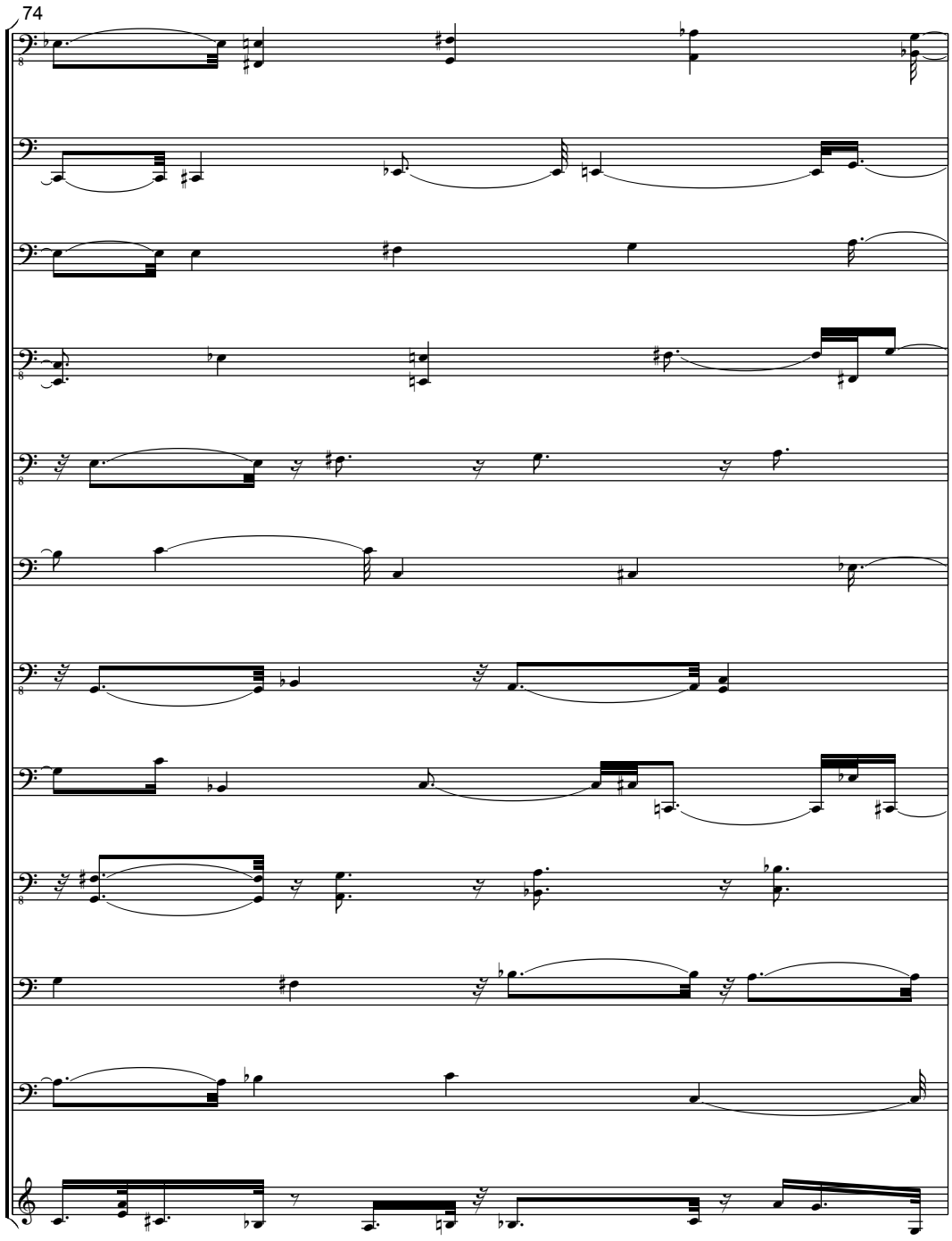

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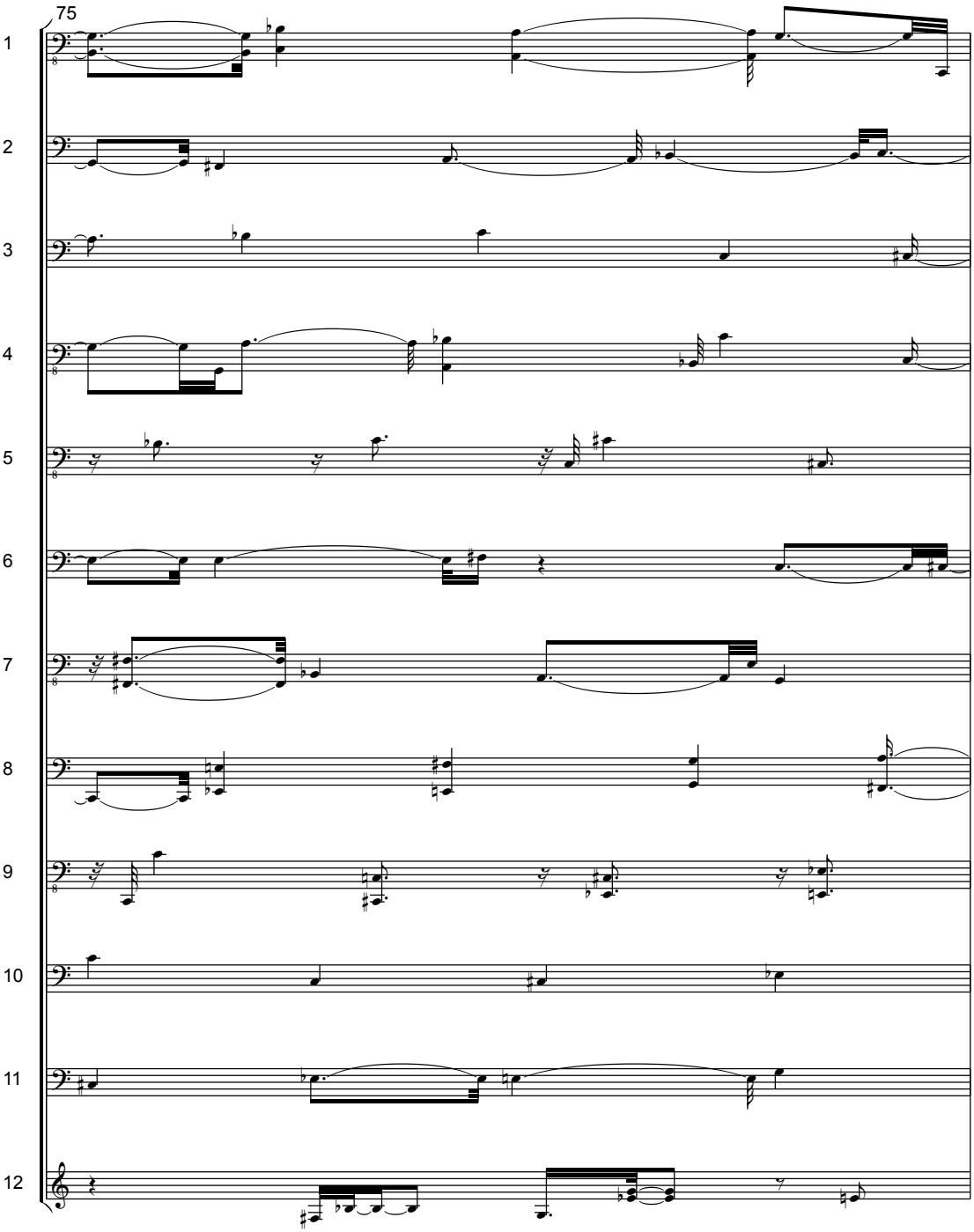

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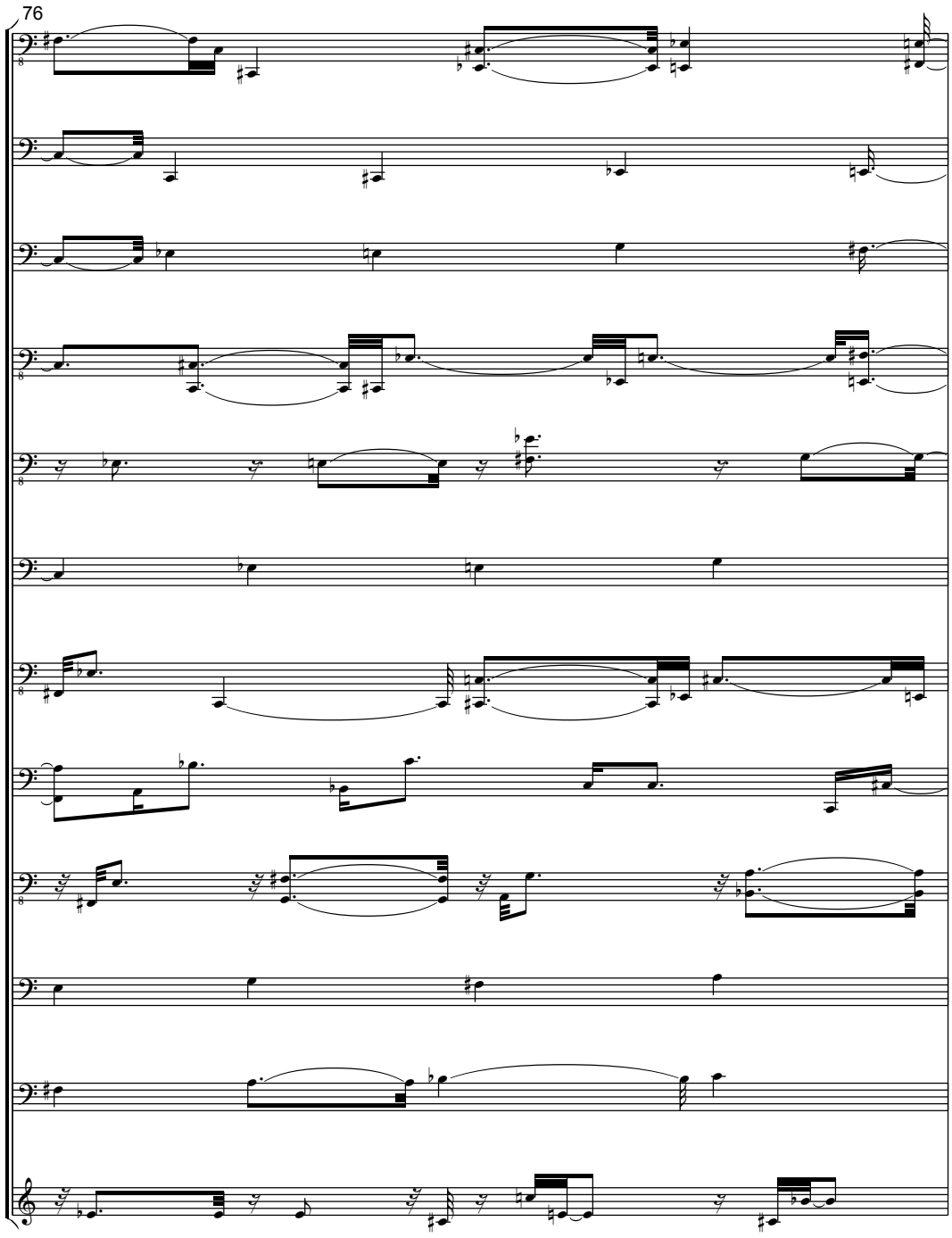

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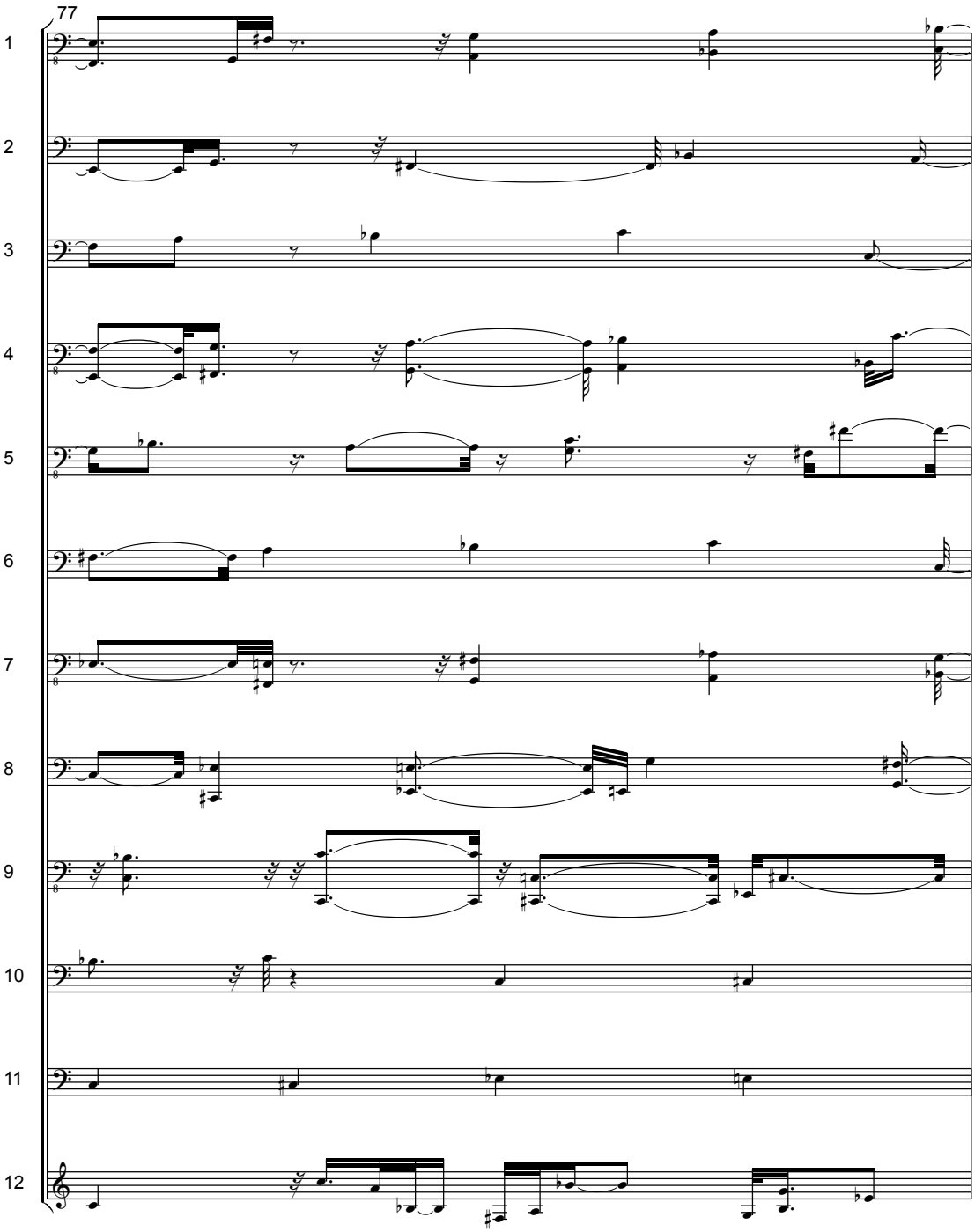

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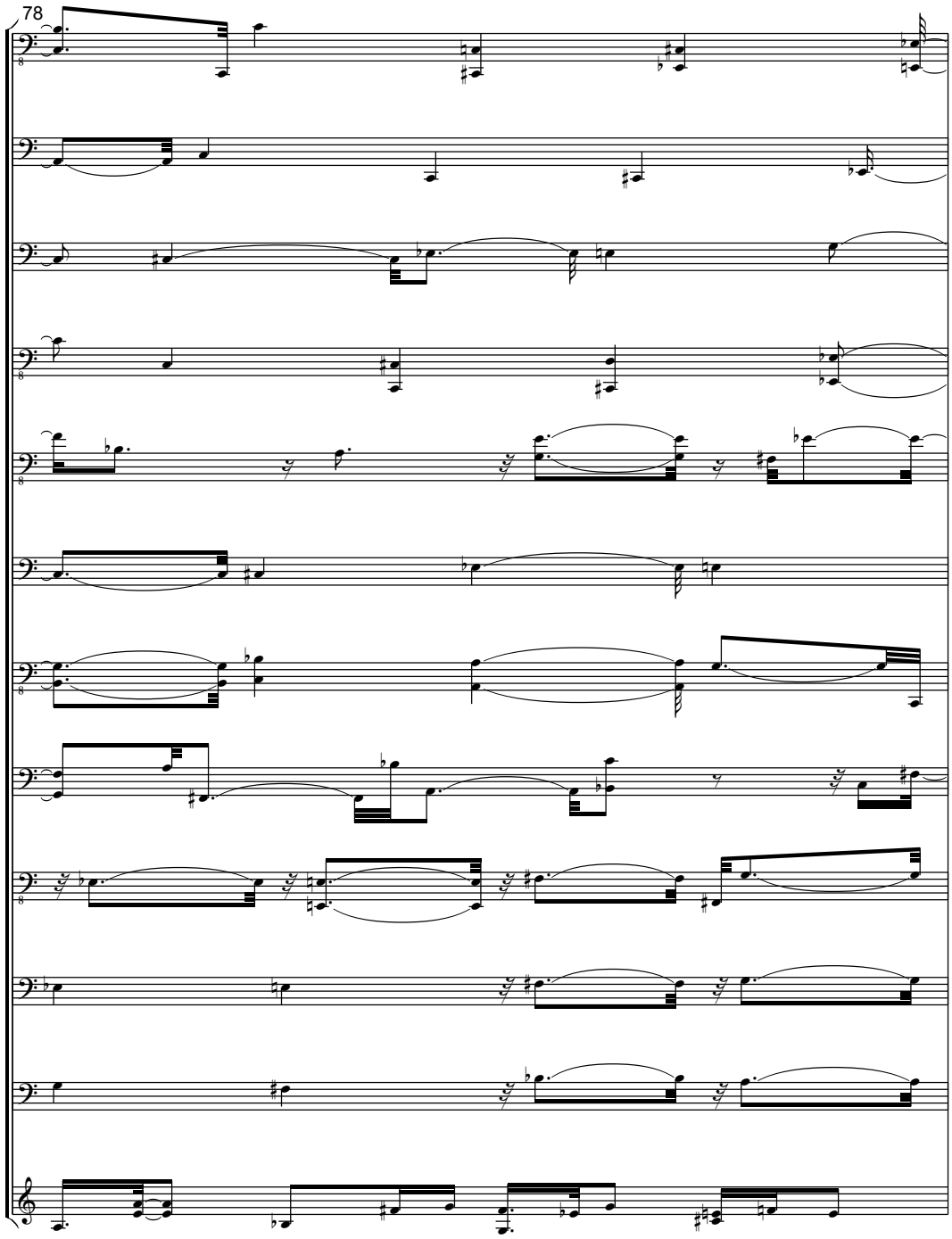

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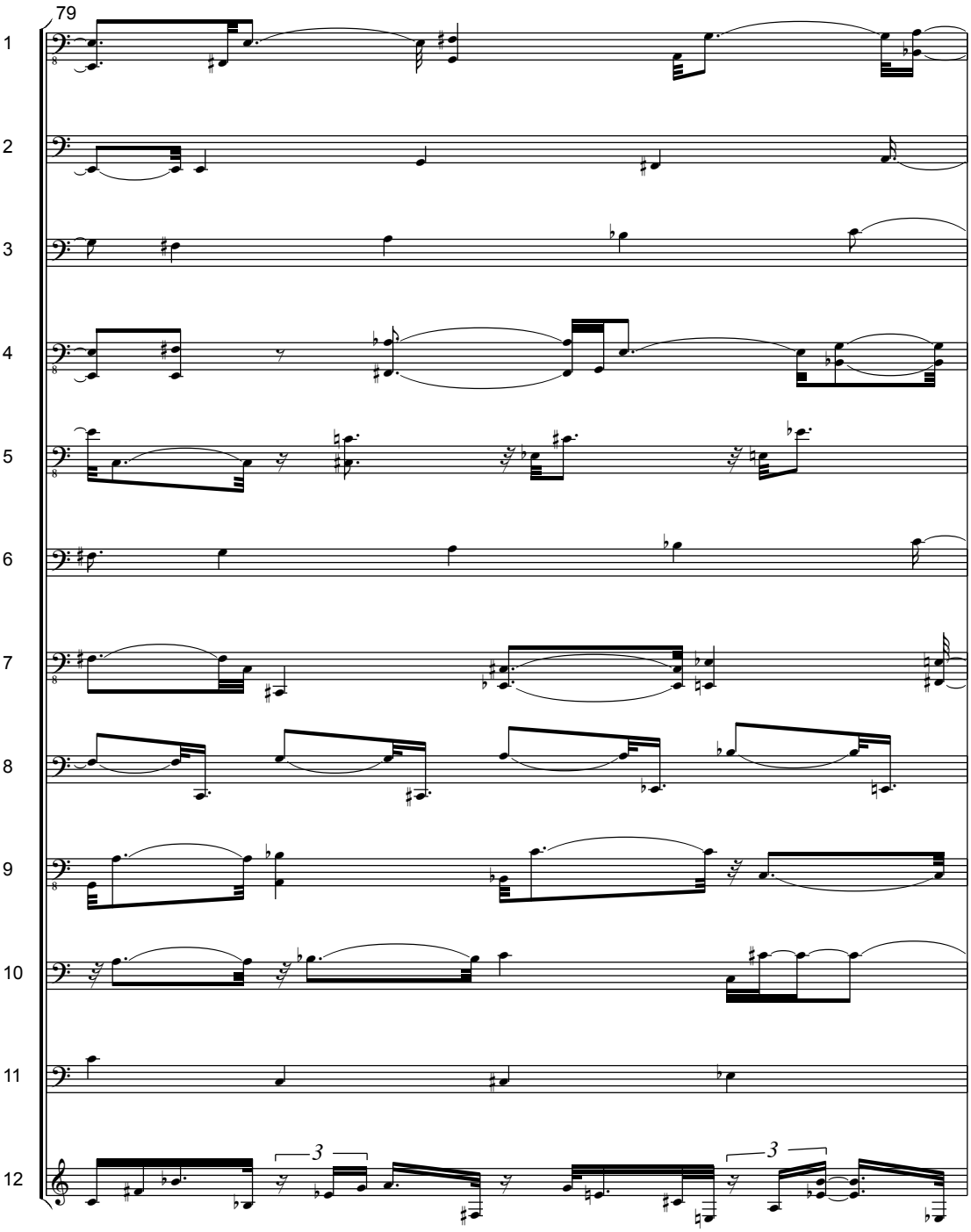

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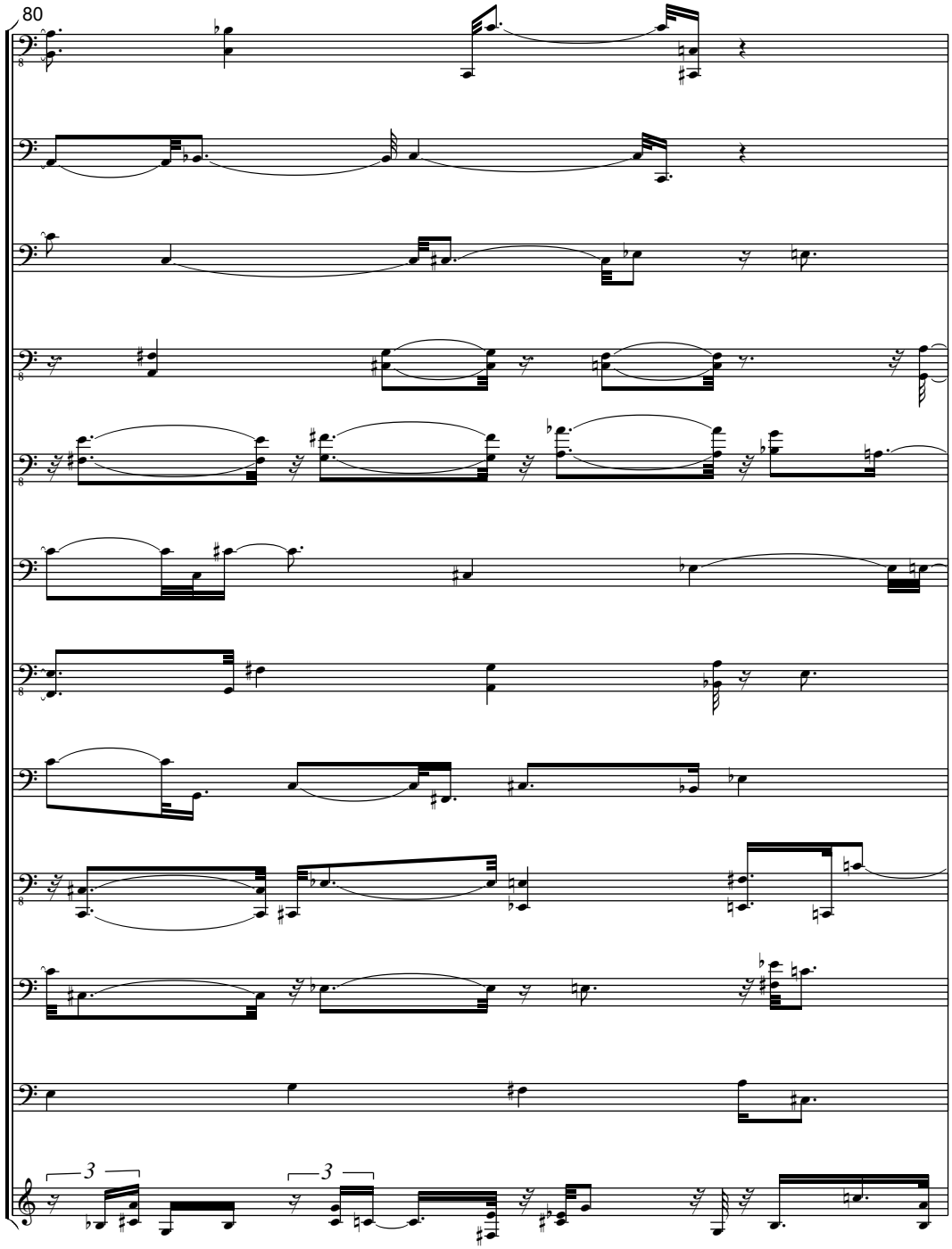

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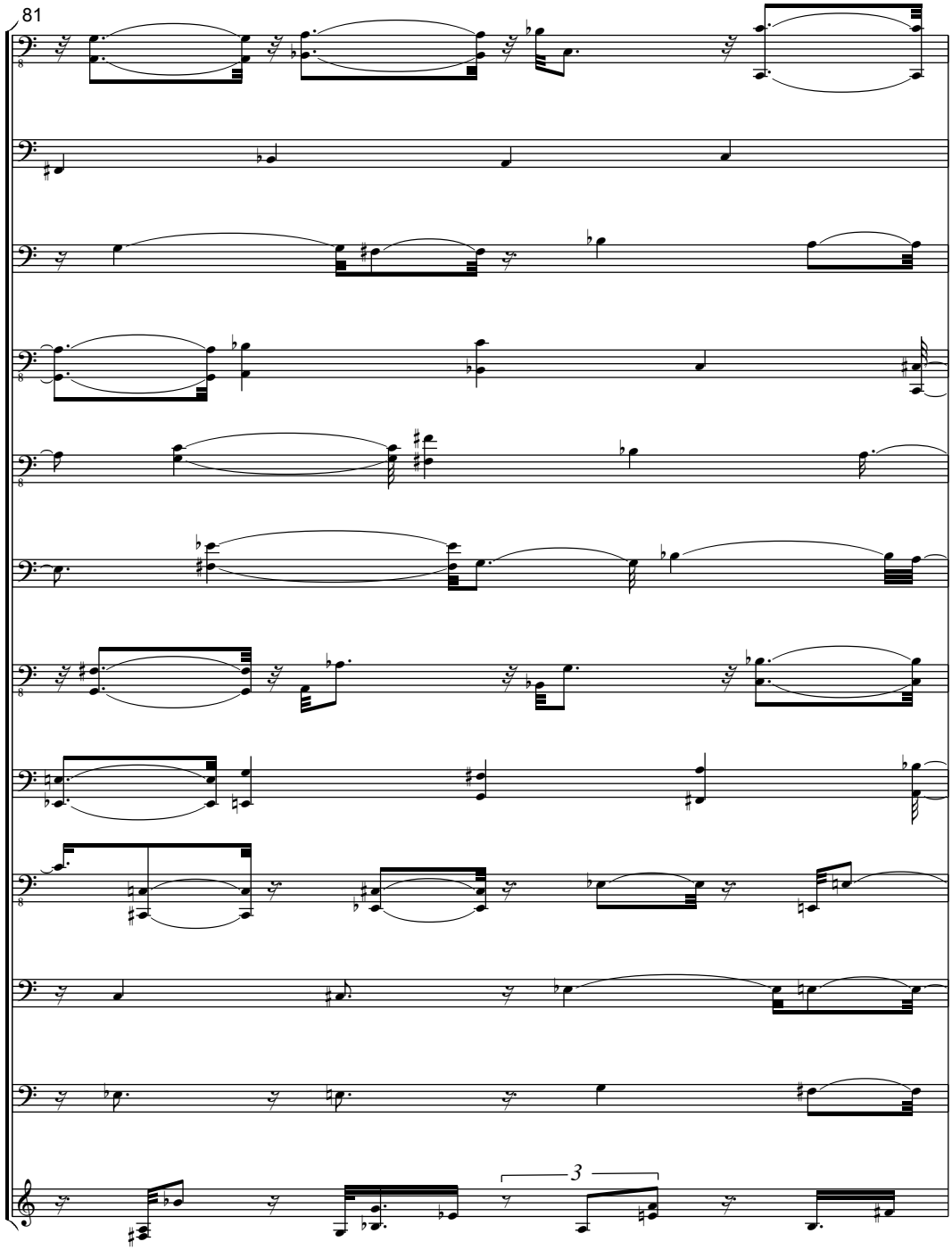

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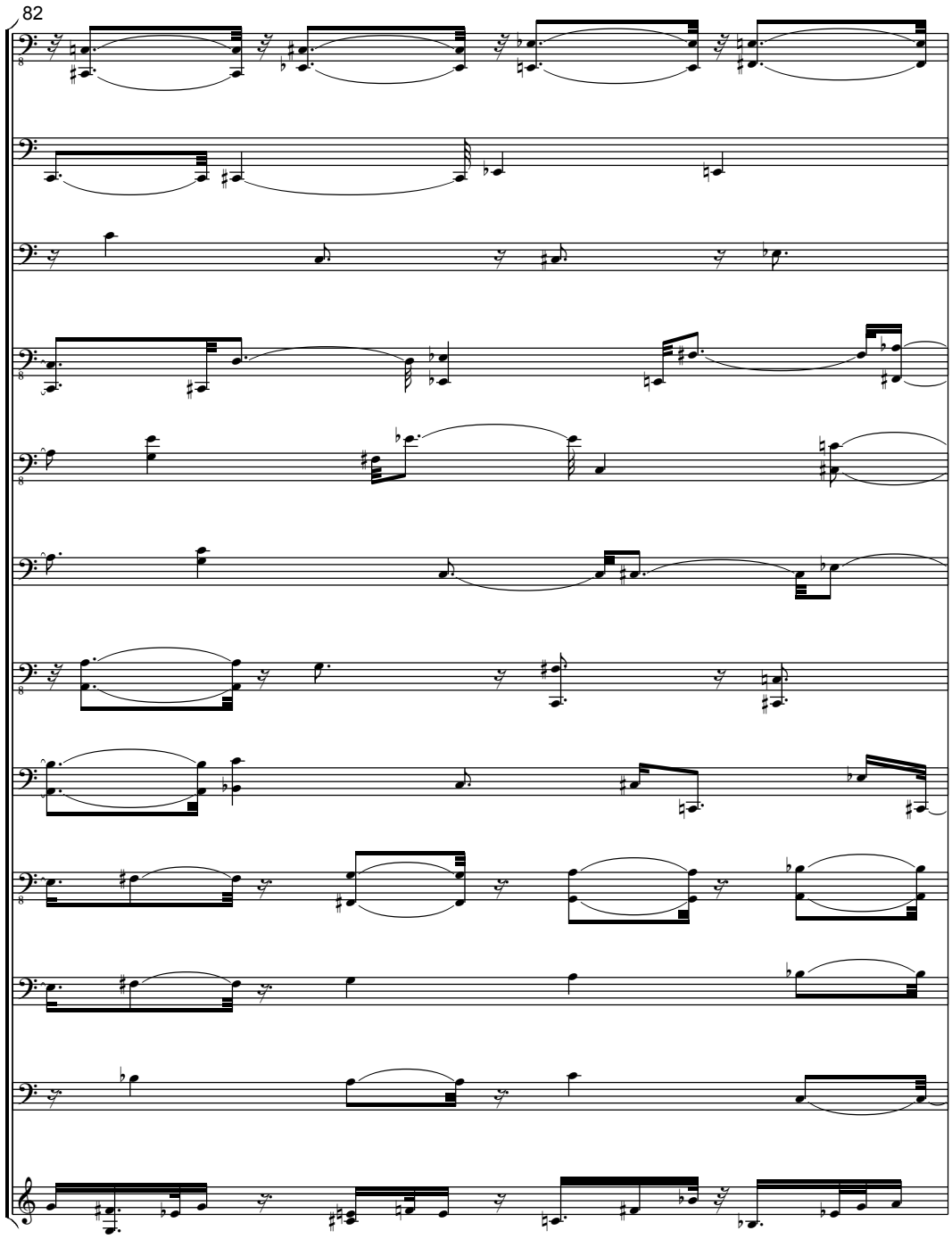

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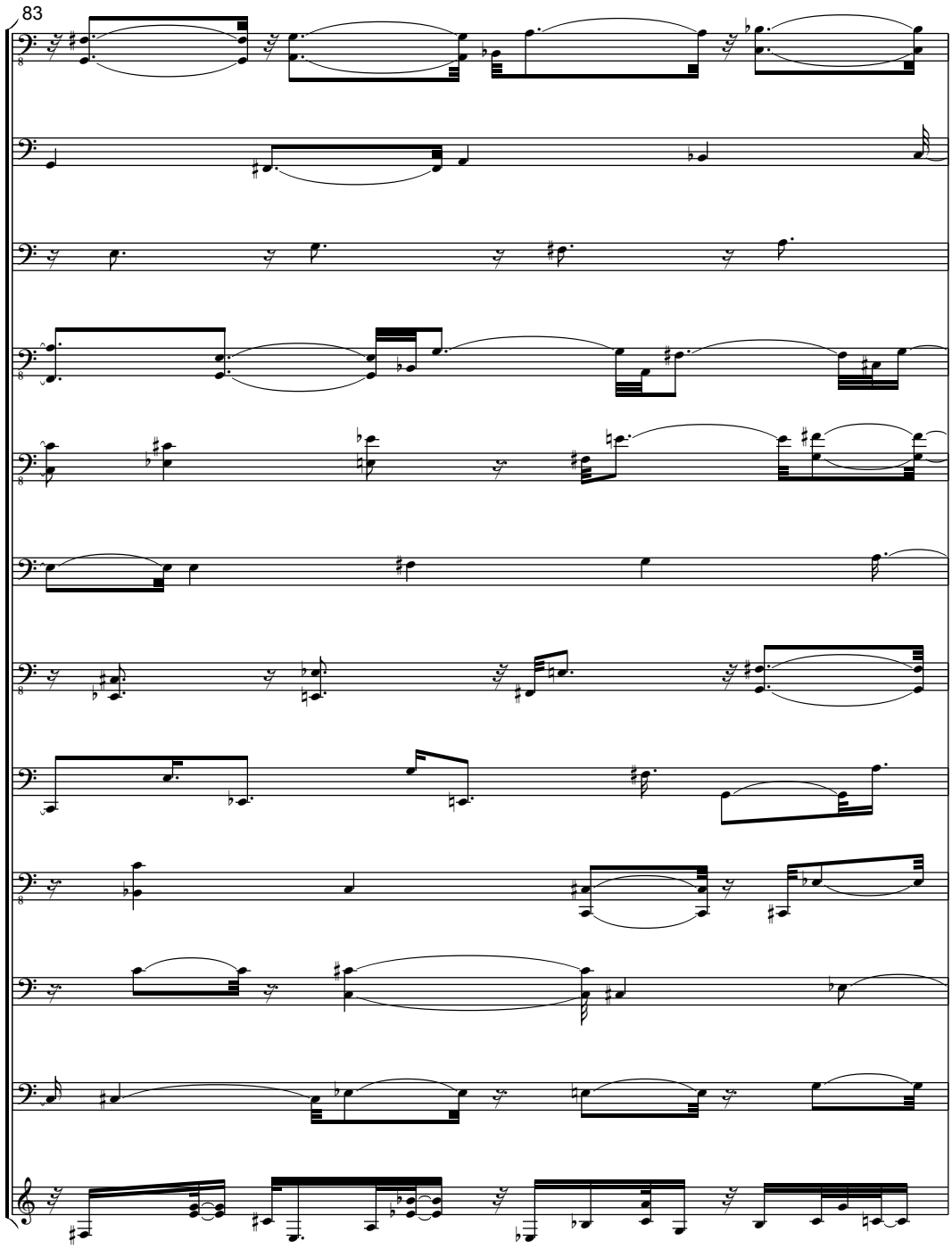

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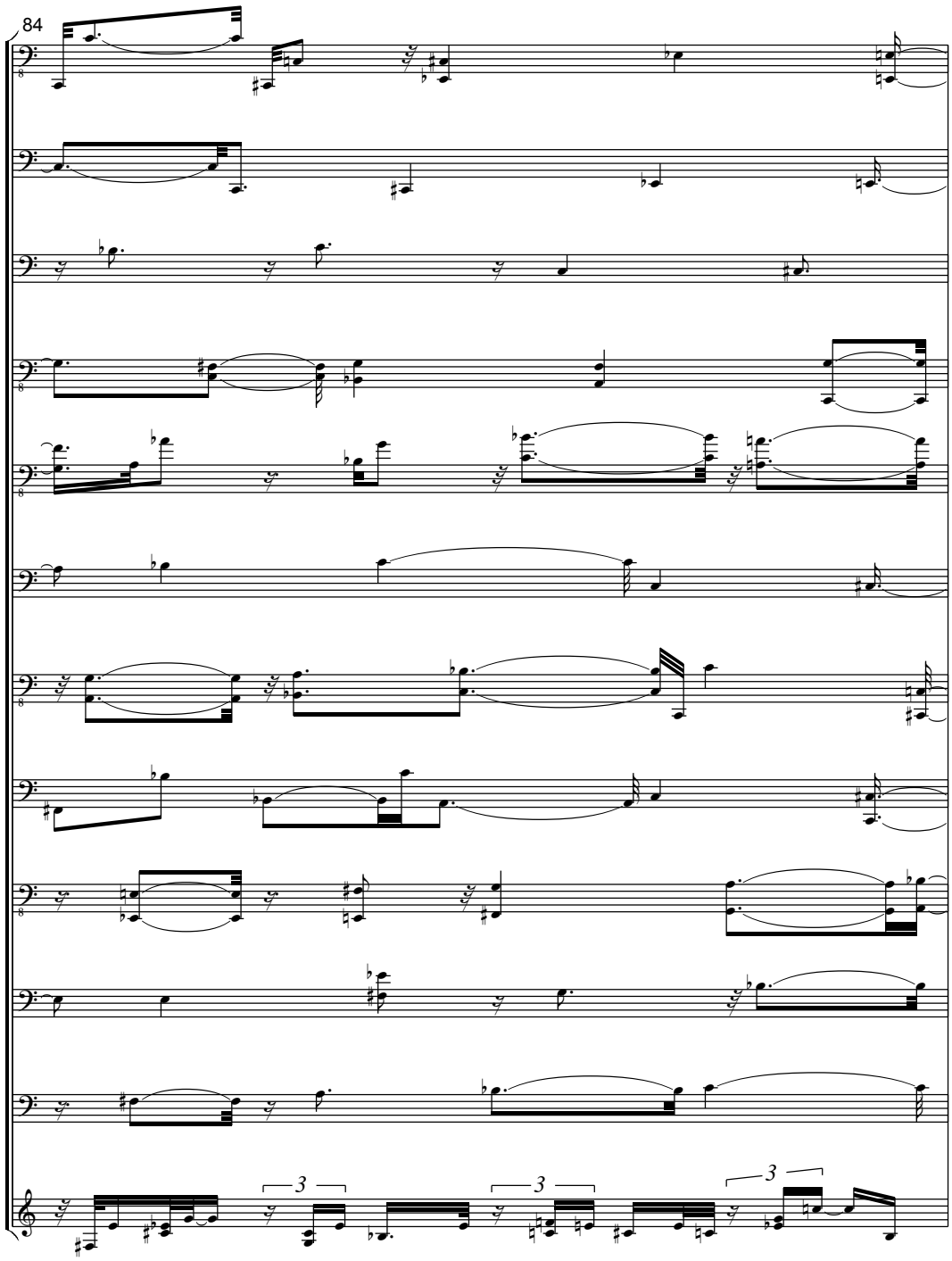

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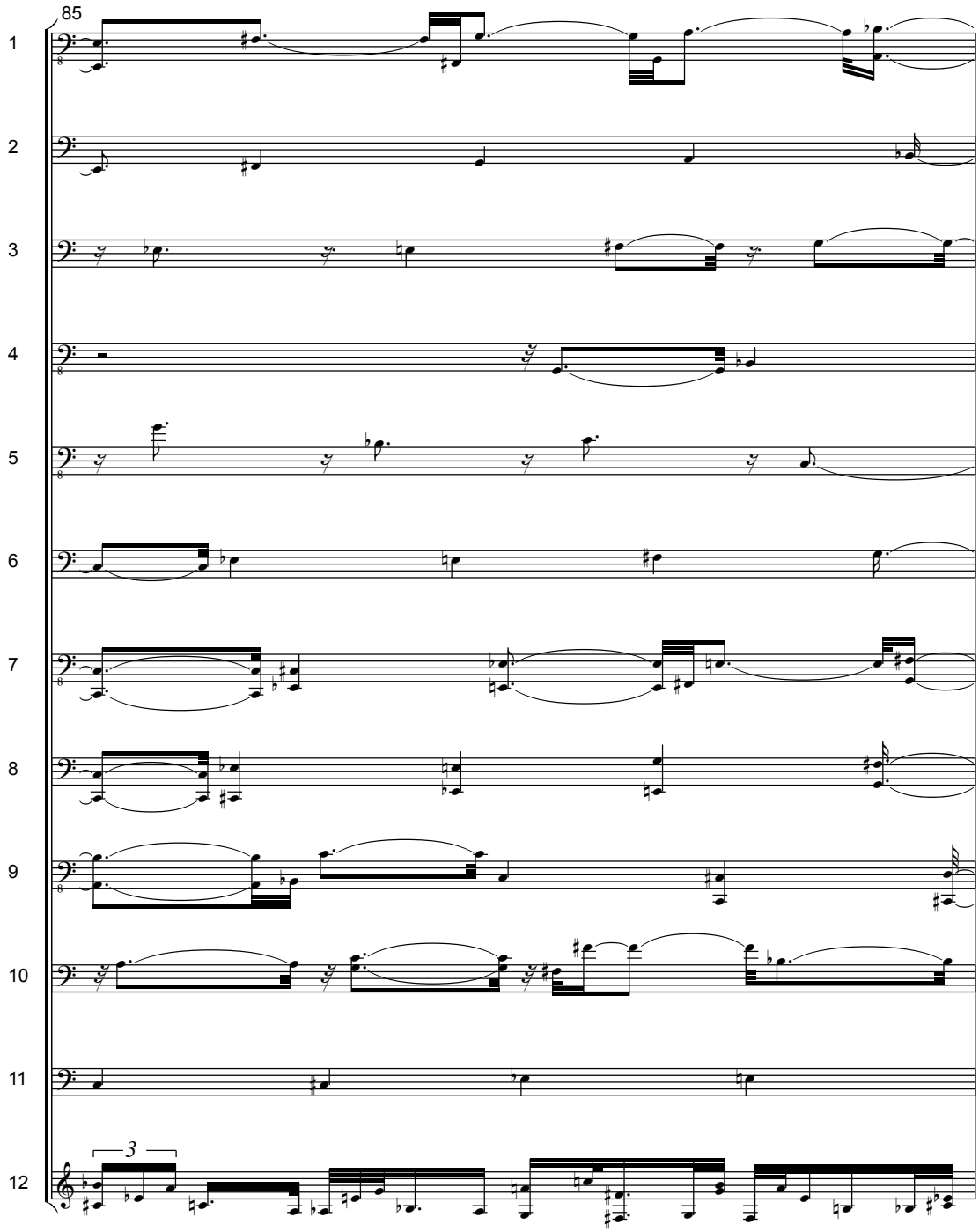

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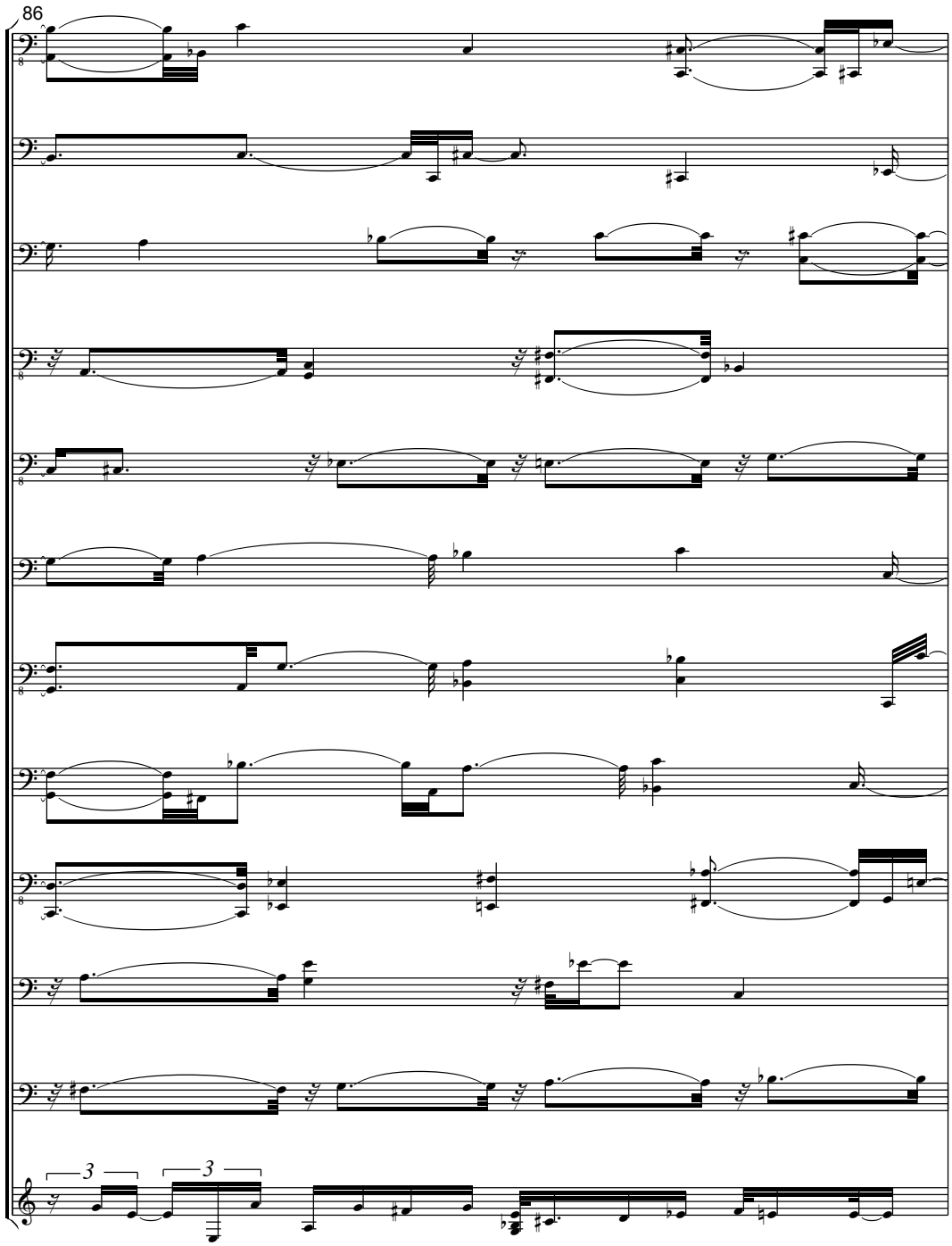

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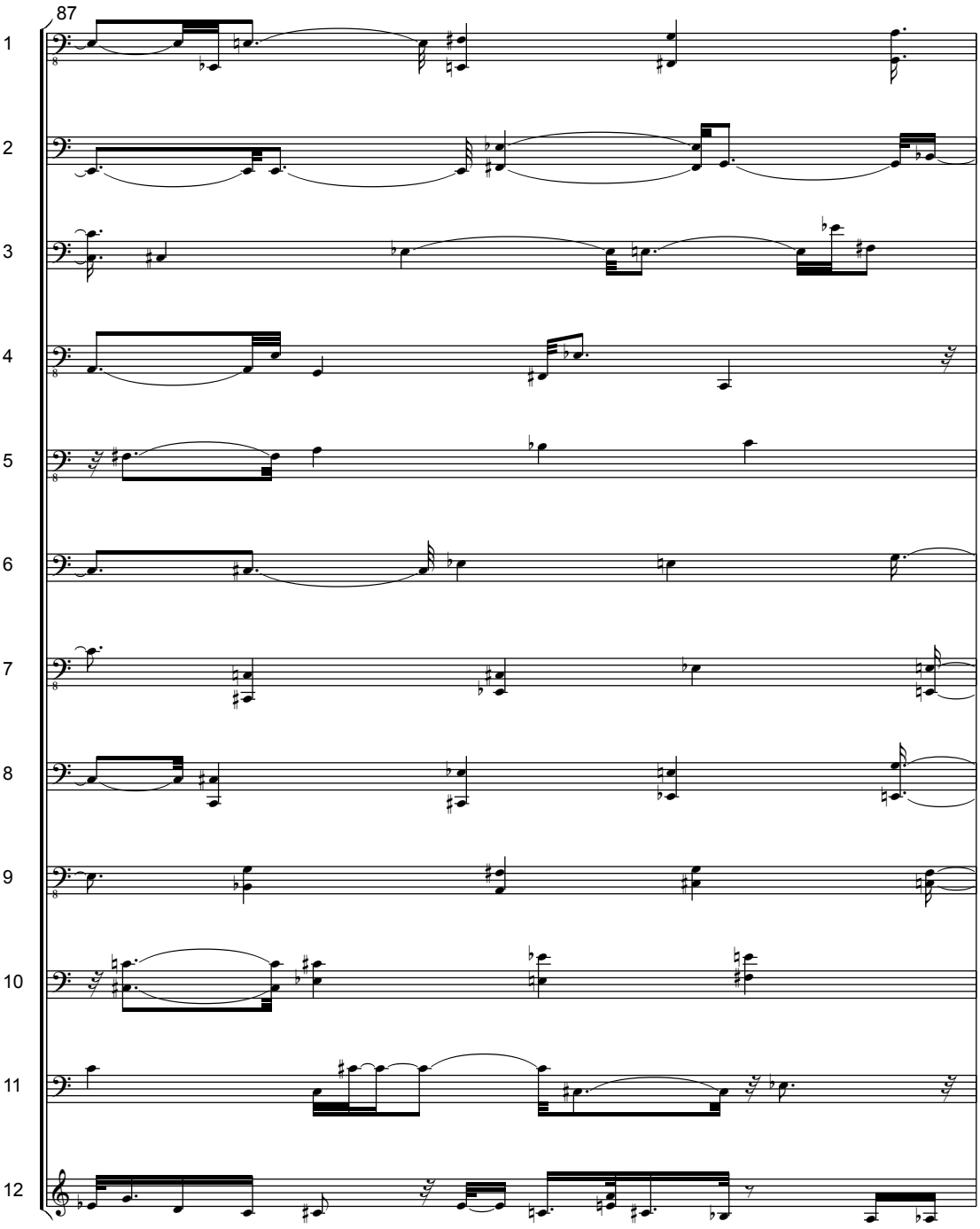

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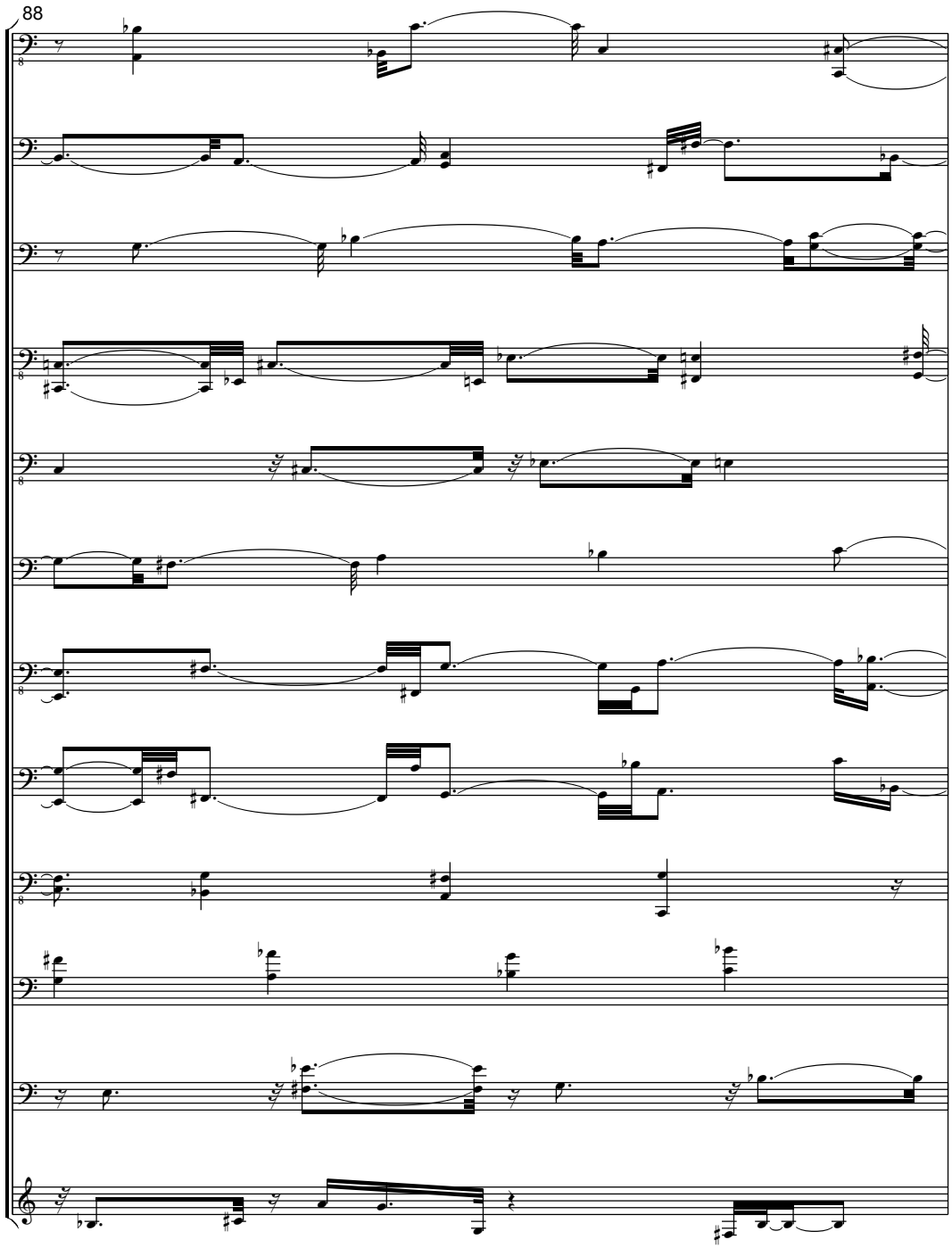

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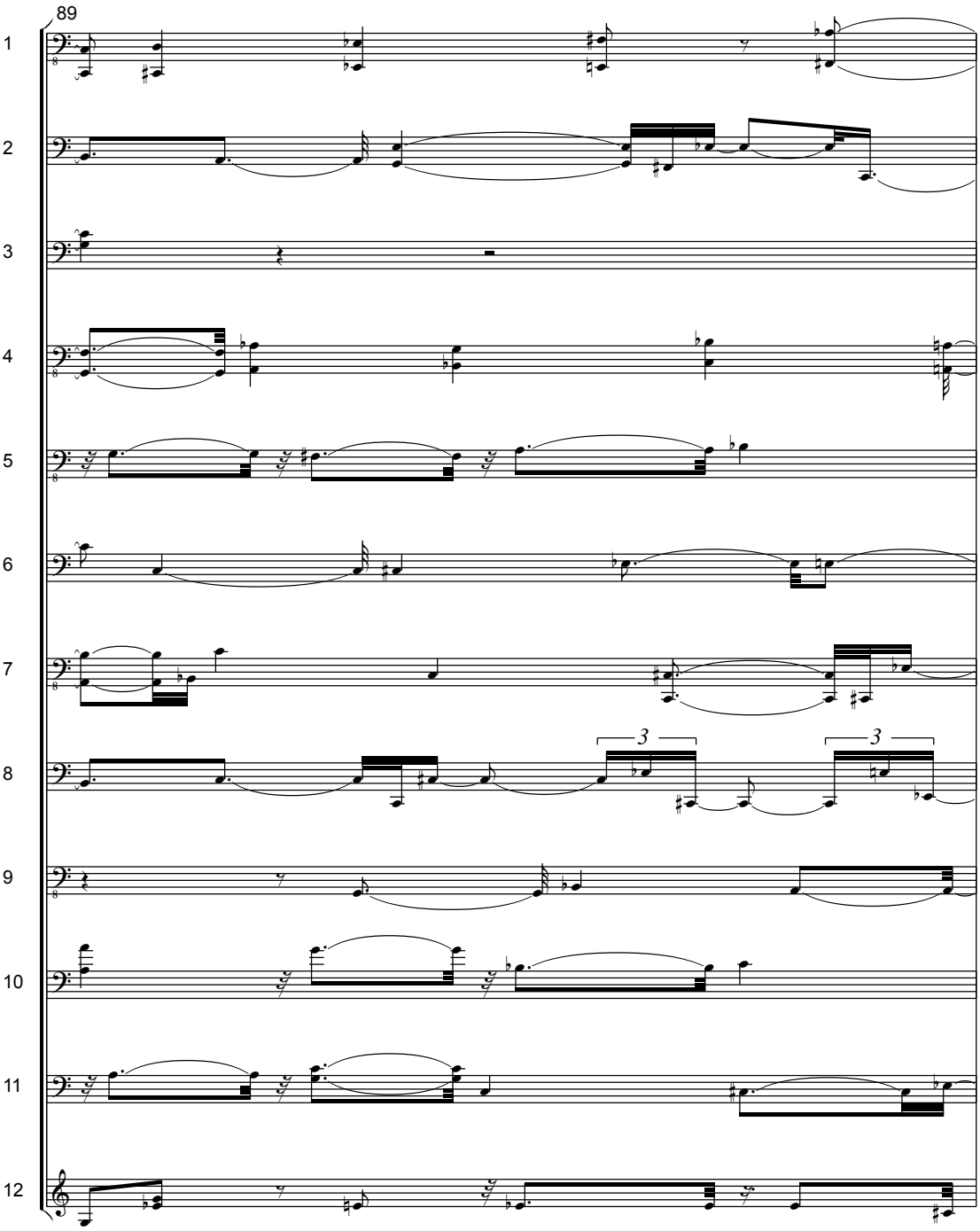

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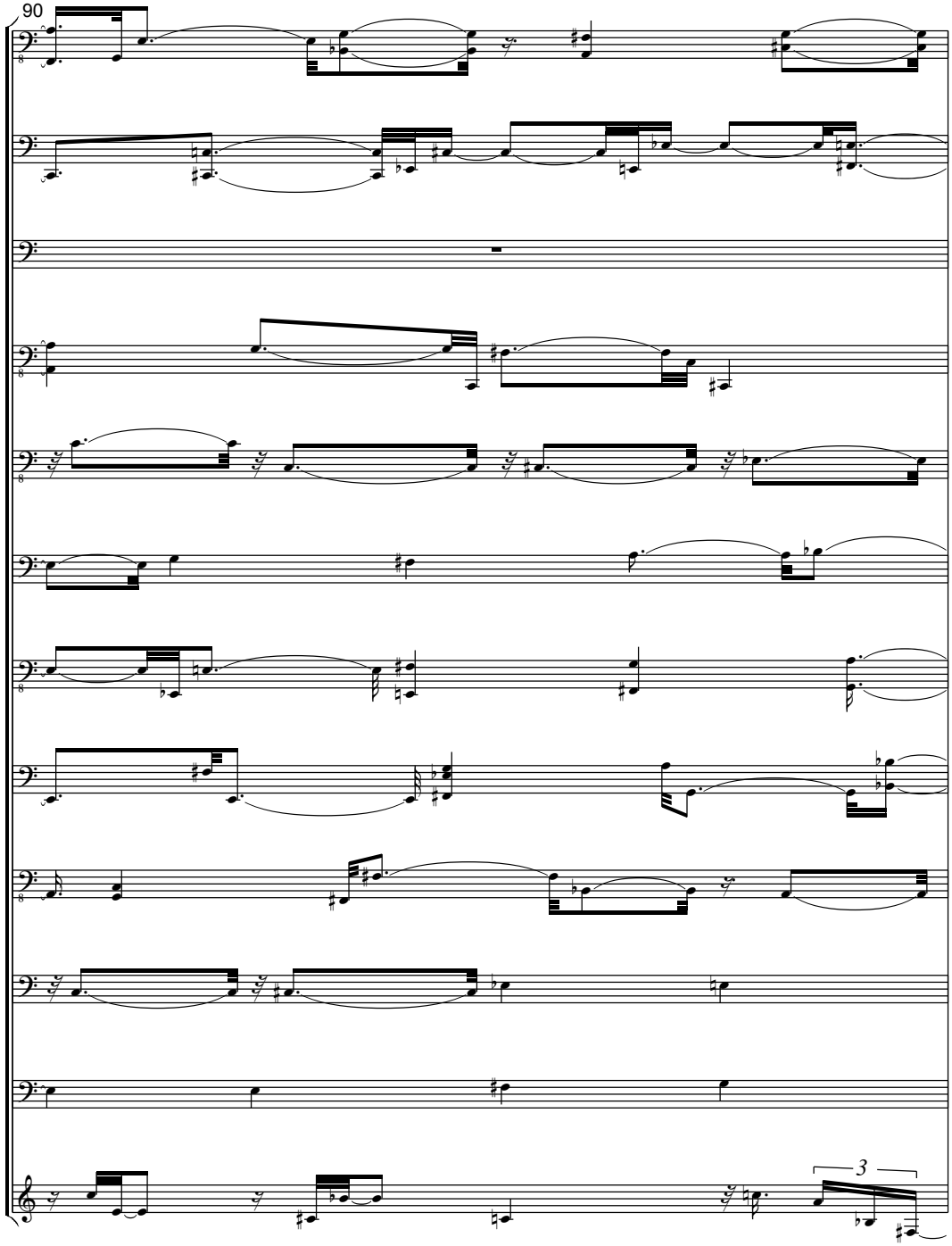

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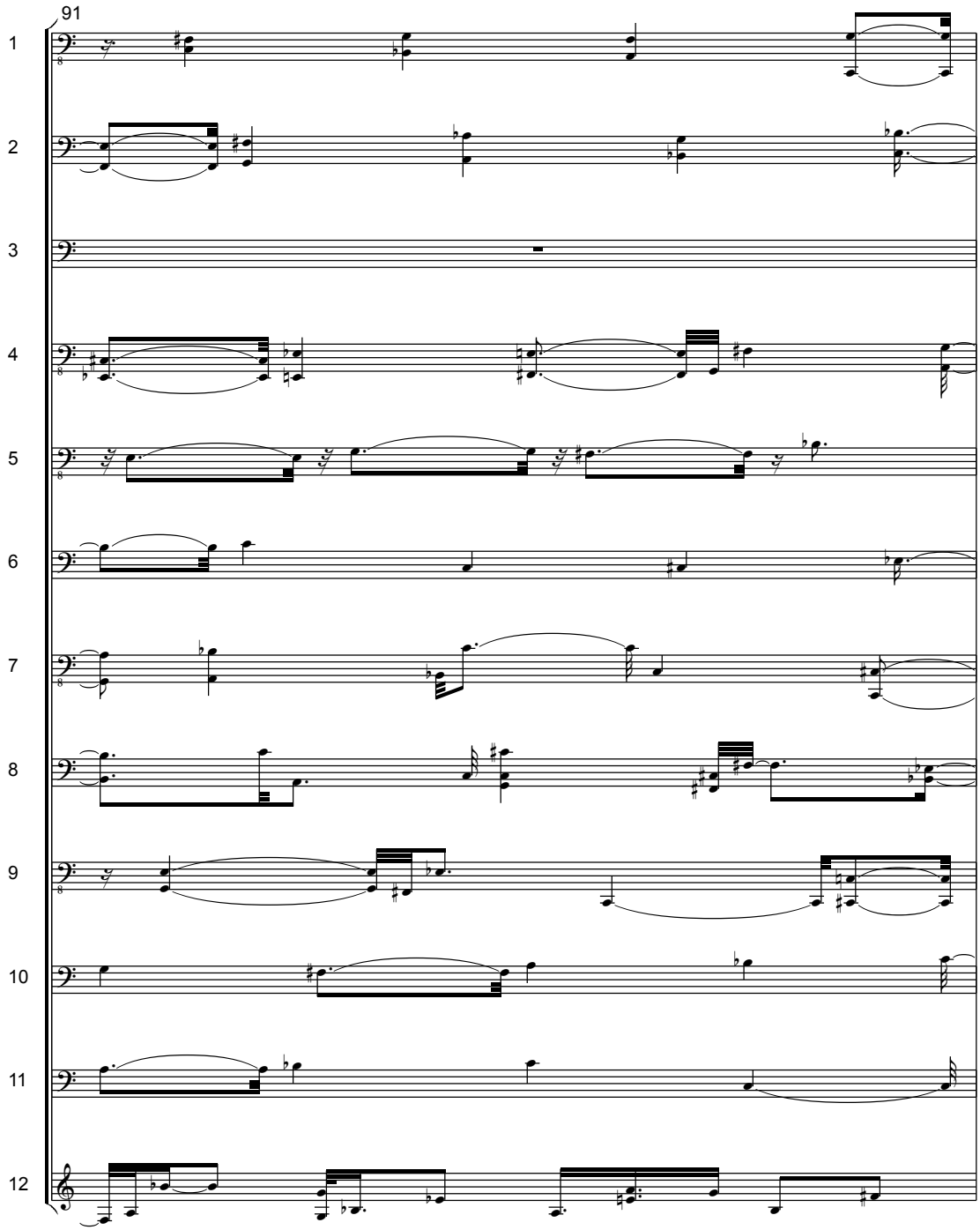

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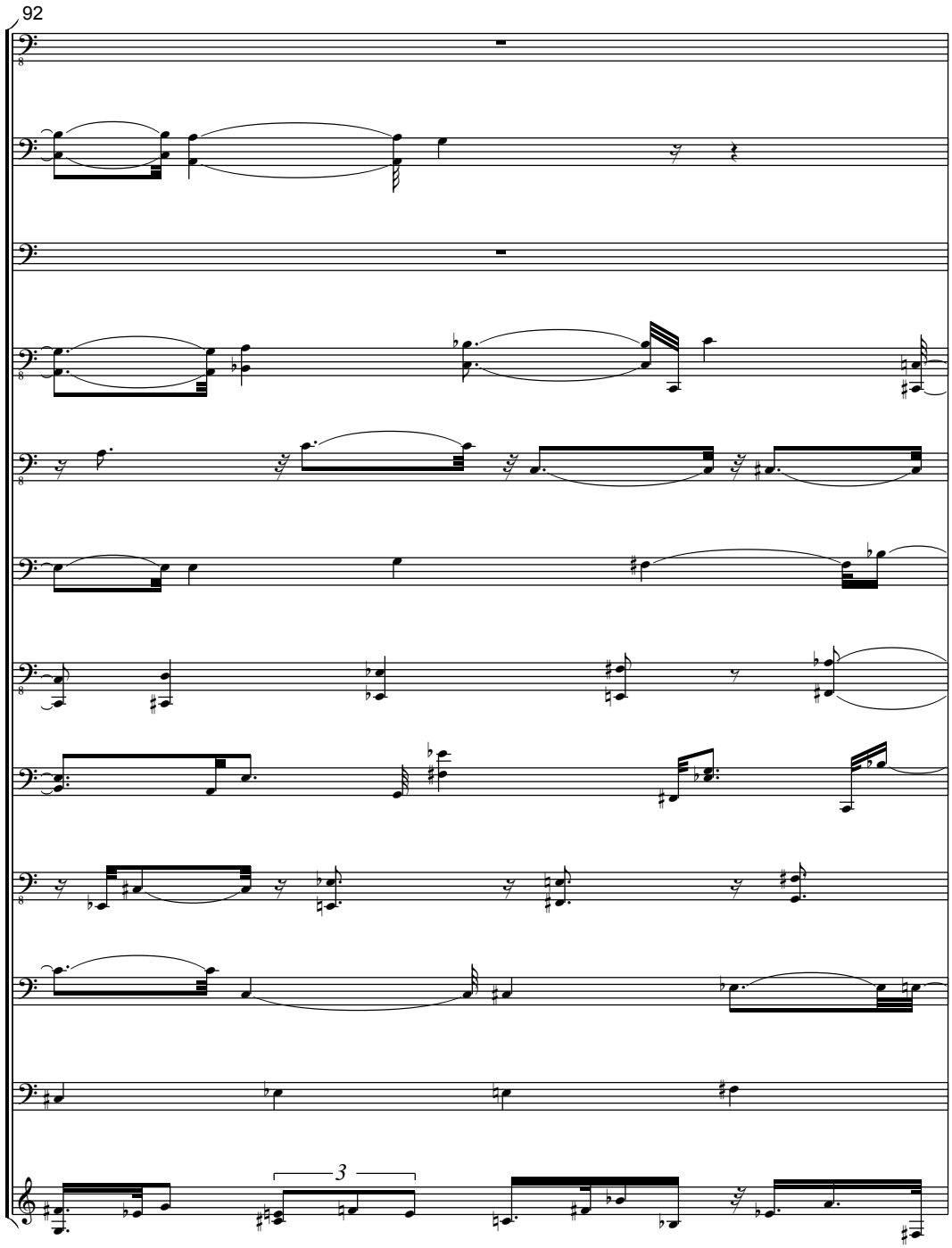

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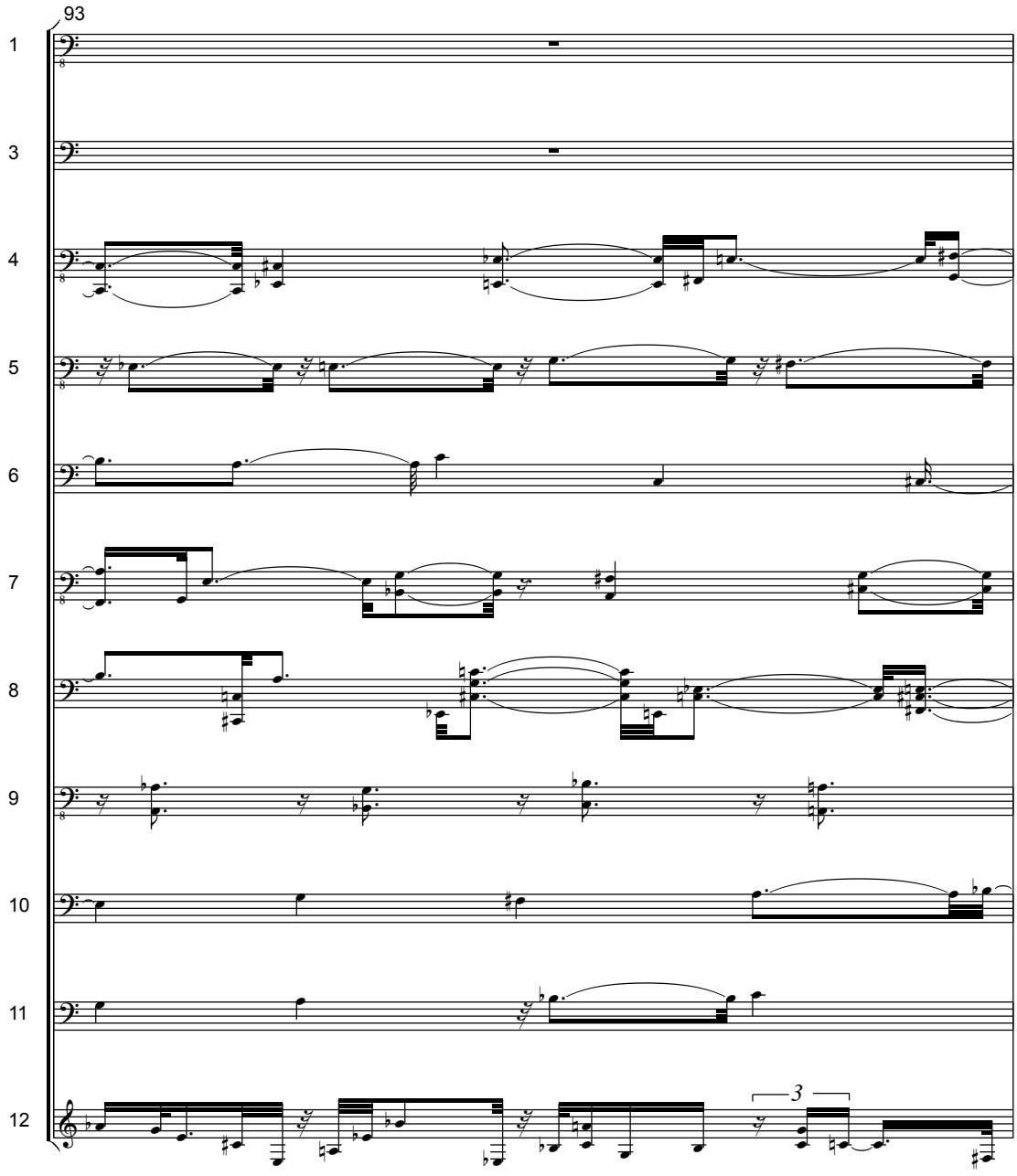

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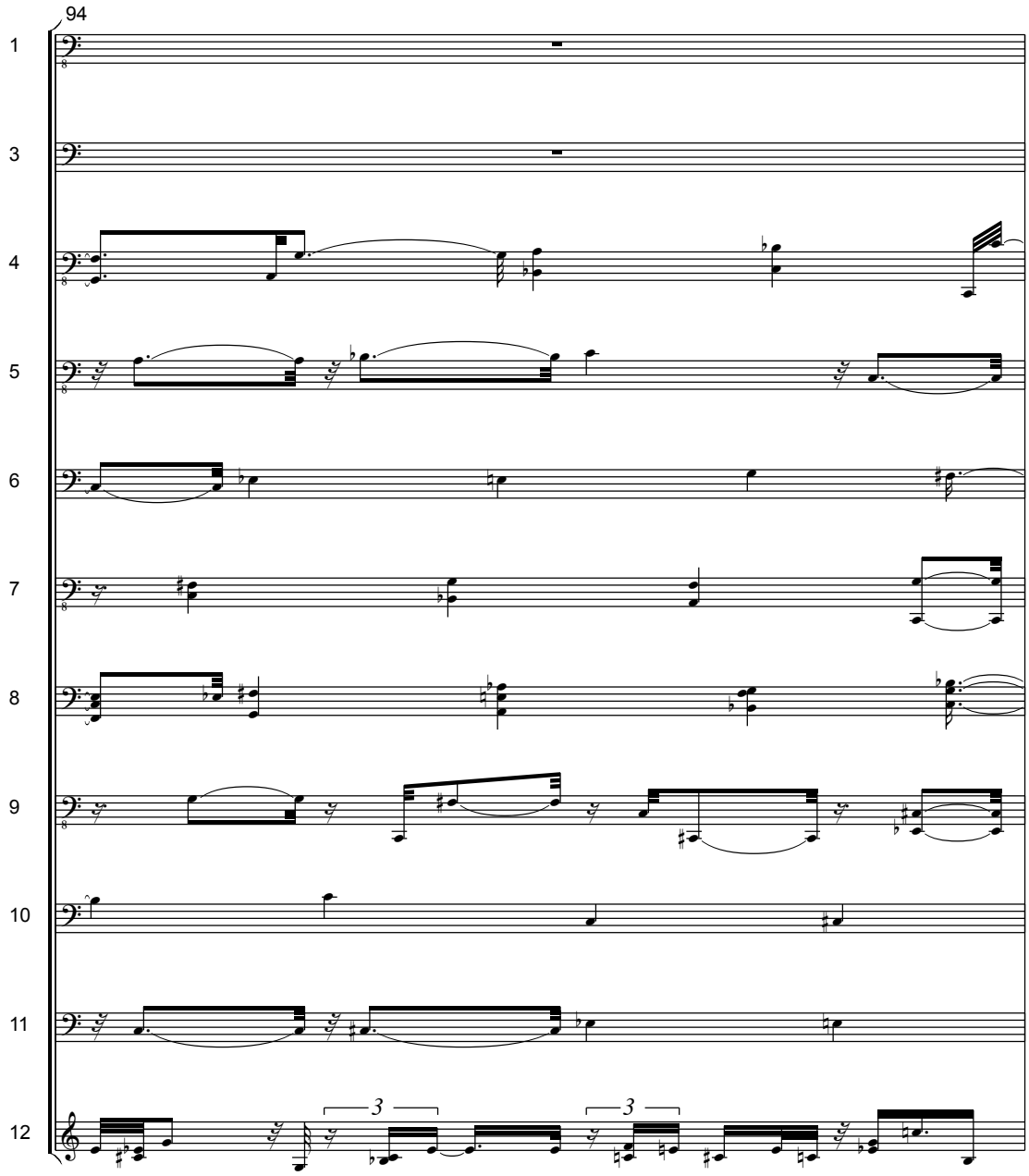

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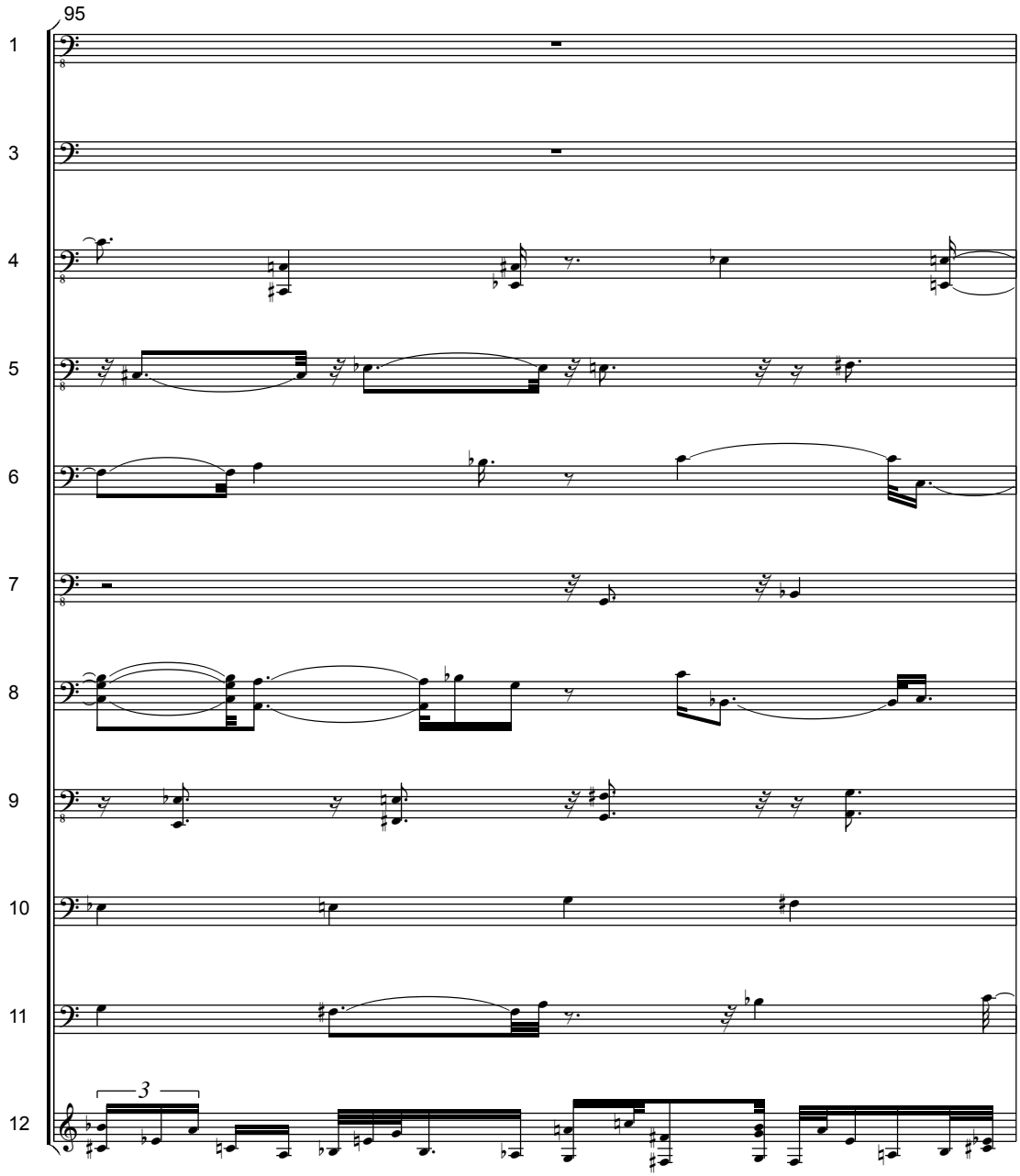

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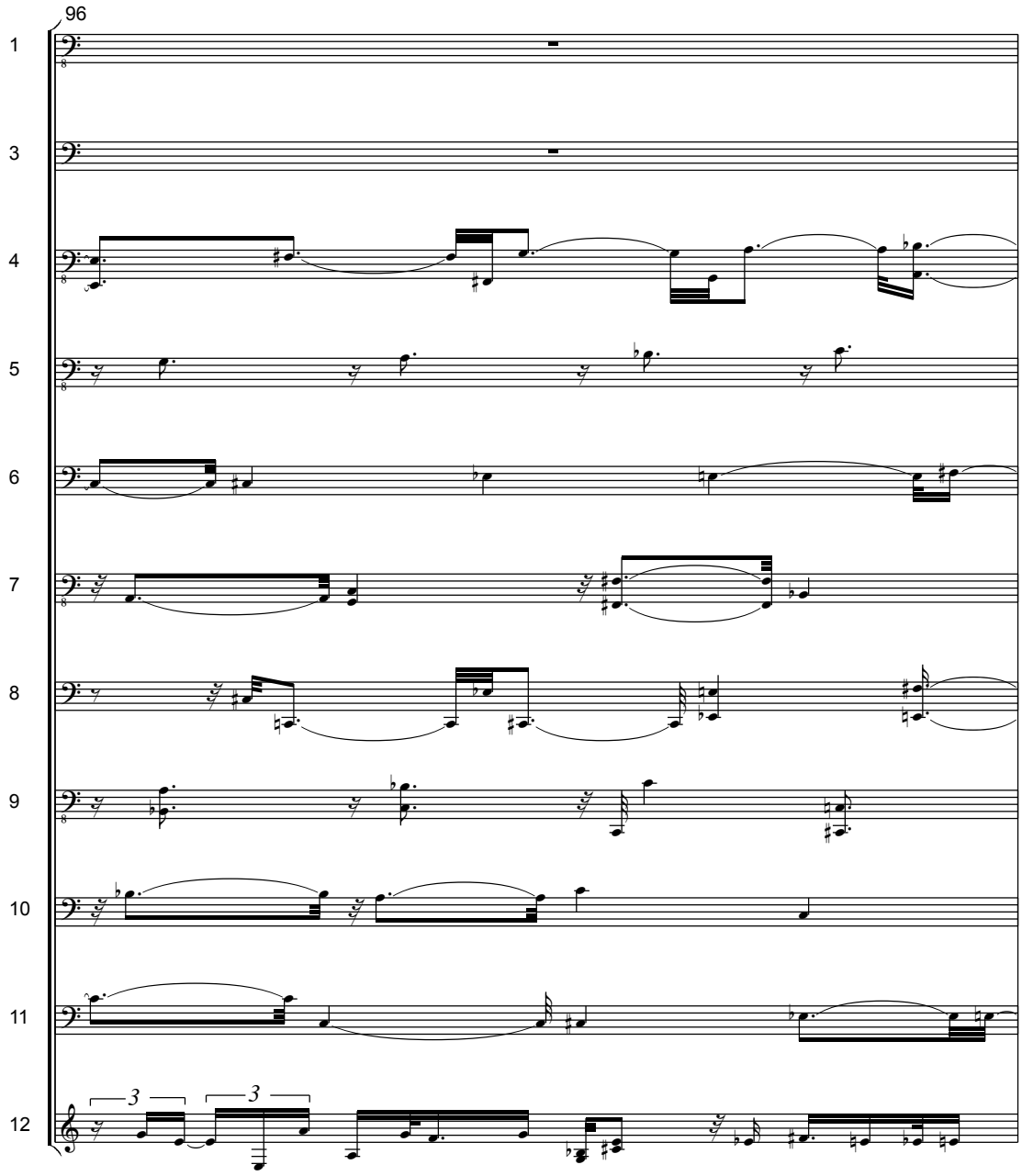

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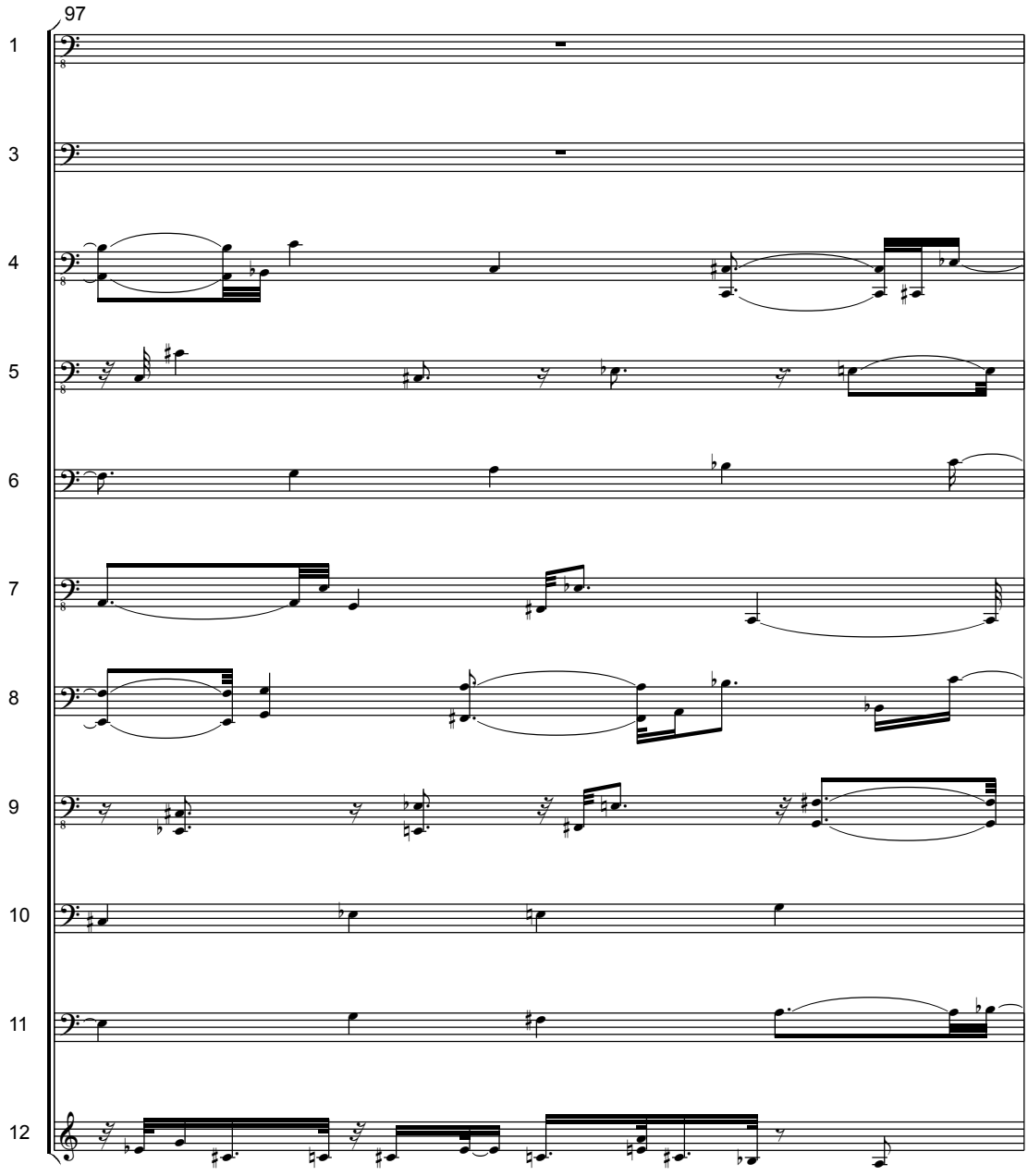

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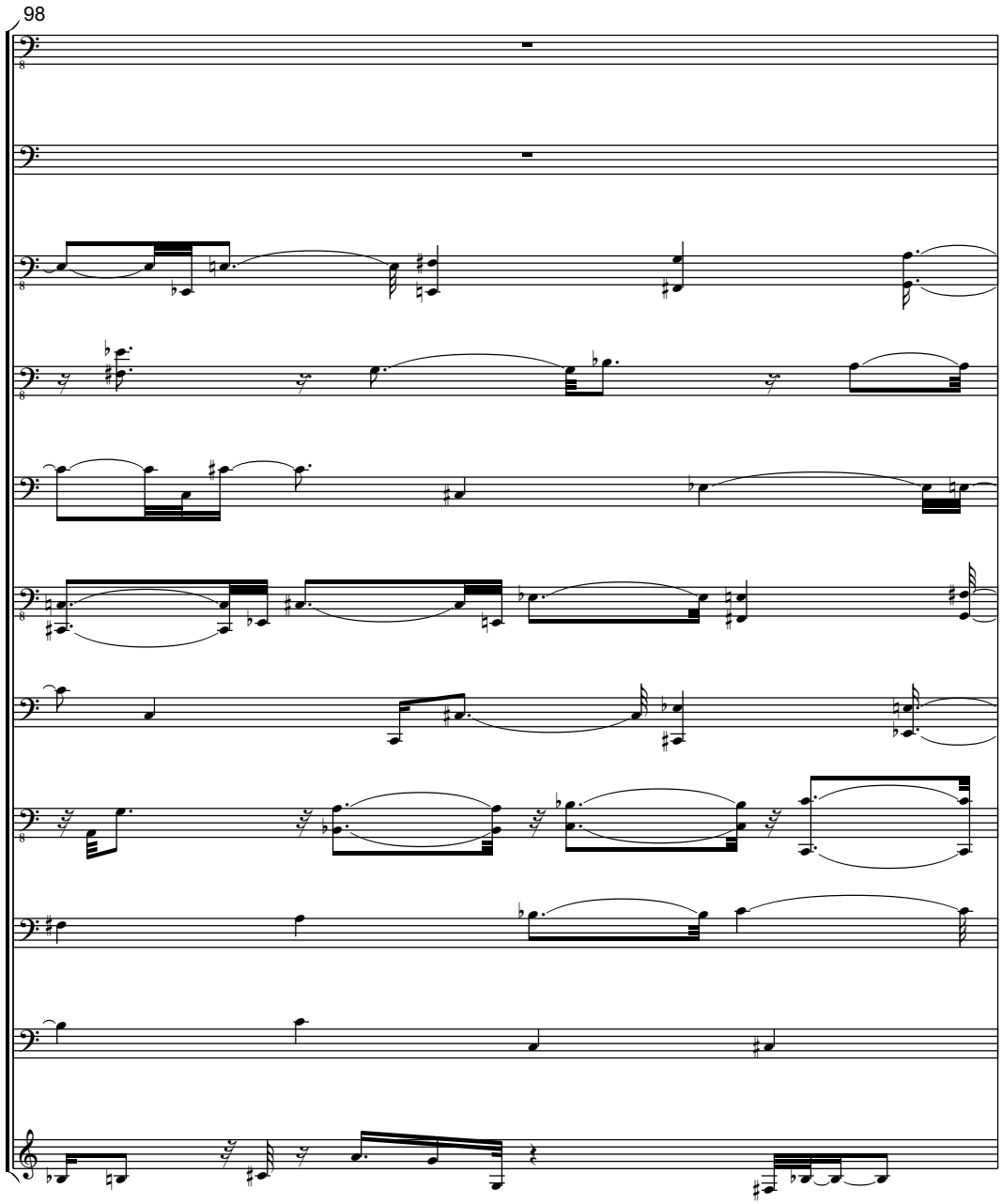

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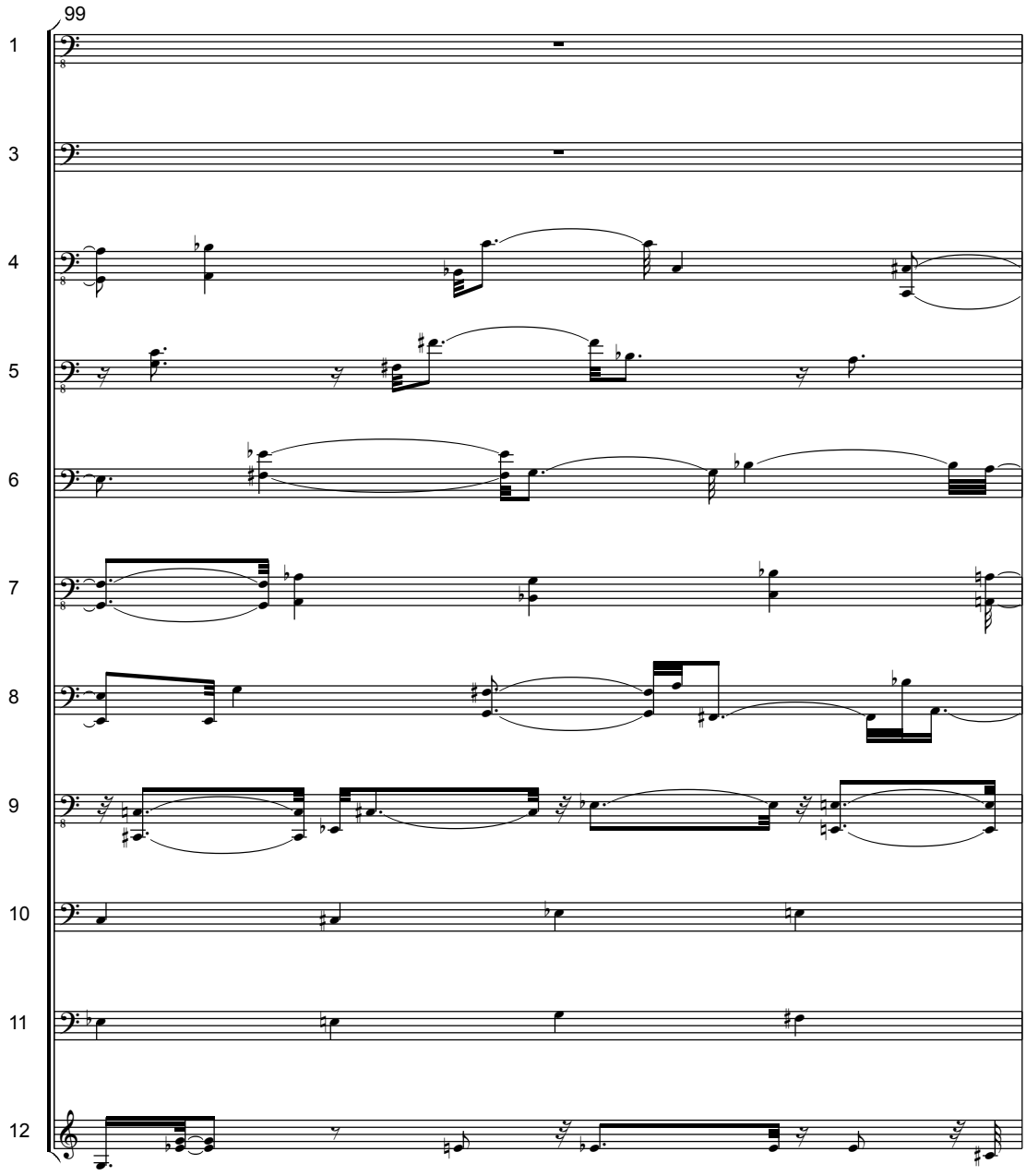

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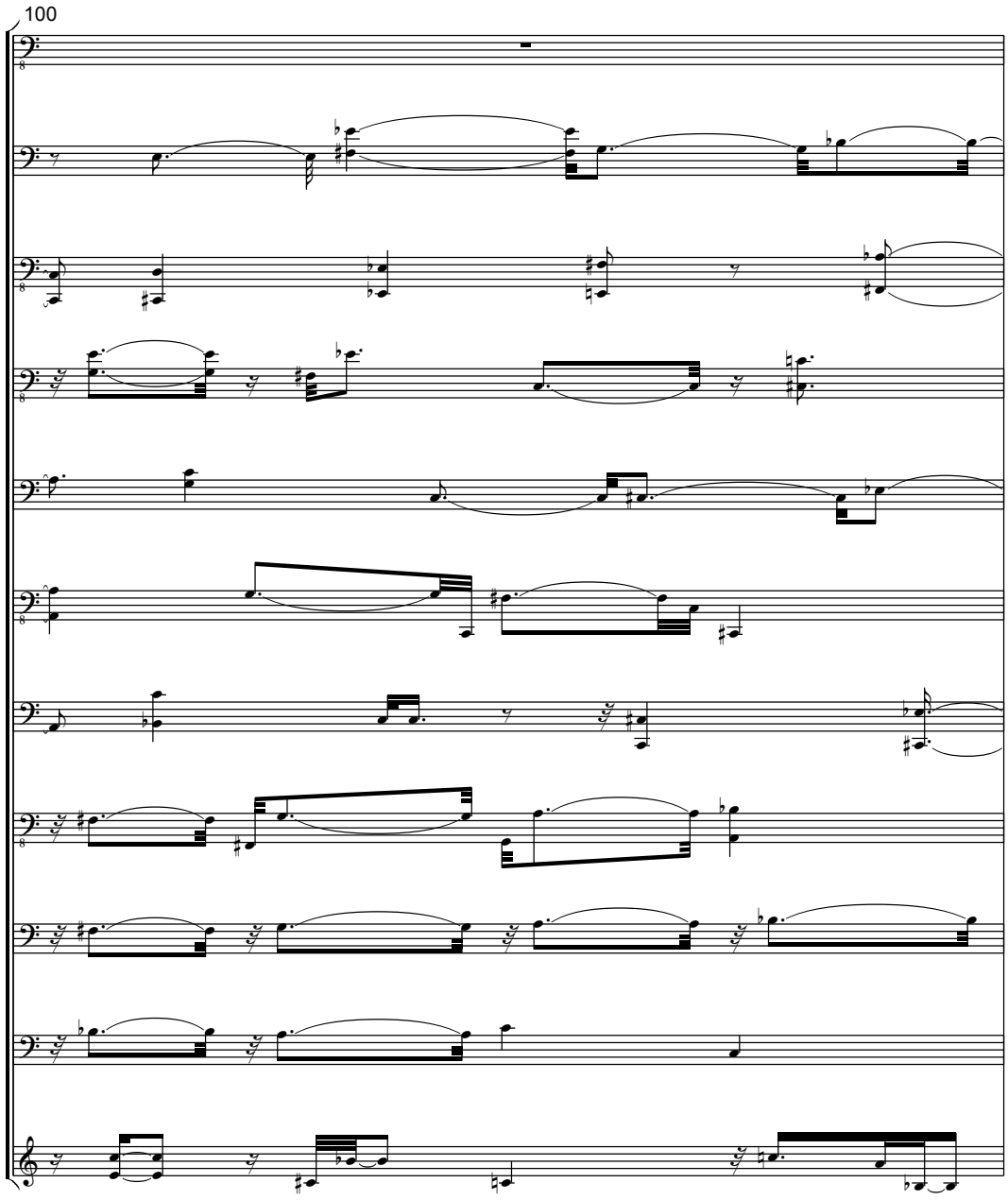

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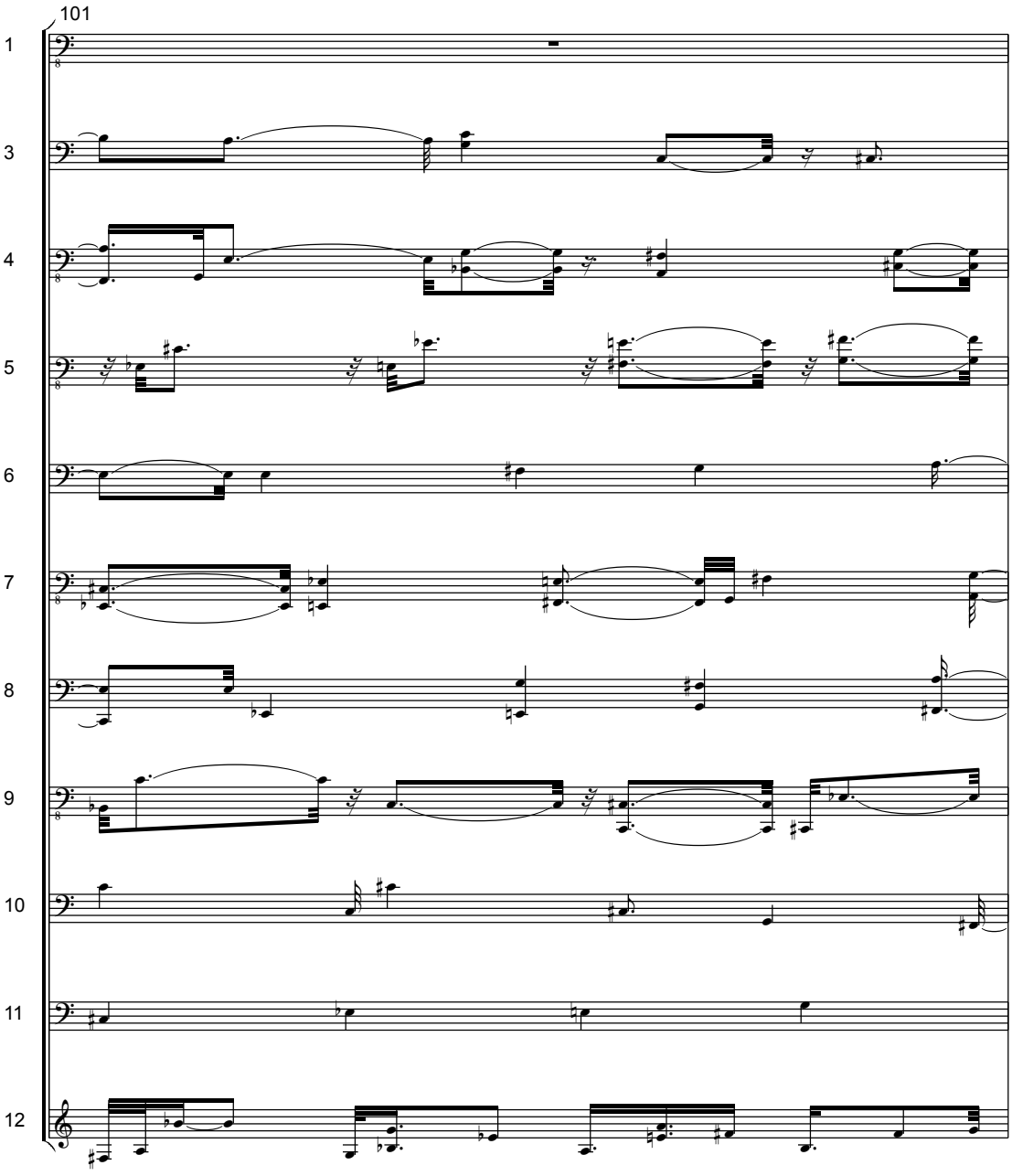

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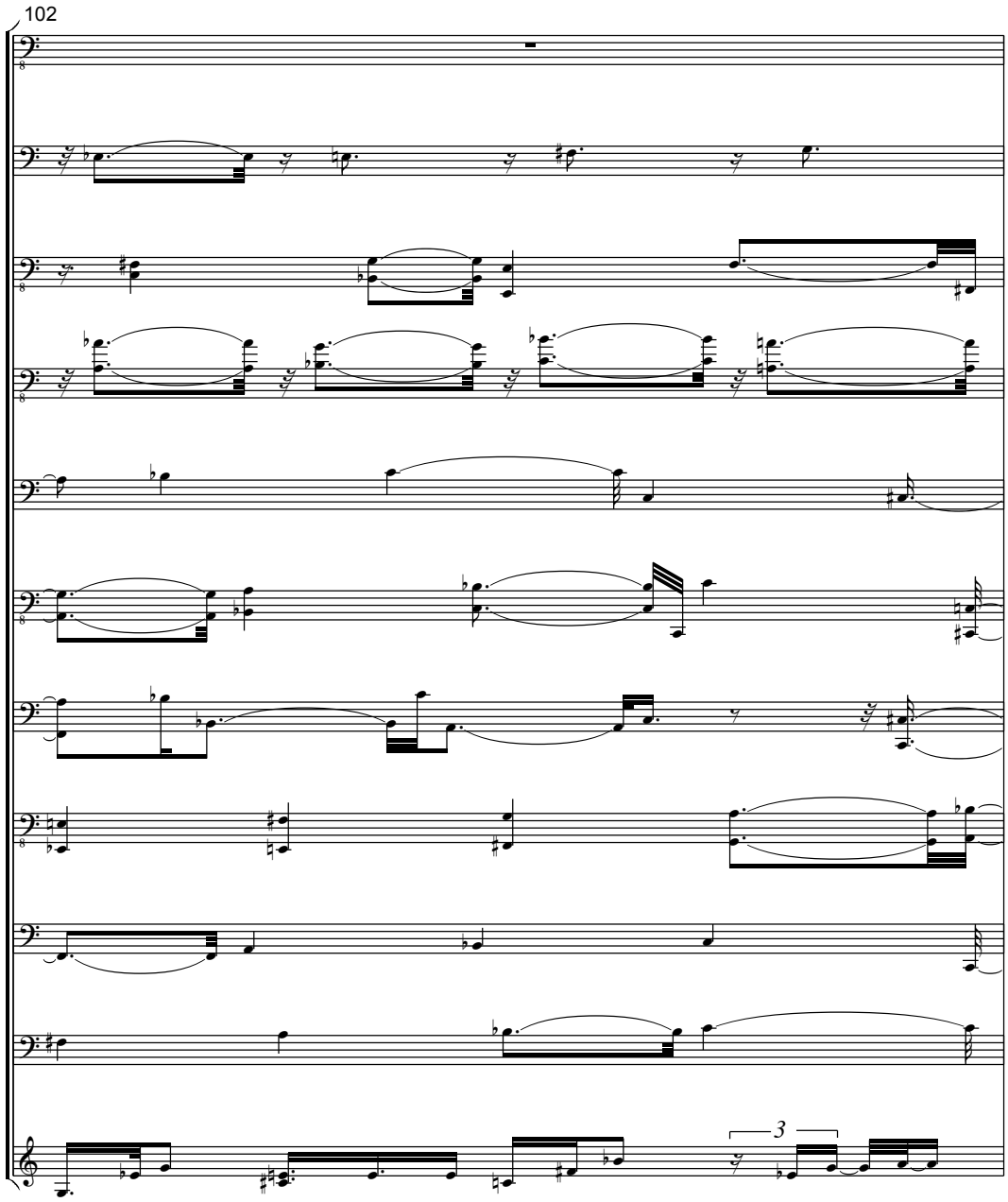

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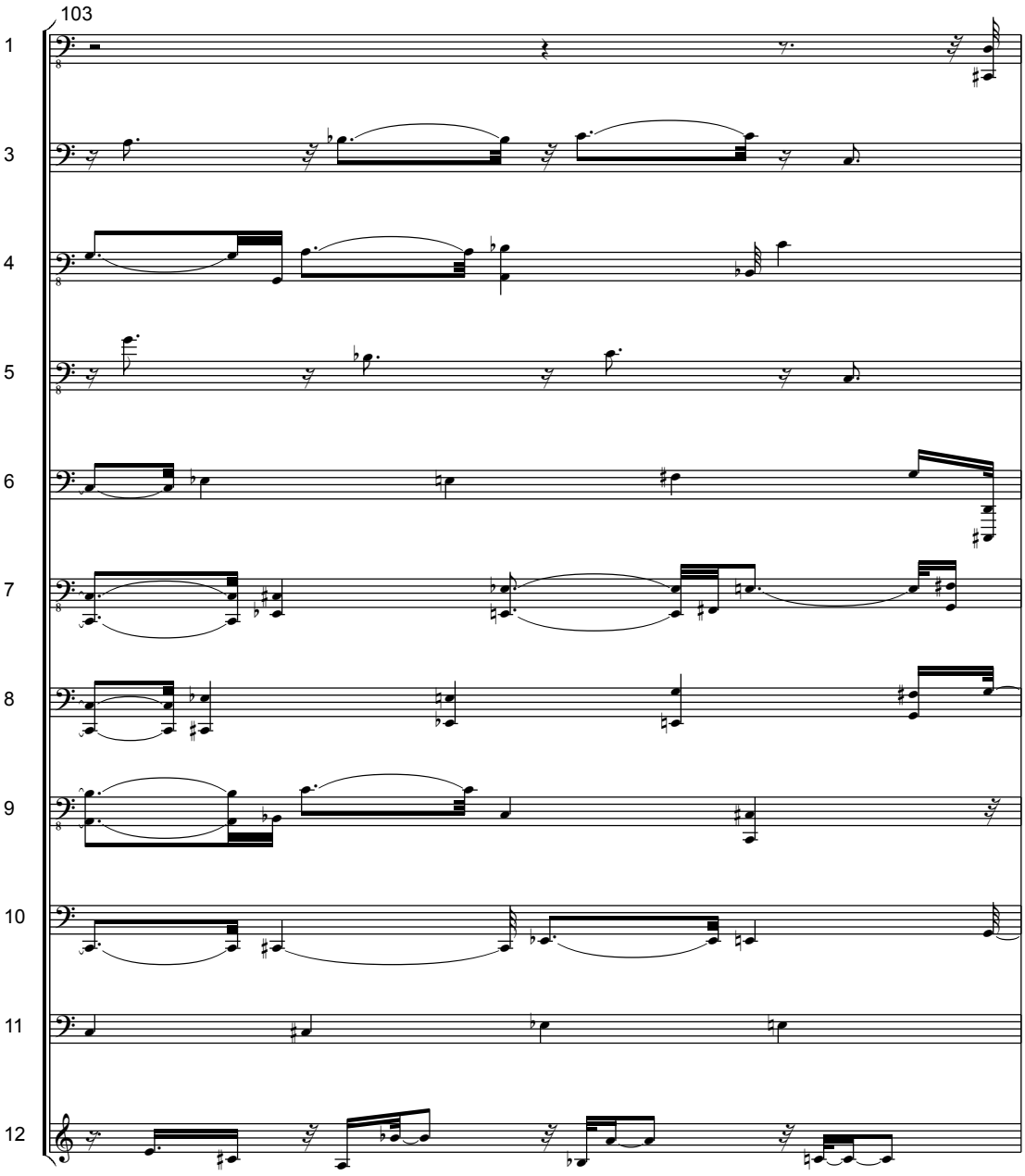

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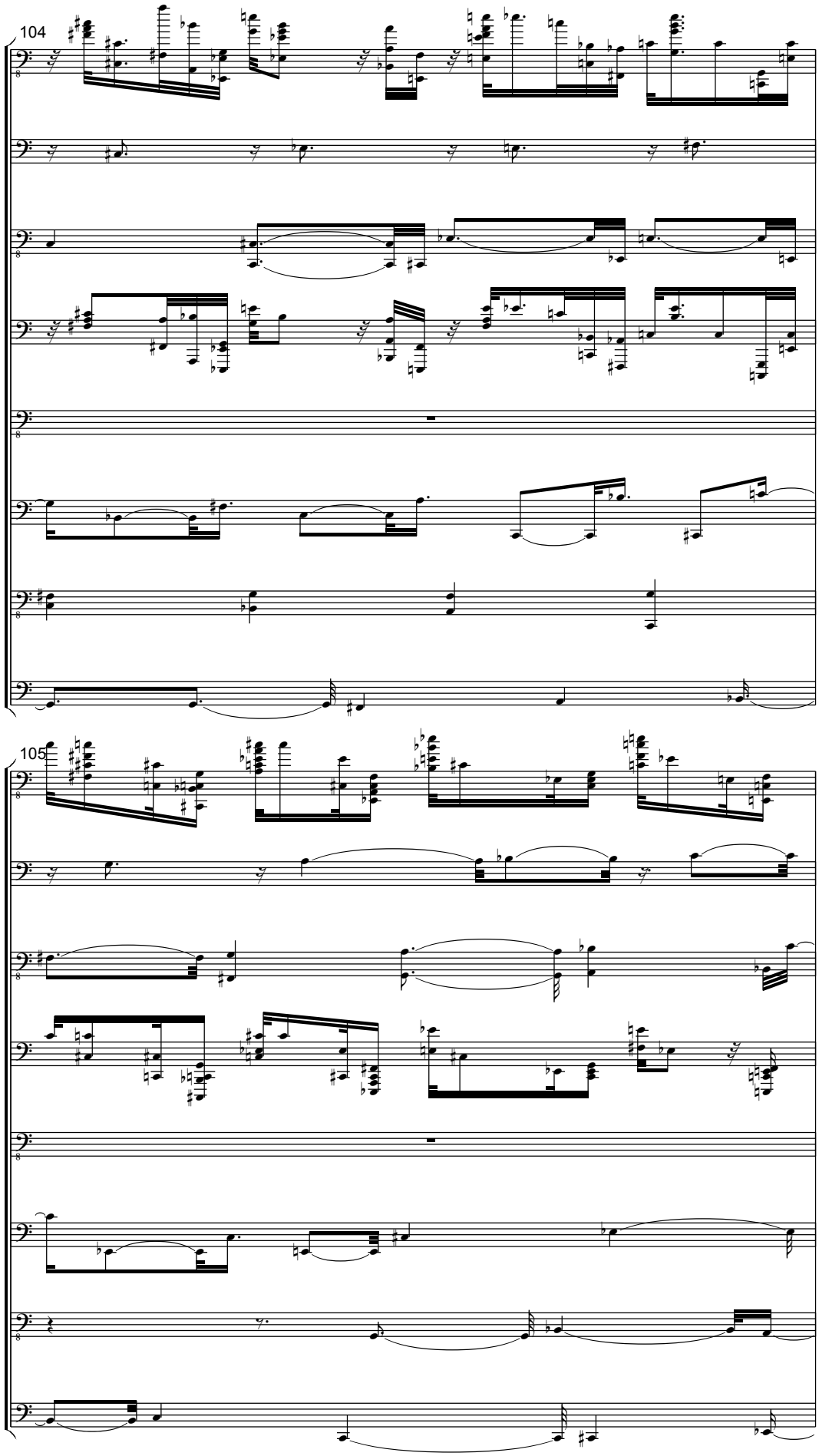

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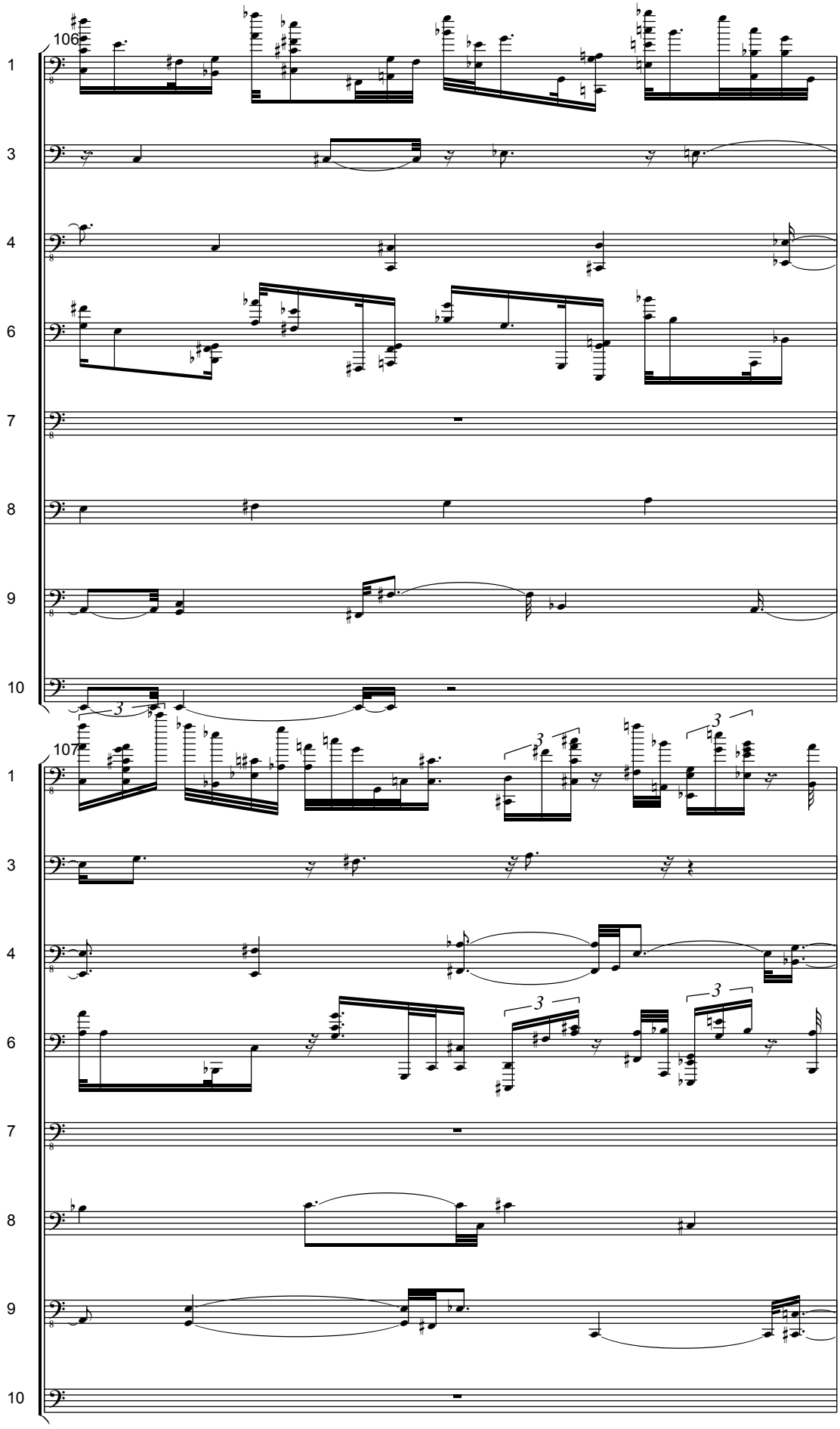

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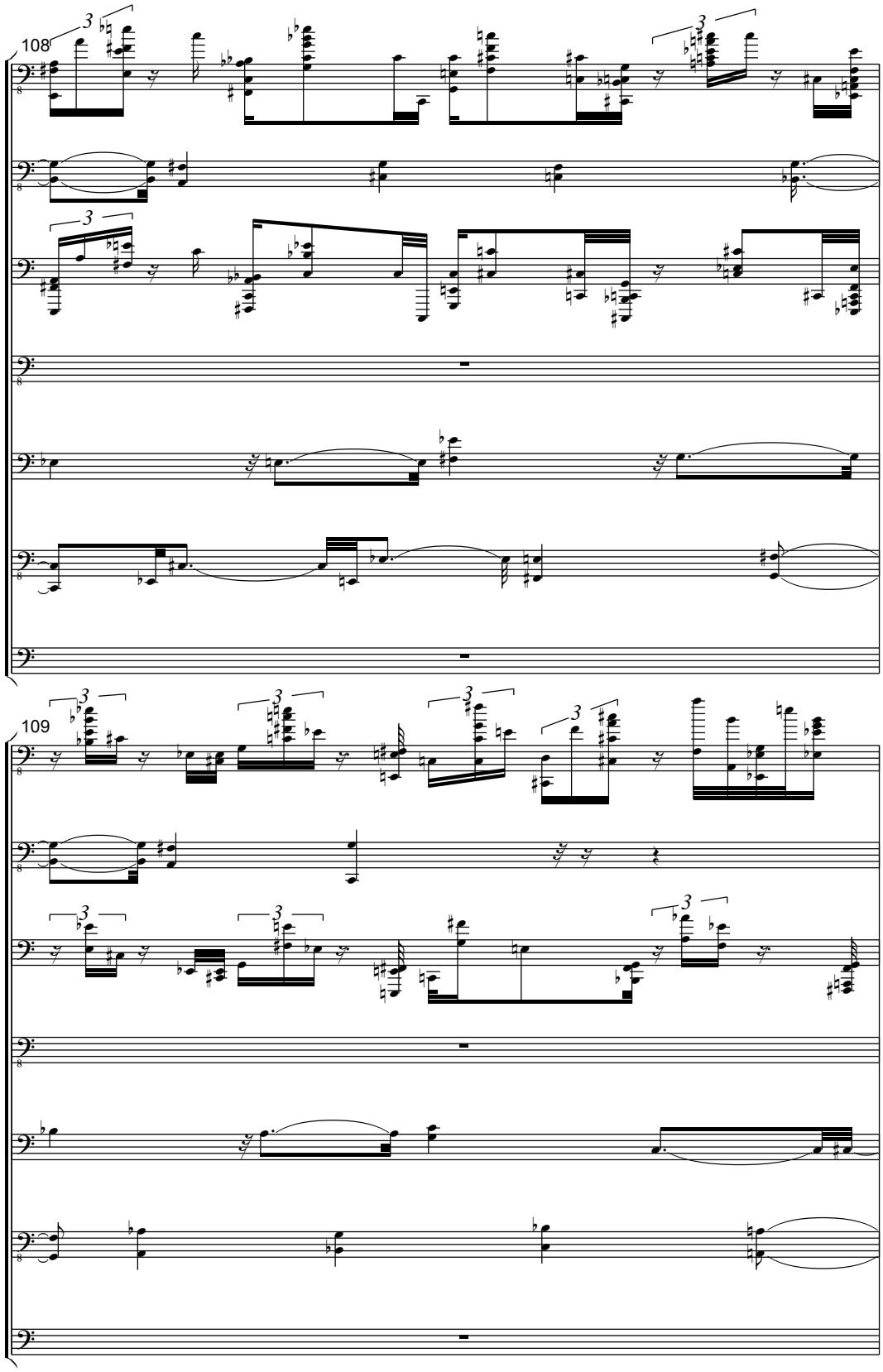

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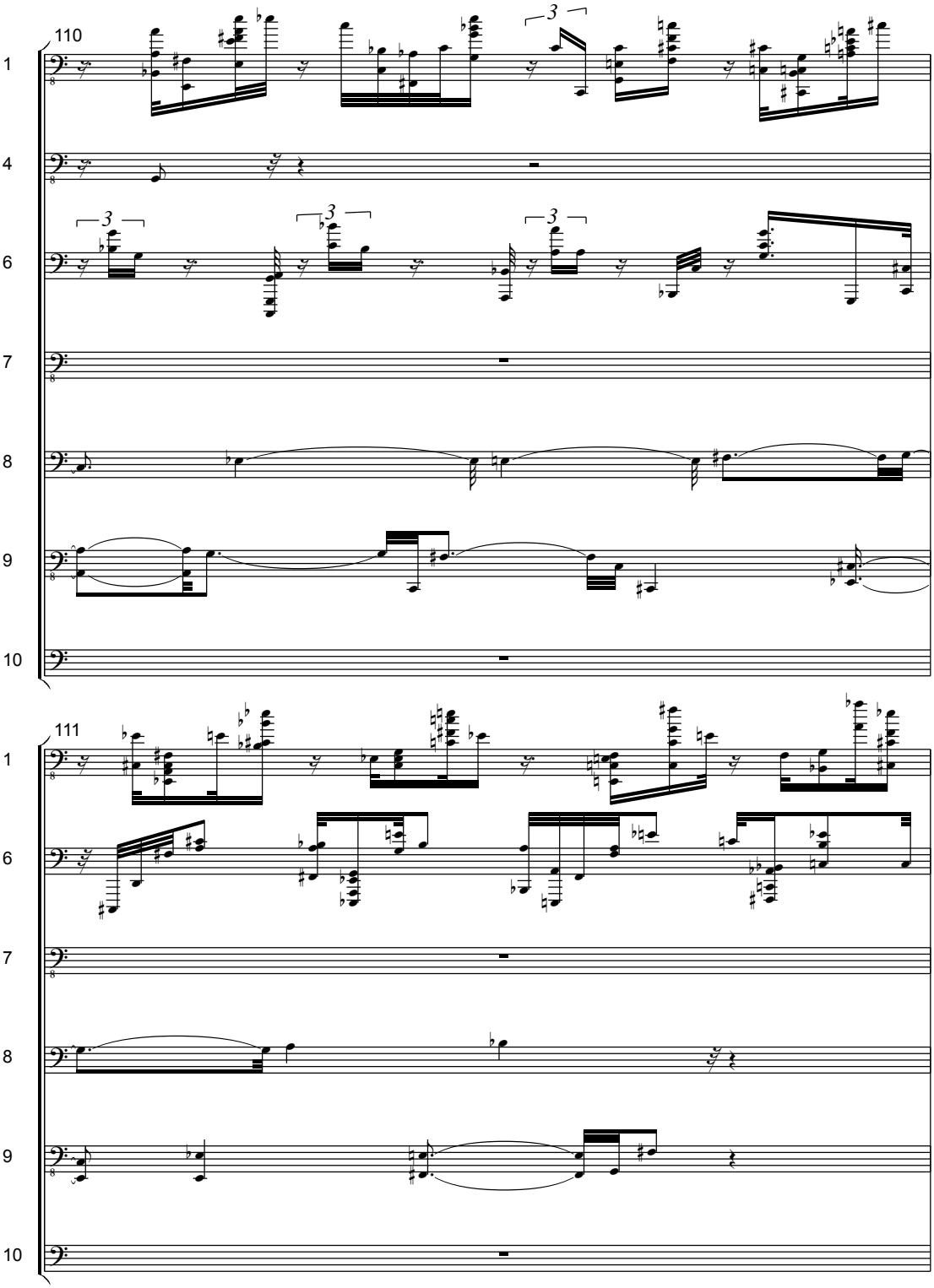

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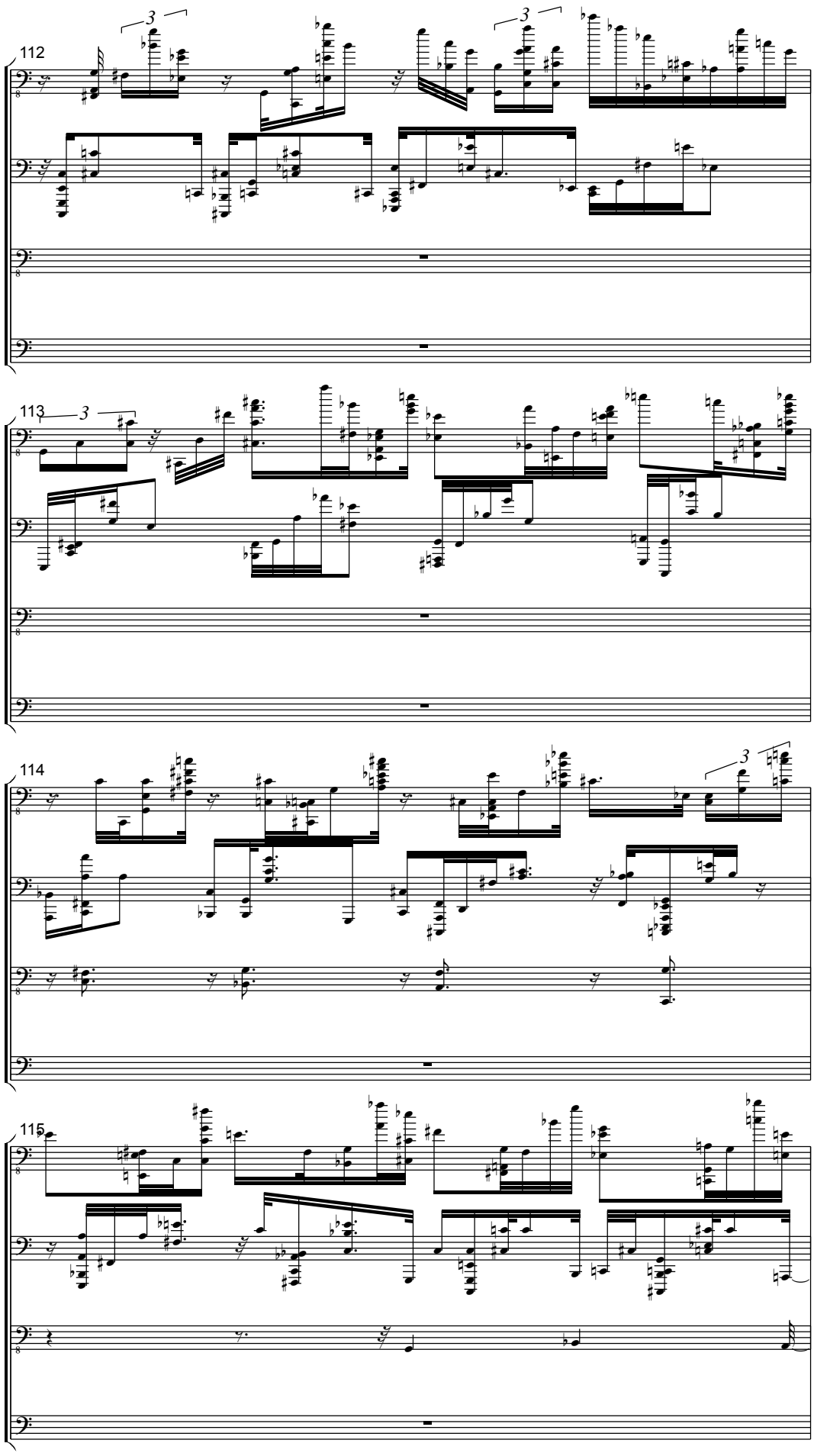

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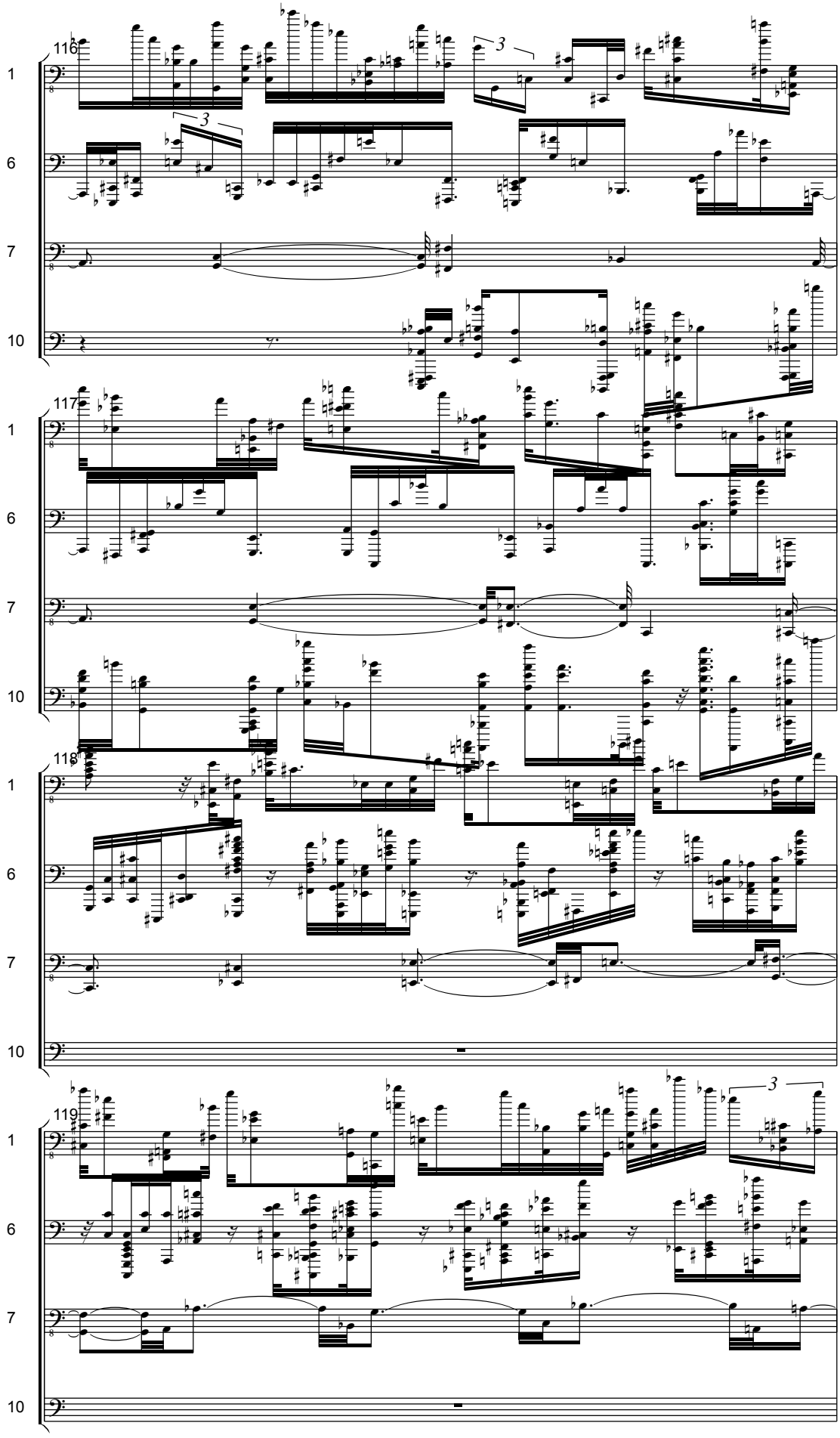

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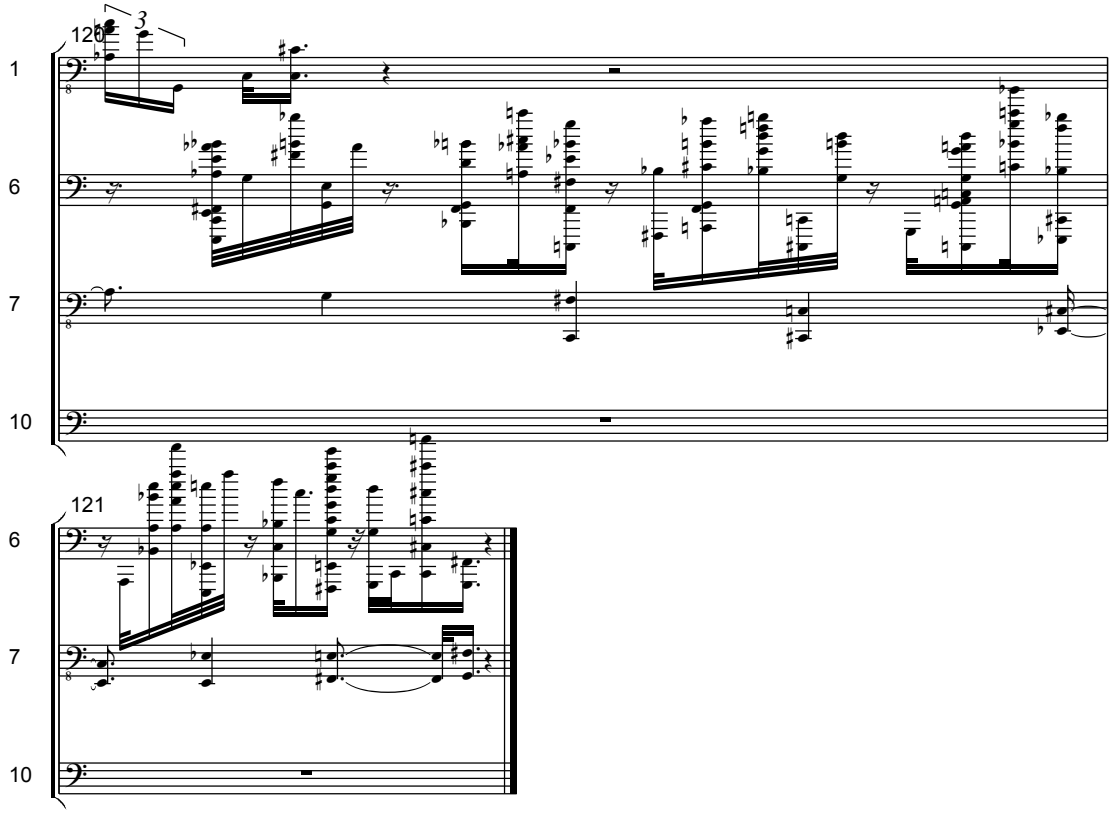

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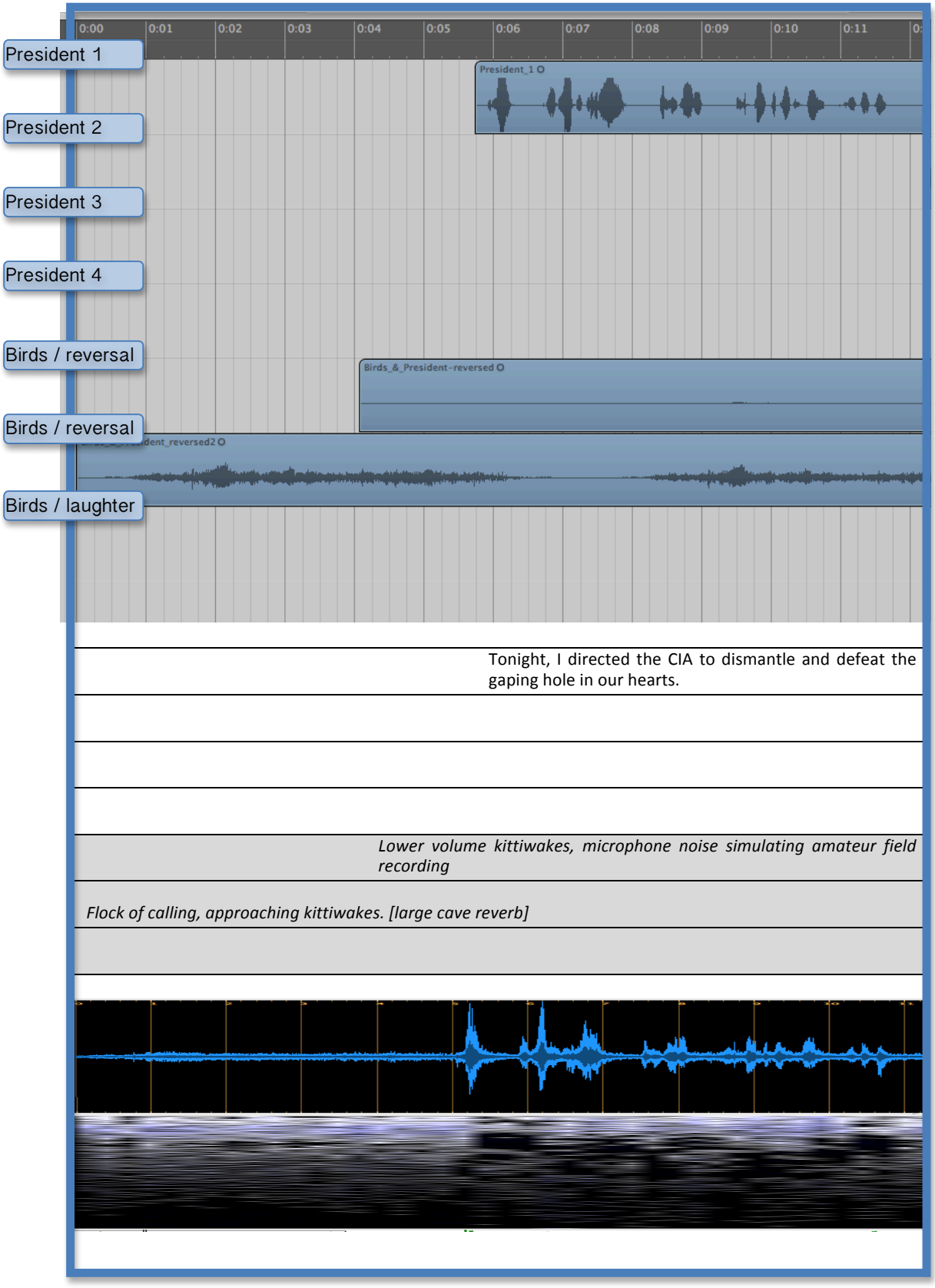
ACOUSMATIC & GEO-LOCATED MUSIC

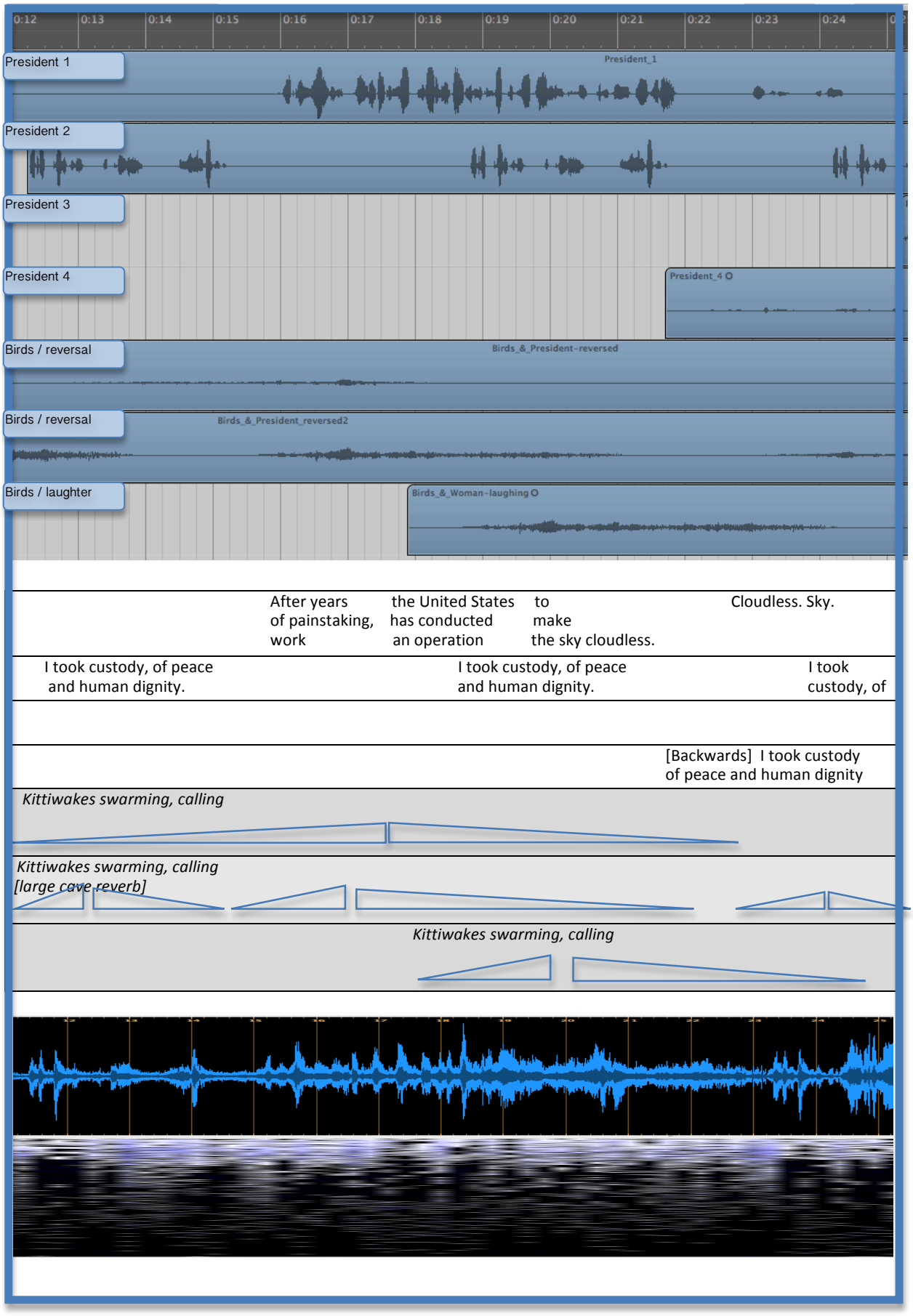
The President: Digitally reconstructed voice

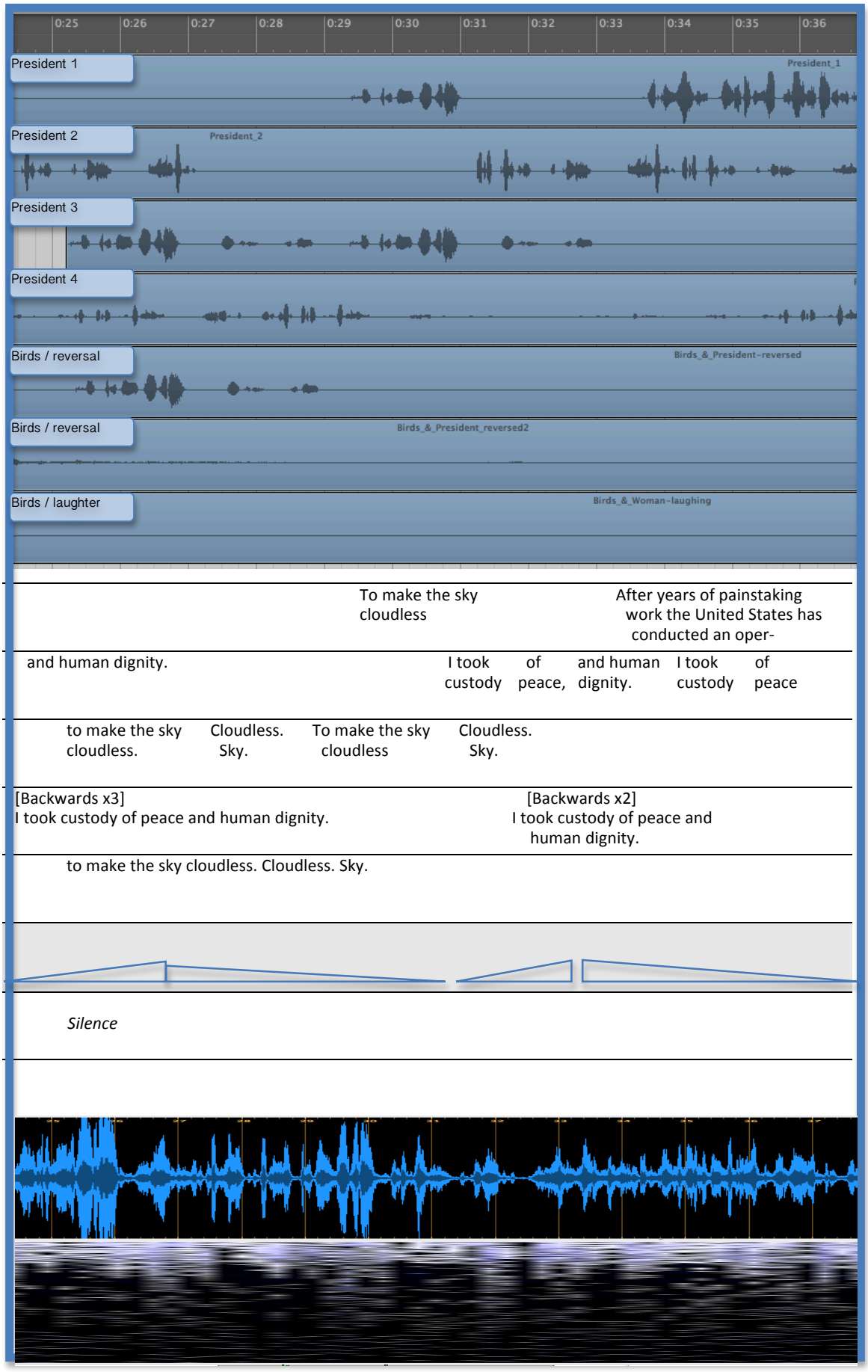
The President

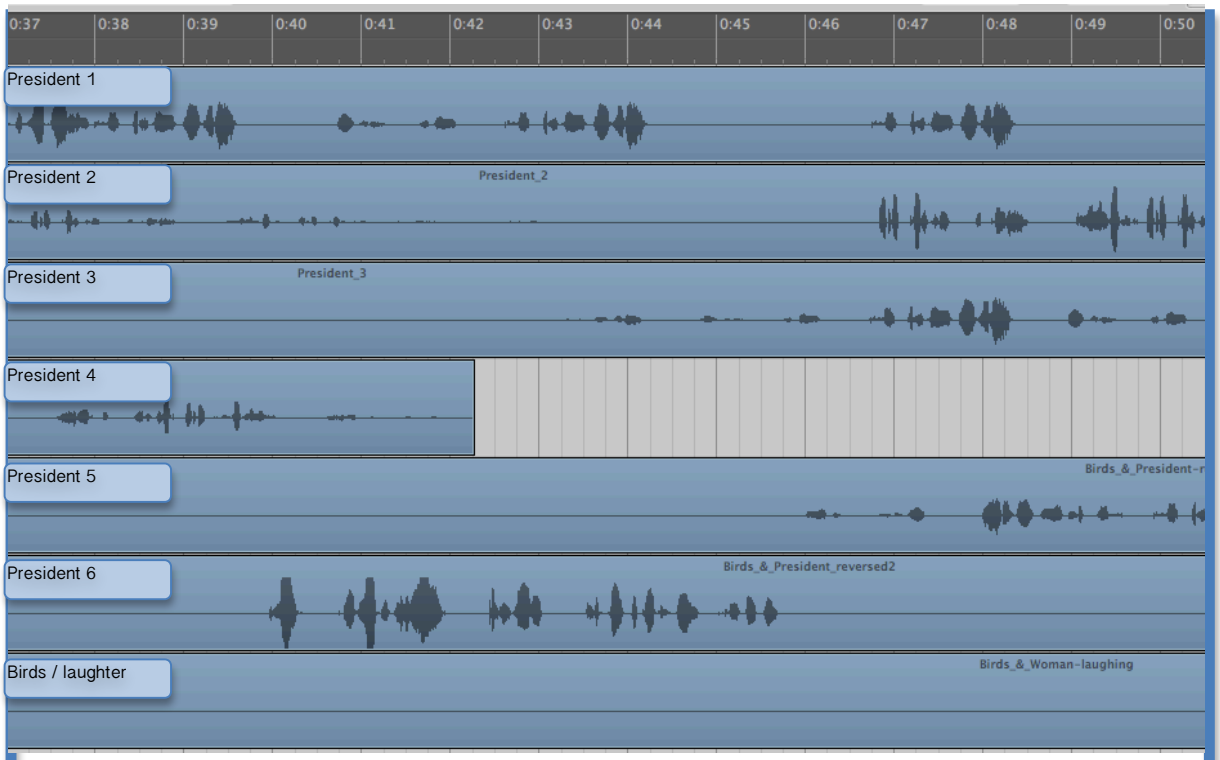
May 2011

Benjamin Mawson

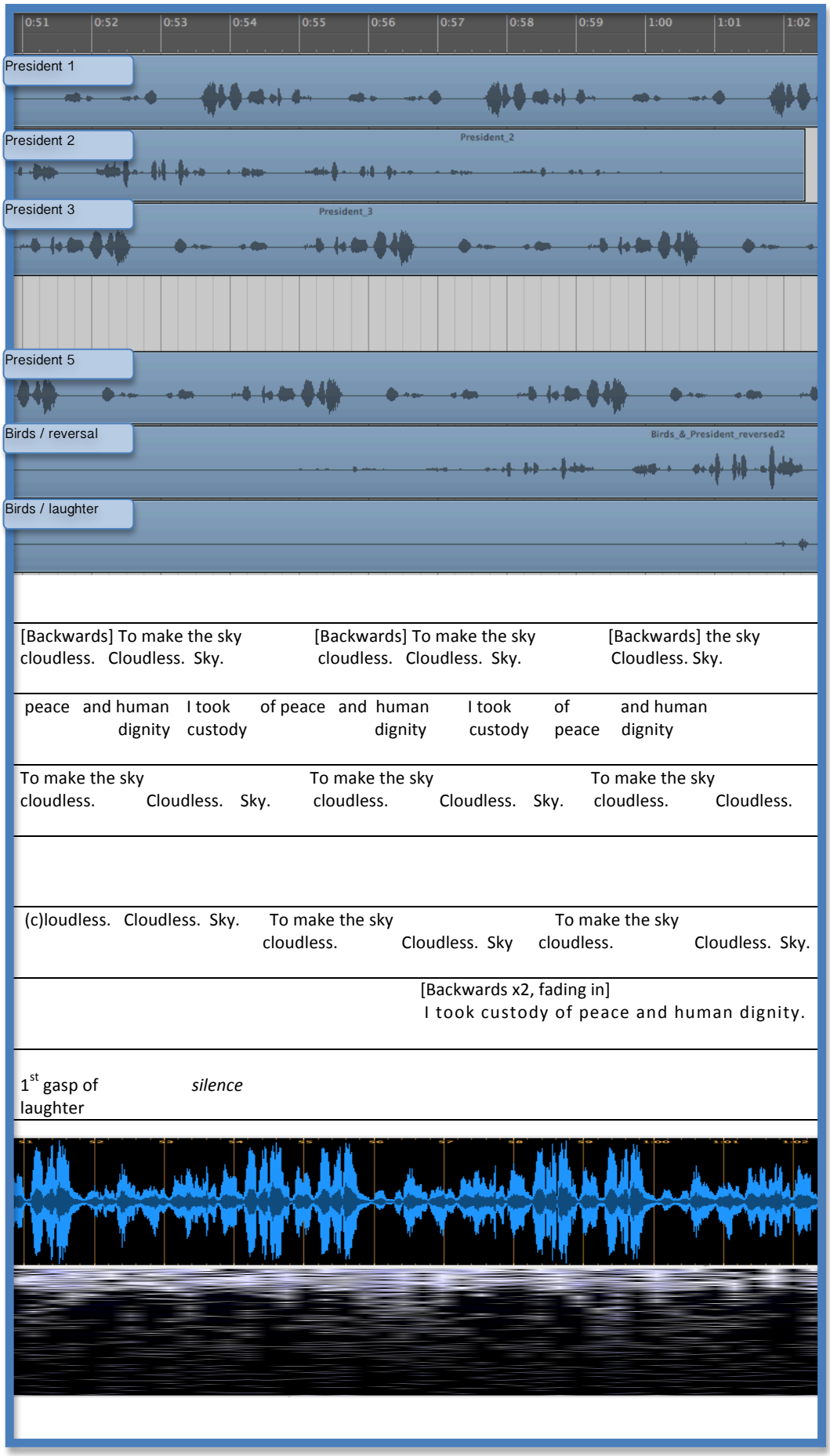



0:12
0:13
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0:16
0:17
0:18
0:19
0:20
0:21
0:22
0:23
0:24
President 1
President_1
President 2
President 3
President 4
President_4
Birds / reversal
Birds_&_President-reversed
Birds / reversal
Birds_&_President_reversed2
Birds / laughter
Birds_&_Woman-laughing
After years of painstaking, work
the United States has conducted an operation
to make the sky cloudless.
Cloudless. Sky.
I took custody, of peace and human dignity.
I took custody, of peace and human dignity.
I took custody, of
[Backwards] I took custody of peace and human dignity
Kittiwakes swarming, calling
Kittiwakes swarming, calling
[large cave reverb]
Kittiwakes swarming, calling

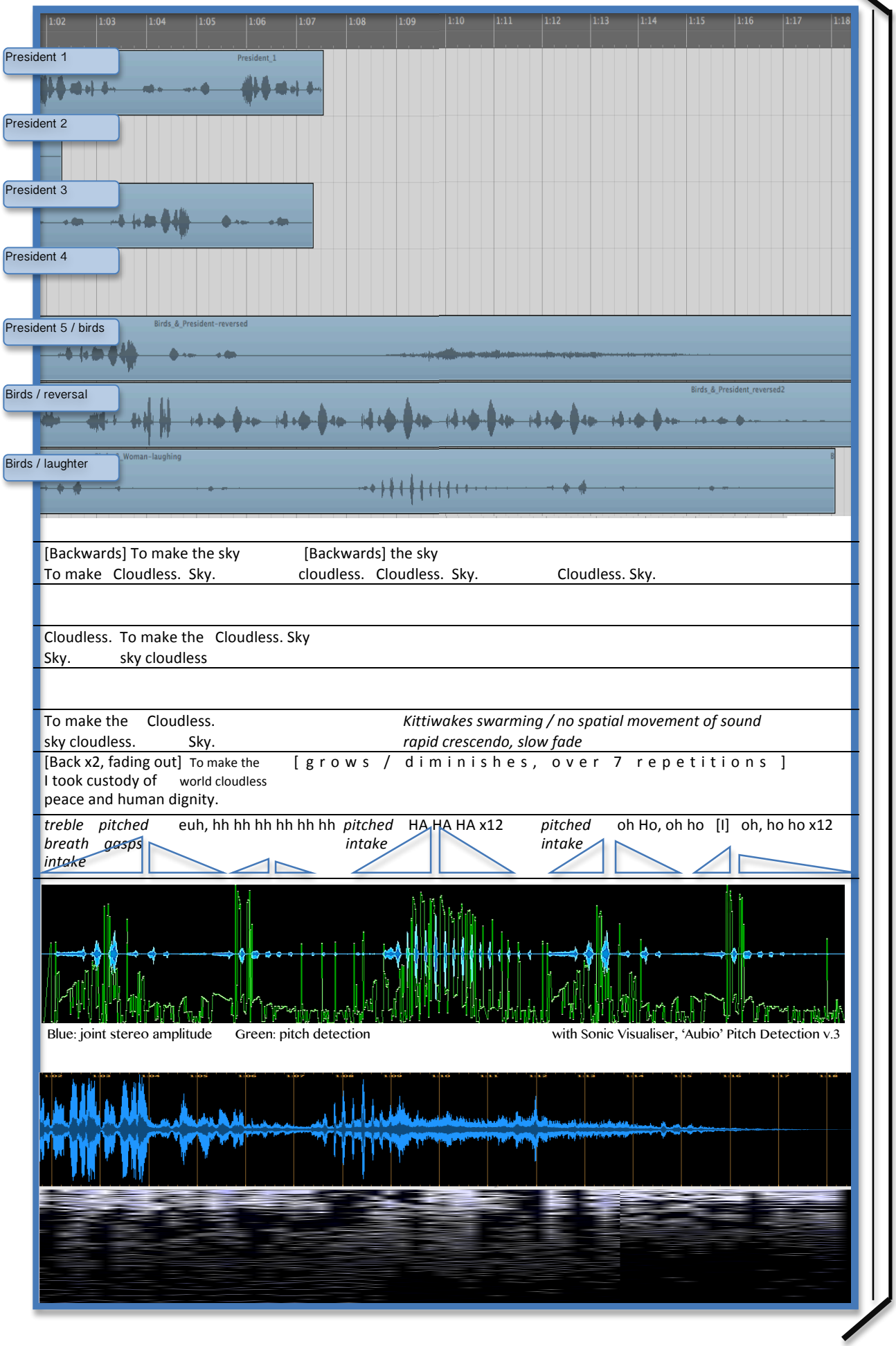

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0:35
0:36
President 1
President_1
President 2
President_2
President 3
President 4
Birds / reversal
Birds_&_President-reversed
Birds / reversal
Birds_&_President_reversed2
Birds / laughter
Birds_&_Woman-laughing
To make the sky cloudless
After years of painstaking work the United States has conducted an oper-
and human dignity.
I took custody of peace,
and human dignity.
I took custody of peace
to make the sky cloudless.
Cloudless. Sky.
To make the sky cloudless
Cloudless. Sky.
[Backwards x3]
I took custody of peace and human dignity.
[Backwards x2]
I took custody of peace and human dignity.
to make the sky cloudless. Cloudless. Sky.
Silence


0:37
0:38
0:39
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0:41
0:42
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0:45
0:46
0:47
0:48
0:49
0:50
President 1
President 2
President_2
President 3
President_3
President 4
President 5
Birds_&_President-r
President 6
Birds_&_President_reversed2
Birds / laughter
Birds_&_Woman-laughing

| | | |



[Backwards] To make the sky cloudless. Cloudless. Sky.	[Backwards] To make the sky cloudless. Cloudless. Sky.	[Backwards] the sky Cloudless. Sky.
peace and human dignity I took custody	of peace and human dignity	I took custody of peace and human dignity
To make the sky cloudless. Cloudless. Sky.	To make the sky cloudless. Cloudless. Sky.	To make the sky cloudless. Cloudless.
(c)loudless. Cloudless. Sky.	To make the sky cloudless. Cloudless. Sky	To make the sky cloudless. Cloudless. Sky.
	[Backwards x2, fading in] I took custody of peace and human dignity.	
1st gasp of laughter	*silence*	



[Backwards] To make the sky [Backwards] the sky
To make Cloudless. Sky. cloudless. Cloudless. Sky. Cloudless. Sky.

Cloudless. To make the Cloudless. Sky
Sky. sky cloudless

To make the Cloudless. *Kittiwakes swarming / no spatial movement of sound*
sky cloudless. Sky. *rapid crescendo, slow fade*

[Back x2, fading out] To make the [g r o w s / d i m i n i s h e s , o v e r 7 r e p e t i t i o n s]
I took custody of world cloudless
peace and human dignity.

treble breath intake *pitched gasps* euh, hh hh hh hh hh hh *pitched intake* HA HA HA x12 *pitched intake* oh Ho, oh ho [I] oh, ho ho x12

Blue: joint stereo amplitude Green: pitch detection with Sonic Visualiser, 'Aubio' Pitch Detection v.3

Caedmon's Hymn: Virtual performance, plunderphonic

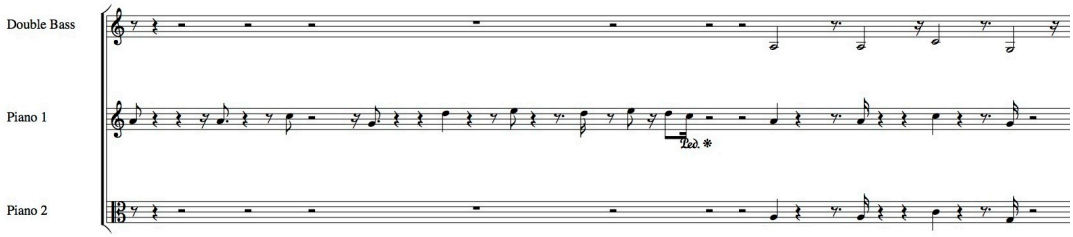
Caedmon's Hymn August 2011

0'16"

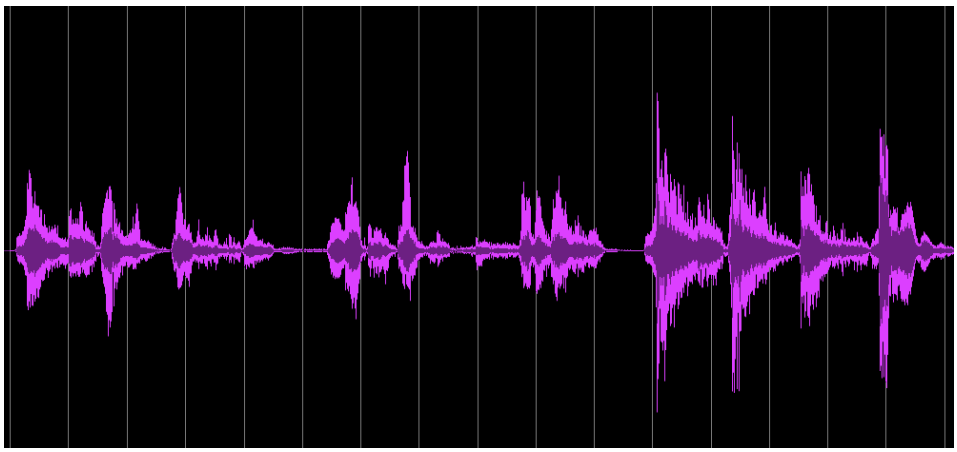
Chanting voices (& toy guitar)



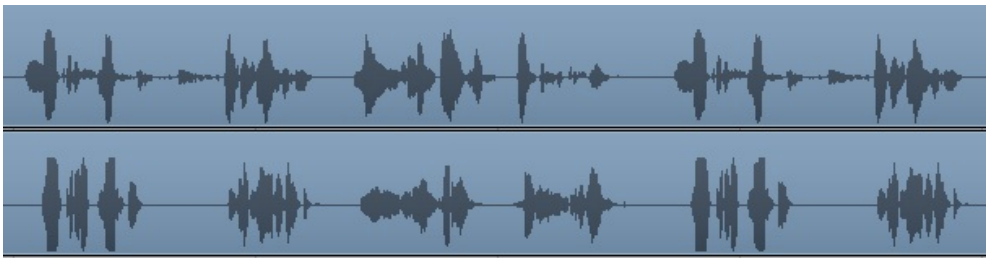
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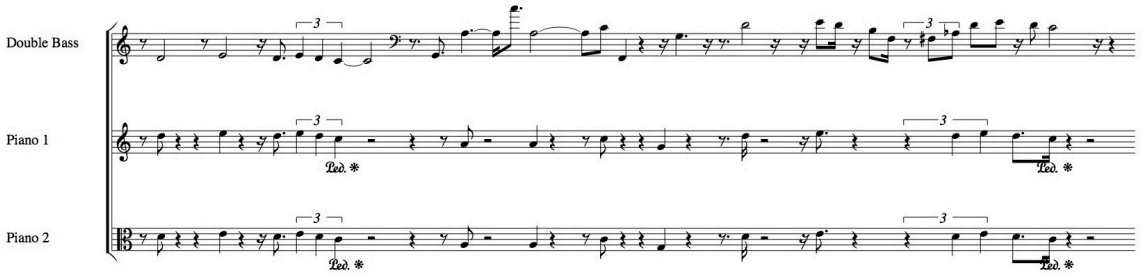


Ampltitude waveform of ensemble (indicating volume changes and attacks

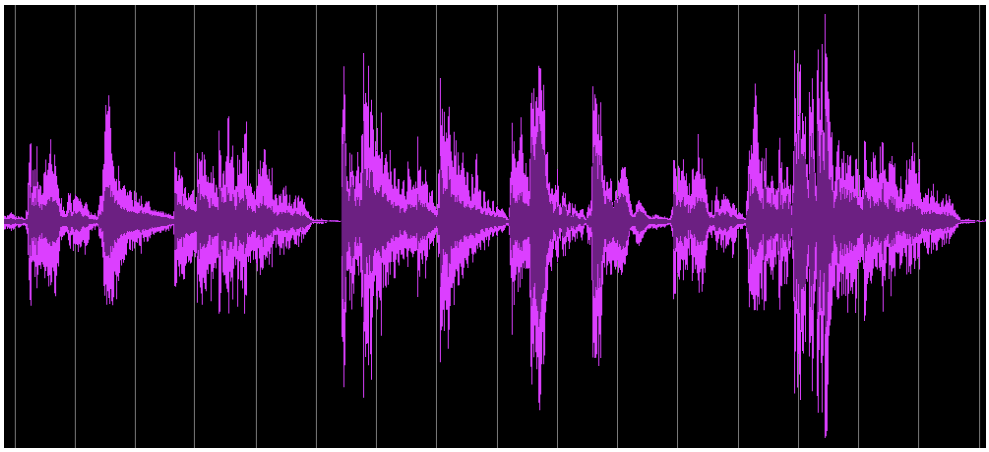


0’32”

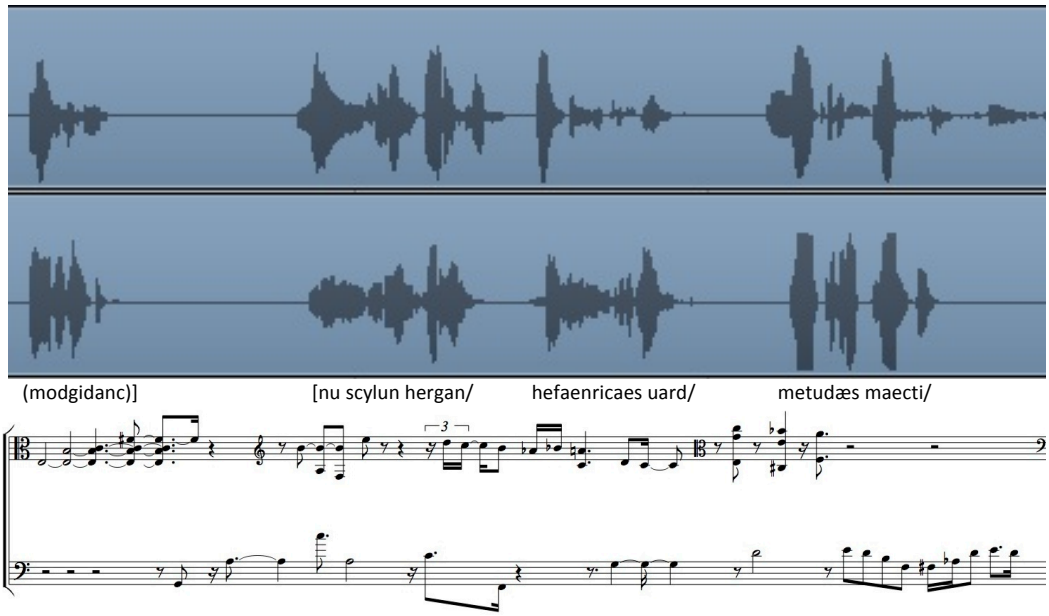


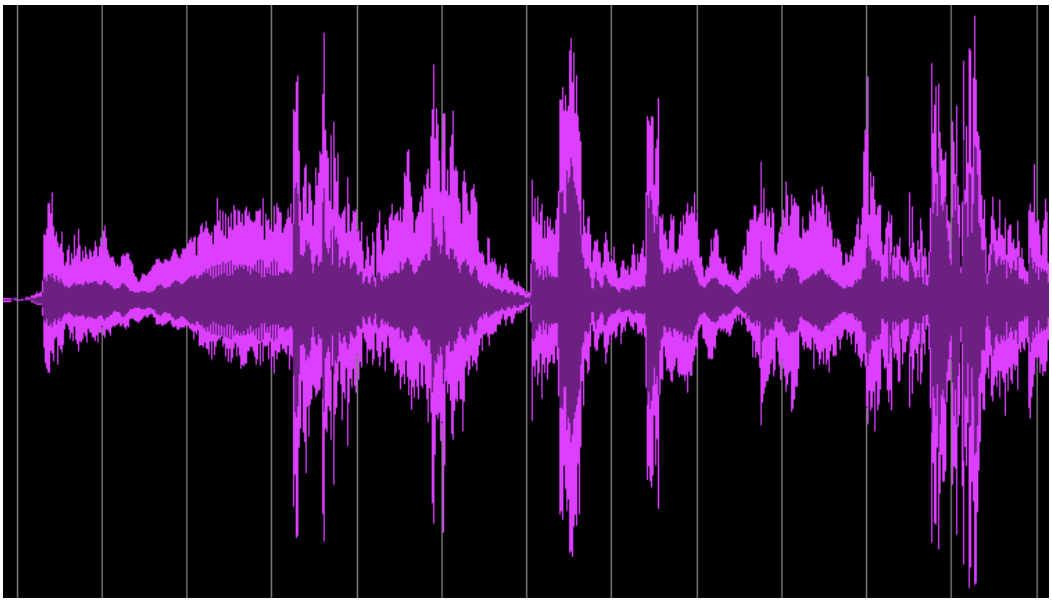
metudæs maecti/ end his modgidanc/] [nu scylun hergan/ hefaenricaes uard/ metudæs maecti/ end his modgidanc/



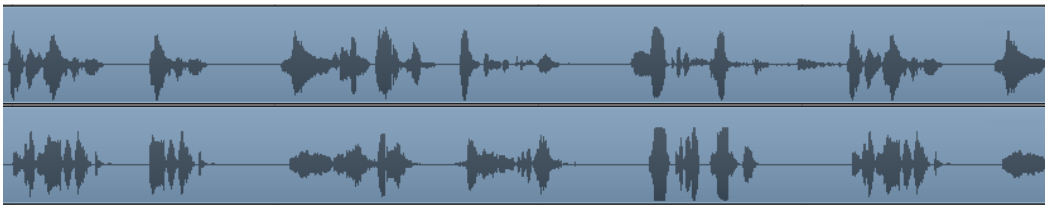


0’44”

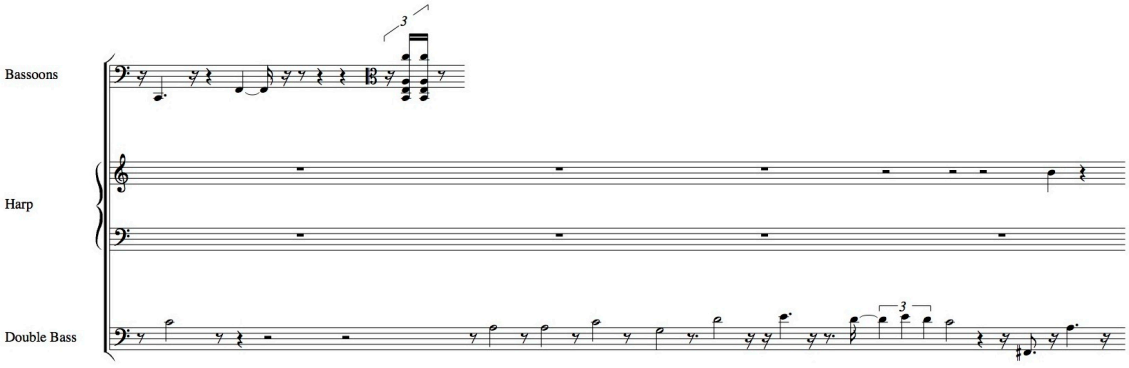

(modgidanc)]
[nu scylun hergan/
hefaenricaes uard/
metudæs maecti/
Bassoons
Double Bass
3

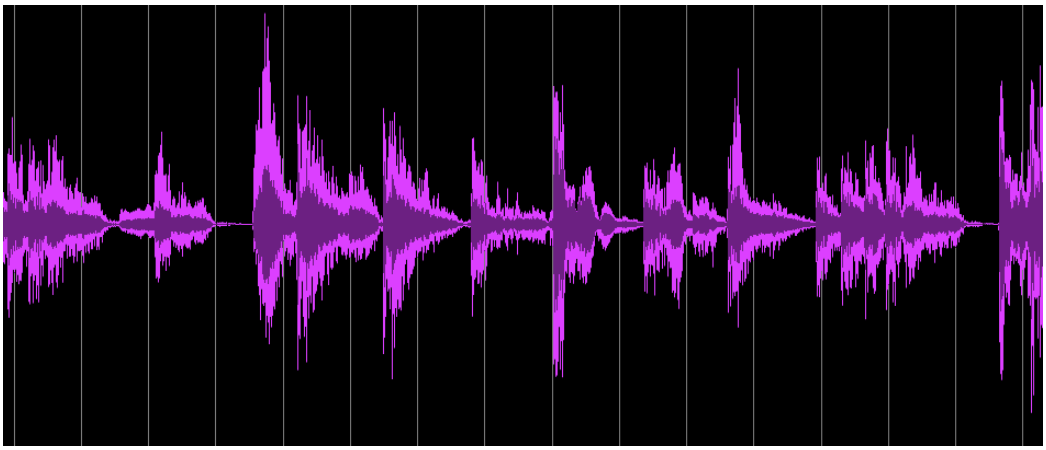


0’59.5”

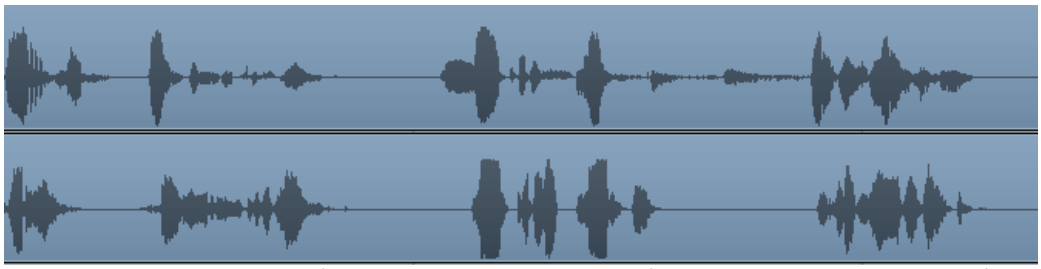


end his (modgidanc)/] [nu scylun hefaenricaes metudæs end his [nu
modgidanc hergan/ uard/ maecti/ modgidanc/] scylun/
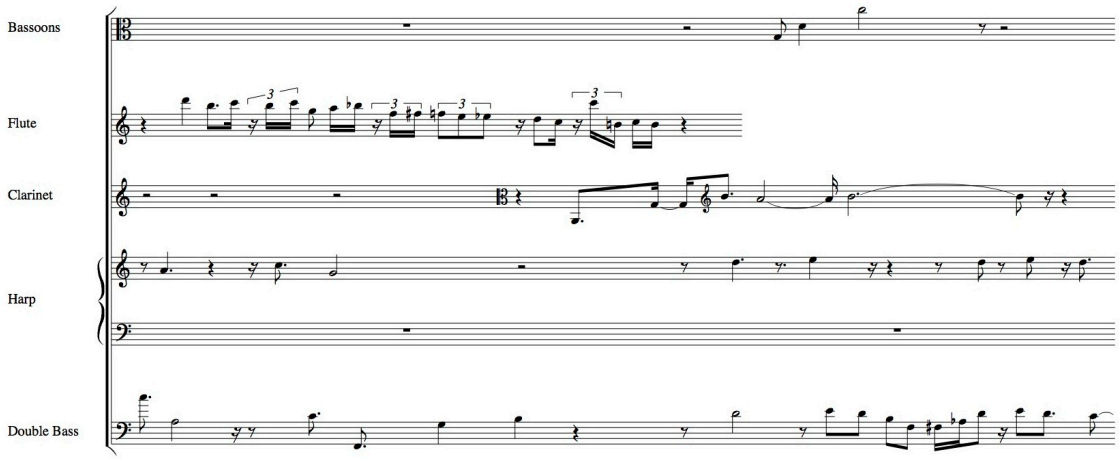


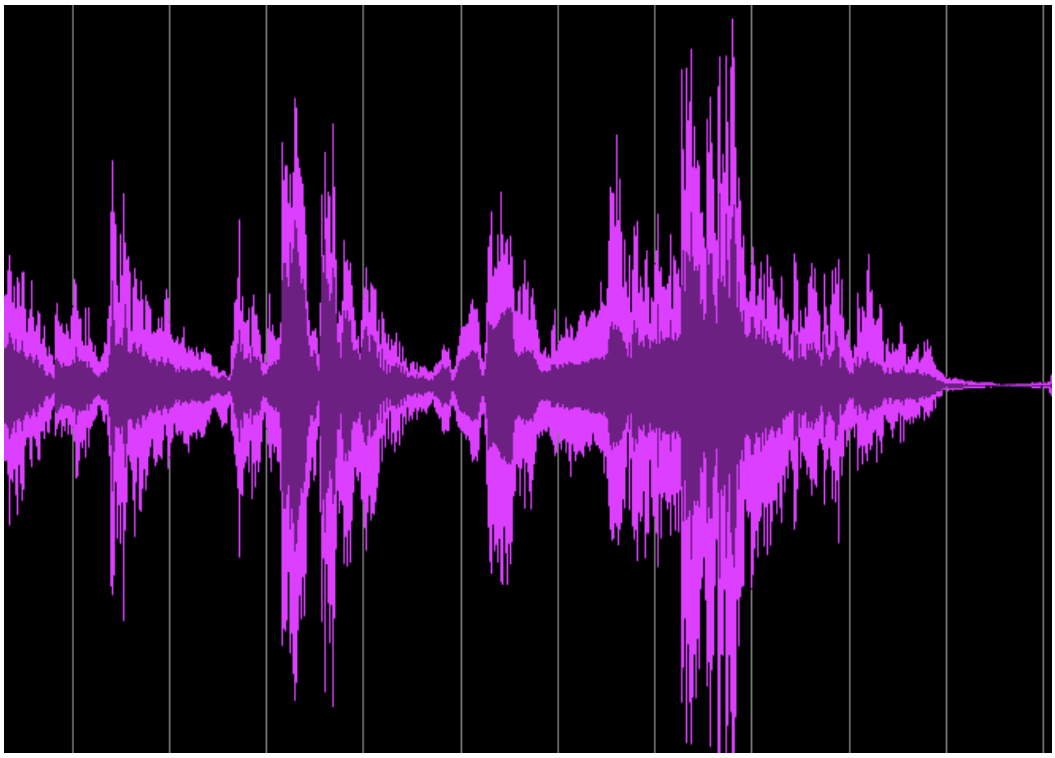


1’10”



hergan hefaenricaes uard/ metudæs maecti/ end his modgidanc/]
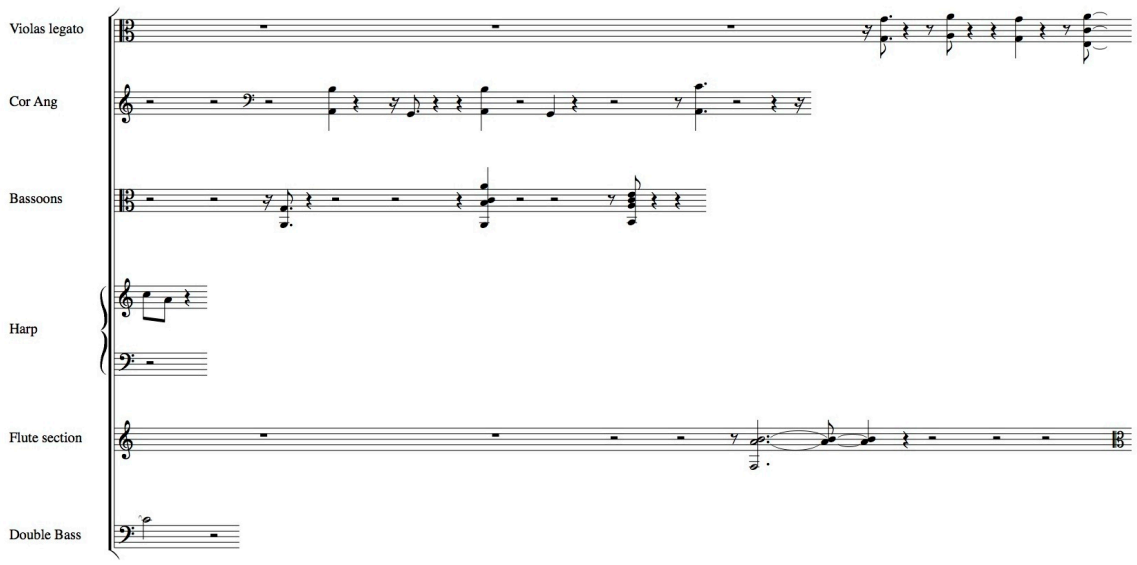


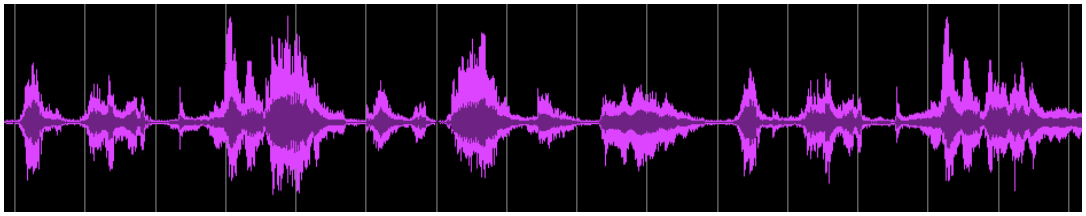


1’25”

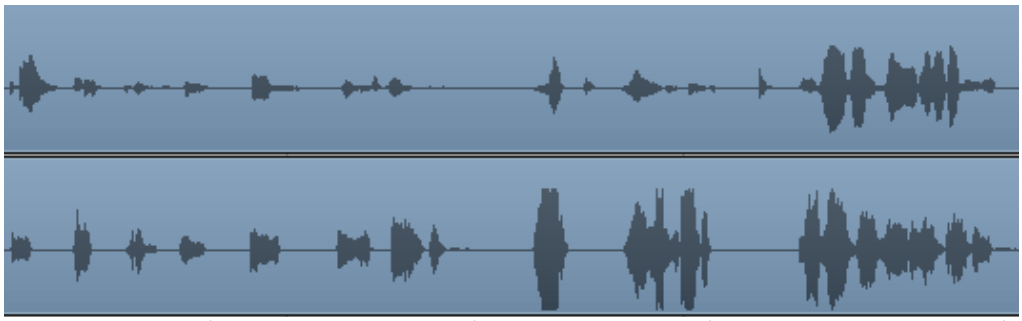


[uerc uuldurfadur/ swe he uundra gihwaes/ e- - c – l dryc- tin/ or- - - astelidæ/] [uerc uuldurfadur/ swe he uundra gihwaes/

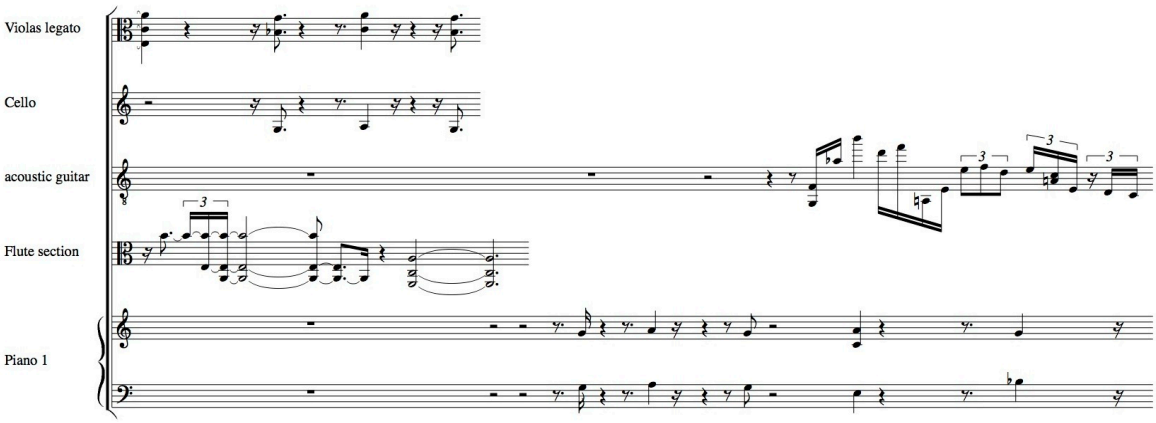


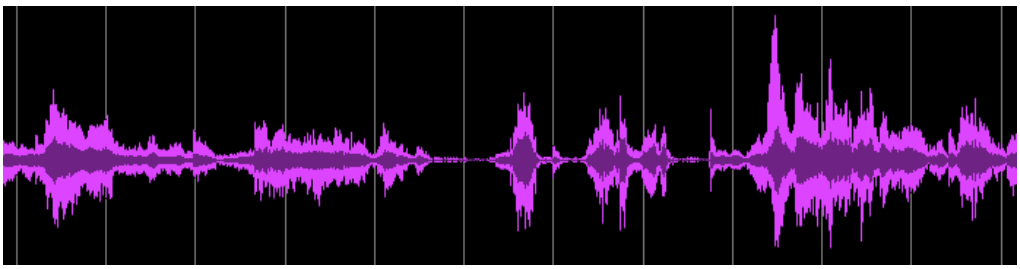


1’36”

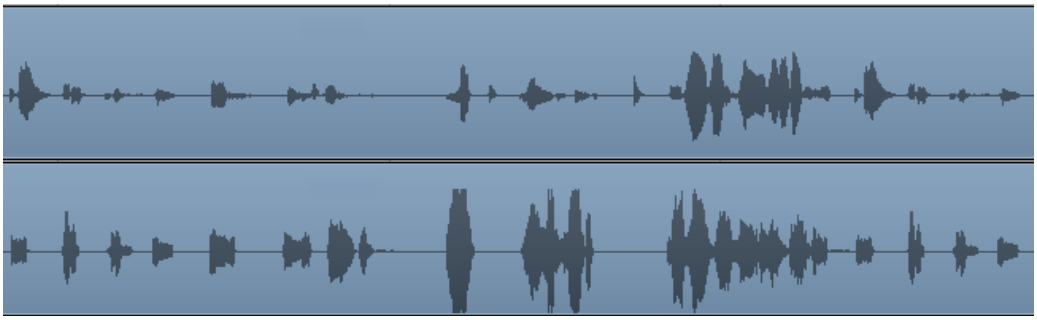


e - c - i dryc- tin/ or- - - as- - - teli- -dæ /] [uerc uuldurfadur/ swe he uundra gihwaes/
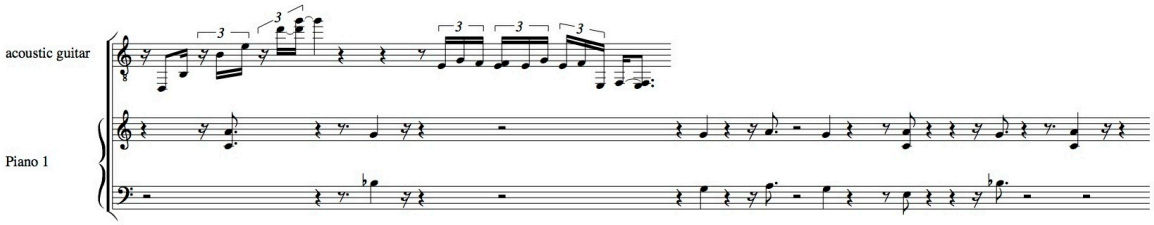


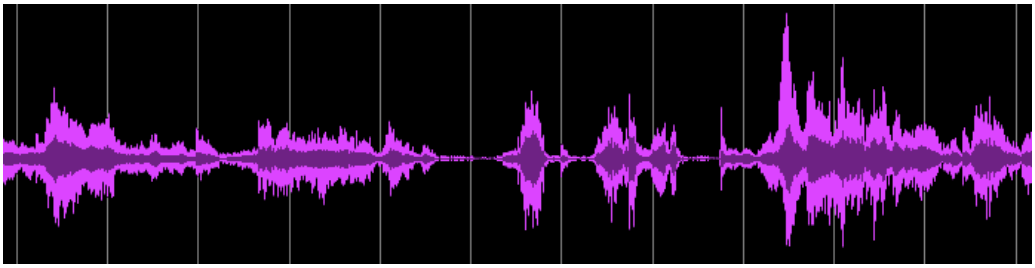


1’48”

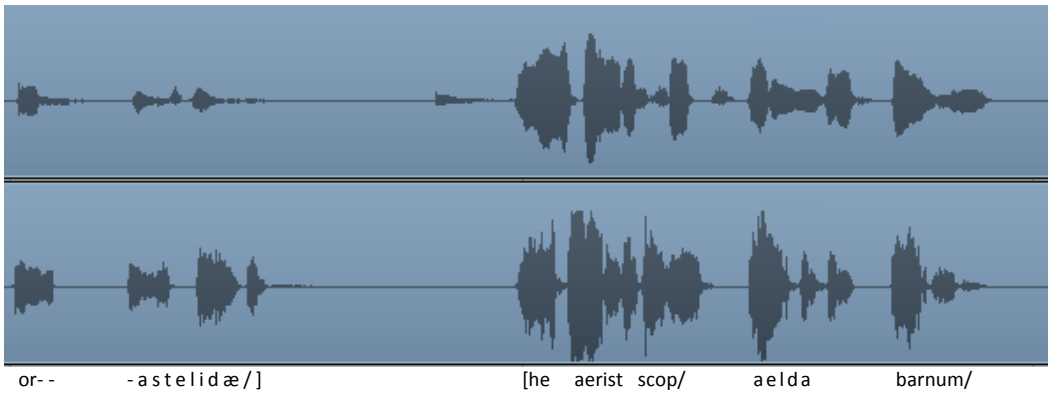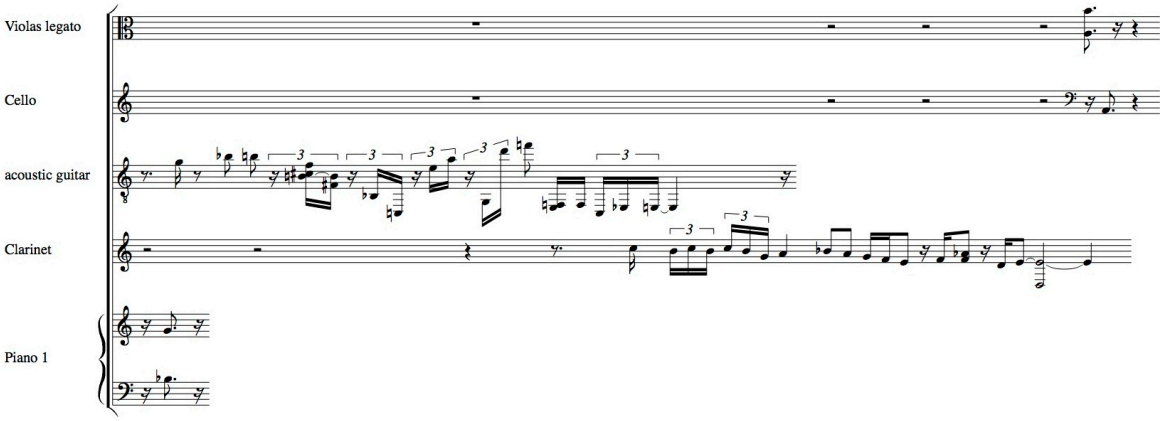


e-c-i dryc- tin/ or astelidæ/] [uerc uuldurfadur/ swe he uundra gihwaes/ e – c - i dryc- tin/

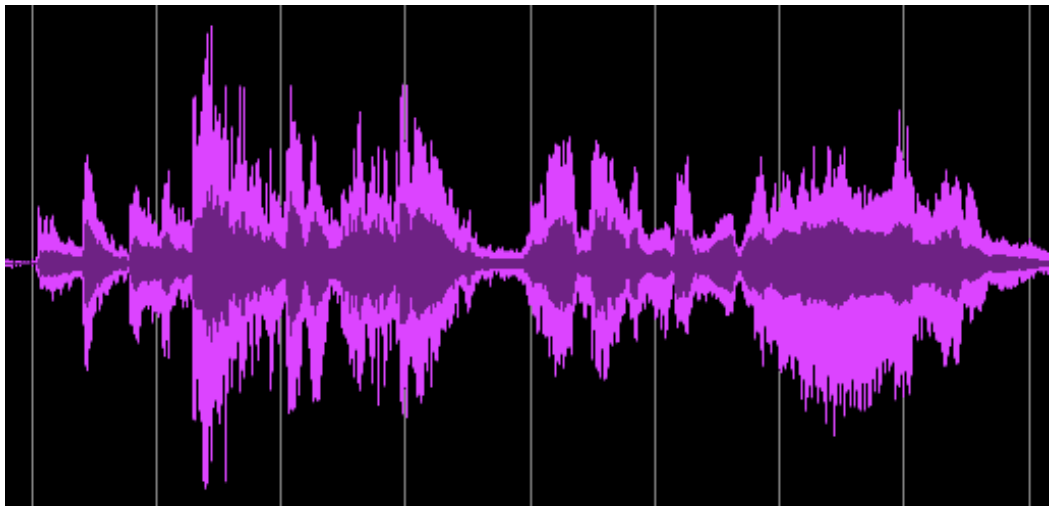




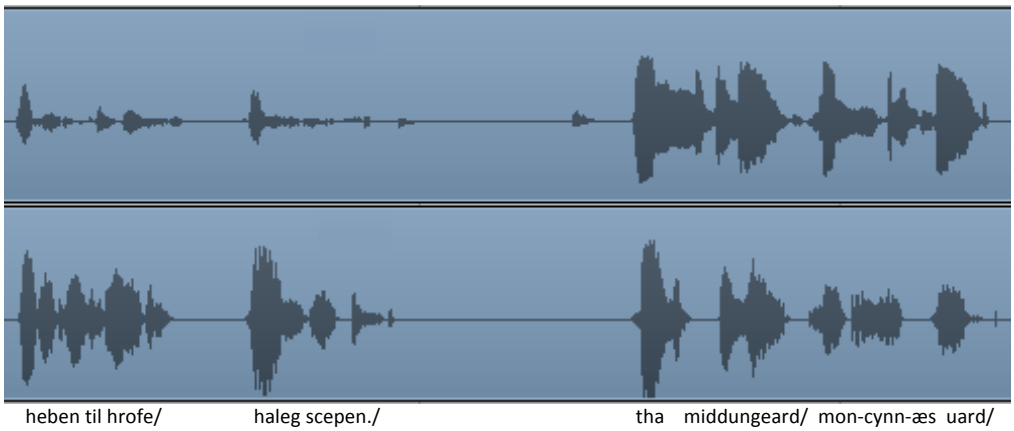
1’56”


or- - - a s t e l i d æ /]
[he aerist scop/ a e l d a barnum/
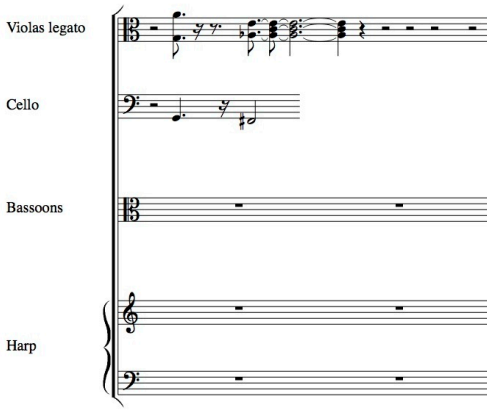

Violas legato
Cello
acoustic guitar
Clarinet
Piano 1

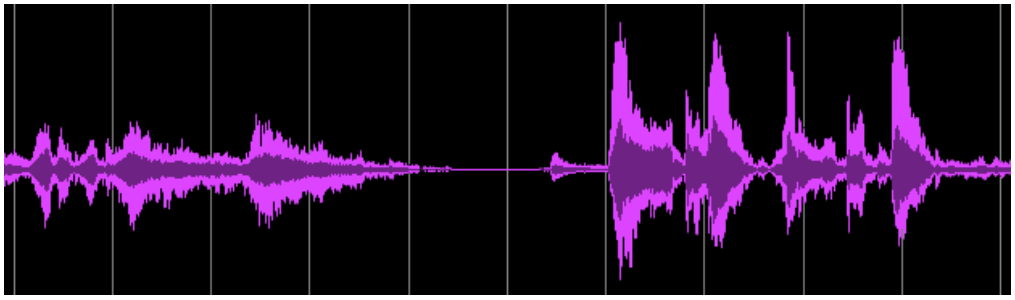


2’06”

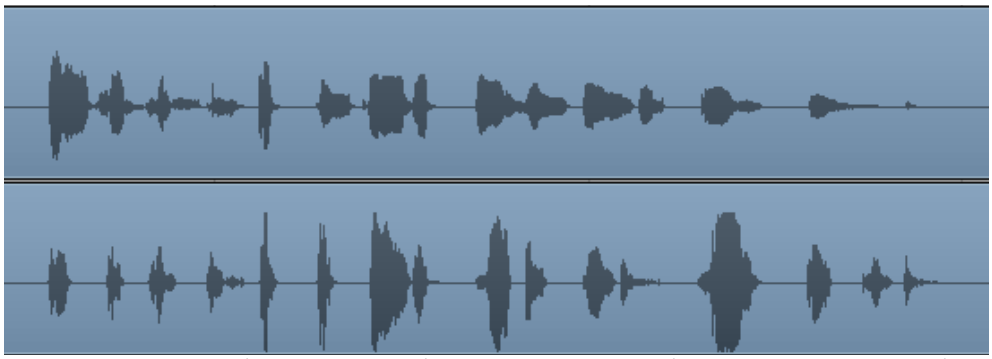


heben til hrofe/ haleg scepen./ tha middungeard/ mon-cynn-æs uard/
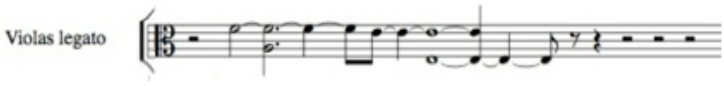


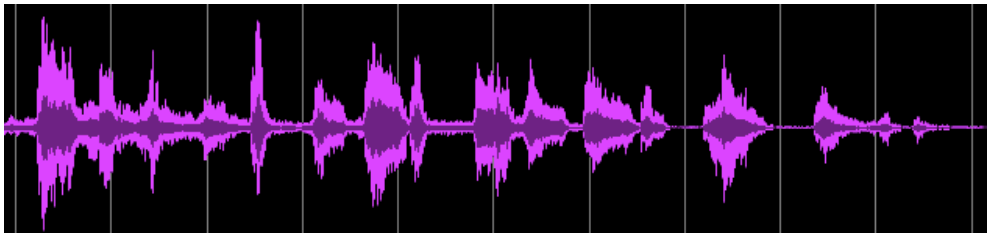


2’16”



e - c - i - dryc -tin/ æ f t e r tiadæ/ f i r u m f o l d u / frea a l l m e c t i g /]





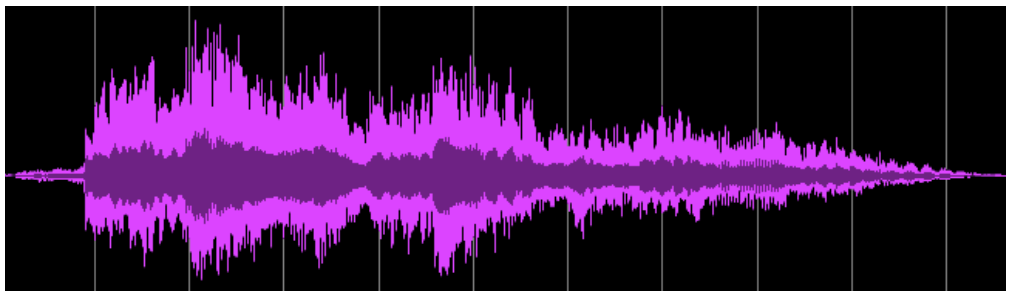
2’27”
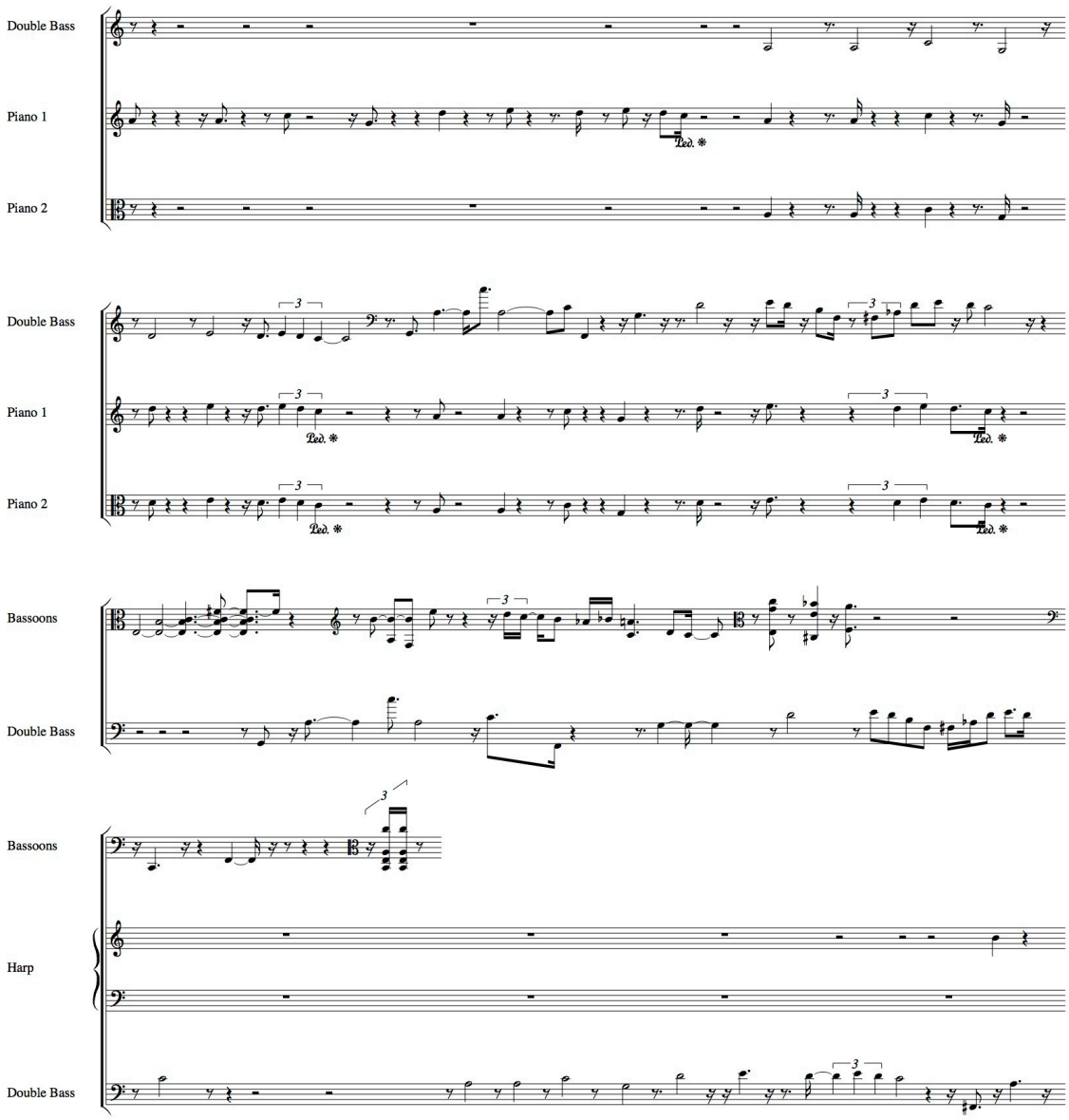
_____/

_____/

Violas legato
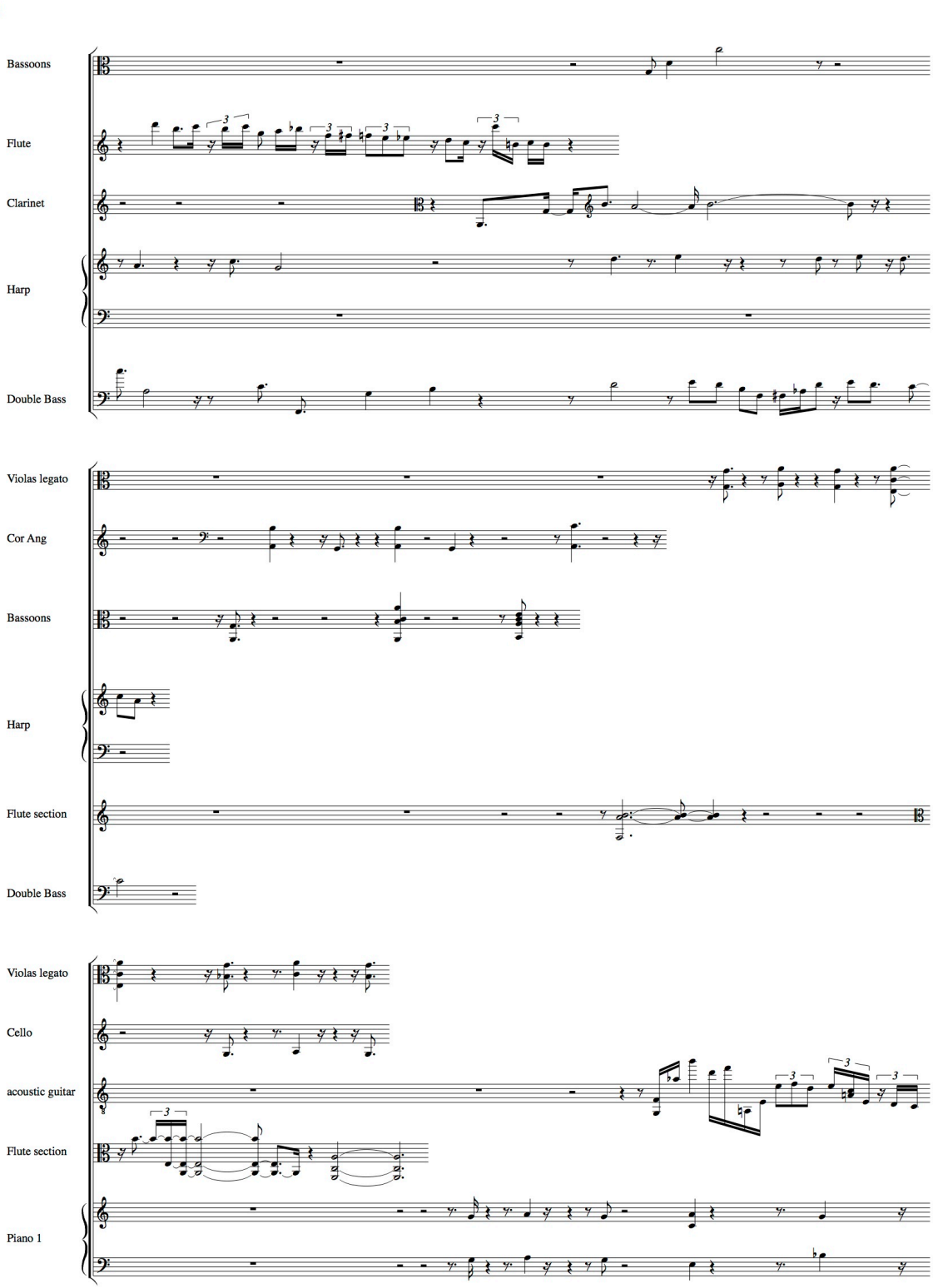
Bassoons
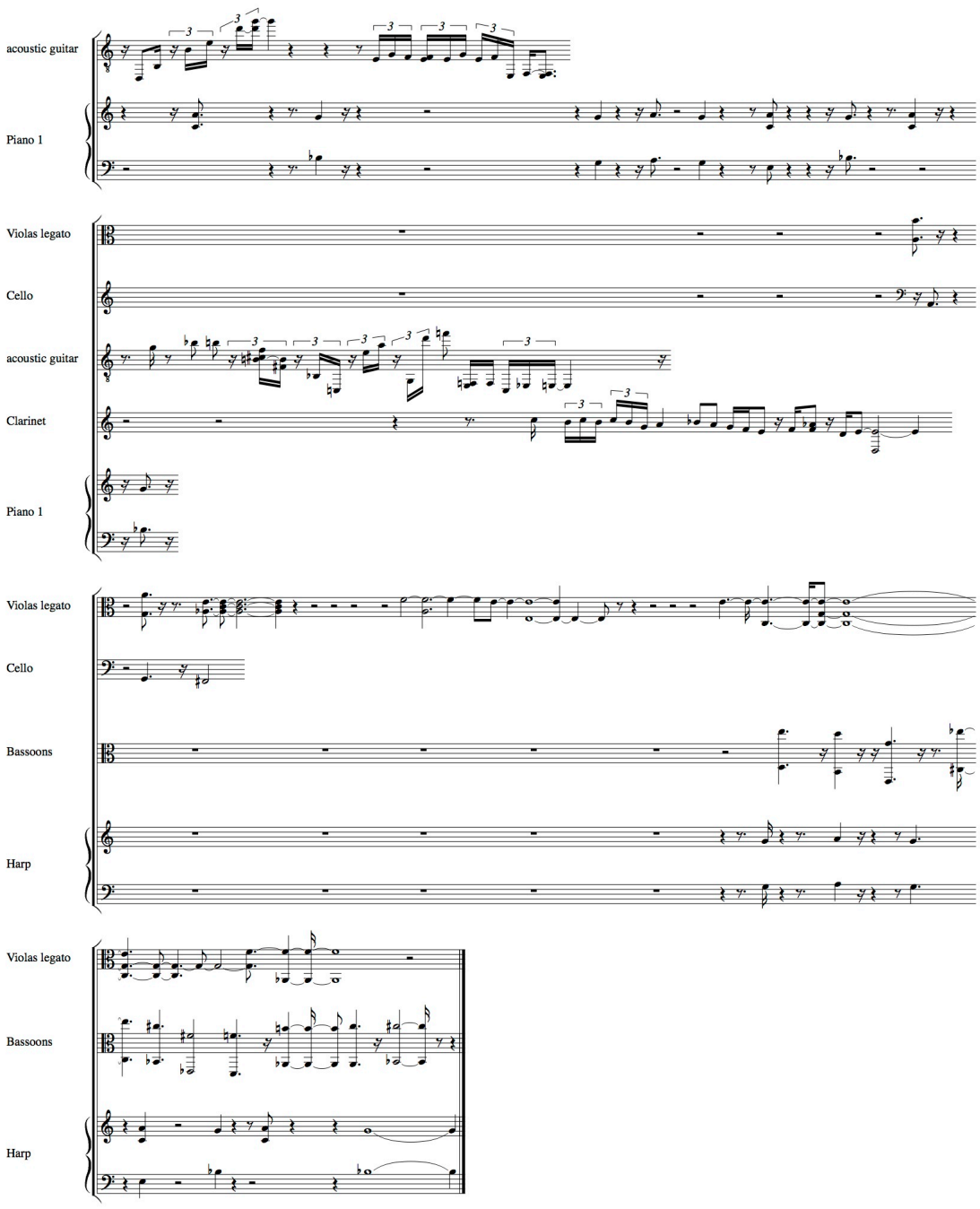


Caedmon's Hymn August 2011

Instrumental parts only


Double Bass
Piano 1
Piano 2
Double Bass
Piano 1
Piano 2
Bassoons
Double Bass
Bassoons
Harp
Double Bass


Bassoons
Flute
Clarinet
Harp
Double Bass
Violas legato
Cor Ang
Bassoons
Harp
Flute section
Double Bass
Violas legato
Cello
acoustic guitar
Flute section
Piano 1


acoustic guitar
Piano 1
Violas legato
Cello
acoustic guitar
Clarinet
Piano 1
Violas legato
Cello
Bassoons
Harp
Violas legato
Bassoons
Harp

Credo: Virtual performance, plunderphonic

Credo (acousmatic) 2012

This score of Credo is compiled from 'Arrange' views of the composition process in Logic 9 DAW software.

Figure 1 shows the separation of sampled audio and instrumental (MIDI) parts. Blue regions are composited, sampled audio of voices. Green regions represent instrumental parts in the accompanying notated score.

It is demarcated according to temporal transitions, the dividers at 5'11" and 8'13" respectively showing transition from section 1 to 2 and between parts of section 2.

It also contains a butterfly form linear representation of all combined channels' amplitude. This gives a generalised indication of fluctuations in loudness as contributory to temporal structure.

Figure 2 combines the time- /region-demarcated overview in Figure 1 with a spectrographic analysis showing peak frequencies according to colour: blue-purple-red-orange-yellow being scale indicators from low to high of amplitude at given frequencies.

Figures 1 and 2 can thus be compared according to changes at once of overall loudness and frequency spectrum coverage as indicators of sound quality and type. These amplitude and frequency indicators are reproduced in higher resolution in the more detailed graphic score that follows.

In the following pages numbers thus: *3* indicate bar number (in accompanying notated score) at which instrumental part begins.

Words on white backgrounds above audio regions give general indication of content.

Accompanying audio files in folder" _Credo_original-audio-files" give source materials.

Label in score	Source
Credo	1_Credo_Messe-Notre-Dame_de-Machaut
Azan	2_Islam-Calls-You
Shingon	3_Buddhist-Chant-Shingon
Shomyo	4_Buddhist-Chant-Shomyo-Dojoge
Tibet	5_Tibetan-Chant
Sofia	6_Sofia_New_Byzantium
Body of Christ	7_TakeyeBodyChristBulgarian
Paraklesis	8_Romanian-Paraclisul
Psalm 33	9_Romanian-Psalm-33

Regions marked "M.R" are MIDI output bounced / re-introduced / transformed as audio.

Audio tracks appearing thus: 

e.g. 1-5 from 5'50" to 10'10" are 'silent' but regions were retained or sections of them duplicated and cross-faded to maintain constant level of noise artefacts in original recordings.

Regions marked "Azan fades" are a recompositing of single voice to different order. Not re-bounced and unified as in other instances as artefacts were amplified by this treatment.

Where discrepancy shows between waveform scales on consecutive pages this is a reflection of the software's re-scaling to permit maximum resolution within a given view (i.e. any duration displayed is shown relative to its own amplitude scale rather than a global one). For overview, refer to Figures 1 and 2.

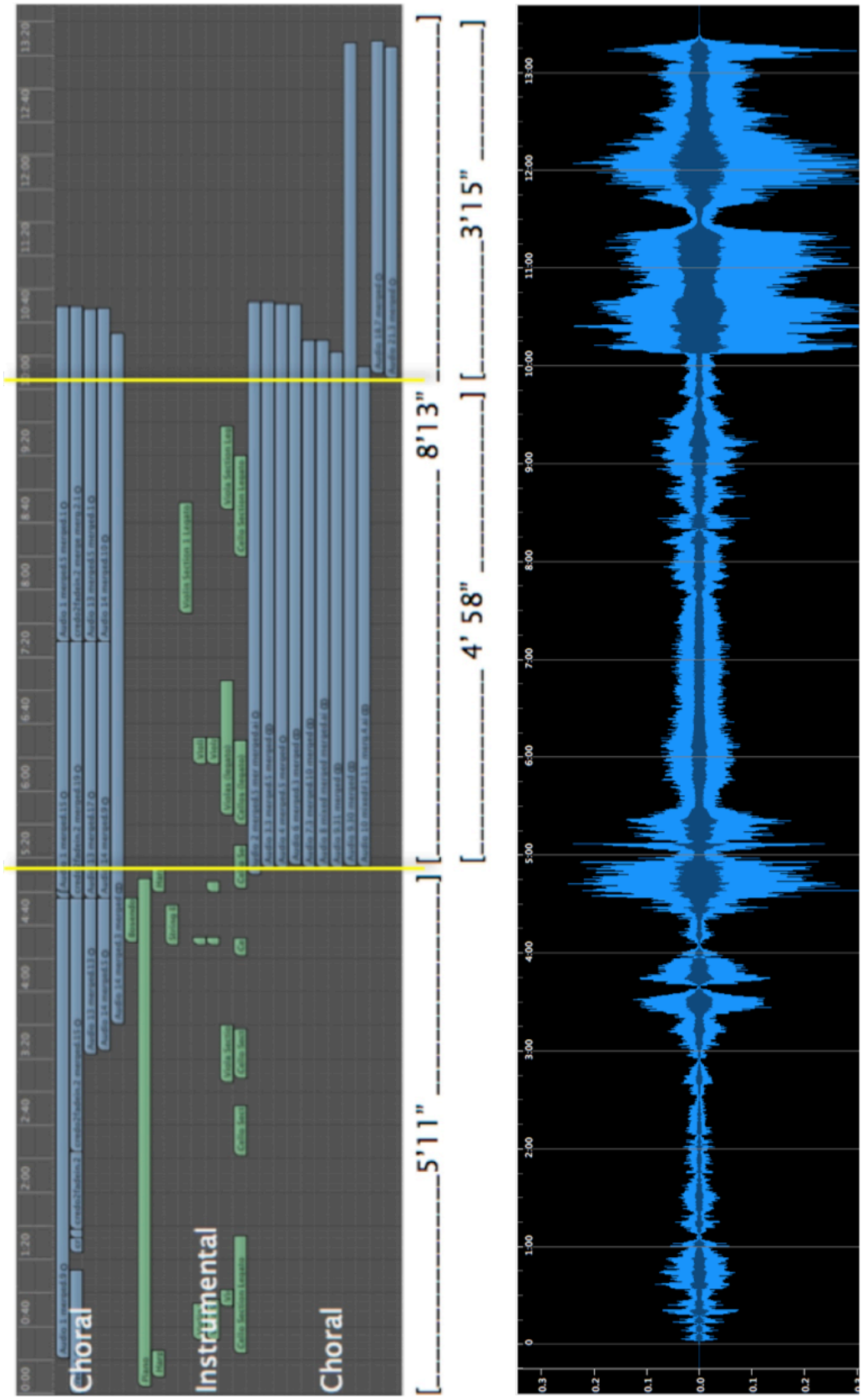
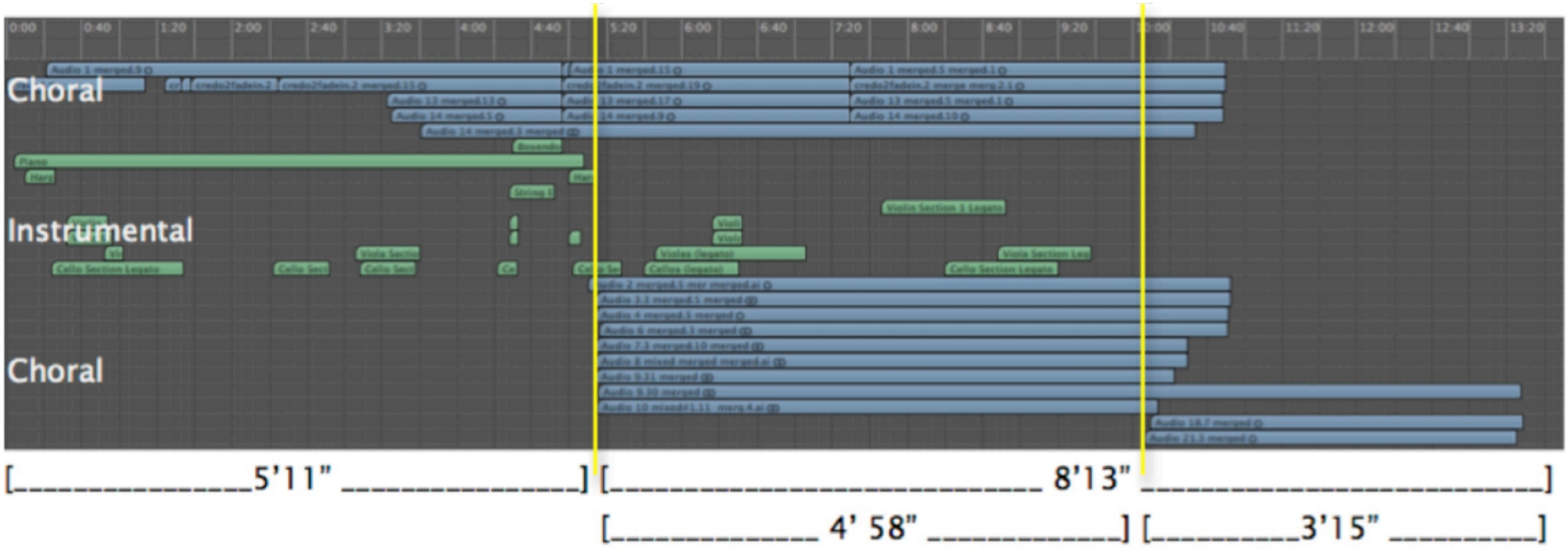
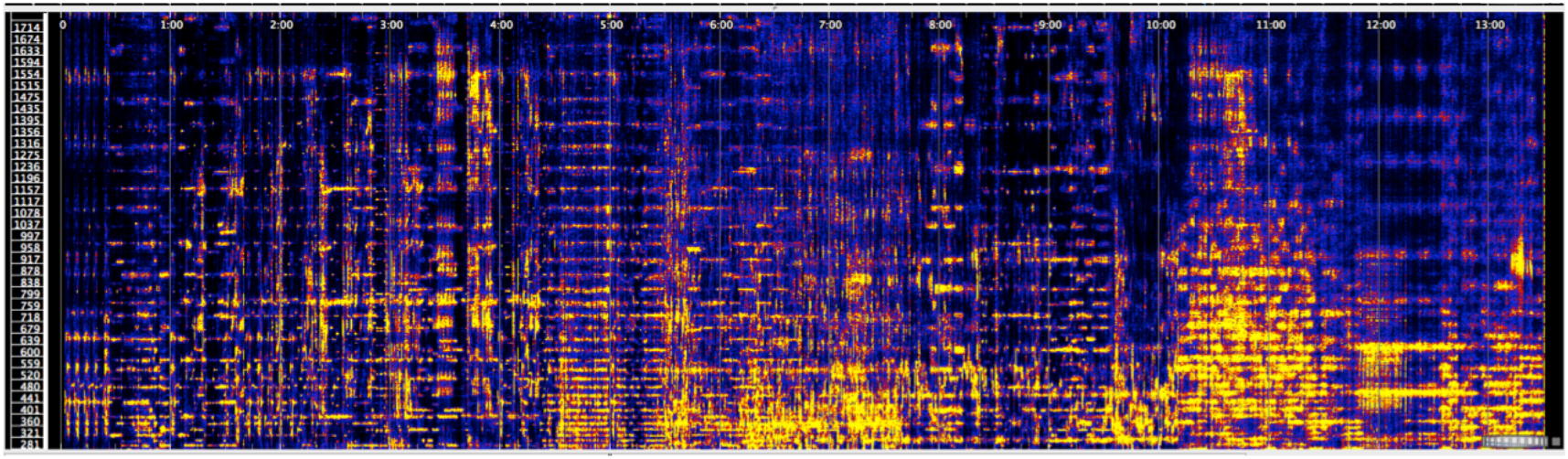


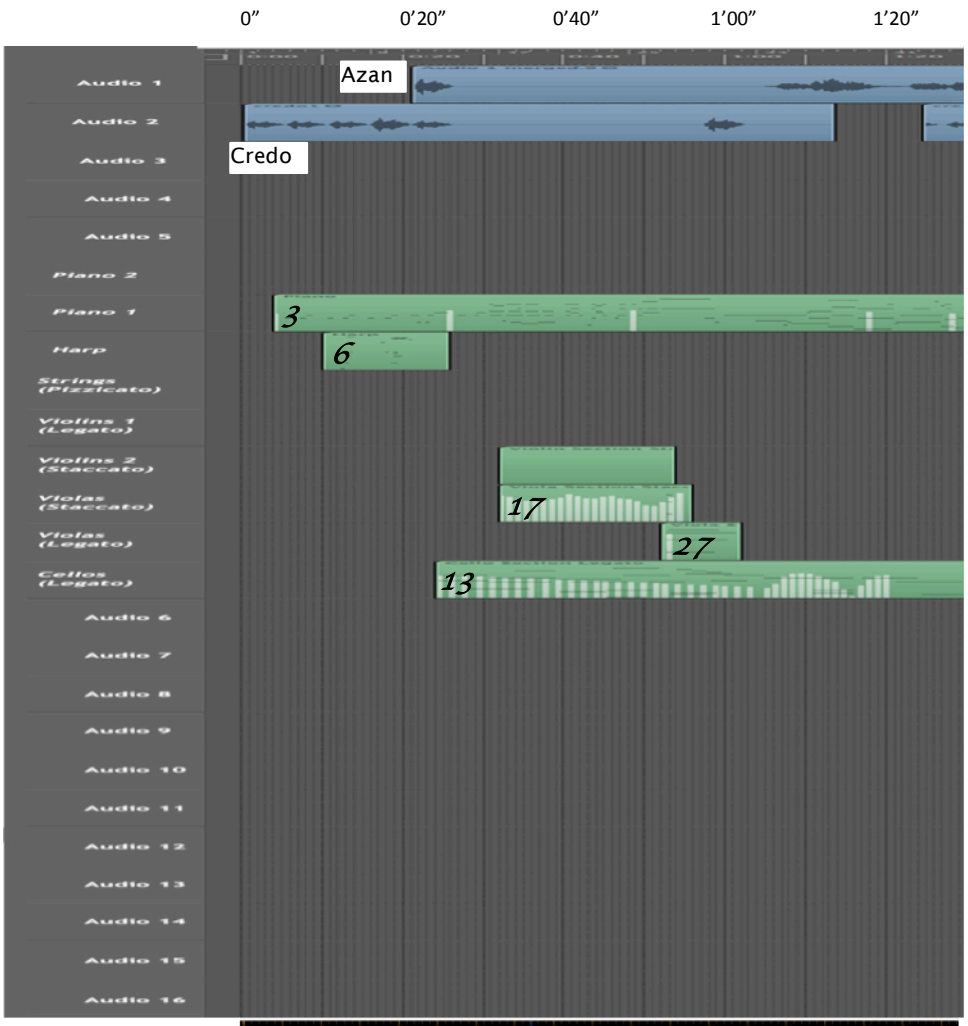
Figure 1

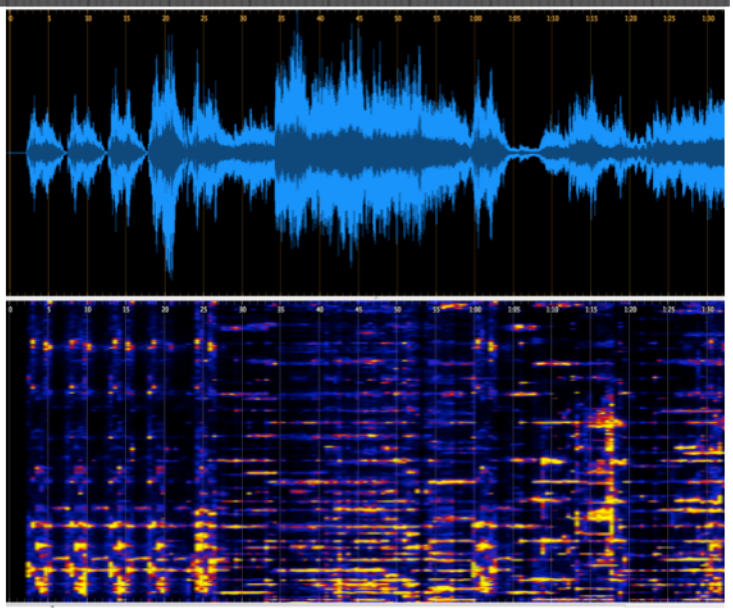
Figure 2

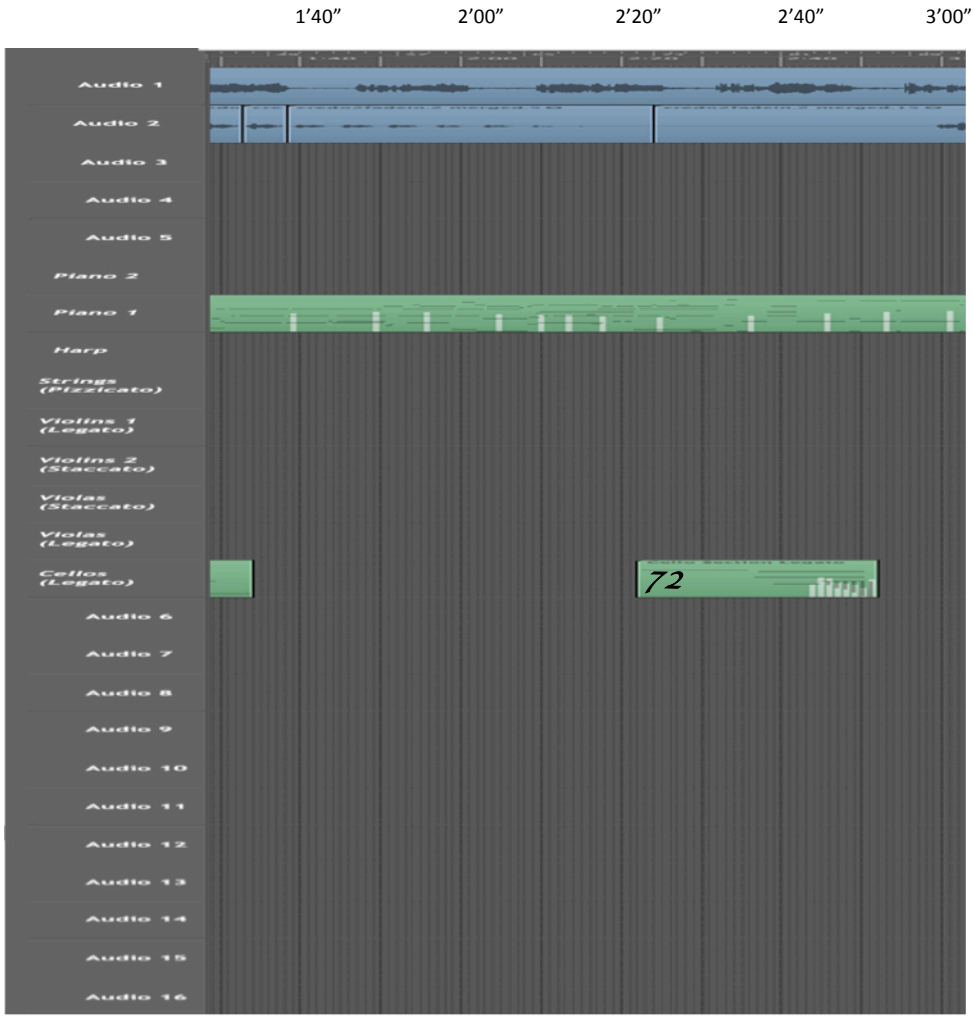

Choral
Instrumental
Choral
[_____5'11" _____] [_____ 8'13" _____]
[_____ 4' 58" _____] [_____3'15" _____]

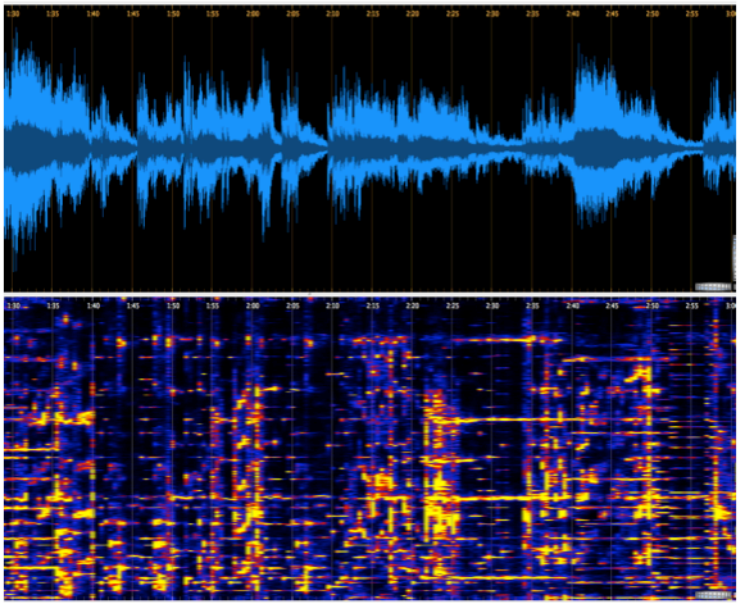

0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00

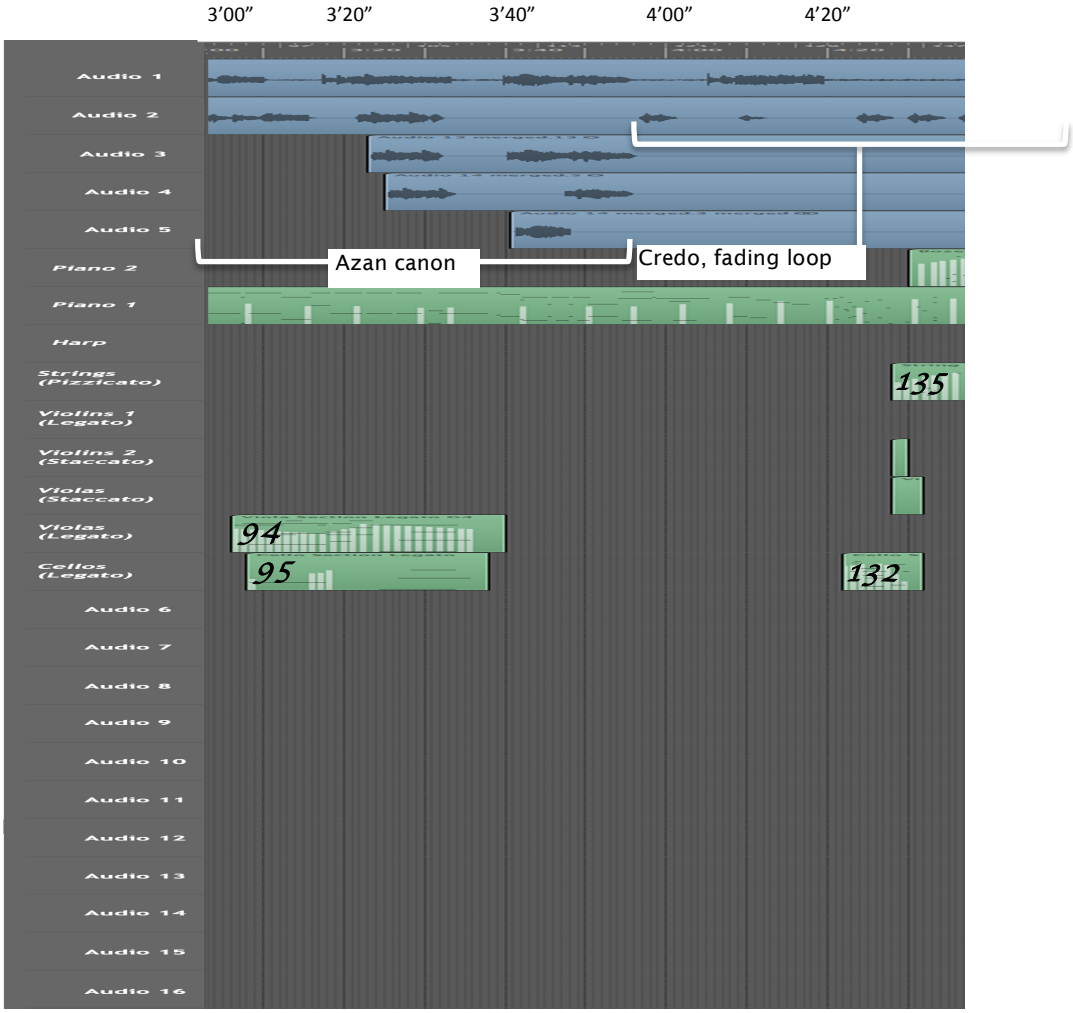
Credo (acousmatic) 2012

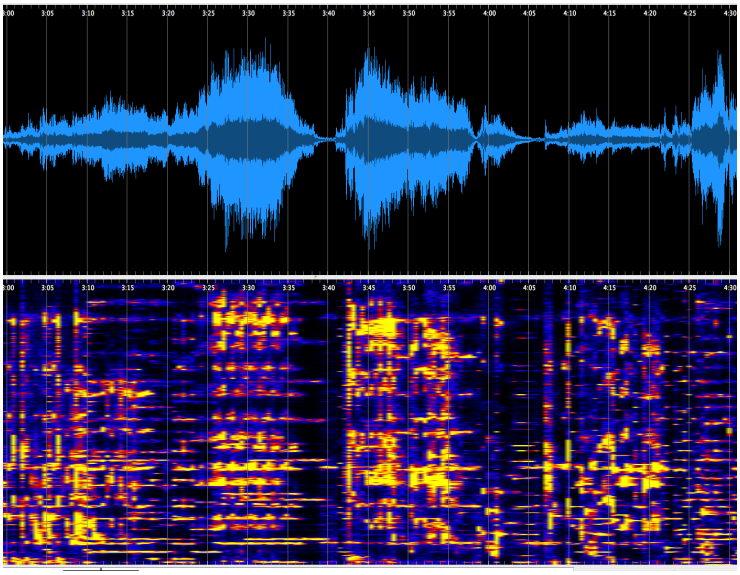


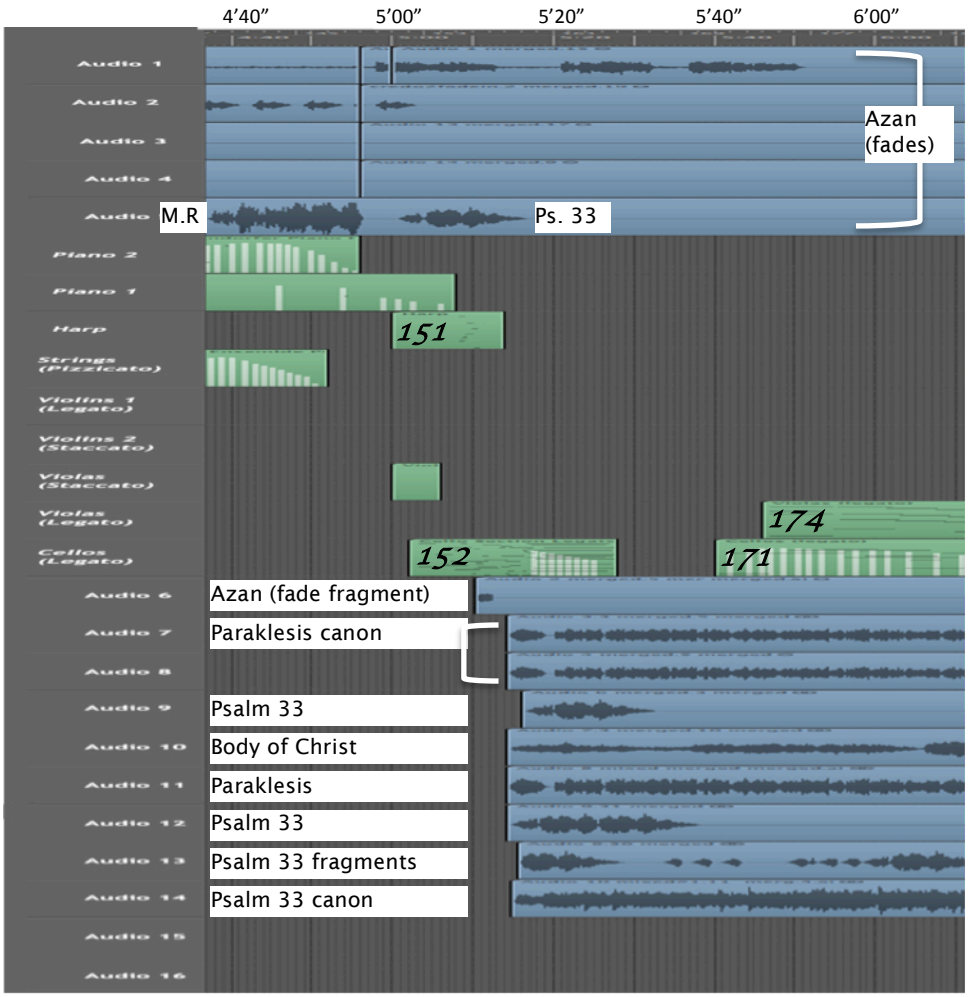


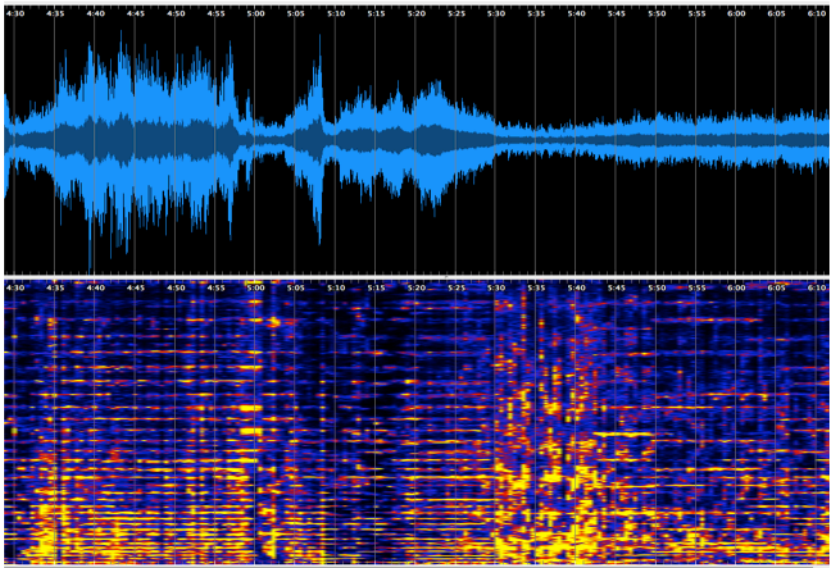

1’40”
2’00”
2’20”
2’40”
3’00”
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
72
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Audio 14
Audio 15
Audio 16

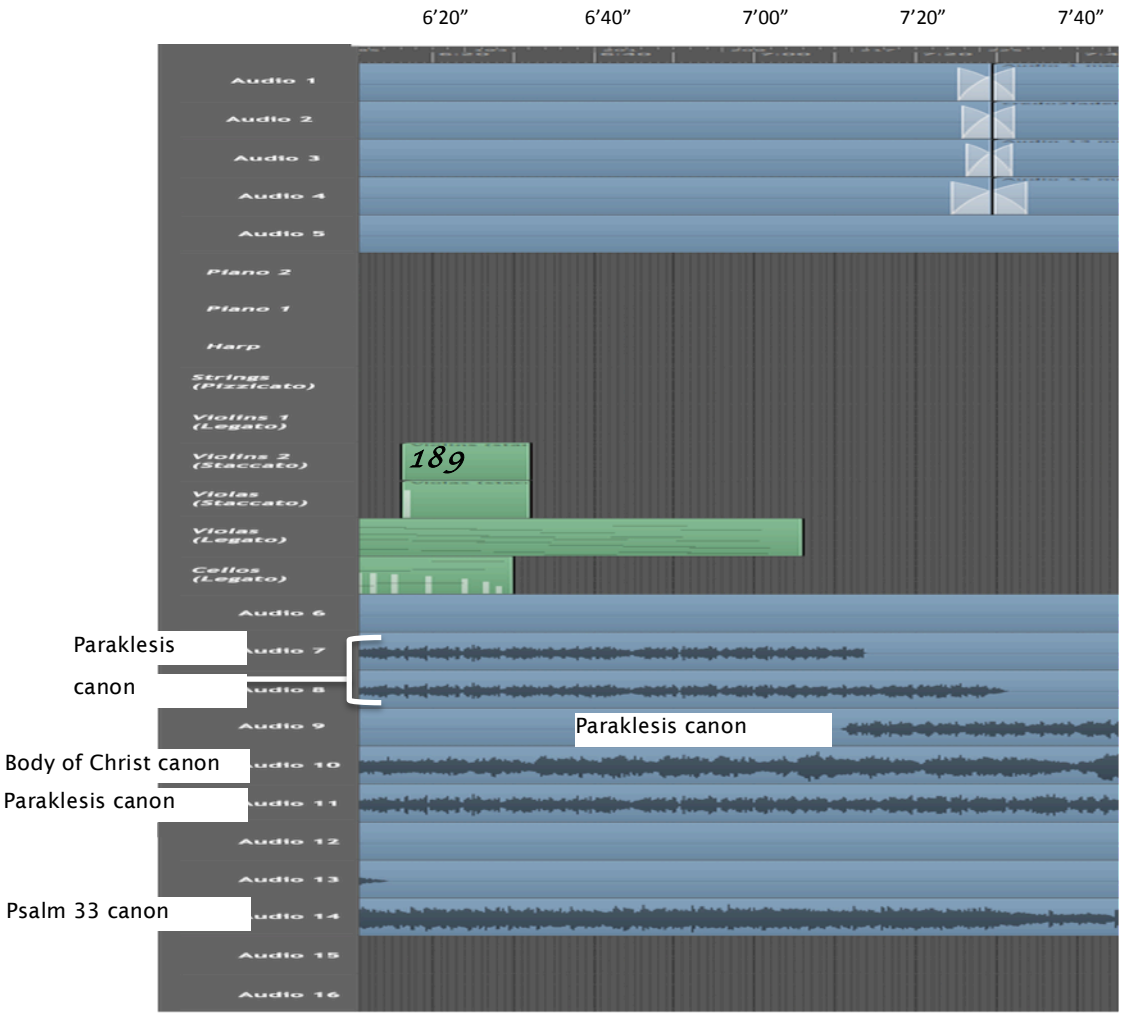


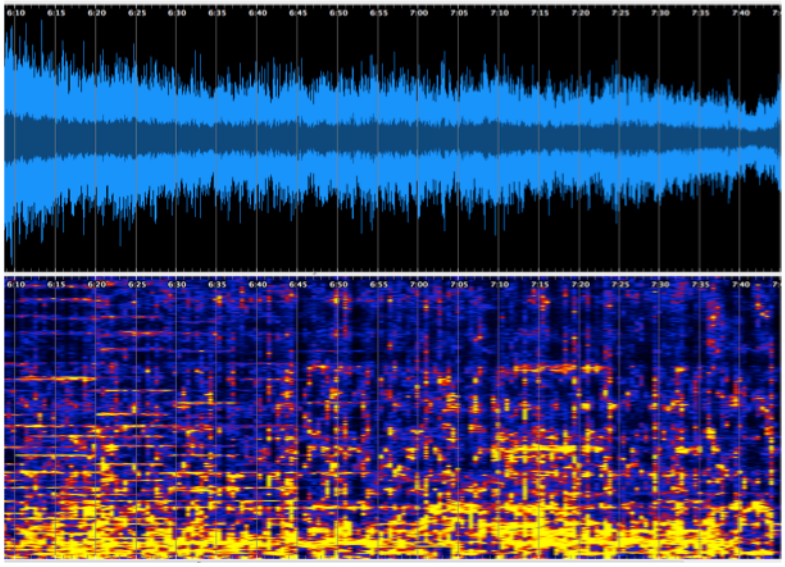

3'00"
3'20"
3'40"
4'00"
4'20"
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Audio 14
Audio 15
Audio 16
Azan canon
Credo, fading loop
135
94
95
132

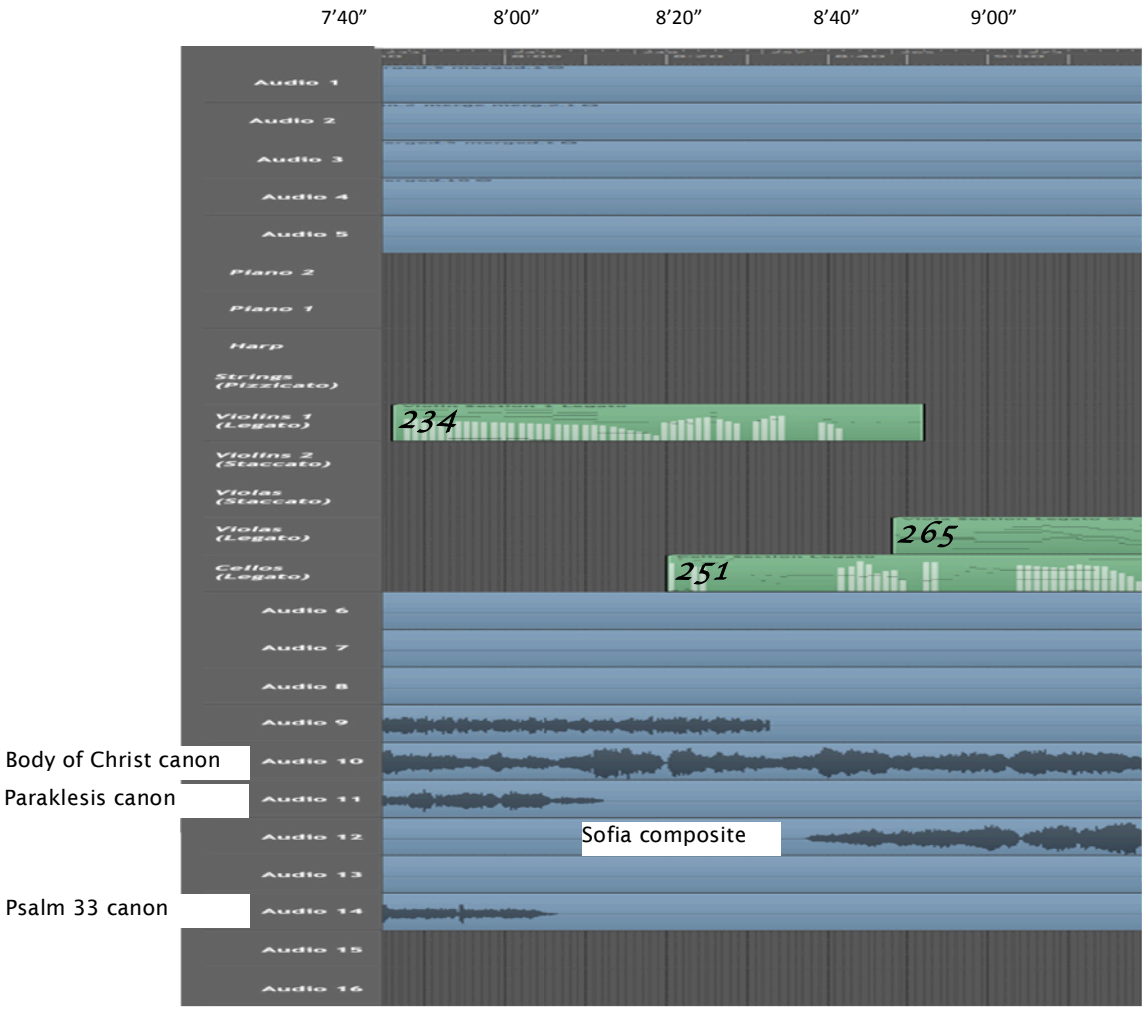


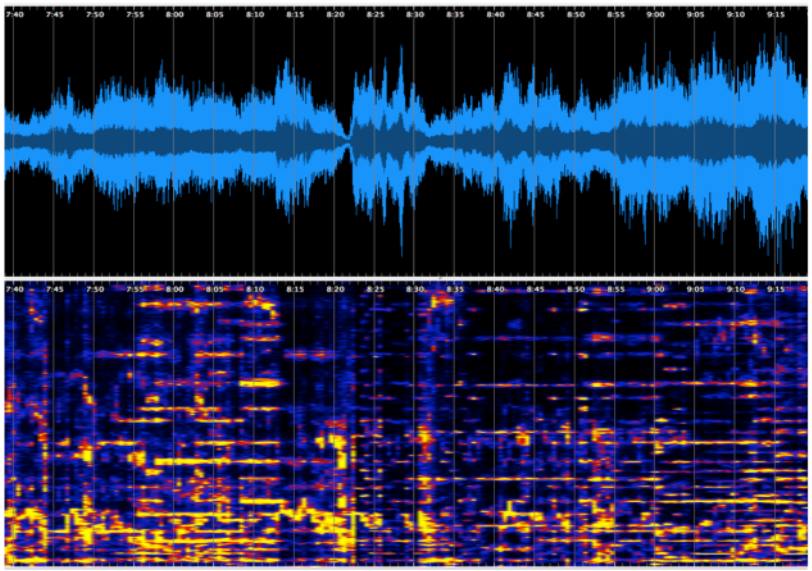

4'40"
5'00"
5'20"
5'40"
6'00"
Audio 1
Audio 2
Audio 3
Audio 4
Audio
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Audio 14
Audio 15
Audio 16
Azan (fades)
M.R
Ps. 33
151
152
171
174
Azan (fade fragment)
Paraklesis canon
Psalm 33
Body of Christ
Paraklesis
Psalm 33
Psalm 33 fragments
Psalm 33 canon

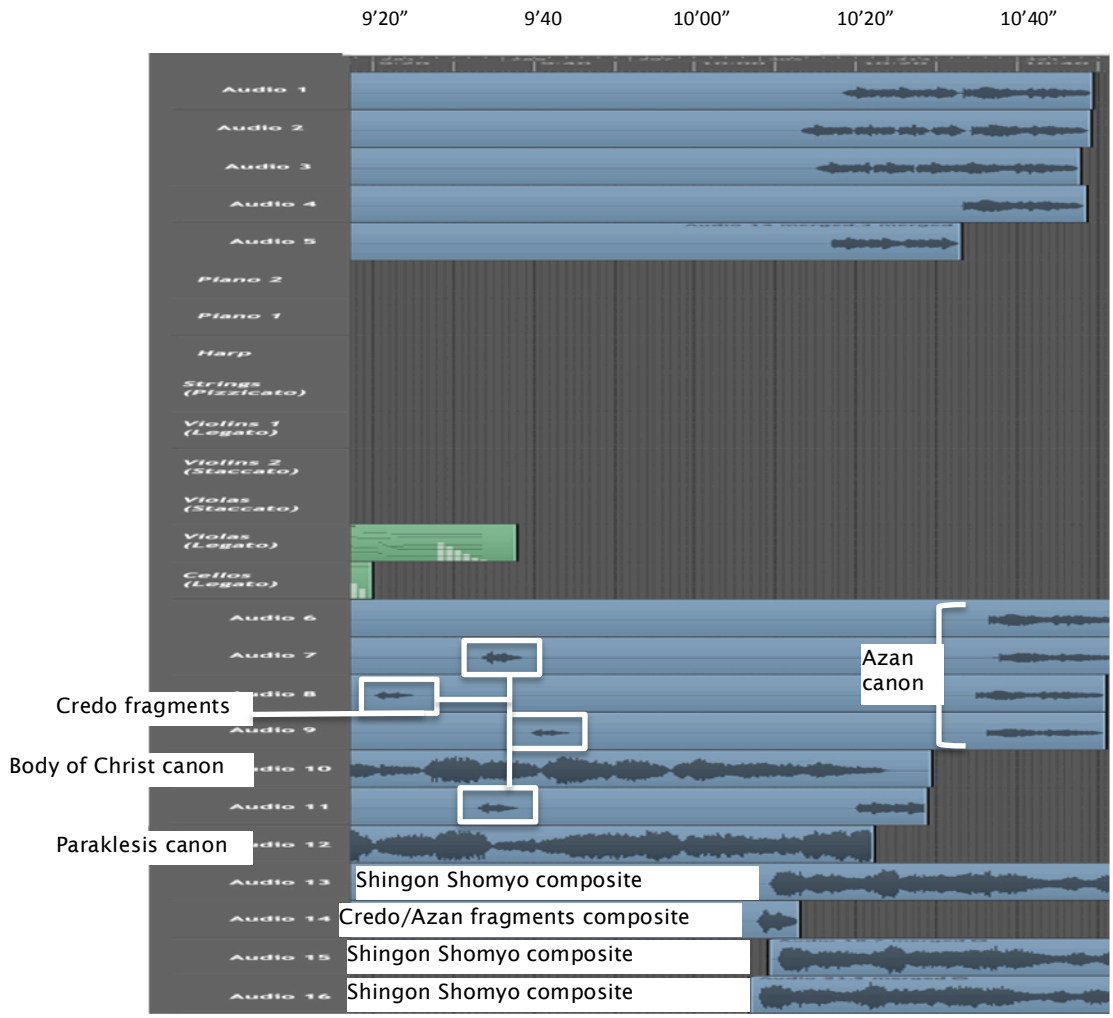


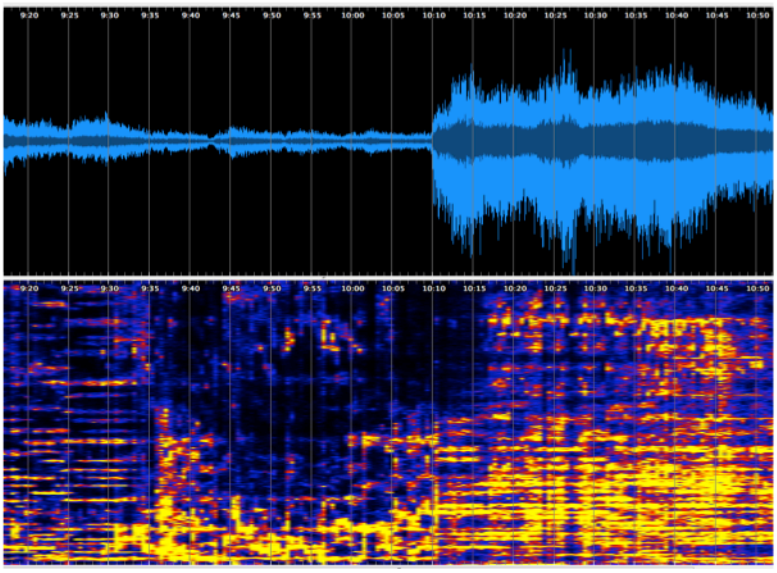

6'20"
6'40"
7'00"
7'20"
7'40"
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
189
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Audio 14
Audio 15
Audio 16
Paraklesis canon
Paraklesis canon
Body of Christ canon
Paraklesis canon
Psalm 33 canon

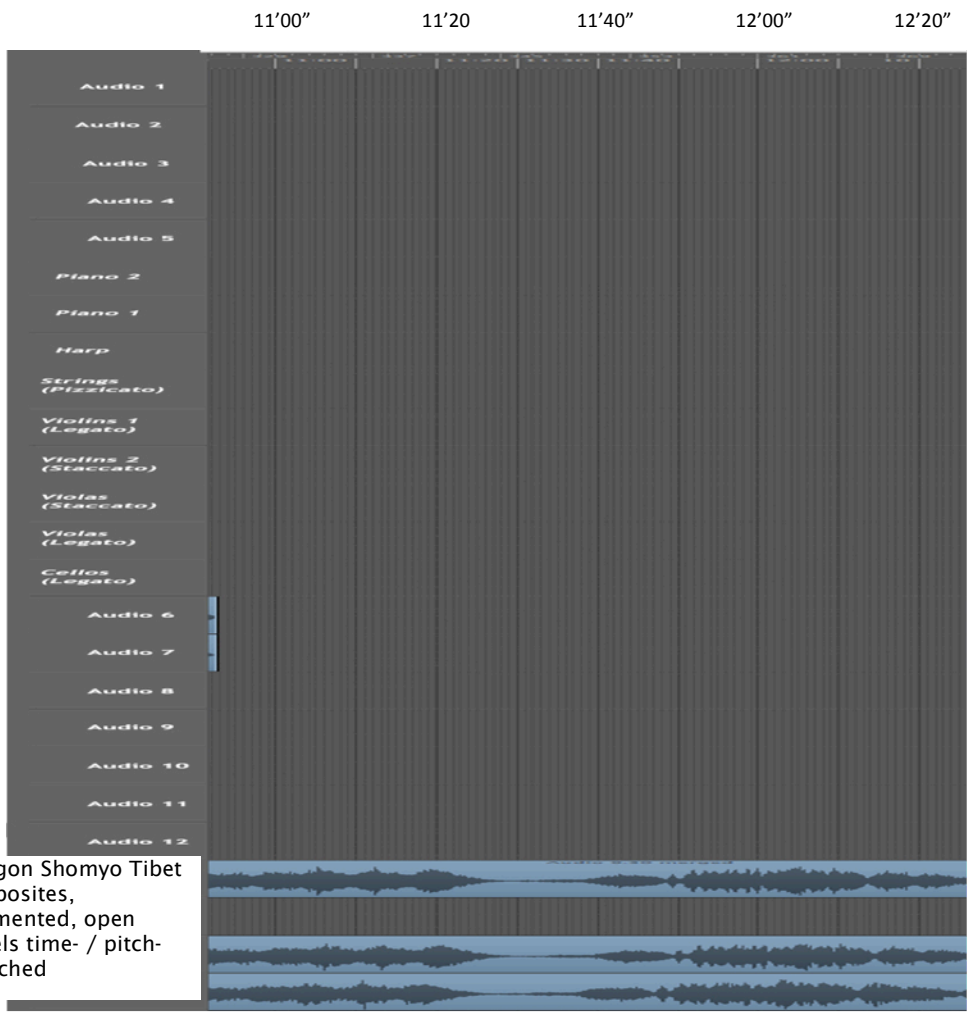



7'40"
8'00"
8'20"
8'40"
9'00"
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
234
265
251
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Audio 14
Audio 15
Audio 16
Body of Christ canon
Paraklesis canon
Sofia composite
Psalm 33 canon

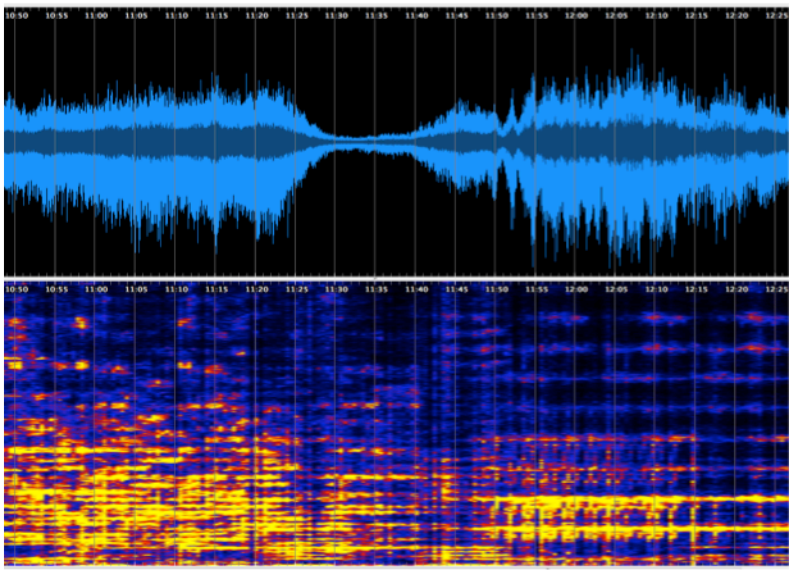


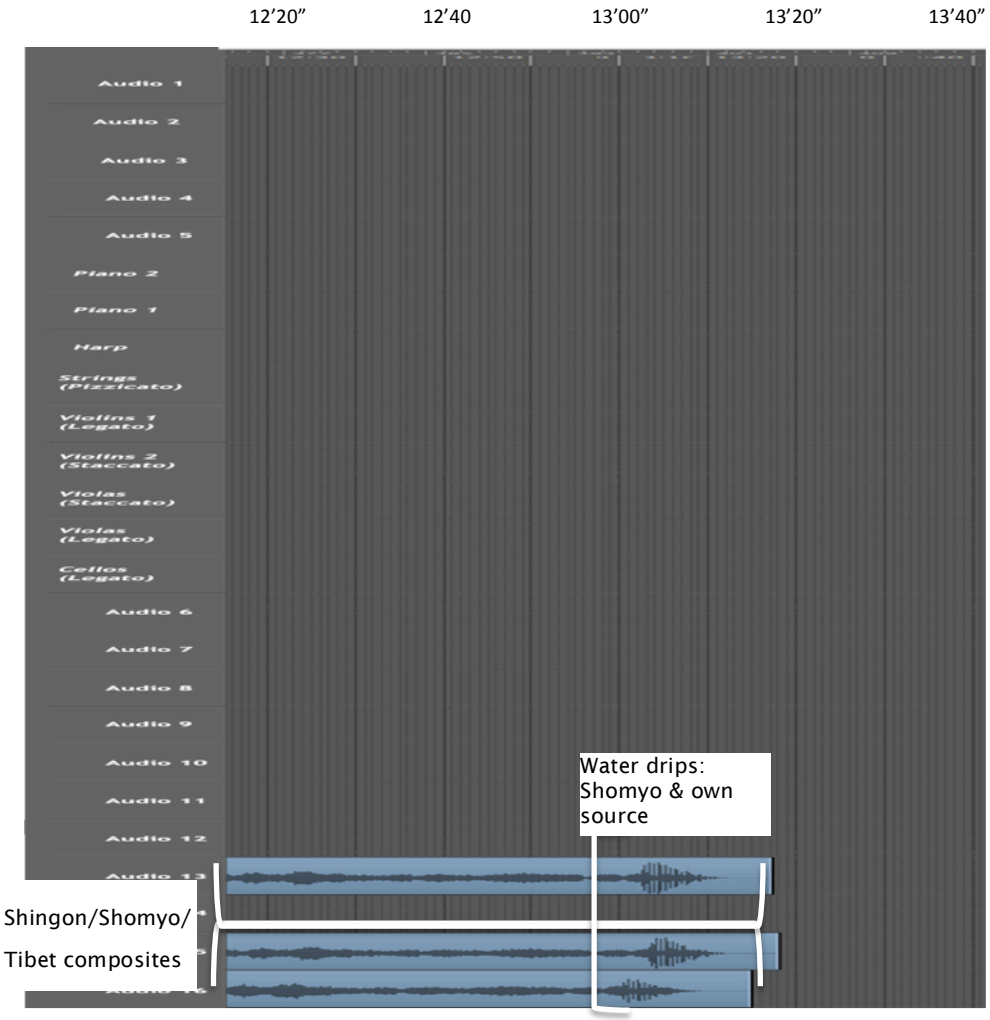

9’20”
9’40
10’00”
10’20”
10’40”
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Audio 14
Audio 15
Audio 16
Azan canon
Credo fragments
Body of Christ canon
Paraklesis canon
Shingon Shomyo composite
Credo/Azan fragments composite
Shingon Shomyo composite
Shingon Shomyo composite

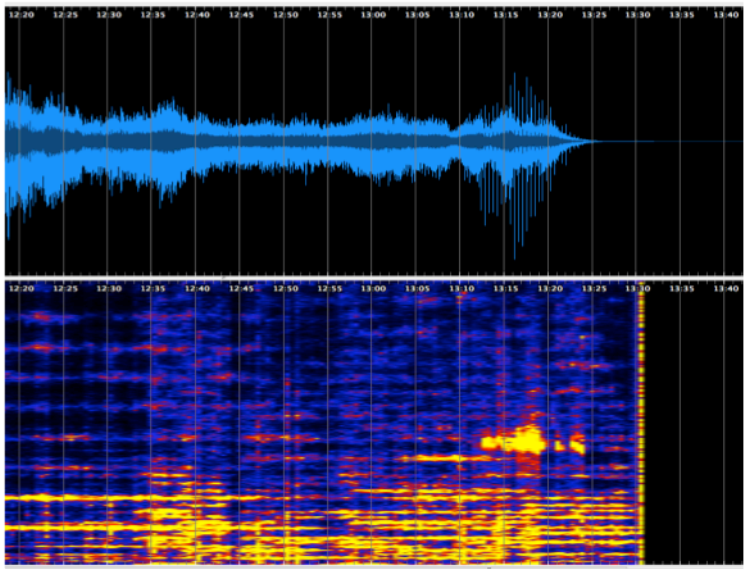




Shingon Shomyo Tibet composites, fragmented, open vowels time- / pitch-stretched




12'20"
12'40
13'00"
13'20"
13'40"
Audio 1
Audio 2
Audio 3
Audio 4
Audio 5
Piano 2
Piano 1
Harp
Strings (Pizzicato)
Violins 1 (Legato)
Violins 2 (Staccato)
Violas (Staccato)
Violas (Legato)
Cellos (Legato)
Audio 6
Audio 7
Audio 8
Audio 9
Audio 10
Audio 11
Audio 12
Audio 13
Water drips: Shomyo & own source
Shingon/Shomyo/ Tibet composites



Credo (Plunderphonic) 2011

Instrumental parts

3

Piano

Harp

8

Piano

Harp
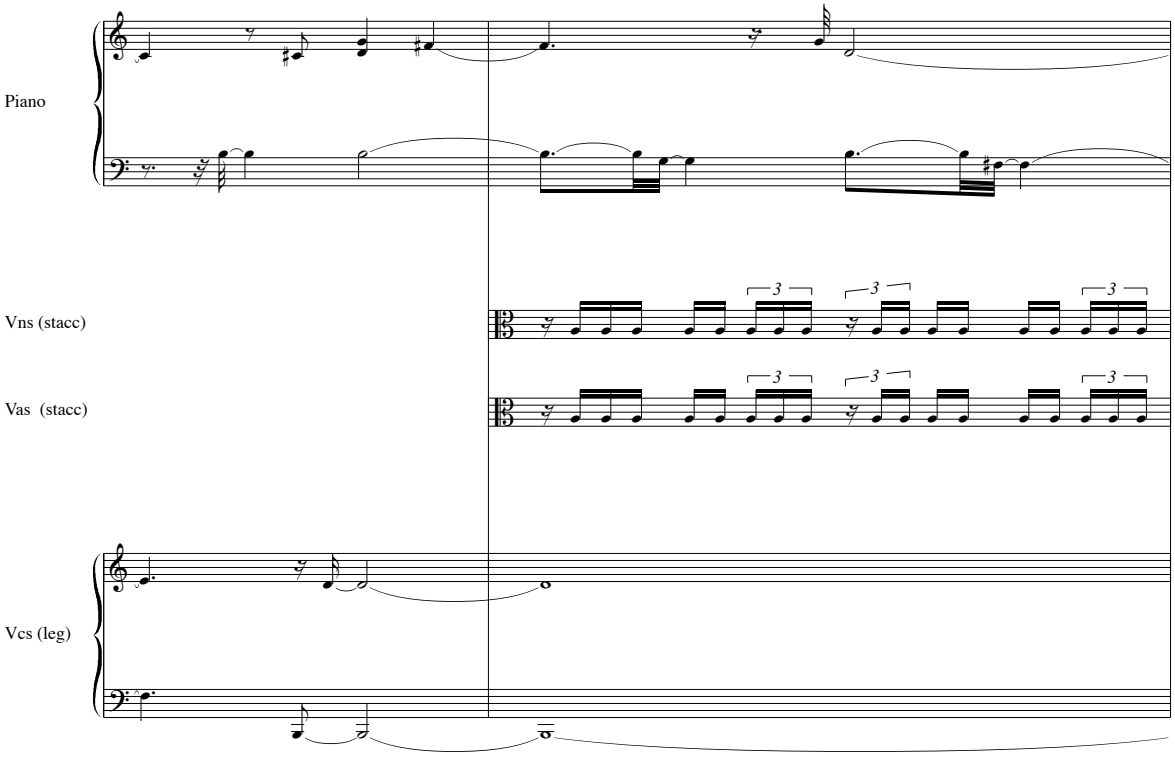
12

Piano
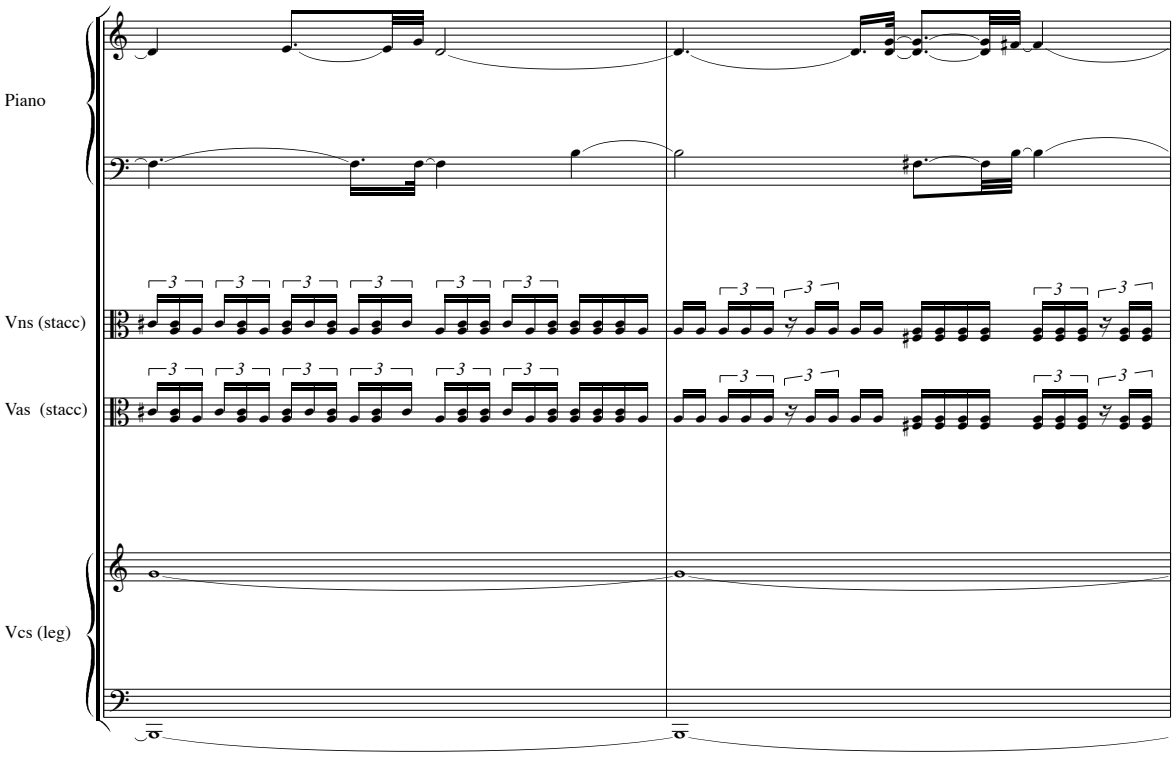
Harp

Vcs (leg)
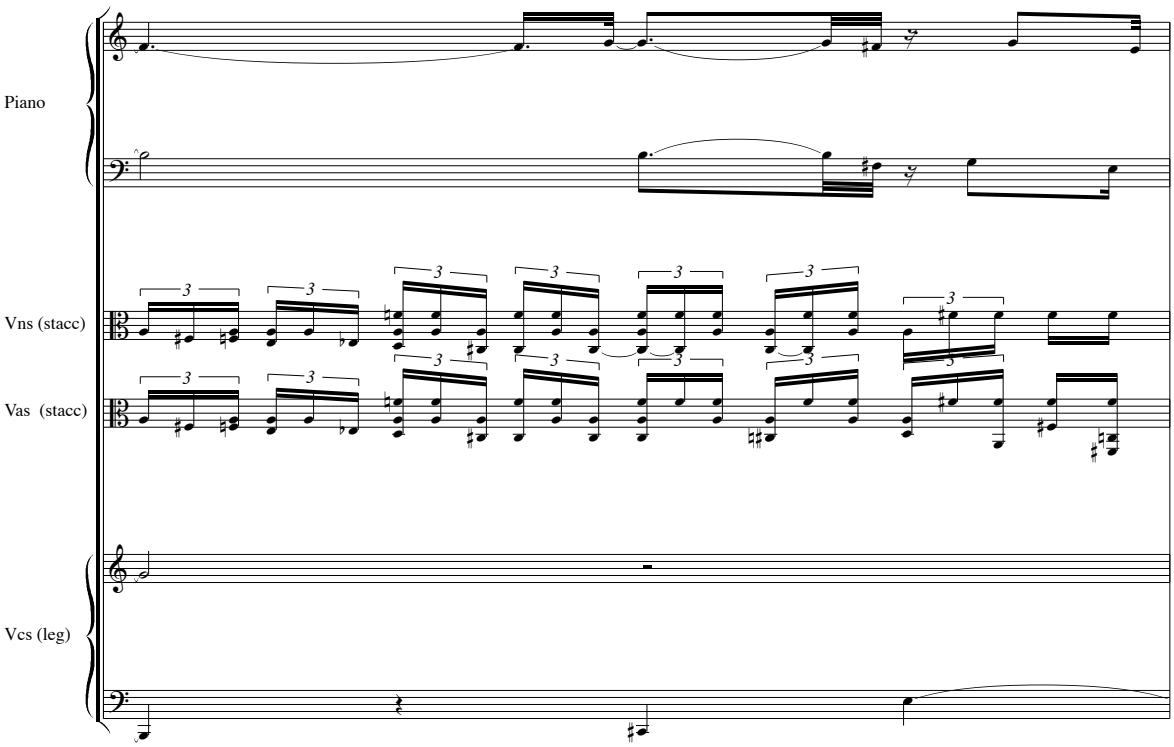
16


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
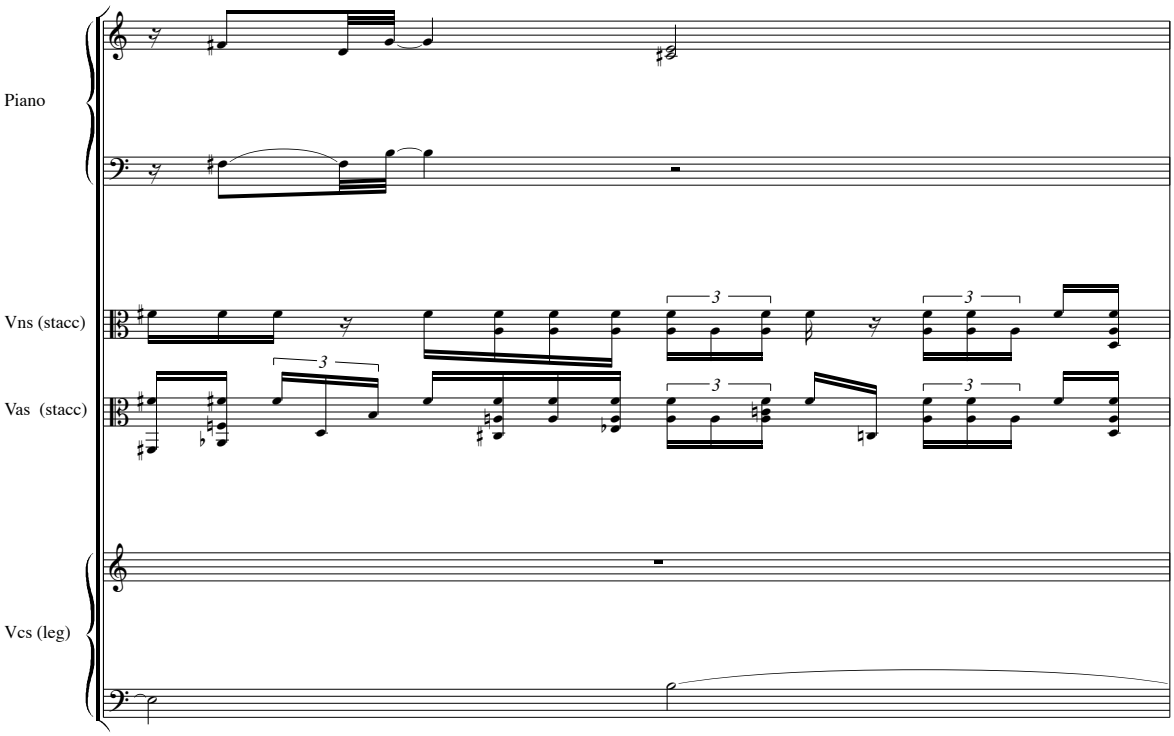
18


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
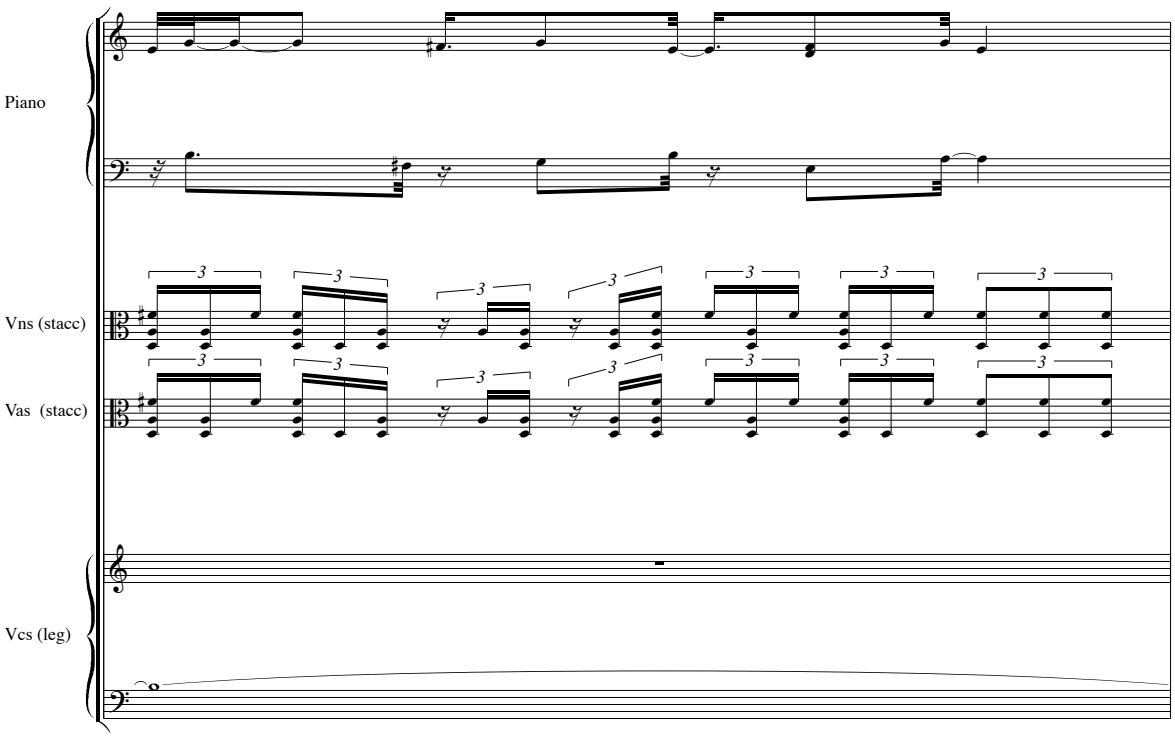
20


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
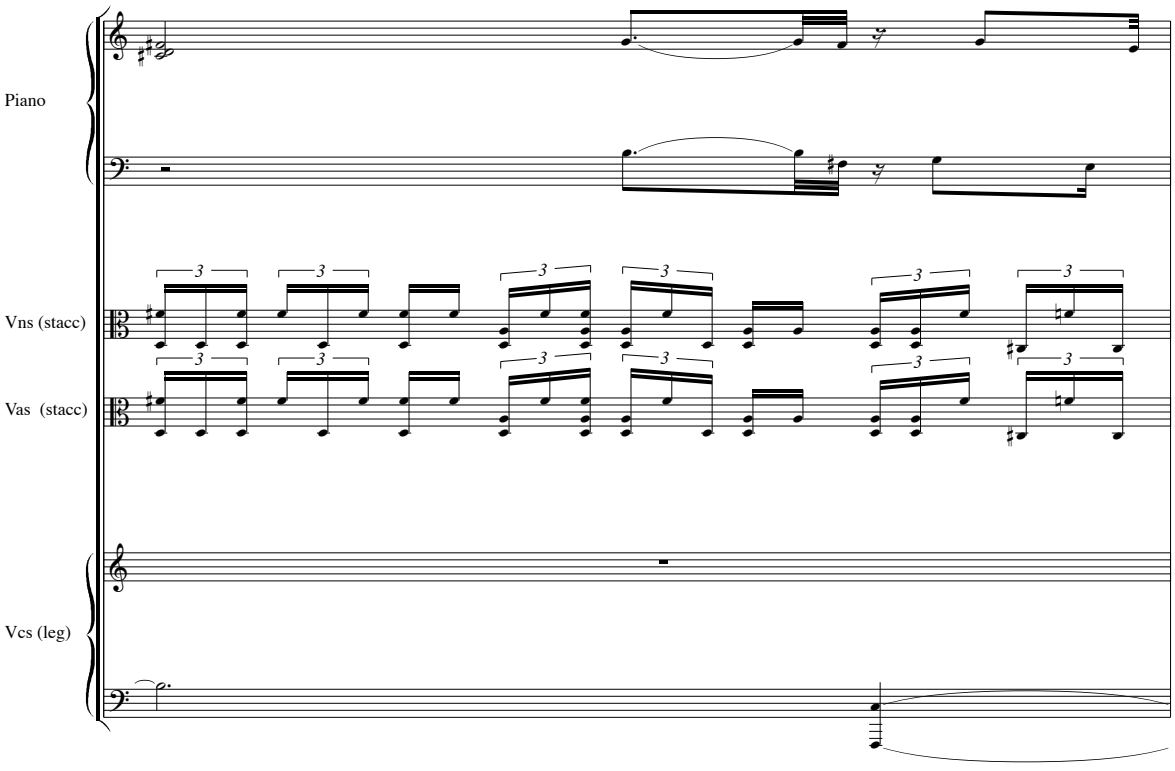
21


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
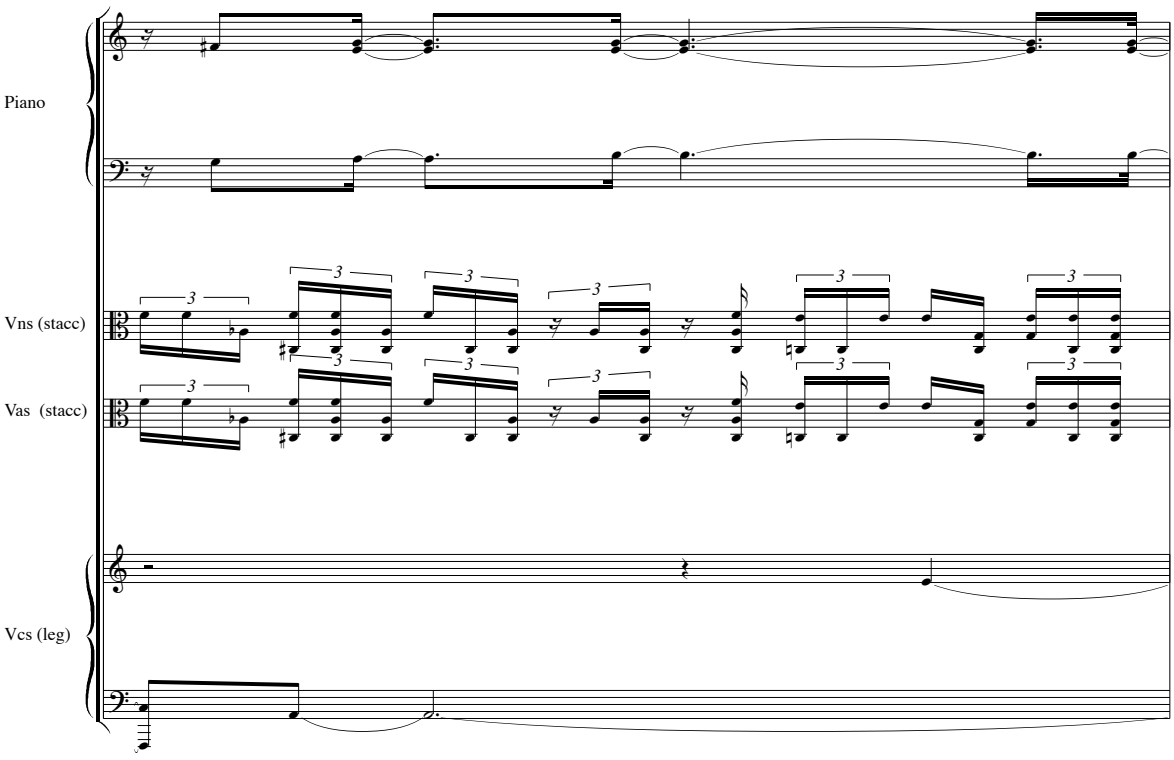
22


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
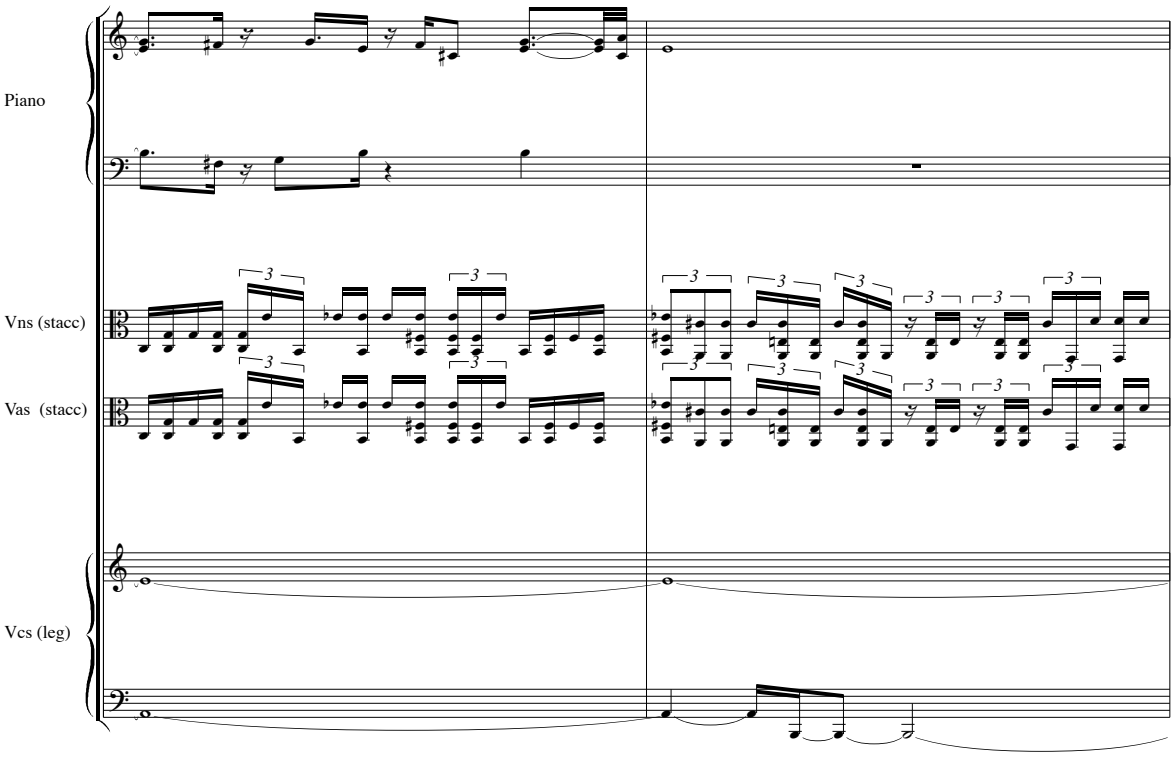
23


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
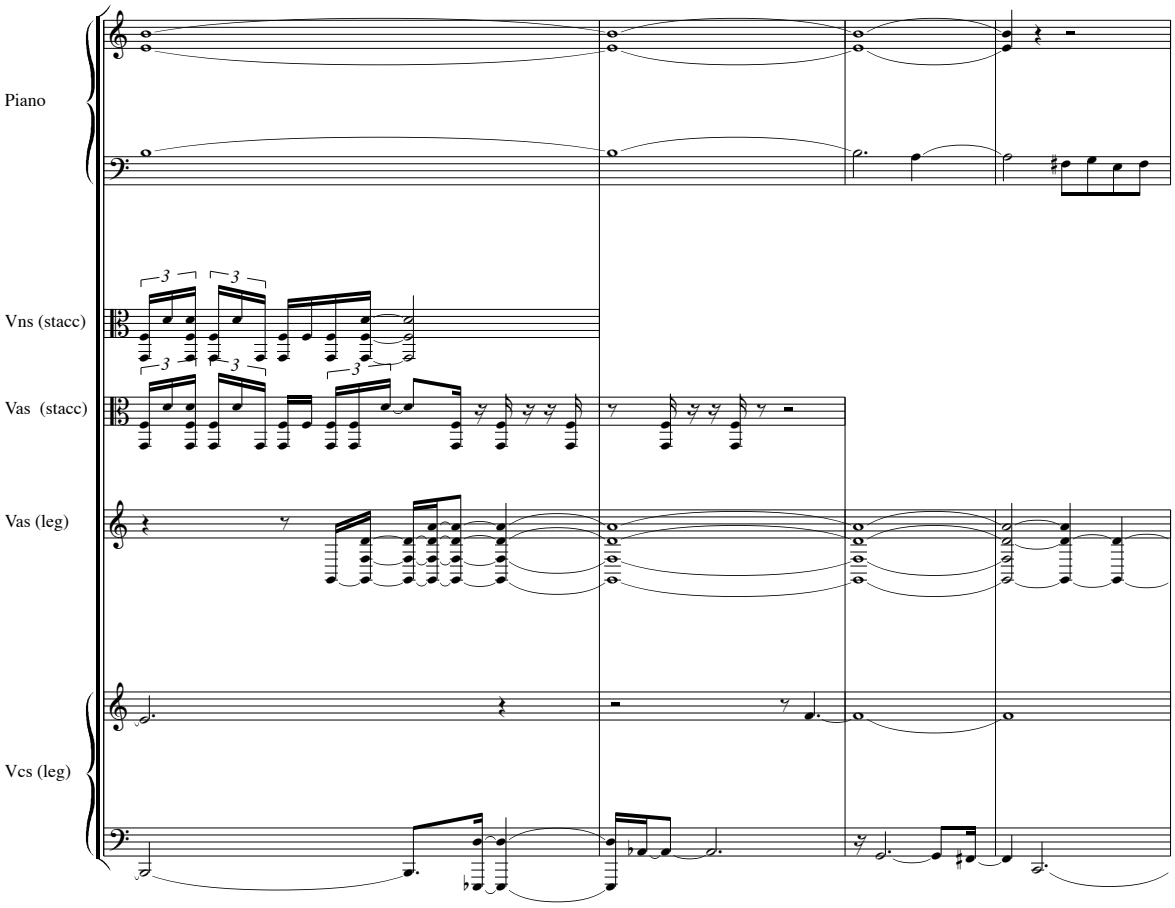
24


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)
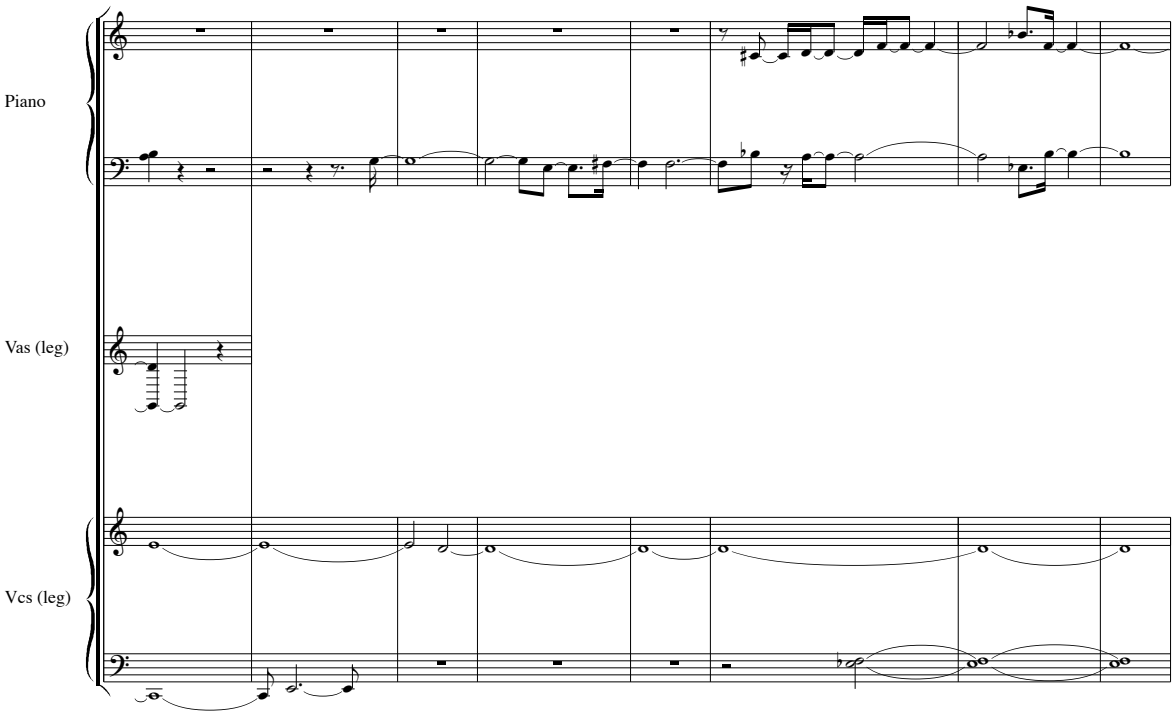
25


Piano
Vns (stacc)
Vas (stacc)
Vcs (leg)

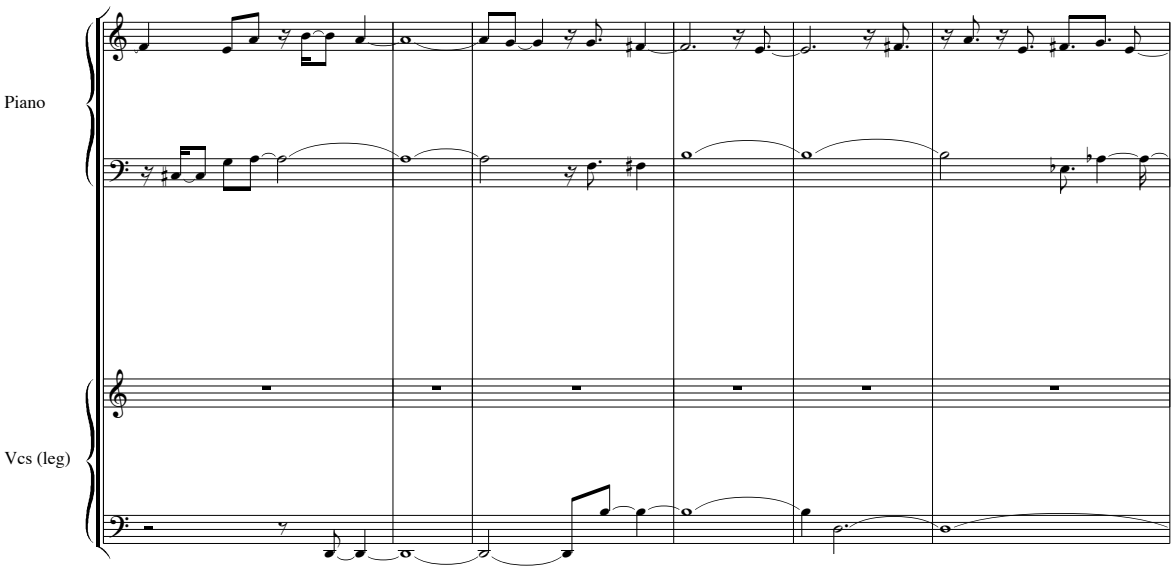
27


Piano
Vns (stacc)
Vas (stacc)
Vas (leg)
Vcs (leg)
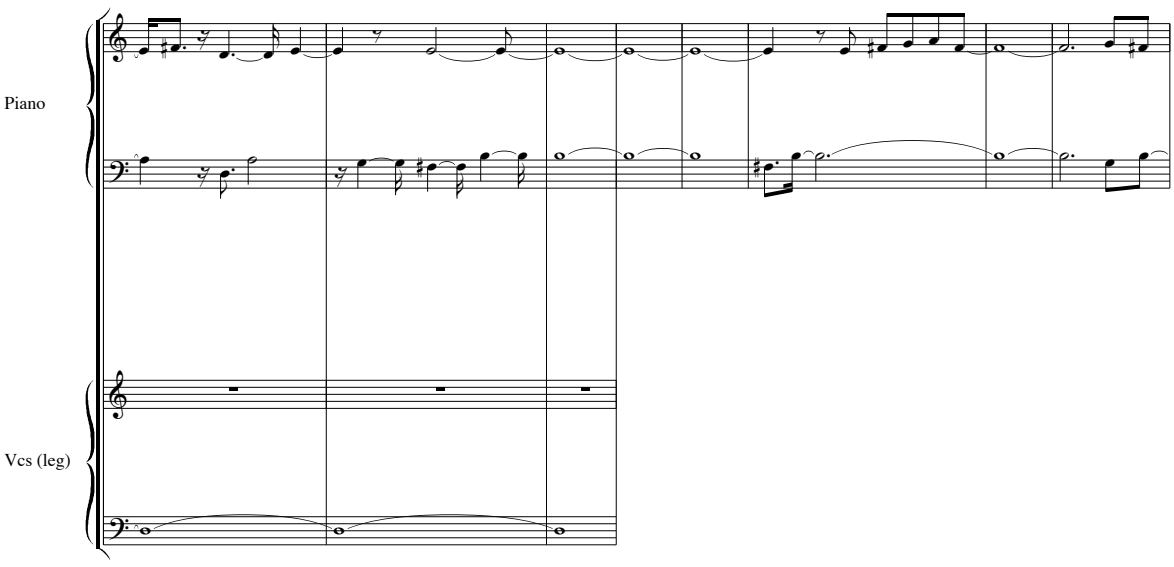
31


Piano
Vas (leg)
Vcs (leg)

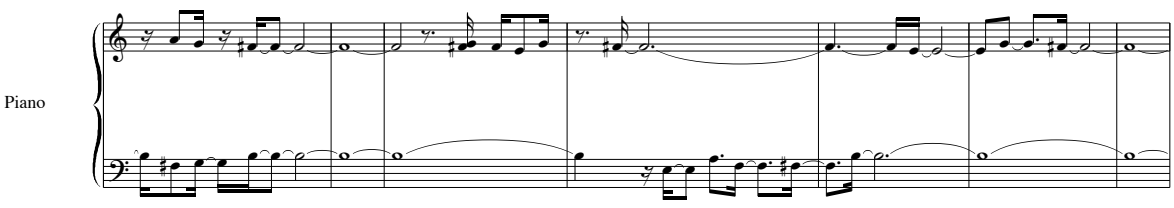
39



45

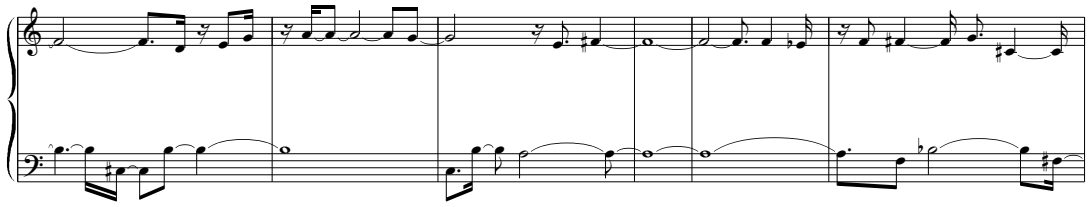


53



60
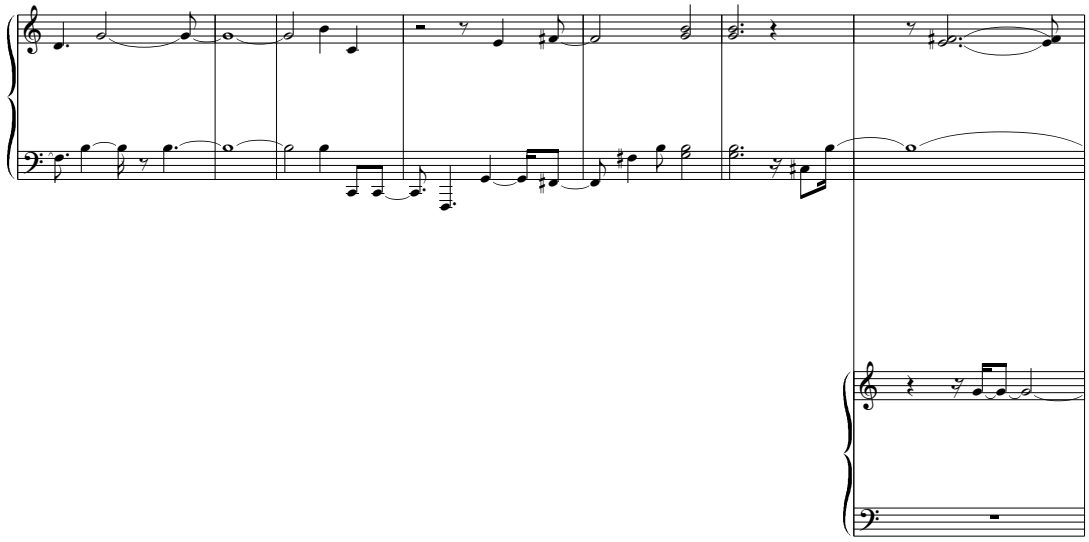
Piano



66

Piano

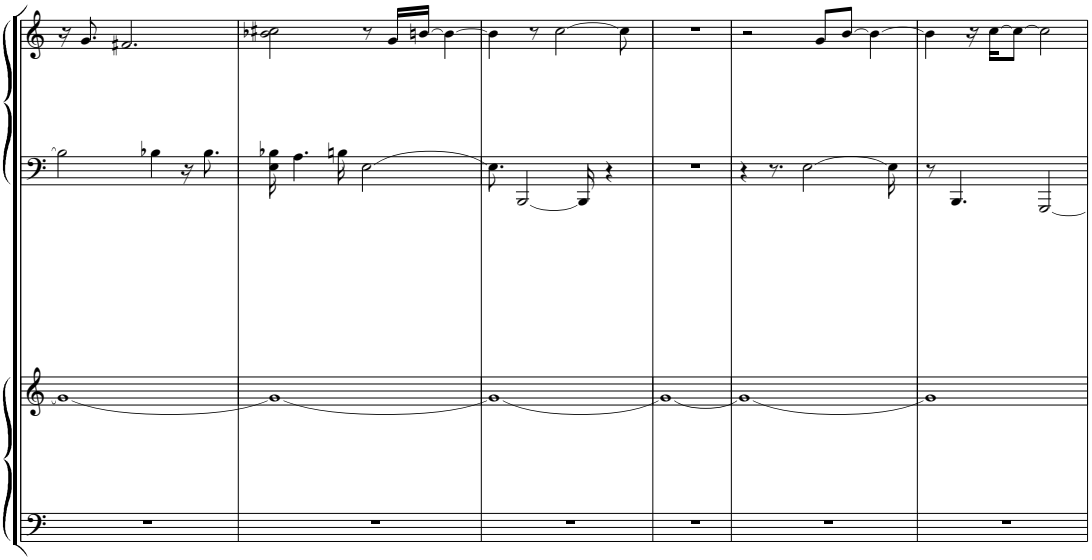
Vcs (leg)



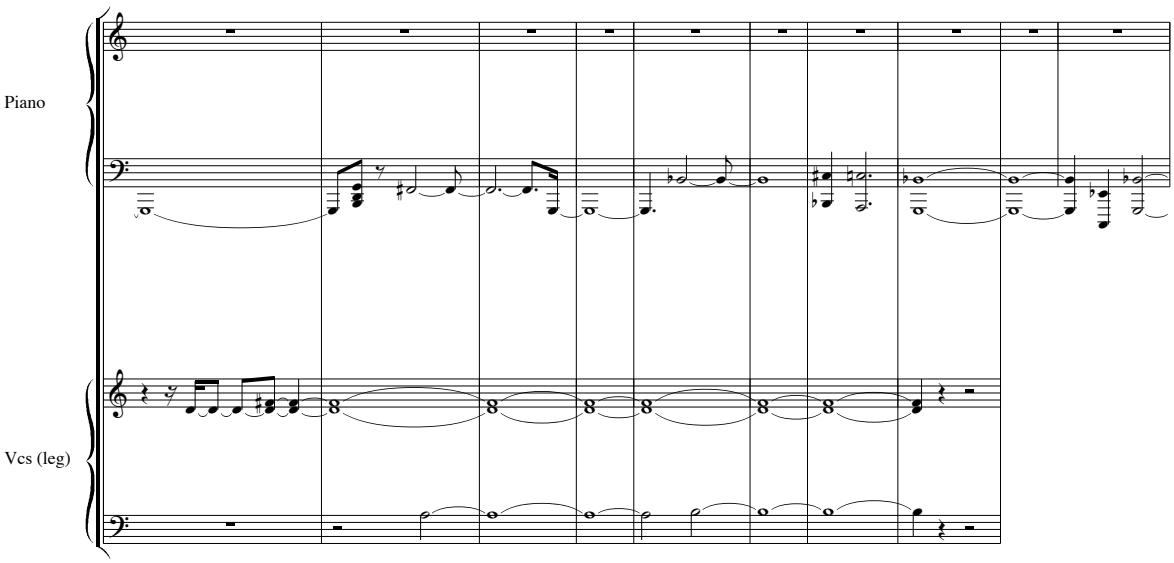
73

Piano

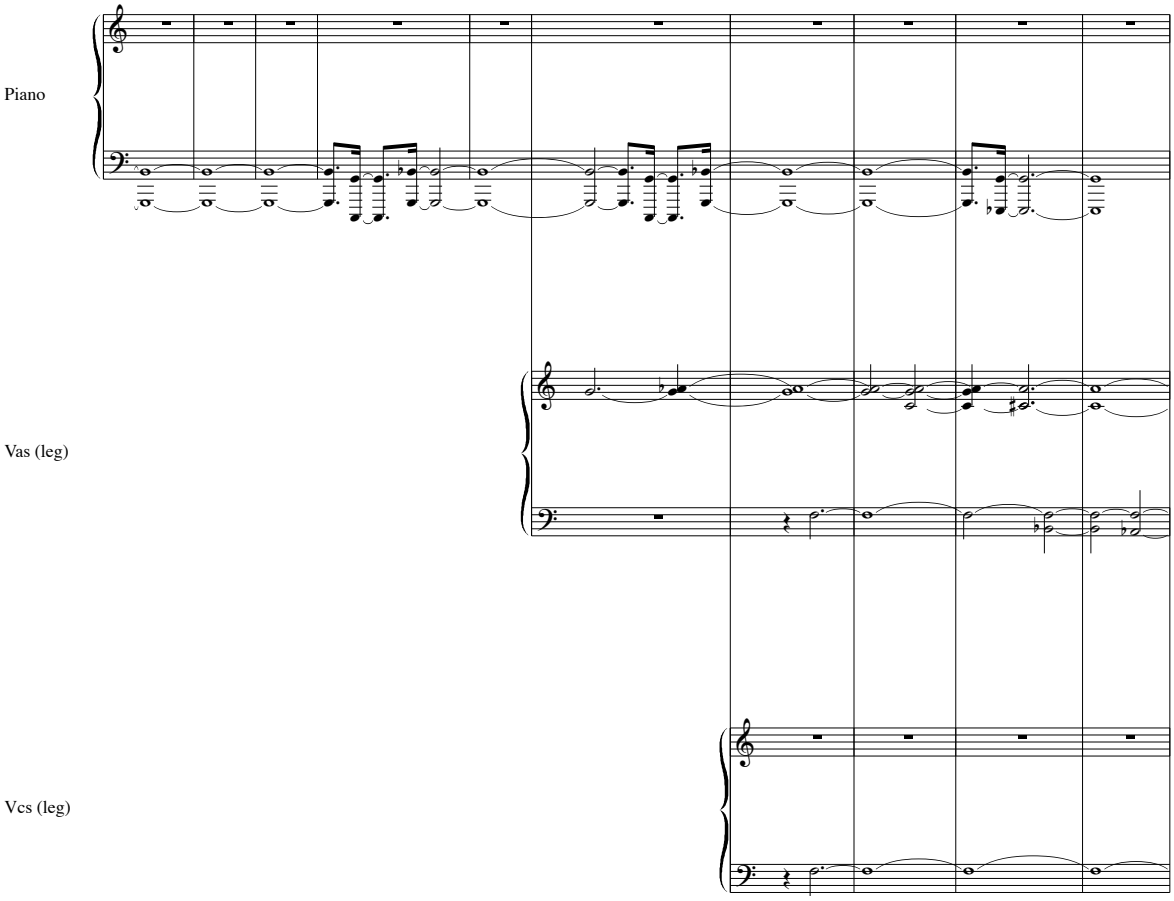
Vcs (leg)



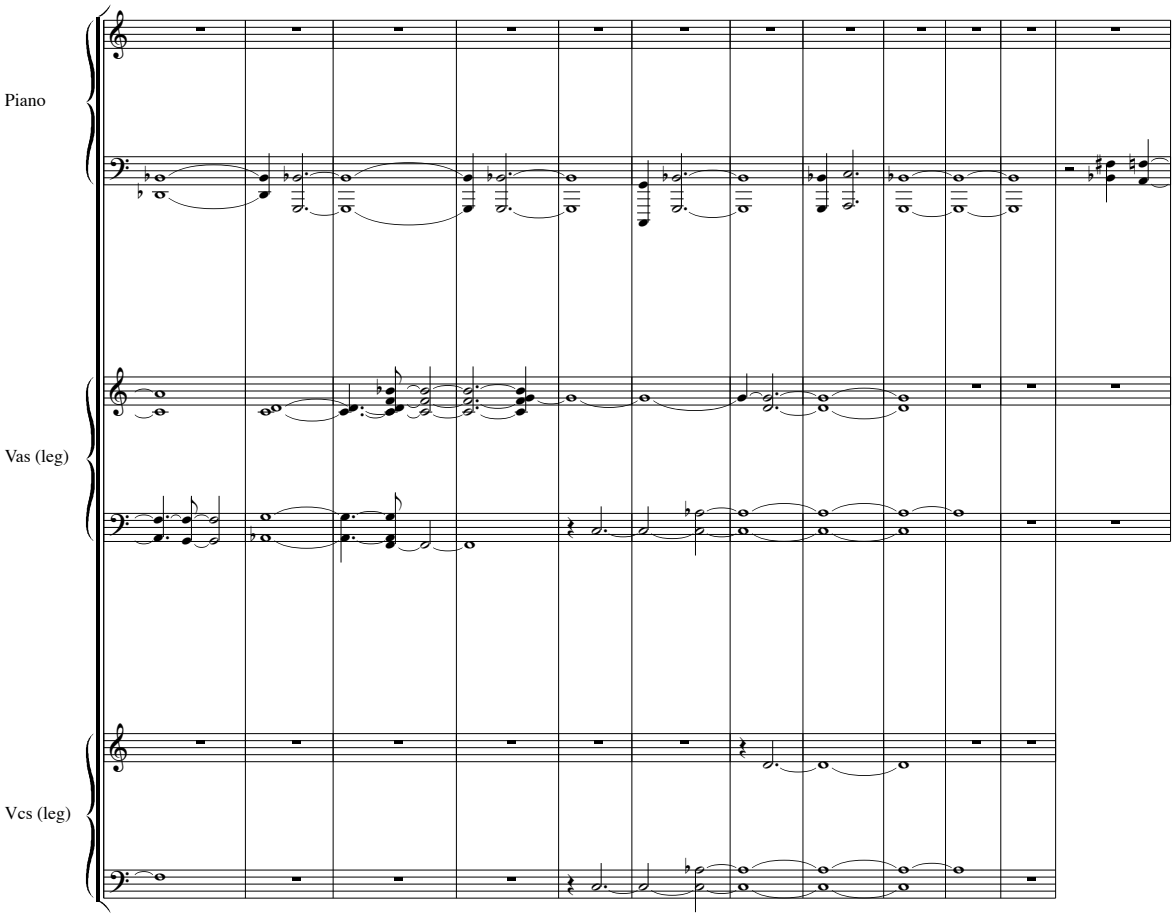
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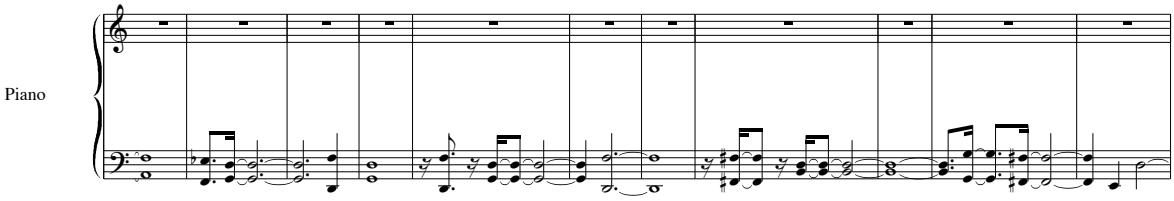
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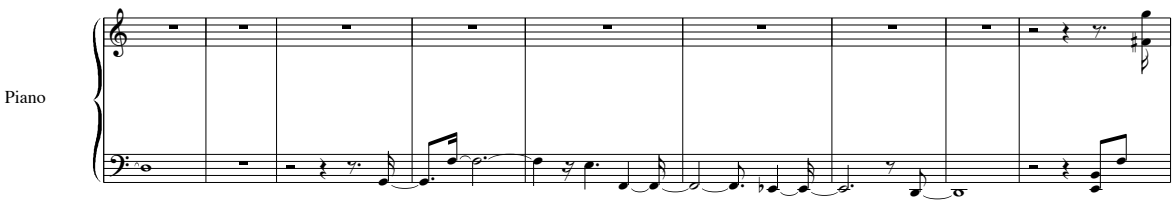


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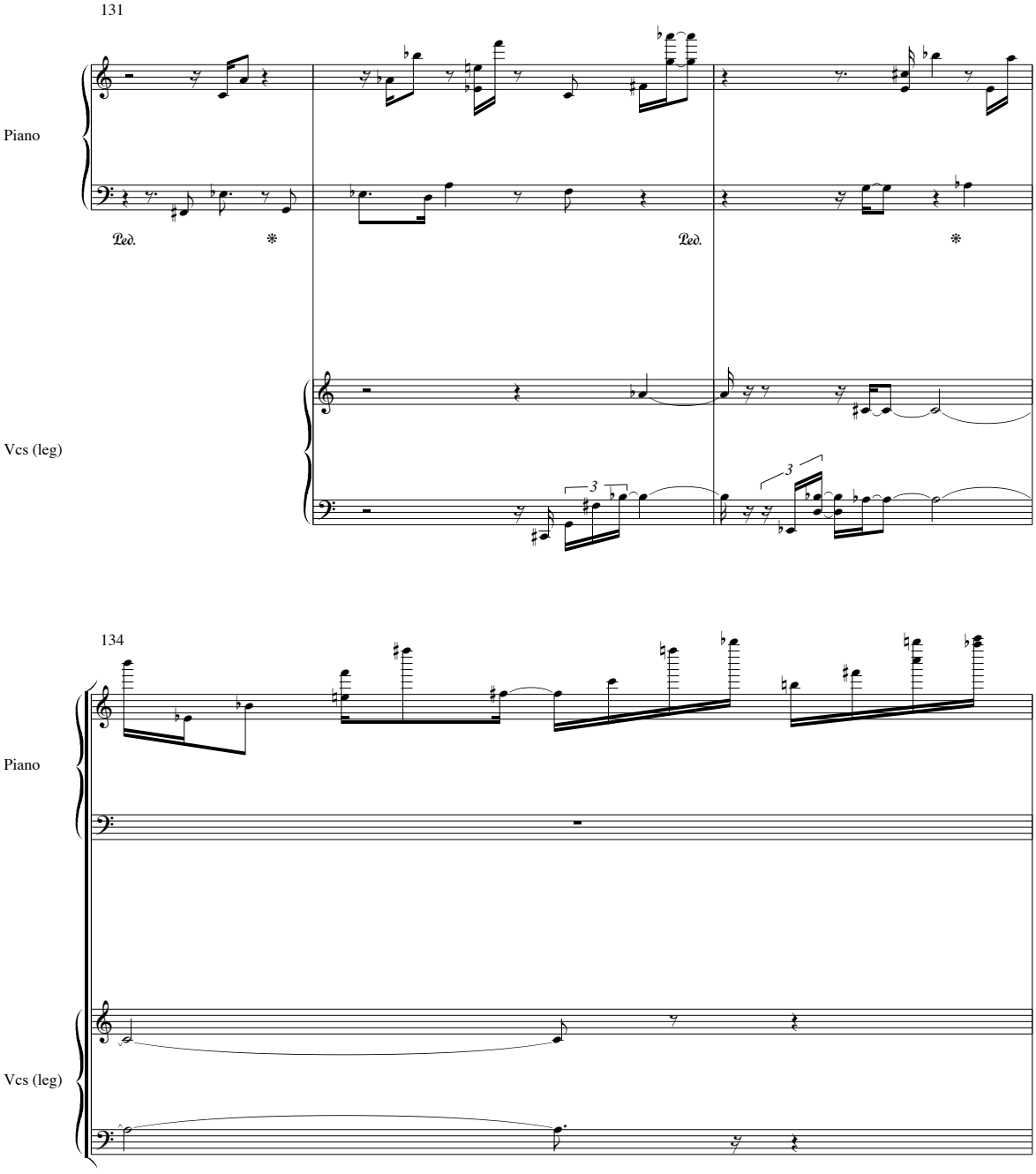


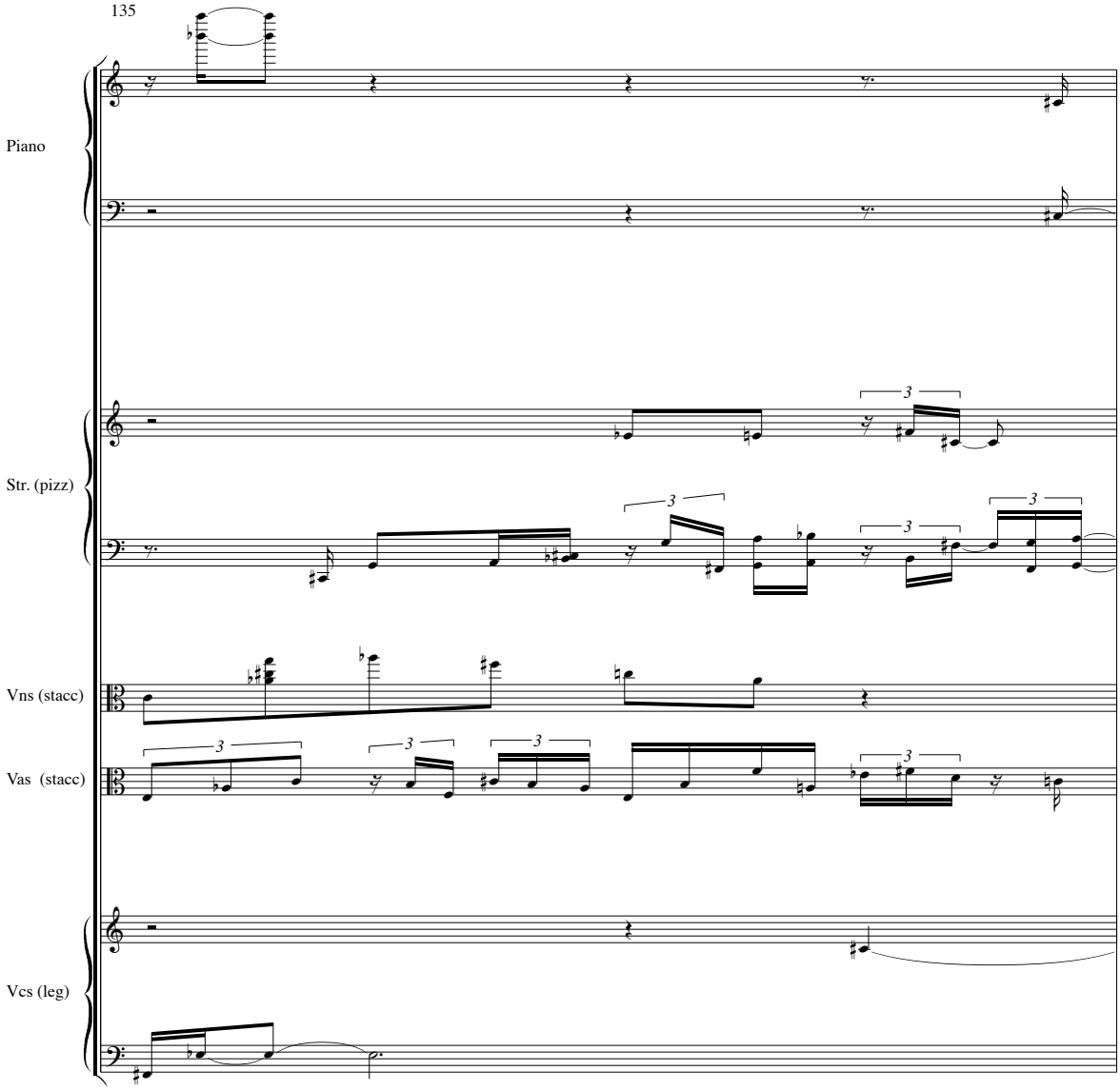
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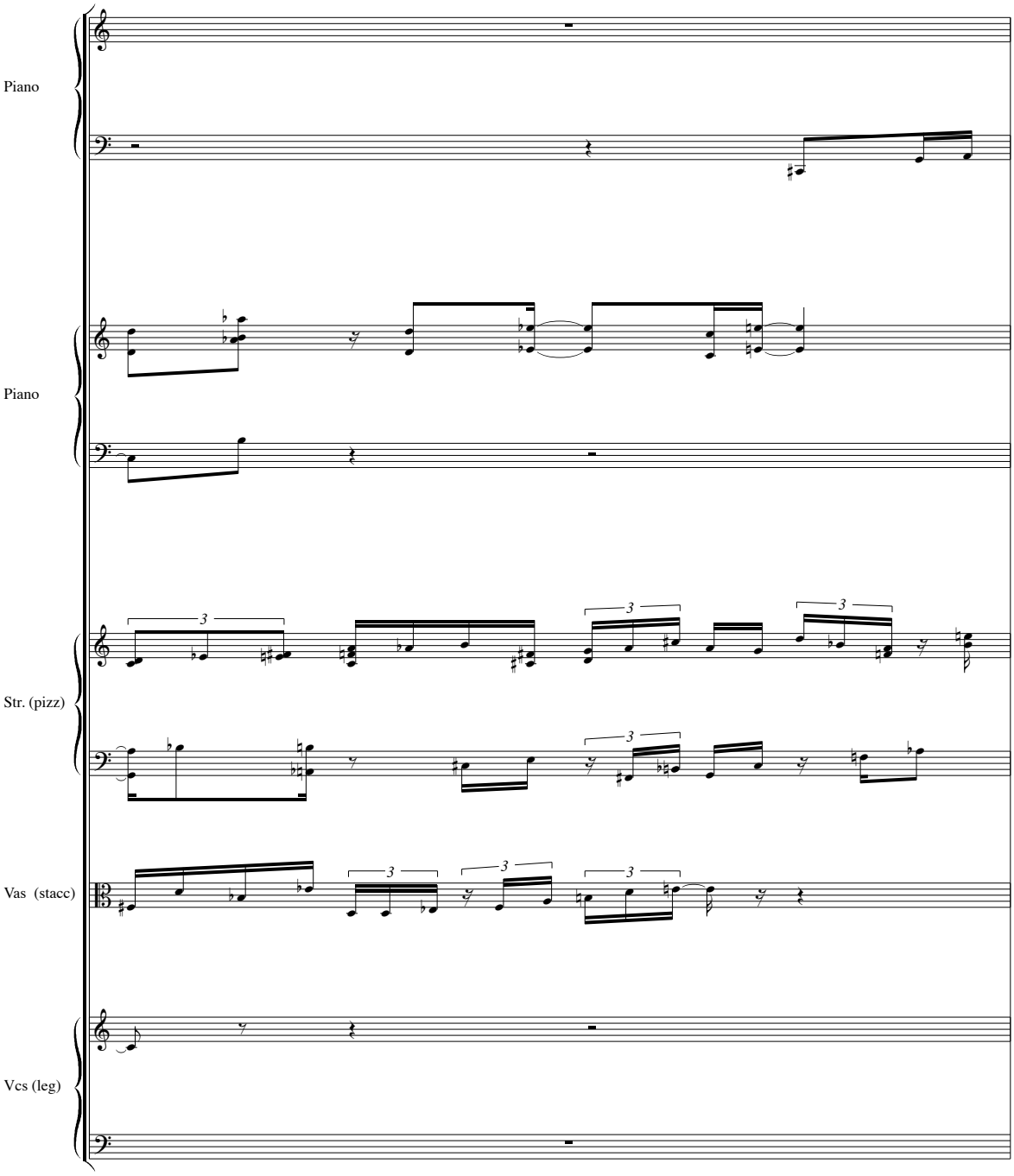


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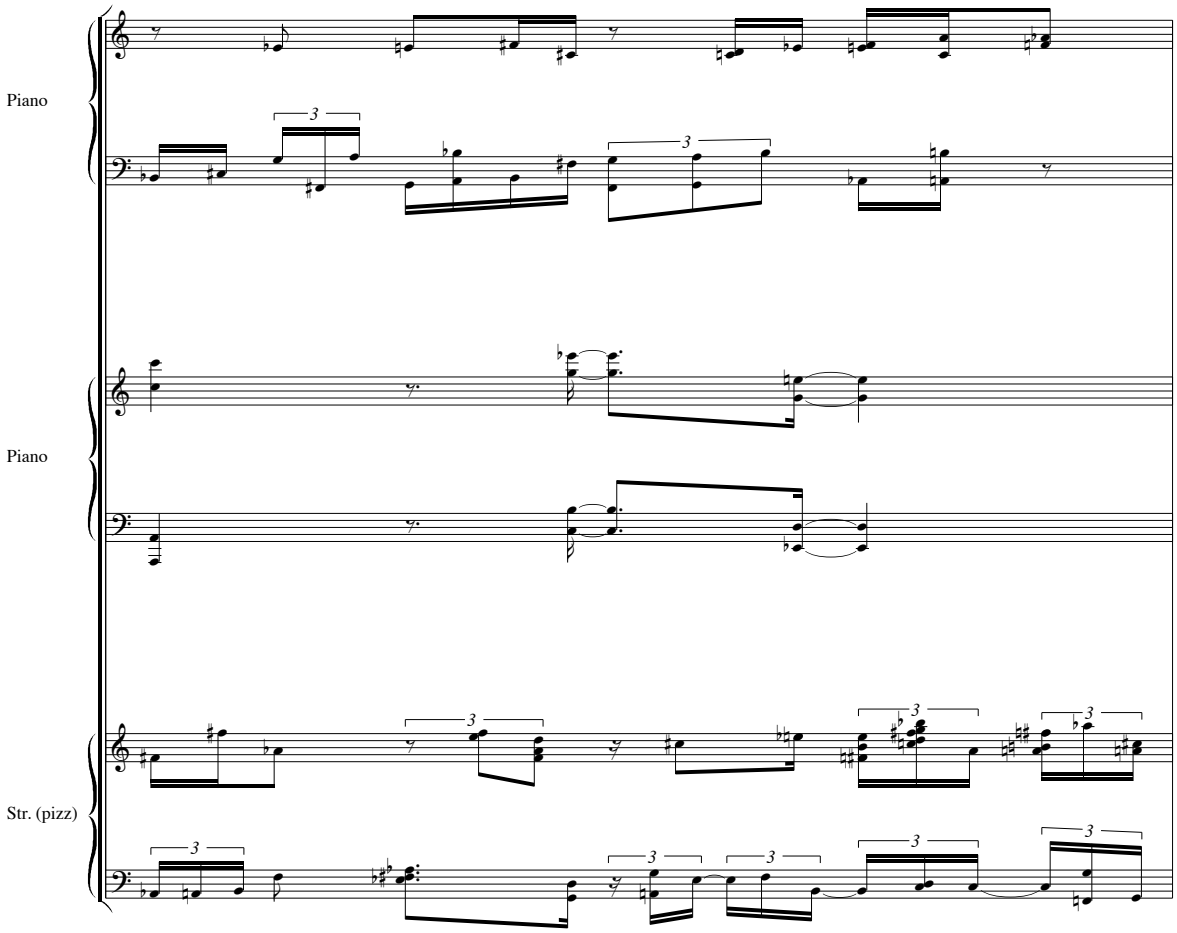



131
Piano
Ped.
*
Ped.
*
Vcs (leg)
3
3
134
Piano
Vcs (leg)
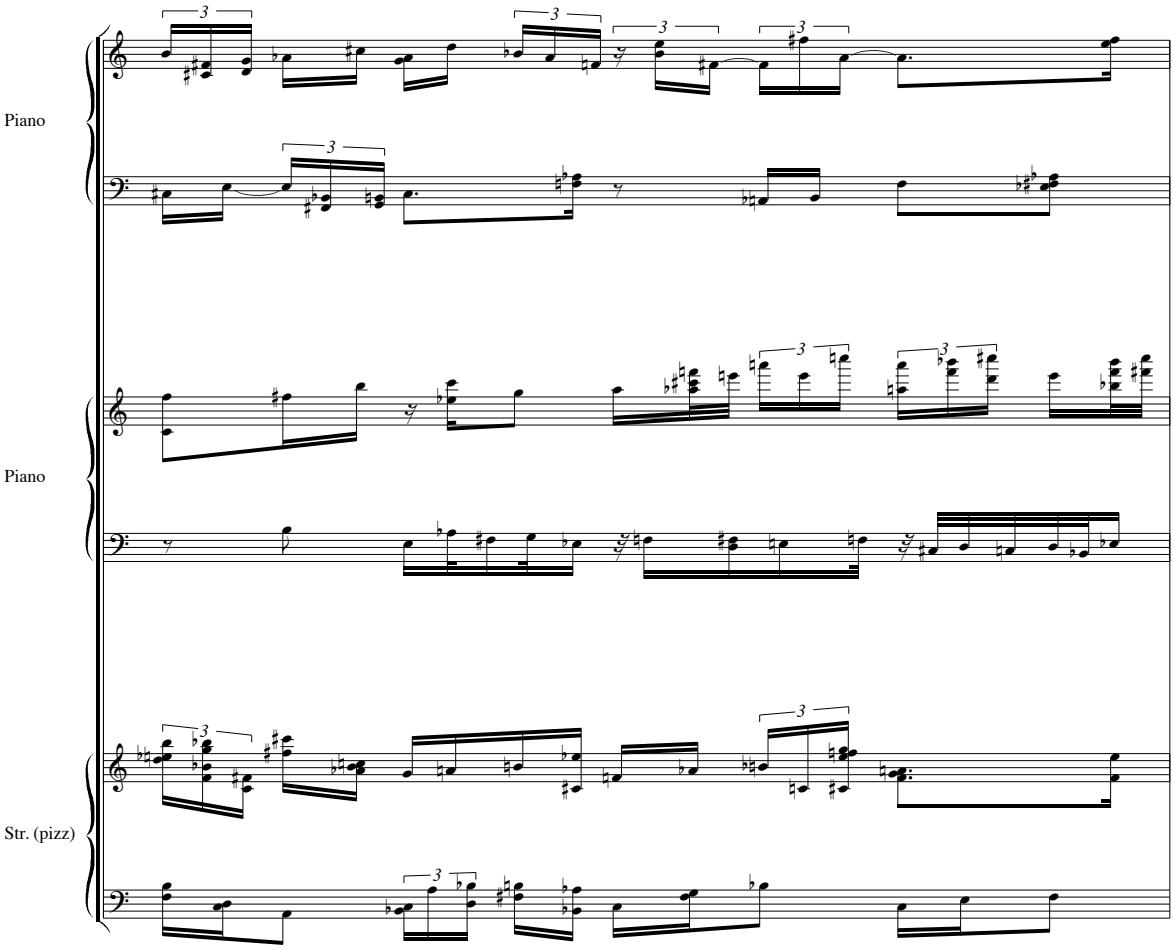

135
Piano
Str. (pizz)
Vns (stacc)
Vas (stacc)
Vcs (leg)
3

136
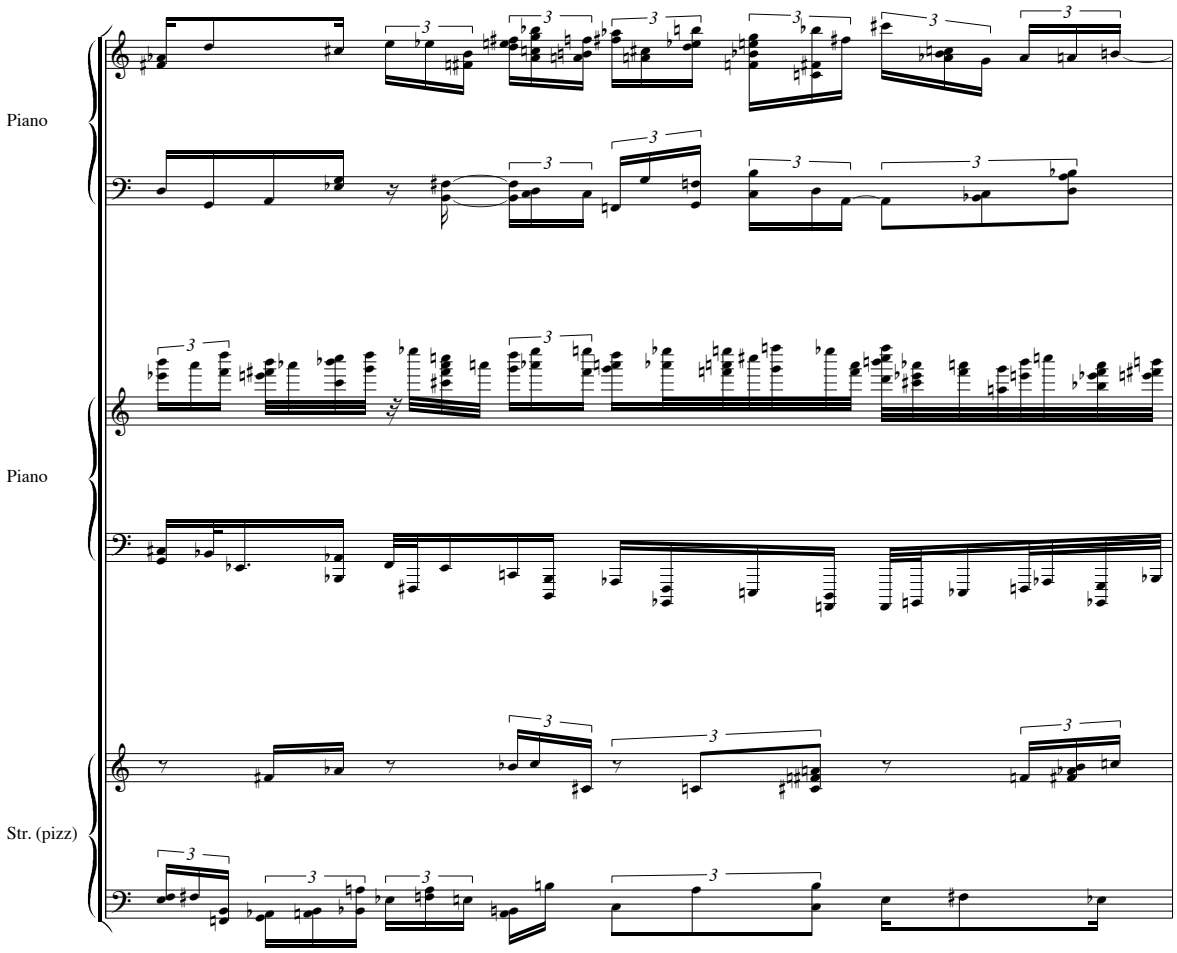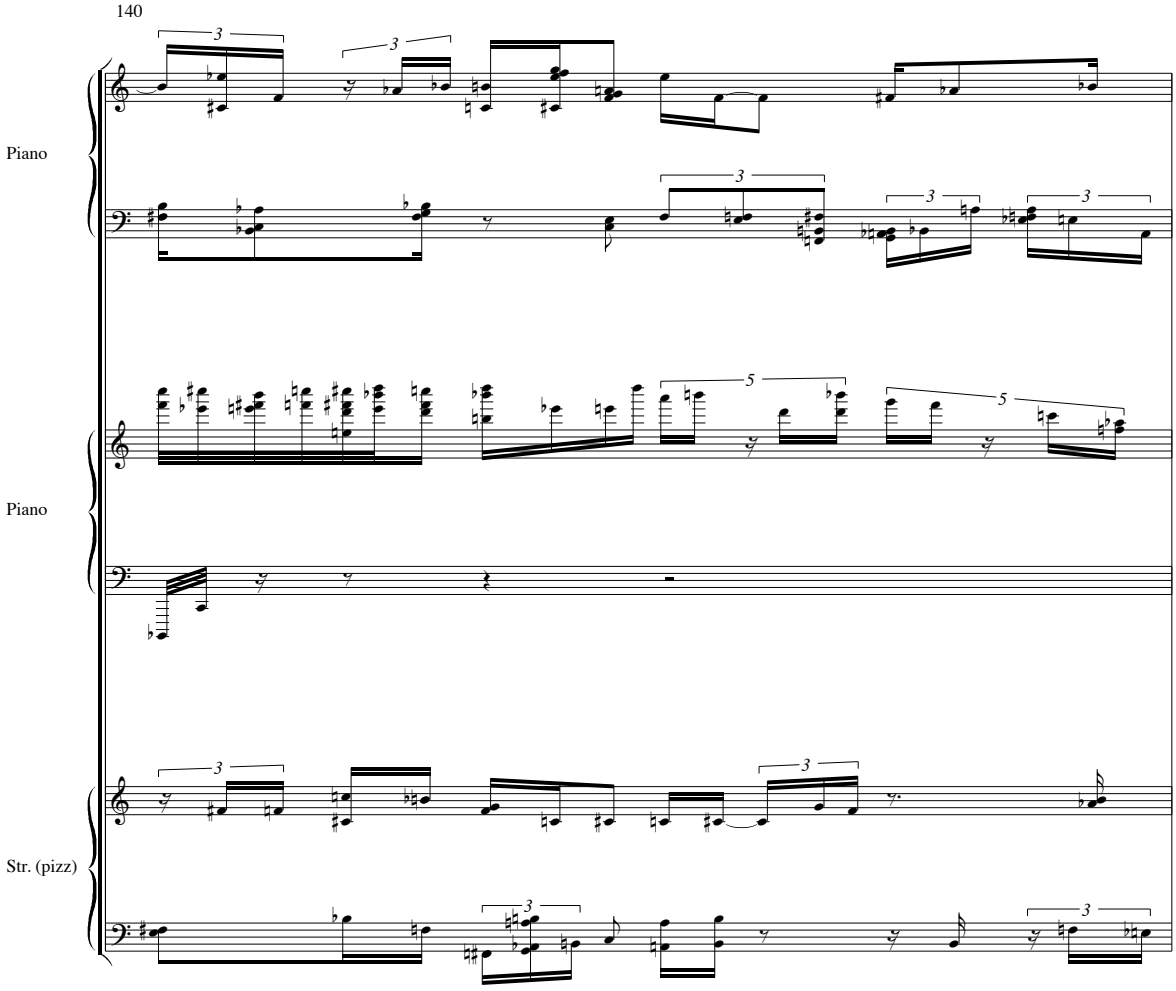



Piano
Piano
Str. (pizz)
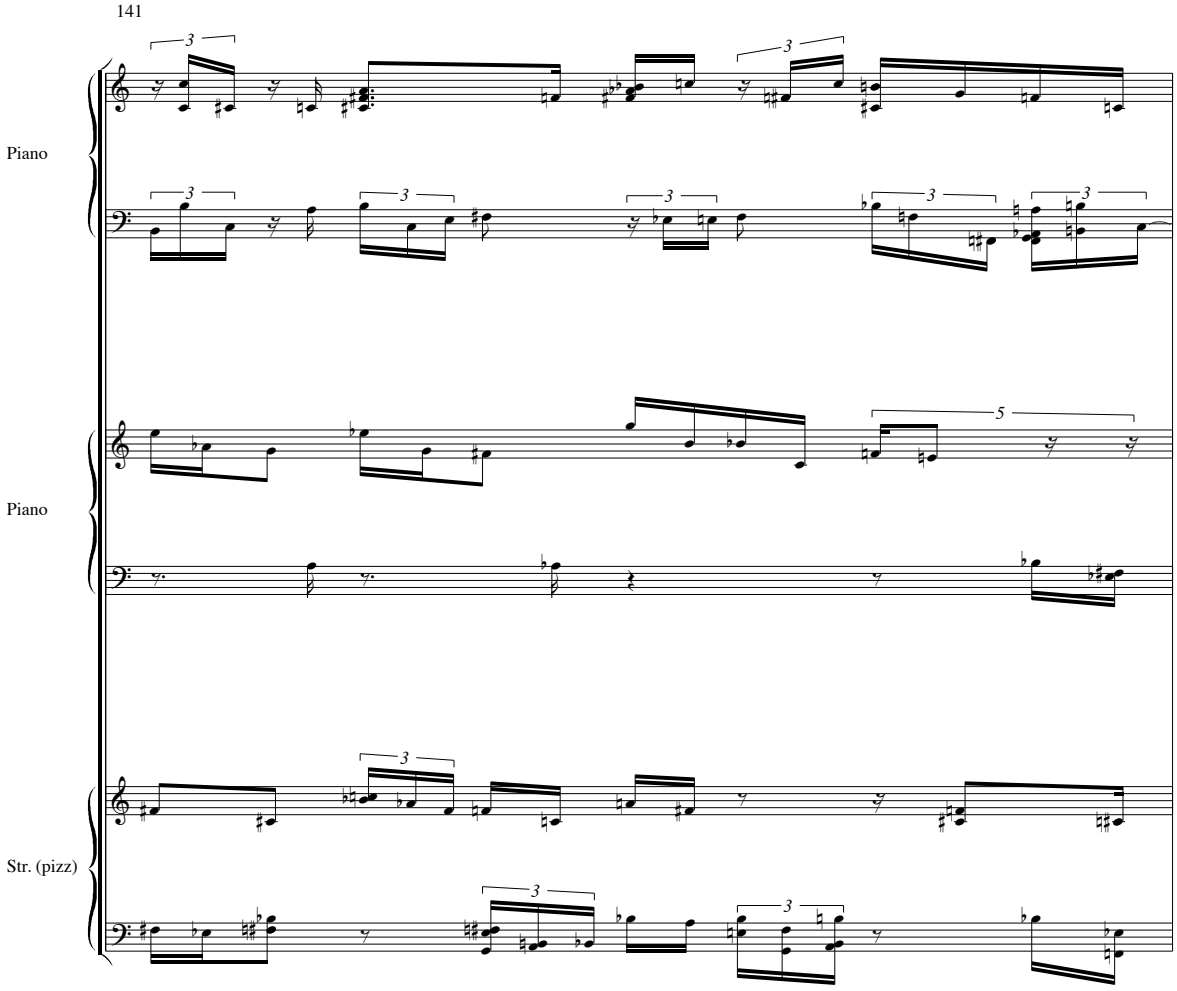
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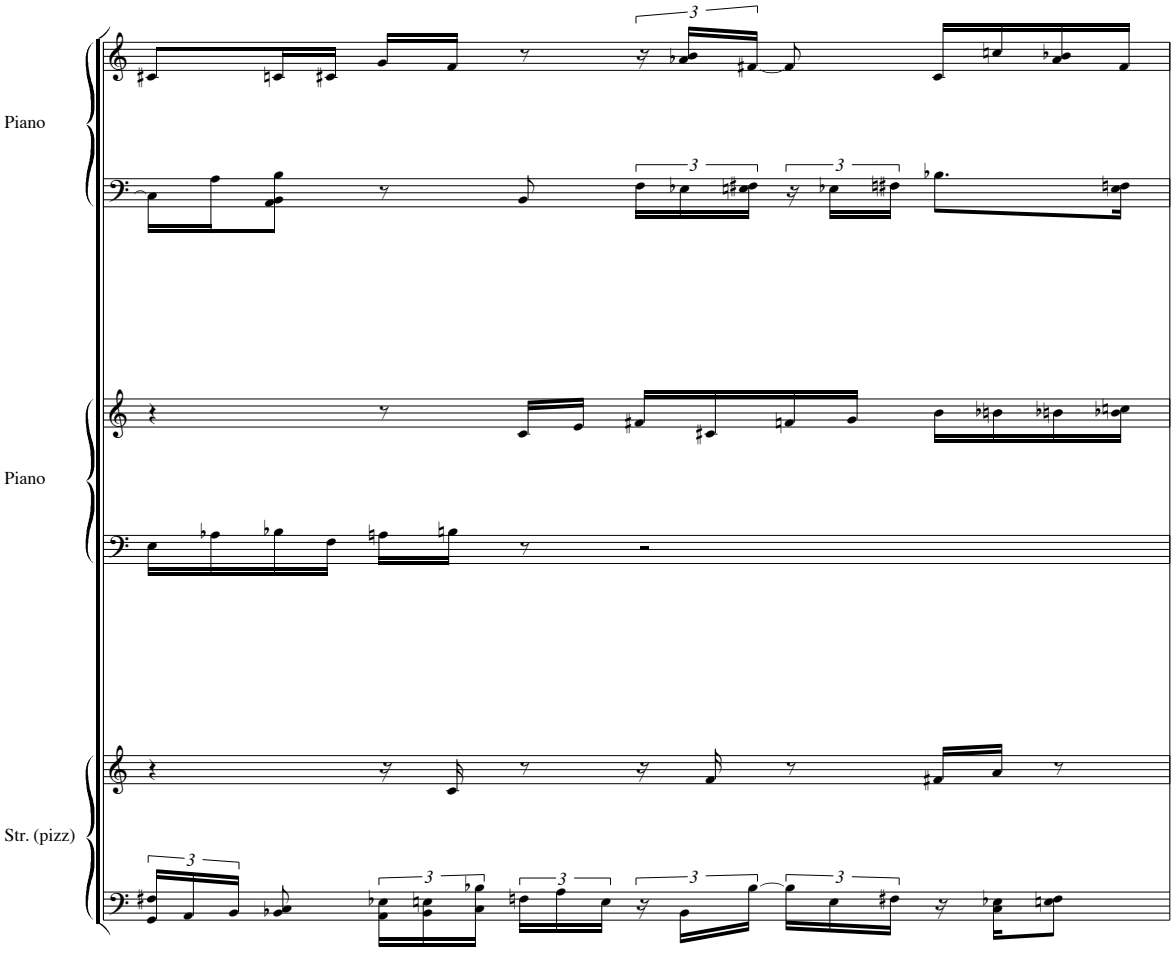


139




140
Piano
Piano
Str. (pizz)


141
Piano
Piano
Str. (pizz)
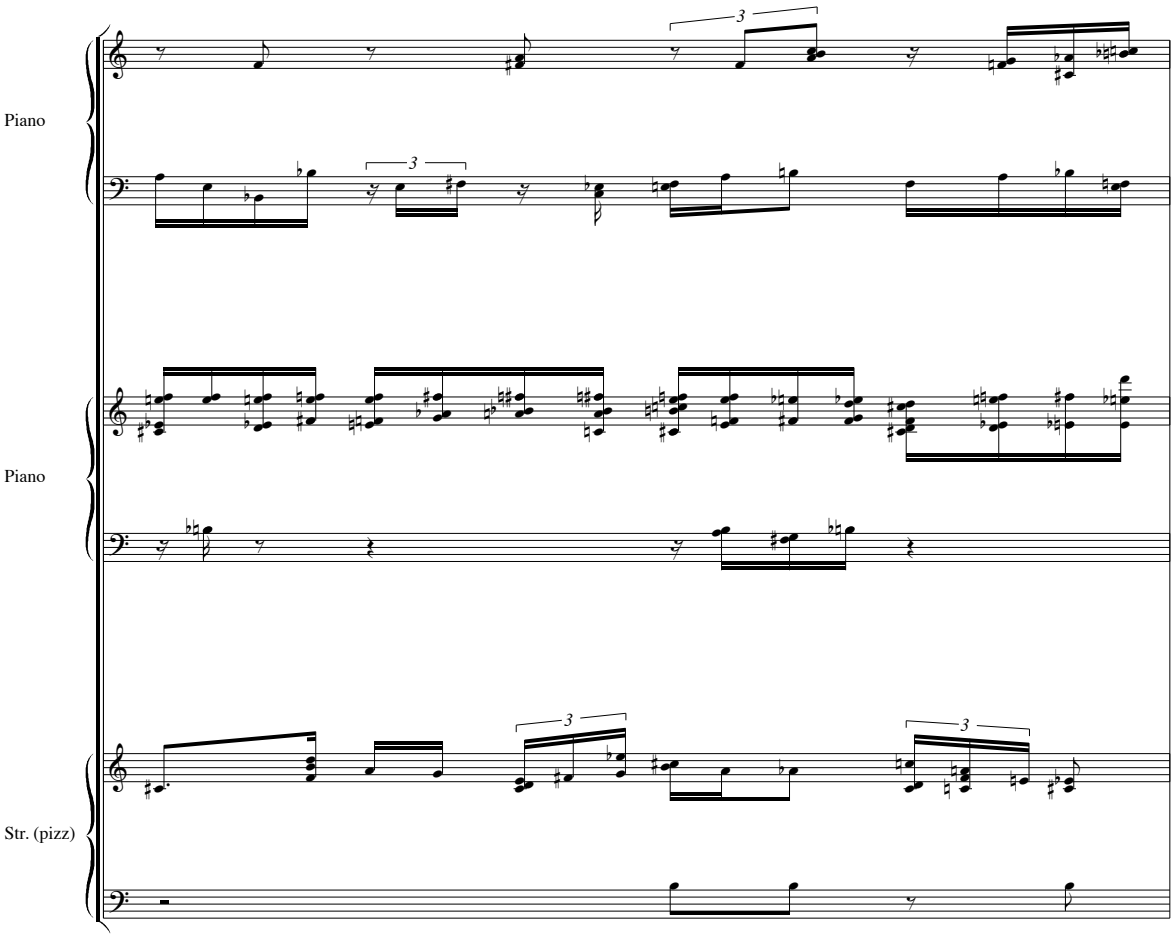
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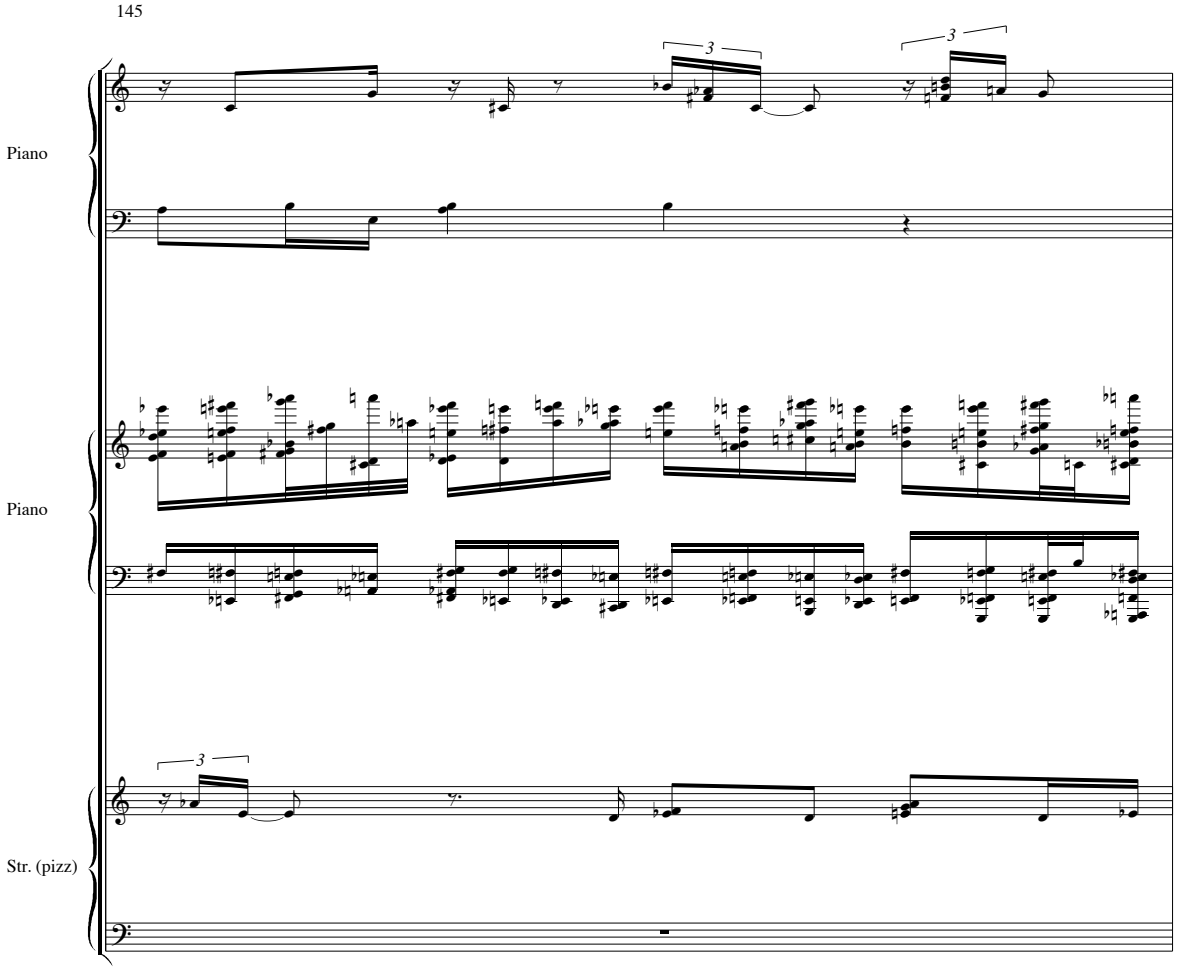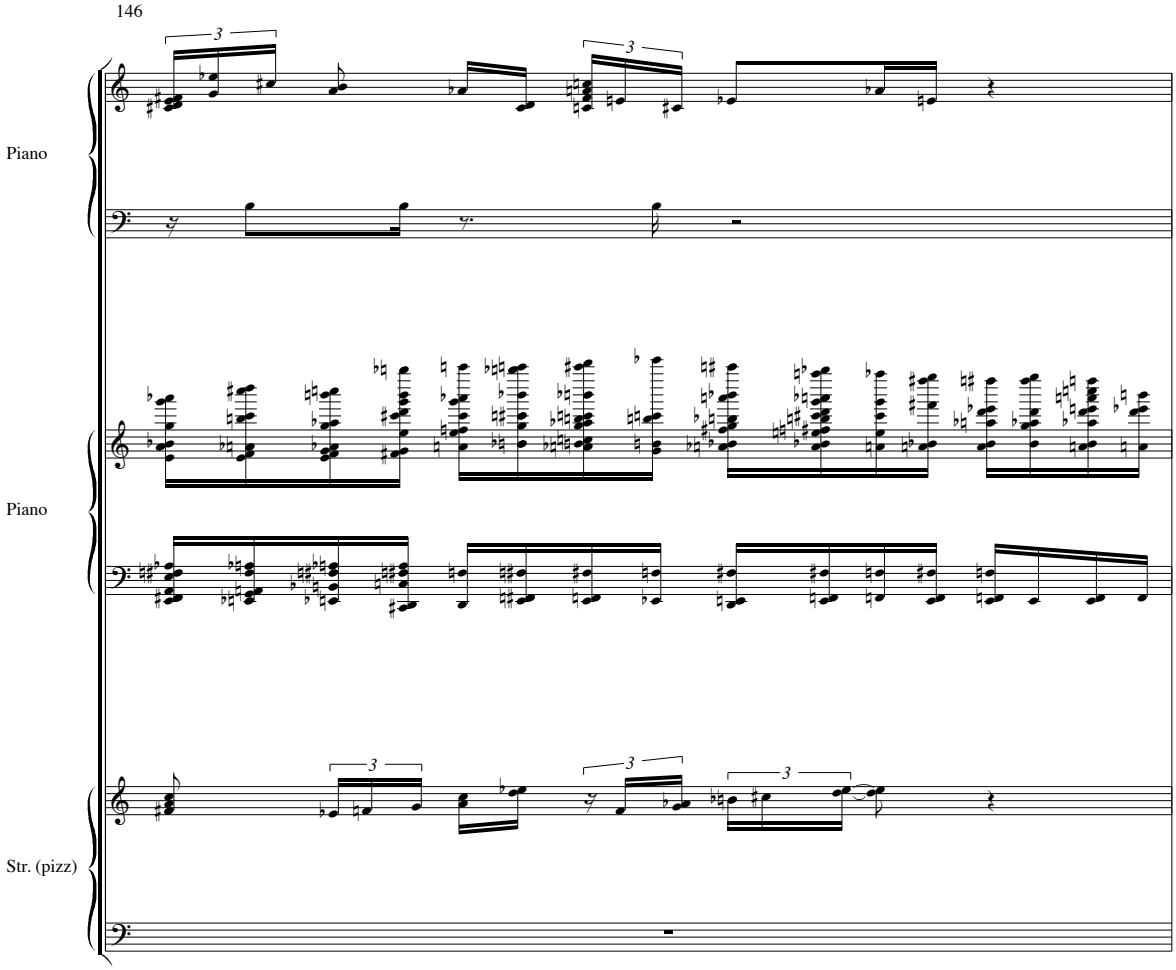


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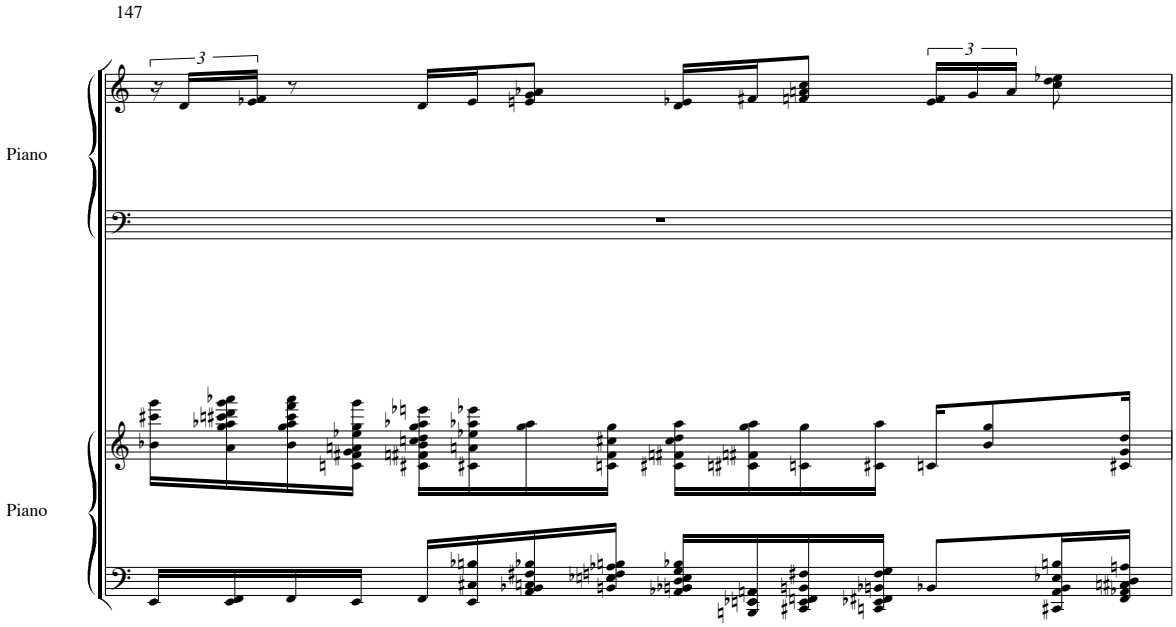


144




145
Piano
Piano
Str. (pizz)
3
3
3


146
Piano
Piano
Str. (pizz)


147
Piano
Piano

148

Piano

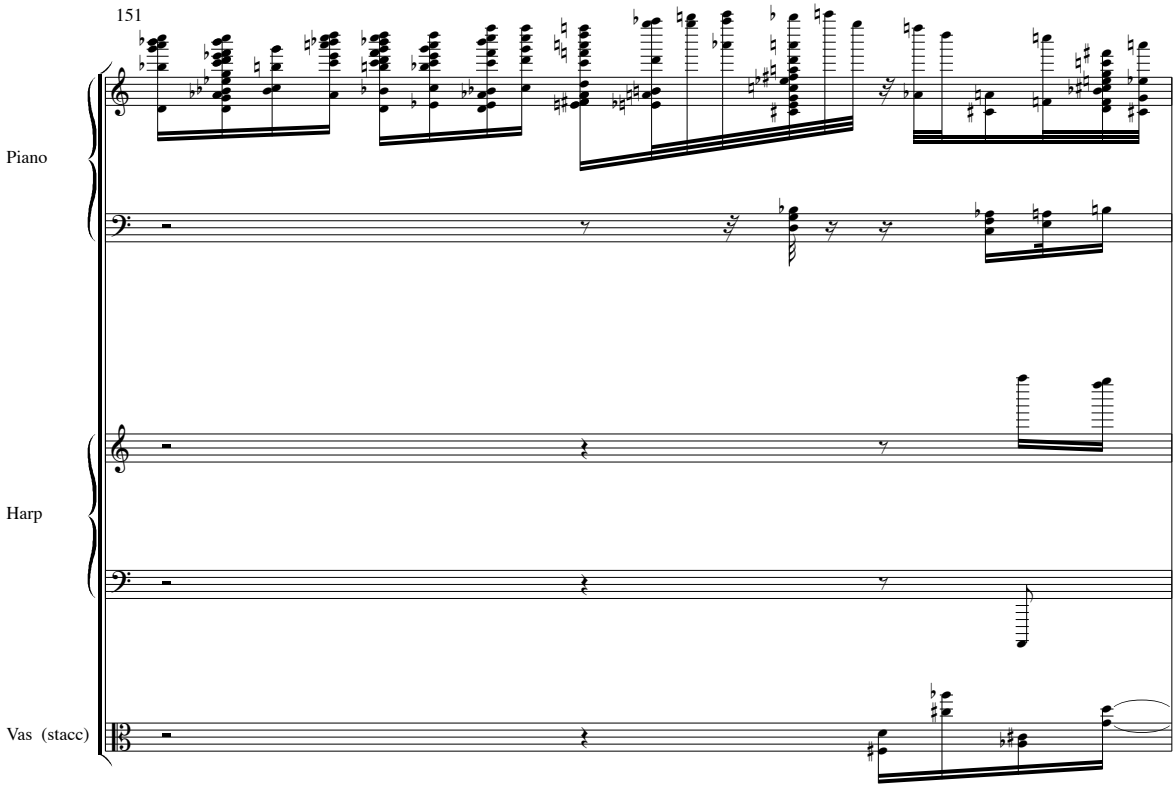
Piano
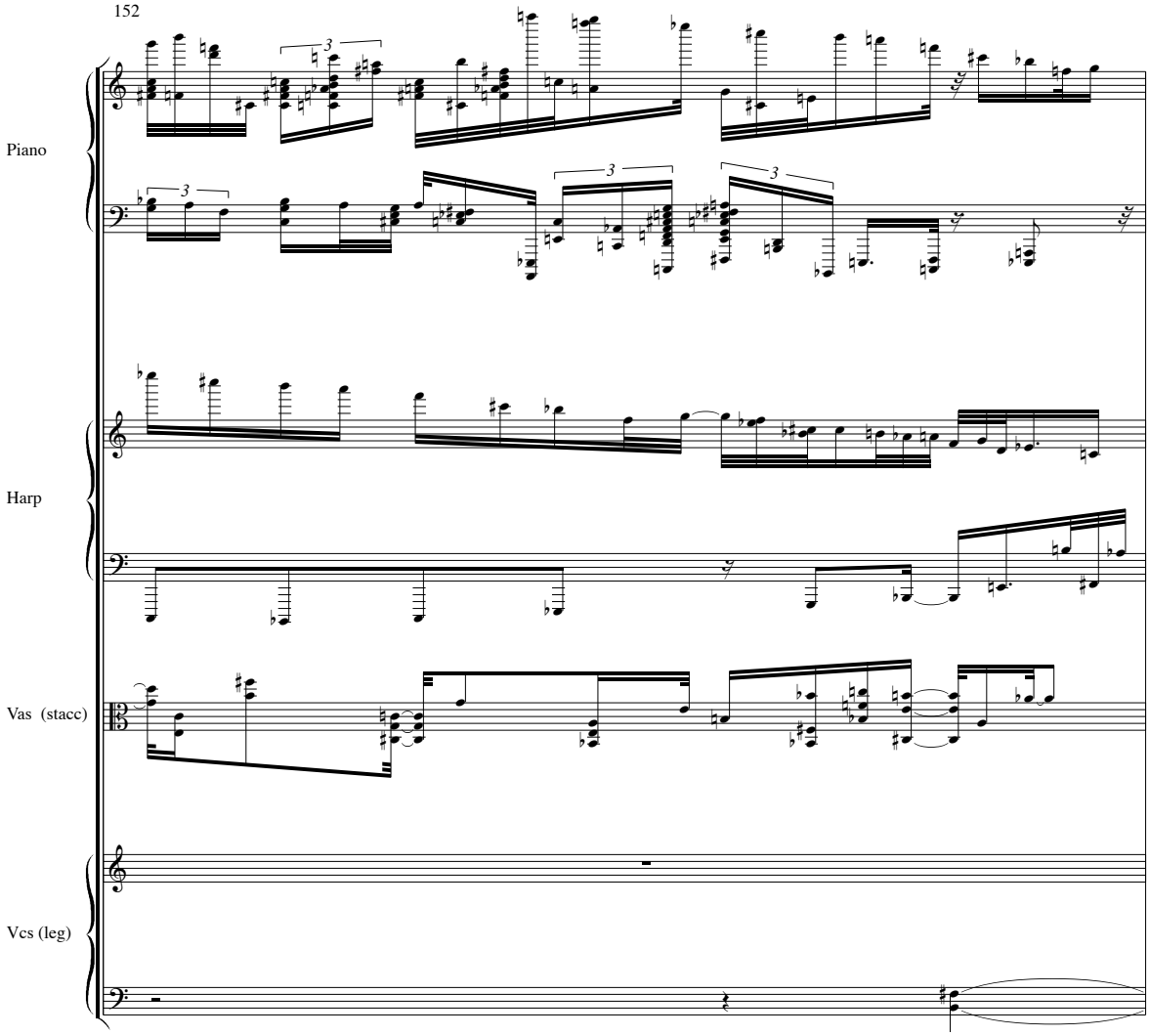
149

Piano
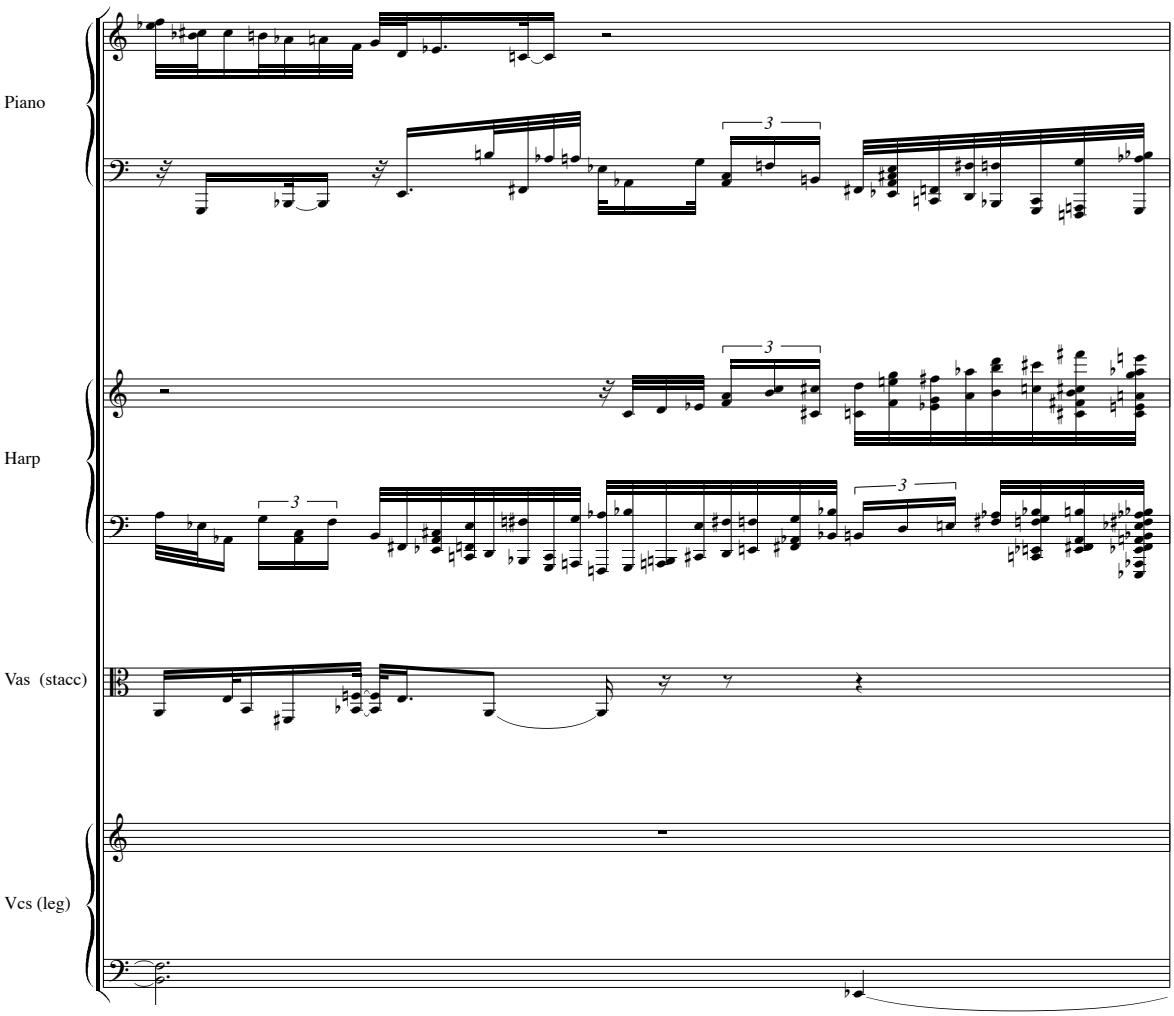
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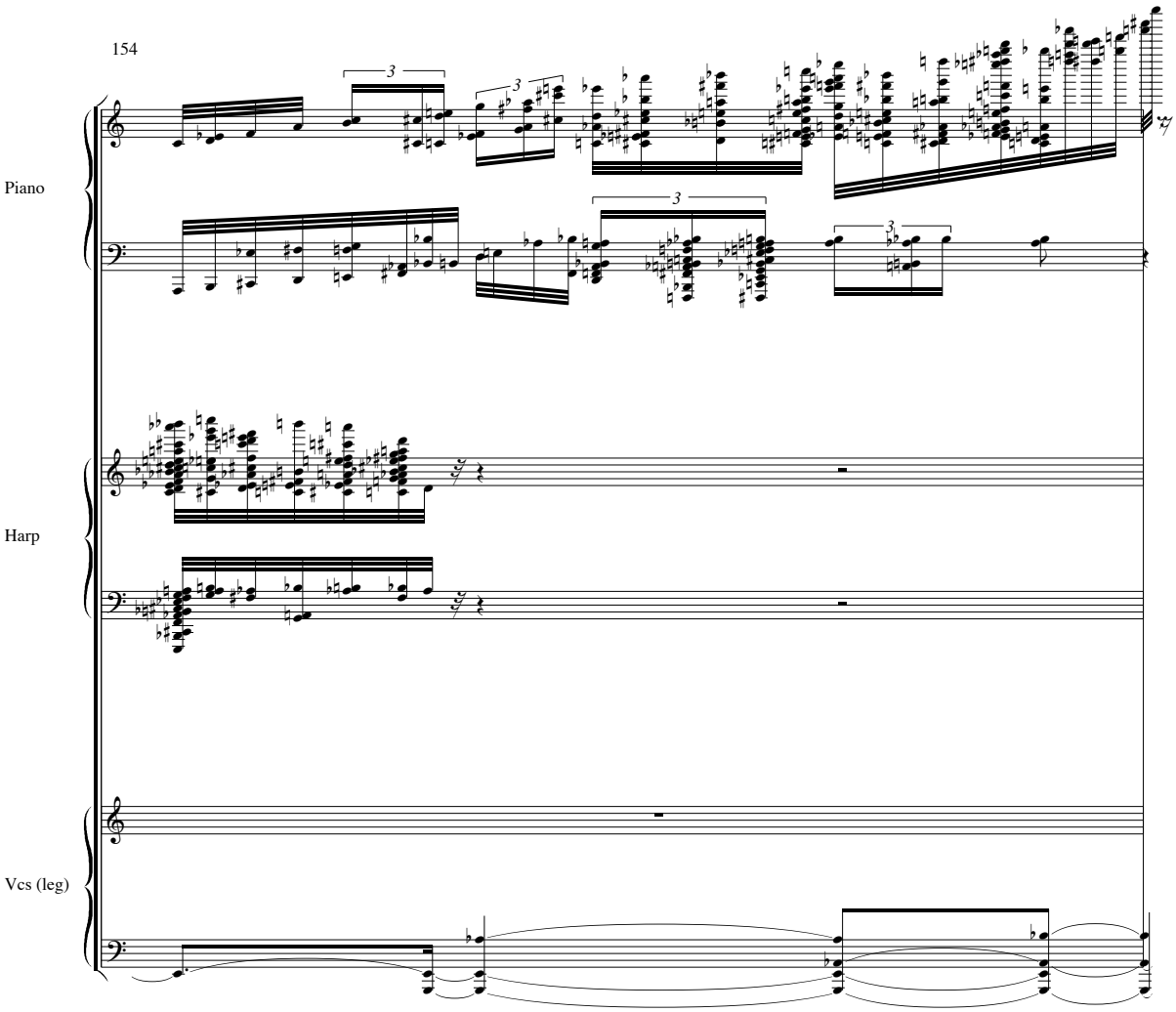
Piano
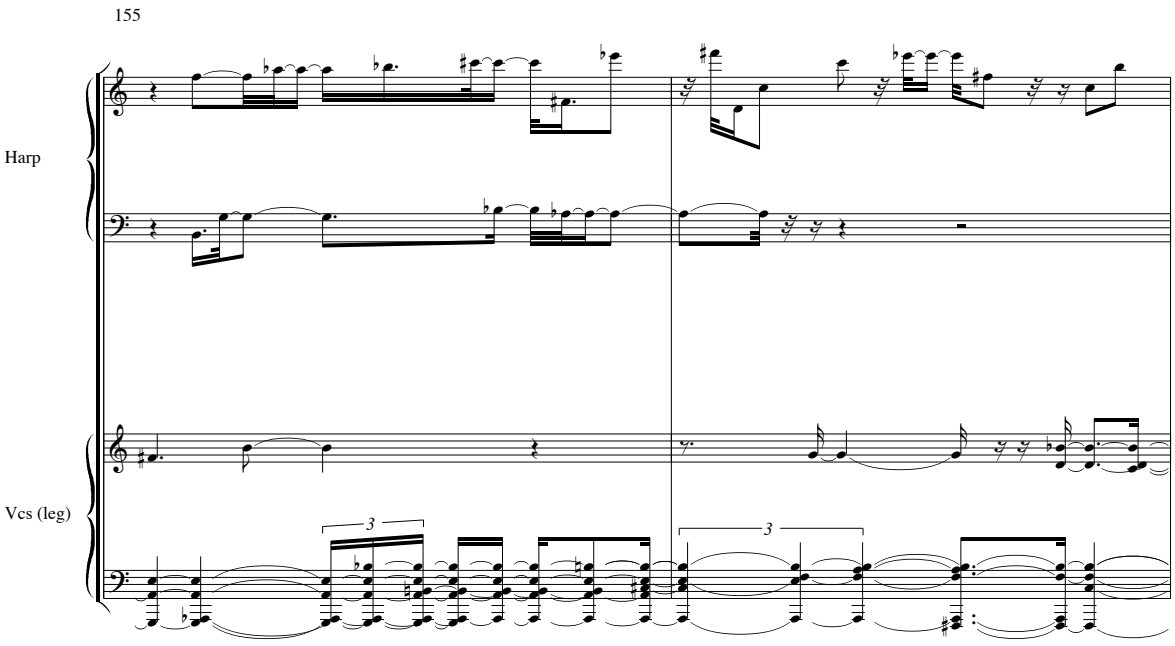

151
Piano
Harp
Vas (stacc)


152
Piano
Harp
Vas (stacc)
Vcs (leg)

153




154
Piano
Harp
Vcs (leg)


155
Harp
Vcs (leg)

157

Harp

Vcs (leg)

159

Vcs (leg)

3

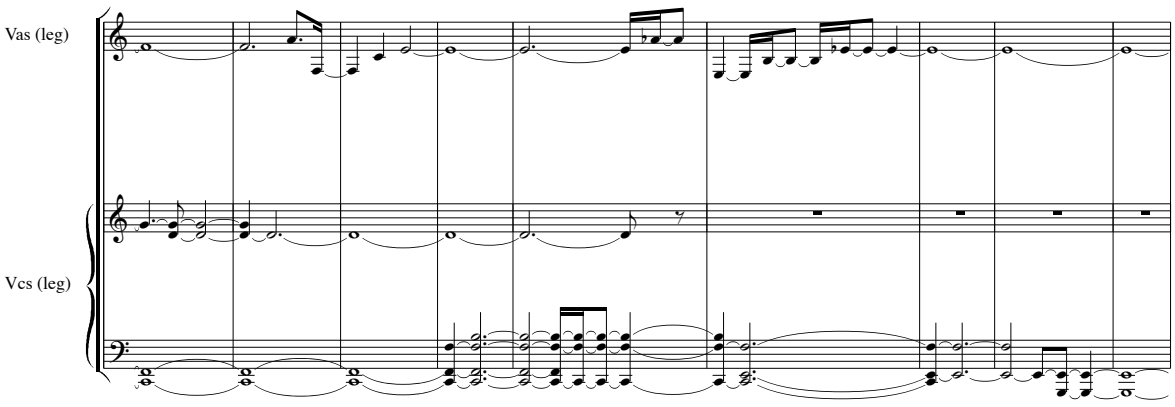
163

Vcs (leg)
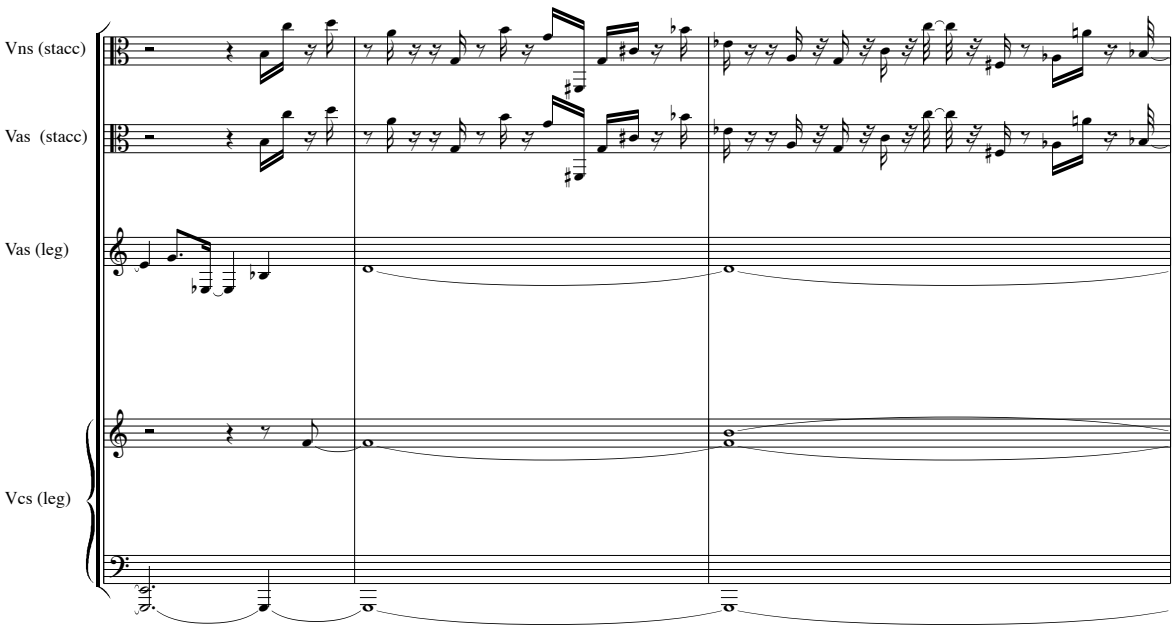
Vas (leg)

Vcs (leg)
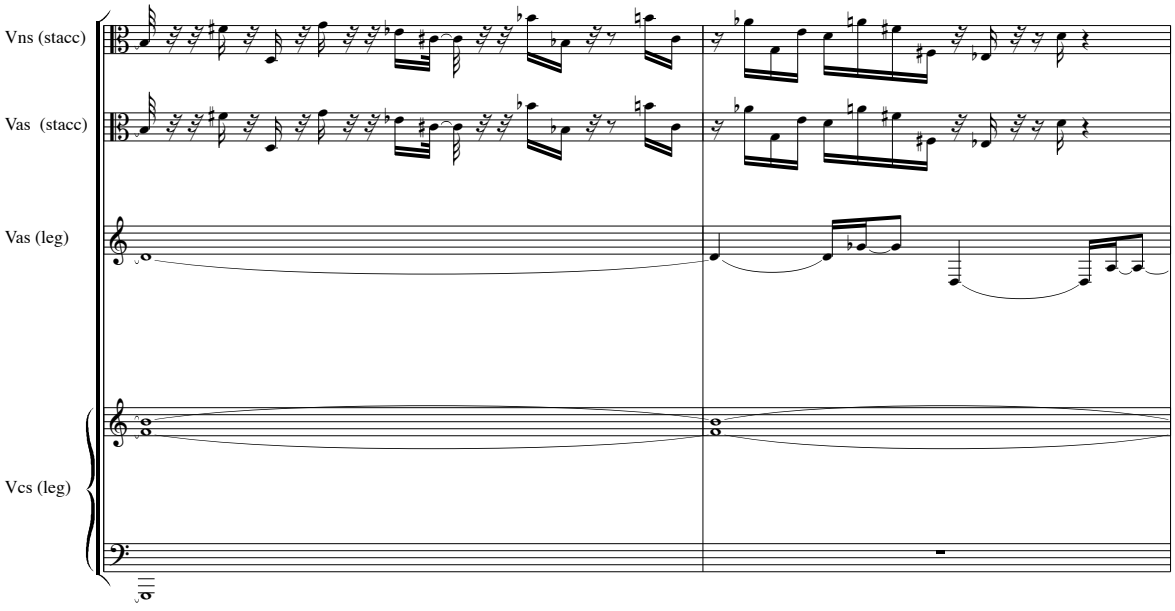
180


Vas (leg)
Vcs (leg)

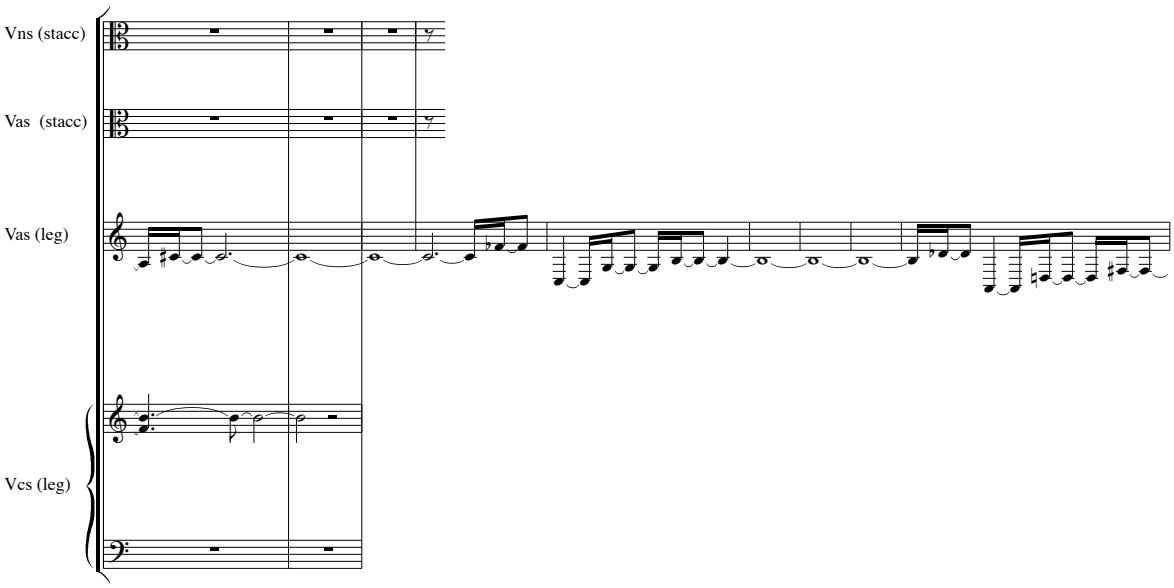
189


Vns (stacc)
Vas (stacc)
Vas (leg)
Vcs (leg)

192


Vns (stacc)
Vas (stacc)
Vas (leg)
Vcs (leg)

194
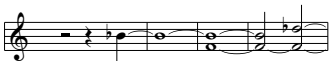


Vns (leg)

203

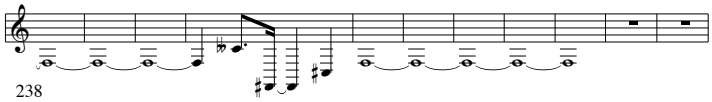
bars 212-234
all instr. silent

234
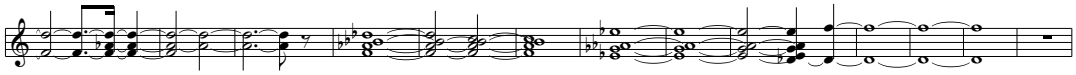


Vas (leg)
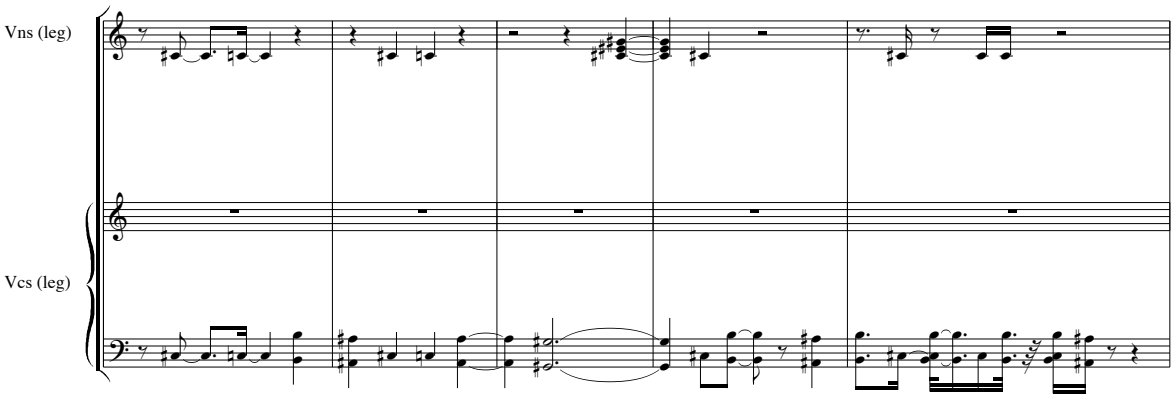
238
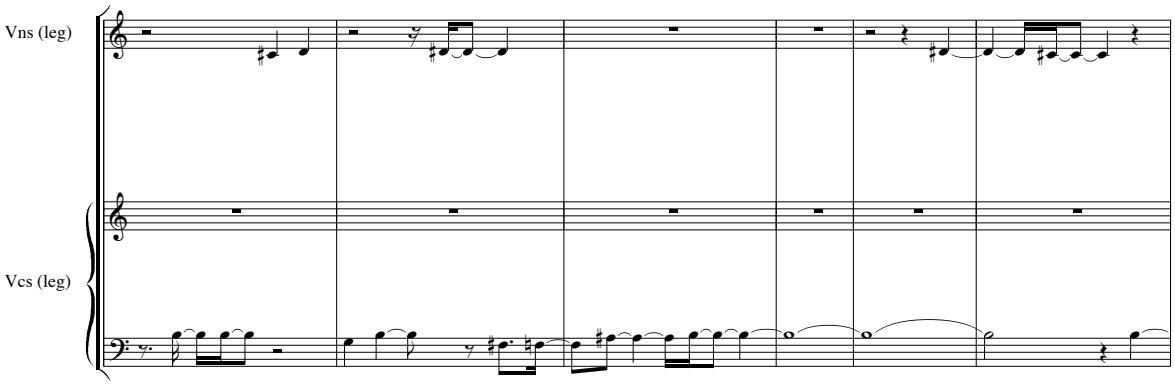


Vns (leg)

251
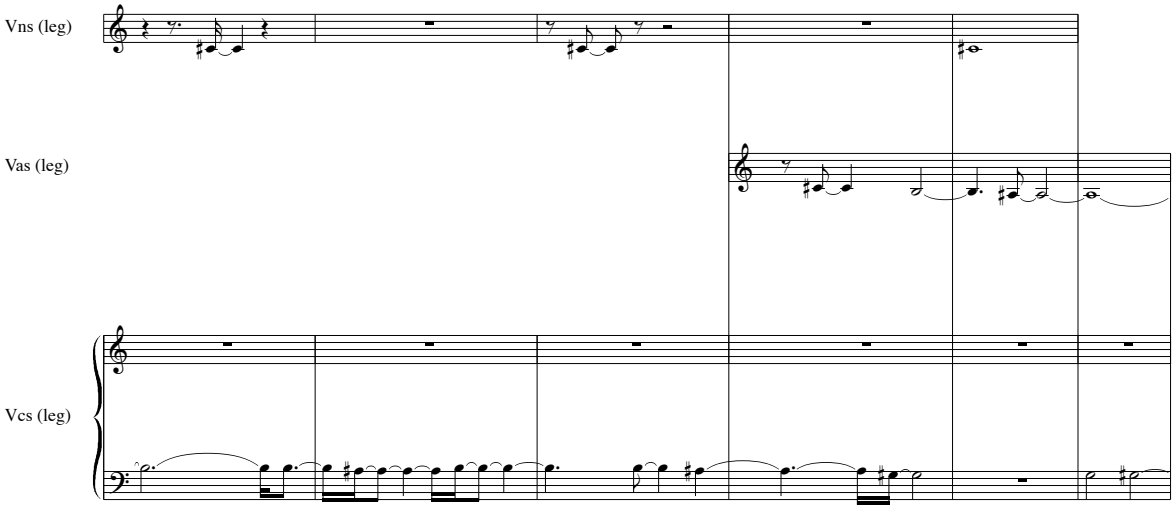




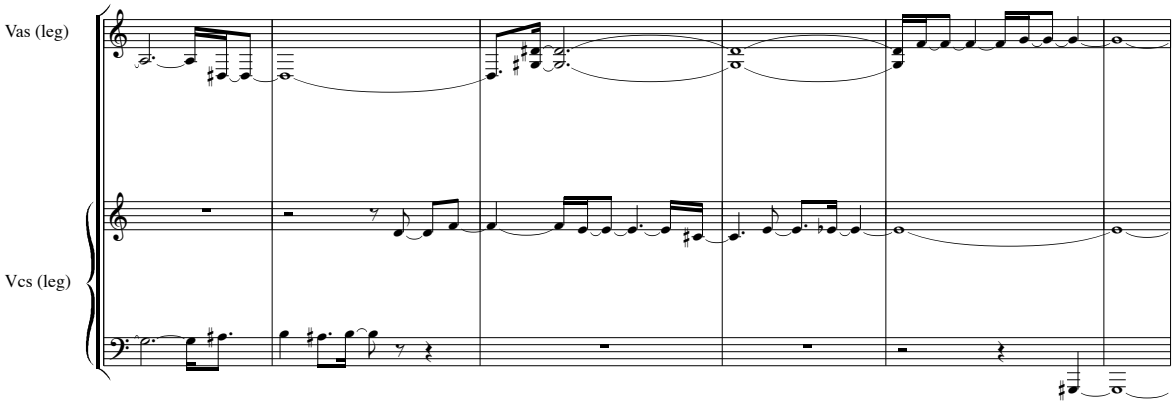
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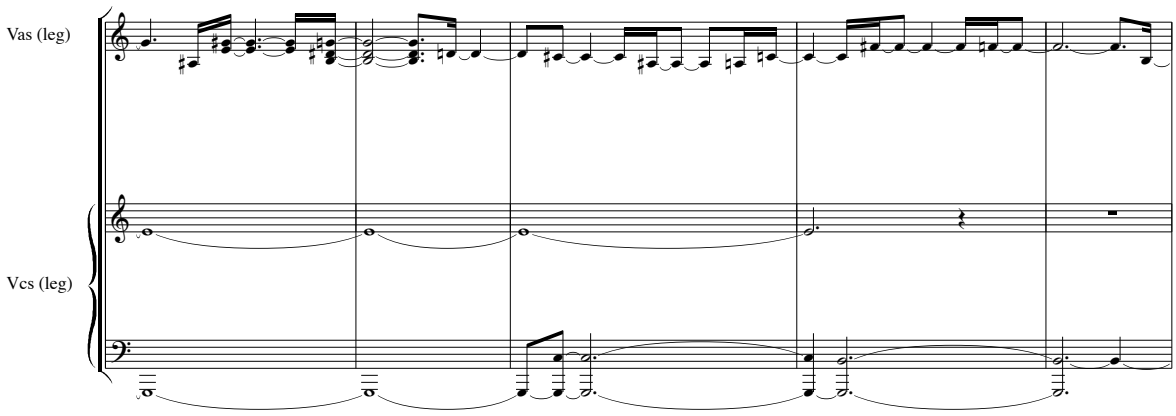
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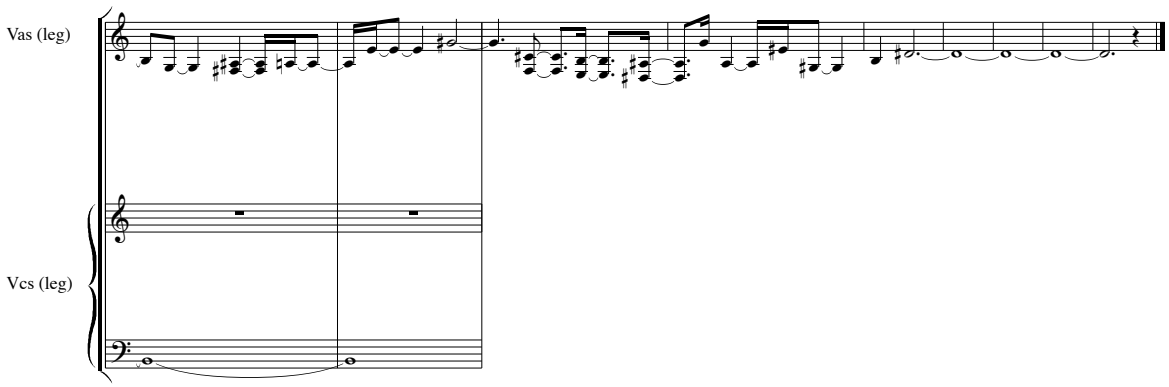


268



274



279



Take Me By The Hand: Virtual Choir

Acousmatic setting

Take Me By The Hand (acousmatic) 2012

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This score of the acousmatic version of Take Me By The Hand is in three forms.
(1) Overview of whole acousmatic form of the composition, colour-coded according to singers' voices.
(2) Transcription of first 64 bars to conventional notation for demonstration of asynchronous heterophonic combination of first heard voice. [1]
(3) Annotated acousmatic montage of sampled voices.
For reconstruction to new performance, this form should be used. [2]
Each voice delivers the primary material, unaltered except for cuts or repetitions.
Exceptions are in short ostinati with open vowels (Part 4 in score legend: baritone and tenor) such as in Figure 1.



Figure 1: Examples of unworded (rounded vowel) vocal harmmonic figure used

[1] A full conventionally notated score, representing only pitch, duration, enunciation and dynamics (but lacking specific timbres or the imprecisions of the sampled performances used) would incompletely recreate the acousmatic form and erroneously slant focus in reproduction of the music onto pitch and localised rhythmic relations.

[2] Performance using this score may be freely reconstituted either in live (physical or virtual) or acousmatic form.

NB: The materials above should constitute the only elements. As many or few voices as required may be used.

In live performance, singers are free to decide the phrases and repetitions from within a given verse. A conductor or designated leader indicates transitions between numbered sections shown. (Syllabic or pitch-related annotations on this score may be incorporated or disregarded.

Other variations may be introduced by common agreement or at will according to the performance plan decided upon by future performers).

For use of this score appropriated first in geo-location (St Paul's Churchyard) then reformed as an acousmatic form of that landscape-based soundwalk,

see *https://soundcloud.com/3dbare/audio-portrait-of-st-pauls-2012*

and a reduced form of it, used as conference lecture sample material, discussing "Mapping Fields: Annotating Landscape with Audio" at ESSA 2014,

https://soundcloud.com/3dbare/tmbth-st-pauls-essa2014

These include breaths between words, simulated stutters by repetition of part-syllables (e.g. “ah” as 1st vowel isolated from “fireside”) and words or phrases, such as “down”, “fireside”, “down the hill”, “put me by” and “take me someone”.
The whole text may be treated in this manner, deconstructed into multiplied, fragmentary form then recompiled through repetition and layering.
Singers may also sing the melody wordlessly to syllables of their own choosing, at transitions between verses one and two and at the end, to disarticulate and disintegrate the poem speaker’s interior voice.
Verse 1

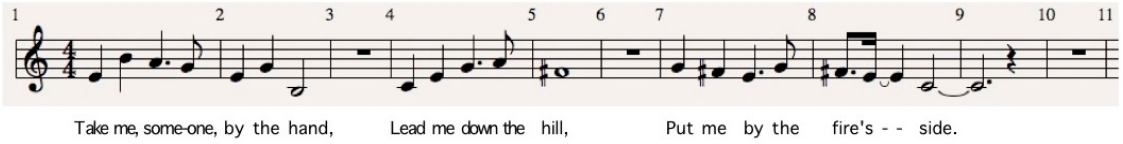


Figure 2: Primary material, verse one melody

Verse 2 [3]
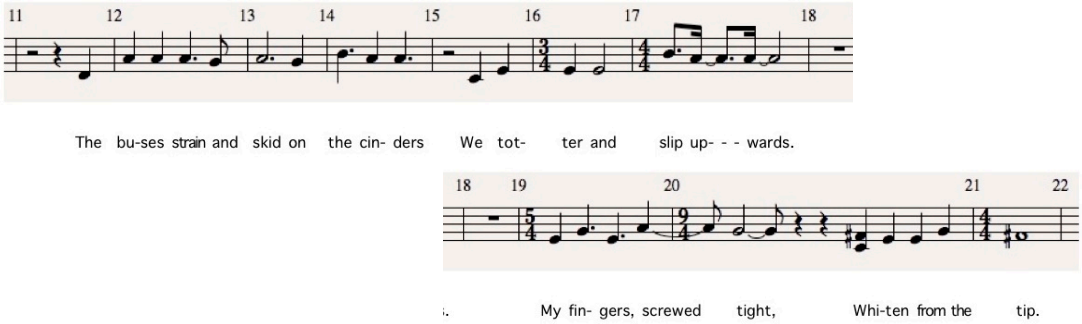


Figure 3: Primary material, verse two melody

Verse 3

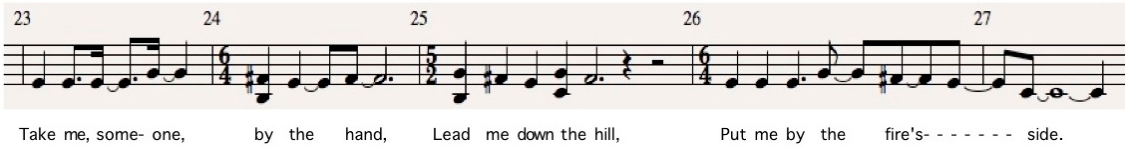


Figure 4: Primary material, verse three melody

[3] Lower part in dyad (bar 20) and those in verse 3 (bars 24-25) are optional alternatives or can be split.

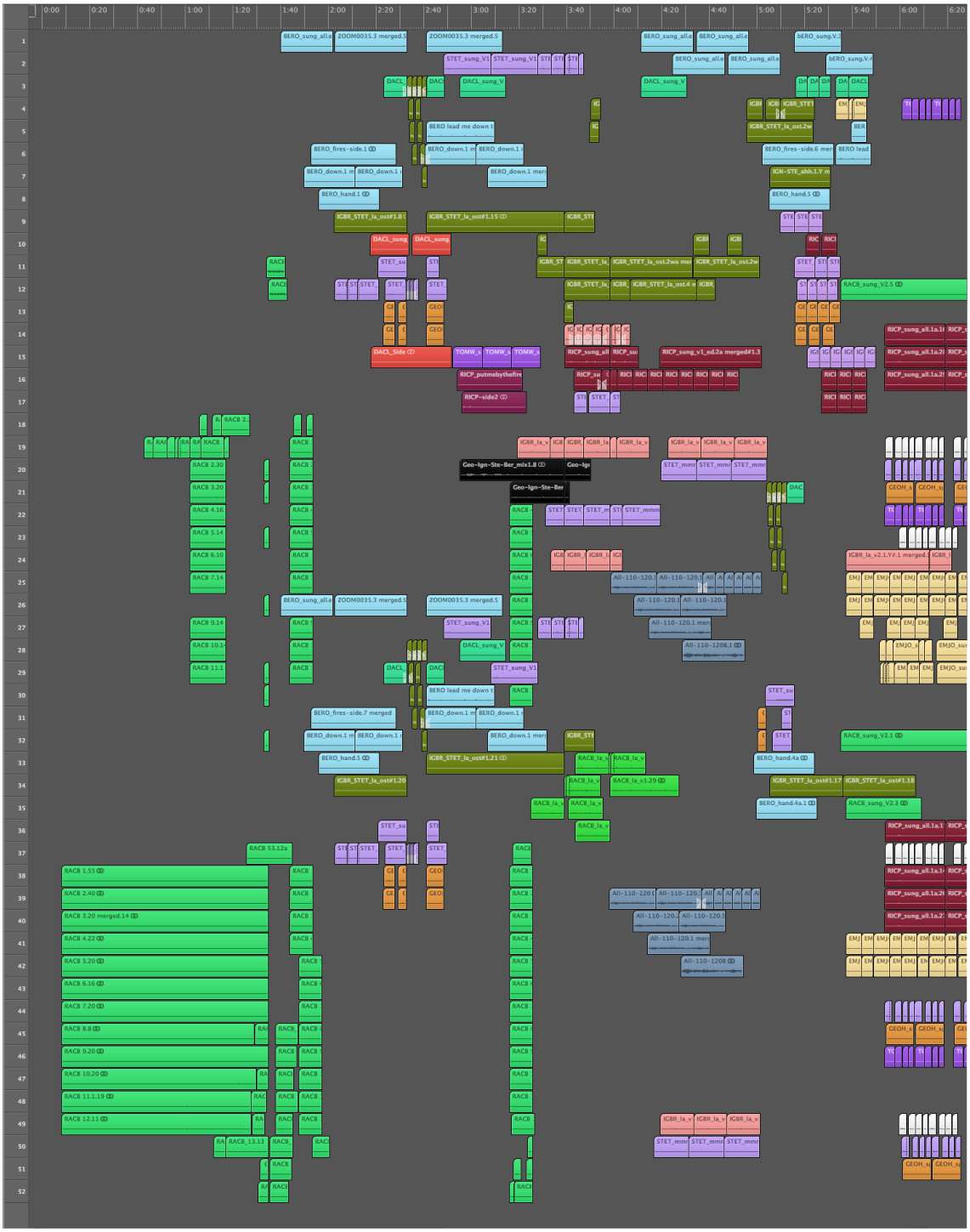


Figure 5: Overview of whole acousmatic score as colour-coded in Logic 9 software, “Arrange” window view. Start to 6’20”

(1) Rachel Boucher, mezzo-soprano
(2) Bereola Ogunleyi, counter-tenor
(3) Steven Troughton, baritone
(4) 2 baritones. (3) and (9)
(5) Daniel Clements, baritone
(6) George Holloway, tenor
(7) Tom Wilson, tenor (speaking & singing)
(8) Richard Patient, bass
(9) Ignacio Brasa, baritone
(10) Emma Joy, soprano
(11) Benjamin Mawson (speaking only)
(12) Lydia Rougon, soprano
(13) mixdown of 5+ voices, homophonic
(14) mixdown of 4 male voices, baritone/tenor

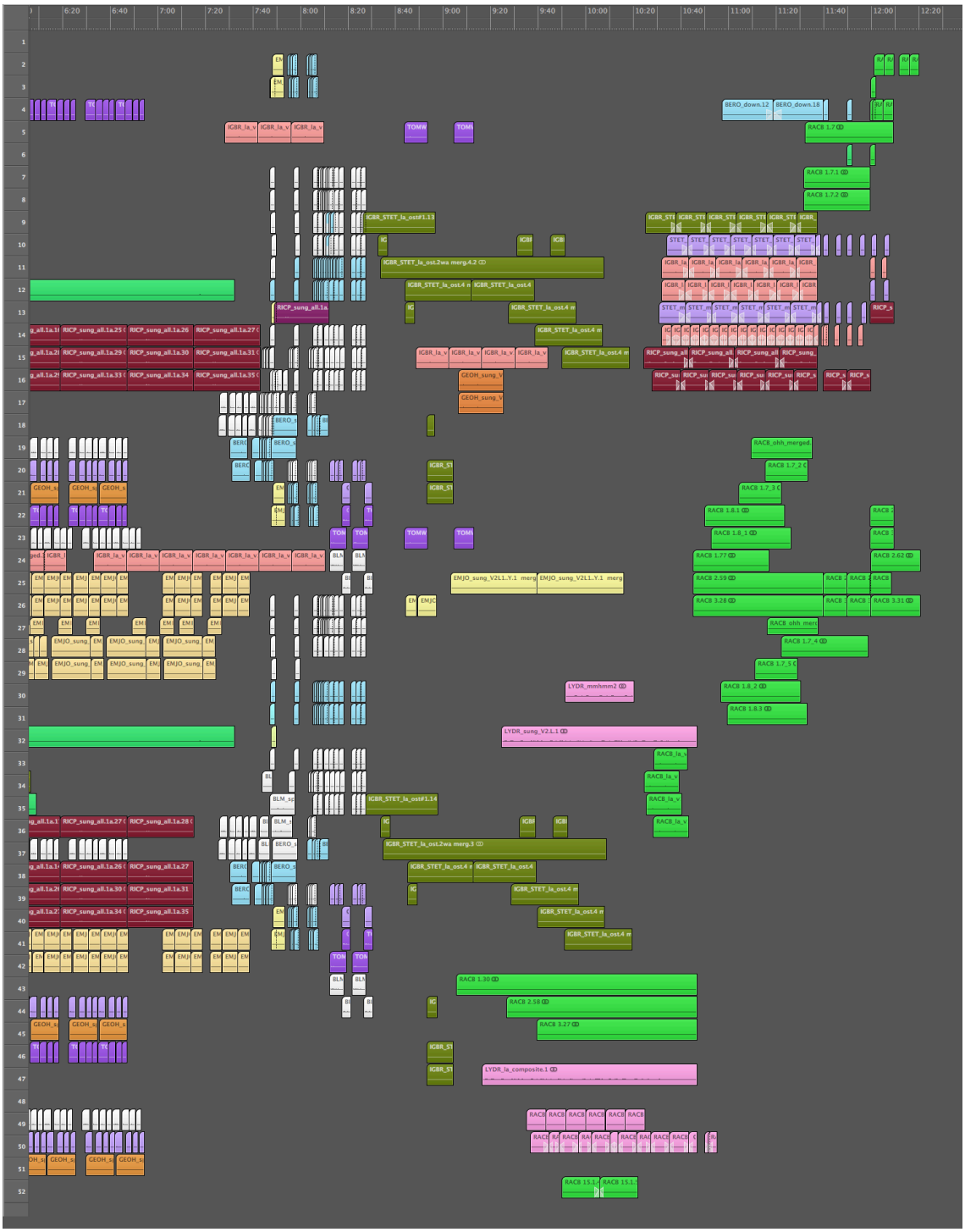


Figure 6: continuation of score overview, 6’20” to end (12’25”)

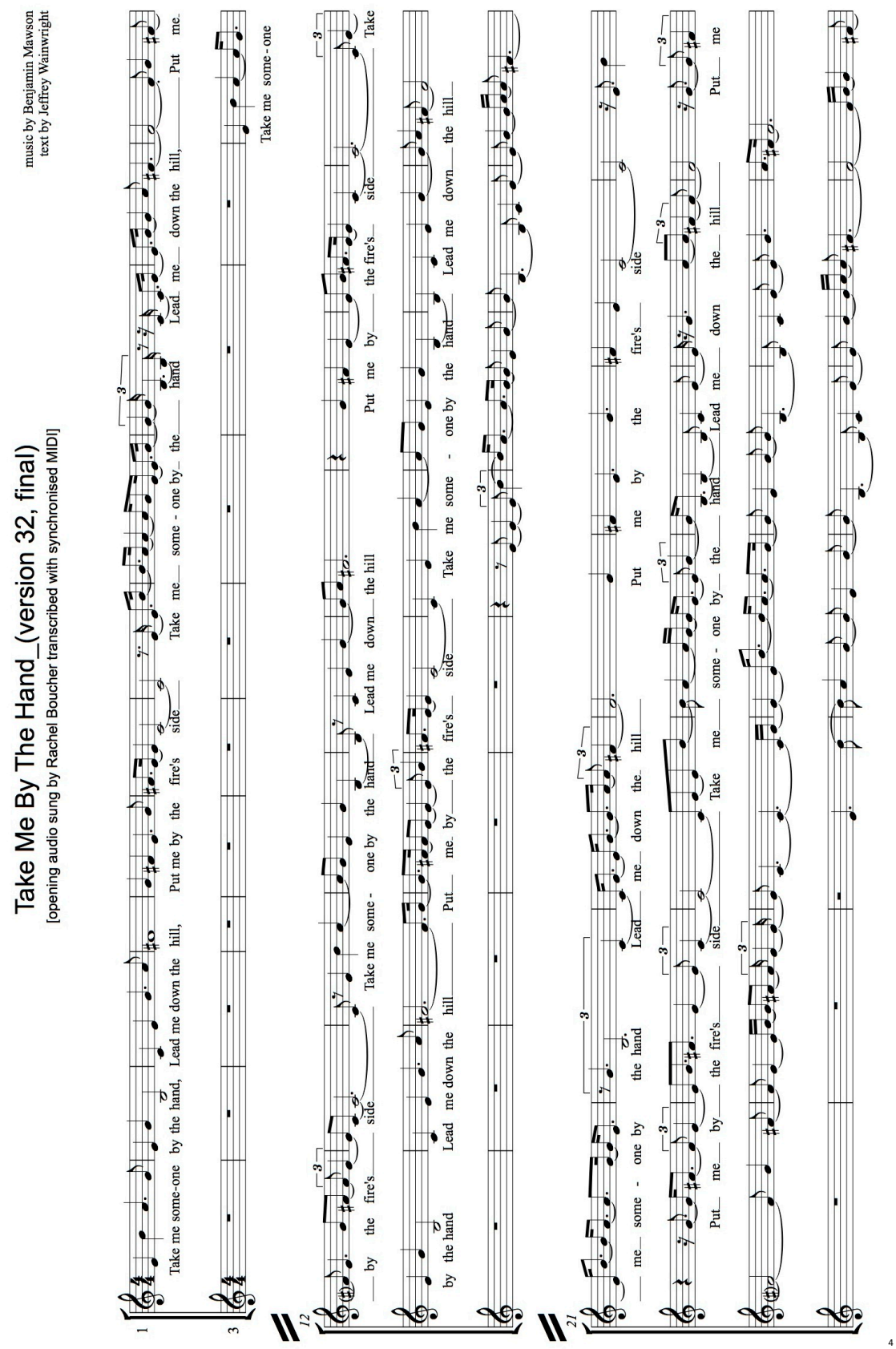


Figure 7: Notation transcription of opening bars sung by Voice 1. Quantised to 16:24 or semi-quaver and semi-quaver triplet.

[4] Bars and metres used in this transcription for clarity. No bar lengths or metres were observed in acousmatic composition process
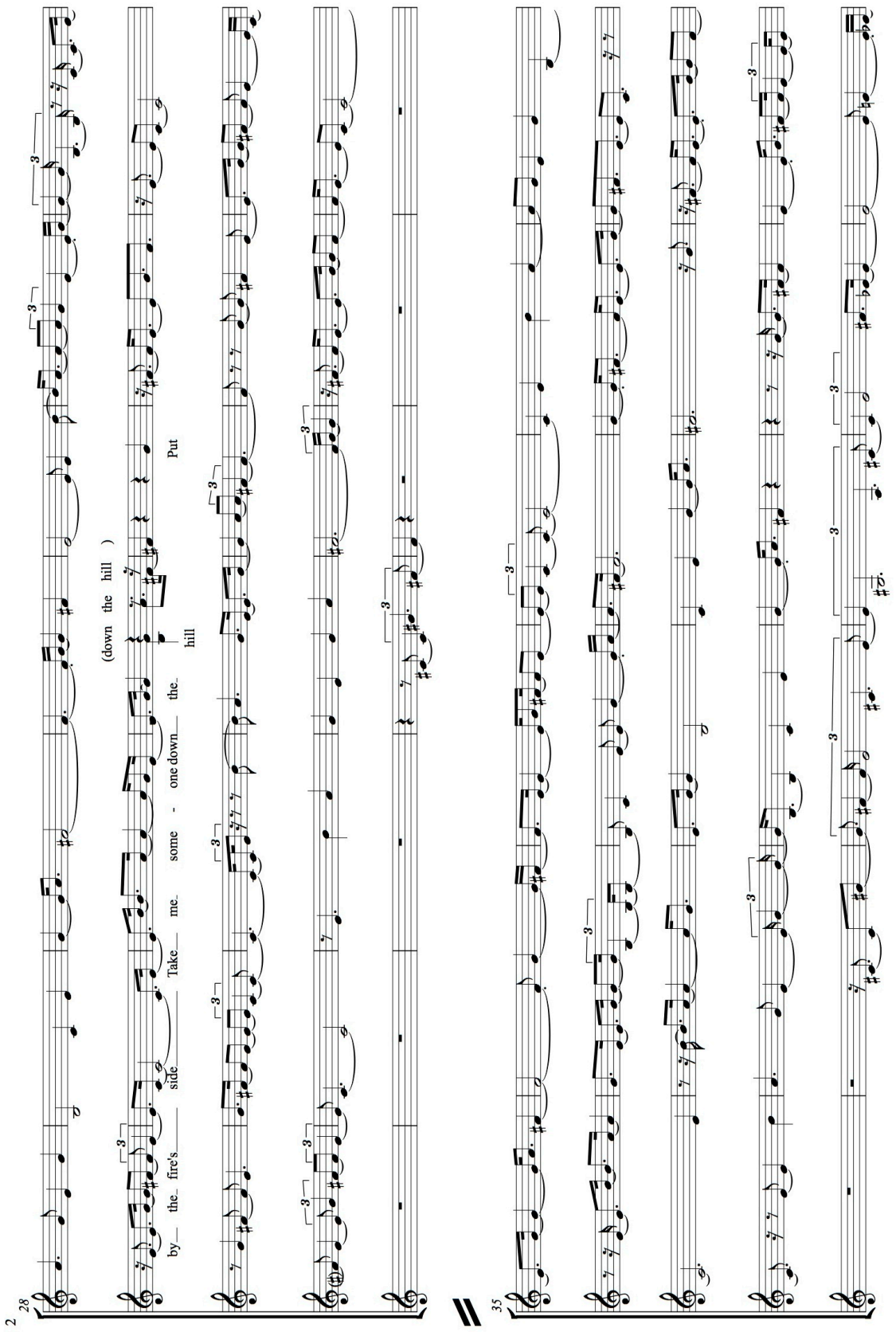


Figure 8: Transcription continued
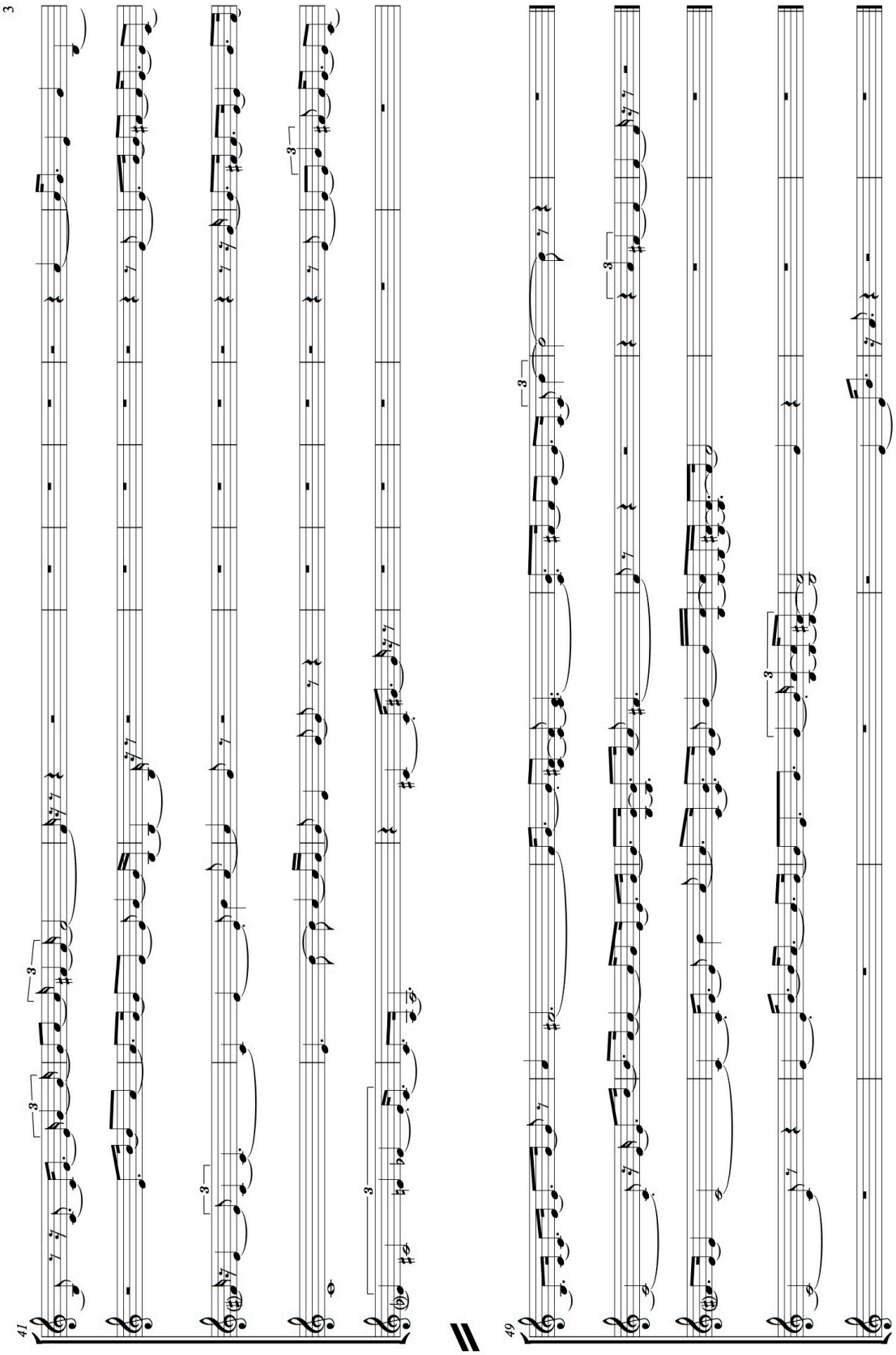


Figure 9: Transcription continued

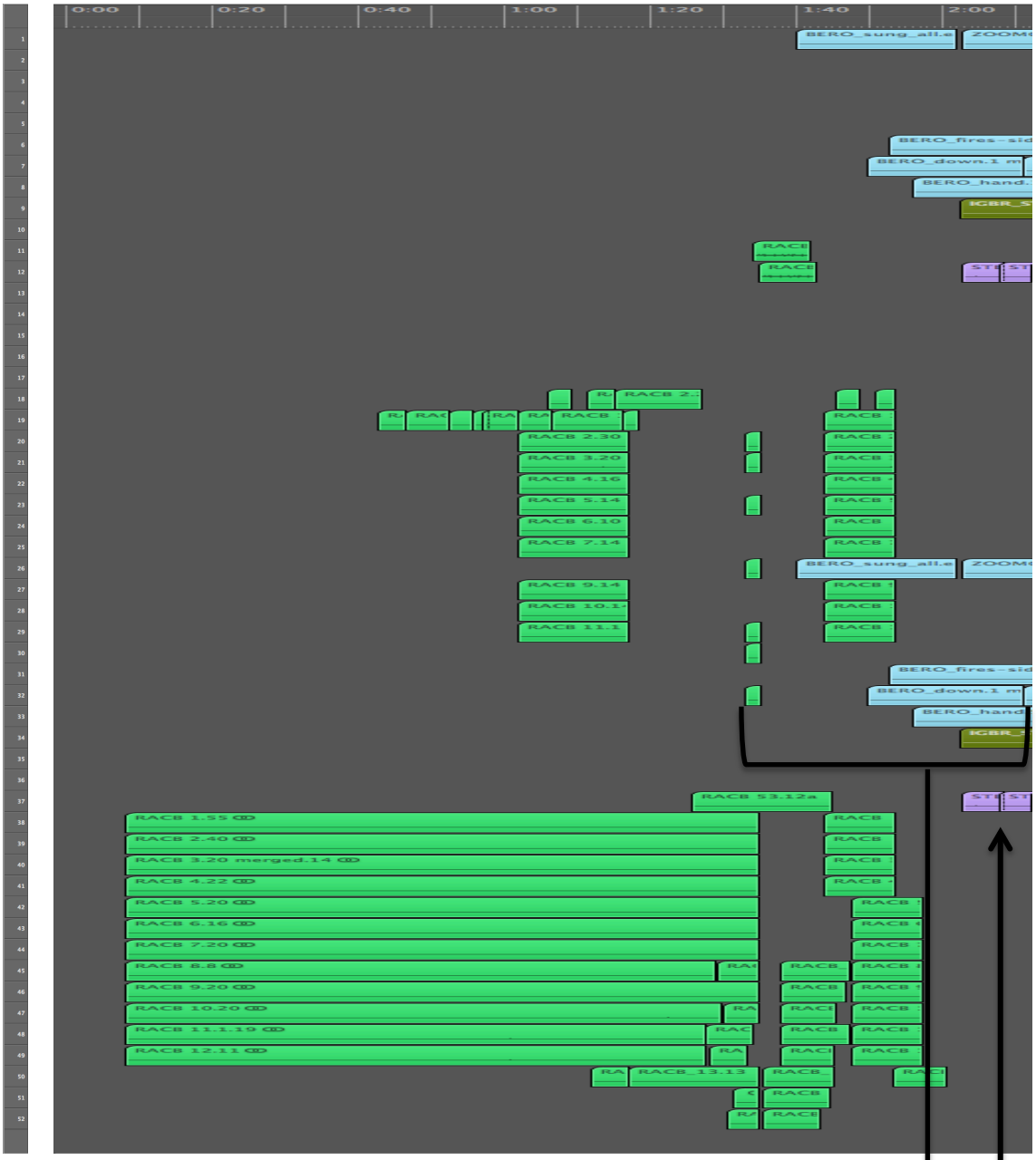


Figure 10: 0’ 00” to 2’10”

Single mezzo soprano voice in heterophonic self-combination (up to 11 whole voices by 1’00” and 5-12 breaths and/or whispers in shorter audio regions

2nd voice, tenor, fragmentary phrases, self-combined, repetition of “down” as pulse.

Other male voices in irregular canon, verse one sung in three octave registers.

Fragmenting increases with “put me by” looped in multiple overlaps, bounced and re-added, combined with breath and open syllables

Other male voices in irregular canon, verse one sung in three octave registers.

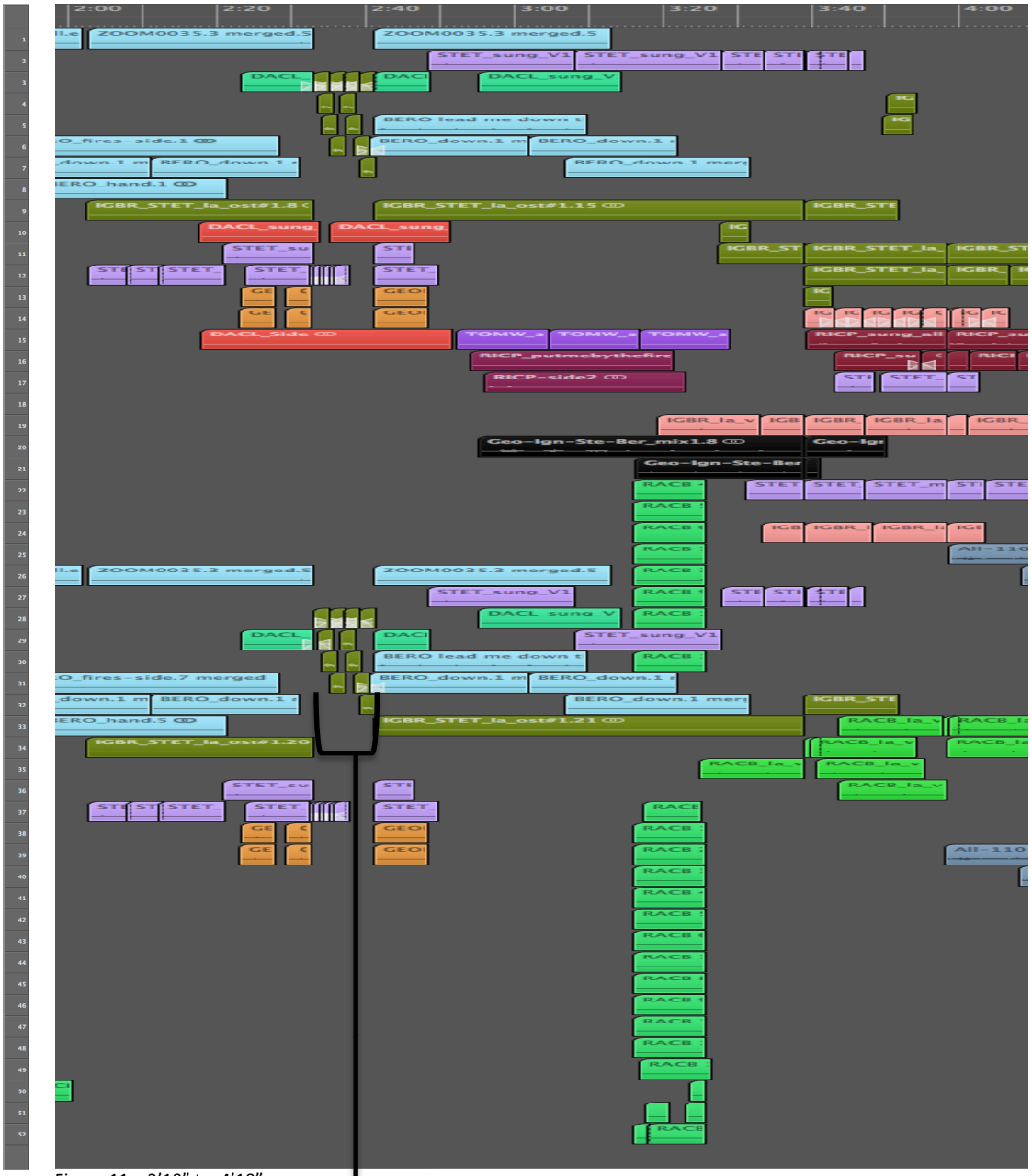


Figure 11: 2'10" to 4'10"

Voice (2) irregularly repeats "hand" and "fireside"
Voices (3) (doubled at raised minor 3rd) and (6) in asynchronous unison, lyric

Voice (2) irregular repetition "down"/ "by the hand"

Voice (8) irreg. repet . "-side"

Voice (3) unmodified verse 1. Unison then canon. Upper / lower parts grouped, open vowels

"Put me by" (1) , (12) and (10) and overlapped wavering unrounded vowels

Voice (1) asynch unison reiterates opening



Figure 12: 4'00" to 6'10"

All voices, sung, merged, long echo. Dissolving clarity as words split, repeated. Doubling of whole cluster into separate swirling panned motions

Voice (3) humming and (9) "la": melody of verse 1

Dissolution of 1st verse, repetition in lower male voices of "Take me someone by the hand". Repeating "hand" and single voice (2) repeats full unaltered 1st verse while (10) fades in with V2, in canonic self-combination

Merging in of verse 2, female voices multi-part heterophonic sung, male voices in spoken canon:

"The buses strain and skid on the cinders. / We totter and slip upwards. / My fingers, screwed tight, / Whiten from the tip."

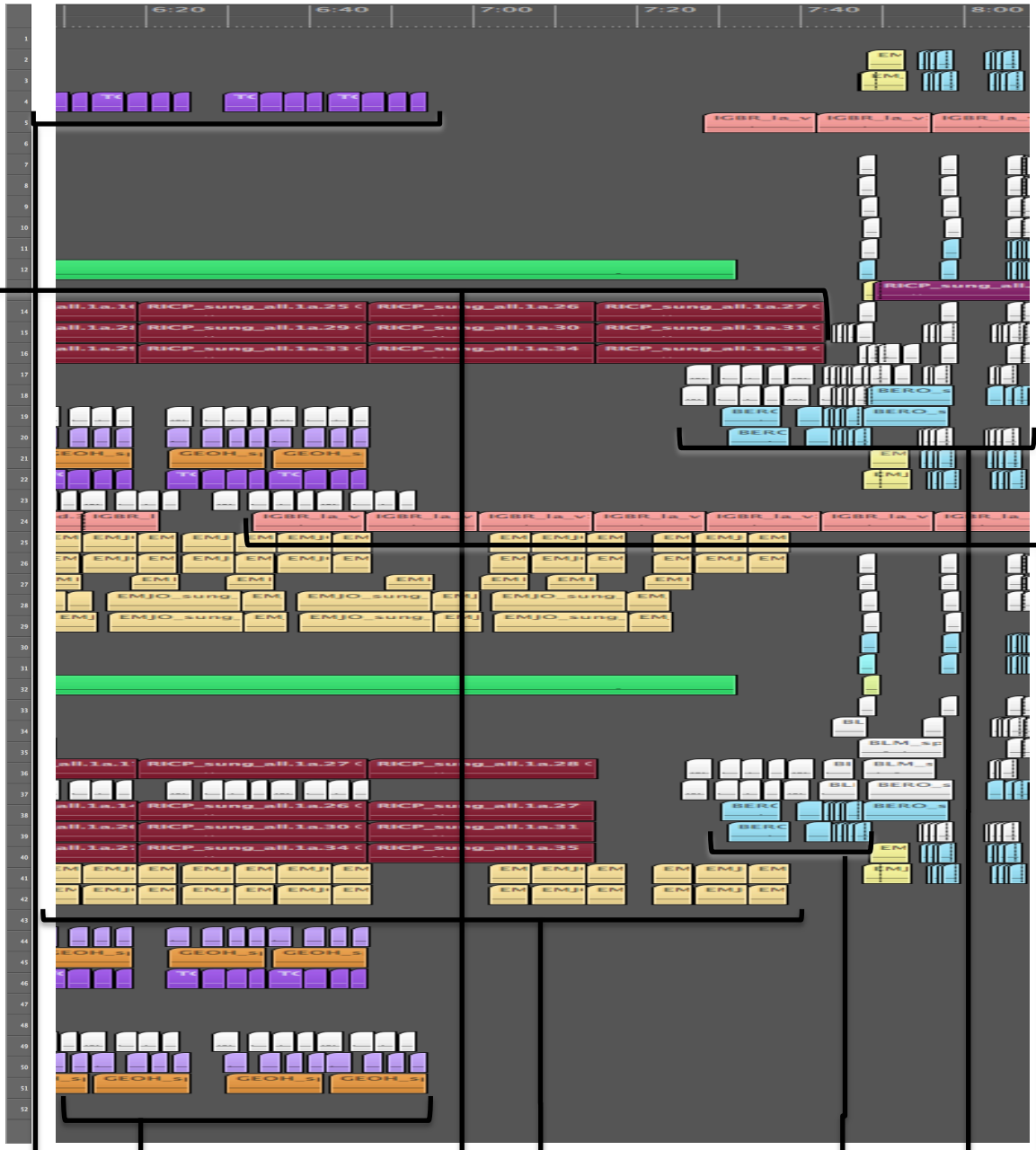


Figure 13: 6'10" to 8'10"

Male voices (6), (7), 9), (11) speaking / humming fragments and non-contiguous 'loops'

Voice (8) sings verse 2 four times, multiple parts different reverb / static, spaced panning

Voice (10) sings verse 2 in asynchronous unison

Voice (2) sings verse 2 fragments, voice (9) sings verse 2 melody to "la"

Voice (2) sings, voice (11) speaks verse 2 fragments,

Voice (9) hums melody verse 1

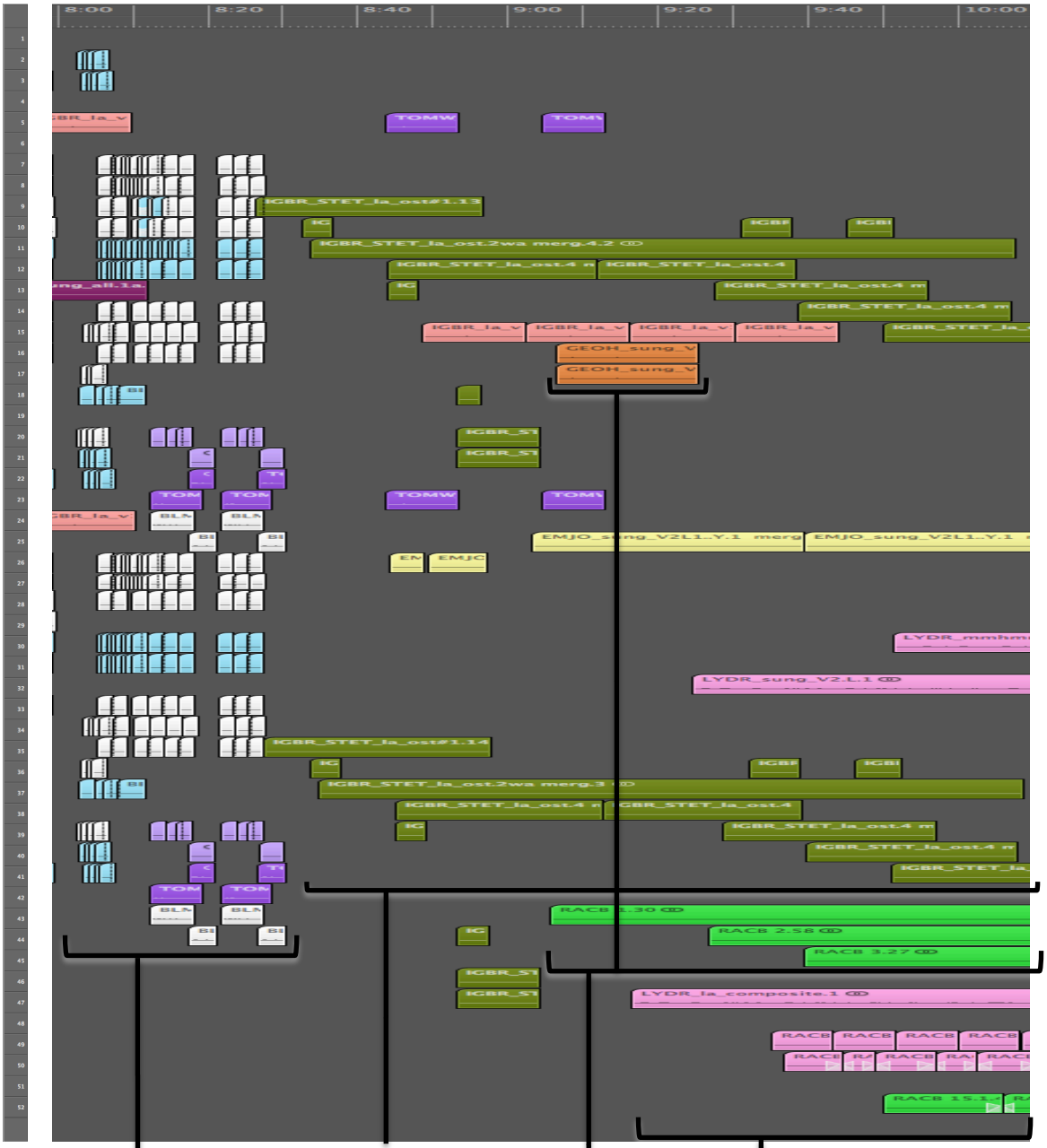


Figure 14: 8'00" to 10'10"

Voices (3), (7), (11) speak , voice (2) sings fragments of verse 2

Voices (3) & (9), sing ostinati see figure 1

Voices (1) & (6) introduce verse 3, sung

Voices (1) & (12) sings verse 2 asynchronously to slow fade

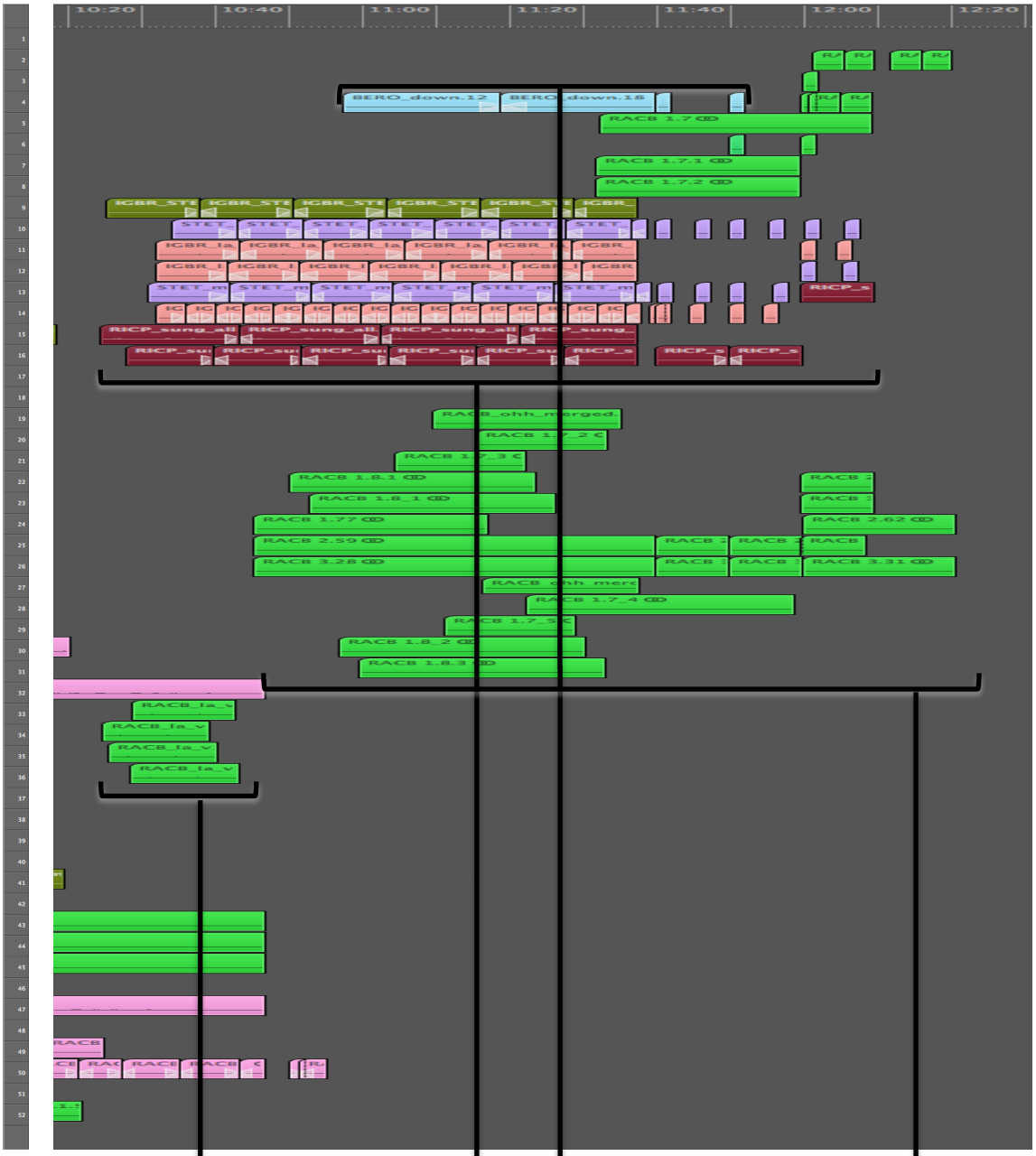


Figure 15 : 10’10” to 12’25”

Voice (2) repeats “down”, echo & fade

Voice (1) asynchronous heterophonic combinations of sung verses 1 & 3

Voices (3) and (8) sing verse 3 asynchronously (voice 8 in two parts), voices (3)/(9) combined in ostinati and voice (9) sings verse 3 melody to “la”

Take Me By The Hand,

Geo-located setting

Take Me By The Hand: Two geo-located versions

Figure 1: Key to audio types in figures with colour-coded circles 1
Figure 2: All audio circles categorised, cartographic information removed 2
Figure 3: Audio circles' descriptors, media and functionality 3
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Figure 16: London SE1, whole circle map, partially sound-type coded. 14

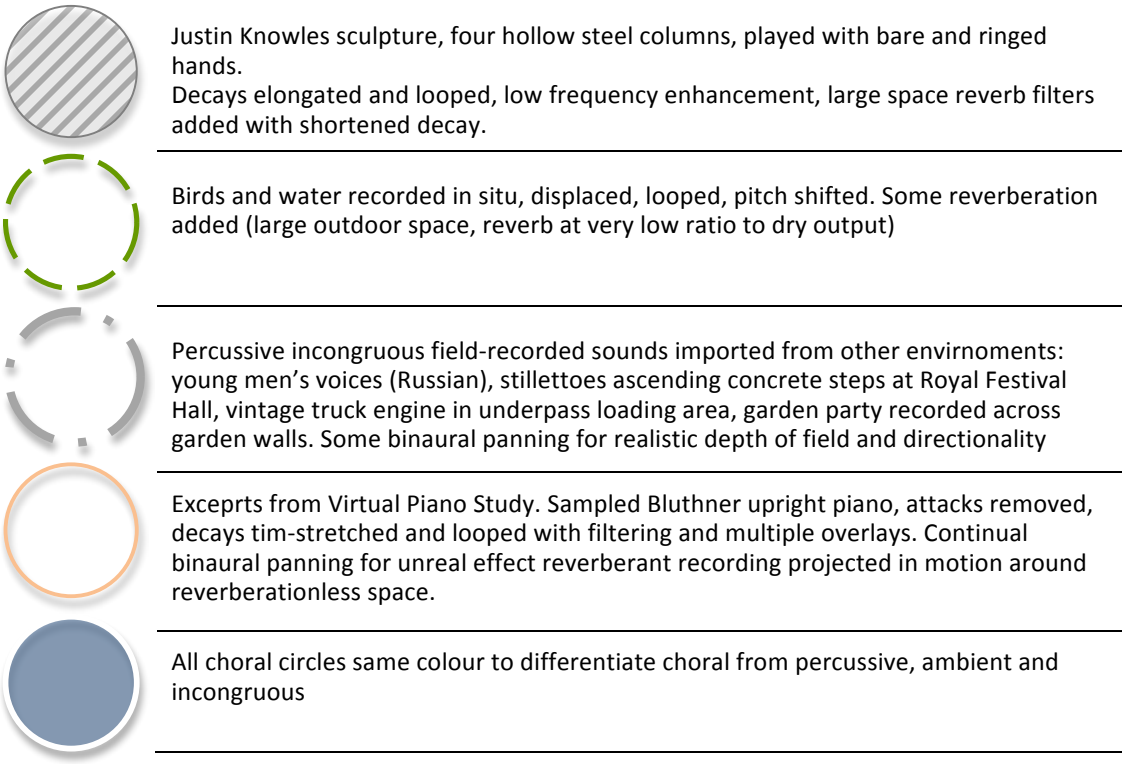


Figure 1: Key to audio types in figures with colour-coded circles

Audio circles in Highfield “Take Me By The Hand”:

Choral and non choral sounds combined, cartographic detail removed

11 singers’ processed voices overlapped with transformed percussive and sustained, incongruous and ambient sounds (recorded in situ and at various locations).

Each landscape-fixed circle is allocated an audio file which may be a single voice, multiple voices, literal or transformed representations of found sounds. A circle may loop or play once only. It may pause (exit) and resume (re-entry) or stop and restart. It may, once activated play for the duration of audition, to create cumulative rather than consecutive sequence. The actions of circles are listed in the table below.

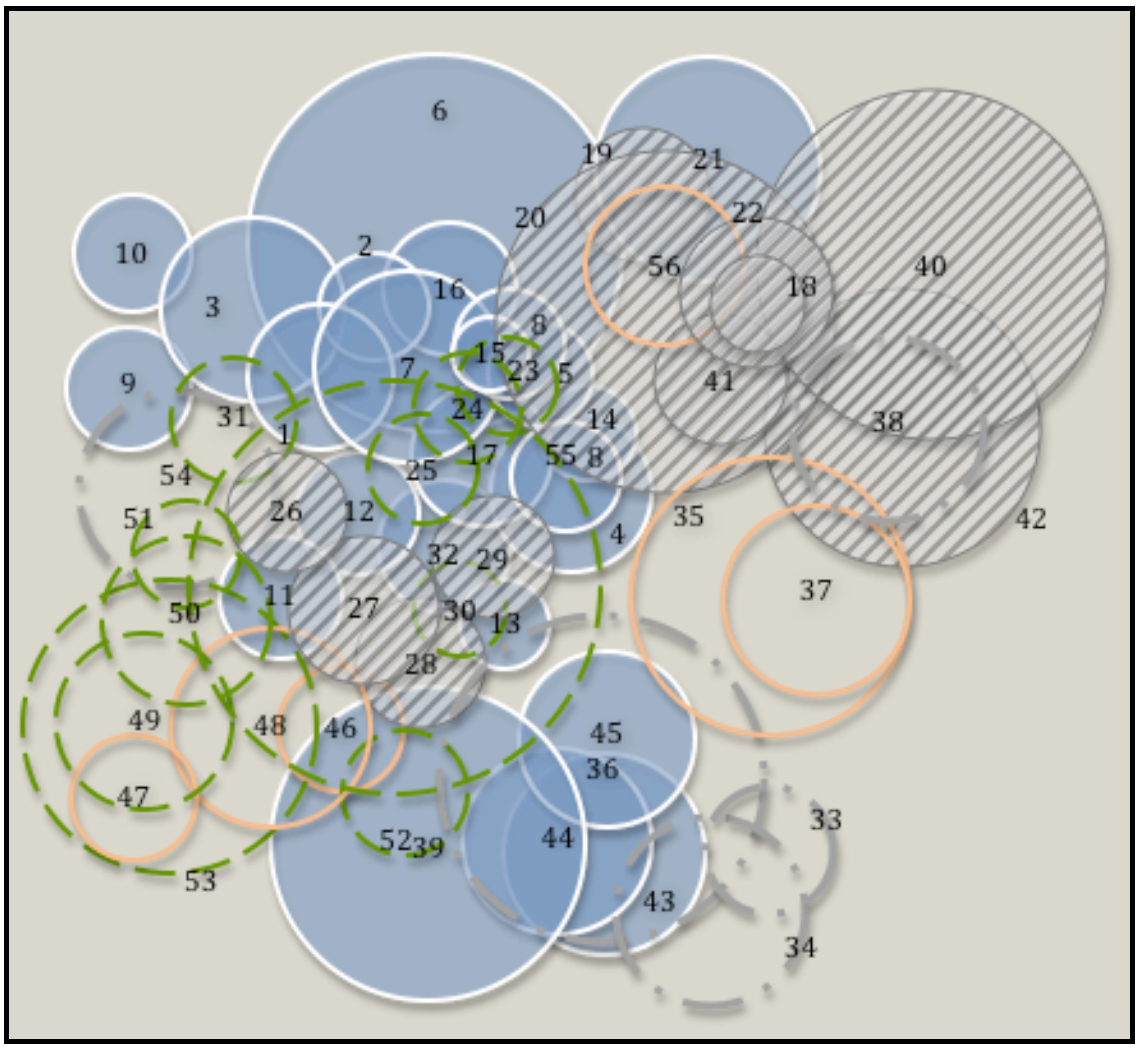


Figure 2: All audio circles categorised, cartographic information removed

All circles, attached audio and their allocated behaviours. Key below.

Circle label	*Order*	*Audio*	*Georss: Latitude – Longitude – Radius (metres)*	*Other functions*
VPS-end1.ii	56	VPS-end1.wav	Lat: 50.935807 Long: -1.397445 Radius: 18.6	loop, stop, speaker
birds_water_X	55	BIRDS3.wav	Lat: 50.935143 Long: -1.398341 Radius: 48.1	fade in/out, loop, pause, speaker
YMV-WSO2_X	54	YMV-WSO2.wav	Lat: 50.935352 Long: -1.399065 Radius: 22.2	fade in, play once, pause, speaker
Water_X	53	WATER2.wav	Lat: 50.934859 Long: -1.399086 Radius: 34.1	fade in, play once, stop, speaker
Birds_3_X	52	BIRDS3.wav	Lat: 50.934713 Long: -1.398308 Radius: 15	fade in/out. loop, play, speaker
Birds1_counter	51	birds1.wav	Lat: 50.935212 Long: -1.399029 Radius: 12.7	fade in, loop, play
Birds2_counter	50	BIRDS2.wav	Lat: 50.935077 Long: -1.399034 Radius: 20.1	fade in, loop, play, speaker
Birds3_counter	49	BIRDS3.wav	Lat: 50.934867 Long: -1.399169 Radius: 21.1	fade in, loop, play, speaker
VPS-sustain1(2)	48	VPS-sustain1.wav	Lat: 50.934854 Long: -1.398756 Radius: 23.4	fade in, loop, play, speaker
VPS-end1.wav	47	VPS-end1.wav	Lat: 50.934705 Long: -1.399206 Radius: 15	fade in, loop, play, speaker
VPS-sustain1	46	VPS-sustain1.wav	Lat: 50.934847 Long: -1.39853 Radius: 15	fade in, loop, play, speaker
TMBTH_2bii	45	TMBTH_2b.mp3	Lat: 50.934813 Long: -1.397656 Radius: 20.7	fade in, loop, play, speaker
TMBTH_11.wav-ii	44	TMBTH_11.wav	Lat: 50.934604 Long: -1.397811 Radius: 22.2	fade in, loop, play, speaker
TMBTH_1-ii	43	TMBTH_1.wav	Lat: 50.934574 Long: -1.397635 Radius: 23.7	fade in/out. loop, play, speaker
KNOWLES-new	42	KNOWLES2_lower.wav	Lat: 50.935477 Long: -1.396653 Radius: 32.5	fade in. loop, play
knowles2.wav_2	41	knowles2.wav	Lat: 50.935572 Long: -1.397254 Radius: 15	fade in/out, loop, play, speaker
knowles2.wav	40	knowles2.wav	Lat: 50.935808 Long: -1.396557 Radius: 41.4	fade in. loop, play
TMBTH_6.wav	39	TMBTH_6.wav	Lat: 50.934602 Long: -1.398214 Radius: 37.3	fade in/out, loop, play
YMV-WSO2.wav	38	YMV-WSO2.wav	Lat: 50.935467 Long: -1.396702 Radius: 22.2	fade in/out. loop, play, speaker
VPS-end1.wav	37	VPS-end1.wav	Lat: 50.935111 Long: -1.396945 Radius: 21.8	fade in/out, loop, play
garden-party2-fade	36	garden-party2-faded.wav	Lat: 50.93474 Long: -1.397653 Radius: 38.2	fade in/out, loop, play, speaker
VPS_sustain	35	VPS-sustain1.wav	Lat: 50.935126 Long: -1.397095 Radius: 32.1	fade in, loop, play, speaker
garden-party1.wav	34	garden-party1.wav	Lat: 50.934463 Long: -1.397299 Radius: 22.5	fade in. loop, play
garden-party2.wav	33	garden-party2.wav	Lat: 50.934597 Long: -1.397106 Radius: 15	fade in/out, loop, play
TMBTH_12	32	TMBTH_12.wav	Lat: 50.935226 Long: -1.398165 Radius: 15	fade in/out, loop, play
WATER2	31	water2.wav	Lat: 50.935486 Long: -1.398873 Radius: 15	fade in/out, loop, stop
WATER1	30	water1.wav	Lat: 50.935104 Long: -1.398125 Radius: 11.3	fade in/out, loop, stop
YMV-WSO4	29	YMV-WSO.WAV	Lat: 50.935208 Long: -1.398013 Radius: 14.1	fade in/out, loop, stop
YMV-WSO3	28	YMV-WSO.WAV	Lat: 50.934988 Long: -1.398254 Radius: 15.6	fade in/out, loop, stop
YMV-WSO2	27	YMV-WSO2.WAV	Lat: 50.935094 Long: -1.398443 Radius: 17.6	fade in/out, loop, stop
YMV-WSO1	26	YMV-WSO.WAV	Lat: 50.935302 Long: -1.398697 Radius: 13.5	fade in/out, loop, stop
BIRDS3	25	BIRDS3.wav	Lat: 50.935389 Long: -1.398233 Radius: 12.6	fade in/out, loop, stop
BIRDS2	24	BIRDS2.wav	Lat: 50.935521 Long: -1.398081 Radius: 13.2	fade in/out, play once, stop
BIRDS1	23	birds1.wav	Lat: 50.935564 Long: -1.397969 Radius: 11.6	fade in/out, loop, stop
KNOWLES4	22	knowles4.wav	Lat: 50.935757 Long: -1.397135 Radius: 18.1	fade in/out, loop, pause
TMBTH_5c.wav	21	TMBTH_5c.wav	Lat: 50.936007 Long: -1.397296 Radius: 26.2	fade in, loop, play
KNOWLES2a	20	KNOWLES2_lower.wav	Lat: 50.935700522021 Long: -1.3974394852501 Radio :39.55	loop, play speaker
KNOWLES3	19	knowles3.wav	Lat: 50.935958 Long: -1.397516 Radius: 15.6	fade in/out, loop. pause
KNOWLES1	18	knowles1.wav	Lat: 50.935718 Long: -1.397119 Radius: 11.9	fade in/out, play once. pause
TMBTH_2b	17	TMBTH_2b.mp3	Lat: 50.935408 Long: -1.39805 Radius: 16.9	fade in/out, loop. stop
TMBTH_2a	16	TMBTH_2a.mp3	Lat: 50.935756 Long: -1.398146 Radius: 15.6	fade in/out, loop. stop
TMBTH_10	15	TMBTH_10.mp3	Lat: 50.935616 Long: -1.398019 Radius: 9.7	fade in/out, loop. stop
TMBTH_9	14	TMBTH_9.wav	Lat: 50.935455 Long: -1.39768 Radius: 11.4	fade in/out, loop. stop
TMBTH_8	13	TMBTH_8.wav	Lat: 50.935053 Long: -1.397985 Radius: 9.8	fade in/out, loop. stop
TMBTH_7	12	TMBTH_7.mp3	Lat: 50.935286 Long: -1.398447 Radius: 14	fade in/out, loop. stop
TMBTH_6	11	TMBTH_6.wav	Lat: 50.935121 Long: -1.398699 Radius: 14.1	fade in/out, loop. stop
TMBTH_5	10	TMBTH_5.wav	Lat: 50.935834 Long: -1.399203 Radius: 13.5	fade in/out, loop. stop
TMBTH_4	9	TMBTH_4.wav	Lat: 50.93555 Long: -1.399203 Radius: 14.6	fade in/out, loop. stop
TMBTH_3	8	TMBTH_3.mp3	Lat: 50.93564 Long: -1.397959 Radius: 13.1	fade in/out, loop. stop
TMBTH_2	7	TMBTH_2.wav	Lat: 50.935587 Long: -1.39828 Radius: 22.7	fade in/out, loop. stop
TMBTH_11	6	TMBTH_5b.wav	Lat: 50.935849 Long: -1.398192 Radius: 44.2	fade in/out, loop. play
TMBTH_4b	5	TMBTH_4b.mp3	Lat: 50.935569 Long: -1.397849 Radius: 12.2	fade in/out, loop. stop
TMBTH_9a	4	TMBTH_9.mp3	Lat: 50.935332 Long: -1.397752 Radius: 18.7	fade in/out, loop. stop
TMBTH_2b	3	TMBTH_2b.mp3	Lat: 50.935716 Long: -1.398804 Radius: 21.1	fade in/out, loop. stop
TMBTH_2a	2	TMBTH_2a.mp3	Lat: 50.935716 Long: -1.398394 Radius: 13.2	fade in/out, loop. stop
TMBTH_1	1	TMBTH_1.mp3	Lat: 50.935576 Long: -1.398568 Radius: 17.2	fade in/out, loop. stop

Figure 3: Audio circles' descriptors, media and functionality

Column name: →	*Circle label*	*Order*	*Audio*	*Georss: Latitude – Longitude – Radius (metres)*	*Other functions*
Example entry: →	VPS-end1.ii	56	VPS-end1.wav	Lat: 50.935807 Long: -1.397445 Radius: 18.6	
Explanation: →	*Name of circle*	*Order in seq of addition: e.g. 1 = first circle*	*Name of audio file called up by circle, within project "sound" folder*	*The latitude and longitude of the circle's centre and its radius in metres. This stipulates the area in which the allocated audio file will play.*	
***Fade in**: four second fade-in on entry to circle*					
***Fade out**: four second fade-out on exiting circle*					
***Loop:** play perpetually until listener leaves circle*					
***Play once**: listener entry to circle activates sound, it plays once and stops*					
***Pause**: stop at point in audio reached when listener leaves circle. Resume at that point if listener re-enters circle*					
***Play**: continue playing after listener leaves (becomes constant layer of subsequent sounds heard)*					
***Stop**: stop playing audio when listener leaves circle. Restart from 0' 00" if listener re-enters circle*					
***Speaker**: simulate function of speaker by doubling loudness inversely proportional to proximity to virtual sound source*					

Figure 4: Key to Figure 3

Non choral sounds: ambient and incongruous sound-producing objects

Circle label	*Order added*	*Audio assigned*	*Description*
VPS-end1.ii	56	VPS-end1.wav	Excerpted from "Virtual Piano Study"
birds_water_X	55	BIRDS3.wav	Manipulated local capture of birds & flowing
YMV-WSO2_X	54	YMV-WSO2.wav	Young mens' voices and women's stillettoes
Water_X	53	WATER2.wav	Flowing water
Birds_3_X	52	BIRDS3.wav	Campus birdlife
Birds1_counter	51	birds1.wav	
Birds2_counter	50	BIRDS2.wav	
Birds3_counter	49	BIRDS3.wav	
VPS-sustain1(2)	48	VPS-sustain1.wav	Excerpted from "Virtual Piano Study"
VPS-end1.wav	47	VPS-end1.wav	
VPS-sustain1	46	VPS-sustain1.wav	
~~TMBTH_2bii~~	~~45~~	~~TMBTH_2b.mp3~~	
~~TMBTH_11.wav-ii~~	~~44~~	~~TMBTH_11.wav~~	
~~TMBTH_1-ii~~	~~43~~	~~TMBTH_1.wav~~	
KNOWLES-new	42	KNOWLES2_lower.wav	Hand percussion on Justin Knowles steel columns
knowles2.wav_2	41	knowles2.wav	
knowles2.wav	40	knowles2.wav	
~~TMBTH_6.wav~~	~~39~~	~~TMBTH_6.wav~~	
YMV-WSO2.wav	38	YMV-WSO2.wav	Young mens' voices and women's stillettoes
VPS-end1.wav	37	VPS-end1.wav	Excerpted from "Virtual Piano Study"
garden-party2-fade	36	garden-party2-faded.wav	Manipulated fragments of urban garden party
VPS_sustain	35	VPS-sustain1.wav	Excerpted from "Virtual Piano Study"
garden-party1.wav	34	garden-party1.wav	Manipulated fragments of urban garden party
garden-party2.wav	33	garden-party2.wav	
~~TMBTH_12~~	~~32~~	~~TMBTH_12.wav~~	
WATER2	31	water2.wav	Flowing water
WATER1	30	water1.wav	
YMV-WSO4	29	YMV-WSO.WAV	Young mens' voices and women's stillettoes
YMV-WSO3	28	YMV-WSO.WAV	
YMV-WSO2	27	YMV-WSO2.WAV	
YMV-WSO1	26	YMV-WSO.WAV	
BIRDS3	25	BIRDS3.wav	Campus birdlife
BIRDS2	24	BIRDS2.wav	
BIRDS1	23	birds1.wav	
KNOWLES4	22	knowles4.wav	Hand percussion on Justin Knowles steel
~~TMBTH_5c.wav~~	~~21~~	~~TMBTH_5c.wav~~	
KNOWLES2a	20	KNOWLES2_lower.wav	Hand percussion on Justin Knowles steel columns
KNOWLES3	19	knowles3.wav	
KNOWLES1	18	knowles1.wav	
~~TMBTH_2b~~	~~17~~	~~TMBTH_2b.mp3~~	
~~TMBTH_2a~~	~~16~~	~~TMBTH_2a.mp3~~	
~~TMBTH_10~~	~~15~~	~~TMBTH_10.mp3~~	
~~TMBTH_9~~	~~14~~	~~TMBTH_9.wav~~	
~~TMBTH_8~~	~~13~~	~~TMBTH_8.wav~~	
~~TMBTH_7~~	~~12~~	~~TMBTH_7.mp3~~	
~~TMBTH_6~~	~~11~~	~~TMBTH_6.wav~~	
~~TMBTH_5~~	~~10~~	~~TMBTH_5.wav~~	
~~TMBTH_4~~	~~9~~	~~TMBTH_4.wav~~	
~~TMBTH_3~~	~~8~~	~~TMBTH_3.mp3~~	
~~TMBTH_2~~	~~7~~	~~TMBTH_2.wav~~	
~~TMBTH_11~~	~~6~~	~~TMBTH_5b.wav~~	
~~TMBTH_4b~~	~~5~~	~~TMBTH_4b.mp3~~	
~~TMBTH_9a~~	~~4~~	~~TMBTH_9.mp3~~	
~~TMBTH_2b~~	~~3~~	~~TMBTH_2b.mp3~~	
~~TMBTH_2a~~	~~2~~	~~TMBTH_2a.mp3~~	
~~TMBTH_1~~	~~1~~	~~TMBTH_1.mp3~~	

Figure 5: Non-choral circles circles' descriptors, media and functionality

Non choral: ambient and incongruous sound-producing objects



Figure 6: Non-choral sounds categorised, in context of entire sound-map

Choral setting of “Take Me By The Hand”

Circle label	*Order added*	*Audio assigned*	*Description*
~~VPS-end1.ii~~	~~56~~	~~VPS-end1.wav~~	
~~birds_water_X~~	~~55~~	~~BIRDS3.wav~~	
~~YMV-WSO2_X~~	~~54~~	~~YMV-WSO2.wav~~	
~~Water_X~~	~~53~~	~~WATER2.wav~~	
~~Birds_3_X~~	~~52~~	~~BIRDS3.wav~~	
~~Birds1_counter~~	~~51~~	~~birds1.wav~~	
~~Birds2_counter~~	~~50~~	~~BIRDS2.wav~~	
~~Birds3_counter~~	~~49~~	~~BIRDS3.wav~~	
~~VPS-sustain1(2)~~	~~48~~	~~VPS-sustain1.wav~~	
~~VPS-end1.wav~~	~~47~~	~~VPS-end1.wav~~	
~~VPS-sustain1~~	~~46~~	~~VPS-sustain1.wav~~	
TMBTH_2bii	**45**	**TMBTH_2b.mp3**	
TMBTH_11.wav-ii	**44**	**TMBTH_11.wav**	
TMBTH_1-ii	**43**	**TMBTH_1.wav**	
~~KNOWLES-new~~	~~42~~	~~KNOWLES2_lower.wav~~	
~~knowles2.wav_2~~	~~41~~	~~knowles2.wav~~	
~~knowles2.wav~~	~~40~~	~~knowles2.wav~~	
TMBTH_6.wav	**39**	**TMBTH_6.wav**	
~~YMV-WSO2.wav~~	~~38~~	~~YMV-WSO2.wav~~	
~~VPS-end1.wav~~	~~37~~	~~VPS-end1.wav~~	
~~garden-party2-fade~~	~~36~~	~~garden-party2-faded.wav~~	
~~VPS_sustain~~	~~35~~	~~VPS-sustain1.wav~~	
~~garden-party1.wav~~	~~34~~	~~garden-party1.wav~~	
~~garden-party2.wav~~	~~33~~	~~garden-party2.wav~~	
TMBTH_12	**32**	**TMBTH_12.wav**	
~~WATER2~~	~~31~~	~~water2.wav~~	
~~WATER1~~	~~30~~	~~water1.wav~~	
~~YMV-WSO4~~	~~29~~	~~YMV-WSO.WAV~~	
~~YMV-WSO3~~	~~28~~	~~YMV-WSO.WAV~~	
~~YMV-WSO2~~	~~27~~	~~YMV-WSO2.WAV~~	
~~YMV-WSO1~~	~~26~~	~~YMV-WSO.WAV~~	
~~BIRDS3~~	~~25~~	~~BIRDS3.wav~~	
~~BIRDS2~~	~~24~~	~~BIRDS2.wav~~	
~~BIRDS1~~	~~23~~	~~birds1.wav~~	
~~KNOWLES4~~	~~22~~	~~knowles4.wav~~	
TMBTH_5c.wav	**21**	**TMBTH_5c.wav**	
~~KNOWLES2a~~	~~20~~	~~KNOWLES2_lower.wav~~	
~~KNOWLES3~~	~~19~~	~~knowles3.wav~~	
~~KNOWLES1~~	~~18~~	~~knowles1.wav~~	
TMBTH_2b	**17**	**TMBTH_2b.mp3**	
TMBTH_2a	**16**	**TMBTH_2a.mp3**	
TMBTH_10	**15**	**TMBTH_10.mp3**	
TMBTH_9	**14**	**TMBTH_9.wav**	
TMBTH_8	**13**	**TMBTH_8.wav**	
TMBTH_7	**12**	**TMBTH_7.mp3**	
TMBTH_6	**11**	**TMBTH_6.wav**	
TMBTH_5	**10**	**TMBTH_5.wav**	
TMBTH_4	**9**	**TMBTH_4.wav**	
TMBTH_3	**8**	**TMBTH_3.mp3**	
TMBTH_2	**7**	**TMBTH_2.wav**	
TMBTH_11	**6**	**TMBTH_5b.wav**	
TMBTH_4b	**5**	**TMBTH_4b.mp3**	
TMBTH_9a	**4**	**TMBTH_9.mp3**	
TMBTH_2b	**3**	**TMBTH_2b.mp3**	
TMBTH_2a	**2**	**TMBTH_2a.mp3**	
TMBTH_1	**1**	**TMBTH_1.mp3**	

Figure 7: Choral circles’ descriptors, media and functionality

Choral setting of “Take Me By The Hand”

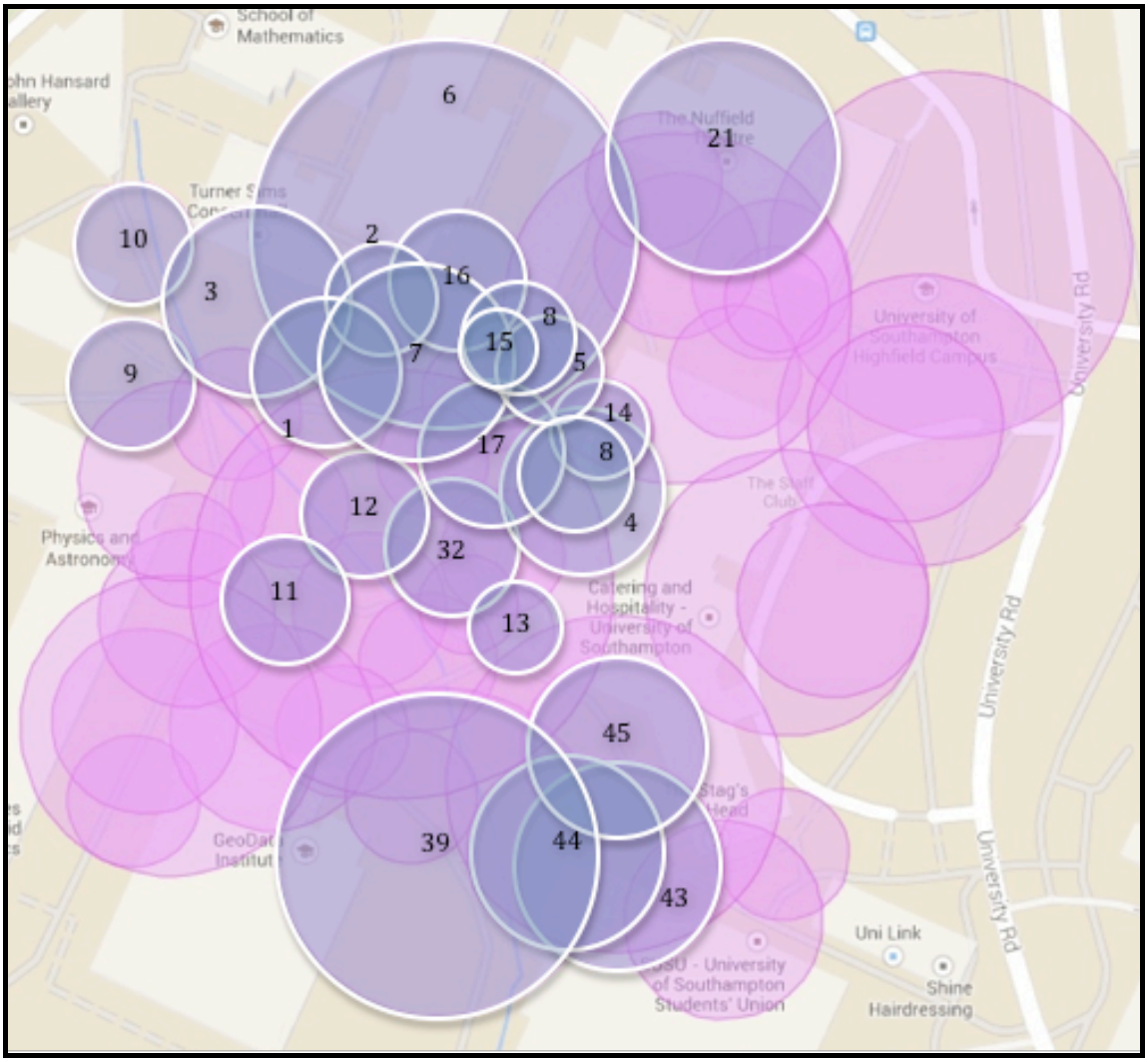


Figure 8: Choral sounds higlighted. Some cartographic information included

Choral setting of “Take Me By The Hand”

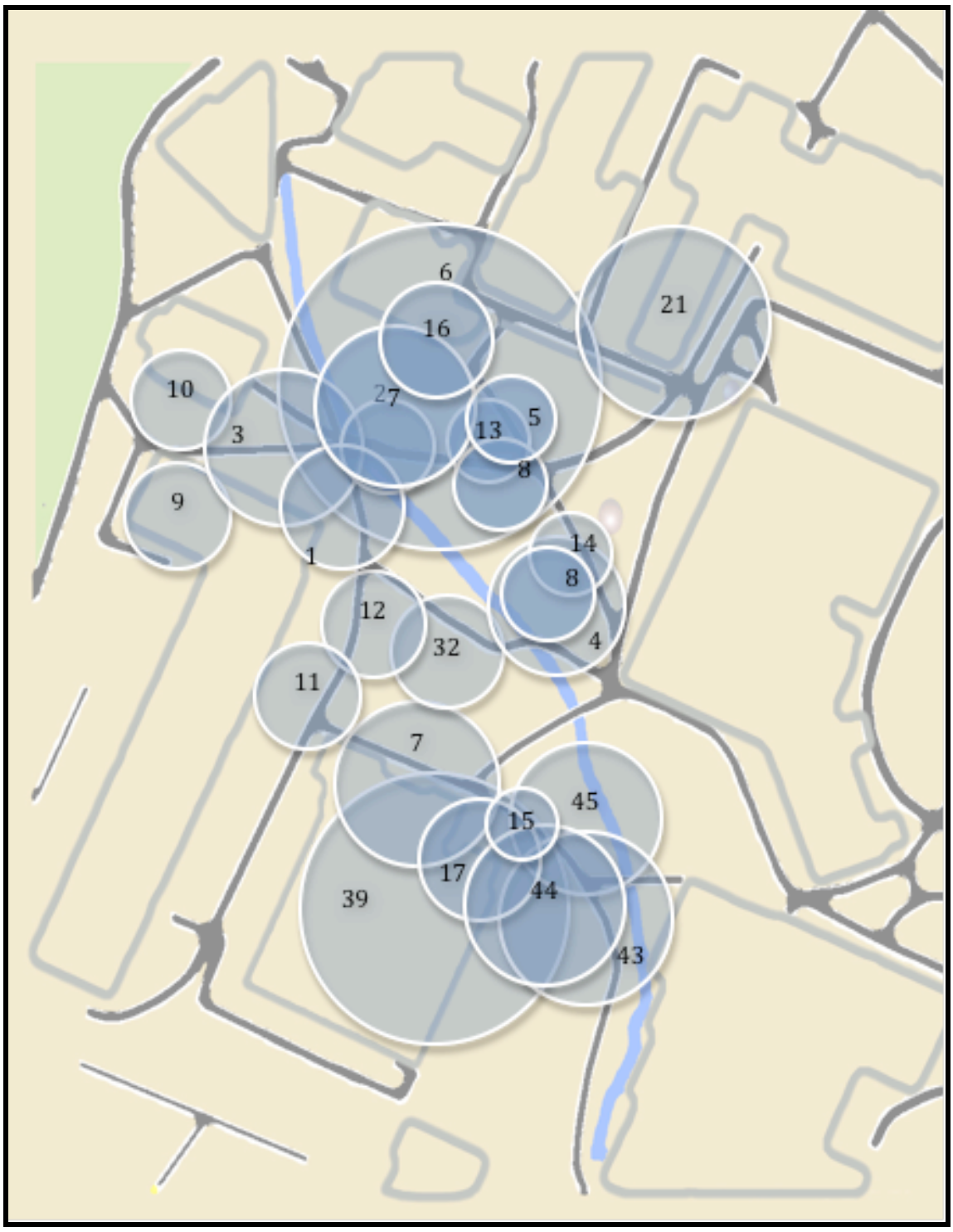


Figure 9: TMBTH, Highfield. Choral circles only

Note: in following two illustrations

- dark grey: footpaths
- light grey: building walls
- light blue: flowing water

All audio circles in “Take Me By The Hand”, Highfield, map detail reduced

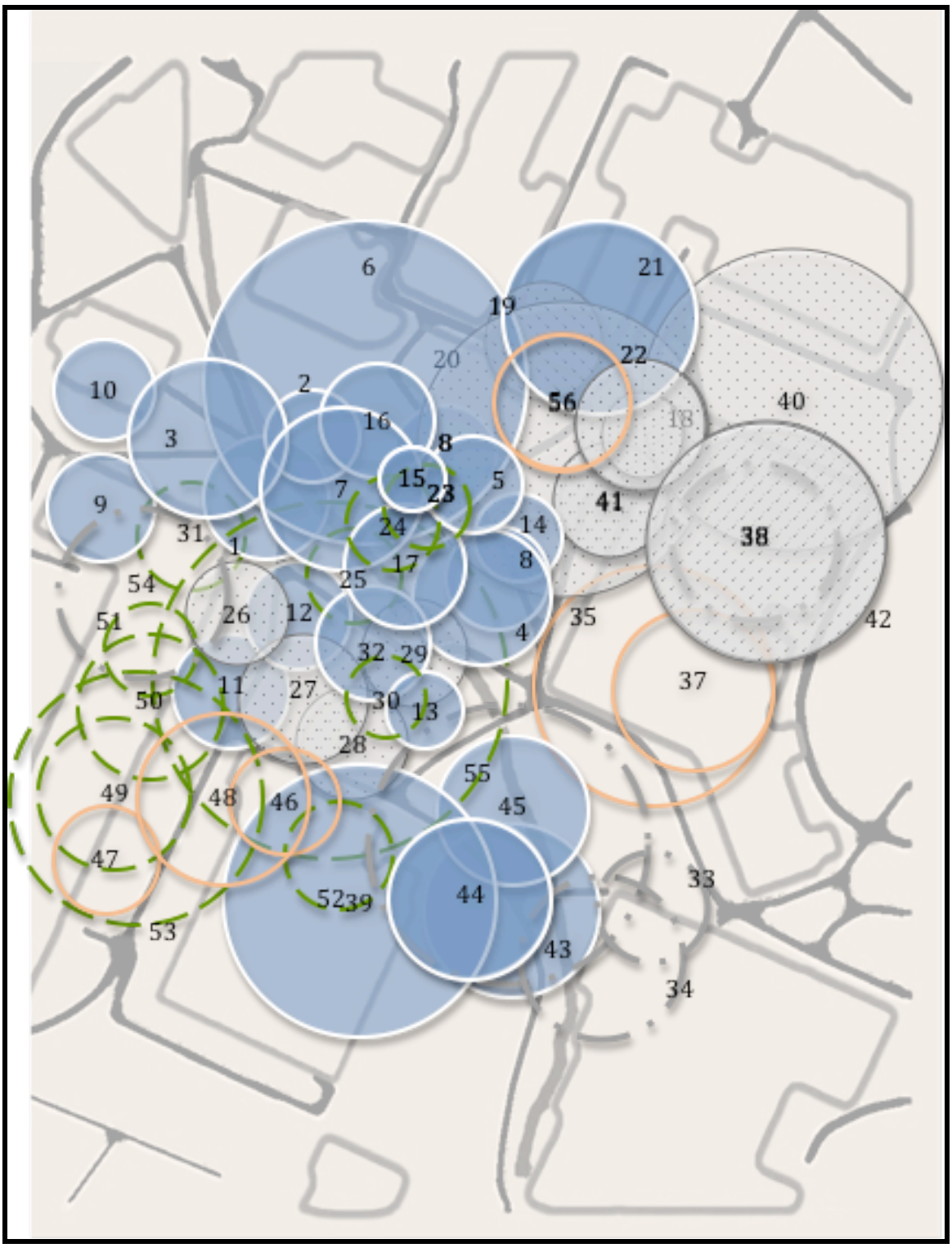


Figure 10: TMBTH, Highfield. All 56 circles: choral, percussive, ambient.

Map overview of setting for “Take Me By The Hand”, London South Bank. (From noTours soundmap editor interface)

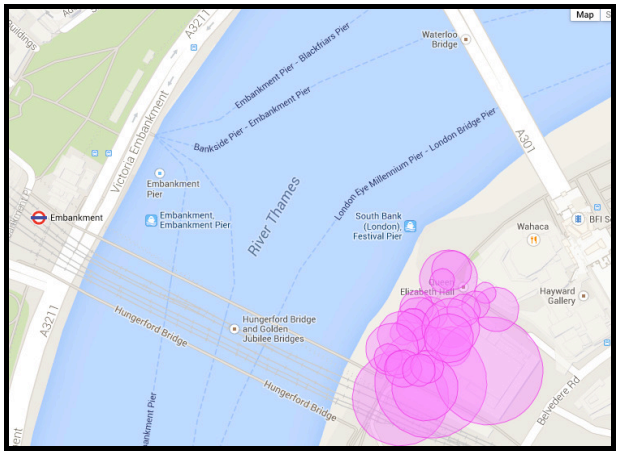


Figure 11: Re-setting, London SE1. General map overview

All circles, undistinguished by type in editor, spreadsheets are used during construction to verify all intended material is visually represented. Field testing reveals relational properties of individual audios that are otherwise unverifiable.

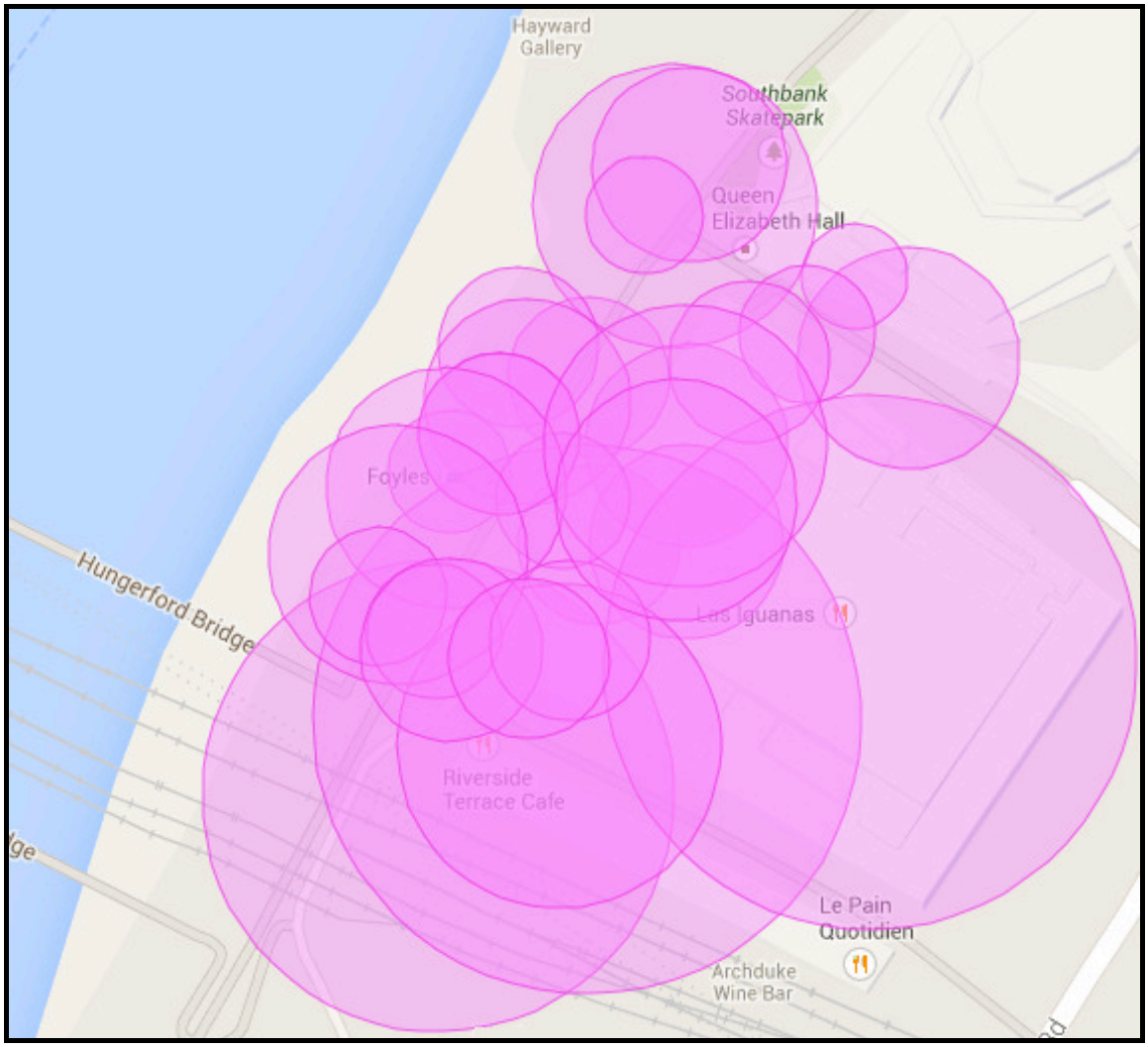


Figure 12: Re-setting, London SE1. Whole circle map with Google map labelling

“Take Me By The Hand”, London South Bank. Choral and non choral sounds combined in single map: 30 circles coded by type

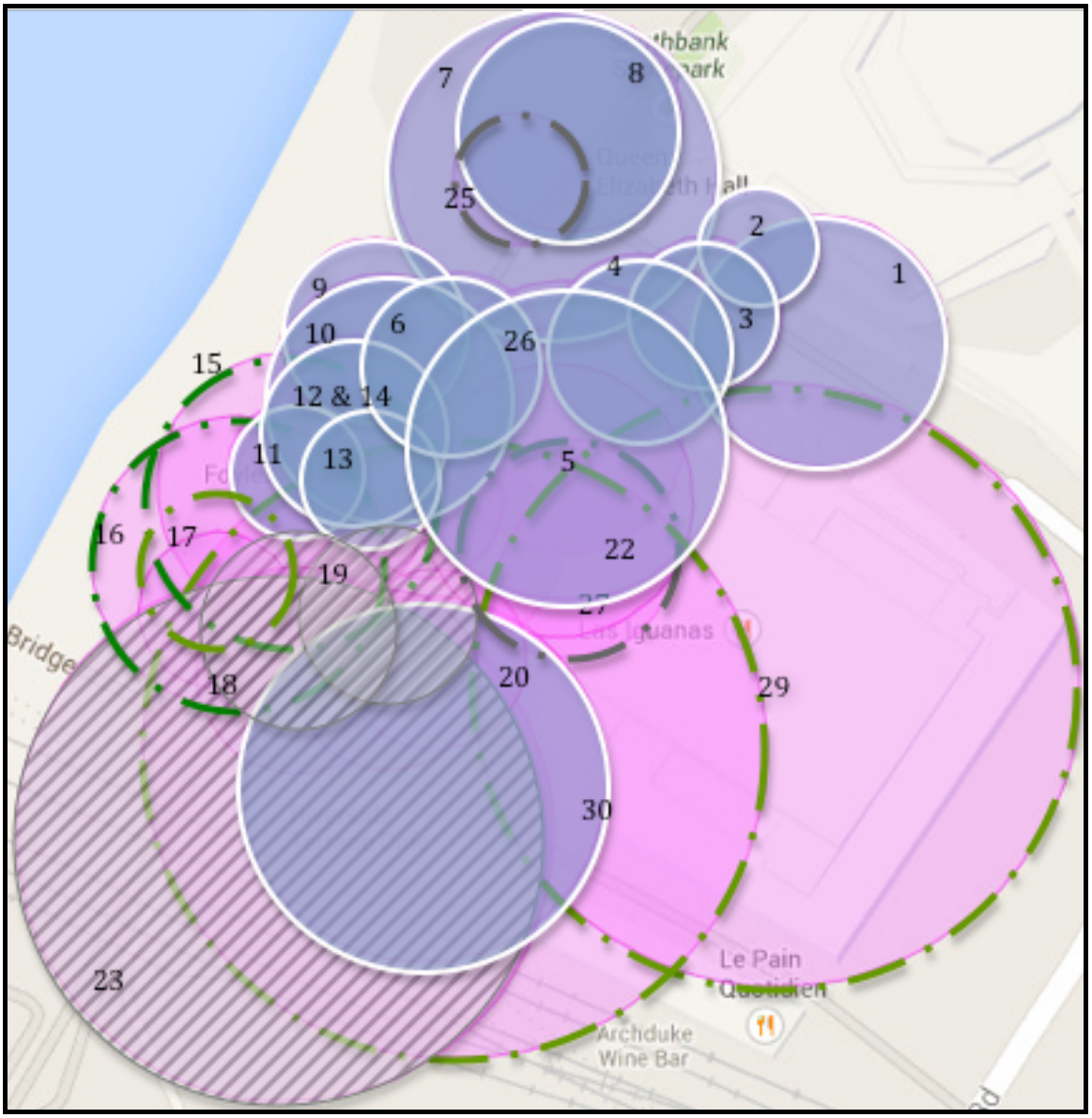


Figure 13: London SE1, whole circle map, coded by sound type (see Legend)

Choral and non choral sounds combined in single map

Circle label	*Order added*	*Audio assigned*	*Description*
TMBTH_8wav	30	TMBTH_8.wav	
WATER2	29	water2.wav	
WATER1	28	water1.wav	
YMV-WSO3.WAV	27	YMV-WSO3.WAV	
YMV-WSO2.WAV	26	YMV-WSO2.WAV	
northernline2	25	northernline1.wav	
northernline1	24	northernline1.wav	
knowles4	23	knowles4.wav	
YMV-WSO.WAV	22	YMV-WSO.WAV	
knowles3	21	knowles3.wav	
Knowles 2b	20	knowles2b.wav	
Knowles 2	19	knowles2.wav	
Knowles 1	18	knowles1.wav	
Birds 3	17	BIRDS3.WAV	
Birds 2	16	BIRDS2.WAV	
Birds 1	15	birds1.wav	
TMBTH 12	14	TMBTH_12.wav	
TMBTH 10	13	TMBTH_10.mp3	
TMBTH 9	12	TMBTH_9.mp3	
TMBTH 8	11	TMBTH_8.mp3	
TMBTH 7	10	TMBTH_7.mp3	
TMBTH 6	9	TMBTH_6.mp3	
TMBTH 5 (wav)	8	TMBTH_5.wav	
TMBTH 5 (mp3)	7	TMBTH_5.mp3	
TMBTH 4	6	TMBTH_4.mp3	
TMBTH 3	5	TMBTH_3.mp3	
TMBTH 2b	4	TMBTH_2b.mp3	
TMBTH 2a	3	TMBTH_2a.mp3	
TMBTH 1a	2	TMBTH_1a.mp3	
TMBTH 11	1	TMBTH_11.mp3	

Figure 14: London SE1. All circles' descriptors, media and functionality

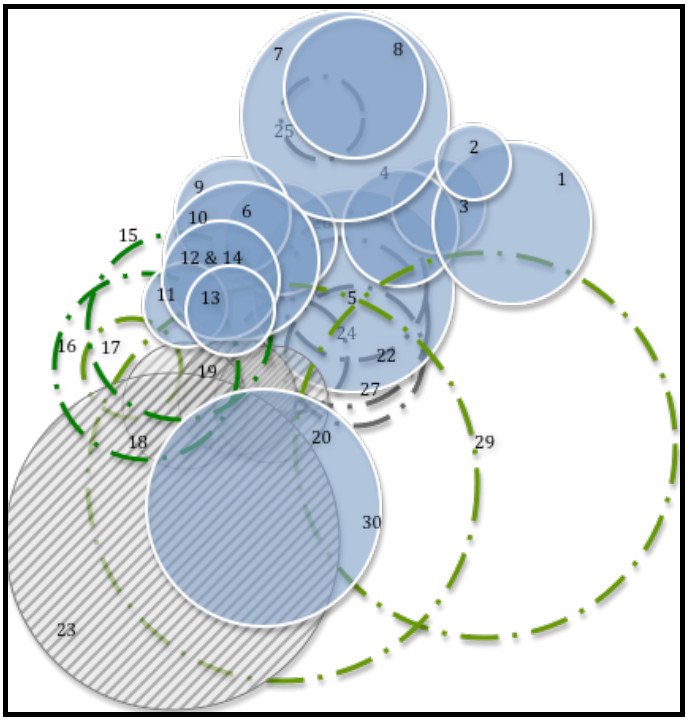


Figure 15: "Take Me By The Hand", London SE1. Map detail removed.

London SE1 aetting, choral and non choral sounds combined in single map, partially deconstructed:

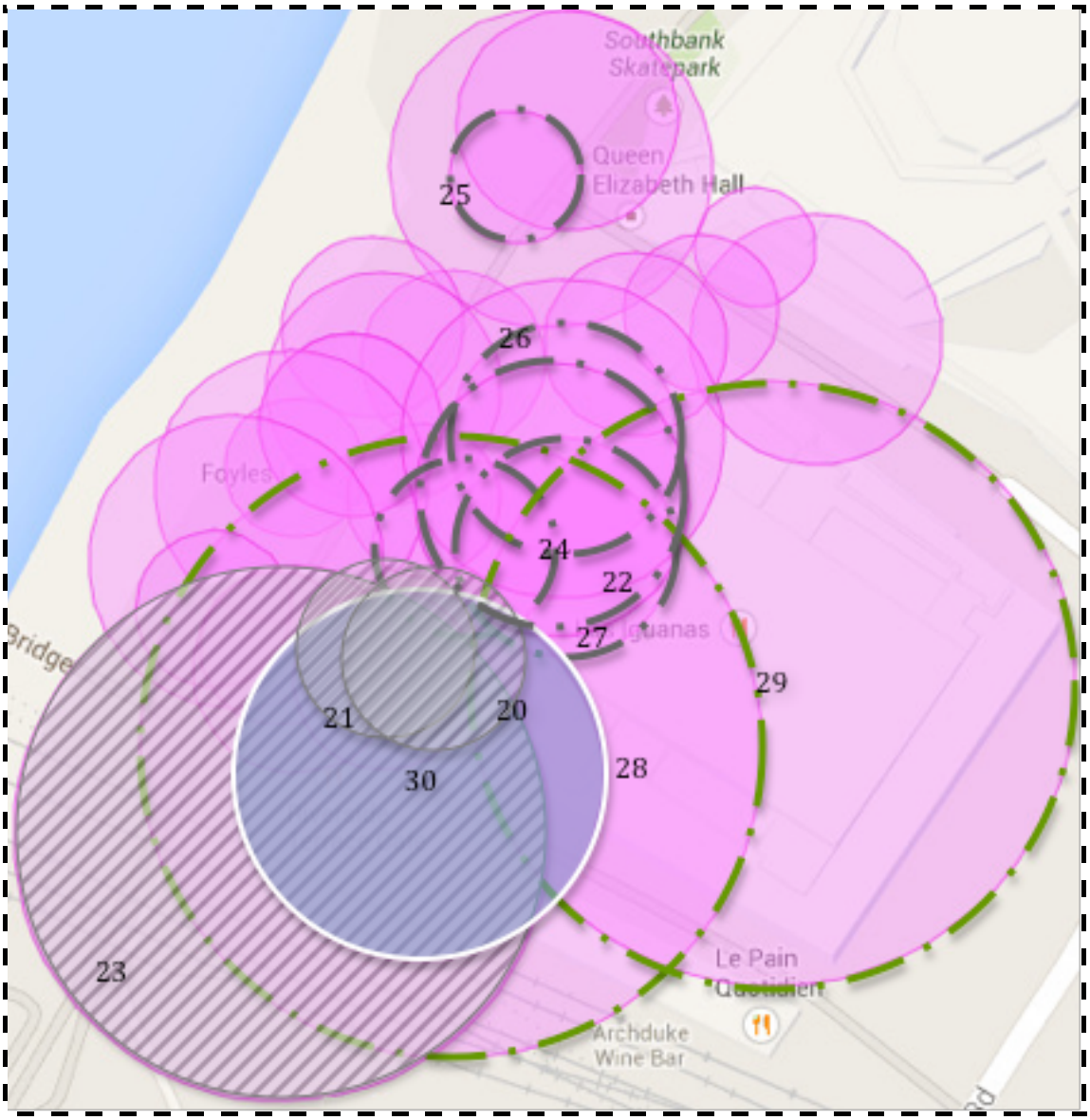


Figure 16: London SE1, whole circle map, partially sound-type coded.

Circles added to noTours maps form virtual layers upon previously added circles.

To edit a circle added previously, those above it must be manually moved and subsequently repositioned.

Exact replication of former positions is not always possible but can be achieved by editing the underlying code in output 'soundscape.rss' files read by the audio handset.

A circle's 3 attributes are noted and manually changed in the handset source code: latitude, longitude, radius.

These alterations are impossible to integrate to subsequent online revisions.

Therefore the working process is characterised by views such as the above, where, in the absence of a possible 'absolute' score, iterations must be possible to refer during revision with previous and planned stages.

Portfolio Appendix 3: Preface to acousmatic versions of ROOM

These versions were produced between three and twenty-one months after the live audition of the acousmatic, loudspeaker-array relayed composition at the John Hansard Art Gallery, Southampton on 15 December 2011.

The versions from 2012 represent some of the sequences of the live version. I continually reworked the material, at first seeking some 'ideal' form. The possibilities of recombination, re-manipulation and addition of initially absent elements (found objects like the Ukrainian lullaby fragments between 20'06" and 23'08" in the third version) paradoxically showed that the initial composition had been a success in the terms demanded of it.

These were that the music could be reinvented by the listener with repeated, differentiated audition, according to their movement around a space. The acousmatic forms recreate or simulate this listener action – mimicking a gamified, interactive form of them by the splicing of constituent parts.

ROOM, as a compositional experiment towards virtual performance, or the concept of 'music you can walk inside', succeeded in the following ways. It constituted a set of re-combinable parts which, despite change in sequence and juxtaposition, are palpably the same composition, a sonic landscape exploring representations of interior and (by contradictory extension) exterior spaces. Recordings and juxtaposed simulated impulse responses (acoustical properties of different physical spaces) were the motivic fragments of an abstract composition. This mutation of found object into musical material and simultaneous use of distinct simulated spaces became increasingly central to developing the 'digital studio as a compositional tool' into a facilitator of 'virtual performance', during later research. It is hoped further opportunities for staging *ROOM* will be found, in different settings from the conceptual art exhibition for which it was composed.

The third recording here was commissioned by BASIC.FM internet radio station. The brief was to recreate the acousmatic experience for headphone-based audition at exactly thirty minutes' duration. All of these recordings should be listened to on headphones.